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INTRODUCTION + GLOBAL ANIMAL WELFARE

CHALLENGES AND OPPORTUNITIES

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Introduction

Small animals play integral parts in people's lives around the globe, including as companions and in working roles. While they improve the well-being of the people whose lives they enrich, the well-being of these animals is not always optimal. Some welfare issues may be solved through education into the basic needs and ability to cope of our companion animals; others such as the pet trade and breeding of animals with functional problems (e.g. brachycephalic animals) require collaborative research including social science approaches. Through further research and education using an evidence based approach, we can continue to enrich the lives of both humans and small animals.

Development of WSAVA Animal Welfare Guidelines

The WSAVA recognize that improving small animal welfare is an important goal around the world. In 2018 the WSAVA Animal Welfare Guidelines were launched1. While it can be challenging to define what animal welfare means, the working definition used in these Guidelines is 'the physical and psychological, social and environmental well-being of animals'. It is important to include psychological and social well-being, as people may restrict themselves to focus on the physical health of animals. Physical health is certainly important, but not sufficient in itself to maintain well-being. For example, a dog may be physically health, but if it is in a state of fear and anxiety for most of its days, then its overall well-being would be poor.

In March 2019 the WSAVA Animal Welfare Guidelines were endorsed by 37 WSAVA member organizations, and have reached their goal to focus global attention on improving the welfare of small animals in our care. While focusing attention on animal welfare, they are not intended to stand alone, but to be integrated with other WSAVA Guidelines, such as the Global Pain and Global Nutrition Guidelines.

As well as working with other veterinary specialties, it is important to remember promoting animal welfare involves complex interactions, not only between the veterinary team, the animal, and the owner, but also involving the wider community, with impacts of cultural values, economics, pet-related industries, the environment and politics (see Figure 4 WSAVA Global Animal Welfare Guidelines).

This means to work on issues relating to animal welfare, interventions need to focus not only on the veterinary team and animal owner, but also the wider community with its cultural values.

Basic needs and ability to cope

Although the standard of veterinary care for companion animals has significantly increased around the world, it is important to remember that even in countries with highly developed and sophisticated veterinary care, the Five Welfare Needs of animals are not always being met.

The Five Welfare Needs are:

- **The need for a suitable environment**
- **The need for a suitable diet**
- **The need to be able to exhibit normal behaviour patterns**
- **The need to be housed with, or apart from, other animals**
- **The need to be protected from pain, suffering, injury and disease.**

In their latest survey of UK pet owners, the PDSA (2018) reported 16% of dogs were walked less than once a day, 24% were left alone for five or more hours on a typical workday, and 53% of cat owners matched images of their cat as being overweight or obese2.

Pet trade and companion animal welfare

Animal welfare does not begin when a new dog or cat enters the owner's house, but well before in the breeding and early environment of the animal. Small animals can sell for large amounts of money, and unscrupulous breeders have the opportunity to make large amounts of money at the cost of the welfare of the animals. In the past the marketplace for unscrupulous breeders was relatively small, but with the introduction and wide adoption of the internet this has changed.

In Europe the internet is now the most common method used by people when they look for a new companion animal.3 Risks to the welfare of these animals include the sale of underage puppies and kittens, with health problems due to lack of routine worming and vaccination. Online scams are also common with significant amounts of money lost due to fraud.

In Australia many dogs and cats are sold online, with thousands of these dogs and cats being relinquished animals looking for a new home.4 This can be a positive contribution in finding a new home, but risks specific to relinquishment include the new owners not knowing the true health and behavioral history of the animal, and of animal hoarders or people involved in dog fighting having ready access to free animals. Although data on online sales of companion animals in other regions, such as the USA and China, are currently lacking, it is likely online sales also represent a large proportion of trade in companion animals in these areas.

Breeding of animals with functional problems

The reasons people decide to purchase a specific type of small animal are complex, and include fads and fashion. Unfortunately, in recent years brachycephalic breeds of dogs and cats have become fashionable. A Danish survey asked owners of four dog breeds their reasons for acquiring that breed, finding that personality was sometimes perceived as more important than health or behavior.5 Veterinarians and other scientists need to play a role in testing brachycephalic dogs to provide information to breeders on the dogs that should or should not be bred from, and to use surgery to improve the lives of individual dogs seriously affected by breathing difficulties. A recent study demonstrated adding a 3 minute trot test could improve grading of brachycephalic airway obstructive syndrome (BOAS).6

The concept of shifting baseline syndrome, used in ecology, is one that also needs to be considered in animal welfare. Shifting baseline syndrome (SBS) describes graduate change in accepted norms in the state of the natural environment due either to a lack of past information, or the lack of experiencing past conditions.7 For example, as the structure of the skull of brachycephalic dogs has gradually changed, each generation has accepted flatter and flatter faces as the norm. When one views images of breeds such as the British Bulldog from a hundred or more years ago, the dramatic change in structure is apparent, but each generation accepts the way the dogs look. In the same way, generations have come to accept difficulty in breathing as normal for these dogs. As SBS in ecology increases tolerance for progressive environmental degradation, SBS in animal welfare has resulted in people accepting breeds that are no longer functional in terms of health and welfare. Through recognition that this has occurred, we may still work to improve future breeding practices and well-being of these animals.

Opportunities to improve animal welfare

While the internet presents risks to animals, such as in online trade, it also presents the opportunity to highlight to the public major risks to the welfare of animals welfare, generating media attention that can change practices. This has occurred in recent years against the dog meat trade; use of electric collars in dog training, and; cosmetic procedures such as declawing in cats and tail docking and ear cropping in dogs.

Improved undergraduate education in animal welfare can help to lead the way to future incremental improvements. Veterinary education has covered animal welfare science more systematically in recent years, and veterinary graduates take this education out into their workplaces to improve standards of animal care.

An example is in pain relief of small animals, which was not routinely performed in the past but is now an established part of veterinary practice. There is still a gap in acknowledgement of the emotional lives of small animals, and recognition of their signs of distress. However, through popular trends such as the fear free movement, this is beginning to change.

Conclusions

The WSAVA has focused attention on the welfare of small animals through release of Global Guidelines. There remain challenges to animal welfare around the world, including the online pet trade and popularity of brachycephalic breeds. As the world is more connected through the use of the internet and social media, these can be used to educate owners of the needs of their animals. It is also important to recognize the impact of shifting baseline syndrome on our recognition of welfare in animals. Continued education and promotion of animal welfare science will help to continue to improve the lives of the animals that live closest to us.

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INTRODUCTION + GLOBAL ANIMAL WELFARE

WHAT DO WE MEAN BY "ONE WELFARE"?

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Introduction

For some years, the term "One Health" has been used to recognize "that human health and animal health are interdependent and bound to the health of the ecosystems in which they exist" (1), often with an emphasis on infectious diseases that can pass between humans and other species. More recently, the term "One Welfare" has been used to emphasize the many other links between animal welfare and human welfare, and to acknowledge that both depend on a well-functioning ecological environment (2, 3). But what exactly are these links?

Improving animal welfare to improve human welfare and vice versa

The most obvious connection is that improving animal welfare is often a way to improve human welfare, and vice versa.

In the case of draft animals, for example, simple steps to improve animal welfare include using well-designed harnesses that do not cause injuries, providing adequate nutrition, and using more efficient carts so that energy is not wasted. One expert estimated that paying attention to these issues could greatly increase the working power of the animals and thus improve the owners' livelihood (4).

Other examples come from programs of animal and human rehabilitation that involve cooperation between animal shelters and prisons. In a typical case, dogs that are deemed unadoptable because of serious behaviour problems are assigned to carefully selected prisoners who work intensively to calm, train and socialize the dogs so that they can be adopted or even become assistance animals. In addition to benefiting the dogs, the program is said to be very beneficial for the prisoners by helping them develop responsibility, patience, tolerance and empathy, and gain a sense of satisfaction through service.

With food-producing animals there are many cases where improving animal welfare brings benefits to people. For example, good handling methods can improve growth and reproduction by reducing animal stress; good nutrition can improve the efficiency of growth; and safe, comfortable environments can prevent injuries (5).

Moreover, the reverse is also true: when people suffer from drought, famine or poverty, they are often unable to provide well for their animals, so improving the welfare of people can be a crucial step in allowing them to provide good welfare for their animals.

The need for coordinated action

One Welfare also underlines the need for veterinary and animal protection services to be coordinated with human health and related services to achieve better outcomes for both animal and human welfare.

Decades of research have shown that people who are violent toward animals are often violent to other people. For example, a study of over 100 women escaping from violent partners found that these women were nearly 11 times more likely to report that their partner had hurt or killed pets than a comparison group of women, and in some cases the threat of harm to the animals was so severe that women delayed escaping from violent partners because of fears for the animals' safety (6). Thus, animal welfare, domestic violence and child welfare agencies need to cooperate because the first person to see an abused child may be an animal welfare inspector acting on a complaint, and if a domestic-violence shelter does not partner with a shelter for pets, then victims may not use their services.

A topic that has received much less research is the neglect of animals and the role of human mental health (7, 8). As one example, a study in Ireland followed thirteen people who had been charged with neglect. It found that in five cases, the underlying problem was failing health or senility, and another four cases involved depression or other mental distress resulting from divorce or other personal difficulties (8). The conclusion was that in the majority of cases, we need to bring together animal welfare and human welfare agencies in order to solve the problems.

The hoarding of animals is another serious animal welfare problem with strong links to human mental health. Veterinarian Gary Patronek has identified classic hoarders as people who accumulate a large number of animals that overwhelm their ability to provide even minimal care, fail to acknowledge the deteriorating condition of the animals and the environment, and fail to recognize the negative effect on their own health and wellbeing.

Such hoarding is now seen as a distinct form of mental illness ("Hoarding Disorder") that often involves other conditions including depression, social phobia and generalized anxiety. The clear message is that to address this problem of animal welfare requires attention also to the mental health of the offender. If the animal welfare intervention is not accompanied by mental health intervention, the problem is likely to be repeated.

The need to coordinate animal welfare and human welfare is also clear in disaster relief. During Hurricane Katrina, for example, many people refused to evacuate from danger unless they could assure the safety of their pets. This became such an issue during Hurricane Katrina that the USA now has protocols in place for rescue of pets in disaster relief.

Protecting the environment is fundamental to both human and animal welfare

Finally, protecting the environment is fundamental for both human and animal welfare.

For example, the introduction of invasive species into places where they cannot be absorbed into a functioning ecological system can cause enormous economic loss and other hardship for people, combined with incalculable hardship for the native animals that often die of disease, starvation or extreme competition.

Pollution also affects human and animal welfare. For example, a review of coastal dead zones – areas of ocean where nutrient loading leads to a lack of oxygen and suffocation of fish – concluded that dead zones now affect a total area of more than 245,000 square kilometers and cause mass mortality to aquatic animals (9), often with severe effects on local fisheries.

Similarly, climate change and associated extreme weather affect people and animals alike. Indeed the effects of climate change are predicted to be so severe as to drive a significant percentage of the world's wild species to extinction (10).

The above problems – ecological collapse, pollution and extinction of species – are often viewed as problems of conservation, not animal welfare. Indeed, animal welfare and conservation have traditionally functioned as different spheres of activity, and sometimes they come into conflict, for example over predator control.

But as these examples show, many harms to the environment are major threats to both conservation and animal welfare, and the two movements need to work together to address them. In fact, I believe we are now in a century when protecting the life-sustaining processes of nature is a major challenge for both human and animal welfare.

Conclusions

As a concept, One Welfare serves as a call to recognize the many interconnections between human welfare, animal welfare and the integrity of the environment. In practical terms it is also a call to improve animal welfare in order to improve human welfare and vice versa, to co-ordinate actions between veterinary and human medical services, and to protect the environment in order to promote both human and animal welfare.

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THE GOLD STANDARD OF ANIMAL WELFARE - POSITIVE AND NEGATIVE IMPACT ON ANIMALS AND VETERINARIANS

ANIMAL WELFARE AND VETERINARY ETHICS: GLOBAL CHALLENGES FOR ANIMALS AND VETERINARIANS

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Introduction

Animal welfare is an area of increasing interest to the global veterinary community. Because of their role in animal health and disease, veterinarians are perceived by society to be experts in animal welfare, and are expected to make judgements about the welfare of animals both in their care and beyond (Siegford, et al. 2010). Additionally both the Federation of Vets of Europe (FVE) and the American Veterinary Medical Association (AVMA) state that “Veterinarians are, and must continually strive to be, the leading advocates for the good welfare of animals in a continually evolving society”(FVE-AVMA 2011).

However, this expectation also presents many challenges for our profession. Historically, veterinarians have not been well-trained in the science of animal welfare, and the robust application of veterinary ethics may be lacking across the curriculum. In some countries, veterinarians are still trained by performing aversive procedures on animals, (Patronek & Rauch 2007). Such practices may have a harmful impact on students attitudes to animals (Paul & Podberscek 2000) and on their learning experience (Balcombe 1997, Hart, et al. 2005, Martinsen & Jukes 2005), potentially leading to objectification and reduced empathy.

Accepted standards of veterinary ethics may sometimes clash with regional or cultural ethical viewpoints around the acceptability of different veterinary procedures such as amputation or euthanasia. In some areas a lack of veterinary regulation may create confusion about the role and responsibilities of veterinarians, and variations in drug availability and licensing may present challenges in anaesthesia and analgesia which contrast with the increasing professional interest in ever more complex veterinary procedures. These multiple and complex issues influence the ways in which we as veterinarians value and treat the animals that we are responsible for. By understanding the interplay between our own ethical decision-making and our impacts on the welfare of the animals we’re responsible for, we can strive to safeguard animal welfare even in challenging situations.
More guidance may be found at:
https://www.wsava.org/Guidelines/Animal-Welfare-Guidelines

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ORAL PATHOLOGY

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Introduction

AOrthodontic problems may be purely cosmetic or can result in trauma to the lips, gums, palate, or teeth. By far, the most common cause of malocclusions is hereditary. Additional genetic causes include tongue size as well as lip and cheek tension.
These patients often do not show any overt clinical signs other than the jaws or teeth being out of alignment. Depending on the type and severity of the problem, oral trauma may be present and can result in bleeding, oral pain, gum disease, tooth death and even nasal infection. Therapy for malocclusions is relative to type and severity of the disease process. Options include:

- No therapy (if purely cosmetic).
- Extraction of the offending tooth or teeth.
- Orthodontic correction using appliances.
- Lowering the tooth and then protecting the root canal (Coronal amputation and vital pulp therapy)

Persistent deciduous teeth

Persistent deciduous teeth are very common, especially in small and toy breed dogs. However, they can occur in any breed as well as cats. They create both orthodontic and periodontal problems if not treated promptly. It used to be believed that the persistent deciduous caused the permanent tooth to become malocclused. Studies have shown, however, that it is the permanent tooth erupting incorrectly that causes the deciduous to be persistent. It has been reported that orthodontic problems begin within two weeks of the permanent canines starting to erupt. This is due to the deciduous tooth being in the place that the adult wishes to occupy.

The periodontal issues occur due to a disruption of the normal maturation of the periodontium. When there is a persistent deciduous tooth, one area of the periodontium is not attaching to the permanent, therefore the periodontal attachment in that location will not be normal. It has been reported that the damage begins within 48 hours of the permanent teeth starting to erupt!

Therefore, the adult tooth does not need to be completely erupted for these problems to occur, and they should be extracted as early as possible, do not wait until six months of age to perform the extractions along with neutering. In fact, we recommend that the owners of breeds prone to retain their teeth be instructed to watch for eruption of the permanent teeth and to present the patient for therapy as soon as this occurs.

Fractured teeth

The two main types of crown fracture seen in veterinary medicine are complicated and uncomplicated. Both types require therapy; however treatment for each is often different.

All teeth with direct pulp exposure (complicated crown fractures) should be treated with endodontic or exodontic therapy; ignoring them is NOT an option. Prior to tooth necrosis, the viable nerve is excruciatingly painful. Following tooth death, the root canal system will act as a bacterial super-highway creating not only local infection, but also a bacteraemia which has been linked to more serious systemic diseases (see the article on periodontal disease for further information). The owners of these patients will be reluctant to pursue therapy as “It does not seem to bother the dog”. Fractured and/or infected teeth do bother the pet and they will act better following therapy. Veterinary patients are known for being stoic, and therefore lack of outward signs of oral pain should not be misinterpreted as a benign state. Therefore, you must be a patient advocate and recommend therapy.

Uncomplicated crown fractures are also a very common finding on oral exam, particularly in large breed dogs. These fractures will result in direct dentinal exposure. The exposed dentinal tubules will create significant pain for the patient. The currently accepted means by which this sensitivity is created is via the theory of fluid dynamics. In addition, some of these teeth will become non-vital due to the traumatic incident, pulpal inflammation, or direct pulpal invasion via the dentinal tubules. For these reasons, it is recommended that these teeth be radiographed to ensure vitality. If the teeth are non-vital (evidenced by periapical rarefaction or a widened root canal) endodontic or exodontic therapy is required. If the teeth appear vital, the application of a bonded composite is recommended to decrease sensitivity.

Intrinsically stained teeth: Endodontic disease is also manifested by intrinsic staining. This can appear as pink, purple, yellow, or grey. A study by Hale showed that only 40% of intrinsically stained teeth had radiographic signs of endodontic disease, however 92.7% are non-vital. Non-vital teeth lose their natural defence ability and are often infected via the bloodstream, which is known as anachorisis. Therefore, do not rely on radiographic appearance to determine vitality; all teeth should be definitively treated via root canal therapy or extraction.

Enamel hypocalcification (hypoplasia)

Areas of enamel hypocalcification will generally appear stained a tan to dark brown (rarely black) color, and may appe ar pitted and rough. The tooth surface is hard however, as opposed to the soft/sticky surface of a caries lesion. The areas of weakened enamel are easily exfoliated which will expose the underlying dentin, resulting in staining. Dentin exposure will result in significant discomfort for the patient.

The roughness of the teeth will also result in increased plaque and calculus retention, which in turn leads to early onset of periodontal disease.
Treatment is aimed at removing sensitivity, avoiding endodontic infection by occluding the dentinal tubules, and smoothing the tooth to decrease plaque accumulation. The most efficient and effective way to accomplish these goals is placement of a bonded sealant or composite restoration.

Feline Tooth Resorption (TR):

The best diagnostic tool for differentiating between types is dental radiology. With type 1 lesions, there is no replacement of the lost root structure by bone, whereas with type 2 there is generally marked replacement of the lost tooth structure.

Type 1 TRs are typically associated with inflammation such as caudal stomatitis or periodontal disease. In these cases, it is thought that the soft tissue inflammation has activated the odontoclasts. Type 2 lesions are generally seen in otherwise healthy mouths; however the lesions will create local gingivitis. The etiology of type 2 TRs remains unproven.

Recently, crown amputation has been suggested as an acceptable treatment option for advanced type 2 lesions as it results in significantly less trauma and faster healing than complete extraction. This procedure, although widely accepted, is still controversial. Most veterinary dentists employ this technique, however in widely varying frequency. Veterinary dentists typically employ this treatment option only when there is significant or complete root replacement by bone. Unfortunately, the majority of general practitioners use this technique far too often. Crown amputation should only be performed on teeth with radiographically confirmed advanced type 2 TRs which show no peri-apical or periodontal bone loss. Crown amputation should not be performed on teeth with: type 1 TRs, radiographic or clinical evidence of endodontic or periodontal pathology, inflammation, or infection; or in patients with caudal stomatitis.

Those practitioners without dental radiology capability SHOULD NOT perform crown amputation. In these cases, the teeth should either be fully extracted or the patient referred to a facility with dental radiology.

WSV - 008

WATER QUALITY IN KOI PRACTICE

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Introduction

With any animal, environmental conditions can affect their overall health, but with aquatic animals such as fish, proper water quality is an important part of keeping them healthy. Without clean water, the fish will be stressed and more susceptible to diseases and parasites. This lecture will provide veterinarians with information regarding how to test pond water and what the various water chemistry characteristics mean for the health of the fish. Correcting water quality problems is also included in the discussion.

Water quality can be measured with test kits available through pet stores or pond supply companies, or from many aquaculture suppliers. The simplest tests are small plastic strips with chemical pads attached that are dipped into the water to be tested. The pads change color which, when compared to a color chart, indicates the level of that substance in the water. These are fast, easy to use, inexpensive, and relatively accurate (they indicate a range rather than a precise measurement). Dry tablet tests are also available where a small tablet is dissolved into a test tube containing the water sample.

Its color is then compared to a chart to determine the results. Some test kits have liquids that are mixed with the water to produce the color reactions. More expensive test kits use a spectrophotometer to electronically compare colors and these give more accurate results. Effective electronic meters are also available for some water tests.

Temperature:

Koi (Cyprinus carpio) have a preferred optimum temperature range of 18-25 degrees Celsius (65-77 degrees Fahrenheit), but are able to survive at temperatures below or above this range. Gradual changes in water temperature within a fish's optimum range seldom cause health problems. Ideally, water temperature fluctuations should be no more than 3°C change per day. Temperature shock can occur with rapid changes, especially from warmer water to cooler water. Increasing the water temperature will lower the saturation point of dissolved oxygen (warmer water holds less oxygen than cooler water). It will also increase the toxicity of dissolved substances such as ammonia, chlorine, and heavy metals.

Chlorine and Chloramine:

Chlorine and chloramine are used by water municipalities to make the water supply safe for human consumption. These compounds are extremely toxic to aquatic organisms and no amount can be tolerated by fish. There should never be any chlorine detectable in aquarium or pond water! Add sodium thiosulfate or other dechlorinator to the koi pond whenever adding tap water of if chlorine is detected.

Ammonia:

Ammonia in the water reduces the ability of the fish to excrete nitrogenous wastes from their blood through the gills. As ammonia increases in the water, so do nitrogenous waste products increase in the fish's blood, causing toxicity, gill damage, and death. Ammonia is mostly converted to nontoxic ammonium at a pH level below 6.5, but above 6.5 ammonia can become toxic very quickly if allowed to accumulate. The higher the pH and temperature of the water, the more toxic ammonia becomes. The ammonia in the pond water is broken down by aerobic nitrifying bacteria into nitrite and then into nitrate. Properly operating biological filtration systems (after they have been cycled) should keep ammonia levels at 0.0 mg/L in the water.

In the event of a filtration system problem that creates high ammonia levels (>0.25 mg/L), Ammonia Neutralizing products can be added to the pond to bind the ammonia in a nontoxic form until water changes can be used to bring the ammonia level down. Failure to eliminate the ammonia through water changes will result in elevated nitrite levels a few days later.

Note: Some municipalities add chloramine to the water to make the tap water safe for human consumption. Contact the local water service if unsure of the chemicals being used in the tap water. Fish keepers in areas that have chloramine added to the tap water need to use an ammonia neutralizer as well as a chlorine remover to make the tap water safe for use in their aquarium or pond.

Nitrite:

Nitrite is produced by the aerobic bacterial nitrification of ammonia. It should also be maintained at a level of 0.0 mg/L. Nitrite reduces the ability of the fish's blood to carry oxygen. Salt in the water at 0.1-0.3% salinity will block the absorption of nitrite by the fish's gills. Remove any nitrite from the system by performing a partial water change. Nitrite will also be converted to nitrate by a different species of aerobic nitrifying bacteria.

Nitrate:

Nitrate is produced by the aerobic bacterial nitrification of nitrite. While high nitrate levels are dangerous to saltwater fish and invertebrates, freshwater fish are very tolerant of high nitrate levels. Most freshwater fish can tolerate levels of 100 mg/L for short periods of time without significant problems. It is preferable to maintain nitrate below 10-20 mg/L, and periodic water changes in the pond should keep the nitrate level down. If nitrate levels exceed 20 mg/L, additional water changes can be used to lower the concentration. High levels of nitrate also promote algae growth.

pH:

The potentia Hydrogenii, or power of Hydrogen, is the acid-base balance in water. Most freshwater fish are highly adaptable to slow changes in the pH as long as it is not too extreme (less than 5.5 or above 8.5). Rapid changes in pH are more detrimental to fish, and it is very important that the pond water has a stable pH. The stability of the pH is related to water Alkalinity and Hardness. If there are extremes of pH, or rapid fluctuations, it is likely because the alkalinity is too low.

Alkalinity:

Alkalinity is a measurement of the negative ions (e.g., Hydroxide, Carbonate, Bicarbonate) in the water that buffer against pH shifts. Ideal alkalinity for koi is in the 100-250 mg/L range. As the alkalinity falls, the water in a pond may experience sudden, and deadly, pH shifts. If it happens in your system you can increase the buffering capacity of the water to stabilize the low pH by adding supplements such as sodium bicarbonate or calcium carbonate to raise the alkalinity.

Hardness:

Hardness is the measurement of metallic positive ions (e.g., Calcium, Magnesium) in the water. Water with high hardness usually also has a high pH. Softening the water will lower the mineral content and the pH. Hardness in koi ponds is best at 100-250 mg/L. Most fish will adapt to existing hardness as long as it is not too extreme of a change.

Summary:

Water testing is one of the most important aspects of maintenance for your filtration systems. It is an important key in determining how the biological filters are functioning. Keep a log book of the water test results, to monitor changes in the water parameters. Water testing is not something to be taken lightly.

Periodic partial water changes using dechlorinated tap water will keep pond water values normal. The frequency of changes will depend on the water test results, but normally once per month in established ponds is sufficient. Examples of incidents requiring increased water changes include toxin contamination, abnormal pH or alkalinity values, high ammonia, nitrite or nitrate levels, or over-medication. Test the water after performing a partial water change; if necessary, repeat partial water change to correct water quality parameters. Test the source water (tap water) to ensure it has the correct water parameters fo the fish, and adjust with chemicals as necessary.

WSV - 099

PAIN MANAGEMENT IN THE CRITICAL PATIENT

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Anesthesia & Pain Management for the Critical Patient

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The role of veterinary technicians in developing an anesthetic and analgesic protocol for critical patients is a complex task. The veterinary technician must work together with the clinician and other team members to ensure that the critical patient is properly evaluated and cared for. Before administration of any anesthetic and analgesic agents, each patient must have a physical exam. This is exam should include (but is not limited to) a chest auscultation to assess cardiovascular and respiratory function, an ECG, temperature, blood pressure, femoral pulse evaluation, and pulse oximetry readings. In some cases it is also important to obtain lab values such as a PCV/TS, blood glucose, electrolyte panel, creatinine level, and blood gases. Once the clinician develops a clearer picture of overall patient status, they can assign an ASA rating, and an anesthetic and analgesic protocol can be administered. Proper protocols will change with each patient and the type of surgery or treatment needed as well as perceived pain. It is important to note that if a patient is thought to be in pain, analgesics should NOT be withheld. This lecture will discuss four common critical patients that are often in need of anesthesia and analgesia.

1. The Urethral Obstruction Patient:

Cats with urethral obstruction often present in pain and distress. They often require immediate and rapid urethral catheterization. Treatment should begin with assessing the patients' electrolyte and hydration status and checking for any arrhythmias. Hyperkalemia is a common finding in urethral obstruction patients. This can lead to ECG changes such as a wide QRS complex and absent or flat P waves. Often the T wave is peaked or tented. (Fossum, 2007) Hyperkalemia and acidosis may require additional drug therapies such as calcium gluconate, insulin given with a concurrent dextrose drip, sodium bicarbonate (Perkowski, 2000) Although calcium gluconate does not alter potassium values, it does stabilize cell membranes, allowing time to reduce the potassium levels and minimize the cardio toxic effects of hyperkalemia. (Cummings, 2014)

An IV catheter should be placed in all critical patients, especially the urethral obstruction patient. Cats will often need analgesics as well as sedation for placement of urinary catheter. Analgesia can be achieved with buprenorphine or hydromorphone. Propofol may be used as an induction agent prior to general anesthesia. Also, if the patient is in the early stages of the disease ketamine can be used in conjunction with diazepam for induction of general anesthesia. If the patient arrives laterally recumbent or critically ill, they may not require chemical restraint. In these patients, urethral catheterization can often be achieved with an opioid analgesic combined with a saccrococcygeal block using bupivacaine. (Campoy, 2013)

Post urethral obstruction, the patient must be monitored closely for hydration status, electrolyte imbalance, and analgesic therapy. In cats without evidence of chronic or acute kidney disease, NSAIDs can be administered to provide analgesia and decrease urethral inflammation. In cases where an NSAID is contraindicated, the clinician may use a therapeutic laser to help reduce the inflammation present post catheterization.

2. Gastric Dilatation Volvulus (GDV)

GDV is characterized by stomach distention and a clockwise rotation. This condition is considered a surgical emergency. Patients presenting with GDV are often large breed canines with deep chests. Presenting problems include restlessness, abdominal pain, unproductive vomiting, dyspnea, and distention of the abdomen. Because most GDV patients present in some form of cardiogenic shock, it is important that all team members be on hand as multiple events need to be synchronized to ensure maximum patient comfort and survival. The dilated stomach obstructs blood flow through the caudal vena cava, while the increase in gastric pressure decreases blood flow through the portal vein. (Benett, 2010) Initial treatment after physical examination will include IV fluid therapy via either a jugular catheter or large bore catheters in each cephalic vein. Gastric decompression by trocarization is recommended to improve ventilation before general anesthesia is initiated. (Bennett, 2010)Pre-medication as well as analgesia may be achieved with an opioid such as fentanyl, oxymorphone or hydromorphone. In animals that present as very ill, opioid doses can be reduced. Anesthesia can be induced using an opioid and benzodiazepine such as midazolam. Alternatively, etomidate combined with a benzodiazepine can be used. These combinations have very minimal impact on the cardiovascular system as opposed to other induction medications like propofol. Intra operatively inhalant anesthesia can be kept to a minimum by using a constant rate infusion (CRI) of fentanyl/lidocaine/ketamine.

This combination will not only provide multimodal analgesia but also lidocaine has the added benefit of being an anti-arrhythmic should ventricular arrhythmias develop. The FLK CRI can be continued in the post-operative period to maintain a steady state of analgesia. Post-operatively, the patient can be transitioned to IV buprenorphine at the clinician's discretion.

3. Hemoabdomen/Splenectomy

The hemoabdomen patient often presents with signs of hypovolemic shock (pale mucous membranes, rapid heart rate, weak or "thread" pulses, etc.). Often this can be secondary to neoplasia (or a ruptured splenic mass. Before proceeding with the splenectomy patient, attempts should be made to restore the patients' tissue perfusion and oxygen delivery before general anesthesia.

Hypovolemic patients often have simultaneous RBC and protein loss so colloids and other blood products are often needed preoperatively. (Cummings, 2014) Hemoabdomen patients proceeding to surgery can be treated similar to the GDV patient. Pre-operatively an opioid will provide analgesia. Induction can be achieved with an opioid and benzodiazepine combination. The patient should also receive concurrent pre-administration of oxygen via facemask or nasal catheter. Etomidate can also be used for induction combined with a benzodiazepine. Agents such as thiopental or propofol are not recommended due to their common side effect of vasodilation.

Again as with GDV patients, a FLK CRI can be a useful adjunct to minimize inhalant anesthesia. The FLK CRI can be continued in the post-operative period to maintain a steady state of analgesia.

4. Dystocia

The patient presenting with dystocia and requiring caesarian section (CS) must be handled very carefully to ensure the safety of the dam as well as fetuses. In CS patients anesthetic requirements are often reduced because of increased progesterone levels. There is also a reduced functional residual capacity of the lungs due to the pressure of the intra-abdominal volume of the fetuses. Patients that are not overly anxious or stressed should have an IV catheter placed, abdominal shaving and pre-oxygenation before drugs are administered.

If selecting an opioid for pre-medication a mixed agonist/antagonist such as butorphanol may be preferred to minimize fetal respiratory and CNS depression. (Norkus, 2010) A longer acting pure-mu opioid can be administered upon fetus removal to provide analgesia to the mother. Induction cab be achieved using a low dose benzodiazepine (<0.15mg/kg) followed by propofol or etomidate. (Norkus, 2010)

Alfaxalone, has become the induction agent of choice for caesarian patients, although it is important to keep in mind Alfaxalone is not an analgesic. Mask induction is not recommended due to the side effects and exposure to the staff.

If staff are so trained, an opioid/local anesthetic epidural can be a very effective analgesic tool that can dramatically reduce the need for inhalant anesthetics.

5. Trauma

Anesthesia and pain management of the trauma patient can be most challenging to the veterinary staff. Many body systems can be affected and concurrent and multimodal therapies are often needed. For the trauma patient, anesthesia should not be initiated until vital organ function has been stabilized. The trauma patient must have a patent airway. The clinician should ensure that circulating blood volume is maintained in order to provide tissue perfusion and oxygen delivery to vital organs. (Wadell, 2010)

The goal with pre-medicating trauma patients is to provide analgesia as well as reduce the overall amount of induction agent needed. Agents that are reversible (opioids& benzodiazepines) are preferred to agents that are not reversible (acepromazine, ketamine). An opioid analgesic such as fentanyl is an attractive option in the trauma patient as it is rapidly cleared from the body very quickly, which can help facilitate a neurologic examination. During induction patients should be pre-oxygenated. Induction can be achieved using an opioid/benzodiazepine combination. In some cases this may not be enough to intubate and a small amount of propofol is necessary to facilitate intubation. In cases where increased intra cranial or intra ocular pressure is not a concern a ketamine/diazepam induction may be an attractive choice as it allows rapid intubation and will provide some analgesia.

Post-operatively trauma patients must have vigilant nursing care constantly assessing their cardiovascular, respiratory, and pain level. Multimodal CRIs provide constant analgesia without the "peaks and valleys" effect seen with some intermittent dosing of analgesics.

Implementing a pain scoring system can help your clinic effectively titrate analgesics to fit your patients' needs. The University of Colorado offers a species specific color chart available for download. These handouts can be placed in recovery and treatment areas to help train technicians and staff to recognize various pain behaviors.
http://www.csuanimalcancercenter.org/assets/files/csu_acute_pain_scale_canine.pdf

Working together the veterinary team can implement an anesthesia and pain management protocol to help ensure the comfort and safety of any patient walking through your doors.

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WSV - 313

USE OF ULTRASOUND IN EMERGENCY MEDICINE: INDICATIONS, BENEFITS, AND PITFALLS

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Introduction

Veterinary Point of Care Ultrasound (VPOCUS) now includes multiple ultrasound- techniques that allow practitioners' to rapidly assess patients for underlying conditions, often life-threatening, without compromising patient safety. They are specifically designed to detect injury within the abdomen, thorax and pericardial space including free abdominal fluid, pneumothorax, pleural effusion, general lung pathology, basic cardiac pathology, and assess intravascular volume status within minutes of patient arrival. They are extremely valuable in trauma patients, unstable emergency patients, daily assessment of critically ill patients, and for general patient evaluation. The information provided by these exams is instrumental in the management of these patients and they can be implemented into everyday practice. It is important to note that VPOCUS exams are not extensive abdominal or thoracic ultrasound nor are they echocardiograms. They are point of care rapid ultrasound techniques that are performed at the same time as the initial patient evaluation and treatment (physical exam, blood pressure, IV catheter, IV fluids, sedation, analgesia, SPO2, minimum emergency database) or as part of continued daily patient monitoring. They are repeatable and objective, and findings are often answered by simple binary questions. They are validated, evidence-based, sensitive and specific, and take under 10 minutes to complete. Indications to VPOCUS exams include, but are not limited to:

Any small animal trauma patient, blunt or penetrating, particularly those that are unstable, that have a total solids less than 60 g/L and/or a decreased PCV, or that show external injury

Any small animal patient presenting with unstable cardiovascular or respiratory signs, particularly if the underlying cause is uncertain

Any patient in which pericardial effusion is suspected (pulses paradoxes, muffled heart sounds, electrical alternans)

Any patient suspected to have pneumothorax (dyspnea with decreased breath sounds dorsally)

Any patient suspected to have pleural effusion (dyspnea with decreased breath sounds ventrally)

Any patient in which intra-abdominal free fluid is suspected

Any collapsed and/or unstable patient (i.e. elevated shock index, hyperlactatemia, unexplained hypotension, tachycardia, or decreased mentation) regardless of trauma, particularly if the underlying cause is uncertain.

Any patient with acute abdomen/abdominal pain
Post-surgical patients that become unstable or in whom there is a concern for bleeding or risk of dehiscence/ peritonitis

Some keys points:

Veterinary point of care ultrasound (VPOCUS) exams cannot replace a physical exam and are in fact often guided by the initial findings of the triage exam (pulses paradoxes, shock, respiratory distress, abdominal pain and vomiting, muffled lung sounds etc.)

They often provide complimentary information which in many situations directs further direct diagnostics and therapies that may be lifesaving
Do the entire VPOCUS scan but answer the most urgent lifesaving question(s) first!

BRING THE MACHINE TO THE PATIENT! Don't discontinue stabilization efforts to perform VPOCUS.
A key approach to learning and expanding the role of VPOCUS is to get comfortable asking yes/no binary questions.

By clearly defining the objectives of the rapid ultrasound, one can avoid "fishing expeditions" that are often associated with low pre-test probabilities and can lead to significant increases in the likelihood of false positive results

Human studies show the likelihood of false negative and false positive results are markedly decreased when asking binary questions

Do a complete thorough POCUS assessment to answer the binary question being asked (if you are looking for abdominal fluid, do a complete fluid search at each site you evaluate!)

Abdominal VPOCUS

The FAST abdominal exam, described in 2004 (Boysen et al 2004), was the first VPOCUS exam to be validated in small animals. The goal was to detect free peritoneal fluid following blunt abdominal trauma, and therefor concentrated on 4 key sites of the abdomen; sites where target organs were most likely to be injured following trauma; liver, spleen, kidneys and urinary bladder, and where fluid is most likely to accumulate based on patient positioning and gravitational forces. The study demonstrated that this FAST abdominal protocol was sensitive and specific for the detection of free abdominal fluid.

The study also demonstrated that abdominal FAST can be performed during resuscitation, was rapid (<5 minutes), required minimal experience, was repeatable, and was noninvasive. Abdominal VPOCUS has now been validated in non-trauma cases (McMurray, Boysen, Chalhoub; JVECCS 2016). How accurate is abdominal VPOCUS?

The detection of free abdominal fluid via sonography is more sensitive than radiographs

A recent study by Walters (JVECC 2018), compared the original 2004 Abdominal FAST to CT for detection of free fluid by minimally trained ER docs and found excellent agreement (Kappa 0.82)

Although abdominal VPOCUS localizes fluid to the abdominal cavity, which permits centesis and fluid analysis, it cannot identify the actual abdominal organ injured in most cases (contrast enhanced ultrasound not done much in veterinary medicine)

Limitations: penetrating trauma and retroperitoneal injury have lower sensitivity for finding effusion, trauma does not always produce effusion and sometimes there is a delay in the appearance of effusion (hence why serial exams are recommended).

Thoracic VPOCUS: Lung, focused Heart and Pleural Space

Arguably, patients presenting with respiratory distress can be quite challenging as it is not always easy to differentiate cardiac, pleural space and parenchymal disease, particularly in cats. An incorrect diagnosis may result in life threatening interventions being delayed, or lead to an incorrect therapy being administered, which may cause patients to deteriorate. There are several algorithms that have been developed to help differentiate cardiac from non-cardiac causes of respiratory distress, most of which rely on radiographs and a cardiology consult if the patient is sufficiently stable, and/or physical exam findings and history of the patient is unstable.

Most algorithms unfortunately do not incorporate the use of point of care ultrasound by non-specialists in differentiating causes of respiratory distress in cats or dogs. The skills required to perform pleural space and lung point of care ultrasound are easily learned with minimal formal training and can differentiate the major causes of respiratory distress. A particular advantage of pleural space and lung ultrasound is the fact it can be performed while the patient is receiving oxygen therapy, anxiolytics, and other stabilization efforts. In general, if it's possible to auscult the patient with a stethoscope, thoracic VPOCUS can also be performed, even in an oxygen cage if necessary.

Following the original TFAST study, additional thoracic VPOCUS techniques have been developed with different objectives. A study by Rademacher et al (2014 Vet Rad Ultrasound) developed a lung ultrasound protocol which was the first to demonstrate that alveolar interstitial syndrome (AIS) can be diagnosed in dogs using sonography. Subsequently multiple VPOCUS techniques (Ward et al, JAVMA 2017; Lisciandro et al, 2014 Vet rad Ultrasound; Vezzosi et al, 2017 JVIM; Armenise A, Rudloff E, Boysen SB et al, JVECC 2017 in press) have been used for the detection of AIS.

In addition to advancements in detecting lung pathology, thoracic VPOCUS can also detect underlying cardiac function abnormalities in cats and dogs. Recent studies clearly show cardiovascular POCUS performed by non-specialists helps to differentiate respiratory from cardiac causes of dyspnea in both cats and dogs (Ostroski C et al, JVECC 2016 abstract; Hezzell MJ et al, JVIM 2017 abstract, in press). Finally, thoracic VPOCUS has recently been demonstrated to help detect intravascular volume changes in dogs and cats via assessment of the caudal vena cava (references)

With so many thoracic protocols being used in small animals there is some confusion as to what clinicians mean when they state "I did a TFAST exam" or "I assessed the thorax with sonography". It is therefore important to standardize the approach to thoracic VPOCUS (e.g. searching for pleural effusion, pericardial effusion, pneumothorax, basic cardiac function, volume status, etc.) so that the information stays objective and translatable. One approach to solving the confusion surrounding the ever-expanding exams incorporated into VPOCUS is to return to the binary questions VPOCUS was originally designed to answer (pleural fluid yes/no, pneumothorax yes/no etc.). This approach helps in keeping these exams standardized, as well as answering important clinical questions (hence why we do these exams).

In the thorax, the broad clinically relevant questions we ask include:

Pleural space:

- Is there pneumothorax (is there a glide sign or B lines)?
- Is there pleural effusion?
- Lung: Is there AIS (are there an increased number of B lines)?

Heart:

- Is there pericardial effusion?
- Is there adequate contractility (decreased)?
- Is there left atrial enlargement (subjective left atrial aortic root ratio enlargement)?

Caudal vena cava:

- Is there evidence of caudal venal caval distention?
- Does the caudal vena cava decrease in size during inspiration?

Limitations: certain normal and abnormal artefacts (z lines, e lines) can be confused for b-lines, a glide sign can be difficult to detect, pneumothorax can be challenging to rule in, small amounts of effusion can be missed if not careful, steeper learning curve for the heart).

WSV - 031

RECENT ADVANCEMENTS IN ONCOLOGY

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Introduction

Oncology is making continual strides with therapies and diagnostics in an effort to help not only diagnose cancers earlier but offer novel therapies to owners

Cancer Vaccines:

Oncept anti cd20 LSA Vaccine

The canine melanoma xenogeneic DNA vaccine has been shown to be safe, results in the development of antibodies and T cells and is effective. Merial has gained conditional approval for its Oncept LSA vaccine, which uses the same concept but is designed to induce immunity to CD20. The concept is therapeutic immunization to be used on achieving remission with chemotherapy. In an abstract of 9 dogs, the survival time of vaccinates after completion of 25-week CHOP protocol was >734 days. Data suggest that the product needs to start early in the treatment protocol as the average time for the generation of the immune response is likely near one-month post completion of the vaccine. Assuming a 6-month protocol + vaccine post completion (2 months), the average remission duration = 6-8 months. Thus, most patients are relapsing likely prior to the vaccine being able to generate an effective response. Data from a recently completed trial in which patients were administered the LSA vaccine during the second cycle of chemotherapy, noted an improvement in remission duration of 4 months.

Where are we now with this product?

Currently, Merial/BI is reviewing the data from the most recent study in order to submit to the USDA for full licensure.

Canine Osteosarcoma Vaccine

Listeria monocytogenes is a gram-positive, intracellular bacteria that are capable of inducing potent innate and adaptive immune responses. Through its expression of listeriolysin (LLO), a pore-forming protein that enables it to escape from the phagosome prior to lysosome fusion, it rapidly gains access to the cytoplasm of the cell and is then involved in the MHC I-processing pathway. This enables the induction of CD8+ cytotoxic T-cell responses. The use of a highly-attenuated form of L. monocytogenes has been proven effective to introduce target antigens into antigen-presenting cells (monocytes, macrophages, and dendritic cells). By genetically fusing the target antigen of interest to LLO, potent CD8+ T-cell responses can be generated against the target antigen. ADXS31-164 is a highly attenuated strain of L. monocytogenes that has a chimeric human HER2/neu antigen fused to its LLO. Using the same platform, a recombinant HER2/neu-expressing Listeria-based therapeutic vaccine (AT-014 or Canine Osteosarcoma Vaccine) has been licensed by Aratana.

In a small study, 18 dogs with appendicular osteosarcoma (OSA) treated first with amputation and chemotherapy (4 doses of carboplatin) then received one of four doses of ADXS31-164 intravenously every 3 weeks x3. The study reported low grade, transient toxicities and it appeared that ADXS31-164 broke peripheral tolerance and induced antigen-specific IFN-responses against the intracellular domain of HER2/neu in 15/18 dogs within 6 months of treatment. There was also a decrease in the incidence of metastatic disease and significantly improved survival times @ 1, 2 and 3-year vs. historical control group). The median survival time of 11 historical control dogs was 316 days vs. 8 of the treated dogs with Grade I disease, that achieved a median survival time of 956 days. 11 of the 18 treated dogs have surpassed the median survival time (MST) of the control group. Adverse events were mild to moderate and primarily consisted of fever, lethargy, and nausea/vomiting.

Where are we now with this product?

Aratana currently has conditional licensure for this product in the USA and a larger safety study of > 150 is underway the data from which will be used to obtain full licensure.

Chemotherapy:
Tanovea CA-1 ™ VetDC:

Tanovea™ was discovered by Gilead Sciences, Inc.,

and licensed to VetDC for use in animal cancer, (previously known as VDC-1101). This agent was designed to preferentially target and attack cancer cells implicated in lymphoma. The data from studies totaling well over 330 patients have shown Tanovea™ to be highly effective against LSA with a 60-80% overall response rate. Not surprisingly, responses are higher in naïve LSA vs relapse and in dogs with a B cell phenotype. Data suggests Tanovea™ is well-tolerated with a similar side effect profile as other commonly used agents. The drug is given via the intravenous route at 1mg/kg every 3 weeks. The FDA has recently given Conditional Approval and the drug is NOT restricted to only oncologists.

Although the majority of side effects associated with this agent are similar to those of most chemotherapeutics, two unique side effects (and one that is not unusual) occur, that clinicians need to recognize and know how to treat.

• Pulmonary fibrosis: this was recorded in a small percentage of the patients treated and the mechanism is unknown. As this was fatal in some cases, screening with thoracic films and exclusion of patients with pre-existing pulmonary issues, or particular breeds at risk of pulmonary fibrosis, is warranted.

• Dermatopathy: occurred in a minority of patients and often appears along the pinna and chest. Per VetDC, resolution of the side effects occurs once discontinuing the protocol.

Where are we now with this product?
The pivotal trial is currently underway as a multisite, randomized, double-blinded prospective study, the data from which will be submitted to the FDA to obtain full approval.

Cancer Screening/Detection

The CADETSM BRAF Assay:
Transitional cell carcinoma (TCC) is the most common bladder cancer. Generally, Diagnosis is based upon signalment, ultrasound, urine cytology, however, definitive diagnosis generally requires histopathology (cystoscopy, traumatic catheterization, surgical exploratory).

Recent studies identified a mutation (V595E) in the canine BRAF (cBRAF) gene in a large proportion of canine urothelial carcinoma (UC) and prostatic carcinoma (PC). In assessing various cancers including epithelial, mesenchymal, and hematopoietic, the V595E mutation was identified in canine UC and PC with the highest penetrance rates of up to 87%.

Knowing bladder and prostatic cancers shed tumor cells into the urine, the presence of the V595E mutation in urine is an excellent molecular diagnostic marker. The digital droplet PCR assay identified the mutation in free catch urine samples from 85% of canine urothelial carcinoma and prostate carcinoma patients.

The assay has since been validated in clinical cases, demonstrating the mutation is not present in the urine of healthy dogs, or from dogs that have benign bladder diseases. In cases with concurrent histopathology, there was concordance between BRAF mutation + in free-catch urine and pathology-based confirmation of a bladder/prostatic carcinoma. As such the presence of the mutation in canine urine is, therefore, a highly specific indicator of the presence of a TCC/UC.
CADET® BRAF Plus assay detects a second signature in >2/3 of non-BRAF TCCs, i.e >10% of the 15% BRAF wild type TCCs. The PLUS assay launched commercially as an ADD-ON test for CADET®-BRAF wild type (mutation undetected) cases and this increases overall sensitivity 85% to >95%

Where are we now with this product?
The product is available to all veterinarians and current trials are assessing the use of early detection followed by NSAID usage.

Appetite stimulation:
Entyce ®(Aratana Therapeutics): Capromorelin mimics the action of the hunger hormone ghrelin. Ghrelin is a 28-amino acid peptide produced primarily in the stomach and binds the ghrelin receptor. It has a short half-life (~10 minutes) and accumulates in the bloodstream slowly between meals. Ghrelin binds to receptors which increases signaling in the hypothalamus, resulting in hunger thereby increasing food intake. Secondary effects of ghrelin include the stimulation of growth hormone secretion by activation of GHS-Rs in the hypothalamus and pituitary gland, which subsequently increases insulin-like growth factor-1 production. This results in an increase in lean body mass. Capromorelin is an orally active small molecule which has more sustained effects vs Ghrelin. The drug has been shown to be safe in both cats and dogs and more specifically has been shown to cause increased food intake and weight gain in both laboratory and client-owned dogs and increased food intake/body weight in cats.

Mirataz® Kindred Bio: Mirtazapine is a commonly used appetite stimulant in cats. Recent pharmacodynamic studies have shown it is safe and can be an excellent appetite stimulant. Higher doses, however, are commonly associated with side effects such as vocalization, hyperexcitability, and tremors.

Thus, the recommendation is the use of smaller, more frequent doses. Still, a challenge is in the administration via a pill. Mirataz® (mirtazapine transdermal ointment is a novel formulation for topical use in cats that are resistant to pilling. Data has shown the product is not only safe but result in weight gain normal cats. This represents another option for cats with cancer.

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WSV - 029

FELINE INFLAMMATORY AIRWAY DISEASES

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OVERVIEW

There are a number of important inflammatory airway diseases of the cat including asthma, chronic bronchitis, parasitic bronchitis, and secondary bacterial bronchitis. Asthma, a type I hypersensitivity reaction against aeroallergens results in pathologic features of airway eosinophilia, airway hyperresponsiveness and airway remodeling. Chronic bronchitis is characterized by airway neutrophilia with mucus hypersecretion and impaired mucociliary function; the initial trigger of chronic bronchitis is uncommonly identified. Parasitic bronchitis encompasses Aelurostrongylus abstrusus, heartworm associated respiratory disease (HARD) and possibly Toxocara cati. Secondary bacterial infections arise as a sequel to a variety of underlying etiologies and are likely associated with a disrupted lung microbiome (i.e., dysbiosis). This lecture will primarily focus on non-infectious inflammatory disorders in the cat, with brief mention of treatment of the other infectious disorders. All airway diseases to a certain extent can have some overlapping clinical signs and thoracic radiographic features. Thus, discrimination of these disorders requires consideration of signalment, historical signs, physical examination findings, thoracic radiography, testing for infectious causes, analysis of lavage fluid cytology and response to therapeutic trials. There are some similarities in the strategy for management (e.g., relevant parasitic control in at risk environments and environmental modulation to reduce inhaled irritants), there are also some specific treatments especially for allergic asthma.
APPROACH TO INFECTIOUS INFLAMMATORY FELINE

AIRWAY DISEASES

Ancillary diagnostics as mentioned above can be helpful to discriminate infectious etiologies of lower airway inflammation. Aelurostrongylus abstrusus, heartworm associated respiratory disease (HARD) and secondary bacterial infections can cause inflammatory airway lesions. Experimentally it has been suggested that Toxocara cati also causes airway-oriented lesions, although the clinical significance of these lesions in pet cats is unknown. Treatment for these diseases may include an anthelmintic, an appropriate year-round heartworm preventative in endemic areas (regardless of whether the cat is indoor only), and an antibiotic ideally based on culture and sensitivity that passes the blood bronchus barrier (e.g., doxycycline), respectively. Short term glucocorticoid therapy may also help resolve inflammation and clinical signs. Chronic infections may predispose to chronic bronchitis, which is not a curable disease, but can be managed with lifelong therapy (see below).

OVERVIEW OF APPROACH TO NON-INFECTIOUS INFLAMMATORY FELINE AIRWAY DISEASES

Ruling out infectious inflammatory airway disease is part of the work up for non-infectious disorders. Ultimately, lavage fluid analysis (cytology and culture) will help discriminate chronic bronchitis from allergic asthma. The hallmark feature of chronic bronchitis is non-degenerate neutrophilic inflammation and of asthma, eosinophilic inflammation. Cultures are generally negative, although secondary bacterial infections can result. Allergen-specific IgE testing may be beneficial for determining relevant aeroallergens and employing avoidance strategies.

For decades, the cornerstone of management for feline asthma and chronic bronchitis has consisted of environmental modulation, glucocorticoids and bronchodilators. Environmental modulation consists of avoiding or minimizing inhalation of irritants or in asthmatic cats, allergens to which a cat has been sensitized. Irritants might include smoke (cigarette smoke, smoke from wood stoves or fireplaces, aerosols, powders, dusty cat litter, etc) and can trigger non-specific airway hyperresponsiveness. HEPA filters are useful when cats are indoors. Glucocorticoids are critical for both asthma and chronic bronchitis as they are anti-inflammatory. Bronchodilators are most important for asthmatic cats, especially those with wheeze or episodic respiratory distress; they may not be necessary for asthmatic cats that have cough as the sole clinical manifestation or in cats with chronic bronchitis.

GLUCOCORTICOIDS

Glucocorticoids are the mainstay of therapy for inflammatory airway disease as unchecked inflammation can predispose to airway hyperresponsiveness and remodeling. There are many routes of administration including oral, inhaled, injectable and transdermal, but not all are good therapeutic options because of adverse effects (e.g., injectable repositol forms) or lack of efficacy (transdermal). There are many types of glucocorticoid preparations, most of which have not been studied specifically in cats. The vast majority of the literature on use of glucocorticoids for feline lower airway disease has been in experimental models.

The author prefers to start treatment of asthma and chronic bronchitis with oral prednisolone, which has higher bioavailability than oral prednisone. If oral prednisolone is not effective, oral dexamethasone has been advocated; however, it has greater diabetogenic effects than prednisolone. Inhaled glucocorticoids have all but replaced oral glucocorticoids in humans with asthma as the drug is delivered directly to the site of disease and systemic effects are minimized.

In cats, inhaled glucocorticoids have been shown to have minimal systemic immune effects but can suppress the hypothalamic-pituitary-adrenal axis. Inhaled fluticasone can effectively suppress airway inflammation in cats. The exact dose for each type of inhalant steroid for pet cats is not known and many doses are used anecdotally. There is a plateau effect where high doses do not achieve a larger benefit, meaning that more is not always better. Experimentally, very high short term doses of fluticasone have been shown to be as effective as prednisolone in reducing airway inflammation. Transdermal administration of prednisone or prednisolone (2 mg/kg BID X 3 weeks) does not lead to detectable blood concentrations of prednisolone and thus should not be used therapeutically.

BRONCHODILATORS

For cats with evidence of acute bronchospasm (e.g., cats having "asthma attacks" also called status asthmaticus), bronchodilators are the most important medication to alleviate the airflow limitation. They are perhaps not as critical for cats who only have cough as the chief complaint when glucocorticoids are given to suppress airway inflammation, as resolution of airway inflammation may reduce narrowed lumens and cough. It is the author's opinion that bronchodilators should not be given as monotherapy to asthmatic cats or cats with chronic bronchitis. The reason is that these are primarily inflammatory diseases and inflammation must be addressed to halt further damage to the airways. Bronchodilators have adverse effects such as hyperexcitability, systemic hypertension and tachycardia; additionally, owner compliance may be poor with oral medications given 2-3 times daily. Thus unless cats have clinically relevant bronchospasm, the emphasis should be placed on glucocorticoids to manage inflammation.

Short acting beta 2 agonists (SABA) are the most important lifesaving therapy for a cat with status asthmaticus as they work quickly and are potent. Interestingly, there is evidence that chronic inhaled use of SABA may paradoxically exacerbate airway inflammation and airway hyperresponsiveness. In humans this is known as the beta agonist paradox and is responsible for increasing mortality associated with over use of SABA alone. In an experimental model of feline asthma, inhaled racemic albuterol which is a 1:1 mixture of R- and S-albuterol given twice daily for 2 weeks led to significant increases in airway eosinophilia; the R-isomer alone did not. Thus, the author recommends racemic albuterol to be used predominantly as a rescue medication at home and ideally no more than twice weekly.

If sustained use of a SABA is needed, inhaled levalbuterol, a commercially available form of R-albuterol, or oral bronchodilators (SABA or methylxanthines) may be administered. Inhaled long acting beta 2 agonists (LABA) are thought to have similar paradoxical reactions, although these effects have not been specifically studied in cats. Overall, LABA (salmeterol) is thought to have weak but more sustained bronchodilatory effects in healthy cats but does not appear to be an effective bronchodilator in asthmatic cats. If given the choice of an injectable or inhaled SABA for an asthmatic cat in crisis, the author will preferentially use an injectable medication as with severe bronchospasm inhaled medications may not adequately reach the target airways. In other words, cat in distress are unable to breathe sufficiently deeply or for long enough periods for inhalant medications to reach their targets.

There have been a variety of other medications have been investigated in experimental asthma models for potential bronchodilatory and anti-inflammatory properties. These include nebulized lidocaine, anticholinergics, cysteinyl leukotriene antagonists, anti-serotonergics and anti-histaminics. Nebulized 2% lidocaine 2mg/kg TID for 2 weeks had no anti-inflammatory effects but significantly reduced AHR compared with placebo. The anticholinergic ipratropium has synergistic bronchodilatory effects with albuterol. There has been no evidence to suggest that the other aforementioned classes of drugs including zafirlukast, cyproheptadine or cetirizine beneficially reduce AHR or airway inflammation.

OTHER ASTHMA THERAPEUTICS

Dietary omega-3 polyunsaturated fatty acids and luteolin (an antioxidant flavinoid) administered to experimentally asthmatic cats for 4 weeks showed no effect on airway inflammation, but did show a decrease in airway reactivity. Importantly, although this prophylactic treatment holds promise to diminish airway hyperresponsiveness, because it does not blunt eosinophilic airway inflammation (which ultimately contributes to worsening airway hyperresponsiveness and airway remodeling), it should not be given as monotherapy to treat feline asthma. Inhaled N-acetylcysteine, a mucolytic and antioxidant medication, was also tested in experimental feline asthma and was found to increase airway resistance putting into question its safety in cats with preexisting airway disease. No studies to date have evaluated the effects of N-acetylcysteine administered either orally or by inhalation on airway inflammation or mucus quality in asthmatic cats.

Since allergic asthma is thought to be driven by a T helper 2 lymphocytic process leading to a type I hypersensitivity reaction, modulating Th2 lymphocyte activity seems like a rational target. Treatments which function by altering T cell activity which have been tested in experimental models include cyclosporine, allergen-specific immunotherapy, receptor and non-receptor tyrosine kinase inhibitors and stem cells. In experimental feline asthma, cyclosporine did not inhibit the early phase response to allergen challenge (mediated in large part by mast cells), but it was effective at blunting airway hyperresponsiveness to acetylcholine and airway remodeling. Because of the need for therapeutic monitoring and the potential side effects of cyclosporine, it is NOT advocated for routine management of feline asthma, but may be considered in severe or refractory cases. Other potential therapies being evaluated for the treatment of feline asthma include allergen-specific immunotherapy ("allergy shots").

Allergen-specific immunotherapy is most commonly administered to humans with allergic rhinitis, but has also been used in the treatment of asthma. There is evidence that an abbreviated form of conventional immunotherapy, called rush immunotherapy, may dampen eosinophilic inflammation in experimental feline asthma. Addition of an adjuvant (CpG immunostimulatory sequences which polarize the immune response towards a T helper 1 and away from a T helper 2 response) demonstrated good safety and efficacy. Comparing the subcutaneous route of injection with topical mucosal delivery of allergen-specific rush immunotherapy was also performed in experimental feline asthma. The latter route of administration more closely mimics the natural route of exposure to aeroallergens. Both routes of administration of allergen-specific immunotherapy decreased eosinophilic airway inflammation and were generally associated with minimal side effects;
either could be used.

However, the subcutaneous protocol demonstrated more consistent resolution of scored clinical signs after allergen challenge by aerosol. Concurrent use of oral glucorticoids during immunotherapy diminishes its efficacy; however, inhaled steroids do not alter beneficial effects of immunotherapy. The major difference between allergen-specific immunotherapy and other forms of treatment (eg, steroids and bronchodilators) is that immunotherapy has the potential for cure of the disease by re-training the immune system to be tolerant to allergens.

This has not yet been tested in pet cats with asthma and there are differences in the protocol used in this model versus conventional immunotherapy—a clinical trial in pet cats still needs to be performed. Inhibition of tyrosine kinases, a group of proteins which regulate cell survival, growth and differentiation, has more recently been of interest for treatment of asthmatic patients.

Tyrosine kinase inhibitors are small molecule inhibitors which block the ATP binding sites of kinases. In asthma, the c-KIT receptor has been associated with proliferation and degranulation of mast cells and eosinophils in humans and mice and seems to be a logical target for therapeutic intervention. Masitinib had beneficial effects on the asthmatic phenotype; however, adverse effects were common and limiting. Toxicity of these small molecule inhibitors is a concern and the side effects must be carefully weighed against the potential benefits on airway inflammation and airflow limitation.

Stem cell therapy has been advocated for use in a number of chronic lung disorders, including asthma. Allogeneic adipose-derived mesenchymal stem cells have been assessed in experimental feline asthma. These are different from commercial autologous stem cells many of which are really "stromovascular fraction" that likely have few stem cells. While with the protocol used there was no reduction of airway inflammation or AHR, airway remodeling assessed by computed tomographic changes was dampened compared with placebo. Additional study of stem cell protocols is warranted.

WSV - 016

SUTURES, NEEDLES, AND SUTURE PATTERNS: ALL YOU EVER NEEDED TO KNOW

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Introduction

The choices that veterinarians make everyday with regard to suture materials, needle choices and how to optimize their use in closure of all kinds of tissues tend to be automated and are generally given little consideration. Most veterinarian's busy clinical lives leave little time for consideration of these more mundane-seeming points but these decisions can have profound effects on surgical outcomes including surgical site infections (SSI) and wound dehiscence. These complications can not only lead to a longer treatment course for the patient and increased costs for owners can even precipitate life-threatening or fatal results when procedures involve luminal organs of the gastro-intestinal or urinary tract. Over the last few years much research in this field has emerged and medical device companies have introduced many new products in the wound closure space.

Needle selection in small animal surgery can be

mind-boggling as a huge variety of choices that are on offer to the human medical world are also available to veterinarians. Needle point type is one important choice to make. Most commonly either taper point or cutting needles are used. Taper point are preferred for luminal organs, vascular surgery and subcutaneous closure. Taper point needles won't cut through delicate tissues and tend to reduce the size of the hole created in the tissue. A variety of cutting needles exist that allow passage of the needle through fibrous or dense tissue such as fascia and the dermis/epidermis. Reverse cutting needles are often the preferred cutting needle type in order to prevent widening of the suture holes as the needle is drawn through the tissues. Regardless of needle type it is essential to remember that the way a needle is passed through tissue has a major effect on the tissue track that a needle creates. Surgeons should always use a rotating wrist action to allow the curvature of the needle to pass through the tissue rather than pushing the needle through which tends to result in larger needle holes.

Suture should ideally only persist in tissue for as long as it is required and no longer. Suture materials are generally categorized according to whether they are monofilament, multifilament, absorbable or non-absorbable.

Monofilament sutures are generally preferred as they have less tissue drag and are less likely to harbor bacteria although there are also coated multifilaments that minimize the risk of bacterial colonization and improve handling. Multifilaments have the one distinct advantage of having less memory and therefore better handling properties. Absorbability occurs due a variety of mechanisms including proteolytic enzyme breakdown (chromic gut) and hydrolysis (polydioxanone, poliglecaprone 25, polyglactin 910). The rate of absorption is important to understand as well as the fact that absorption can be markedly affected in the face of different tissues as well as different environments such as infection. In healthy tissue loss of 50% of normal tensile strength for commonly used suture materials including Poliglecaprone 25 (e.g. Monocryl), Polyglactin (e.g Vicryl), and polydioxanone (PDS) occurs at 1-2 weeks, 2-3 weeks and 5-6 weeks respectively with complete absorption occurring at 119 days, 56-70 days and around 180 days respectively. However, an example of the effect of tissue environment on suture absorption is urinary tract infection. Data from experimental studies where commonly used suture materials were bathed in urine containing bacteria commonly implicated in urinary tract infections showed profound effects in some cases.1In this study soaking of tested sutures in urine accelerated degraded of all suture types tested and Proteus infected urine caused poliglecaprone 25 to retain only 11-14% of tensile strength by day 14.1As a result, the authors suggested that poliglecaprone 25 may not be an appropriate suture type for use in animals that might be harboring such an infection. Data such as this should help inform surgeons suture choices and is the reason the author prefers longer lasting sutures such as polydioxanone in the urinary tract and why if possible an effort should be made to minimize exposure of suture material to urine when these cases are being operated. The gastro-intestinal tract environment can also have potential effects on the degradation of certain suture materials. One study evaluated the effect of pH on polydioxanone degradation and found that in acidic environments such as the stomach tensile strength degraded rapidly after 2 weeks immersion in a solution with a pH of 1.0 at which time there was no measureable tensile strength remaining.2

Other important considerations when choosing sutures are suture sizes and knot security. The weakest point of any continuous closure is the knot and so in these situations knot security is paramount. It is well known that extra throws should be placed on the ends of continuous closures and it is generally recommended that one extra throw should be placed at the beginning and 2-3 extra throws should be placed at the end of a continuous line.

3We also know that suture size is an important variable in knot size and secondarily tissue reactivity to the knot. For every suture size increase knot volume increases by a factor of 4-6 with a consequent increase in tissue reactivity of 2-3 fold.4 Use of the smallest sized suture that is strong enough for any given indication is therefore encouraged.

As it is well recognized that there is an inverse relationship between the volume of suture material in a wound and the number of bacteria needed for a SSI to develop, considerable interest in the role of antibacterial sutures has developed. Most antibacterial sutures use a coating of Triclosan as their active agent which has been shown to have in vitro activity against Staphylococcus aureusand epidermidis, methicillin-resistant staphycoccus aureus, enterococcus sp., pseudomonas sp., and Escherichia Coli.5While several large studies have struggled to demonstrate wholesale improvements in SSI or other wound complication rates both in veterinary6,7and human studies8, other studies have shown interesting findings in certain procedure types, notably in gastrointestinal applications, where inflammatory and wound healing parameters were improved with the use of triclosan-coated antibacterial suture materials.9Further larger studies in veterinary species will be required to fully elucidate the quantitative benefit if any in our small animal species.

One new and exciting development in the suture space recently has been the availability of barbed sutures designed to facilitate knotless continuous suturing. While primarily developed to facilitate intracorporeal suturing where knot tying is a significant challenge, they are also being used extensively in open surgical techniques. Barbs cut into the body of the suture create friction as they pass through tissues thereby maintaining tension and negating the need for knots to be tied at the end of the continuous line. At the start of a suture line barbed sutures either incorporate a loop (VLOC, Medtronic Inc, Stratafix, Ethicon Inc) through which the suture is passed after the first bite has been thrown or a fixation tab (Stratafix, Ethicon Inc) which will anchor the suture end as it will not easily pass through the tissue after the first bite has been taken. These sutures have been used extensively in minimally invasive procedures such as intracorporeal gastropexy10but also have been described for open gastro-intestinal suturing as even tendon repair.

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WSV - 011

UPDATE ON INSULIN THERAPY: WHAT'S AVAILABLE AND WHEN TO USE IT

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OVERVIEW AND CLASSIFICATION OF INSULIN

TInsulin is classified by source, duration of action, and preparation. Today, the majority of available insulin preparations are human recombinant or synthetic insulin. In fact, Vetsulin® is the only remaining animal source (porcine) insulin in use today. When classified by onset and duration of action, insulin preparations are classified as rapid-acting, short-acting, intermediate-acting, or long-acting. The rapid-acting and majority of the long-acting insulin preparations are human insulin analogs, which are created by modifying the amino acid structure of recombinant human insulin. In general, these alterations make absorption and duration of action more consistent and predictable. This has led to an overall decrease in the occurrence of hypoglycemic episodes in human diabetics. This is in comparison to crystalline insulin preparations (e.g. NPH, Vetsulin®, PZI) where the addition of protamine and/or zinc promotes the formation of insulin hexamers leading to a slower onset and longer duration of action. Hexamer dissociation is associated with greater variability in absorption and duration of action, and increases the risk of hypoglycemic events.

CURRENTLY AVAILABLE INSULIN PREPARATIONS

- Rapid-acting: Insulin lispro (Humalog®)
- Insulin aspart (NovoLog®)
- Insulin glulisine (Apidra®)
- Short-acting: Regular insulin (Humulin® R, Novolin® R)
- Intermediate-acting: NPH (Humulin® N, Novolin® N)
- Lente insulin- 30% semilente + 70% ultralente (Vetsulin®)
- Long-acting: Insulin glargine- 100 U/ml (Lantus®, Basaglar®)
- Insulin glargine- 300 U/ml (Toujeo®)
- Insulin detemir- 100 U/ml (Levemir®)
- Protamine Zinc Insulin (ProZinc®)

INSULIN THERAPY IN DOGS

Intermediate-acting insulin formulations continue to be the most commonly used and recommended insulin preparations for the management of canine diabetics. The two currently available intermediate-acting insulin formulations are NPH and Vetsulin®. The starting dose is 0.25-0.5 U/kg every 12 hours with acceptable glycemic control being achieved in most dogs with a dose of 0.5-1 U/kg every 12 hours.

The long-acting insulin formulations have been evaluated in dogs, and there does not appear to be a clear benefit to using insulin glargine (Lantus®) or PZI (ProZinc®) in the management of dogs. Insulin detemir (Levemir®) results in improved glycemic control in some dogs but the potency (Levemir® starting dose: 0.1-0.2 U/kg) of the formulation limits its use in small dogs. The low potency of Lantus® and Toujeo® make these formulations useful in small dogs that are unregulated but have recurrent hypoglycemia with small doses (1-3 U) of NPH or Vetsulin®. Long-acting insulin analogs are an option for dogs in which acceptable glycemic control cannot be achieved with NPH or Vetsulin®.

The use of a rapid-acting insulin analog administered concurrently with NPH has been investigated in a small group of dogs. This protocol (i.e., administration of a rapid-acting insulin with an intermediate-acting maintenance insulin) is similar to protocols commonly used to manage human diabetics. In the trial, insulin lispro was administered with NPH at mealtime in six dogs that were considered to have well-regulated diabetes while receiving NPH, but continued to have a profound postprandial spike in blood glucose. Subcutaneous insulin lispro at a dose of 0.1 U/kg was well tolerated and blunted the postprandial spike (decreased the blood glucose at 60 and 90 minutes). Although this approach may prove beneficial in dogs that have unacceptable glycemic control related to postprandial hyperglycemia, this combination protocol is likely not necessary for the majority of canine diabetics and increases the risk of hypoglycemia. When initiating this protocol, it is recommended that the maintenance insulin dose be reduced by at least as many units as the number of units of rapid-acting insulin being added (i.e., total units of insulin being administered is the same or less). This will hopefully decrease the potential for hypoglycemic complications.

INSULIN THERAPY IN CATS

It is possible to achieve ideal glycemic control in most cats with twice daily administration of long-acting insulin formulations. The time-action profile of these insulins is more appropriate in cats than intermediate-acting insulins and higher remission rates are reported in cats receiving long-acting insulin preparations. Currently available formulations that are routinely used in cats include insulin glargine (Lantus®), PZI (ProZinc®), and insulin detemir (Levemir®). The recommended starting dose for these long acting formulations is 1-2 U/cat every 12 hours. The majority of cats will have acceptable glycemic control at a dose of 1-6 U/cat every 12 hours. Twice daily insulin administration is recommended and is more likely to result in good glycemic control.

If it is not possible to administer insulin twice daily, once daily administration of Levemir® or Toujeo® (starting dose: 1-2 U/cat) may provide acceptable control of clinical signs and decrease the occurrence of complications associated with untreated diabetes mellitus. Toujeo® has been studied in healthy cats, but there is limited information about clinical use available.

INSULIN THERAPY FOR DIABETIC KETOACIDOSIS (DKA)

The three protocols for the treatment of DKA that have been described in veterinary medicine include administration of human regular insulin via intravenous constant rate infusion (CRI), hourly intramuscular (IM) insulin, and IM insulin administered every 4 to 6 hours. Many clinicians consider intravenous CRI the standard of care although the ideal route of administration remains a matter of debate. More recently, insulin lispro and insulin aspart administered as an intravenous CRI have been successfully used to treat DKA in dogs. It was concluded that these rapid-acting analogs are a safe and effective alternative to regular insulin although a clinically significant benefit was not identified.

To the author's knowledge, subcutaneous administration of rapid-acting insulin analogs for the treatment of DKA in dogs and cats has not yet been investigated. This treatment may provide an alternative to CRI and IM regular insulin protocols in cats and dogs, and may have advantages when compared to traditional protocols.

Results obtained in the author's research laboratory in healthy cats combined with the clinical data obtained in people suggests that a subcutaneous insulin aspart protocol could be an effective treatment for cats with DKA. This type of intermittent treatment protocol could be a better option for intermediate care wards or veterinary facilities that do not have an intensive care unit or access to numerous intravenous fluid pumps.

The ability to use rapid-acting analogs to treat dogs and cats with DKA may be of greater importance in the future if regular insulin becomes unavailable due to decreasing demand for the management of human diabetics.

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WSV - 044

THE ART OF SKIN CYTOLOGY

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Overview of the Issue

TCutaneous cytology is an important diagnostic tool to definitively diagnose secondary infections of the skin and ears due to bacteria (cocci and rods) and yeast (Malassezia). Cytology is an inexpensive tool with a short turn around time as it can be performed in clinic. Cytology can provide valuable information about skin/ear infections that need to be treated in our dermatologic patients. Cytology is also a valuable tool for determining response to treatment. Cytology can help characterize the microbial population on the surface of the skin when lesions are present.

Objectives of the Presentation

1. To review cytology techniques
2. How to stain and interpret cytology

When taking cytology it is important to determine what micro-organism you are most suspicious of when looking at your samples. Bacteria and Malassezia can be found in higher numbers using certain cytology techniques over another. Certain cytology techniques will be more favourable based on lesion appearance. For a moist dermatitis, an impression smear might be the technique of choice. If samples are to be taken from a crusting dermatitis, the edge of a glass slide can be used to gently lift the corner of the crust and an impression smear obtained from under the crust. If pustules are present, a sterile 25G needle can be easily used to lift the top of the pustule and then an impression smear obtained from the open pustule. If epidermal collarettes are present, a cotton tipped applicator can be rubbed under the scaly ring for the best sample. Cotton tipped applicators can be used to collect other cytology samples. When using a cotton tipped applicator, the skin should be rubbed vigourously until there is a colour change on the applicator. The sample should be rolled onto a slide. Multiple samples can be rolled onto one labelled slide to allow for more efficient reading of the cytology samples.

I personally find tape preparations the best way to find Malassezia. Acetate tape preparations can also be used for dry lesions. Clear acetate tape should be used for these samples. A small piece of tape is taken and then "stuck" onto the lesion multiple times1. Once the tape is no longer "sticky" it can be stained. Tape preparations are also a great way to collect samples from areas such as the lip margin, interdigital regions and nail beds.

One study by Lo et al, showed that by inserting a toothpick into the claw folds on dogs with suspected claw fold dermatitis, a higher yield of yeast and cocci was noted when compared to using acetate tape or impression smears2.

Ear cytology

When doing ear cytology it can be helpful, when taking the sample, to rub the opposite ear to prevent the pet pulling away from you or jumping as you are taking the sample. Ear cytology and skin cytology can be performed with a cotton tipped applicator. The cotton tipped applicator should be rubbed vigorously onto the skin until there is a colour change on the applicator. If ear cytology is being taken, the cotton tipped applicator should be inserted into the ear canal to the junction of the vertical and horizontal canals. The cotton tipped applicator can then be gently rotated a few times and removed from the ear.

Cytology samples should be heat fixed and then stained using Diff-Quik® and viewed under the microscope. I use the 10-10-20 rule for dipping into the stain (more dips into the blue stain).

Staining Cytology

If an impression smear or sample from a cotton tipped applicator are obtained, these slides should be heat fixed and then stained. A modified Wright stain, or Diff-Quik®, is the most common stain used for cytology preparations3,4. Once stained the slide is rinsed with water and then dried before being examined under the microscope. If an acetate tape preparation is obtained, this does not need to be heat fixed but does need to be stained. DO NOT put the tape into the fixative as this will cause the adhesive in the tape to break down and your sample will be left at the bottom of the fixative jar! I like to stick one end of my tape onto a glass slide to hold the tape. I then use the slide to dip the tape into the red and blue stains (10 dips in the red and 20 in the blue). The "sticky" side of the tape is then laid onto the glass slide. With any cytology samples, a cover slip can be placed onto the slide to allow for better viewing under the microscope.

Viewing Cytology

Slides should first be scanned at a low power for aggregates of inflammatory cells, nuclear streaming or acantholytic keratinocytes4,5. Any identified areas are then examined under higher power. Multiple regions on the slide should be viewed as findings can differ between different areas of the slide.

Interpreting Cytology

Classification of a semi-quantitative method for assessing cytology has shown good intra-observer and inter-observer reproducibility. The Canadian Academy of Veterinary Dermatology has one of these type of scales available on their website. You can also grade cytology using number estimates of how many organisms are noted e.g. 0-2 yeast/OIF.

In my opinion, I do not have a rule as to "how many organisms are too many and require treatment". I always pair my cytology findings with what my patient is showing me and their clinical signs. However, documentation of an inflammatory reaction and intracellular bacteria provides confirmation of pyoderma3. Minimal data exists documenting normal yeast numbers on feline skin so the presence of any yeast on cutaneous cytology taken from a cat should be considered abnormal. When viewing otic cytology, rods are not commensals of the ear canal in dogs or cats so the presence of any rods should be considered abnormal.

Normal findings on cytology

It is important to be familiar with what constitutes normal findings on cytology. Keratinocytes and melanin granules are considered normal findings. Simonsiella organisms can also be found on cutaneous cytology. This is a bacterial species that lives commonly within the oral cavity. It is not a pathogenic organism but does indicate that the patient has been licking or chewing at the region the cytology was obtained from.

Summary including 5 KEY "TAKE HOME" POINTS:

1. Cytology is a simple and inexpensive way to determine whether a cutaneous infection is present and contributing to your patients pruritus or skin disease.
2. Knowing what is "normal" on cytology is important to allow interpretation of your samples.
3. There are multiple ways to obtain cytology (cotton tipped applicators, tape preparations etc), some of which are better for specific lesions or micro-organisms.
4. Diff-Quik® can be used to allow better identification of micro-organisms on your samples.
5. Always pair cytology findings with the clinical signs your patient is exhibiting.

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WSV - 045

THE ART OF SKIN BIOPSY

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Overview of the Issue

TA skin biopsy is a powerful tool in veterinary dermatology. Many differential diagnosis lists can only be shortened via a skin biopsy. Even without a definitive diagnosis, a biopsy report can still guide you in your treatment/diagnostic decisions. In certain cases biopsies can be unrewarding but this is often due to timing of the biopsy, poor lesion selection or poor technique/processing. Obtaining a diagnosis via skin biopsy takes teamwork between the clinician and the pathologist; the clinician must carefully select, obtain and preserve the skin specimen and the pathologist will carefully process and interpret the specimen.

Objectives of the Presentation

To review biopsy site selection
To review biopsy technique
How to avoid errors in obtaining skin biopsies
When to biopsy?
There are no “hard and fast” rules as to when to take a skin biopsy. Some guidelines to follow include:1-2

1. Biopsy any obviously neoplastic or suspected neoplastic lesions
2. Biopsy any persistent ulcerations or nodular lesions
3. Biopsy any case where your differential diagnosis list can only be ruled in/out via biopsy
4. Biopsy any dermatosis not responding to rational therapy
5. Biopsy any unusual dermatosis or serious dermatosis
6. Biopsy any vesicular lesions
7. Biopsy any condition where the therapy is expensive, dangerous or time consuming

Appropriate antibiotics should be given prior to biopsy as secondary bacterial infections can obscure histopathological features of disease. If you are able, it is best to discontinue any anti-inflammatory therapy 2-3 weeks prior to biopsy (6-8 weeks for repositol corticosteroids) or these medications may affect the histologic appearance of many dermatoses. There will be cases where you may not be able to discontinue therapy.

Where to biopsy?

Pick the lesions or regions of the skin you think will show diagnostic change. For example, if you are suspicious of discoid lupus erythematosus, think of the pathology of the disease. DLE leads to depigmentation and pigmentary incontinence. Therefore it is best to select an area that is depigmenting (not completely depigmented; select the blue/grey areas). Skin histopathology varies depending on the site selected. For example, non-haired skin normally has fewer hair follicles and therefore is not the best place to biopsy if you suspect an endocrinopathy. It is better to select an area with more follicles such as the shoulder.2 If the dermatosis appears to have an unusual distribution, search for primary lesions such as pustules, vesicles, nodules, papules etc. If an ulcer is apparent, do not biopsy the ulcer itself. Try to take your sample from the side of the ulcer. There is still a debate in the literature as to whether obtaining the margin between normal and abnormal tissue is informative. Take multiple samples including different lesions if the clinical presentation is such with different lesions. Never biopsy just one lesion or site unless you have no other choice (e.g. feline nose, only one lesion apparent). Most laboratories will charge one fee for a number of samples so it is recommended to call the lab and check prior to obtaining the biopsy. If the disease has a waxing and waning nature and no primary lesions can be seen, consider asking the owner to bring their pet back when lesions are apparent. If the lesion has a crust, ALWAYS include this with your sample.1-2 If the crust falls off, you can include the crust in the formalin and then write on the submission sheet that the crust is separate but you would like it examined.

How to biopsy?

Supplies

Selection of punch biopsies (size will depend on lesion), Adson thumb forceps, iris or small curved scissors, formalin vial(s), needles and suture material, needle holders, gauze, tongue depressors, scalpel blade.
Ideally chose a punch size that just fits over the lesion. If lesions are generalized select a site within the generalized area. If you are suspicious of neoplasia, the whole nodule/mass can be removed and sent for histopathology.
Smaller punch sizes should be used for smaller lesions or areas of the body more challenging to biopsy e.g. 4mm, for footpads, ear pinnae and nasal planum.

Site Selection

Circle sites to biopsy with a Sharpie.
If whole footpad affected, I recommend obtaining your sample from the edge of the pad (there will be less tension during healing).
Trim hair if needed, use caution using clippers as you can remove crusting.

Anesthesia

Local anesthesia versus general anesthesia.
General anesthesia is often recommended for the nasal planum and footpads as these regions are generally more painful.3
Subcutaneous block with 0.5-1ml 1-2% lidocaine per site.1
Lidocaine toxic dose – try not to exceed 5 mg/kg for dogs or 2.5 mg/kg cat.1
Lidocaine solely has been found to be superior to 1% lidocaine with epinephrine or topical prilocaine.4
Lidocaine can sting upon injection so can use 1:10 ratio of lidocaine: 8.4% sodium bicarbonate.5
Taking the biopsy
Allow 5 minutes for the local anesthesia to take effect.
Make sure you have adequate light.
Turn biopsy punch in one direction to minimize shearing of tissue along with firm downward pressure as you turn.
May feel "give" as you go through to subcutaneous tissue.
You want some subcutaneous tissue on the bottom of the biopsy.
Use forceps to grasp the subcutaneous tissue – NOT the epidermis or you will crush it!!1,3
Cut underneath and then place immediately into 10% neutral buffered formalin (100ml 40% formaldehyde, 900ml tap water, 4 g acid sodium monohydrate and 6.5g anhydrous disodium phosphate).
Ratio of 10 parts formalin to 1 part specimen.
Close with cruciate or 1-2 single interrupted sutures and remove in 10-14 days.
When to use a scalpel:
Large lesions, vesicles or bullae where a punch could damage the lesions.
Centre lesion and cut elliptical shape around lesion.
Fixation causes tissue shrinkage – if larger than 4mm punch or elliptical, press sample down onto tongue depressor for 30-60 seconds.
Submission of biopsy
Avoid freezing – can add 95% ethyl alcohol as 10% fixative volume or allow 12 hours fixation before cold exposure.6
Section samples lager than 1cm in diameter (formalin can only penetrate to that depth).
Specimens should ideally be sent to a veterinary dermatopathologist or pathologist with interest in skin.1,2
Always include differential list, thorough history including response to medications, photos if possible.3
Can ask for special stains if infectious disease suspected.
Complications of biopsy
Bleeding usually minimal - always look for vessels prior to biopsy.
Delayed healing if patient has hyperadrenocorticism or taking glucocorticoids.
Infections are rare.

Key Prognostic Points:

The final diagnosis is always made by the clinician not the pathologist
If you are submitting a skin biopsy for a tissue culture, do not use lidocaine local block and make sure to scrub the surface. Lidocaine will inhibit certain gram positive and negative bacteria, fungi and Mycobacteria, as does bicarbonate and epinephrine.7 Instead you can do a ring block or use general anesthesia.

Summary including 5 KEY "TAKE HOME" POINTS:

1. When selecting a biopsy site think about your differential diagnosis list or look for primary lesions.
2. Always take multiple specimens if you are able.
3. Select punch biopsy that just fits over lesion or consider excisional biopsy with scalpel.
4. Include thorough history including response to medication, other clinical signs, photos, time period etc.
5. Treat the clinical picture not the biopsy report.

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WSV - 009

BASIC DIAGNOSTIC TECHNIQUES FOR FISH

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Overview of the Issue

TAs with all our diagnostic protocols for different species in veterinary medicine, the first step is to observe the patient (or patients) in their natural environment. In fish medicine, this means slowly approaching the pond or tank to note the movements and interactions of the fish. Stressors, such as water quality and temperature issues, parasites, feeding behavior abnormalities and cohort interactions may manifest themselves in gross or subtle changes in fish behavior. The direct physical exam can then be done after capture and before microscopic exam sampling. Many species are sedated for this sampling. The general condition of the skin, eyes, mouth and fins are noted. A small sample of peripheral gill tissue is excised (gill snip) and placed on a glass slide. A drop of tank water is applied and covered with a coverslip. These will then be examined to determine the microscopic condition of the gill tissue and check for the presence of parasites. Small samples of gill tissue, obtained non-lethally in this way, can also be submitted to the lab for histopathology and viral antigen identification. Similarly, several samples of skin mucus are obtained by gently but firmly scraping craniocaudally with a coverslip (preferably plastic) in high- probability areas. These are typically areas of minimal water movement, such as behind the pectoral fins. Scrapings should also be done at the periphery of any skin lesions found. A fin clip at the tip of any fin can be useful to identify bacterial, fungal and/or parasitic lesions. Blood analysis can be useful to identify internal disease conditions, though less so than in homeotherms. This is because parameters will vary depending on water temperatures, making standardized norms harder to establish. In some species, important viral screening can be done via blood tests. Many different locations are sampled, depending on the species and size of the patient. In typical pet fish species, such as koi and goldfish, the caudal vein is accessed via a ventrodorsal puncture, similar to the technique used for reptiles. In large specimens, the lateral cutaneous vein can also be sampled via an anterolateral needle insertion. Fecal exams are often done to identify parasites or ova. Radiology can be useful to visualize internal abnormalities. Of particular interest is the condition of the swimbladder, which may be affected when buoyancy disorders occur.

A horizontal beam lateral x-ray, with or without sedation, is useful to visualize fluid in the swimbladder. Ultrasound is also a beneficial diagnostic procedure to identify solid masses and when fluid is found to be present in the swimbladder, to help guide the aspiration procedure.

WSV - 027

RESPIRATORY DISTRESS – A GUIDE TO LOCALIZING BREATHING PATTERNS IN DOGS AND CATS

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OVERVIEW

TDogs and cats with respiratory tract disorders can present to veterinarians for a variety of clinical signs including nasal discharge, sneeze, reverse sneeze, noisy breathing (snoring/stertor, stridor, wheeze), cough, alterations in respiratory rate or effort, and respiratory distress. The most urgent of these clinical signs is respiratory distress. This finding mandates rapid assessment to streamline the diagnostic and therapeutic approach. This lecture will highlight a clinically useful approach to respiratory distress.

CLASSIFICATION SYSTEM

Understanding the causes of respiratory distress in dogs and cats is critical for prompt and effective diagnosis and treatment. Respiratory distress can be broadly classified into one of eight causes: upper airway obstruction, lower airway obstruction, flail chest, abdominal enlargement, pulmonary parenchymal disease, pleural cavity disorders, pulmonary thromboembolism, and "look-alike" syndromes (i.e., causing labored breathing but not being a true disorder of the respiratory system). This scheme allows for prompt recognition of the first four causes listed above after initial auditory and visual examination of the patient. In particular, emphasis should be placed on the pattern of respiration (inspiratory distress, expiratory distress, or both; paradoxical respiration), audible noises (stridor or wheezing) or the absence thereof, obvious physical abnormalities (eg, trauma associated with flail chest, distended abdomen) and other findings on thoracic auscultation (adventitial lung sounds, diminished heart or lung sounds, arrhythmias, murmurs).

Upper airway obstruction can be due to mechanical or functional obstruction of the large airways (pharynx, larynx, or trachea) at or above the thoracic inlet.

Examples of mechanical obstruction include intra-or extraluminal masses (neoplasia, granuloma, abscess, and blood clots), foreign bodies, tracheal stenosis or tracheal stricture. Functional obstruction is often caused by laryngeal paralysis or tracheal collapse. Inspiratory stridor is an important discriminating feature.

Lower airway obstruction traditionally arises from narrowing of the bronchial lumen due to bronchospasm, accumulation of mucus or other exudate, bronchial wall edema, or external compression of the airways by a thoracic mass or other structure (eg lymph nodes). The classic example of a lower airway disease is feline asthma, which causes bronchospasm, mucus accumulation, and bronchial wall edema. Asthma in dogs is an exceedingly rare diagnosis, but lower airway obstruction in dogs can be seen with severe bronchomalacia that allows for passive collapse of the airways on expiration. Additionally, disorders of the intrathoracic trachea can also lead to lower airway obstruction. The aforementioned disorders of the extrathoracic trachea are included in the differentials for intrathoracic tracheal obstruction along with hilar lymphadenopathy. Expiratory wheezes are an important discriminating feature.

Flail chest results from trauma to the thoracic cavity that allows destabilization of a portion of the rib cage (i.e., the ribs are fractured at two different locations leaving a segment that is detached from the rest of the rib cage). Focal paradoxical respiration is seen so that, as an animal inspires, the injured chest wall segment is sucked inward, and as the animal exhales, the segment is pushed outwards in opposition to the remainder of the chest wall.

Severe abdominal enlargement exerts pressure on the diaphragm and makes it more difficult for the thoracic cavity to expand on inspiration. Examples of diseases associated with abdominal enlargement include ascites, gastric dilatation, hepatosplenomegaly, neoplastic abdominal masses and pregnancy or pyometra in females. Note that abdominal enlargement must be pronounced in order to affect respiration. Silent inspiratory distress in the presence of a large abdomen is a discriminating feature.

Pulmonary parenchymal diseases are diseases affecting the terminal and respiratory bronchioles, interstitium, alveoli or vasculature of the lung. They may be associated with infiltration by infectious microorganisms, inflammatory or neoplastic cells; the airspaces may be filled with edema fluid or foreign material; or lung tissue may be replaced with fibrotic tissue. Examples of diseases affecting the pulmonary parenchyma include infectious pneumonia (bacterial, fungal, viral, protozoal, and parasitic), aspiration pneumonia, interstitial lung diseases such as pulmonary fibrosis, pulmonary edema (cardiogenic or non-cardiogenic), and neoplasia.

Pleural cavity disorders arise when the potential space between the parietal and visceral pleura, which normally just contains a small amount of fluid for lubrication, becomes filled. This may occur due to accumulation of fluid (pleural effusion), air (pneumothorax), a mass, or displacement of abdominal organs (i.e., diaphragmatic hernia).

Pulmonary thromboembolism (PTE) refers to obstruction of blood flow in the pulmonary vasculature by a thrombus or embolus formed in the systemic venous system or right side of the heart. Any condition causing an abnormality in blood flow, endothelial damage, or hypercoagulability can predispose to the formation of thromboemboli. Common causes in veterinary medicine include immune mediated hemolytic anemia, protein losing nephropathy or protein losing enteropathy, and in certain circumstances, hyperadrenocorticism and cancer.

Finally, look-alike syndromes are conditions which result in apparent difficulty in breathing due to non-respiratory causes. Essentially, these conditions mimic respiratory disease when the respiratory system actually remains functional. As such, arterial oxygenation should remain unchanged. Examples of such mimics include pain, severe anemia, hyperthermia, acidosis, drugs (e.g., opioids), and hypotension. For look-alike syndromes, both diagnostic and therapeutic efforts must be focused on the underlying condition. Oxygen supplementation is not beneficial to these animals.

DIAGNOSTIC APPROACH

The first four etiologies of respiratory distress (upper and lower airway obstruction, flail chest, and abdominal enlargement) can be discerned on initial examination of a patient. Patients with upper respiratory distress will have a characteristic stridorous or squeaking noise that is readily audible, even without a stethoscope. Similarly, patients with a lower airway obstruction should have an audible wheeze on auscultation. Visual examination will reveal if a flail chest or abdominal enlargement are present. Pleural space disease is sometimes readily apparent based on examination, but is sometimes more difficult to confirm without additional testing. Clues to pleural space disorders include shallow inspiratory effort with muffled lung and heart sounds, hyper-resonance on chest percussion, and paradoxical movement of the chest and abdomen (paradoxical movement can also been seen in some animals with obstructive airway disease).

To determine which of the remaining etiologies of respiratory distress are causing a patient difficulty breathing, further diagnostic testing will need to be performed. If mimics are a possibility, a simple PCV and measurement of oxygen saturation are in order. When true respiratory disease is suspected, thoracic (and sometimes cervical) radiographs are often indicated early in disease diagnosis. In addition to examination of extrathoracic structures, the pleural and mediastinal space, and heart size and shape, careful attention should be given to pulmonary pattern (eg, alveolar, interstitial, bronchial, or vascular), distribution (eg, affected lobes, predominantly ventral or perihilar distribution), and severity. Size of the lungs should also be assessed (eg, atelectatic lung lobes are small, lung lobes with infiltrate are large).

Other useful diagnostics may include some of the following: complete blood counts, serology for infectious diseases, fecal examination, heartworm testing, advanced thoracic imaging (ultrasound, computed tomography, mucociliary scintigraphy), abdominal imaging (looking for related disease in the abdominal cavity), fundic examination, arterial blood gas, fine-needle aspiration for cytology/culture, transtracheal wash/endotracheal wash/bronchoalveolar lavage, bronchoscopic examination, bronchial mucosal or mass biopsies, and biopsies obtained by a key-hole procedure or thoracoscopy or thoracotomy. More details on the diagnostic workup of these conditions will be presented using clinical case examples.

SUMMARY

Respiratory distress is unfortunately a relatively common clinical sign in dogs and cats indicative of severe and often life-threatening illness. It requires rapid recognition of the site of disease within the respiratory tract to help narrow the list of differential diagnoses and promptly select a rational diagnostic and therapeutic plan. The pattern of respiration and the presence or absence of audible noises is tremendously helpful in determining the anatomic location/possible cause of respiratory distress. In this lecture, a series of videos of animals in respiratory distress will be presented to illustrate how the pattern of respiration can be used quickly and efficiently to narrow the involved region of disease and narrow the list of differential diagnoses.

WSV - 017

LOCAL SKIN FLAPS THAT ANY PRACTITIONER CAN USE

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Considerations in wound closure

The management of large wounds or those in challenging locations has received much attention in the veterinary literature over the years and have been the subject of many research efforts to find innovative new ways to manage these often challenging situations. With so many different options for closure available, it can be confusing to know which technique or combination of techniques to use to maximize the chance of achieving a good outcome. In this presentation an attempt will be made to offer solutions to some examples of challenging wounds that are commonly encountered in veterinary practice with local skin flap techniques that do not necessarily demand specialist training or equipment.

Decision-making

In general, the surgeon should always choose the simplest modality for wound closure that is likely to yield a successful outcome. Many different factors come into play when deciding what technique to use to close a wound. In oncological procedures that require large tissue excisions, certain principles must be adhered to; a larger area of tissue should not be contaminated with neoplastic cells by the use of elaborate flaps if a more simple closure could be successful. Failure to adhere to these principles can make subsequent management with further surgery or adjunctive radiation therapy in the event of an incomplete excision, more challenging.

The use of drains in oncological excisions is similarly controversial given the possibility that the drain tract could be seeded with neoplastic cells. Careful use of drains is generally considered reasonable in these situations but drains should always exit adjacent to the primary incision and in an area where complete excision or radiation treatment of the drain tract is possible.

The level of wound contamination is an important factor to consider. Closure of contaminated or dirty wounds is discouraged whether primary closure or a skin flap is planned. The most common contaminated wounds encountered are traumatic (especially degloving injuries) in origin or the result of post-operative wound infections. These wounds are managed open until a healthy granulating bed has formed at which point decisions can be made as to whether closure is reasonable and if so whether any kind of skin flap is necessary.

Many factors both related to the local wound environment as well as systemic or other exogenous influences affect the ability of wounds to close and may influence the reconstructive techniques chosen. Local wound factors such as oxygen tension, blood supply and presence of necrotic or foreign material must be taken into account. Exogenous factors such as systemic disease, corticosteroids, cytotoxic drug use and radiation therapy can have profound effects on normal wound healing. These factors may necessitate the use of techniques that improve blood supply. This could include excision of a pre-existing old granulation bed that no longer has a good blood supply and waiting for a new granulation bed to form that has improved vascularity. Another example might be the choice of a well-vascularized skin flap over a skin graft for reconstruction of a poorly-vascularized radiation ulcer.

Vascular supply to the skin

A knowledge of the blood supply to the skin is important when considering any kind of reconstructive surgery for wound closure. If inappropriately handled local flaps may suffer vascular compromise, which may lead to necrosis. Direct cutaneous arteries and veins supply the subdermal plexus in dogs and cats. The subdermal plexus lies above and below the panniculus muscle in areas where this muscle is present, which includes most of the head, neck, trunk and abdomen. In the middle and lower parts of the limbs where there is no panniculus muscle present, the subdermal plexus lies in the deep areolar tissue on the deep face of the dermis. It is vital whenever skin is being undermined for primary closure, or elevated for flap development, to dissect in the plane below the subdermal plexus and to avoid any damage to the vascular pedicles of the direct cutaneous arteries. The course of many of the direct cutaneous arteries have been documented in dogs and cats and can be found in most of the surgical texts.1

Local flaps

Many different types of local flaps exist. All rely on the availability of readily moveable skin located adjacent to the wound. Local flaps transfer full thickness skin along with varying degrees of the underlying subcutaneous tissue and have the advantage of providing padding and a fairly reliable blood supply.
Local flaps obtain blood supply through the subdermal plexus without known inclusion of a direct cutaneous artery and vein. These flaps can be transposed, rotated or advanced into the wound depending on where the supply of loose skin for closure is located relative to the wound. Unfortunately, there is no direct relationship between flap width and length that guarantees an adequate vascular supply to local flaps and so it is difficult to give exact rules regarding how wide the pedicle should be.

As wide a base as possible should be used as this will increase the likelihood of incorporating more direct cutaneous vessels. A loose rule of thumb is to ensure that flap length is no more than twice the width of the base.

One type of local flap that we have used extensively are the skin fold advancement flaps.2These flaps take advantage of the abundance of loose skin available in the axillary and inguinal regions. These folds of skin have a medial and lateral attachment to the upper limb and dorsal and ventral attachments to the trunk. Any three of these four attachments can be elevated resulting in a surprisingly large amount of skin that can be rotated into defects of the medial or lateral limb or areas on the trunk or lower abdomen depending on whether the axillary or inguinal folds have been used. They are extremely versatile and can also be elevated bilaterally for closure of large wounds on the ventrum. It has been suggested that in some cases the axillary skin fold is actually an axial pattern flap based on the angiosome of the lateral thoracic artery.2,3

Other very user-friendly and simple flaps include the single pedicle advancement flap, the transposition flap and rotational flap. The anatomy of these flaps and areas where the author has found these flaps useful will be discussed in this lecture using case examples in each case.

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WSV - 012

HOW TO DEAL WITH PROBLEM DIABETICS

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Considerations in wound closure
MAINTENANCE INSULIN THERAPY IN DOGS

Intermediate-acting insulin preparations continue to be the most commonly used and recommended preparations for the management of canine diabetics. The two currently available intermediate-acting insulin preparations are NPH (Humulin® N, Novolin® N) and Vetsulin®.

Dosing Recommendations

NPH and Vetsulin®
-0.25 – 0.5 U/kg subcutaneously every 12 hours
-Acceptable glycemic control achieved with 0.5 – 1 U/kg every 12 hours in most dogs
-Begin suspecting and evaluating for causes of insulin resistance when dose is ≥ 1.5 U/kg
-Consider changing insulin formulation if dose ≥ 2 U/kg and no cause of resistance or lack of acceptable glycemic control identified
-Insulin should be administered at the time of feeding to avoid hypoglycemia and minimize postprandial hyperglycemia

DIETARY RECOMMENDATIONS

It is most important that the type and amount of food remain consistent and that all or most of the calories (including treats) be consumed at or near the time of insulin administration. Ideally, food consumption would coincide with maximal insulin activity, but this could be challenging to predict, create unnecessary stress for the pet owner, and increase the risk of hypoglycemia because of variability in the onset of action. It is possible to achieve acceptable glycemic control in most dogs that consume a balanced maintenance diet at the time of insulin administration. It is also worth noting that it has not been possible to identify a clear benefit to feeding high-fiber, moderate-carbohydrate, and moderate-fat diets. High-fiber, calorie restricted diet formulations should not be fed to dogs that are underweight and/or have decreased lean body mass.

GOALS OF THERAPY

-Resolution of clinical signs
-Normal activity level and good quality of life
-Stable body weight
-Avoidance of hypoglycemic episodes
-Ideal glycemic control (BG < 250 mg/dL for majority of the day) is nice but not always necessary to achieve the above goals

REASONS FOR POOR REGULATION

Insulin therapy
-Underdosing (common cause)
-Insulin time-action profile not appropriate
-Handling issues and/or inactivation
-Administration issues
Treatment regimen
-Inconsistent feeding and/or insulin administration time
-Access to food and/or treats throughout the day
-Increased activity/exercise
Insulin resistance
-Urinary tract infection
-Pancreatitis
-Cardiac disease
-Renal disease
-Diestrus
-Hyperlipidemia
-Hyperadrenocorticism
-Hypothyroidism

MONITORING AND INSULIN DOSAGE ADJUSTMENT

Changes in the insulin dose should be based on clinical assessment combined with some assessment of glycemic control (blood glucose curves or continuous glucose monitoring). The parameters that are considered when determining how much the insulin dosage should be increased include the degree of hyperglycemia, the size of the dog, and the current insulin dose (U/kg). Although dependent on the degree of hyperglycemia, the dose is typically increased by 1-2 units per dose in small dogs and 2-3 units per dose in larger dogs.

Continuous Glucose Monitoring (dogs and cats)
The FreeStyle Libre continuous glucose monitoring system provides a readily available, cost-effective way to continuously assess glycemic control over a 14-day period. This system does not require calibration so the owner does not have to obtain blood samples from the pet to check the blood glucose concentration. Continuous glucose monitoring is the recommended assessment method for any challenging diabetic and could replace the blood glucose curve in most diabetics.

Home Blood Glucose Curve Protocol (dogs and cats)
-Use a hand-held glucometer that has been designed and validated for use in dogs and cats
-Blood glucose before food and insulin administration
-Feed and administer insulin
-Blood glucose 1 hour after food and insulin, then every 2 hours (every 4 hours in cats receiving long-acting preparations) until the next dose of insulin

Despite substantial day-to-day variation in BG curves, a complete 12-hour BG curve can provide useful information when evaluating a poorly regulated diabetic, especially if continuous glucose monitoring is not an option. Blood glucose curves may provide more accurate information when performed in the home environment. It is recommended that BG curve data from multiple days during a 2-3 week period be evaluated prior to recommending significant changes such as a change in the insulin formulation. This will allow the clinician to evaluate trends rather than basing the decision on a single BG curve that may not be an accurate representation of the overall glycemic control. Routine blood glucose monitoring also plays an important role in detecting subclinical hypoglycemia.

DIETARY MANAGEMENT OF UNREGULATED DIABETIC DOGS

Consider a moderately to markedly carbohydrate-restricted diet (15-30% metabolizable energy from carbohydrate) in dogs with unacceptable glycemic control that appears to be associated with postprandial hyperglycemia. Dietary fat restriction is recommended for diabetic dogs that have persistent hypertriglyceridemia and/or recurrent pancreatitis.

USING LONG-ACTING INSULIN FORMULATIONS IN DOGS

Based on the currently available clinical data, there does not appear to be an obvious benefit to using long-acting insulin analogs in most dogs. The low potency of Lantus® (insulin glargine 100 U/ml) and Toujeo® (insulin glargine 300 U/ml) make them useful in small dogs that are unregulated but have recurrent hypoglycemia with small doses of NPH or Vetsulin®. These formulations have a slower onset of action and a more gradual glucose lowering effect. Levemir® (insulin detemir 100 U/ml) is an option for dogs in which acceptable glycemic control cannot be achieved with NPH or Vetsulin®. The author has observed improved glycemic control when switching to Levemir® even if a short duration of action is not the cause of poor regulation.

Levemir® is a potent insulin formulation and a dosage reduction is necessary when switching from NPH or Vetsulin®. The recommended starting dose for insulin detemir is 0.1-0.2 U/kg, which limits the use of this insulin in small dogs. The long-acting insulin analogs are substantially more expensive than NPH and Vetsulin®. For this reason, the use of long-acting analogs is often reserved for cases in which acceptable glycemic control cannot be achieved with standard therapy.

USING RAPID-ACTING INSULIN ANALOGS AT MEALTIME

It is standard practice to use two insulin formulations in the management of human diabetics. One preparation is a short or rapid-acting insulin that is administered at mealtime (bolus), while the other has an intermediate or long duration of action (basal insulin) and maintains the BG during periods of fasting. This is not commonly recommended in diabetic dogs because it increases the risk of hypoglycemia and because it is often possible to achieve acceptable glycemic control with a single insulin preparation administered twice daily.

The use of a rapid-acting insulin analog administered concurrently with NPH was investigated in a small group of dogs. Insulin lispro (Humalog®) was administered with NPH at mealtime in six dogs that were considered to have well-regulated diabetes while receiving NPH, but continued to have a profound postprandial spike in blood glucose. Subcutaneous insulin lispro at a dose of 0.1 U/kg was well tolerated and blunted the postprandial spike (decreased the blood glucose 60 and 90 minutes after eating). Although this approach may prove beneficial in dogs that have unacceptable glycemic control related to postprandial hyperglycemia, this combination protocol is likely not necessary for the majority of canine diabetics and could increase the risk of hypoglycemia. When initiating this protocol, it is recommended that the maintenance insulin dose be reduced by at least as many units as the number of units of rapid-acting insulin being added (i.e., total units of insulin being administered is the same or less). This will hopefully decrease the potential for hypoglycemic complications. It is not appropriate to substitute regular insulin for a rapid-acting analog in this protocol. Regular insulin has a slower onset of action, longer duration of effect, and will increase the risk of hypoglycemia.

Case example: 20 kg dog receiving 30 units of NPH every 12 hours but continues to have profound postprandial hyperglycemia associated with unacceptable glycemic control.

Recommendation: Add insulin lispro at the starting dose of 0.1 U/kg = 2 units

New insulin dosing protocol: 25-28 units NPH (dosage reduction) + 2 units insulin lispro every 12 hours.

Recommend performing a blood glucose curve (or using a continuous glucose monitor) following the first administration of the rapid-acting analog to confirm that hypoglycemia is not an immediate concern.

MAINTENANCE INSULIN THERAPY IN CATS

It is possible to achieve ideal glycemic control in most cats with twice daily administration of long-acting insulin formulations. The time-action profile of these insulins is more appropriate in ca ts than intermediate-acting insulin formulations and higher remission rates are reported in cats receiving long-acting insulin preparations. Currently available formulations that are routinely used in cats include insulin glargine (Lantus®), PZI (ProZinc®), and insulin detemir (Levemir®). The recommended starting dose for these long acting formulations is 1-2 U/cat every 12 hours. The majority of cats will have acceptable glycemic control at a dose of 1-6 U/cat every 12 hours. Twice daily insulin administration is recommended and is likely to result in better glycemic control than once daily administration. If it is not possible to administer insulin twice daily, once daily administration of Levemir® or Toujeo® (starting dose: 1-2 U/cat) may provide acceptable control of clinical signs and decrease the occurrence of complications associated with untreated diabetes mellitus. Toujeo® has been studied in healthy cats, but there is limited information about clinical use available.

DIETARY RECOMMENDATIONS

-Low carbohydrate diet (Purina DM, Hill's Prescription Diet m/d)
---Associated with better clinical control, reduce insulin requirements, and increased remission rates
-Meal feeding is ideal, but eating does not need to be coordinated with insulin administration (grazing is allowed)
-Recommend weight loss in obese cats
---1-2% loss of body weight per week
-Have had success with Hill's Prescription Diet Metabolic when cats gain weight or fail to lose weight with classic high protein/low carbohydrate diets.

GOALS OF THERAPY

-Resolution of clinical signs
-Normal activity level and good quality of life
-Stable body weight
-Possible to achieve ideal glycemic control in most cats with long-acting insulin
-Diabetic remission

REASONS FOR POOR REGULATION

Insulin therapy
-Underdosing
-Time-action profile is not appropriate (use of intermediate-acting insulin)
-Handling issues and/or inactivation
-Administration issues

Insulin resistance

-Hypersomatotropism / Acromegaly- recommend screening (measure IGF-1 concentration) all diabetic cats 6-8 weeks after initiating insulin therapy
-Urinary tract infection
-Pancreatitis
-Renal disease
-Hyperthyroidism
-Hyperadrenocorticism

MONITORING AND INSULIN DOSAGE ADJUSTMENT

Increases in the insulin dosage should be based on the presence of clinical signs combined with an objective assessment of glycemic control (see above- continuous glucose monitoring [FreeStyle Libre], home blood glucose curves, fructosamine concentration, HbA1c, +/- urine glucose monitoring). Routine blood glucose monitoring allows for assessment of glycemic control as well as detection of subclinical hypoglycemia. This is especially important in cats because of the possibility of diabetic remission (return to a noninsulin-dependent state). The insulin dose in cats is typically increased by 1-2 U per dose.

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WSV - 028

COLLECTION OF BRONCHOALVEOLAR FLUID USING A BLIND TECHNIQUE IN CATS

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Overview

Disorders of the respiratory tract are a common reason for cats to seek medical attention. There are a wide variety of disorders including those affecting the upper airways, lower airways, pulmonary parenchyma and pleural space. A wide variety of diagnostic tests are available to help discern the underlying reason for the particular type of pathology. One of the earliest and most important diagnostic test for respiratory disease in cats is thoracic radiography. While thoracic radiography provides great value in discriminating cardiac from respiratory causes of clinical signs, and in localizing the site of the affected respiratory tract (airways, parenchyma, or pleural cavity), it does not provide a cellular diagnosis. After initial diagnostic tests, including thoracic radiography are performed and point to disease of the lower airways and pulmonary parenchyma, sampling of these regions may be necessary for a definitive diagnosis. There are a wide variety of clinically important respiratory diseases in the cats affecting these regions including infection, non-infectious inflammatory or fibrotic disorders and neoplasia. Microscopic evaluation and culture of acquired material can be extremely helpful. Cytologic specimens are classically obtained by using trans-thoracic fine needle aspiration, endotracheal lavage, bronchoalveolar lavage or bronchial brushings. This lecture will describe a technique for obtaining bronchoalveolar lavage fluid without the need for a bronchoscope which requires additional expense, expertise and may provide additional risk of airway obstruction. The blind technique for collection of bronchoalveolar lavage fluid can be performed quickly, easily and without the requirement for specialized equipment.

SUPPLIES

There are several supplies to be gathered prior to performing a blind bronchoalveolar lavage fluid collection. As pre- and post-procedural oxygenation is recommended, an oxygen tank and mask should be hand. The author pre-medicates cats with terbutaline as a bronchodilator, assuming there is no contraindication (e.g., hypertrophic cardiomyopathy, etc).

Cats should receive 0.01 mg/kg intramuscularly or subcutaneously 20-30 minutes prior to the procedure. A laryngoscope with an appropriately sized blade, lidocaine (0.2 ml in a tuberculin syringe with the needle removed), sterile endotracheal tube (two sizes based on the size of the cat), an 8 french sterile red rubber catheter, sterile warmed 0.9% saline filling a 20 ml syringe (capped with a needle to ensure sterility until ready), and two to three sterile tubes without additives (one for cytology, one for culture). Depending on prior conversations with the laboratory performing cultures, a sterile tube without additives may be less optimal than using a specialize culturette (swab). Most cats will use an endotracheal tube of 4.0 or above; this is ideal since an 8 french red rubber catheter will easily pass through the lumen of these sized tubes. Saline warmed to body temperature will reduce the degree of bronchoconstriction (compared to cool saline). Monitoring with a pulse oximeter is advised.

ANESTHESIA AND INTUBATION

The cat should have a short intravenous catheter placed (e.g., cephalic catheter). Pre-oxygenation for 3-5 minutes is recommended. A short acting anesthetic agent can be administered using the iv catheter. The author prefers propofol, although other combinations such as ketamine and valium, are also acceptable. The anesthetic protocol should ideally be short lived and given in a low dose titrated to effect. The entire procedure takes well under two minutes. After induction and prior to intubation, a small volume of topical lidocaine can be placed on the arytenoids to prevent laryngospasm. Intubation can then be performed with a sterile endotracheal tube, taking care not to touch the tip of the endotracheal tube to the oral cavity.

POSITIONING AND CATHETER PLACEMENT

After intubation, the cat can be placed in lateral recumbancy. The neck should be outstretched so there is a straight line between the tip of the nose and carina. While the red rubber tube is still within the sterile package, it can be held above the cat to measure/estimate how deep the wedge needs to be. Roughly it should be inserted around the last rib (ie measure the distance from the tip of the endotracheal tube to the last rib). In a sterile fashion, the red rubber catheter should be gently threaded through the lumen of the endotracheal tube, while an assistant helps maintain the straight line of the body position. There should be no resistance to catheter passage until it is close to being wedged. If there is resistance, the catheter can be gently rotated or “spun” while gentle pressure is exerted to move it forward. It should never be forcibly pushed. Once it is firmly wedged and in the correct estimated position, the lavage procedure can be commenced. It is important to remember that the technique of catheter placement must both be done correctly and quickly, as the catheter is occupying the majority of the lumen of the endotracheal tube.

THE LAVAGE PROCEDURE

When the catheter is wedged in place, the 20 ml syringe filled with 20 ml of sterile warmed saline is attached. In a rapid smooth fashion, the entire aliquot of saline should be instilled. Using gentle manual suction, the fluid is aspirated back into the syringe. There should never be extreme suction placed on the syringe as that can create trauma and artificial hemorrhage. If there is negative pressure felt, the pressure should be let off, the catheter backed out very slightly, and pressure can be reapplied again. Aspiration can be continued in this fashion with gentle suction followed by release of the suction if there is no fluid brought into the syringe and backing out of the catheter to try again. If there is any point where fluid is being retrieved into the syringe, the catheter should stay in place at that level until no more fluid is being retrieved. A reasonable volume of retrieval is 50-80% of the volume of the fluid instilled. Within the syringe, a foamy layer which represents surfactant, should be seen. Once there is a reasonable volume of saline within the syringe and no more fluid is aspirated, the red rubber tube should be fully removed. To help remove any residual fluid, the hindquarters are raised and the chest undergoes coupage, with gravity helping drainage of the fluid. Supplemental oxygen can be provide while the cat is intubated, and as needed after extubation using a face mask. In some instances, recovery in an oxygen cage (or other oxygen enriched environment) may be beneficial.

WHAT TO DO WITH THE SAMPLE

As promptly as possible, the samples should be processed. Taking care to keep the aliquots of saline sterile, the culture should be prepared first. If a sterile tube without preservatives is being used for transport, there should be a new needle placed on the 20 ml syringe first. The sterile tube cap can be wiped off with alcohol and a small volume of the bronchoalveolar lavage fluid instilled. The volume in part depends on how much was retrieved, but generally 1 ml should suffice. The remainder of the aliquot is used for cytology. Assuming a large enough volume and the need to send a sample to a clinical pathologist off-site, the remaining sample can be split into two aliquots. One can be placed into the tube without additives and placed on a refrigerated pack for transport (or on ice, or in the fridge if there will be a delay in transport). The other sample can be processed in a similar fashion to a urinalysis. Briefly the bronchoalveolar lavage fluid can be centrifuged to create a pellet and overlying fluid layer.

The overlying fluid layer can be decanted leaving the pellet. A drop of sterile saline can be added as needed to resuspend the pellet. The pellet can then be smeared out on several slides. It is recommended to view at least one slide in-house to have a general but rapid determination of the underlying disease process as that may affect the therapeutic plan. The other slides should be left unstained and left to air dry. These slides can be sent to the outside laboratory. in a case along with the other aliquot of bronchoalveolar lavage fluid for cytology; and the culture.

RISKS

General anesthesia poses a risk to all patients to a certain degree. Those with more severe respiratory compromise or other comorbid conditions have a higher risk. The procedure of bronchoalveolar lavage fluid collection can be associated with transient hypoxemia. Pre-treatment with supplemental oxygen and with a bronchodilator can minimize the severity of the hypoxemia. Pneumothorax is rare and is generally only observed either if there is a risk factor (eg a pulmonary bulla) or if a stiff polypropylene catheter is used in place of a red rubber catheter.

WSV - 038

CURRENT CONCEPTS OF PERIODONTAL DISEASE

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Periodontal disease overview

Periodontal disease is the number one health problem in small animal patients. By two years of age, 70% of cats and 80% of dogs have some form of periodontal disease. However, there are generally little to no outward clinical signs, and therefore therapy typically comes very late in the disease. Consequently, periodontal disease may also the most undertreated disease in our patients.

Pathogenesis:
Periodontal disease is generally described in two stages, gingivitis and periodontitis. Gingivitis is the initial, reversible stage in which the inflammation is confined to the gingiva. The gingival inflammation is created by plaque bacteria and may be reversed with a thorough dental prophylaxis and consistent homecare. Periodontitis is the later stage of the disease process and is defined as an inflammatory disease of the deeper supporting structures of the tooth (periodontal ligament and alveolar bone) caused by microorganisms. The inflammation results in the progressive destruction of the periodontal tissues, leading to attachment loss. This can be seen as gingival recession, periodontal pocket formation, or both. Mild to moderate periodontal pockets may be reduced or eliminated by proper plaque and calculus removal. However, periodontal bone loss is irreversible (without regenerative surgery). Although bone loss is irreversible, it is possible to arrest its progression. However, it is more difficult to maintain periodontally diseased teeth in comparison to healthy teeth. Additionally, periodontal attachment loss may be present with or without active inflammation.

Periodontal disease is initiated by oral bacteria which adhere to the teeth in a substance called plaque. Plaque is a biofilm, which is made up almost entirely of oral bacteria, contained in a matrix composed of salivary glycoproteins and extracellular polysaccharides. Calculus (or tartar) is basically plaque which has secondarily become calcified by the minerals in saliva.

Plaque on the tooth surface is known as supragingival plaque. Once it extends under the free gingival margin and into the area known as the gingival sulcus (between the gingiva and the teeth or alveolar bone), it is called subgingival plaque.

Supragingival plaque likely affects the pathogenicity of the subgingival plaque in the early stages of periodontal disease. However, once the periodontal pocket forms, the effect of the supragingival plaque and calculus is minimal. Therefore, control of supragingival plaque alone is ineffective in controlling the progression of periodontal disease.

The bacteria in the subgingival plaque secrete toxins as well as metabolic products. This creates inflammation which damages the gingival tissues and initially results in gingivitis. Eventually, the inflammation can lead to periodontitis, i.e. the destruction of the attachment between the periodontal tissues and the teeth.
The inflammation produced by the combination of the subgingival bacteria and the host response damages the soft tissue attachment of the tooth, and decreases the bony support via osteoclastic activity. This causes the periodontal attachment of the tooth to move apically. The end stage of periodontal disease is tooth loss; however the disease has created significant problems prior to tooth exfoliation.
Clinical Features:.

Normal gingival tissues are coral pink in color (allowing for normal pigmentation), and have a thin, knife-like edge, with a smooth and regular texture. In addition, there should be no demonstrable plaque or calculus on the dentition.

The first obvious clinical sign of gingivitis is erythema followed by edema of the gingiva. However, it is now known that the FIRST evidence of gingivitis is bleeding during brushing, probing, or after chewing hard/rough toys. Therefore it is important to realize that normal appearing teeth/gums can actually be infected. If the first stages of gingivitis are not treated, it will progress into edema, spontaneous bleeding, and halitosis.
Gingivitis is typically associated with calculus on the involved dentition, but is primarily elicited by PLAQUE and thus can be seen in the absence of calculus. Alternatively, widespread supragingival calculus may be present with little to no gingivitis. It is critical to remember that calculus itself is essentially non-pathogenic. Therefore, the degree of gingival inflammation should be used to judge the need for professional therapy.

As gingivitis progresses to periodontitis, the oral inflammatory changes intensify. The hallmark clinical feature of established periodontitis is attachment loss. In other words, the periodontal attachment to the tooth migrates apically. As periodontitis progresses, alveolar bone is also lost.

On oral exam, there are two different presentations of attachment loss. In some cases, the apical migration results in gingival recession while the sulcal depth remains the same. In other cases, the gingiva remains at the same height while the area of attachment moves apically, thus creating a periodontal pocket.
Severe local consequences:

The most common severe local consequence of periodontal disease is an oral-nasal fistula (ONF). ONFs are typically seen in older, small breed dogs; however they can occur in any breed as well as felines. ONFs are created by the progression of periodontal disease up the palatal surface of the maxillary canines however; any maxillary tooth is a candidate. This results in a communication between the oral and nasal cavities, creating an infection (sinusitis). Appropriate treatment of an ONF requires extraction of the tooth and closure of the defect with a mucogingival flap. However, if a deep periodontal pocket is discovered prior to development of a fistula, periodontal surgery with guided tissue regeneration can be performed to save the tooth.

Another potential severe consequence of periodontal disease can be seen in multi-rooted teeth, and is called a class II perio-endo abscess. This occurs when the periodontal loss progresses apically and gains access to the endodontic system through the apical blood supply, thereby causing endodontic disease via bacterial contamination. The endodontic infection subsequently spreads though the tooth via the common pulp chamber and causes periapical infection on the other roots.
The third potential local consequence of severe periodontal disease is a pathologic fracture. These fractures typically occur in the mandible (especially the area of the canines and first molars), due to chronic periodontal loss, which weakens the bone in affected areas. This condition is again, most commonly seen in small breed dogs, mostly because their teeth (especially the mandibular first molar) are larger in proportion to their jaws as in comparison to large breed dogs. Pathologic fractures occur most commonly as a result of mild trauma, or during dental extraction procedures. Pathologic fractures carry a guarded prognosis for several reasons including: lack of remaining bone, low oxygen tension in the area, and difficulty in rigidly fixating the caudal mandible. Regardless of the method of fixation, the periodontally diseased root (s) MUST be extracted.

The fourth local consequence of severe periodontal disease results from inflammation close to the orbit which could potentially lead to blindness. The proximity of the tooth root apices of the maxillary molars and fourth premolars, places the delicate optic tissues in jeopardy.

The fifth local consequence is described in recent studies which have linked chronic periodontal disease to oral cancer. The association in this case is likely due to the chronic inflammatory state that exists with periodontitis. In this way, periodontal inflammation acts as a 'promoter" of cancer, similar to the chronic inflammation from smoking increases the incidence of lung cancer.

The final significant local consequence of periodontal disease is chronic osteomylitis, which is an area of dead, infected bone. Once an area of bone is necrotic, it does not respond effectively to antibiotic therapy. Therefore, definitive therapy generally requires aggressive surgical debridement.

Severe systemic manifestations:
Systemic ramifications of periodontal disease are also well documented. The inflammation of the gingiva and periodontal tissues that allows the body's defenses to attack the invaders also allows these bacteria to gain access to the body. It is important to note that just established gingivitis (i.e. no attachment loss) is enough to create these systemic effects. In humans, the periodontal surface area comprises a surface area the size of the palm of your hand. This is a large area of infection for the body to deal with. However, if you consider the size of the mouth and teeth of a small breed dog in relation to their body, there is actually a far greater level of infection affecting these patients.

There are a plethora of studies both in the human and veterinary literature which document a link between periodontal inflammation and organ dysfunction. Affected organs include the kidneys and liver, leading to decrease in function of these vital organs over time.
Most critically, periodontal disease is now associated with early mortality. In other words, humans with bad periodontal disease die earlier than those in good periodontal health. In fact, periodontal disease is now viewed as a higher risk factor for early death than smoking!

Conversely, proper therapy of periodontal disease has been shown to have beneficial effects on systemic maladies. The kidney, liver, and heart function have all been shown to improve when periodontal disease is properly treated. Further, glycemic control is increased in patients with good periodontal health.

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ANESTHESIA FOR THE DENTISTRY PATIENT

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Often, when asked why veterinarians do not recommend dental care earlier for their patients, they commonly respond that the benefit is not worth the risk of anesthesia. Unfortunately, the patient suffers in the long run. Without appropriate preventive care, inevitable periodontal disease flourishes in our small animal patients.

So, as technicians, what can we do to ensure our Drs know that we reduce anesthetic risk to a bare minimum? First, we have to get out of the mind-set that "dentals" are an add-on procedure. Dentistry requires its own case management and planning. In many cases, dental cases are older patients in a state of chronic infection.

The anesthesia records should be read in advance to ensure that all preoperative bloodwork and cardiac status is good and if not, a plan for support be at the ready. If a murmur was heard on exam, was a cardiac work up recommended? If so, was that completed and do you have the report? Does this patient have increased renal values and is there a plan to preload with fluids prior to anesthesia? Everything this case needs should be carefully planned and provided.

Pressure test your anesthesia machine prior to each day. Make sure your equipment is all working properly before you induce any

Consider preoperative ECG's prior to anesthesia. Often auscultation does not suggest the presence of VPCs and a baseline ECG is valuable before choosing the right drugs or deciding if a cardiac consult is now recommended and rescheduling is prudent.

Once all pre-planning is complete, then here are some things to keep in mind to optimize patient safety:

1. Most important: there should be a separate anesthetist for each dentistry. Someone needs to monitor all parameters every 5 minutes to note trends so that they can be corrected before it becomes an issue while maintaining protocols for discontinuing the procedure.

2. Temperature (discontinue if you cannot maintain a body temperature of 96 degrees F or greater and not higher than 102.
a. HotDog Patient Warming System
b. Baer Hugger
c. Gaymar Water Circulating Pump
d. Patient not on a cold grate. Use blankets
e. Bubble wrap
f. IV line warmers
g. Avoid thermal burns at all costs. Extreme caution with rice bags, heated fluid bags, plastic microwavable warmth discs. Do not leave against an unconscious animal.

3. Pulse ox: This can be difficult on dentistry patients since usually the tongue is where the sensor is commonly placed. There are a variety of sensors; pediatric, tongue, "C" clamp, and a rectal sensor. Since patients are on 100% O2, a reading lower than 95% should be investigated until corrected.

4. Blood pressure: cuff size should be properly selected. The front leg is most accurate and multi-parameter NIBP usually give a pretty accurate reading. However, a Doppler and a manometer is the most accurate method for ascertaining the actual reading.

5. Capnography: This technology provides the anesthetist with a capnogram. This provides valuable information about:

a. Respiration rate
b. Respiration rhythm
c. Shape of form is diagnostic or helps troubleshoot

anesthetic issues before you realized there were issues
i. Bronchial intubation
ii. Equipment disconnection
iii. Airway obstruction
iv. Exhausted CO2 absorber
v. Leaks in tubing

6. An all too common complication from dental cases are tracheal tears. This is usually from improper intubation techniques. Measure your endotracheal tubes. Put the Murphy's eye of the tube at the thoracic inlet and then place your tie at the corner of the mouth.

a. Use clear plastic, high volume, low pressure cuffs
b. Pre-inflate the cuff and lubricate with lubricant
i. Make sure that the cuff expands uniformly and it doesn't bleb to one side
c. Deflate and place, use a laryngoscope and lidocaine if needed.

d. One person inflates the cuff while the other person closes the pop-off valve and gently squeezes the O2 reservoir bag. Stop inflating once you no longer hear air escaping around the cuff. You should be able to hold 10mmHg of pressure. Re-open pop-off valve.

7. Employ regional nerve blocks in an attempt to reduce inhalant anesthesia to preserve blood pressure. The most commonly utilized regional nerve blocks for dentistry include the mandibular block , the maxillary block, and the infraorbital block.

8. No use of spring loaded mouth gags. Recent studies suggest possible blindness where the ocular nerve were not supplied with blood secondary to pinched vessels from mouth gags.

In closing, it is our responsibility to provide the safest anesthetic experience for our patients. Not recommending professional dental care only leaves these patients at risk for infection, pain and a shorter life span.

WSV - 032

UPDATES IN CANINE AND FELINE LYMPHOMA

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Phenotyping:

On a very basic level, lymphoma is broken down into two main phenotypes, B and T cell. Traditionally 2/3 of dogs with lymphoma are classified as B cell and 1/3 are T cell. A minor percentage (<2%) are deemed "null cell." Phenotyping of lymphoma patients can be achieved through a variety of tests including immunohistochemistry, immunocytochemistry, PARR, and flow cytometry. T cell lymphoma is more commonly associated with certain breeds including the boxer, golden retriever, Australian shepherd, Asian lap dogs, and Siberian husky. T cell LSA is also associated with certain anatomic forms including cutaneous (epitheliotropic, AKA ELSA), mediastinal, hepatic and gastrointestinal.

Why Phenotype?

Many studies have documented a worse prognosis for dogs with T-cell lymphoma and for this reason, many oncologists have begun modifying protocols based upon phenotype. Further support of this was based upon a several studies: Beaver et al. assessed the response of T cell LSA to a single dose of doxorubicin was ~50% vs ~100% for dogs with B cell LSA.

The idea of using more alkylating agents into T cell protocols was partially based on the high response rates noted in dogs with ELSA treated with lomustine (CCNU). Although only 17% experienced a complete remission (CR), 61% experienced a partial remission (PR). Furthermore, the combination of L-asparaginase, mechlorethamine, vincristine, procarbazine, and prednisone (L-MOPP) was investigated in dogs T-cell lymphoma and was associated with a complete remission rate of 78%, and overall survival 270 days, However, >20% were alive at >900 days. The challenge with this protocol is cost, the difficulty of administration and toxicity. Currently protocols with substitutions of CCNU for doxorubicin and Elspar in each cycle are underway, however, data is lacking. There does exist one report evaluating only T cell phenotype treated with a standard CHOP-based protocol and its associated survival is similar to that noted in other studies.

Additional support for the importance of phenotyping comes from human experience with monoclonal antibodies, specifically Rituximab, which standard of care in CHOP-based protocols (R-CHOP). Monoclonal antibody (mAb) can be used to specifically bind to target cells or proteins. This may then stimulate the patient's immune system to attack those targeted cells and remove them from the body. In human oncology, monoclonal antibodies have been developed for T and B cell and these have now become standard of care therapy. The first series in Veterinary Oncology were grant full licensure by the USDA but are no longer commercially available due to specificity issues.

Merial has gained conditional licensure for its Oncept LSA vaccine, which uses the same concept but is designed to induce immunity to CD20 (present on the surface of B cell LSA). Data from a recently completed trial in which patients were administered the LSA vaccine during the second cycle of chemotherapy, noted an improvement in remission duration of 4 months.

Feline New Classification System:

In feline lymphoma, a new classification system has been developed. The current vernacular of "low, intermediate, and high grade" are being replaced with more informative descriptions, such as diffuse large B-cell lymphoma (DLBCL), and enteropathy associated T-cell lymphoma (EATL). The rationale is that these tumors are as biologically different from one another as is comparing a mast cell tumor and a plasma cell tumor. Histologically, nodal lymphomas are first classified based on their growth pattern (i.e., diffuse vs. follicular), nuclear size next (i.e., small, intermediate, and large cell lymphomas) that are further classified using mitotic counts, phenotype etc. For gastrointestinal (GI) LSA, tumors are differentiated as primary «extranodal» GI LSA or LSA with extension to the GI tract. Based upon immunohistochemistry and clonal analysis, a significantly higher incidence of T-cell lymphomas than B-cell lymphomas occurs in the intestines of cats. Furthermore, the majority of feline intestinal T-cell lymphomas are small cell, mucosal T-cell lymphomas, consistent with type 2 EATL.

The second form, consisting of large cell transmural T-cell lymphomas, is classified as type 1 EATL. There is an uncommon and very aggressive subtype of EATL type I called large granular lymphoma (LGL), that is comprised of either cytotoxic T-cells or NK cells. LGL is characterized by multiple masses within the GI tract and other organ systems, including the blood. In cats, B-cell lymphomas are less common and are usually diffuse large B-cell (DLBCL). They commonly occur primarily in the stomach and the ileo-ceco-colic junction or in both locations.

Applying the Terminology to the Real World:
Cats with EATL type I often present with a palpable mass effect and more acute and severe clinical signs while cats with EATL type II, present with more chronic signs, similar to that with IBD.

Cytology can often provide an expedited diagnosis depending upon the form. For large cell lymphoma, whether EATL I, DLBCL or LGL lymphoma, the predominant cell type is a large lymphocyte, cytology is an excellent tool for diagnosis. With EATL Type II, which is primarily comprised of small lymphocytes, cytology is often unrewarding.

is EATL-Type II previously known as small-cell lymphoma/lymphocytic/indolent LSA is considered a less aggressive variant of lymphoma. Although unproven, there is certainly evidence to suggest a possible link to inflammatory bowel disease and the potential that the two syndromes represent a continuum of the same disease process, as both are often present in the same tissue concurrently. In general, clinical signs occur over a prolonged timeframe (several months to even years) and typically include weight, diarrhea, intermittent vomiting and loss of appetite. Unlike the aggressive EATL Type I form which is composed of large «blastic» lymphocytes, this form is comprised of small lymphocytes that invade the intestines, lymph nodes, stomach and liver. Bloodwork is generally unremarkable, however, mild anemia and leukocytosis may be noted. Imaging findings with ultrasound often yield thickened intestines and rarely a mass effect. Aspirates can be unrewarding in providing a definitive diagnosis as lymph nodes normally contain mostly small lymphocytes. Definitive diagnosis requires histopathology and, in some cases more advanced testing to include clonality testing and immunohistochemistry. In general, this requires either an endoscopy, or more preferred by this author, an exploratory surgery, whereby multiple organs can be biopsied (full thickness), in an effort to determine the true extent of the disease.

Treatment for EATL Type II does not involve multidrug protocols, only daily prednisolone and chlorambucil (Leukeran), which may be q 21 days, every other day or m/w/f depending upon protocol chosen. Resolution of gastrointestinal signs and weight gain, and in some cases abdominal ultrasound are used to monitor efficacy. The overall response rate is very high >90% and evidence suggest that treatment may be discontinued after a year. If a relapse occurs, rescue therapy with cyclophosphamide can be considered, as this protocol has been associated with a high response rate. The overall median survival time is nearly 2 years for EATL Type II. Since many cases have concurrent

Tanovea™ VetDC:
Tanovea™ was discovered by Gilead Sciences, Inc., and licensed to VetDC for use in animal cancer, (previously known as VDC-1101). This agent was designed to preferentially target and attack cancer cells implicated in lymphoma. 15-17 The data from studies totaling well over 330 patients have shown Tanovea™ to be highly effective against LSA with a 60-80% overall response rate. Not surprisingly, responses are higher in naïve LSA vs relapse and in dogs with a B cell phenotype.

Data suggests Tanovea™ is well-tolerated with a similar side effect profile as other commonly used agents. The administration is via the intravenous route with a 1mg/kg dosing every 3 weeks. The FDA is in the final staging to approve Tanovea.

Side Effects:
Although the majority of side effects with this agent are similar to most chemotherapeutics, two unique side effects are present that clinicians need to be educated in order to better recognize and treat them.

Pulmonary fibrosis: this appears to be recorded in a small percentage of the patients treated and the mechanism is unknown. In some cases this was fatal, thus clearly screening with thoracic films and exclusion of patients with pre-existing pulmonary issues or particular breeds at risk of pulmonary fibrosis is warranted.

Dermatopathy: also occurring in a minority of patients and often appears along the pinna and chest. Per VetDC, resolution of the side effects occurs once discontinuing the protocol.

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WSV - 046

COMMON IMMUNE-MEDIATED DERMATOLOGIC DISEASES

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Overview of the Issue

OAn immune mediated disease is defined as a condition that lacks a definitive etiology but is characterized by inflammatory pathways resulting from, or triggered by, a dysregulation of the normal immune response.

Objectives of the Presentation

1. To review common immune mediated dermatologic diseases
2. To review diagnosis and treatment options

Pemphigus Foliaceus

Pemphigus foliaceus (PF) is the most common disease that is part of the pemphigus complex. The complex is characterized by acantholysis; breakdown of intercellular desmosomal components between keratinocytes1. In PF the major antigen targeted within the desmosome was originally thought to be Desmoglein-1. More recently studies have shown that Desmocolin-1 may also be a major autoantigen in PF2. PF can be triggered by an adverse drug reaction and there is also evidence to suggest that chronic skin disease, such as atopic dermatitis, can predispose to PF3.
Clinical signs include large, multi-follicle pustules and intense crusting. A facial presentation is the most common seen with PF including lesions on the nasal planum, dorsal muzzle, periocular region and the pinnae. Lesions are most often symmetrical1. Occasionally the footpads can become hyperkeratotic and fissure. In cats, lesions are commonly noted around the nail beds as a sterile paronychia. The areolar region and the legs are more commonly affected in cats compared to dogs. A more generalized pustular form of the disease has also been documented. Pruritus with PF has been found to be variable depending on the individual1.

Diagnosis

Cytology should be performed to diagnose any secondary infections. Acantholytic cells can be found on cytology but one must be aware that these cells are not pathognomonic for PF. Skin biopsy can provide a definitive diagnosis if lesions are selected appropriately.
If pustules are found on examination, these should be submitted as samples. Histopathology will reveal intra/subcorneal or intragranular pustules with acantholytic keratinocytes, “fresh” neutrophils and eosinophils1. Fungal stains will be negative and should be pursued to rule out Trichophyton.

Treatment

The mainstay of treatment with PF is glucocorticoids administered at immunosuppressive dosages. These can then be tapered to the lowest effective dose that keeps clinical signs under control. If doses cannot be tapered or patients do not respond to glucocorticoids, then a second immunosuppressive agent should be added to the therapeutic regimen. Azathioprine (dogs), chlorambucil (dogs/cats) or mycophenolate mofetil (dogs) have been sown to be effective1,3. Cyclosporine is another treatment option. In this author’s opinion cyclosporine therapy is more effective in cats than dogs when treating PF. The prognosis for PF is fair. In a retrospective study by Gomez et al, the case fatality rate was 60.5%. Treatment times lasting more than 10 months correlated significantly with survival as did the use of concurrent antimicrobials during initiation of immunosuppressive treatment3.

Discoid Lupus Erythematosus

Discoid Lupus (DLE), is one of the forms of cutaneous lupus. This disease tends to be localized to the face and more specifically the nasal planum. In DLE, autoantibodies to antigens on epidermal basal cells are created leading to immune complex deposition at the level of the basal membrane4.

The age of onset for this disease is young to middle aged and no sex predilection has been documented. Dolichocephalic breeds are affected and some breed predispositions have been noted (German shepherd, Akita, Husky etc)4.

Dogs can present with depigmentation of the nasal planum followed by a loss of cobblestone architecture, erythema, scaling, erosion and ulceration. Leions can extend up the dorsal muzzle and can sometimes affect the periocular region or the ear pinnae. Footpads are rarely affected4.

Diagnosis

Cytology in cases of DLE is unrewarding. Histopathology will show a lymphocyte rich interface dermatitis with hydropic degeneration of basal cells and pigmentary incontinence. Both DLE and mucocutaneous pyoderma (MP) have overlapping histopathological changes so MP should be ruled out prior to beginning therapy for DLE4.

Treatment

DLE carries a good prognosis. Sunlight should be avoided to prevent UV damage to the skin. Treatment options can include systemic glucocorticoids, topical 0.1% tacrolimus, tetracycline/niacinamide and Vitamin E. Cyclosporine has been shown to be effective in some cases4.

Symmetrical Lupoid Onychodystrophy

Claw disease as the only manifestation of disease is uncommon and in one study accounted for 1.3% of dogs presented to a veterinary hospital5. Symmetrical Lupoid Onychodystrophy (SLO) is a condition described in dogs. The exact cause and pathogenesis in unknown but based on response to therapy, an immune mediated basis is suspected.

The disease is generally noted in young to middle aged dogs with no sex predilection. Predisposed breeds include German Shepherd dogs and Gordon setters5. Another common breed presenting with this disease is the Rottweiler. In a study by Wilbe et al, DLA class II alleles have been found in Gordon setters indicating a possible genetic predisposition6.

Dogs are otherwise healthy. In a retrospective study of 30 dogs and literature review, 17% of dogs with SLO were also diagnosed with hypothyroidism7. It is thought that antithyroid antibodies could be binding to the claw matrix causing a lupoid reaction. Many patients in this study had well controlled hypothyroidism prior to developing SLO so the direct association is not clear. This author continues to recommend thyroid evaluation in SLO patients. In the above study, there was 1 dog with a confirmed cutaneous adverse food reaction (CAFR), so CAFR have also been proposed as a possible factor in development of SLO7. Dogs will show licking of the paws, dry/brittle claws, sloughing of claws, exudate from the claw bed, misshapen claws and pain (lameness). It is common for dogs to have secondary infections at the claw base. A feature of the disease is that multiple claws on multiple feet will become affected.

Diagnosis

Cytology of the claw beds should always be performed to assess for any secondary infections. If digits are swollen, radiographs should be taken to rule out a tumour or boney changes. Thyroid testing may be indicated as well as a complete bloodcount and serum biochemistry as a baseline for overall health and prior to treatment.

Most dermatologists will diagnose SLO based on clinical signs, history and examination. Very few diseases affect the claws and SLO should be at the top of your differential list if multiple claws are affected. The diagnosis of SLO can be confirmed via biopsy and histopathology if required. To collect a biopsy sample, the 3rd phalanx of an effected digit must be amputated so that the entire claw and base can be assessed. If possible a dewclaw should be selected for biopsy. Histopathology will show a hydropic and lichenoid interface dermatitis similar to that seen in cases of discoid lupus. There is, however, concern that these changes may be just a reaction pattern to an insult on the claw.

Treatment

Treatment options include supplementation with omega 3 and 6 fatty acids, tetracycline and niacinamide, cyclosporine, pentoxifylline and glucocorticoids5,8. Patients should receive pain medications if required and claws should be trimmed every 2-3 weeks. Improvement is generally noted within 3-4 months at which time, medications can be tapered to the lowest effective dose. Each time the dose is tapered, no further adjustments should be made for at least 6-8 weeks. At rechecks, new claw growth should be assessed by looking at the base of the claw.

Summary including 5 KEY "TAKE HOME" POINTS:

1. Immune mediated disease is due to dysregulation of the immune response
2. Histopathology paired with clinical signs is the best way to diagnose an immune mediated skin disease
3. Treatment is often long term if a trigger factor cannot be identified
4. Treatment revolves around either topical or systemic immunosuppressive/immunomodulating agents
5. Most immune mediated dermatologic diseases are treatable

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WSV - 039

PROPER PERIODONTAL THERAPY TECHNIQUES

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OB. Homecare

Homecare is an absolutely critical part of periodontal therapy. This is because plaque forms in 24 hours, tarter in 3 days and gingivitis in 2 weeks. This means that even with annual cleaning, patients are infected 50 weeks a year. In fact, human studies show that professional cleanings without homecare are essentially worthless. There are 2 major divisions of homecare, active and passive. Active homecare is defined that the client actually needs to perform work as opposed to feeding a diet or treat, the latter is considered passive.

Active Homecare

As far as homecare is concerned, tooth brushing is still the gold standard. Educate your clients early about the benefits and compliance will increase. Brushing is performed with a toothbrush and veterinary toothpaste. However, mechanical removal of plaque by the bris the most important part of periodontal care. The toothpastes typically only provide flavorings and anti-tartar agents, neither of which is actually helpful for control of periodontal disease.

Antiseptics such as chlorhexidine and zinc ascorbate can be good adjunct therapy for periodontal disease. However, as above, plaque bacteria are very resistant to antiseptics and therefore mechanical removal of plaque is the most important part of periodontal care.
As great as effective toothbrushing is, this is rarely the case. Toothbrushing needs to be performed correctly on a very regular basis. If a client stops brushing even for a short time, gingivitis will return. Since it has been shown that less than 1% of clients brush their pets daily, this is rarely a great choice. Further, it is very difficult to access the distal teeth as well as the linguo-palatal surfaces.

It has been shown that brushing is effective on rostral teeth (canines and incisors) but less so on premolar and molar teeth. Chew based “passive” homecare is more effective on the chewing teeth. Therefore, a combination of the two is likely best.

Passive homecare

Passive homecare is mostly chew based removal of plaque. As far as “passive” methods of homecare are concerned, many available products have NO scientific evidence behind them. Essentially all pet store products have no studies.

Further, most studies just look at overall plaque and calculus reduction, not WHERE the reduction occurs. This may or may not indicate true effectiveness against periodontal disease. This is because the decrease is generally at only the incisal edge to middle of the tooth and does not reach to the gingival margin where the disease actually occurs. This may or may not indicate true effectiveness against periodontal disease Therefore, when you are determining what products to recommend to your clients, ideally look beyond just plaque and calculus control and determine where that control occurs. Softer and more pliable products are not only safer in general, they should clean all the way to the gumline.

C. Periodontal Surgery

The other “new” form of pathogen control should be periodontal surgery. As discussed in the last article, pockets greater than 3-mm are pathologic and in need of therapy. All pockets between 3 and 6-mm should be treated with closed root planing and ideally the administration of a sustained release local antimicrobial. Pockets greater than 6-mm or furcation level II and III require periodontal flap surgery to effectively clean the root surface and allow for reattachment and infection control. These procedures can be learned by a general practitioner and require minimal investment in equipment. If this is not an option, these teeth should be extracted.

D. Extraction

While extreme, the ultimate in plaque control is extraction. This will completely remove the plaque retentive surface of the tooth. It is the actual cure for gum disease. Dental radiographs will greatly facilitate the procedure. This author is a big believer in minimally invasive surgery. Use small, sharp luxating elevators, minimal bone removal, and envelope flaps for extractions.

BONE REGENERATION

Regenerating bone lost via periodontal disease is another weapon in the fight against periodontal disease. This is combined with periodontal flap surgery to clean and regenerate the lost bone. The technique of guided tissue regeneration (GTR) has been around for decades, but recent advances in barriers and bone grafting has markedly improved the success rates. Regardless, there are only a handful of conditions which carry a good prognosis for bone regeneration. The best prognosis is seen with 3-walled periodontal pockets (typically seen on the palatal aspect of the maxillary canine and distal aspect of the distal root of the mandibular first molar) and class II furcation lesions. Since these are quite common in small breed dogs, there are a large number of patients who would benefit from these procedures.

The theory of GTR is that the down growth of faster healing soft tissue must be prevented to allow the slower growing bone and periodontal ligament to repopulate the periodontally induced bony defect. GTR involves creating a periodontal flap and performing open root planning to create a clean root surface for healing. After this is accomplished, the defect is filled with bone augmentation and a barrier membrane placed. There are numerous products currently utilized on the human side, however currently the products of choice for most veterinary dentists are cancellous freeze-dried demineralized bone for the graft and demineralized laminar bone sheets as the membrane.

HOST MODULATION

This is an exciting new area of periodontal therapy. It is the use of products to decrease the inflammatory response to bacterial plaque. In this way it can lessen gingivitis and in some cases decrease the amount of alveolar bone loss. Some products are drugs, but there are and increasing number of nutraceuticals in this segment.

Probiotics have been shown to be very effective at improving oral health. They can be administered orally, bit are more effective when rubbed on the gums. Additionally, they have been shown to decrease pocket depths when injected into a periodontal pocket.
Fatty acids are well known for their anti-inflammatory effect on skin and joints. They have also been shown to be effective against periodontal disease. In particular, a veterinary labelled product can be topically applied for maximum local effect, but when swallowed also provides joint support.

Other agents in this category are CoQ10, antioxidants, and proper overall nutrition.

CONCLUSIONS

Periodontal disease is by far the most common disease process in small animal veterinary patients. It is particularly common in small and toy breed dogs. Not only does it create local infection and can lead to tooth loss, there are numerous negative local and systemic effects of untreated periodontal disease. In fact, on the human side periodontal disease is known as the “silent killer”. Proper care of periodontal disease is critical for the overall health of the patient.

The basis for therapy of periodontal disease is plaque control. This is achieved by a combination of professional cleanings, periodontal surgery, extractions, and most critically homecare. It is critical to select therapies (particularly homecare) which are effective at and below the gumline. Recently, guided tissue regeneration and host modulation have emerged as additional options for combatting periodontal disease.

WSV - 010

WATER BIOLOGY FOR HEALTHY FRESHWATER AQUASYSTEM

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In natural bodies of freshwater, the purification of pathogens from the water column occurs primarily in wetlands. Four processes have been identified in achieving this end, being: aggregation (floc formation) and sedimentation; adsorption on suspended inorganic matter; competitive inhibition and ingestion by beneficial micro-organisms; and the presence of antibiotics and biocides produced by beneficial micro-organisms and plants. Despite the absence of inorganic matter, it is possible to identify and utilize both floc formation and sedimentation and competitive inhibition and ingestion in purifying artificial freshwater aquasystems. It is also likely that antibiotics and biocides produced by algae and higher plants may play a role in purifying artificial systems.

Aggregation of suspended organic matter and pathogens into settleable solids (floc) is primarily due to the presence of mucopolysaccharides in the water column. These have been highly exploited in treating storm runoff water and sewage water. Many commercial preparations of bacterial origin are used to this end. Of interest to aquaculture is the presence of nematodes in the substrate which produce these mucopolysaccharides. as well as those of bacterial origin. Once floc formation has occurred, upflow filtration provides excellent separation of settleable solids via sedimentation for removal from the aquasystem.

Competitive inhibition and ingestion by beneficial micro-organisms is an important function which occurs primarily in the microstructure of the periphyton. Many of the rotifers of natural bodies of freshwater can be present in artificial aquasystems. They require a suitable substrate on which to attach and a steady gentle flow of highly oxygenated water. Many of these sessile rotifers, such as stentor, vorticella and epistylis may take months or years to develop their potential in a given aquasystem. Of particular interest is the motile rotifer Philodina, which can swim through the water column or crawl along the microstructure to a desirable location. These rotifers possess the ability to process large quantities of organics and bacteria under ideal conditions. They can reproduce and mobilize rapidly when conditions warrant. They are also capable of anhydrobiosis, thus not killed through desiccation. A suitable substrate microstructure, which supports these rotifers and nematodes, while facilitating the transit of highly oxygenated water will maximize the purification process in filtering artificial aquasystems.

The antibiotic and biocidal effects of both algae and higher plants has yet to be studied, but their presence in the aquasystem, where possible, is desirable for the removal of iron, nitrates and phosphates from the system.

Based on these processes, a phytoremedial device was developed for use in artificial aquasystems. When combined with an upflow refugium, a synthetic wetlands filter was produced. Once biologically activated and planted with a terrestrial plant, excellent control of ammonia, nitrite and nitrate was achieved. Lower turbidity levels were measured compared to the inert control setup.[2],[1] Further testing for the control of a pathogenic strain of Aeromonas sobria introduced into the aquasystem proved the synthetic wetlands filter to be highly effective.[3] Additional testing in an aquasystem housing a painted turtle Chrysemys picta for an extended period showed excellent control of total coliforms.

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WSV - 106

YOUR ANESTHETIC ARSENAL: DRUGS EVERY TECHNICIAN SHOULD KNOW

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Every veterinary professional knows the list of drugs related to anesthesia and pain management can seem overwhelming. This lecture will cover the following classes of drugs and explain their mechanism of action, when to use them appropriately, and how to create multimodal anesthetic and analgesic plans for your patients. By combining multiple drug classes in your anesthetic protocols, you can provide better pain control (by blocking more pain pathways) with less side effects (as most side effects are dose dependent).
Drug classes covered will include opioids, benzodiazepines, NMDA receptor antagonists, alpha two receptor agonists, induction agents, local anesthetics, non-steroidal anti-inflammatories (NSAIDs), inhalant anesthetics, and emergency drugs.

Part 1: Opioids

Opioids are considered by many to be the prototype analgesic. They have a wide range of analgesic action from ultra-short acting agents such as remifentanyl to longer acting agents such as hydromorphone. Their general reversibility makes them especially attractive in higher risk cases. And in some cases they are relatively inexpensive. They are also extremely versatile in that they can be administered via many different routes. Opioids can be given as oral tablets, intermittent injection, constant rate infusion, transdermally, or epidurally.

The effects of opioid analgesics are dependent upon the receptors at which they act. Currently, there are three major classes of opioid receptors recognized within the CNS. They are as follows mu, delta, and kappa. All three classes of opioid receptors produce some level of analgesia.

Drugs acting on opioid receptors are also classified as being agonists, partial agonists, mixed agonist/antagonists, and antagonists.

Opioid Agonists: These drugs have high affinity for the mu opioid receptors responsible for analgesia and sedation. Opioid Agonists include: Morphine, hydromorphone, oxymorphone, fentanyl, methadone, etc.

Partial Agonists: These drugs by definition are only partially as effective as agonists. This is because its binding with the mu opioid receptor produces an effect that is less pronounced than that of an opioid agonist such as fentanyl. An example of a partial agonist would be buprenorphine.

Mixed Agonist/Antagonists: These opioids work by exerting an agonist effect at the kappa receptors being responsible for sedation and some analgesic properties. They also act as an opioid antagonist at mu receptor sites. Agonist/antagonist opioids can include butorphanol and nalbuphine. These drugs can also be used to reverse some of the unwanted side effects of full agonist opioids such as excessive sedation. (Wagner, 2009)

Antagonists: These drugs work to fully antagonize and reverse the effects of opioids at the mu and kappa receptors. Drugs in this category include naloxone and naltrexone. These drugs will cause increased alertness. They will also reverse the analgesic effects of opioids so opioid antagonists should be used with caution in the painful patient.

Part 2: Benzodiazepines

Benzodiazepines are a class of drugs used as tranquilizers for their calming and (sometimes) sedative effects. These drugs also provide some muscle relaxation. There are three benzodiazepines commonly used in veterinary medicine today. These are diazepam, midazolam, and zolazepam (the benzodiazepine component of the mixture telazol).

Diazepam has been traditionally used as an anticonvulsant. Diazepam is not water soluble and is provided in a carrier solution of propylene glycol, therefore IM administration is not recommended due to pain on injection (Robbins, 2010).

Diazepam is highly protein bound, and it should be used with caution in animals with low total protein levels. Midazolam is water soluble and can easily be combined with opioids in the pre-medication. It is important to note that these drugs DO NOT have analgesic properties. Benzodiazepines have minimal effects on both the cardiovascular and respiratory systems.

Another attractive trait to benzodiazepines is their ability to be reversed via the administration of flumazenil.

Part 3: NMDA receptor antagonists

NMDA receptor antagonists are used in veterinary medicine as analgesic adjuncts and agents of chemical restraint. By inhibiting NMDA receptors, ketamine has been shown to reduce the activity of neurons in the spinal cord in response to nociceptive stimuli and reduce sensitization of these neurons (Kerr, 2010). This helps to decrease the "wind-up" pain phenomenon from starting. NMDA receptor antagonists include ketamine and tiletamine (the NMDA antagonist component of the mixture telazol). NMDA receptor antagonists cause an increased heart rate and blood pressure due to an indirect stimulation of the cardiovascular system (Robbins, 2010). Ketamine can be especially useful at decreasing inhalant gas anesthetic requirements when used as a constant rate infusion.

Part 4: Alpha-2 adrenergic agonists

Alpha 2 drugs such as medetomidine, xylazine and the newest form dexmedetomidine function as both sedatives and analgesics. Alpha-2s have analgesic properties that are primarily mediated via alpha-2 adrenergic receptors located in the dorsal horn of the spinal cord. These receptors modulate the release of neurotransmitters responsible for transmission of nociceptive signals to higher centers (Kerr, 2010) It is recommended that alpha-2s be used on only cardiac healthy patients as they can have significant cardiovascular side effects. Alpha-2 agonists cause increased systemic vascular resistance, peripheral vasoconstriction, and therefore increased systemic arterial blood pressure. Because of this increase in blood pressure, a decreased heart rate is often seen as the body's normal response. Dexmedetomidine can be used as a premedication, and when combined with an opioid can sometimes be enough to preform minor surgical procedures (Shaffran, 2011). Dexmedetomdine can also be used as a constant rate infusion for overly anxious patients that require treatment and hospitalization.

Part 5: Local Anesthetics

Local anesthetics are used to block transmission of nerve endings or fibers. Local anesthetics inhibit the generation and propagation of nerve impulses by blockage of sodium channels in the nerve membrane (Mama, 2009) Bupivicaine and lidocaine are the two most commonly used local anesthetics in veterinary medicine. Local anesthetics can be administered intravenously, epidurally, and directly infiltrated. They can be especially useful as a part of multimodal analgesic plans.

Part 6: Induction Medications

Propofol can produce general anesthesia in animals, as a sole agent with continuous infusion for surgery, or as a pre-anesthetic for endotracheal intubation. It is valued for its fast recovery time, even after prolonged administration. Propofol has minimal analgesia at sub-anesthetic doses. It can be a profound respiratory depression, and may also cause hypotension. Because of its rapid elimination, it must be administered IV. Propofol can be used as a constant rate infusion for cases of total intravenous anesthesia.

Alfaxalone is another option for induction. Alfaxalone is a neurosteriod anesthetic and is similar to propofol in administration and use. Alfaxlone has been associated with less respiratory depression than propofol and less subsequent hypotension.

Another option for induction is a ketamine/diazepam combination. This combination works well for young healthy animals. The drug profiles for each of these drugs can be found above.

Part 7: Non Steroidal Anti-inflammatory drugs

The advent of newer, more potent, more specific anti-inflammatory agents has increased their usefulness in veterinary patients. NSAIDs are used to reduce fever, reduce inflammation, and provide varying degrees of analgesia. Carprofen, ketoprofen, ketorolac, and meloxicam may have duration of analgesic action up to 24 hours. They may be used concurrently with anesthetics, with opioid analgesics, and with local anesthetic/analgesics. Injectable NSAIDs are useful for accurate dosage and administration. NSAIDs may decrease clotting ability, of possible concern following surgery. Gastric upset and even ulceration may occur, especially with prolonged use. Prolonged use carries the risk of kidney or liver disease. Cats can be particularly susceptible to toxic effects of NSAIDs. Acetaminophen is never administered to cats; other NSAIDs should be used only at the dose and frequency recommended by your clinician.

Part 8: Inhalant Anesthetics

A variety of inhalant anesthetics are available, but isoflurane is the most commonly used. Isoflurane produces rapid induction and recovery from anesthesia. The depth of anesthesia can be easily and quickly altered. Virtually no metabolism occurs in the body because isoflurane is almost completely eliminated in expired air. Liver microsomal enzymes are minimally affected which results in little interference with drug metabolism or toxicology studies. The use of isoflurane requires an anesthetic machine fitted with a precision vaporizer to deliver controlled amounts of anesthetic and oxygen.

Part 9: Emergency Drugs

Atropine, Glycopyrrolate, Epinephrine, Lidocaine, Flumazenil, Naloxone, and Atipamezole are all drugs that should be calculated for each patient prior to general anesthesia.
Should an anesthetic emergency develop, refer to your clinician for guidance and specific drug dosages.

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CHRONIC KIDNEY DISEASE: THE NEW PARADIGM OF EARLY DIAGNOSIS AND EVOLVING TREATMENTS

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It is generally accepted that 30% of cats may develop chronic renal azotemia after 9 years of age. Above age 15, it is thought that over 50% of cats will have some form of CKD. In dogs, the prevalence of CKD is accepted to be less than 1% based on a recent U.K. study. Therefore, most of the discussion below will be based on cats and CKD. There are numerous possible causes of CKD in cats, but its exact pathophysiology has not yet been established. There is increasing suspicion that CKD evolves from possible multiple mini active kidney injuries secondary to ischemia or chronic inflammation (IRIS Napa meeting 2016). Unfortunately, as of now we do not have biomarkers sensitive enough to catch these mini-AKIs. However, this may change our future approach to chronic kidney disease in cats as it may highlight certain preventative stratgies.

Traditionally, the diagnosis of CKD has been based on the presence of renal azotemia and inappropriate USG for at least 3 months' duration. However, this assumes that we have eliminated post renal causes of azotemia (such as ureteroliths) AND that the azotemia has been chronic. AIt takes a 75% decrease in nephron mass for azotemia to appear, which is defined as an increase in creatinine (MUCH more stable and predictable) and/or BUN (MUCH less reliable and variable) above established reference ranges. These references ranges can vary greatly from one reference laboratory to another. TThe development of isosthenuria is not much better in diagnosing CKD, as its appearance signifies a 68-70% decrease in renal function. Also, multiple conditions will affect USG (endocrine disease, afternoon urine sample, diet etc.).

Symmetric dimethylarginine (SDMA) is a molecule that has become quite important in the early diagnosis and also staging of CKD in cats and dogs. SDMA has no physiologic role in the body. Studies in veterinary medicine have shown that SDMA increases at roughly at 40% of renal dysfunction, and in some cases will detect a 25% in renal function. Using this biomarker will take some getting used to because we are so used to seeing a normal creatinine and USG and concluding there is no CKD! We are now able to diagnose CKD much earlier than before, and this will hopefully lead to new treatments. SDMA is more sensitive than creatinine at detecting CKD especially at earlier stages of CKD.

It is a specific biomarker as well based on studies. In cats with CKD, SDMA shown to increase 17 months earlier; and in dogs an average of 9 months earlier (Hall et al, JVIM 2014). SDMA is not impacted by muscle mass, thereby much more accurate in low BCS geriatric animals. This is very important because most of our geriatric cats have decreased muscle mass. In addition, with CKD there is progressive muscle mass loss and therefore CKD stage may be understated because of the reliance on creatinine. SDMA is stable, and intraday and interday variability negligible. There is no impact from hemolysis, icterus, lipemia.

Once CKD has been diagnosed, it is important to then refer to staging principles. The IRIS staging guidelines have become a mainstay of staging cats and dogs with CKD. They have permitted us to create clear and objective guidelines on how to treat our patients based on creatinine (because it is more stable and predictable than BUN), proteinuria, and hypertension. The IRIS guidelines underline the importance of regular physical exam and lab work for our patients. For instance, proteinuria and hypertension are often silent. If left undiagnosed and untreated, not only will organ damage occur, but CKD also progresses much faster.

IRIS guidelines have been modified in 2015-2016 to reflect the addition of SDMA as both a diagnostic tool and also a staging tool. An SDMA that is persistently above 14ug/dl is consistent with CKD. This values reflects IRIS stage 1 and 2 patients if the SDMA is below 25ug/dl. These patients often have minimal to absent clinical signs. SDMA above 25ug/dl usually indicates IRIS stage 3, and this is important for cats and dogs with creatinine values in stage 2 but that have muscle mass loss. Therefore, these patients have an underestimated renal function and are likely in stage 3 with that SDMA level. This changes their prognosis and treatment recommendations. The same is true for a creatinine above 45ug/dl. If a cat or dog has a creatinine that puts them in IRIS stage 3 but an SDMA of 45ug/dl, this pet is actually in stage 4. The treatment recommendations and prognosis vary greatly between these 2 stages (prognosis 778 days for IRIS stage 3 vs. 30-60 days for IRIS stage 4).

Stage 1 has long been a mystery. It was almost impossible to diagnose as there are usually no clinical signs associated with this stage, and our diagnostics tests were not sensitive enough. However, now with SDMA we can diagnose cat in this stage. This has helped us learn a lot more about early stage CKD and discovered that in fact some cats do have symptoms such as mild weight loss. In addition, we are understanding that stage 1 is not a benign state as previously thought. Because of early diagnosis, this is allowing research to advance in early stage treatments (especially diets).

As such, cats in stage 1 may likely benefit from a geriatric-type diet or an early-stage kidney diet. A study by Hall et al demonstrated possible benefits of cats in stage 1 eating an early kidney disease diet, and a similar study done on dogs by the same author also showed a similar benefit. There are multiple reasons why these diets are likely beneficial including decreased phosphorus and increased omega-3 fatty acids.

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WSV - 033

PALLIATIVE CARE AND THE CANCER PATIENT

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Introduction:
Palliative care is defined as treatment of symptoms of a condition, rather than treatment of the underlying condition itself. The world health organization defines palliative care as «The active total care of patients whose disease is not responsive to curative treatment. Control of pain, of other symptoms, and of psychological, social and spiritual problems, is paramount. The goal of palliative care is an achievement of the best quality of life for patients and their families". is believed that ~ half of all animals with cancer will die as a result of the disease and most will require symptom or pain control. The need for palliative care in veterinary oncology is already great but will likely continue to increase over time.

Pain Management:
Pain is a primary concern of most owners upon hearing the diagnosis of cancer and their feeling of not wanting their pet to be considered "in pain". Pain is a normal physiologic response that typically serves a protective function; however, pathologic pain results from overt damage to nerves or tissues. Tumors are generally poorly innervated structures but may induce pain via by the pressure on normal tissue and their subsequent destruction. Primary treatment of the tumor may result in some degree of pain control even if the tumor does not respond by a reduction in volume.

The analgesic effectiveness of radiation therapy is well documented in the treatment of bone pain, metastases, and cancer of the central nervous system. The effect of chemotherapy on cancer pain is generally associated with a reduction in tumor size. Surgery can relieve pain and discomfort via removal or an ulcerated superficial mass, large oral tumors preventing adequate nutrition, gastrointestinal obstruction, abscessed tumor, compression of nervous tissue by a tumor etc.

The benefits of this type of therapy need to be adequately weighed against the risks such as the associated hospitalization time, recovery time and the overall expected duration of benefit.

Alternative therapies:
Although data is limited, acupuncture, chiropractic management, and physical therapy may be incorporated into pharmacologic management of pain to enhance overall well-being.

Palliation as a Primary Therapy:
Primary therapy for palliative purposes is accomplished in order to control symptoms associated with cancers includes physical disruption of vegetative functions such as dysphasia, tenesmus, dysuria and, dyspnea and symptoms associated with metabolic or paraneoplastic sequelae to cancer such as anemia, cachexia, hypoglycemia or hypercalcemia.

Surgery:
Surgery may be beneficial if the symptoms are associated with the presence of a mass and ideally reducing the mass will improve those symptoms. The goals of primary therapy in a palliative setting are certainly different than in a curative setting and these need to be addressed with the owner to manage expectations. Palliative surgical debulking is not intended to include large normal tissue margins but simply remove enough of the tumor to alleviate symptoms. Cases in which a tumor is large enough to affect nutritional intact, urination or defecation, respiration ambulation or may be infected are all examples in which a debulking may provide a benefit.

Radiation Therapy:
We often break radiation therapy into one of two categories based on the total radiation dose and fractionation scheme:
Definitive (curative intent) radiation protocols typically entail the delivery of 2.25 to 3.20 Gy/fraction on a M-F schedule for a total of 16 to 25 treatments resulting in a total dose of 48 to 63Gy. Generally, this is reserved for the microscopic setting.

Palliative (hypofractionated) radiation protocols typically involve the administration of a larger dose per fraction, with fewer total fractions and lower total radiation dose. On the positive side, in regard to quality of life, palliative protocols typically are associated with little to no acute adverse effects seen with definitive protocols such as moist desquamation of the skin or oral mucositis. The larger dose/fraction, however, is associated with an increased risk of late adverse effects, but ideally,

most animals receiving palliative radiation therapy typically will not live long enough to develop late effects. Palliative radiation therapy is used in the treatment of canine appendicular osteosarcoma, oral tumors, nasal tumors, hemangiosarcoma (SQ/IM), thyroid carcinomas, mast cell tumor, injection site sarcoma, and soft tissue sarcomas. A variety of palliative protocols exist and

these include:
8 Gy/fraction, given once weekly for 4 consecutive weeks for a total dose of 32 Gy.
5 Gy/fraction once daily for 5 consecutive days for a total dose of 20 Gy.

Sterotactic radiation therapy is also considered hypofractionated delivery extremely high doses/fraction in 1-3 treatments. It is sometimes called radiosurgery, and an example is CyberKnife. CyberKnife utilizes hundreds to thousands of small beams of radiation to target a tumor, which is administered from up to 1200 different angles around a patient's body, thus "painting" on a dose of radiation with submillimeter accuracy. This means that a clinically insignificant dose of radiation is received by the healthy tissue surrounding a tumor, making radiation side effects minimal to absent. CyberKnife is able to deliver a very large dose of radiation in 1-3 treatments, which is equivalent to 3-4 weeks of daily treatments on a conventional linear accelerator. This results in a patient being required to undergo anesthesia fewer times and completion of a radiation protocol in one week or less.

Chemotherapy:

Chemotherapy, when used in a palliative setting, is administered to attempt reduction or stabilization of the tumor to improve quality of life. One could say treatment of any bulky tumor would be described as "Palliative" in nature, however, for the purposes of this lecture, we reserving this for patients whose cancer has adversely affected their quality of life. Responses to chemotherapy in such a setting have been noted with transitional cell carcinoma, hemangiosarcoma, soft tissue sarcoma, mast cell tumor, histiocytic sarcoma, thyroid carcinoma, etc.

Interventional Radiology

The use of expandable stents for relieving luminal obstruction secondary to cancer can be performed under fluoroscopic guidance, and have been evaluated in patients with urethral and colonic neoplasia. In select cases, this may actually be a life-saving procedure.

Nutritional Support:

Malnutrition can occur as a result of cancer and it has been shown that while ~ 4% of dogs with cancer were emaciated (defined as body conditioning score < 3 out of 9) at the time of initial diagnosis, 68% had documented evidence of weight loss and 15% had moderate to severe muscle wasting. Cancer Cachexia is defined as a metabolic alteration and weight loss despite adequate nutrition. This is not to be confused with Cancer Anorexia which is weight loss and metabolic alterations associated with inadequate nutrition.

Cancer cachexia is a real entity and likely underestimated in veterinary medicine. The incidence is likely higher in cats vs. dogs. The cause is unknown, however, metabolic alterations in carbohydrate, protein and lipid metabolism occur as a result of cancer. Cancer cells prefer anaerobic glycolysis which results in hyperlactatemia. The conversion of lactate to glucose (Cori cycle) yields a net energy loss. A negative nitrogen balance can also lead to immunosuppression.

There are three associated phases of cachexia:

1. Silent phase: No clinical signs of the disease are present, however, biochemical changes such as hyperlactatemia,
hyperinsulinemia, and alterations in amino acid and lipid profiles are noted.
2. Clinical Phase: At this point, patients will demonstrate signs such as anorexia, lethargy and weight loss.
3. Severe Phase: This phase is associated with weakness, severe debilitation, and significant weight loss.

A patient›s nutritional assessment is based on both a thorough history (type of food, number of meals, how voracious a patient is in eating) and physical examination (assess body weight, body condition score, and overall muscle mass). The extent of nutritional support is based upon the results of the history and exam. Often is may require on mild intervention such as introducing higher coloric diets or medications such as appetite stimulants (megesterol acetate, prednisone, cyproheptadine, and mirtazapine), antiemetics (metoclopramide, dolasetron, ondansetron, and maropitant) or gastrooprotectants (famotidine, sucralfate, and omeprazole). For some, there is an ethical dilemma in the placement of feedings whether nasogastric, gastric or intestinal for palliation. In rare cases, in which a bulky mass prevented the ability to ingest adequate nutrition, I have used more aggressive means to ensure adequate nutritional intake but this represents a minority of cases.

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WSV - 030

STATE-OF-THE-ART LECTURE: INTERSTITIAL LUNG DISEASES IN DOGS AND CATS

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OVERVIEW

PInterstitial lung diseases (ILDs) encompass a wide variety of non-infectious and non-neoplastic inflammatory lung diseases. The term "interstitial" in ILD is misleading, because these diverse pulmonary disorders involve changes to the distal lung parenchyma including airways, pulmonary parenchyma, blood vessels and/or the pleura. A more accurate description sometimes used in the human literature is diffuse parenchymal lung diseases (DPLDs). Globally, interstitial lung diseases comprise many distinct syndromes with over 200 described in humans. They are grouped together based on similarities in clinical signs, imaging features, and physiologic and pathologic manifestations. Interstitial lung diseases are still considered rare and poorly characterized in veterinary medicine, in large part due to the need for lung tissue for histopathologic examination, expertise in respiratory pathology, and a multidisciplinary approach involving clinicians, radiologists and pathologists. In this lecture, based on a review of the literature and clinical case examples, recognized interstitial lung diseases in dogs and cats will be presented along with a comparison to related syndromes in humans.

ARE INTERSTITIAL LUNG DISEASES RARE?

In dogs and cats very few ILDs are recognized which is in stark contrast to human medicine in which over a couple hundred ILDs that have been characterized. Interstitial lung diseases are probably not as rare as we think in dogs and cats, despite infrequent diagnosis. There are several reasons for this. First, interstitial lung diseases are challenging to diagnose with histologic examination required for confirmation. Lung biopsy in a patient with respiratory compromise is not a trivial procedure. It is expensive, associated with some morbidity and occasional mortality. In dogs or cats that die from interstitial lung disease, necropsy is often not pursued. Even if histopathology is performed, a definitive diagnosis may not be reached for many interstitial lung diseases because as a whole they are poorly characterized. This in turn leads to frustration by clinicans ("why did I recommend getting lung tissue if I didn't get an answer") and owners ("why did I spend all that money and put my dog or cat at risk for a test that was inconclusive").

This may lead to bias in the future where clinicians then fail to advocate strongly for histopathologic examination. A second reason why there is so little known about veterinary interstitial lung diseases is the lack of routine multidisciplinary collaboration between clinicians, radiologists and pathologists to help characterize these disorders and explain discrepancies from each individuals' perspective. Veterinary pathologists cannot work in a bubble, but must talk to clinicians to help understand what compromises a clinical syndrome. If no lesions to explain the histologic results can be found, it is worth discussing distribution of lesions with a radiologist as recuts of a different section of tissue may provide answers. As another example, pathology reports commonly use the term "histiocytic pneumonia" which may accurately describe the findings under a microscope. However, there is no specific clinical syndrome of a histiocytic pneumonia, so to a clinician this is an unsatisfactory answer. Histiocytes could be present secondary to infection, neoplasia or as part of an interstitial lung disease and diagnosis does not end with the histologic description of "histiocytic pneumonia". After discussion with the clinician, the pathologist should be able to apply special stains to help identify certain microorganism or to do immunohistochemistry to help determine if the histiocytes represent a histiocytic sarcoma. A third reason we lack concrete knowledge about interstitial lung diseases is that there has been a tendency to assume interstitial and alveolar radiographic patterns correlate with a histologic diagnosis of disease confined to the interstitium or alveoli and that no further testing is needed. While radiographs are a reasonable first screening test, they are not a sensitive modality and certainly not to correlate pathology accurately on a histologic level. With the advent of computed tomography, accuracy of thoracic imaging has dramatically improved and computed tomographic patterns of disease now have more meaning.

TYPES OF INTERSTITIAL LUNG DISEASE

Interstitial Lung Disease in Humans

There is no single classification scheme for interstitial lung disease in humans, in part because of the sheer numbers of disorders, overlap in features between diseases and constant improvements in diagnostic capabilities. Idiopathic interstitial pneumonias (IIPs) comprise a large and important number of interstitial lung diseases. They have been subdivided into idiopathic pulmonary fibrosis (IPF), idiopathic non-specific interstitial pneumonia (iNSIP), respiratory bronchiolitis-interstitial lung disease, desquamative interstitial pneumonia, cryptogenic organizing pneumonia (COP), acute interstitial pneumonia (AIP), a group of rare IIPs and unclassifiable IIPs.

Of the IIPs, IPF is the most common. With substantial multidisciplinary collaboration, a diagnostic algorithm frequently negating the need for lung biopsy has been developed in human patients. Key to diagnosis of IPF is recognition of a "usual interstitial pattern" on high resolution computed tomography that closely correlates with a usual interstitial pattern on histology. Importantly, other interstitial lung diseases that may mimic IPF must be ruled out with historical questions, physical examination findings and other relevant diagnostic tests. The presence of fibrosis alone does not make a diagnosis of IPF, as is often incorrectly presumed in veterinary medicine (see below).

It is somewhat confusing that there is both a histologic pattern of NSIP as well as a clinical disease syndrome of NSIP. The histologic pattern can either be idiopathic with no underlying cause identified (falling into the category of IIPs) or be secondary to many other disorders, including familial fibrosis, drug toxicity, collagen vascular disorders and hypersensitivity pneumonitis, among others. Respiratory bronchiolitis-interstitial lung disease and the majority of cases of desquamative interstitial pneumonia are considered smoking-related diseases. They represent a spectrum of injury induced by cigarette smoking. This is important as smoking cessation represents a key part of therapy. Prognosis in general for respiratory bronchiolitis-interstitial lung disease is good; prognosis for desquamative interstitial pneumonia is more varied with severe respiratory impairment and death as possible sequelae.

Cryptogenic organizing pneumonia is the idiopathic form of a syndrome previously referred to as bronchiolitis obliterans with organizing pneumonia. The small airways damaged from an insult develop inflammation and plugging, leading to a downstream organizing pneumonia. Organizing pneumonia, like NSIP, is also a histologic pattern of disease as well as a distinct clinical syndrome secondary to known (infection, drugs, radiation, neoplasia, transplantation, aspiration, etc) and unknown (COP) etiologies.

Acute interstitial pneumonia, sometimes referred to as idiopathic adult respiratory distress syndrome (ARDS) presents as acute respiratory failure with diffuse bilateral infiltrates on lung imaging. Additionally, patients lack an inciting cause, have prior radiographs failing to document respiratory disease and have histologic evidence of "diffuse alveolar damage", the characteristic histologic lesion seen with ARDS. Mortality is high, with mechanical ventilation being an important tenant of therapy.

A discussion of the other human ILDs is well beyond the scope of this lecture; the emphasis will switch to ILDs recognized in dogs and cats or syndromes which likely exist but have not yet been well documented.

Interstitial lung disease in dogs and cats

One of the most commonly diagnosed ILDs in dogs and cat is IPF. A variety of injuries to alveolar epithelial or capillary endothelial cells can lead to inflammation, and as part of the reparative process, may share a common pathway culminating in pulmonary fibrosis. In veterinary medicine, the presence of an unknown cause of pulmonary fibrosis, even if severe, does not alone fit the diagnostic criteria for human IPF. As described above, human IPF has several important defining criteria including a UIP histologic pattern. Even the West Highland White terrier, the poster child for canine IPF, does not have the analogous disease to humans: while there is no doubt they have a familial fibrotic lung disease, it is not the same as human IPF. In fact, one report suggests its histologic appearance more closely resembles NSIP than UIP. Although histologic lesions noted in a series of cats with "IPF" showed resemblance to human IPF, a more thorough evaluation for other known causes that could terminate in fibrosis should be attempted. This is important because end stage pulmonary fibrosis has no effective treatment; however, if underlying inflammatory disease, inhalational injury, drugs, infection, etc. is aggressively treated early, progression to fibrosis may be slowed or halted. Intervening before development of end stage lung will have better success that attempting to find a viable treatment in a lung obliterated with scar tissue. To underscore the myriad numbers and types of diseases and triggers for pulmonary fibrosis (each with different time courses for progression, responses to treatment, and likely prognosis), the term fibrotic lung disease or fibrotic ILD is proposed to replace IPF in veterinary medicine. Known causes of fibrotic lung disease in dogs and cats include drugs (e.g., chemotherapeutics), toxins (e.g., paraquat), genetics (West Highland White terrier, Dalmatian).

Still termed bronchiolitis obliterans with organizing pneumonia in the veterinary literature, idiopathic cryptogenic organizing pneumonia (COP) has been described in both dogs and cats. Most disease is diffuse, but solitary lesions mimicking a lung neoplasm has been seen by the author. In comparison to fibrotic lung disease, COP appears to be very steroid-responsive. Diagnosis is made through antemortem lung biopsy. Delay in diagnosis and subsequent therapy can be life-threatening. Immunosuppressive doses of steroids and sometimes other immunosuppressants with a slow taper has been curative in the author's experience. However, rapid tapering or insufficient immunosuppression may lead to clinical relapses.

Hypersensitivity pneumonitis, also known as extrinsic allergic alveolitis in humans, is caused by diffuse small airway and pulmonary parenchymal inflammation from repetitive inhalation of small particulate environmental antigens. The closest disease in the veterinary literature resembling the human syndrome is inhalation of puff-ball mushroom spores in dogs. However, inhalation of puffball mushroom spores usually occurs as a single massive inhalation of these antigens, compared to human disease triggered by repetitive exposure to mushrooms. Although there are many other antigens capable of inducing hypersensitivity pneumonitis in humans, no other spontaneous examples of this disease have been reported in dogs or cats.

Pulmonary alveolar proteinosis, described in dogs and a cat, is a rare disorder resulting from flooding of the alveoli with surfactant. Thoracic radiographs generally display diffuse interstitial to alveolar patterns, and diagnosis can be made via the opaque, milky BAL fluid showing PAS positive macrophages and lipid on cytology. Lung lavage was successfully used to treat a dog with this condition.
Pulmonary alveolar microlithiasis is classified as an interstitial lung disease. Small calculi accumulate in alveolar spaces for unknown reasons in small animals; this disease must be distinguished from metastatic and dystrophic calcification and from broncholithiasis. In many cases, animals are asymptomatic and thoracic radiographs pick up mineralized densities as an incidental finding.

The pneumoconiosis represent a similar group of diseases sharing in common environmental exposure to mineral dusts and fibers. Anthracosis, a mild form of pneumoconiosis, occurs with chronic exposure to smoke, coal dust or air pollution and has been linked to lung cancer in dogs. Silicosis in and asbestosis has been reported rarely in dogs. There are a couple of unique features of pneumoconiosis compared to other ILDs: first, they are preventable and second, by employing avoidance strategies in ongoing disease, improvements may be noted clinically.
Lipid (or lipoid) pneumonia comes in two forms: exogenous from accidental inhalation of animal, vegetable or mineral sources of lipid and endogenous in response to accumulation of lipids after injury to type II pneumocytes. Both forms have been described in dogs and cats. Exogenous lipid pneumonia most commonly occurs after administration of mineral oil for constipation or hairballs. Endogenous lipid pneumonia in cats tends to occur secondary to obstructive pulmonary disease. In dogs, endogenous lipid pneumonia has been associated with mycobacterial pneumonia and rarely in tandem with other respiratory diseases (with unclear cause and effect).

Other interstitial lung diseases poorly characterized on the veterinary side include pulmonary hyalinosis; diffuse alveolar hemorrhage; ILDs from drugs, biologics and radiation; lymphocytic interstitial pneumonia, granulomatosis with polyangiitis (Wegener's granulomatosis); and histiocytic disorders.

CLINICAL APPROACH TO CANINE ILDs

In this lecture, using case based examples, clinical and pathologic features of interstitial lung diseases (ILDs)/ diffuse parenchymal lung diseases (DPLDs) in dogs and cats will be described. Emphasis will be placed on the diagnostic evaluation, paying special attention to interpretation of imaging findings and discrimination of these disorders from others.

RECCOMENDED READING

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WSV - 018

GASTROINTESTINAL SURGERY: CHALLENGING CASES

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Gastrointestinal (GI) surgery can vary from very simple to highly complex depending on the state of the patient, the disease process being treated and the expertise of the surgeon. It is critical to understand the general principles of anatomy and physiology in order to achieve good surgical outcomes when intervening in the GI tract. In general, vascular supply to bowel is still evaluated using very simple clinical parameters as more objective methods have generally failed to translate into practical and reliable “in the clinic” assessment tools. Color, consistency, motility and bleeding/perfusion are still the four principal methods used to assess the vascular integrity of GI tissue. Knowledge of the blood supply to different parts of bowel is important to plan enteric incisions and anastomoses. The jejunum has generally obvious vascular arcades that lend themselves easily to planned ligation. The duodenum receives shared blood supply from the cranial and caudal pancreaticoduodenal arteries, branches of the celiac and cranial mesenteric arteries respectively as well as the gastroduodenal and right gastroepiploic in its most proximal aspect. When the descending portion of the duodenum requires resection it is usually best to seal the duodenal blood supply directly at the antimesenteric margin in order to avoid damage to the pancreatic ductal system and blood supply. If a more extensive disease process dictates the resection of part of the pancreas, consideration should be given to making sure pancreatic tissue is resected in a way that avoids leaving areas of pancreas that are isolated from their ductal drainage system and therefore exocrine drainage mechanism. Care should also be taken in this area to make sure that the common bile duct is not involved in the disease process or is not impacted by the proposed resection.

The area around the ileocecocolic junction can also be challenging as it receives a mixed blood supply from the colic and ileocolic arteries. In this area, extensive collateral circulation appears to exists but direct visualization can be obscured by extensive fat deposition and the lymph nodes present within the mesenteric root. Much like in the duodenum, the safest course of action when performing an ileocolic resection is to take down the blood supply close to the mesenteric margin. The large intestine receives its blood supply from anastomosing branches of the colic arteries that arise from the cranial and caudal mesenteric arteries. These arteries, however, are not intimately associated with the mesenteric wall of the large intestine.

In contrast, they give off vasa recta which are short branches that emanate from the arteries and provide a segmental supply blood along the length of the large intestine. In the case of large bowel resections these vasa recta are individually sealed by ligation or use of a vessel-sealing device between the colic arteries and the intestinal wall thus preserving optimal blood supply from the colic arteries.

Care should be taken if resection of the distal descending colon is planned to try and preserve as much of the cranial rectal artery, a branch of the caudal mesenteric which provides the principal arterial blood supply to this area of colon.

Many principles of bowel closure are common to all areas of the GI tract. When hand-sutured enterotomy closure or resection and anastomosis is performed, simple appositional suture patterns are usually preferred with the use of monofilament suture. Simple continuous and simple interrupted have been shown both in cadaver studies1and in vivo2to be largely equivalent in effectiveness and safety. More recently barbed suture has been shown to be safe for use in enteric closure although its widespread adoption has not yet occurred possibly due to current cost concerns.3Although skin staples have been used for enteric closure in clinical studies in both dogs and cats4,5 some concerns have been raised as to their ability to counteract physiological pressures during peristalsis in cadaveric models.

No matter which suture technique is used the critical component of any enteric closure pattern is that the submucosa, the holding layer of the gastrointestinal tract, be incorporated in the closure. For small intestinal resection specifically, new data has recently been published documenting improved outcomes with surgical stapling compared to hand-suturing in certain cohorts of patients.6,7These multi-institutional studies have shown statistically using much larger case cohorts that dehiscence rates may be decreased if surgical stapling is used especially in the presence of septic peritonitis.7Generally a functional end-to-end anastomosis is created using a Gastro-intestinal anastomosis (GIA) stapler.

The end of the two stapled segments of small intestine are then sealed with either a Thoracoabdominal (TA) stapler or a second GIA cartridge.

These anastomoses are very rapid to perform but do add significant cost over hand-sutured techniques.

However, in the subgroup of dogs requiring GI resection in the face of peritonitis this cost appears to be warranted. Surgical stapling however is not the only modality a surgeon can rely on as it really is only practical for GI resection in the jejunum and ascending duodenum as the large ends of the GIA forks need to be able to be passed through the lumen of adjacent segments of intestine. This requires significant mobility of the bowel segments involved and makes it impossible in the descending duodenum, around the ileocecocolic valve and in the large intestine. It is also not practical in smaller breeds of dogs and cats using the most commonly used human GIA staplers (e.g. GIA stapler, Medtronic, Salem, MA).

The descending duodenum is an unusual site for surgical lesions to occur with the possible exception of ulcers associated with NSAID and/or steroid use, renal disease or other conditions. In these dogs, a predilection site for the upper descending duodenum appears to be present although these lesions seem to be getting less commonplace with a better understanding by veterinarians and owners on the use of sensible prescribing habits and the avoidance of co-administration of these different groups of drugs. In the case of a perforating ulcer in the proximal descending duodenum a local resection of the ulcer bed can be performed with a transverse closure in order to minimize the risk of luminal narrowing if the lesion is modestly-sized. With more extensive ulcers or masses in this area care should be taken to visualize the common bile duct as if resection of this structure or the major duodenal papilla is deemed necessary biliary rerouting will need to be performed.

Knowledge of factors that adversely affect healing of the large intestine should be considered prior to undertaking large intestinal resections. The large intestine has a much greater anerobic bacterial load compared to the small intestine. The large bowel heals more slowly and may in the case of large resections (such as those performed during subtotal colectomy for feline megacolon) be exposed to significant tension. Additionally, the blood supply to the lower colon may not be as robust as that of other areas of the bowel making preservation of the caudal rectal artery important when performing resections in this area. Indications for large intestinal resection are principally for management of megacolon, resection of neoplastic lesions and rarely mesenteric volvulus involving the large intestine.

Colotomy for foreign body removal is generally not indicated and neither are full thickness biopsies of the colon as colonoscopic biopsies usually suffice for diagnosis of inflammatory conditions of the large intestine. Large intestinal closure is performed by this author in the same way as for small intestine with a single layer appositional suture pattern although some surgeons prefer a two-layer closure for large intestine especially in large breed dogs.

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WSV - 013

BUT IT HAS TO BE CUSHING'S… CHALLENGES IN DIAGNOSING CANINE HYPERADRENOCORTICISM

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DIAGNOSING HYPERADRENOCORTICISM (HAC)
Testing is divided into screening (confirming the presence of HAC) and differentiation (pituitary dependent hyperadrenocorticism or functional adrenal tumor). It may be necessary to perform multiple screening tests or repeat testing at a later date in order to confirm the diagnosis in early or more challenging cases.

SCREENING TESTS

Urine cortisol to creatinine ratio (UCCR)

- Most commonly used to rule out HAC when there is a low clinical index of suspicion
- False-positive results are common because stress/non-adrenal illness can cause an increase in the UCCR
- Recommend performing a low-dose dexamethasone suppression test or ACTH stimulation test after obtaining a positive UCCR because of the lack of specificity (high risk of false positive results)

Protocol:

- Client/owner collects a urine sample at home. Urine should not be collected in the hospital or within 48-72 hours of a clinic/hospital visit because the stress of a clinic/hospital visit has been shown to increase the UCCR and increases the possibility of a false-positive result.
- Typically recommend first urination in the morning
- Using pooled samples (3 consecutive days) may provide a more representative result

Interpretation:

- Normal ratio (below the laboratory cut-off)– HAC is very unlikely
- Abnormal ratio (above the laboratory cut-off)– recommend performing another screening test (low-dose dexamethasone suppression test or ACTH stimulation test) to confirm HAC prior to initiating therapy

Low-dose Dexamethasone Suppression Test (LDDS)

- Highly sensitive test
- Greater chance of false-positive result with non-adrenal illness than ACTH stimulation test (not a significant concern if screening an appropriate population)
- Can also serve as a differentiating test if positive and meet criteria for pituitary dependent HAC

Protocol:

- Collect baseline blood sample
- Administer 0.01-0.015 mg/kg of dexamethasone or dexamethasone SP intravenously (preferred) or intramuscularly
- Collect blood samples at 4 and 8 hours after the administration of dexamethasone

Interpretation:

- Normal dog- complete suppression at 4 and 8 hours
- Consistent with HAC- lack of suppression at 4 and/or 8 hours
- Lack of suppression does NOT confirm the presence of a functional adrenal tumor (FAT).
- Consistent with pituitary dependent hyperadrenocorticism (PDH)
- Suppression at 4 hours with an escape at 8 hours
- Suppression at 4 and/or 8 hours to less than 50% of the baseline cortisol concentration

ACTH Stimulation Test

- Less sensitive test than LDDS test
- Less chance of false-positive result than LDDS test
- Only test that can diagnose iatrogenic HAC

Protocol:

- Obtain baseline blood sample
- Administer synthetic ACTH (cosyntropin or tetracosactrin) intravenously at a dose of 5 µg/kg (maximum dose 250 µg/dog)
- Obtain blood sample 1 hour after administering ACTH (post-ACTH). Some clinicians also collect a 2-hour post-ACTH sample in order not to miss (get a false-negative result) the small percentage of dogs that have peak cortisol secretion after 2 hours rather than 1 hour.

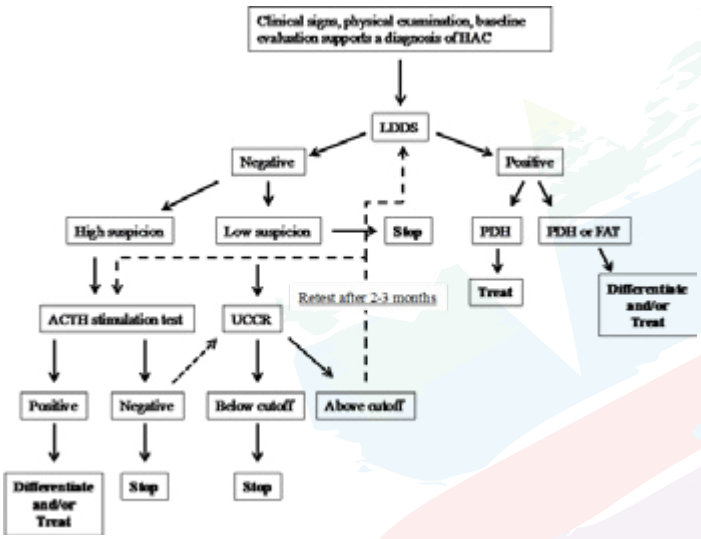
Interpretation:

- Normal dog- post ACTH cortisol concentration below the laboratory cut-off
- Consistent with HAC- post ACTH cortisol concentration above the laboratory cut-off

Basal or Resting Cortisol Concentration

No diagnostic value for HAC

Below is the author's approach to screening for HAC. The decision to perform additional screening tests following a negative LDDS test is based on the degree of clinical suspicion. In situations of high clinical suspicion, it is important to remember that no screening test is perfect. It may be necessary to perform multiple screening tests or repeat testing at a later date in order to confirm the diagnosis in early or more challenging cases.



DIFFERENTIATING TESTS

High-dose Dexamethasone Suppression Test Protocol (same as LDDS test but with higher dose of dexamethasone):

- Collect baseline blood sample
- Administer 0.1 mg/kg of dexamethasone or dexamethasone SP intravenously (preferred) or intramuscularly
- Collect blood samples at 4 and 8 hours after the administration of dexamethasone

-Results can support the presence of PDH
-Results CANNOT confirm the presence of a FAT

Interpretation:

- Consistent with PDH
- Complete suppression at 4 and/or 8 hours
- Cortisol concentrations less than 50% of baseline concentration at 4 and/or 8 hours
- Lack of suppression does NOT confirm the presence of a FAT.

Endogenous ACTH Concentration

- Single blood sample
- Immediately centrifuge and separate plasma from cells and freeze until shipping. Ship overnight on ice. This will minimize the amount of degradation, which is a concern with inappropriate sample handling.
- Possible to confirm PDH or an FAT

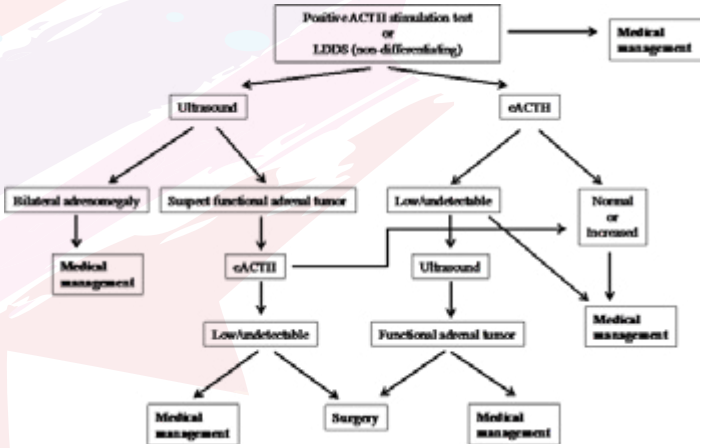
Interpretation:

- Consistent with PDH- ACTH concentration is normal or increased
- Consistent with presence of a FAT- ACTH is low or undetectable

Ultrasonography

- Evaluate size and appearance of adrenal glands
- Can confirm presence of an adrenal tumor
- Aid in the detection of concurrent illness

Below is the author's approach to differentiating PDH from FAT. The author believes it is important to confirm a FAT with ultrasound and endogenous ACTH prior to surgery because asymmetric adrenal gland enlargement and nodular hyperplasia is not uncommon with PDH.



OCCULT HYPERADRENOCORTICISM

Historically known as “atypical hyperadrenocorticism”
Clinical signs, physical examination findings, and clinicopathologic findings support a diagnosis of HAC, but the UCCR, LDDS test, and ACTH stimulation test fail to support the diagnosis.
It has not been proven that sex hormones are responsible for this syndrome.

Reasons to suspect Occult HAC

- Clinical signs consistent with HAC
- Cortisol concentrations on ACTH stimulation test and

LDDS test are below the reference interval

- Presence of an adrenal tumor supports the diagnosis
- Lack of tumor does not rule out diagnosis

If clinical signs are mild, retest for classical HAC when signs worsen

If clinical signs are moderate/severe, perform an abdominal ultrasound
Normal adrenal glands- reconsider diagnosis
Bilateral adrenomegaly- consider confirming PDH with

cross-sectional imaging

- May be mild or early HAC
- May be food-dependent HAC (considered rare)
- Specificity of sex hormone panel is low- interpret with caution

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WSV - 047

COMMON REASONS FOR DERMATOLOGIC TREATMENT FAILURE

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OVERVIEW

Frustration can arise when treatment for a particular disease fails to lead to clinical improvement. Other cases may initially improve, but then show a decline. Secondary infections, ectoparasites, development of another disease or adverse drug reactions can all lead to presumed treatment failure. In these cases of "treatment failure", diagnostic steps should be revisited and further diagnostics may be needed.

Objectives of the Presentation

1. Review common reasons for treatment failure
2. Review steps to take should treatment fail

Key Diagnostic steps:

When faced with a patient not responding to appropriate therapy, there are multiple steps to take to find out why therapy is not working. First and foremost, client compliance must be checked. The correct dose and frequency of administration must be verified. If the treatment failure involves topical therapy, the owner should be asked how they have been applying or using the topical to make sure application is correct. You can even ask your clients to show you how they have been doing things at home.

Revisit history taking to see if there is additional information you can gather or things that were missed first time around - ask additional questions such as are other pets affected, are humans in the house affected, Any seasonality to the skin disease, has their been a change in clinical signs, what age did the itching start. To make your time as efficient as possible, consider having a questionnaire owners can fill in ahead of time or have technicians take a history first or read cytology samples while you are talking to clients.

Doses of medications and length of treatment should also be revised when dealing with a case of treatment failure. For example, an animal receiving glucocorticoids for atopic dermatitis presents for non-pruritic hair loss. This hair loss may, in fact, be due to the long-term use of glucocorticoids as opposed to the atopic disease. Attention should be paid to the time of year the pet is presenting to you - the treatment failure may coincide with a change of season and be due to a peak in the number of allergens and a "flare-up" of the patient's allergic dermatitis.

Questions should be asked as to whether there have been any dietary indiscretions that could have triggered a food allergic reaction e.g. was there just a Canada Day barbeque with Uncle Fred who we all know likes to sneak food to the dog under the table!

In allergic patients with previously controlled pruritus, who re-present for pruritus +/- dermatologic lesions, cytology should always be performed to check for the presence of a secondary infection. Secondary infections (bacterial pyoderma and Malassezia dermatitis) are common reasons for perceived treatment failure as they mask the effects of anti-inflammatory therapy. Treatment may involve systemic or topical therapy, or a combination of the two. If left untreated, infections will continue to lead to treatment failure. Superficial bacterial and yeast infections must be treated for a 4 week period. Deep bacterial pyoderma should be treated for a longer period (8-12 weeks). It is also very important to repeat cytology at the end of the course of antimicrobial to document the infection has resolved and that you are not dealing with a case of antibiotic resistance.

Demodicosis, Sarcoptes or other ectoparasites must also be ruled out via skin scrapings, as they can lead to a worsening of clinical signs in a previously stable patient. An animal receiving high doses of glucocorticoids can develop demodicosis. Flea combing and examination for flea dirt should also be repeated.
Individuals on long term glucocorticoids can begin to show alopecia, erythema, pruritus and papular eruptions that many clinicians will interpret as a "flare up" of the pet's allergies. Glucocorticoid doses may be increased in these patients. In these cases, it is important to more closely examine and palpate the skin itself. These could be cases of calcinosis cutis developing. Calcinosis cutis can be diagnosed via skin biopsy and treated with topical application of DMSO. Every effort should also be made to wean the pet off of steroids.

Antibiotic resistance has received much attention over the past few years with the incidence of MRSP increasing dramatically1. Any animal with a bacterial pyoderma not responding to an appropriate dose and selection of antibiotic, should have an aerobic bacterial culture and sensitivity performed and an appropriate antibiotic selected from the list or antibiotics to which the bacteria is susceptible to.

Approach to treatment failure:

Treatment failure is most often reported when there is a lack of response to glucocorticoids, cyclosporine, oclacitinib or lokivetmab in a presumed atopic dog.
If this occurs, there could be an underlying food allergy and therefore it is imperative to perform an adequate novel protein or hydrolyzed diet, restricted diet trial.

If a novel protein diet is selected, I prefer diets with exotic proteins due to potential cross reaction of other more common proteins; for example beef and venison. The owner must be informed that no treats, table scraps, pilling vehicles or flavoured medications can be used during the diet trial (that means you Uncle Fred). The diet trial should involve a diet with a novel protein that the animal has not been exposed to previously and should last for 8 weeks to determine whether an improvement is noted. Cutaneous adverse drug eruptions can lead to a worsening of clinical signs. For example, a dog with a secondary bacterial pyoderma due to allergic skin disease, receives a cephalosporin antibiotic and then develops further dermatologic lesions consisting of erythema, alopecia etc. This animal could be exhibiting signs of a cutaneous adverse drug reaction as opposed to a flare-up of allergies. If pruritus occurs primarily in one location where topical products are applied, contact dermatitis should be considered.

In an animal previously responsive to glucocorticoids but now the beneficial effect is waning, consider steroid tachyphylaxis ("steroid fatigue"). The steroid can be switched to another glucocorticoid e.g. oral dexamethasone2. If there is a lack of response to a correct dose of cyclosporine, cyclosporine levels can be checked. However, in atopic dogs there does not appear to be a correlation between blood concentrations and clinical response3. If the lack of response to glucocorticoids, cyclosporine and oclacitinib, in a patient with atopic dermatitis, is definitively proved and cytology, skin scrapings etc are all negative, one must consider either a case of pruritus refractory to conventional therapy or an incorrect diagnosis. At this point diagnostic steps should be retraced and revised if necessary. Skin biopsies sent for histopathology can also be a great way to help eliminate and identify a diagnosis.

Immune mediated disease can usually be diagnosed via histopathology. Other dermatological diseases, such as cutaneous epitheliotropic T cell lymphoma, can present with clinical signs similar to atopic dermatitis but are non responsive to conventional anti-inflammatory therapy. If histopathology is consistent with atopic dermatitis then more aggressive immunosuppressive therapy may be needed in these refractory cases.

Prior to beginning systemic immunosuppressive therapy, all patients should have full bloodwork performed (complete bloodcount and serum biochemistry) as well as a urinalysis. Azathioprine has been used in certain cases to treat refractory canine atopic dermatitis at a dose of 2-2.5 mg/Kg once daily4. Further bloodwork is also recommended every 2-4 weeks after starting therapy due to the potential adverse effects such as myelosuppression and hepatic toxicity (increase in ALT, ALP).

Pruritus can originate from regions other than the skin. Pruritus maybe associated with pain or can also be neuropathic. Studies are lacking to document efficacy of the following medications for treatment of pruritus but could be considered in specific cases. Gabapentin is used in humans to treat neuropathic and uremic pruritus5. Side effects include sedation and ataxia. Maropitant is a neurokinin-1 receptor antagonist that inhibits substance P6. This medication can have an anti-pruritic effect. Maropitant is licensed to prevent and treat vomiting in dogs as a dose of 2 mg/kg once daily. This dose has also been suggested to decrease pruritus.

5 KEY "TAKE HOME" POINTS:

1. In any case where treatment is not efficacious, cytology and skin scrapings should be performed and client compliance should be verified.
2. Consider potential antibiotic resistance in a patient with bacterial pyoderma, confirmed on cytology, which is unresponsive to antibiotics.
3. Taking skin biopsies and sending for dermatohistopathology can provide more information in cases of treatment failure.
4. In certain pruritic cases consider non-conventional therapy or changing the type of glucocorticoid prescribed.
5. In a pruritic patient non responsive to therapy for atopic dermatitis, consider food allergies or cutaneous epitheliotropic T cell lymphoma as an underlying etiology.

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WSV - 040

DENTAL RADIOLOGY TECHNIQUES AND BASIC INTERPRETATION

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Taking a dental radiograph:

Step 1: Patient positioning

Position the patient so that the area of interest is convenient to the radiographic beam. In general this is where the object is "up". For maxillary teeth, the patient should be in ventral recumbency. For mandibular canines and incisors the pet should be in dorsal recumbency. Finally, for maxillary cheek teeth, the patient should be in lateral recumbency with the affected side up. This being said, in our practice virtually all radiographs are exposed in lateral recumbancy. This takes some getting used to, but decreases the number of times a patient must be rolled when doing surgical or endodontic procedures.

Step 2: Film Placement within the patient's mouth

There is an embossed dot on the film. The convex side of this should be placed towards the x-ray beam. In most films, this side is pure white. The opposite or "back" side of the film will usually be colored (purple or green). Place the film in the mouth so that the entire tooth (crown and entire root surface) is covered by the radiograph. Remember, the roots of all teeth are very long. This is especially true of canine teeth, which are longer than you think. Always err on the side of having the film too far in the mouth to ensure you do not cut off the root apexes. The film should be placed as near as possible to the object to minimize distortion.

Step 3: Positioning the beam head

There are two major techniques for positioning the beam head in veterinary patients. Both of these techniques are used daily in veterinary practice.
Parallel technique: This is where the film is placed parallel to the object being radiographed and perpendicular to the beam. This is how standard (large) films are taken. This gives the most accurate image. Unfortunately this is only useful in the lower cheek teeth in the dog and cat. This is due to the fact that these patients don't have an arched palate. The film cannot be placed parallel to the tooth roots because of the palate's interference. Therefore this technique is not always possible.

Bisecting Angle Technique: This is the most common type of dental radiograph taken in veterinary patients. This uses the theory of equilateral triangles to create an image that accurately represents the tooth in question. To utilize this technique, the film is placed as parallel as possible to the tooth root. Then the angle between the tooth root and film is measured. This angle is cut in half (bisected) and the beam placed perpendicular to this angle. This gives the most accurate representation of the root.

If this angle is incorrect, the radiographic image will be distorted. This is because the x-ray beam will create an image that is longer or shorter than the object imaged. The best way to visualize this is to think of a building and the sun. The building will create a 90 degree (right) angle to the ground. The bisecting angle in this case is 45 degrees.

Early and late in the day, the sun is at an acute angle to the building and casts a long shadow. In radiology this occurs when the angle of the beam to the object is too small and is known as elongation. At some point in the late morning and early afternoon, the sun is at a 45 degree angle to the building, which is the bisecting angle. This gives an accurate representation of the building height. As the sun continues up in the sky, the shadow shortens. This occurs in veterinary radiology when the angle is too great and is known as foreshortening. Finally, at noon, the sun is straight up from the building, which gives no shadow.

The "Simplified Technique" as developed by Dr. Tony Woodward does not utilize direct measurement of any angle, instead relying on approximate angles to create diagnostic images. There are only 3 angles used for all radiographs in this system 20, 45, and 90.
Mandibular premolars and molars are exposed at a 90 degree angle, maxillary premolars and molars at a 45-degree angle, and incisors and canines at a 20 degree angle.

To initiate any radiograph, place the film in the mouth and set the positioning indication device (PID) perpendicular to the film. For mandibular cheek teeth, this is the correct placement. For the maxillary premolars and molars, rotate the beam to a 45 degree angle. For the incisors and mandibular canines rotate 20 degrees. For the maxillary canines an additional rotation 20 degrees lateral is necessary to avoid superimposition of the first and second premolars.

Step 4: Setting the exposure

If you are using a machine where you set the exposure manually, you will need to set up a technique chart similar to one for a standard (large) unit. The good news is that there is only one variable that needs to be adjusted.

If you are utilizing the computer controlled system, set the buttons for the species, size of the patient, and tooth to be imaged. If you have correctly set the machine and the image is incorrectly exposed, the easiest way to adjust is to change the f setting. By pressing this button, you will see the numbers go up on both sides. The one on the left is the f number and the one on the right is the exposure time. If you continue to press the button it will continue to increase the exposure until you reach 9 when it will markedly lower and the f number will go back to 1. If the radiograph is overexposed (too dark) lower the f number by 1. If it is underexposed (too light) increase the number by 1. Continue this process until you have the film that you want. Generally, the f number will be the same for all radiographs once you have discovered the correct setting for your machine start at that number in future sessions.

Step 5: Exposing the radiograph

Dental radiograph machines have a hand held switch to expose the radiograph. If it is possible, leave the room prior to exposing the radiograph. If it is not, stand at least 6 feet away at a 90 to 130 degree angle to the primary beam (meaning to the side or back of the tube head, not in front or behind). Once everything is set, press the button. It is important to remember, that these switches are “dead man’s”. This means if you let up during the exposure, it will stop the production of x-ray beams. On a standard unit, this will make a light radiograph, on a computer controlled one it will give an error message and you will need to start over. Make sure you hold the button down until the machine stops beeping.

Interpretation:

Interpreting dental radiographs can be daunting, but it is very similar to interpreting a standard boney radiograph. The major difference is that dental radiographic changes are often more subtle. In addition, there are pathologic states that are unique to the oral cavity. Finally, there are several normal anatomic structures that may mimic pathologic changes.

Determining which teeth were imaged:

The first step in radiographic interpretation is determining which teeth have been imaged. This requires not a firm knowledge of oral anatomy as well as the architecture of dental films. Digital systems with veterinary templates do not require this step as long as the images are properly placed (DO NOT ASSUME THIS WAS DONE CORRECTLY). If your system does not support a veterinary template, there is a mark on the image which is in a consistent location. Review the owner’s manual for instructions on its use.

The key to properly identifying the imaged teeth is the embossed dot, which is on one corner of the film. When exposing a radiograph, if the film is properly positioned, the convex surface will point towards the radiographic tube head. There is no way to expose a diagnostic radiograph with the film in backwards, due to the lead sheet on the back side of the film. Therefore, when interpreting the film, the embossed dot is facing out of the mouth.

First, place the dot towards you (this is done for you on most digital systems). This means you are looking at the teeth as if you are the beam. Next, rotate the film so that the roots are in their natural position (up on maxillary and down on mandibular).

Canines and incisors: This orients the film so the right side of the mouth is on the left, and right side is on the left. This is like a VD abdomen radiograph.
Molars and Premolars: Ascertain mesial from distal. If the mesial side is on the left side of the film, it is a radiograph of the left side of the patient and vice versa for the right.

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ANESTHESIA INDUCTION AND MONITORING IN FISH

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Learning Objectives

Learn which veterinary anesthetics can be used with fish, how are they administered and at what dosages, and how to monitor depth of anesthesia by assessing the fish's heart rate, pulse and respiration.

Sedation aids in handling fish during physical examination, for biopsy sampling or for purposes such as egg stripping during artificial spawning. Anesthesia and analgesia are required for surgical or invasive procedures. Surgery can be performed on anesthetized fish to repair wounds, remove skin and fin tumors, or to remove abdominal masses. And sometimes euthanasia is needed to end the suffering of a sick or injured animal, or for research or other purposes. Each of these techniques can be accomplished with fish by adding anesthetic medications to the water, and sometimes by injection or oral administration of anesthetics. Food fish have specific limitations to medications that can be used with them, and withdrawal times for approved medications must be observed. This paper will focus on anesthetics used for ornamental and pet fish.

Many chemicals have been used to induce tranquilization or anesthesia in fish. All have some element of risk, but when used carefully they have successfully induced sedation or anesthesia. Anesthetic agents used in lower doses produce tranquilization, and at higher doses they are used for anesthesia purposes. Care must be taken not to overdose the fish, or leave them anesthetized too deeply for too long of time. It is recommended to start with a lower dose and add more as needed if using a new drug or working with an unfamiliar species of fish. Monitor heart rate, blood oxygen concentration, and operculum (gill cover) motion during anesthesia to ensure fish is not too deeply anesthetized.

Most fish anesthetics are added to clean, well-oxygenated water in a suitable glass or plastic container. The water is thoroughly mixed to ensure all the chemical is dissolved and dispersed evenly. The anesthetic solution should be the same temperature and pH as the aquarium or pond water. Use a thermometer to monitor the water temperature during surgery, and if an oxygen meter is available, also monitor the dissolved oxygen concentration of the anesthetic solution.

A pulse oximeter can be clipped onto the caudal fin of large fish such as koi, near the tail base, in order to monitor the pulse and blood oxygen concentration. ECG monitors can also be used by attaching the monitor clips to hypodermic needles placed into the muscles on either side of the body by the pectoral fins.

Commonly utilized chemicals for anesthesia and tranquilization:

Alfaxalone
(3-alpha-hydroxyy-5-alpha-pregnane 11,20-dione) – Immersion in alfaxalone can be used in koi carp at a concentration of 2.5 mg/L.

Benzocaine
(ethyl p-aminobenzoate) –
Dose at 12.5 milligrams/Liter of water for a shipping sedative, 25–500 mg/L for anesthesia (may need to dissolve in ethanol first).
Induction time in 1-3 minutes, recovery in fresh water in 3-15 minutes.
The longer the fish is under anesthesia, the longer it usually takes to recover.

Carbon Dioxide (CO2) –
A dose of 100–400 mg/L bubbled through the water will cause unconsciousness, high exposure will cause death. Use with caution, under constant observation! Use in ventilated area. Avoid breathing CO2 released from the water. Induction is in 1-2 minutes and recovery in 5-10 minutes in fresh water. Effective to use for euthanasia in absence of other anesthetic agents.

Diazepam (Valium) –
A sedative and muscle relaxant, used as a pre-anesthetic agent.
Can be injected intramuscularly at 0.1-0.5 mg/kg, or given orally at 1-4 mg/kg.

Ethanol (ethyl alcohol) –
1% added to the water will produce sedation, 3% or more will result in euthanasia.
20 ml of 100 Proof (50%) Grain Alcohol in 1 Liter of water will produce a 1% solution.

Ether (dimethyl ether) –
Dose at 10-15 ml/L water.
Induction occurs in 2-3 minutes, recovery in clean water in 2-3 minutes.
HIGHLY EXPLOSIVE! Do not use near flames or sparks!

Eugenol / Isoeugenol (clove oil) –
Eugenol: 1 drop = 0.029 ml = 28.6 mg. Use 30-60 mg/L (1-2 drops / Liter of water). Mix vigorously. Induction occurs in 2-3 minutes.

Excellent for short duration physical examinations. A dose of 4 drops per liter (114 mg/L) induces euthanasia in 10-60 minutes.

Isofluorane
(1-chloro-2,2,2-trifluoroethyl difluoromethyl ether) –
Dose at 0.5-1 ml/L water for anesthesia. Euthanasia dose 4 ml/L.
Spray the required dose through a 25 gauge needle under the water while mixing.
Induction in 2-8 minutes, recovery in clean water in 3-30 minutes.

Ketamine Hydrochloride –
Dose at 1 gram/L water, or 66-100 mg/kg injected intramuscularly.
Provides sedation and immobilization for handling or transportation.

Metomidate Hydrochloride (Aquacalm) –
Sedation concentration: 0.1–1.0 mg/L of water; Anesthesia: 1.0–10.0 mg/L of water.
The dosage should be individualized, depending upon the fish species and the degree of anesthesia required.
May need buffering if water is at a low pH.

Propofol (2,6-diisopropylphenol) –
Anesthesia induction dose is 1.5-2.5 mg/kg intravenously. Induction time is 5 minutes, recovery in 60-75 minutes.
Can be used as a sedative at 1 mg/L in the water.

Quinaldine Sulfate (2-methylquinoline sulfate) –
Dose at 5-10 mg/L for sedation, 25-200 mg/L for anesthesia.
Induction in 2-6 minutes, recovery in fresh water in 5-20 minutes.
Acidifies low alkaline water, use sodium bicarbonate buffer in water as necessary.

Tricaine Methane Sulfonate,
MS-222 (3-Aminobenzoic acid ethyl ester) –
Dose at 10-40 mg/L for sedation (handling/ shipping).
Dose at 50-400 mg/L for anesthesia induction, 50-100 mg/L for maintenance.
Induction in 1-5 minutes, recovery in 3-15 minutes in clean water.
Acidifies water – buffer with equal volume of sodium bicarbonate or use hard water.

When placed into the container with the anesthetic in the water, the fish will gradually begin to lie on its side and the respiratory rate will slow as the chemical induces anesthesia. In some cases, there may be an excitatory stage, so the anesthetic chamber may need to be covered to prevent fish from jumping out. After the fish is anesthetized in the anesthetic bath, it can be removed from the water for short-term examination or diagnostic procedures. If the fish is removed for longer procedures, anesthetic solution can be dripped across the gills through an IV bag and drip line, by hand with a syringe, or with a recirculating water pump or aquarium filter powerhead. Have oxygenated fresh water on hand to syringe across the gills if the plane of anesthesia becomes too deep. Keep the body moist if out of the water for examination or surgery. Use ophthalmic ointment on the eyes to keep them from drying. Monitor the respiration rate (operculum movements) to assess the depth of anesthesia.

Table 1 Stages of Anesthesia in Fishes

Stage	Plane	Description	Signs
0	0	Normal	Swimming actively, equilibrium normal
I	1	Light sedation	Reduced motion, ventilation decreased
I	2	Deeper sedation	Motionless unless stimulated
II	1	Light anesthesia	Partial loss of equilibrium
II	2	Deep anesthesia	Total loss of equilibrium
III	1	Surgical anesthesia	Total loss of reactivity when stimulated
III	2	Deep surgical anesthesia	Decrease in respiratory and heart rates
IV	1	Medullary collapse	Cessation of respiratory movements
IV	2	Cardiac arrest	Death

Recuperation after anesthesia is accomplished by transferring the fish into a container of fresh, well-aerated water without any anesthetic. Never leave a fish unattended while it is under anesthesia. Some large fish have a tendency to jump during induction or recovery from anesthesia. Moving the fish gently in a forward direction will aid the flow of fresh water across the gills, hastening anesthesia release from the gills. Do not slosh the fish back and forth in the water. Once there are steady operculum movements let the fish rest and gradually recover in a quiet, dim environment. The longer a fish is under anesthesia, the longer it will take to recover from the anesthetic. Monitor the fish until it has regained its equilibrium and is swimming normally and can be transferred back into the aquarium or pond.

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BREED-SPECIFIC ANESTHESIA

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Brachycephalic patient considerations:
In 2013 three of the top ten most popular breed of dog as determined by the AKC were breeds classified as brachycephalic.[i] So it only makes sense that as these breeds become more popular, you will be asked to anesthetize a brachycephalic patient. The brachycephalic breeds require special consideration when selecting anesthetic protocols as these breeds typically have anatomical abnormalities that cause some degree of upper airway obstruction. These abnormalities include: stenotic nares, an elongated soft palate, laryngeal collapse, hypoplastic trachea, and laryngeal saccule eversion. These abnormalities have been grouped together into what is known as brachycephalic syndrome.

Of the abnormalities listed above the most commonly seen with brachycephalic breeds are stenotic nares and an elongated soft palate. Stenotic nares is a condition in which the nostrils are malformed. Theses nostrils are narrow and sometimes collapse inward during inhalation making it difficult for the patient to breathe through its nose. An elongated soft palate is a condition where the soft palate is too long and the tip of it protrudes into the airway and interferes with inspiration of air into the lungs. Brachycephalic breeds tend to learn to compensate for these respiratory insufficiencies, but sedation and anesthesia removes these compensatory mechanisms. It them becomes the job of the anesthetist to monitor and protect the airway.

Often brachycephalic breeds present as excitable, nervous, skittish, or high strung. The tendency in those cases would be to use a higher dose of premedication which can have serious consequences in a brachycephalic patient. Deep sedation of these patients can be associated with excessive relaxation of upper airway muscles and worsened airway obstruction.[ii] Unless a patient is aggressive or dangerous to you, use lower doses of pre-medications. Also note that analgesic agents should always be used for surgical procedures. Opioids are the most frequently used pre-anesthetic analgesic agents. Opioids are not contraindicated simply because the patient is brachycephalic. Although it is thought that opioids cause respiratory depression, this is more of a dose dependent issue.

Opioids commonly used for pre-medication include: morphine, hydromorphone, oxymorphone, fentanyl, buprenorphine, and butorphanol. The premedication also frequently involves a sedative component in the form of an alpha-2 agonist such as dexmedetomidine, a tranquilizer such as acepromazine, or a benzodiazepine such as diazepam or midazolam. Unlike phenothiazines and benzodiazepines, Dexmedetomidine will also provide analgesia. When combined with other medications in the pre-medication, Dexmedetomidine may even provide sufficient analgesia and muscle relaxation for minor surgical procedures to be performed.

Brachycephalic breeds tend to have a higher vagal tone than other breeds. Impulses from the vagus nerve result in parasympathetic effects such as bradycardia, bronchoconstriction, and excessive saliva formation.[iv] Anticholinergics block muscarinic receptors, thus blocking the aforementioned parasympathetic effects. Anticholinergics (such as atropine and glycopyrrolate) can be beneficial if not contraindicated. Anticholinergics are given on a case-by-case basis and are not often included in the pre-medication unless deemed necessary. Cases where anticholinergics may not be warranted include patients that have cardiac disease in which you want to avoid tachycardia such as congestive heart failure.

After proper premedication has been administered it is recommended that brachycephalic patients be “pre-oxygenated” prior to the administration of induction drugs. Administration of 100% oxygen before induction of anesthesia prolongs the time to onset of arterial hypoxemia. This technique increases the body’s oxygen stores, primarily in the functional residual capacity (FRC) of the lungs.[v] Pre-oxygenation should only occur if it is not overly stressful to the patient. Induction should be rapid in order to gain control over the airway.

When possible, use the following sequence of events: Pre-medicate/sedate, pre-oxygenate while placing IV catheter, Induction medication given IV, intubation when patient adequately anesthetized. Note that facemask inductions are not recommended for most brachycephalic patients as it is stressful and the edge of the facemask can damage the cornea of the patient. Induction agents that are rapidly metabolized are preferred in these patients.

When intubating a brachycephalic patient, expect to use a much smaller endotracheal tube. Carefully select a wide variety of sizes, but be ready with 2 tubes smaller than what you estimate to be the right size. A laryngoscope is a necessary tool for intubation, as the amount of redundant tissue in the pharynx may reduce the visibility of the laryngeal opening.

While under anesthesia patients can be maintained with inhaled anesthetic such as isoflurane or sevoflurane in 100% oxygen. Sevoflurane is metabolized faster than isoflurane allowing for a faster recovery.[vi] This may be an attractive choice when anesthetizing a brachycephalic patient. As with any other patient undergoing anesthesia monitoring during the intra operative period is of utmost importance. It is ideal to use a multiparameter monitor that will give you information such as EKG tracings, %SPO2, capnography, temperature, and blood pressure. End tidal CO2 (ETCO2) readings are a valuable monitoring tool as it will tell you how well your patient is ventilating. ETCO2 is a non-invasive estimate of the patient's alveolar ventilation status by its close correlation with arterial carbon dioxide (PaCO2) under normal conditions. Normal canine and feline ETCO2 should be between 35-45mmHg.[vii]

The recovery period is an important time for the anesthetist to stay vigilant about patient monitoring. Appropriate post-operative medications should be administered, taking into account the level of pain anticipated from the surgery performed. Note that acepromazine has no analgesic properties and is not considered an adequate post-operative medication if a painful procedure has been performed. We want recovery to be smooth and stress free. Because brachycephalics can sometimes desaturate when in recovery, a portable pulse oximeter is a useful tool when in recovery. Brachycephalic patients should be recovered in sternal recumbency with their heard slightly elevated. Avoid overly aggressive initial stimulation, as this may trigger swallowing only to be followed by a relapse into unconsciousness when the stimulation is removed. It is important to have additional induction agent and additional endotracheal tubes ready in recovery in the event that airway obstruction and re-intubation is needed. Recovering these patients in an oxygen chamber is advisable; however a more effective tool is nasal oxygen during recovery. A nasopharyngeal tube can be placed and connected directly to an oxygen source to allow delivery of oxygen to the oral cavity during recovery.

In summary brachycephalic breeds have anatomical abnormalities that require the anesthetist to carefully monitor breathing and any airway disturbances. However, proper premedication, vigilant monitoring in the pre-operative to recovery stages, as well as a stress free induction and recovery, can make working with these patients less challenging and more rewarding.

Sighthounds:

The following is a brief summary of why sighthounds are «unique» when it comes to choosing a safe and effective anesthetic regimen. The keys to choosing anesthesia protocols are to understand the basics of anesthesia and that there is no "one right way" to do things.

There are actually many anesthetics that are safe for sighthounds. The patients' medical history and your familiarity with the various anesthetics will determine which is the safest. Most research has been done on Greyhounds, and the findings have been applied to other sighthounds.

Sighthounds have unique physical characteristics that will influence anesthetic choices as well as monitoring needs. Sighthounds are commonly mistaken as being polycythemic, as they tend to have higher packed cell volumes 50-60%, where a normal canine is 35-55%.[viii] They also tend to have lower serum protein. The lower serum albumin concentrations can result in an increased effect of drugs that are highly protein bound (anesthetics). They are extremely deep chested and have greater lung capacity than other breeds of equivalent weight. Their body conformation and lack of body fat effects the redistribution of drugs.

Greyhounds are quite normally very quiet, cooperative, agreeable dogs that rarely need deep levels of sedation for restraint and control. Some Greyhounds that have recently come off a track environment will be nervous and more inclined to develop stress related clinical complications such as colitis, hypertension, and even hyperthermia.

In these cases appropriate levels of sedation as well as analgesia are important.

Sighthounds have a low body fat to muscle ratio. This makes them more susceptible to hypothermia when their own temperature regulatory mechanisms are impaired- such as under general anesthesia. Prevention of hypothermia is important as these breeds tend to cool down very rapidly. Once their temperature has dropped it can lead to significant problems such as bradycardia. Prevention of hypothermia can be achieved by using circulating warm water blankets, Hot Dog® warmers, Bair Huggers®, and warmed IV fluids during the procedure.

The liver metabolism of several drugs is different in sighthounds. There is a decrease in the activity of liver enzymes of the cytochrome P450 family. Cytochrome P450, are family of over 60 enzymes the body uses to break down toxins.[ix] This decrease in activity of liver enzymes can affect the metabolism of thiobarbituates, but evidence shows that other drugs such as methohexital and even propofol are cleared more slowly. Just as young, healthy animals are more able to exercise vigorously, they are more able to tolerate the depression in heart function caused by general anesthesia because they have such great cardiovascular reserve. Older or debilitated animals have less cardiovascular reserve and may have less tolerance for general anesthesia. Older or debilitated animals often recover from general anesthesia and surgery more slowly than a young patient, in part because of their decreased reserve. Before any anesthetics are administered it is important to obtain a baseline temperature, heart rate and respiratory rate, as well as an ASA rating. On physical exam, Greyhounds can normally have a sinus arrhythmia (a condition where the heart rate increases with inspiration and decreases with expiration).

When selecting a pre-medication for a sighthound one should consider the ASA status of the patient as well as the anticipated level of pain associated with the procedure. Sighthounds usually do very well with a pre-medication classified as Neuroleptal analgesia- this is a technique of combing an opioid and sedative in the pre-medication. Analgesic agents should always be used for surgical procedures. Sometimes these breeds are very excitable, skittish, nervous, or “high strung”. These patients are prone to tachycardia and hypertension in the clinical setting, also known as the “white coat effect”. When confronted with sighthounds, the technician anesthetist should take this into consideration and make the pre-operative experience as calm as possible. This may include administering the pre-op sedative with the owner present or scheduling your sighthound patients to be done first in the order of the day. Your inclination may be to use higher does of pre-medication but this can be dangerous in a patient that is older, debilitated, or has reduced ability to clear anesthetic drugs. Unless the patient is a danger to you (it will bite, is known to be aggressive) use lower doses of pre-medications. You can always add more if needed.

Opioids are the most frequently used pre-anesthetic analgesic agents. Although it is thought that opioids cause respiratory depression this is more of a dose dependent issue.

Examples of opioids for pre-medication: morphine, hydromorphone, oxymorphone, methadone, buprenorphine, nalbuphine and butorphanol. Morphine may be the most attractive opioid as it is the least protein bound opioid, which can be beneficial for sighthounds and their altered hepatic metabolism.[x]
The opioid can be combined with a benzodiazepine or tranquilizer such as acepromazine. These drugs have anti-anxiety and calming effects. Benzodiazepines have an advantage in that they are reversible (via flumazenil). While neither of these classes of drugs has analgesic effects by itself, they enhance the sedation and analgesia of other agents. Benzodiazepines do not commonly cause sedation in young healthy animals unless used in combination with other agents (opioids, ketamine, etc.). They may actually cause excitement, dysphoria, and ataxia in young healthy patients. Unlike phenothiazines and benzodiazepines, alpha 2 agonists like dexmedetomidine will also provide analgesia. When combined with other medications in the pre-medication, alpha 2 agonists may even provide sufficient analgesia and muscle relaxation for minor surgical procedures to be preformed. Anticholinergics do not need to be part of the pre-surgical medication unless deemed necessary. (Example: in cases of pediatric patients who are dependent on heart rate for adequate cardiac output.)

Table of Sample anesthetic protocols used on sighthounds (ASA 1-2)
Morphine (0.75mg/kg)+/- midazolam (0.20mg/kg)+/- “micro” dose of dexmedetomidine (0.005mg/kg) IM
Morphine (0.75mg/kg)+ midazolam (0.20mg/kg)+ low dose acepromazine (0.02mg/kg) IM
Can interchange morphine with other opioids such as oxymorphone, hydromorphone, fentanyl, etc.

Many induction agents can be safely used in sighthounds. Propofol can be used on patients in whom rapid recovery is desired such as brachycephalics, diabetics, older patients, and sighthounds. Propofol is capable of providing a smooth and rapid return to the patients’ pre-op state. Rapid administration of propofol can cause apnea, vasodilation, hypotension, and reduction in myocardial contractility. To avoid these unwanted side effects; plan on delivering the calculated dose over 90-120 seconds, stopping when the patient appears deep enough to intubate. It is best to always administer propofol near an oxygen supply and have intubation materials ready.

The neuro-steroid anesthetic alfaxalone is another induction choice with a short and rapid duration of action with minimal side-effects. In general its clinical use and properties can be compared to propofol. Unlike propofol, alfaxalone has little or no cardiovascular effects when given in the normal dosage.[xi]

Similar to propofol, alfaxalone is an induction agent that, because of its short half-life in dogs and cats, is very suitable for repeated bolus injections or a continuous rate infusion (CRI). Another induction choice are the thiobarbiturates. There are several reasons why thiobarbituates are not ideal choices in the sighthound patient. They are extremely soluble in fat therefore they are absorbed almost immediately into fat after an injection into a vein. Secondly, they are then broken down by the liver and excreted in urine. Lastly, any remaining thiobarbiturate will redistribute to fatty tissues and the animal then recovers from anesthesia. Because sighthounds have little or no fat, thiobarbiturates remain in their bloodstream causing lengthy, prolonged recovery from anesthesia.

Isoflurane & sevoflurane are commonly used for maintenance of anesthesia. They are considered some of the safest common inhalant agents. With the exception of patients experiencing extreme respiratory compromise sevoflurane is rarely of any advantage over isoflurane.[xii] During the anesthetic event, vigilant monitoring of the patient is necessary. It is best to use a multiparameter monitor that gives you information such as an electrocardiogram, pulse oximetry, temperature, capnography, and blood pressure. Sighthounds have a high surface to body ratio and therefore are more susceptible to hypothermia. The Hot Dog® patient warming system is an effective device for warming your patient during and after the anesthetic event. This warmer features flexible blankets made of electrically conductive fabric for even heat distribution. An advantage they possess over a Bair Hugger® is there is no blowing air on the surgical site, so it won't dry out EKG leads.

One very potentially life threatening condition called malignant hyperthermia (MH) can result in Greyhounds under anesthesia. This can be fatal and is associated with a rapid rise in body temperature that their body is unable to regulate. This rapid onset of changes in their metabolism as a result can lead to a shock like state. Malignant hyperthermia can be triggered from administration of anesthetic gas, stress from exercise, and trauma. During an episode of MH, the patient has an uncontrolled rise in myoplasmic calcium concentration, this leads to the increased oxygen consumption of skeletal muscle.[xiii] The patient will become hypoxic, begin to hyperventilate and the body temperature will increase rapidly. Anesthetic gas should be turned off and patient maintained on another anesthetic agent such as a continuous rate infusion of propofol. Treatment should include dantrolene, a muscle relaxant. This will lower the amount of calcium in the myoplasm.

Recovery of sighthounds often mimics the activity seen during pre-medication and induction. If the patient does not respond well to the drugs used in the premeds or has an extended "excitement phase" after initial induction, then they will most often have an eventful recovery. Excitement and pain in the post-operative period cause tremendous stress and serious side effects such as hypertension, tachycardia, and cardiac arrhythmias.[xiv] Sighthounds should always have analgesics administered if the surgical procedure was thought to be painful. Adding a sedative or tranquilizer to the analgesic will facilitate a smoother recovery. A small dose of the opioid used in the pre-medication combined with a low dose of acepromazine (0.01mg/kg) or dexmedetomidine is usually sufficient to facilitate a smoother recovery. For cardiac healthy patients, a "mini" dose of dexmedetomidine within the range of 2-5 mcg/kg IV usually provides 30 minutes of sedation to move smoothly from anesthesia.

Sighthounds present unique challenges for the veterinary technician anesthetist. Because of their unique physiological characteristics anesthesia protocols should be tailored to reflect the ASA status of each patient as well as the anticipated pain level. With experience, sighthound anesthesia can move from scary to successful and rewarding.

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WSV - 335

DIAGNOSIS & MANAGEMENT OF FELINE HYPERTENSION

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Causes

- Prevalence of hypertension increases with age in cats.
- Situational hypertension is common in cats as stress causes catecholamine release; however, the effects are variable and unpredictable.
- The two most common diseases associated with hypertension are chronic kidney disease (CKD) and hyperthyroidism. Hyperaldosteronism is less common but is an under appreciated cause. Hypertension in cats is not commonly associated with obesity, heart disease, or a high salt diet.

Clinical signs

- Target organ damage (TOD): ocular, neurologic, cardiac
- Ocular signs include blindness, mydriasis, hyphema, retinopathy (edema, hemorrhage, detachment, vessel tortuosity). Important to do regular fundic examinations on senior cats.
- Neurologic signs are variable (ataxia, seizures, changes in mentation, head tilt, nystagmus), associated with acute increase in systolic blood pressure (SBP) or SBP>180 mm Hg.
- Cardiac effects include murmur, gallop rhythm, left ventricular hypertrophy. Changes are reversible and congestive heart failure is uncommon.
- Renal effects include azotemia, proteinuria, and progress CKD.

Measuring blood pressure

- Screening for hypertension should be performed for apparently healthy senior cats and cats with CKD, hyperthyroidism, and left ventricular hypertrophy. See Figure 1.
- Hypertension is classified based on the risk of TOD:
- Normotensive (minimal TOD risk) SBP <140 mm Hg
- Prehypertensive (low TOD risk) SBP 140159 mm Hg
- Hypertensive (moderate TOD risk) SBP 160179 mm Hg
- Severely hypertensive (high TOD risk) SBP ≥180 mm Hg

BP should be measured with a standardized protocol to reduce external influences and produce reliable, reproducible measurements:

- Calm, quiet environment; allow time for acclimatization; use Feliway.
- Properly trained personnel
- Best equipment: Doppler, high definition oscillometric
- Technique: discard first reading, get 5-7 readings with <20% variation, average the results

Use a standard form to record the protocol used and results

Figure 1: Approach to evaluation of potentially hypertensive patients

From ACVIM consensus statement: Guidelines for the identification, evaluation, and management of systemic hypertension in dogs and cats

Treatment of hypertension

- Amlodipine: 0.125-0.25 mg/kg PO once daily (typically 0.625-1.25 mg/cat)
- Telmisartan (Semintra, 10 mg/mL)
- Europe: 2 mg/kg PO once daily; after 4 weeks, if SBP is <140 mm Hg, reduce dose by 0.5 mg/kg increments
- North America: 1.5 mg/kg PO every 12 hours for 14 days, then 2 mg/kg PO once daily; reduce dose by 0.5 mg/kg increments as needed
- Benazepril: not a first-line treatment, 0.5 mg/kg PO once daily
- Re-evaluate patients with serious TOD in 1-3 days; other patients in 1 week; ongoing re-evaluations at least every 4 months

Resources and Reading

- *ISFM Consensus Statement on the Diagnosis and Management of Hypertension in Cats*
- *https://journals.sagepub.com/doi/pdf/10.1177/1098612X17693500*
- *International Cat Care feline hypertension resources (forms, videos in various languages)*
- *https://icatcare.org/vets/guidelines/hypertension-cats*
- *ACVIM consensus statement: Guidelines for the identification, evaluation, and management of systemic hypertension in dogs and cats*
- *https://onlinelibrary.wiley.com/doi/full/10.1111/jvim.15331*
- *International Cat Care YouTube channel with how-to videos*
- *https://www.youtube.com/user/iCatCare/videos*

WSV - 034

HOW TO READ A HISTOPATHOGY REPORT WITH A CRITICAL EYE

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At times, the pathology report can be a source of frustration for both the submitting clinician and the pathologist. The goal of this lecture is to better understand the roles and responsibilities of both surgeon and pathologist, discuss times when a call to the pathologist is needed and when the use of immunohistochemistry/special stains is warranted. Just as we as clinicians would be frustrated (for lack of a better word) with a client who simply claims there pet is "sick" with no other additional information, pathologists have a similar visceral reaction to histopathology submissions forms that simply state "mass".

1. Surgeon responsibilities:
*Signalment (age, breed, sex)
*History including duration, prior diagnosis or therapy, etc.
*Physical examination, bloodwork, imaging findings
*Mass: Gross appearance, size, location/source, duration of growth, invasiveness, etc
*Type of biopsy (incisional or excisional)
*Ink margins and label which margins are colored, etc.
*Clinical impression of the case
*Submit all tissue removed en bloc
*Label lids and container and ensure proper amount of formalin

2. Pathologist responsibilities:
*Margin information (if excisional)
*"narrow", incomplete, clean
*Should be quantified (mm or cm)
*Histologic grade
*MCT I,II,III or low grade/high grade
*Sarcomas, carcinoma
*Vascular/lymphatic invasion
*Mitotic index (soft tissue sarcoma, MCT, Melanoma)
*Final diagnosis
*Should contain negative findings
*Meaning "no vascular invasion noted"

3. There are times when a call to the pathologist is warranted as more information is needed:
*When the histopathologic diagnosis does not fit the clinical presentation
*When crucial information missing on report
*When all information present, but not detailed enough.

Use of Immunohistochemistry (IHC):
In veterinary oncology, the main use of IHC has been to aid the pathologist in determining the origin of the neoplastic cell population. The importance of which can't be overstated as often poorly differentiated tumors can be very difficult to determine the exact cell of origin with routine light microscopy alone. The identification of specific antigens on the surface of cells can provide further information regarding the cell type and in some cases aggressiveness. The ever-increasing number of available antibodies is growing and is becoming commonplace in veterinary oncology.

Examples whereby IHC is important for diagnosis and therapy
1. Amelanotic melanoma of the oral cavity (PNL2, Melan-A, TRP-1, TRP-2) vs. Sarcoma
*Melanoma: systemic control with the Oncept® melanoma vaccine
*Sarcoma: systemic control with chemotherapy (Doxorubicin)

2. Synovial sarcoma (cytokeratin+, CD18-) vs. histiocytic sarcoma (cytokeratin-, CD18+)
*Synovial cell: if low or moderate grade local control only, if high grade Doxorubicin
*Histiocytic sarcoma: Lomustine (CCNU)

3. Gastrointestinal stromal tumor (CD117+) vs leiomyosarcoma
*If high grade; tyrosine kinase inhibitor if a GIST vs chemotherapy (Doxorubicin) if a leiomyosarcoma

4. Osteosarcoma (osteocalcin+) vs. fibrosarcoma (osteocalcin-)
*Fibrosarcoma: no therapy if low or moderate grade or Doxorubicin if high grade
*Osteosarcoma: Carboplatin

5. Feline Nasal carcinoma (cytokeratin+, round cell markers-) vs. lymphoma (cytokeratin+, round cell markers+)
*Nasal carcinoma: usually radiation alone
*Nasal Lymphoma: combination therapy with CHOP and radiation therapy

6. Round cell tumor
*Toluidine Blue, Chymase, Tryptase (MCT)
*CD3 (T cell lymphoma)
*CD20, CD79a (B cell lymphoma)
*CD 18 (histiocytic sarcoma)
Tumor Markers/Panels for Prognosis

The importance of using "panels" containing several markers of malignancy is best illustrated in canine mast cell tumors. There is general consensus that the pathology and behavior of an MCT may depend substantially on the histologic pattern of the tumor, which is associated with the tumor grade. However, there is variation within the grading scheme used among pathologists which can thereby lead to subjectivity in assigning a tumor to a particular category. Traditionally, these categories are grade I (well-differentiated or low grade), grade II (intermediate grade), and grade III (poorly-differentiated or high grade). Subsequently, guiding the appropriate therapy and providing prognostic information based on the traditional grading scheme has become complicated and unpredictable. The introduction of a two-tier system (Kiupel) of low and high grade designed to minimize the subjectivity was introduced several years ago and has since been further validated in 2 additional studies.

To assist in more objectively categorizing a grade II MCT or a low grade that appears biologically high grade, various immunohistochemical and molecular tests of tumor cell proliferation are now recommended in addition to routine histopathology. These markers of proliferation are now clinically available and are readily performed on tissue biopsy samples in the form of MCT panels (www.dcpah.msu.edu/Sections/Immunohistochemistry/FAQ.php#08).

These assays provide clinicians with the ability to make more sound recommendations regarding the appropriate adjuvant therapy. This particular panel evaluates argyrophilic staining nucleolar organizing regions (AgNOR), proliferation cell nuclear antigen (PCNA), Ki-67, c-kit pattern assessment, and PCR for c-kit gene mutation. AgNOR frequency is an indirect measure of tumor cell proliferation and may be equally or even more important as the tumor grade in terms of predicting the biologic behavior of the MCT. PCNA and Ki-67 are also indirect measures of tumor cell proliferation and are most useful when interpreted in conjunction with one another.

c-kit is the protein receptor for stem cell factor found in many cells including mast cells. A genetic mutation of the c-kit gene, which encodes for the c-kit receptor itself, has been identified in some MCTs. When mutated, the receptor is constitutively active and promotes the malignant process within the cells. Mutations within the c-kit gene are associated with a more aggressive phenotype. With the new two-tier system, ideally, this should decrease the need for further panels, as low-grade tumors, for the most part, are associated with longterm survival.

If the new grading scheme may become standard of care, then the data suggest 5-15% of "low grade" tumors will behave more aggressively. Ideally, an MCT panel may help differentiate these patients and thereby guide the clinician to either a more aggressive surgery or adjuvant therapy that could benefit that patient. To run MCTs panels on all "low grade" tumors seems overkill to help identify the 5% of atypical cases, and also takes away the validity of this grading scheme in this authors opinion. Ideally, the MCT panel should be reserved for cases in which the biopsy results do not fit the clinical picture; ie a more aggressive site (muzzle), fast-growing tumor, severely ulcerated, large tumor, lymph node involvement, etc.

For high-grade tumors, performing a portion of the panel may be useful for treatment decision. Knowing a kit mutation status in a high-grade tumor may change the treatment choice from chemotherapy to a combination of chemotherapy and a TKI, whereby a higher response rate is noted in kit mutation-positive patients. Currently, studies are underway utilizing mutation status to help logically guide treatment decision for a more personalized medicine approach, albeit on a very basic level.

The Use of Tumor Markers for Targeted Therapies

On a basic level, this is being performed with kit mutation analysis in which results may play a role in the use of tyrosine kinase inhibitor. In the future assessment of HER-2/Neu expression in dogs with osteosarcoma could influence the decision to utilize targeted immunotherapy. Currently, the Aratana listeria based Canine Osteosarcoma Vaccine has conditional licensure and one could see a scenario whereby its use would be limited to those tumors expressing the oncoprotein. Similarly, the use of are COX-1/COX-2 and vascular endothelial growth factor (VEGF) receptor analysis may aid not only in prognosis but the use of NSAIDs and tyrosine kinase inhibitors (Palladia™).

Understanding the responsibilities of both clinician and pathologist is needed to ensure that we, as clinicians obtain the information needed to best serve our client and patients. We are entering a new era in veterinary pathology in which panels of markers may help us better predict prognosis for a variety of neoplasias.

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WSV - 023

RATIONAL USE OF GASTRIC ACID MODIFIERS IN SMALL ANIMAL PRACTICE

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The major ways in which the stomach is protected against acid injury include the physical and biochemical characteristics of gastric mucus, the tight epithelial cell junctions, prostaglandin production, bicarbonate secretion and rapid turnover of cells. Mucus is produced by surface mucosal cells in the gastric glands containing oxyntic and chief cells, which in turn secrete hydrochloric acid and pepsinogen, respectively. The surface mucosal cells also secrete bicarbonate, which is dependent on the blood flow to the mucosa, as well as serum bicarbonate concentrations and the acid productivity of oxyntic cells. Prostaglandins are responsible for stimulating the bicarbonate secretion from mucosal cells. The bicarbonate-rich mucus layer neutralizes hydrogen ions and leads to the formation of carbonic acid, which is then converted by carbonic anhydrase to form carbon dioxide and water for excretion.

If there is failure of the bicarbonate-mucus layer, intracellular bicarbonate protects the epithelial cells against acid back-diffusion. Proton pump exchanges on the basolateral epithelial membrane also protect against increasing intracellular acid. The epithelial cells are rapidly renewed, with surface mucous cells migrating from the wall of the crypts to the tips in as little as three days. When the stomach is exposed to acidic stimulants, there is localized hyperemia caused by increased mucosal blood flow. This in turn increases the bicarbonate-rich mucus secretion locally and protects against further damage.

Pathophysiologically, the most commonly implicated causes in veterinary medicine are decreased mucosal blood flow, abolition of surface prostaglandins, overwhelming gastric acid secretion or loss of the tight junctions due to inflammatory or neoplastic change.

Drugs used for gastric protection are classified according to their mechanism of action as non-systemic antacids, prostaglandin analogue(s), diffusion barriers, histamine-receptor (type 2) antagonists and proton-pump inhibitors (PPI). Anecdotally, the use of PPIs in veterinary practice has increased dramatically in the past decade and appears to have increased in popularity above that of histamine receptor antagonists.

Antacids are available as over the counter products, usually marketed to treat gastric reflux. The use of antacids leads to rebound gastric hypersecretion and they have no place in veterinary medicine. Misoprostol is a prostaglandin analogue, and as such should be used very carefully due to its potential to cause abortion. The only support beneficial use of misoprostol is prophylactically in dogs prior to high-dose aspirin administration.

The most well-known diffusion barrier is sucralfate, which is a complex of sucrose octasulfate and aluminium hydroxide that in the presence of acid dissociates into these two components. Sucrose octasulfate will polymerise into a sticky, viscous, yellow-white gel that is strongly anionic and electrostatically binds to cationic tissue proteins of ulcerated mucosa. The ulcerated site covered by this gel is then protected from backwards diffusion of hydrogen ions. Sucralfate also has additional cytoprotective roles that may involve mucosal synthesis of protective prostaglandins, secretion of mucus and bicarbonate, and increases in epidermal growth factor. It has little effect on stomach acidity. Although frequently cited as useful in the treatment of gastro-esophageal reflux and esophagitis, there is no compelling evidence to support its use in veterinary practice. Additionally, the tablet formulation may not dissolve sufficiently to be useful in dogs, so if available the liquid formulation is preferable.

H2-receptor antagonists competitively inhibit H2-receptors in the gastric parietal cells and cause approximately 70-90% reduction in gastric acid production and a corresponding decline in pepsin production. H2 antagonists have significant popularity in human medicine, and in many countries are sold over the counter. Despite differences in the degree of gastric acid inhibition between the different drugs of this group, no studies have shown one to be superior to the other in a clinical setting. There is no advantage to giving these drugs in place of PPIs in truly indicated cases, and there is no indication that concurrent administration with PPIs will improve therapeutic outcomes.

As PPIs are the most effective group of drugs (and most widely used) to treat gastric ulceration, it is important to understand their mechanisms of actions and potential side effects. Proton pump inhibitors covalently bond to and irreversibly inhibit the proton pump (H+-K+-ATPase) that exists on the luminal surface of the parietal cell. New proton pumps are continuously formed, so the pharmacological effect is not permanent. All afferent pathways that culminate in the basal or stimulated secretion of hydrogen ions from the parietal cell (gastrin, histamine and acetylcholine) are inhibited. The two drugs from this class most commonly utilised in small animal medicine are omeprazole and pantoprazole.

These drugs should be given on an empty stomach as the presence of ingesta will decrease oral bioavailability. Studies have shown that twice daily dosing is most effective, and tablets should not be split or crushed. Long-term use of proton pump inhibitors (>8 weeks) may lead to increased levels of gastrin from the inhibition of negative feedback pathways, although this has not been documented to date in dogs or cats. Likewise, there is concern that rebound gastric hypersecretion can occur if the drug is used long-term (more than 3-4 weeks) and suddenly stopped. Therefore, current recommendations are to taper the dosage by 25-50% per week.

One of the major concerns of the use of PPI in people is the associated dysbiosis that may occur. In the intensive hospital setting, this has major implications in terms of nosocomial infection and ventilator-associated pneumonia. Some authors also associate the increase in Clostridia difficileassociated diarrhea with the increased use of PPIs. Although not studied extensively in dogs, one study has shown an increase in total duodenal bacterial counts and quantitative changes in healthy dogs given omeprazole for two weeks. This raises concerns about long-term effects of PPIs in dogs and cats, particularly if administered when not clinically indicated.

In 2018, a consensus statement about the use of gastric protective agents was published by the American College of Veterinary Internal Medicine. In this review, the authors felt the evidence for the use of PPIs in dogs and cats overall was poor, and much less compelling than the human guidelines. However, the indications for PPIs does closely mirror that of the human situation, and can be summarized as below:

Indications for use of PPIs:

Gastroduodenal ulceration and erosion, regardless of cause

Uncertain whether indication for use of PPIs at this stage:

Stress-related mucosal disease (potentially beneficial in sled dogs)
Reflux esophagitis

No indication for use of PPIs:

Gastritis without erosion/ulceration
Hepatic disease without erosion/ulceration
Renal disease (IRIS stage 1-3)
Pancreatitis, without gastric erosion/ulceration
Non Helicobacter pylori Helicobacter
Thrombocytopenia-induced bleeding
Spinal cord injury (intervertebral disc disease)
Anorexia, vomiting, diarrhea

As can be seen, the clinical situations when PPIs are truly indicated are few and should be reserved for when there is documented or strongly suspected gastroduodenal ulceration. This will be in cases of iron deficiency anemia, melena or hematemesis (when there is no cause of coagulopathy). The need to be cautious with PPI usage is strengthened by the fact that the GI microbiome is altered when used. In addition, as gastric acid production is almost abolished, drugs that require an acidic environment to be active should not be administered concurrently.

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WSV - 019

STATE-OF-THE-ART LECTURE: MINIMALLY INVASIVE SURGERY: FROM EVERYDAY PROCEDURES TO THE STATE OF THE ART

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Minimally invasive surgery (MIS) in veterinary medicine is experiencing a rapid increase in popularity. These surgical techniques allow veterinary species to enjoy many of the same benefits that humans experience when undergoing less invasive procedures. In this lecture, we will discuss procedures that every general practitioner that performs routine soft tissue surgery can hone his or her skills on as well touch on the state of the art procedures that are being performed at the cutting edge of the field and envisage where MIS will go in the future.

One of the reasons that laparoscopic surgery is very much within the reach of general practitioners in private practice is that many of the routine soft tissue procedures being performed through a celiotomy approach lend themselves very well to a laparoscopic approach. These include elective ovariectomy and ovariohysterectomy, gastropexy, cystotomy, abdominal organ biopsy, and cryptorchidectomy. All that is required to make these procedures a success in every practice is an initial investment in some specialized equipment and enough passion for the topic to go out and seek additional training in the field. Because the fundamental knowledge of anatomy and surgical technique are already in place when you are performing surgery routinely there is no reason to fear making the switch to laparoscopy for some of these procedures. Furthermore, because these are routine surgical procedures, most practices will have the necessary caseload to ensure a business plan can justify the financial outlay required to purchase good quality equipment to initiate an MIS program in most practices.

Laparoscopic procedures can be broadly separated into totally laparoscopic procedures and laparoscopic-assisted procedures. As the name suggests totally laparoscopic procedures involve all necessary manipulations being performed within a closed body cavity. Laparoscopic-assisted procedures involve the telescope and instruments aiding in the process of exteriorization of an organ through a small “assist” incision allowing the surgeon to operate on that organ outside the body cavity. Laparoscopic-assisted procedures are a good way to start the learning curve for certain procedures that lend themselves well to this approach such as gastro-intestinal biopsy, gastropexy and ovariohysterectomy. The assisted approaches are simpler to perform and are a good stepping stone to totally laparoscopic procedures or the more advanced laparoscopic procedures. There are also some procedures where a laparoscopic procedure can be performed in the early stages of the learning curve before moving on to the more technically challenging but perhaps more advantageous to the patient, totally laparoscopic approaches. A good example of one of these procedures might be the totally laparoscopic gastropexy technique. An essential skill that is taught to all prospective human MIS surgeons is intracorporeal suturing. While this has received relatively little attention in the veterinary literature to date it has recently been made simpler by the development of the barbed sutures (e.g. VLOCä, QuilläAND Stratafixä). These sutures avoid the need for laborious intracorporeal knot-tying and have simplified procedures such as totally laparoscopic gastropexy that was first described by the author in 2009.1Intracorporeally-sutured gastropexy has now been described by several authors2-4 and represents a step forward in the development of a minimally invasive gastropexy. It has been shown that dogs undergoing totally laparoscopic gastropexy return to normal activity more rapidly compared to those undergoing traditional laparoscopic-assisted gastropexy.1

As surgeons gain greater and greater skill in laparoscopy more advanced surgical interventions can be mastered. Small numbers of LS have been described in experimental and clinical canine patients in the literature.5-7The principal indication for splenectomy in cats and dog is for resection of potentially neoplastic lesions, which in many cases can be very large. If splenic size and/or lesion size is substantial a careful assessment needs to be made as to whether a laparoscopic approach is recommended. One difficulty with this procedure is that physical manipulation of heavy organs can be challenging laparoscopically and care has to be taken not to cause iatrogenic rupture of splenic lesions, which could lead to seeding of neoplastic cells within the abdominal cavity. However, there is a significant subset of dogs and cats that present for splenectomy that have smaller lesions or diffuse splenic disease that may be good candidates for this procedure. Both multiport5, single port6and laparoscopic-assisted splenectomy7have now been described. In this author’s, opinion single-port splenectomy is best designed for small dogs and cats and larger dogs with larger masses are most easily treated using the laparoscopic-assisted technique.

Laparoscopic adrenalectomy is another procedure performed regularly in humans for resection of both adrenocortical tumors as well as pheochromocytomas and lends itself very well to veterinary patients.8-12We have performed this procedure now in >80 dogs and around 10 cats and feel that it can be performed efficiently, safely and with a very low complication and conversion rate. Case selection is absolutely paramount in these cases with careful exclusion of cases that have vascular invasion into the caudal vena cava being critical. For this reason, we always perform a CT angiogram study pre-operatively to rule out vascular invasion. Tumors up to 5cm can readily be excised with experience although early in the learning curve it is better to select smaller masses that are technically less challenging to resect. We believe that LA is one procedure that lends itself so well to a laparoscopic approach that in the future, adrenal gland tumors might be routinely approached in this fashion, by those with the appropriate equipment and experience.

Thoracoscopic surgery offers an exciting new modality for treatment of a variety of thoracic disease processes. In humans suggested advantages of VATS include a reduced volume of thoracic drainage, less post-operative pain, shorter hospital stay and a more rapid return to normal function. Limited objective comparisons of "open" versus VATS procedures have been reported in the veterinary literature but similar advantages are likely to be present in smallanimal patients. The most common interventions performed in veterinary thoracoscopy include pericardectomy, lung lobectomy, thoracic duct ligationand cranial mediastinal mass resection amongst others. The level of complexity increases with thoracoscopic interventions and familiarity with open thoracic surgery is obviously an advantage in these cases. While some procedures such as pericardectomy and thoracic duct ligation can performed just using the pneumothorax that occurs when open chest cannulae are introduced into the chest lung resection usually requires the use of specialized anesthetic techniques such as one-lung ventilation which increases the complexity of the case and requires careful anesthetic monitoring.

We can only guess where veterinary minimally invasive surgery will go in the future. We have many perceived limitations compared to the human MIS field but innovation and technology often surprise us with their ability to break down theoretical barriers to progress. I envision MIS developing much rapidly in veterinary medicine in the next decade compared to the last as access to high quality equipment and training improves and our clients demand the same procedures for their much loved companion animals as they would want for themselves.

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WSV - 014

TRILOSTANE TREATMENT AND MONITORING: IS THE ACTH STIMULATION TEST GONE FOR GOOD?

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TRILOSTANE

Trilostane (Vetoryl®, Dechra Pharmaceuticals) is licensed for use in dogs for the treatment of pituitary-dependent hyperadrenocorticism as well as for hyperadrenocorticism resulting from a functional adrenocortical tumor. It is an orally active synthetic steroid analog that inhibits 3-beta-hydroxysteroid dehydrogenase (and 11-beta hydroxylase) in the adrenal cortex leading to decreased production of cortisol and to a lesser extent aldosterone. Trilostane is not cytotoxic and does not damage the adrenal cortex so withdrawal of the drug should result in a fairly rapid increase in the cortisol concentration unless adrenal necrosis has occurred. Adrenal necrosis is an uncommon complication that can occur during treatment with trilostane and is thought to be related to an increased ACTH concentration (endogenous and potentially exogenous from repetitive ACTH stimulation testing associated with therapeutic monitoring). Numerous clinical trials have confirmed the efficacy of trilostane for the treatment of hyperadrenocorticism, and the majority of dogs have good clinical response with minimal side effects/complications.

DOSING RECOMMENDATIONS

The manufacturer recommends starting trilostane therapy at a dose of 2.2 – 6.7 mg/kg (1 – 3 mg/lb) once daily with food (Vetoryl® package insert).
The most common starting dose in our hospital is 1 – 2 mg/kg (0.5 – 1 mg/lb) every 12 hours with food. Some authors have recommended administering this dose once daily, but in our experience once daily administration in this dosage range (1 – 2 mg/kg) does not provide adequate cortisol suppression and clinical control in most cases.
Dosing frequency continues to be a topic of debate. While once daily administration may improve compliance and reduce the cost of treatment, it is our experience that twice daily administration of a lower dose results in superior clinical control and reduces the risk of complications associated with excessive cortisol suppression.

The commercially available capsule sizes (5 mg, 10 mg, 30 mg, 60 mg, 120 mg) allow the targeted dose to be administered to most dogs without the need for compounding.

If an additional size is needed, the commercially available product (Vetoryl®) can be reformulated into the appropriate capsule size by a compounding pharmacy.

MONITORING AND DOSAGE ADJUSTMENT

Dechra's European division has recently changed the monitoring recommendations for Vetoryl® because of a shortage of synthetic ACTH in Europe. Research performed at the University of Glasgow and surrounding veterinary practices in the United Kingdom found that the pre-trilostane (before the next dose) resting cortisol concentration correlated better with clinical control than did the post-pill resting (baseline) and/or post-ACTH cortisol concentrations. It is important to recognize that the pre-trilostane resting cortisol is not the same as the post-trilostane resting cortisol (baseline sample of the ACTH stimulation test performed after trilostane administration), which is not a useful monitoring tool. Although multiple research groups have shown that the post-trilostane ACTH stimulation test (historical monitoring approach) is not a very useful monitoring tool, they have been unable to identify an alternative and superior monitoring option. The pre-trilostane (before the next dose) resting cortisol concentration may be a better alternative to the post-trilostane ACTH stimulation test. In Europe, the manufacturer recommends combining clinical assessment with the pre-trilostane resting cortisol concentration (ideal range: 1.5 – 5 mg/dL [40 nmol/L – 140 nmol/L]) to determine if a dosage change is necessary. It is important to note that clinical assessment and the presence of clinical signs should always be considered when determining if an increase in the trilostane dosage is warranted regardless of the monitoring protocol utilized. It should also be noted that using the pre-trilostane resting cortisol concentration for monitoring should be reserved for dogs that are clinically well. Dogs that are exhibiting signs of cortisol deficiency should have a complete evaluation including an ACTH stimulation test performed.

Although the monitoring recommendations have not "officially" changed in the United States, a number of institutions in the US are evaluating the use of the pre-trilostane resting cortisol concentration for monitoring trilostane therapy. Similar to what has been reported by researchers in the UK, we have found the pre-trilostane cortisol concentration and clinical assessment/response to be an effective and safe way to monitor most dogs that are clinically well. If a single cortisol measurement is to be used for monitoring purposes (synthetic ACTH is not available or an ACTH stimulation test cannot be performed because of financial limitations), the pre-trilostane cortisol concentration will likely provide the most clinically useful information.

Current Monitoring Options

Pre-trilostane resting cortisol concentration (attractive because inexpensive and convenient)
Post-trilostane ACTH stimulation test (remains most common monitoring protocol in US)
Pre-trilostane cortisol + post-trilostane ACTH stimulation test (recommended for any dog exhibiting signs of cortisol deficiency)
It is very important that clinical control and/or persistence of clinical signs associated with hypercortisolemia be considered when interpreting the results of any monitoring test/protocol and determining if a trilostane dosage increase is necessary.
Author's Recommendations Based on the Post-ACTH Cortisol Concentration 2-4 hours after trilostane administration.

Post-ACTH Cortisol Concentration	Recommendation
< 1 mg/dL (< 28 nmol/L)	Stop treatment. Evaluate electrolytes; ACTH stimulation test (off of trilostane) in 2 weeks and/or re-start trilostane at a lower dose if/when clinical signs reoccur.
< 1.8 mg/dL (< 50 nmol/L)	Temporarily stop treatment. Re-start at a lower dose
1.8 – 9.1 mg/dL (50 – 250 nmol/L)	Either: Continue current dose if clinical signs are well controlled Or: Dosage increase based on clinical assessment and persistence of clinical signs
> 9.1 – 16.3 mg/dL (> 250 – 450 nmol/L)	Either: Continue current dose if clinical signs are well controlled Or: Dosage increase based on clinical assessment and persistence of clinical signs
> 16.3 mg/dL (> 450 nmol/L)	Dosage increase based on clinical assessment and persistence of clinical signs

Author's Recommendations Based on the Pre-trilostane Cortisol Concentration (modified from the Pre-VetorylÒ Cortisol monitoring guidelines; Dechra Europe)

Pre-trilostane Cortisol Concentration	Recommendation
Pre-trilostane Cortisol Concentration	Consider a lower dose
< 1 – 1.5 mg/dL (< 28 – 40 nmol/L)	No clinical signs of HAC- continue current dose Or: Increase dosage or dosing frequency (once to twice daily) if inadequate clinical control/persistent clinical signs
1.5 – 5 mg/dL (40 – 140 nmol/L)	No clinical signs of HAC- continue current dose Or: Increase dosage or dosing frequency (once to twice daily) if inadequate clinical control/persistent clinical signs
3 – 5 mg/dL (80 – 140 nmol/L)	No clinical signs of HAC- continue current dose Or: Increase dosage or dosing frequency (once to twice daily) if inadequate clinical control/persistent clinical signs

Monitoring Frequency and Recommended Testing

10 – 14 days after initiating therapy or a dosage change: confirm that the dog is clinically well; no hormone testing necessary if no signs of cortisol deficiency
4 – 6 weeks: cortisol monitoring (see Current Monitoring Options)
2 – 3 months: cortisol monitoring (see Current Monitoring Options)
4 – 6 months: cortisol monitoring (see Current Monitoring Options), electrolytes
Recommend re-evaluation 2 – 3 times per year as long as the dose is stable, clinical signs are well-controlled, and the dog is doing well.
Dosage Adjustment
Dosage adjustments should be based on a combination of clinical assessment (persistence of clinical signs) and serum cortisol concentrations.

The trilostane dose should be increased by 5 – 10 mg/dose depending on the cortisol concentrations, severity of clinical signs, size of the dog, current dose, and frequency of administration.
If the dog is receiving once daily trilostane and the cortisol concentrations are within the recommended/acceptable ranges but clinical signs are not well-controlled (persistent polyuria, polydipsia, polyphagia, and/or other signs), divide the dose and administer twice daily. If the cortisol concentration(s) are above the recommended range(s), divide the dose for twice daily administration and increase by 10-25%.

REFERENCES

References available upon request.

WSV - 048

THEY'RE NOT ITCHY…WHAT DO I DO NOW?" DIAGNOSIS OF NONPRURITIC ALOPECIA

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Overview of the Issue

When a patient is nonpruritic, it can be difficult to determine the underlying etiology. Many diseases look strikingly similar and often a diagnosis can only be made after ruling out diseases on your differential list one at a time.

Objectives of the Presentation

1. Review diagnostic steps for the nonpruritic patient with skin disease.

Key Etiologic and Pathophysiologic Points:

Hair loss can be both inflammatory and non-inflammatory. Inflammatory causes encompass parasitic disease, infectious disease, immune mediated disease and neoplasia. Non-inflammatory alopecia occurs when there is either hair cycle arrest or when abnormal hair is formed due to a dysplastic disease process. The etiology for many of these diseases is not well understood. Certain parasitic diseases (demodecosis) and fungal infections (dermatophytosis) are also often nonpruritic.1

Hair Cycle Arrest Alopecia

1. Endocrine disorders (hypothyroidism, hyperadrenocorticism)
a. Require appropriate blood tests to diagnose
b. Systemic signs may also be present
2. Alopecia X2
a. Hairs remain in telogen
b. Possible abnormal adrenal sex hormone imbalance and growth hormone deficiency
c. Possible local follicular receptor dysfunction
d. Young dogs (2-5 yrs)
e. Chow chow, Samoyed, Pomeranian, Alaskan Malamute, Keeshond, Husky. Miniature poodle
f. Truncal alopecia starting around perineum and caudal thighs
g. Head and neck spared
3. Canine recurrent flank alopecia
1. Alopecia of the flanks (thoracolumbar region), often recurrent between November and March each year
i. Symmetrical or asymmetrical
ii. Hyperpigmentation
b. Often will regrowth within 3-8 months
c. Due to changing photo period, pineal gland and prolactin secretion
d. Boxer, Airedale terrier, bulldog
4. Post clipping alopecia4
a. Hair fails to regrow after clipping
b. Chow chow and Husky
c. Regrowth after 3-4 months

Dysplastic Alopecia

1. Congenital alopecia/hypotrichosis5
a. Dogs and cats born without hair
b. Ectodermal defect

2. Colour dilution alopecia
a. Alopecia associated with blue (dilute black) or fawn (dilute brown) coat colours
i. Defective hair pigment results in the formation of large pigment granules
ii. Can fracture hair shafts leading to alopecia
iii. Doberman, dachshund, Great Dane, Yorkshire terrier, whippet, greyhound, miniature pinscher, Saluki, Chow Chow, Boston terrier, Shetland sheepdog, Chihuahua, poodle and Irish setter
iv. Normal at birth then hair loss occurs around 6 months
v. Non colour dilute areas remain normal

3. Black hair follicular dysplasia1
a. Familial in bicoloured/tricoloured dogs
b. Only black hair affected – possible defect in pigment transfer
c. Bearded collie, basset hounds, Saluki, beagle, dachshund, pointer
d. Normal at birth then progressive loss of black hairs around 4 weeks

4. Follicular dysplasia1,7
a. Abnormal hair follicle development
b. Doberman pinscher, miniature pinscher, Manchester terrier
c. Husky, Alaskan malamute
d. Irish water spaniel, Portuguese water dog
e. Greyhounds

5. Pattern alopecia1
a. Idiopathic hair cycle arrest – miniaturization of hair follicles
b. Alopecia of affected areas, usually symmetrical
c. Three syndromes:
i. 1. Male dachshunds – alopecia of pinnae
ii. 2. American water spaniels and Portuguese water dogs – alopecia of ventral neck, caudomedial thighs and tail
iii. 3. Female dachshunds, Chihuahua, whippet, greyhound - alopecia of the post auricular area, ventrum and caudomedial thighs

Certain immune mediated diseases will also present with non pruritic alopecia such as Sebaceous adenitis and alopecia areata. These conditions need skin biopsies to definitively diagnose and immune modulating/suppressive therapy to treat.

Key Clinical Diagnostic Points:

1. It is important to remember that any "non-pruritic disease" can become pruritic if a secondary bacterial or yeast dermatitis is present. Therefore it is imperative to perform cytology on any animal with skin disease to rule in/out these secondary infections and pursue appropriate treatment.

2. Skin scrapings must also be performed as demodicosis can present in many different ways and is often a nonpruritic disease.

3. Fungal culture should be considered, as dermatophytosis is also a nonpruritic disease.

4. Full bloodwork should be performed in any animal with non-pruritic alopecia. Results may provide evidence of underlying etiology if endocrine.

5. Further blood tests including thyroid tests and tests such as an ACTH stimulation test for hyperadrenocorticism are also warranted (especially if the animal has other systemic signs indicative of these diseases e.g. lethargy and weight gain for hypothyroidism or polyuria, polydipsia, polyphagia, "pot-bellied" appearance for hyperadrenocorticism).

6. Trichograms (hair plucks) will provide valuable information and a potential diagnosis and are easily obtained and read in house.

7. Skin biopsies sent to a dermatohistopathologist can provide more information and a potential diagnosis.

Key Prognostic Points:

1. Many diseases can look the same on histopathology and therefore histopathology findings need to be paired with other diagnostic tests for an accurate diagnosis.

Summary including 5 KEY "TAKE HOME" POINTS:

1. Many nonpruritic, alopecic diseases look similar clinically.
2. Perform baseline diagnostics including cytology, skin scrapings and fungal culture in any nonpruritic patient.
3. A trichogram is a simple test that can be performed in house and can provide information regarding the etiology of the disease.
4. Any nonpruritic disease can become pruritic if a secondary infection is present.
5. Skin biopsies sent for dermatohistopathology can also provide extra information and a diagnosis.

References/Suggested Reading

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WSV - 015

MONITORING CANINE AND FELINE DIABETICS: BEYOND THE GLUCOSE CURVE

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MONITORING AND INSULIN DOSAGE ADJUSTMENT

Increases in the insulin dose should be based on the presence of clinical signs (polyuria and polydipsia, changes in body weight) combined with proof of hyperglycemia and/or unacceptable glycemic control (continuous glucose monitoring, blood glucose [BG] curves, glycated proteins [fructosamine, HbA1c]). Prior to recommending an insulin dosage increase, one should consider the severity of clinical signs, degree of hyperglycemia, size of the animal (typically increase by 1 unit/dose in cats/small dogs and 2-3 units/dose in larger dogs), and the current insulin dose (consider causes of insulin resistance or need to change formulations when dose is >1.5-2 U/kg). In order to avoid overdosing and hypoglycemia, it is recommended to wait at least 7-10 days following an increase in the insulin dose before considering another dosage increase.

Urine Glucose Quantification

Semi-quantitative urine glucose measurement is a crude assessment of glycemic control that confirms hyperglycemia in excess of the renal threshold (180-220 mg/dL in the dog and 200-280 mg/dL in the cat). The detection of glucosuria is of limited utility in dogs because given the current approach to managing canine diabetes, even well-regulated dogs would be expected to exceed the renal threshold for glucose at some point during the day. In most cases, it is possible to obtain similar clinical information by questioning the owner about observed polyuria and polydipsia. If urine glucose is used for monitoring in dogs, the author recommends only using it to assess for over supplementation/persistent hypoglycemia (i.e., recommend decreasing the insulin dose after documenting the absence of glucosuria) and not as a guide for increasing the insulin dose. Urine glucose measurement is no longer recommended as the only assessment of glycemic control in dogs and better monitoring techniques are available.

Urine glucose quantification can be used to assess glycemic control in cats because it is possible to safely maintain their blood glucose below the renal threshold (~250 mg/dL) for most/all of the day with long-acting insulin formulations.

As a result, the presence of glucosuria suggests inadequate glycemic control and the need for more insulin. Urine glucose monitoring cannot be used to detect/confirm persistent hypoglycemia in cats that are in a diabetic remission (non-insulin dependent state) receiving insulin so blood or interstitial glucose monitoring must be used to confirm remission.

Blood Glucose Curves

Despite substantial day-to-day variability in BG curve results, a complete 12-hour BG curve can provide useful information when evaluating a poorly regulated diabetic, especially if continuous glucose monitoring is not an option. Blood glucose data collected in the home environment is likely more representative of the actual glycemic control than monitoring in the clinic or hospital. This is especially true in cats because of stress hyperglycemia. The author does not recommend in clinic/hospital monitoring for cats even if it appears they are tolerant/"not stressed". It is recommended that BG curve data from multiple days during a 2-3 week period be evaluated prior to recommending significant changes such as a change in the insulin formulation. This will allow the clinician to evaluate trends rather than a single BG curve which may not be an accurate representation of the glycemic control. Routine blood glucose monitoring also plays an important role in detecting subclinical hypoglycemia, the occurrence of diabetic remission, and/or the return to an insulin-dependent state in cats.

Home Blood Glucose Curve Protocol

- Use a hand-held glucometer that has been validated for use in dogs and cats
- Blood glucose before food and insulin administration
- Feed and administer insulin
- Blood glucose 1 hour after food and insulin, then every 2 hours (every 4 hours in cats receiving long-acting preparations) until the next dose of insulin

Continuous Glucose Monitoring

The FreeStyle Libre continuous glucose monitoring system provides a readily available, cost-effective way to continuously assess glycemic control over a 14-day period. The system measures the interstitial glucose, stores up to 8 hours of data, and does not require blood sampling for calibration.

Continuous glucose monitoring is the recommended assessment method for any challenging diabetic and has replaced blood glucose curves for monitoring in most diabetics in the author's practice.

Glycated Proteins

The fructosamine concentration provides an estimate of glycemic control/average blood glucose concentration during the preceding 1-3 weeks. Factors or conditions known to affect the fructosamine concentration include hypoproteinemia, hyperlipidemia, azotemia, and hyperthyroidism. The fructosamine concentration is infrequently measured in our practice and may provide additional information about glycemic control in fractious diabetic cats that will not tolerate home blood glucose curves or continuous glucose monitoring or to establish a diagnosis of diabetes mellitus.

Glycated hemoglobin or HbA1c plays an important role in the detection of pre-diabetes and assessment of long-term glycemic control in people. Although previously studied in dogs and cats, species differences affected the performance of human assays and greatly limited the utility of this monitoring technique. A canine and feline specific HbA1c (A1CARETM, http://baycomdiagnostics.com) test has been developed and is now commercially available. Glycated hemoglobin provides information about the average blood glucose during the preceding ~110 days in the dog and ~70 days in the cat (lifespan of the red blood cell). This test is expected to prove useful in screening and early detection of diabetes/pre-diabetes and will likely provide a better assessment of long-term glycemic control than fructosamine.

References

References available upon request.

WSV - 041

SURGICAL EXTRACTIONS/COMPLICATIONS

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Challenging extractions are best performed via a surgical approach. Canine and carnassial (maxillary fourth premolar and mandibular first molar) teeth are typically considered “difficult”. However, it is also beneficial for teeth with root malformations or pathology (ie.e ankyloses) and retained roots. A surgical approach allows the practitioner to remove buccal cortical bone, promoting an easier extraction process.
Envelope flaps are created by incising the interdental gingiva and then releasing the gingival attachment with a periosteal elevator along the arcade including one to several teeth on either side of the tooth or teeth to be extracted. The advantages to this flap are

· Decreased surgical time
· Blood supply is not interrupted
· Less suturing.
· Less chance of dehiscence

The more commonly used flap includes one or two vertical releasing incisions. This method allows for a much larger flap to be created, which (if handled properly) will increase the defects which can be covered. The incisions should be made slightly apically divergent. Once created, the entire flap is gently reflected with a periosteal elevator. Care must be taken not to tear the flap, especially at the muco-gingival junction.

Following flap elevation, buccal bone can be removed. Again, this author favors a cross cut taper fissure bur. The amount is controversial, with some dentists removing the entire buccal covering. However, this author prefers to maintain as much as possible and starts by removing 1/3 of the root length of bone on the mandible and 1/2 for maxillary teeth. If ankylosis is present, a significant amount of bone removal may be required.

Following bone removal, multirooted teeth should be sectioned. Then follow the steps outlined for single root extractions for each piece. After the roots are removed the alveolar bone should be smoothed before closure.

Closure is initiated with a procedure called fenestrating the periosteum. Since the periosteum is fibrotic, it is inflexible and will interfere with the ability to close the defect without tension. The buccal mucosa however, is very flexible and will stretch to cover large defects.

The fenestration should be performed at the base of the flap. This can be performed with a scalpel blade, however a LaGrange scissor allows superior control.
After fenestration, the flap should stay in desired position without sutures. If this is not the case, then tension is still present and further release is necessary prior to closure. Once the release is accomplished, the flap is sutured.

Maxillary fourth premolar

The first step when extracting this tooth is to create a gingival flap. Classically this is a full flap with one or two vertical releasing incisors. This will allow good exposure, However, an envelope flap is sufficient for small and toy breed dogs, as well as cats.
Following flap creation, buccal bone is removed to a point approximately □ the length of the root. Next, the tooth is sectioned. The furcation is fairly deep, so make sure that you have it fully sectioned by placing an elevator between the teeth and twisting gently. If fully sectioned, the pieces will move opposite each other easily.

Mandibular first molar

In canine patients, these extractions are further complicated by a groove on the distal aspect of the mesial root. In addition, the mesial root is often curved. Finally, in small breed dogs, there is commonly a significant hook at the apex. Moreover, this tooth is the most common place for an iatrogenic mandibular fracture and it is possible to damage the mandibular nerve and vessels.
The first step when extracting this tooth is to create a gingival flap. Classically this is was full flap with one or two vertical releasing incisors. However, this author finds that an envelope flap is sufficient in virtually all cases. Following flap creation, buccal bone is removed. Next, the tooth is sectioned and the extraction proceeds as for single rooted teeth

Maxillary Canine

Maxillary canines are a very challenging extraction due to the significant length of the root. In addition, the very thin (less than 1-mm) plate of bone between the root and the nasal cavity often results in the creation of an oronasal fistula.

Vertical incisions are usually necessary for exposure and closure. At least a distal incision should be performed, and performing a mesial and distal incision will allow for increased tissue for closure.

The distal releasing incision is typically created at the mesial line angle of the first premolar. This is to allow sufficient exposure for bone removal, as the root curves back to over the second premolar. Following the creation of the vertical incisions, the flap is carefully elevated. If it is not elevating fairly easily, ensure that the interdental tissue is fully incised.

Once the flap is raised, approximately ˝ of the buccal bone is removed. Make sure to remove some of the mesial and distal bone as the tooth widens just under the alveolar margin. Once the tooth is elevated to a point of being very loose, it can be carefully extracted with forceps.
Closure is initiated with fenestration of the periosteum. When this is performed the tissue should stay in position over the defect. If it does not, tension is present and the flap will dehisce.

Mandibular canine

These are quite simply the most difficult extraction in veterinary dentistry. This is due to the length and curve of the root, the hardness of the mandible, and the minimal bone near the apex. Furthermore, extraction of this tooth will greatly weaken the jaw and further predispose the patient to an iatrogenic fracture.
The flap for this extraction is generally triangular with just one distal vertical flap. A horizontal incision is created along the arcade to the mesial line angle of the first premolar. Then a distally divergent vertical incision is created. Next, the flap is carefully elevated and the buccal bone is removed to a point about 1/3 of the way down the root. More bone can be removed if necessary. The tooth is then carefully elevated and extracted. Debridement and closure is as above.

Extraction of retained roots

Root fracture is a very common problem in veterinary dentistry. While it seems that removal of retained root tips is a daunting task, with proper technique and training it can be fairly straightforward. The first step is to create a gingival flap. Depending on the anticipated amount of exposure necessary to retrieve the fragments, this can either be an envelope flap or a full flap with one or two vertical releasing incisions.

Following flap creation, buccal cortical bone is removed with a carbide bur to a point somewhat below the most coronal aspect of the remaining root. If necessary, the bone can be removed 360 degrees around the tooth, but this author tries to avoid this aggressive approach.
Once the root(s) can be visualized, careful elevation with small, sharp elevators is initiated. Once the tooth is mobile, it can be extracted normally. After radiographic confirmation that the tooth is fully extracted, the bone is smoothed and the defect closed.

Oronasal fistula repair

In most cases, the single layer mucogingival flap technique is sufficient to repair ONFs, especially when done correctly the first time. This is the most common surgical treatment used to repair ONFs and therefore will be presented here.

The single layer mucogingival flap is created with either one or two vertical incisions. Proper design of the mucogingival flap will allow maximum exposure of the area for extraction of the tooth (if necessary), debridement of the fistula, and critically important tension-free closure.

When making flap incisions, adequate pressure should be placed to ensure full thickness of the soft tissue is incised down to the bone. Any vertical incisions should be created slightly divergent as they proceed apically. Divergent incisions allow for adequate blood supply for the newly created flap.

The mucogingival flap is gently elevated off the bone using a periosteal elevator. Any margins of the flap associated with the oronasal fistula should be debrided using a LaGrange scissors or coarse diamond bur to remove 1-2mm of tissue, leaving fresh epithelial edges.
As with any closure in the oral cavity, the key to success is to ensure there is no tension on the incision line.

Fenestration of the inelastic periosteum (see previous section on surgical extractions) is performed to increase the mobility of the flap and allow for a tension free closure. This is accomplished by a combination of sharp and blunt dissection with a LaGrange scissors to ensure the overlying mucosa is not damaged.

The gingival flap is then placed over the defect so that it remains in position without being held. Once this is accomplished (i.e. no tension is present), the flap is ready to be sutured into place.

WSV - 024

MANAGING THE SPECTRUM OF CANINE PANCREATITIS

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The definitions of pancreatitis can sometimes be challenging, as usually the terms used in textbooks refer to the histological classification, which does not always relate to the clinical presentation. Technically, acute pancreatitis is defined as a neutrophilic inflammation, without fibrosis or exocrine atrophy; and is usually present within the body of the pancreas and/or peri-pancreatic fat. Chronic pancreatitis (CP) is defined as a mononuclear (often lymphocytic) inflammation, with disruption of the pancreatic architecture due to concurrent fibrosis. The presence of nodular hyperplasia in the pancreas of dogs is now considered an incidental finding, with an increased presence in older animals.

Increasingly it is being recognised that mild, multi-focal inflammation within the pancreas occurs frequently, and as such some low-grade inflammation may be on the spectrum of normal for many animals, and not associated with any specific clinical signs. Likewise, due to the anatomical location of the pancreas, other abdominal or intestinal disease can cause 'by-stander' inflammation in the pancreas. This makes it very important to ensure that clinically we rule out other causes of acute abdominal disease in dogs before reaching a diagnosis of acute pancreatitis.

Obese and overweight dogs are at greater risk of pancreatitis, and this may be associated with abnormal dietary intake or indicate a general predisposition to inflammation associated with production of adipokines. In one retrospective survey, dogs with recent ingestion of unusual food items and garbage ingestion all showed an increased risk of developing pancreatitis, rather than dogs that appeared to have a higher intake of treats and snacks. It has also been observed that feeding a low-protein, high fat diet to dogs for prevention of struvite urolithiasis is linked with an increased incidence of pancreatitis.

None of the changes seen on routine clinical pathology are specific for pancreatitis but are useful in aiding in the diagnostic pathway. Some dogs may have overt lipaemia, which does increase the index of suspicion for pancreatitis. Serum lipase and amylase concentrations have been shown to increase in experimental and naturally occurring canine pancreatitis.

The fenestration should be performed at the base of the flap. This can be performed with a scalpel blade, however a LaGrange scissor allows superior control.
After fenestration, the flap should stay in desired position without sutures. If this is not the case, then tension is still present and further release is necessary prior to closure. Once the release is accomplished, the flap is sutured.

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The distal releasing incision is typically created at the mesial line angle of the first premolar. This is to allow sufficient exposure for bone removal, as the root curves back to over the second premolar. Following the creation of the vertical incisions, the flap is carefully elevated. If it is not elevating fairly easily, ensure that the interdental tissue is fully incised.

However, neither enzyme is specific to the pancreas as they also originate from gastrointestinal mucosa and are excreted by the kidneys. Conversely, serum lipase and amylase concentrations can also be normal in dogs that do have pancreatitis.

None of the changes seen on routine clinical pathology are specific for pancreatitis but are useful in aiding in the diagnostic pathway. Some dogs may have overt lipaemia, which does increase the index of suspicion for pancreatitis. Serum lipase and amylase concentrations have been shown to increase in experimental and naturally occurring canine pancreatitis. However, neither enzyme is specific to the pancreas as they also originate from gastrointestinal mucosa and are excreted by the kidneys. Conversely, serum lipase and amylase concentrations can also be normal in dogs that do have pancreatitis.

Canine pancreatic lipase measures lipase that originates solely in the pancreas. The canine pancreatic-lipase immunoreactivity (cPLI) assay was developed into a commercially available specific canine pancreatic lipase (spec-CPL) sandwich ELISA, with results < 200 µg/L expected in healthy dogs, and results > 400 µg/L considered consistent with a diagnosis of pancreatitis. An in-clinic rapid semiquantitative assay (SNAP-cPL; Idexx Laboratories) is also available. In brief, a negative result for SNAP-cPL or cPLI means it is likely that the dog has disease other than acute pancreatitis. A positive result still requires confirmation and elimination of other disease by some other modality. This is especially true as approximately 25% of dogs with a positive SNAP cPL test presenting to a veterinary emergence centre had non-pancreatic disease as their primary presentation in one study. Conversely, there are a high number of false negative cPLI results in dogs with CP.

Diagnostic imaging is a vital component of the diagnostic work-up for dogs with possible pancreatitis. Radiography is not generally that helpful for diagnosis of pancreatitis but is essential to rule out intestinal obstruction or other clinical signs. Abdominal ultrasound is increasingly being considered the mainstay of diagnosis. Acute pancreatitis is usually diagnosed by ultrasound in both dogs and cats, seen as an enlarged, hypoechoic pancreas and peri-pancreatic necrosis (manifested as hyperechogenicity surrounding the pancreas). It is extremely difficult to elucidate sensitivity or specificity of ultrasound as it is both operator and equipment dependent. Likewise, we need to be sure to evaluate the entire abdomen to rule out other causes of disease.

Ultrasonographic changes for CP are poorly described, and not often present. It has also been shown that pancreatic duct dilatation, once considered a hallmark of CP in cats, may be an age-related change and not reflect inflammation.

Modalities that are used commonly in people such as MRI, contrast-enhanced CT and endoscopic retrograde cholangiopancreatography (ERCP) are poorly described in animals. It is likely that they will be of minimal clinical benefit, due to the equipment and prolonged anaesthesia that is required.

There are no specific treatment modalities that are effective against pancreatitis. In acute pancreatitis, the aim is to treat the clinical consequences of the disease (dehydration, pain, nausea) and prevent further inflammation (interventional enteral nutrition). Therefore, the treatment

of acute pancreatitis consists of:

IV fluid replacement
Analgesia aimed at preventing wind-up- so starting maximally and then titrating down but avoiding use of drugs that affect gastrointestinal motility if possible.
Interventional nutrition: tin dogs with moderate to severe disease, this should start within 3-5 days of when there has been no oral intake. An oeosphageal feeding tube ideally should be used, inserted when the animal is suitable for a general anaesthetic. Gradually increasing feeding volumes to resting energy requirements over 3 days is recommended, and normal convalescent diets appear to be adequate unless there is known pre-existing hyperlipidaemia.

Controlling vomiting is also necessary when there are ongoing fluid losses, and when it is suspected that nausea is contributing to hyporexia/anorexia. There is no single agent that has been shown to be most effective in acute pancreatitis. There is a theoretical advantage in using maropitant, as NK1-receptor antagonist, as substance P may be involved in visceral pain. If single-drug antiemetic therapy is not effective, then addition of ondansetron or metoclopramide may be necessary. Although there is a theoretical disadvantage with metoclopramide (as it is a dopamine receptor antagonist), if poor intestinal motility is thought to be contributing to nausea or anorexia, then its use may be indicated.

Antibiotics are not indicated in most dogs with AP, unless there is documented concurrent infection. Other treatments are generally aimed at treating complications as they occur and draining acute fluid collections that appear to be caus ing pain. In all animals, if a drug reaction is suspected, then of course the drug should be withdrawn. Follow-up assessment should consist of re-checking serum triglycerides and cholesterol 1-2 weeks after discharge. Long-term dietary management is then dictated by whether hyperlipidaemia is present or not. If it isn't, the avoidance of trigger foods alone should be enough to minimise risk of recurrence.

Unfortunately, treatment options for CP are poorly explored. In animals with co-existing diseases such as inflammatory bowel disease or cholecystitis, treatment of the concurrent conditions takes priority, and often leads to resolution of clinical signs associated with CP. Therefore, the main priority in treating animals with CP is to look for and manage concurrent conditions.

The second priority is to look for underlying triggers for CP that can be corrected such as hyperlipidaemia. If cholesterol is high, and triglycerides are normal, then an underlying endocrinopathy should be investigated for, even though this may be problematic due to the influence of other disease on hormonal axis testing.

If both triglycerides and cholesterol are increased, then an inherent defect in lipid metabolism is more likely. In the absence of an endocrinopathy, treatment should initially consist of feeding a low-fat, with < 15% DM as fat. This is achieved by feeding many of the prescription low fat, high fibre diets. Other treatments such as omega-3 supplementation (20-30 mg/kg/day) can also be used.
If triglycerides (TG) alone are high and don't decrease with dietary management then gemfibrosil (7.5-10 mg/kg PO q 12 hours) may be used. Usually treatment is not required to reduce cholesterol.
If no underlying cause is identified and it is thought CP is causing clinical signs, then the dilemma is whether to manage pain or try to reduce inflammation. Ideally, immune suppression should be used only when there is histological confirmation of inflammation within the pancreas. If the animal is not diabetic, prednisolone is the drug of choice for both immune suppression and to treat inflammation/fibrosis, albeit at different dosages for the different effects.

Cyclosporine is also a viable anti-inflammatory treatment option in diabetic dogs, but it is more expensive in medium to larger breeds. Azathioprine has been associated with causing pancreatitis in dogs, but this is a weak association. More importantly, it has not been shown that dogs with pre-existing idiopathic or dietary-induced pancreatitis are more likely to develop reactions to azathioprine. I have personally used azathioprine in dogs that have had previous bouts of pancreatitis with no adverse consequences, but always have warned the owner and monitored closely for side effects. When this drug works, it is much cheaper than cyclosporine and generally well tolerated. Other side effects include myelosuppression that needs to be monitored and the small risk of hepatotoxicity.

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PERFORMING WATER TESTS: WHAT DO THEY TELL US?

N. Saint-Erne
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With any animal, environmental conditions can affect their overall health, but with aquatic animals such as fish, proper water quality is an important part of keeping them healthy. Without clean water, the fish will be stressed and more susceptible to diseases and parasites. This lecture will provide veterinarians with information regarding how to test pond water and what the various water chemistry characteristics mean for the health of the fish. Correcting water quality problems is also included in the discussion.

Water quality can be measured with test kits available through pet stores or pond supply companies, or from many aquaculture suppliers. The simplest tests are small plastic strips with chemical pads attached that are dipped into the water to be tested. The pads change color which, when compared to a color chart, indicates the level of that substance in the water. These are fast, easy to use, inexpensive, and relatively accurate (they indicate a range rather than a precise measurement). Dry tablet tests are also available where a small tablet is dissolved into a test tube containing the water sample. Its color is then compared to a chart to determine the results. Some test kits have liquids that are mixed with the water to produce the color reactions. More expensive test kits use a spectrophotometer to electronically compare colors and these give more accurate results. Effective electronic meters are also available for some water tests.

Temperature:

Koi (Cyprinus carpio) have a preferred optimum temperature range of 18-25 degrees Celsius (65-77 degrees Fahrenheit), but are able to survive at temperatures below or above this range. Gradual changes in water temperature within a fish's optimum range seldom cause health problems. Ideally, water temperature fluctuations should be no more than 3°C change per day.

Temperature shock can occur with rapid changes, especially from warmer water to cooler water. Increasing the water temperature will lower the saturation point of dissolved oxygen (warmer water holds less oxygen than cooler water). It will also increase the toxicity of dissolved substances such as ammonia, chlorine, and heavy metals.

Chlorine and Chloramine:

Chlorine and chloramine are used by water municipalities to make the water supply safe for human consumption. These compounds are extremely toxic to aquatic organisms and no amount can be tolerated by fish. There should never be any chlorine detectable in aquarium or pond water! Add sodium thiosulfate or other dechlorinator to the koi pond whenever adding tap water of if chlorine is detected.

Ammonia:

Ammonia in the water reduces the ability of the fish to excrete nitrogenous wastes from their blood through the gills. As ammonia increases in the water, so do nitrogenous waste products increase in the fish's blood, causing toxicity, gill damage, and death. Ammonia is mostly converted to nontoxic ammonium at a pH level below 6.5, but above 6.5 ammonia can become toxic very quickly if allowed to accumulate. The higher the pH and temperature of the water, the more toxic ammonia becomes. The ammonia in the pond water is broken down by aerobic nitrifying bacteria into nitrite and then into nitrate. Properly operating biological filtration systems (after they have been cycled) should keep ammonia levels at 0.0 mg/L in the water.

In the event of a filtration system problem that creates high ammonia levels (>0.25 mg/L), Ammonia Neutralizing products can be added to the pond to bind the ammonia in a nontoxic form until water changes can be used to bring the ammonia level down. Failure to eliminate the ammonia through water changes will result in elevated nitrite levels a few days later.

Note: Some municipalities add chloramine to the water to make the tap water safe for human consumption. Contact the local water service if unsure of the chemicals being used in the tap water. Fish keepers in areas that have chloramine added to the tap water need to use an ammonia neutralizer as well as a chlorine remover to make the tap water safe for use in their aquarium or pond.

Nitrite:

Nitrite is produced by the aerobic bacterial nitrification of ammonia. It should also be maintained at a level of 0.0 mg/L. Nitrite reduces the ability of the fish's blood to carry oxygen. Salt in the water at 0.1-0.3% salinity will block the absorption of nitrite by the fish's gills. Remove any nitrite from the system by performing a partial water change. Nitrite will also be converted to nitrate by a different species of aerobic nitrifying bacteria.

Nitrate:
Nitrate is produced by the aerobic bacterial nitrification of nitrite. While high nitrate levels are dangerous to saltwater fish and invertebrates, freshwater fish are very tolerant of high nitrate levels. Most freshwater fish can tolerate levels of 100 mg/L for short periods of time without significant problems. It is preferable to maintain nitrate below 10-20 mg/L, and periodic water changes in the pond should keep the nitrate level down. If nitrate levels exceed 20 mg/L, additional water changes can be used to lower the concentration. High levels of nitrate also promote algae growth.

pH:
The potentia Hydrogenii, or power of Hydrogen, is the acid-base balance in water. Most freshwater fish are highly adaptable to slow changes in the pH as long as it is not too extreme (less than 5.5 or above 8.5). Rapid changes in pH are more detrimental to fish, and it is very important that the pond water has a stable pH. The stability of the pH is related to water Alkalinity and Hardness. If there are extremes of pH, or rapid fluctuations, it is likely because the alkalinity is too low.

Alkalinity:
Alkalinity is a measurement of the negative ions (e.g., Hydroxide, Carbonate, Bicarbonate) in the water that buffer against pH shifts. Ideal alkalinity for koi is in the 100-250 mg/L range. As the alkalinity falls, the water in a pond may experience sudden, and deadly, pH shifts. If it happens in your system you can increase the buffering capacity of the water to stabilize the low pH by adding supplements such as sodium bicarbonate or calcium carbonate to raise the alkalinity.

Hardness:
Hardness is the measurement of metallic positive ions (e.g., Calcium, Magnesium) in the water. Water with high hardness usually also has a high pH. Softening the water will lower the mineral content and the pH. Hardness in koi ponds is best at 100-250 mg/L. Most fish will adapt to existing hardness as long as it is not too extreme of a change.

Summary:
Water testing is one of the most important aspects of maintenance for your filtration systems. It is an important key in determining how the biological filters are functioning. Keep a log book of the water test results, to monitor changes in the water parameters. Water testing is not something to be taken lightly.
Periodic partial water changes using dechlorinated tap water will keep pond water values normal. The frequency of changes will depend on the water test results, but normally once per month in established ponds is sufficient.

Examples of incidents requiring increased water changes include toxin contamination, abnormal pH or alkalinity values, high ammonia, nitrite or nitrate levels, or over-medication. Test the water after performing a partial water change; if necessary, repeat partial water change to correct water quality parameters. Test the source water (tap water) to ensure it has the correct water parameters fo the fish, and adjust with chemicals as necessary.

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PERFORMING WATER TESTS: WHAT DO THEY TELL US?

J. Tepper1,2
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With any animal, environmental conditions can affect their overall health, but with aquatic animals such as fish, proper water quality is an important part of keeping them healthy. Without clean water, the fish will be stressed and more susceptible to diseases and parasites. This lecture will provide veterinarians with information regarding how to test pond water and what the various water chemistry characteristics mean for the health of the fish. Correcting water quality problems is also included in the discussion.

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Alkalinity:
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URINARY SURGERY FOR THE PRACTITIONER: TIPS AND TRICKS

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INTRODUCTION

Cystotomy is most commonly performed for retrieval of cystic calculi, with other indications including ureteral evaluation and biopsy/removal of masses. Several key principles should be followed when performing cystotomy in dogs and cats. For example, the urethra should be included in diagnostic imaging prior to surgery and should urethral calculi be present, they should be hydropulsed back into the urinary bladder. There is no reason to perform a dorsal cystotomy despite concerns for urine leakage and/or adhesion formation to a ventral cystotomy incision. A cystotomy incision should be closed using a simple continuous, appositional pattern with a monofilament short-acting suture with FULL-thickness bites of the bladder wall which will ensure the submucosa is captured. Inversion of the urinary bladder as a second layer is not required and contraindicated in cases where there is a thick bladder wall. Post-operative diagnostic imaging is a REQUIREMENT of the procedure to ensure all calculi have been retrieved. Minimally-invasive surgical (MIS) techniques have recently been described for cystic calculi removal.

PREOPERATIVE PREPARATION

A thorough pre-operative evaluation and patient stabilization is performed prior to undertaking surgery of the urogenital tract, especially in cases of urethral obstruction secondary to calculi. The vast majority of animals undergoing cystotomy are healthy and standard protocols for anesthesia will suffice. Caution should be exercised in patients with hyperkalemia and this should be addressed prior to induction of anesthesia
If pre-operative radiographs (performed under general anesthesia) reveal urethral calculi, retropulsion into the urinary bladder must be performed and urethrotomy avoided. It is the authors' experience that urethrotomy can be avoided in the vast majority of cases with urethral calculi by retropulsing them back into the urinary bladder. It is of paramount importance to perform retropulsion with the patient under general anesthesia (+/- epidural anesthesia) to allow for urethral relaxation. Briefly, an assistant should place a gloved finger per rectum and occlude the urethra. An appropriately sized urinary catheter is inserted and flushing commenced. As the assistant feels urethral dilation, the finger is removed from the urethra and the sudden jet of fluid allows for urethral calculi to eventually move into the bladder after several flushing cycles.

It is important to realize that, as stated previously, the vast majority of urethral calculi can be retropulsed into the urinary bladder avoiding the need for urethral surgery.

Once all calculi have been retropulsed into the urinary bladder (confirmed radiographically), the ventral abdomen is aseptically prepared for surgery. In female dogs and cats, it is ideal to place a urinary catheter (Foley) prior to surgery. In male dogs, the author recommends preparing the prepuce routinely and keeping the prepuce in the surgical field so that the surgeon is able to place the urinary catheter at the time of surgery in the operating room. This allows the surgeon the ability to perform retrohydropulsion several times at their discretion. If the prepuce is draped outside of the surgical field, a non-sterile assistant is required to perform retrohydropulsion and replacing the urinary catheter is challenging.

OPERATIVE PROCEDURE

A caudal laparotomy is performed; in male dogs the skin incision is created only to the lateral aspect of the prepuce (parapreputial – right hand side for a right handed surgeon). As stated previously, the author routinely leaves the prepuce in the surgical field to facilitate retrograde lavage of the urethra and urinary bladder. Following preputial incision, subcutaneous dissection is performed to the body wall and the linea alba is visualized. Preputial blood vessels will be encountered during the preputial approach and these can be ligated or cauterized. Once the bladder is visualized, a stay suture is placed in the apex of the bladder using a monofilament suture. This is readily apparent as a small, circular, fibrous scar at the cranial aspect of the bladder. The bladder is then exteriorized from the abdomen and then packed off with laparotomy sponges. If operating as a solo surgeon, the stay suture can be attached to the surgical drapes to maintain cranial tension on the urinary bladder.

A ventral cystotomy is recommended as this location provides the best visualization of the trigonal region where calculi are often found and avoids iatrogenic damage to the ureteral openings and neurovascular supply which are located in the dorsal aspect of the urinary bladder. Previous research has shown that ventral cystotomy is not associated with an increased incidence of complications such as body wall adhesions and incisional failure resulting in uroabdomen.

Suction is extremely helpful and valuable in this procedure. The ventral ligament of the bladder attaches on the midline and is sharply detached from the body wall. This attachment can be used as a proposed location for cystotomy.

A stab incision is then made into the ventral aspect of the urinary bladder. Immediately following stab incision, the suction tip is inserted to empty the bladder of urine and prevent spillage into the abdomen. The cystotomy is then extended to the desired length using Metzenbaum scissors. Readily apparent calculi are retrieved using an atraumatic instrument (e.g. bladder spoon). In some cases, calculi are not readily apparent upon performing cystotomy. This can be a result of calculi falling into the proximal urethra when positioned for laparotomy and as the bladder is exteriorized. At this point the bladder is emptied of visible calculi.

In male dogs a urinary catheter is passed by the surgeon or assistant surgeon in a retrograde manner and flushing with sterile lavage fluid initiated. Additional stay sutures can be placed in the lateral and caudal aspects of the cystotomy incision to improve visualization especially if operating solo. These stay sutures can be connected to the surgical drapes to free the surgeon's hands for performing lavage and retrieval of calculi. The suction tip is placed in the urinary bladder as suction is being performed to improve visualization by removing lavage fluid. Suction also helps prevent spillage of fluid into the abdomen. The urinary catheter is gradually advanced while flushing with saline and then withdrawn once its visible in the urinary bladder and the procedure repeated several times until the surgeon is confident calculi are not present within the lower urinary tract. The author will routinely perform retrograde flushing several times to be confident calculi are not present in the lower urinary tract.

In female dogs and cats a urinary catheter is placed pre-operatively and gradually withdrawn (with concurrent lavage) by a non-sterile assistant. ****This strategy can also be performed for male dogs, however, repeated lavage cannot be performed to ensure a calculi-free urinary tract if the prepuce is draped outside of the surgical field. In female dogs and cats, following retrograde lavage by a non-sterile assistant, normograde lavage can be performed by the surgeon. Normograde lavage should be performed cautiously in male dogs since if calculi are present, they can become lodged at the level of the os penis.
Prior to closure a crushed calculi or a mucosal biopsy should be obtained and submitted for bacterial culture and sensitivity. It is has previously been shown that antibiotics do not need to be withheld until after the bladder mucosal biopsy is obtained and, therefore, standard protocols for administration of perioperative antibiotic prophylaxis should be performed (within 60 minutes of surgical incision and re-dosed every 90 minutes for cefazolin).

CYSTOTOMY CLOSURE

Several strategies exist for cystotomy closure. The author usually performs a single layer, appositional closure with a monofilament, rapidly absorbable suture material (e.g. polyglecaprone 3-0). A clear advantage of a double layer inverting pattern has not been demonstrated in recent studies. In fact, a double layer inverting closure may be challenging to perform in bladders where marked thickening of the wall exists. In fact, in animals with a thickened bladder wall secondary to cystic calculi, the author believes a second inverting layer is contraindicated as this may result in additional trauma to the urinary bladder wall, compromising closure integrity. Full thickness bites of the urinary bladder wall should be taken in order to capture the submucosal layer (holding layer). Ideally, the mucosa is not captured so as to prevent suture exposure within the urinary bladder as this could be a potential for suture-associated calculi. However, it is very likely that exposed suture becomes epithelialized and it is more important to ensure the submucosa is captured during cysotomy closure. The urinary bladder is unique compared to other tissues in that 100% of bursting strength following cystotomy is achieved after 3 weeks. Post-operative radiographs should be performed in all cases to ensure complete calculi removal. Three-view radiographs should be performed including two lateral views with the limbs extended and flexed to ensure a complete view of the urethra. Should calculi be present on post-operative imaging it is much easier to return to surgery to remove retained calculi than to continue some type of medical management.

POST OPERATIVE MANAGEMENT

In the authors' institution patients are recovered on intravenous fluids overnight. Non-steroidal anti-inflammatory therapy (pending contra-indications) is highly recommended for urogenital surgery. A urinary catheter is not maintained in most cases. Discharge of the patient is performed 24hrs postoperatively. At that time the animal should be urinating normally and may or may not have hematuria present which the owner should be cautioned about. If the animal has not urinated or is straining to urinate this warrants diagnostic investigation as to the cause (e.g. uroabdomen, incomplete calculi removal).

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UPDATE ON FELV AND FIV TESTING: ITS A NEW WORLD

S. Little
Bytown Cat Hospital, None, Ottawa, Canada

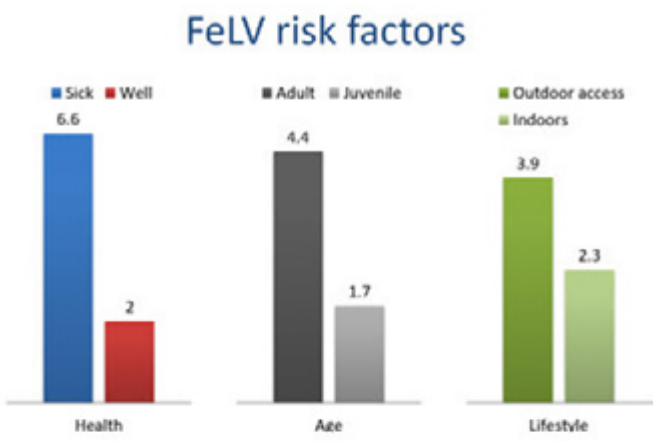
United States		
	FeLV	FIV
2006 (Levy)	2.3%	2.5%
2017 (Burling)	3.1%	3.6%
2008-2016 (Buch)	**3.8%**	**4.9%**

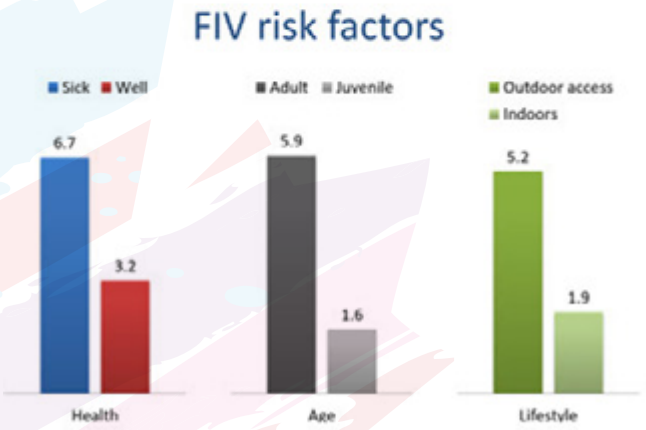
Canada		
	FeLV	FIV
2009 (Little)	3.4%	4.3%
2008-2016 (Buch)	**4.1%**	**5.3%**

-United States (Burling et al, J Am Vet Med Assoc 2017):
West: FeLV 3.3%, FIV 3.9%
Midwest: FeLV 3.7%, FIV 3.3%
Northeast: FeLV 2.4%, FIV 3.3%
South: FeLV 3.1%, FIV 4.0%
-Canada (Little et al, Can Vet J, 2009)
FeLV range: 6.6% in Quebec & Nova Scotia, 2.6% in Ontario
FIV range: 7.1% in Quebec & Saskatchewan, 3.8% in Ontario

Transmission and risk factors for infection

-FeLV: transmitted primarily via saliva (grooming, bite wounds), queen to kittens
-FIV: transmitted primarily in saliva via bite wounds; queen to kittens is uncommon
-Oral disease: 1 in 5 cats with stomatitis is retrovirus-positive; almost 1 in 5 cats with bite wounds or abscesses are retrovirus-positive
-Retroviruses have little or no environmental persistence; readily inactivated by most disinfectants; not spread by indirect contact
-Testing and identification of infected cats is still the cornerstone of control





FIV testing

-Diagnostic tests
-Antibody: soluble; patient-side and multi-well; various target antigens
-Western blot: various target antigens
-Nucleic acid: PCR for proviral DNA, viral RNA; not suitable for screening; positive result with a validated test confirms infection, negative result cannot completely rule out infection.
-Patient-side test kits vary in ability to distinguish natural infection from vaccination
-Kittens: may acquire FIV antibodies in colostrum from a vaccinated or naturally infected queen; most kittens lose maternally-acquired antibodies by 12 weeks of age
-When a kitten tests FIV positive consider re-testing in 1 month or re-testing now with a validated PCR test
-When an adult cat tests FIV positive, consider re-testing with a different brand of patient-side test if the cat may have been FIV-vaccinated in the past or re-testing now with a validated PCR test

FeLV clinically relevant stages of infection
FeLV status may be fluid, not a static disease state in all cats

Abortive: virus is eliminated before proviral integration, infection is prevented
Regressive: cat is infected but infection is controlled by the cat's immune system, unlikely to shed virus, low risk of FeLV-related disease unless infection is reactivated
Progressive: cat is infected, virus is shed in saliva, higher risk for FeLV-related disease
FeLV testing

Diagnostic tests:
-Antigen: soluble, patient-side and multi-well (p27 antigen); cellular (IFA)
-Nucleic acid: PCR for proviral DNA, viral RNA
-FeLV vaccination does not interfere with testing; maternal immunity does not interfere with testing
-Understanding FeLV test results is evolving.
-Healthy cats negative on whole blood with a reliable test are likely to be negative unless last potential exposure was <30 days ago.
-Cats positive on patient-side tests can be re-tested with referral lab ELISA or PCR.
-It may not be possible to determine a cat's infection status based on the results of any single test from a sample collected at a single point in time. Repeat testing over time may be required to determine if some cats have regressive vs progressive infection.
-FeLV infection can be spread via blood transfusion from cats that have regressive infections; care must be taken in testing potential blood donors.

1. Resources and reading

2013 AAFP Feline Vaccination Advisory Panel Report: Disease Information Fact Sheets
2. *https://catvets.com/guidelines/practice-guidelines/feline-vaccination-guidelines*
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4. *http://www.abcdcatsvets.org/*
5. *Buch J, Beall M et al. Worldwide Clinic-Based Serologic Survey of FIV Antibody and FeLV Antigen in the Cat; ACVIM Forum 2017*
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WSV - 336

KCS IN DOGS - BEYOND CYCLOSPORINE

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Keratoconjunctivitis sicca (KCS), or “dry eye”, is a common disease of dogs that, since the introduction of cyclosporine, is usually relatively easily managed. Here, we briefly discuss routine management of KCS but then emphasize those patients where cyclosporine (alone) seems relatively ineffective. How are they best diagnosed? What are the potential causes of such cases? Are all cases of dry eye due to aqueous deficiency only? And what is the latest in therapy?

My five main treatment goals:

Diagnose and treat the underlying cause if possible. (Especially in patients unresponsive to cyclosporine)
Minimize further tear loss and maximize tear distribution
Stimulate endogenous tear production
Supplement the tear film in a manner that considers which of the components is deficient
+/- Treat or prevent secondary infection

Cyclosporine

Cyclosporine remains the mainstay of therapy in my practice. In addition to its ability to reduce immune-mediated infiltration of the lacrimal gland (the most common cause of KCS in dogs), it has a direct lacrimogenic function, and it promotes mucin production from conjunctival goblet cells. Its direct lacrimogenic function appears to rely on frequent application, while immunosuppression and remodelling of glandular tissue presumably require more chronic use. Therefore, in most cases this drug should be instituted twice daily and the patient rechecked in approximately 2 weeks. It is important that the client be instructed to apply cyclosporine as scheduled right up until the time of recheck examination. Omitting the morning treatment because the dog was going to be examined later that day may cause an artificial depression in Schirmer tear test (STT) values. Clients should also be advised that initial response to therapy is best judged by change in STT values, mucoid discharge, and ocular comfort, rather than decrease in pigmentation or corneal vascularization. Improvement in these corneal changes occurs at a similar rate to that which they occurred – slowly.

Tapering of dose frequency or product concentration is typically not possible and should be based on clinical and measured (STT) responses. Failure to respond to 0.2% cyclosporine BID is a reason to trial a higher concentration such as 1% or 2%. In my experience, increased frequency beyond BID does not have a satisfactory effect.

Tacrolimus

Tacrolimus acts by a similar mechanism to cyclosporine but is more potent and operates via a different cellular receptor. It is effective in some dogs that are unresponsive to cyclosporine. I typically have it compounded as a 0.03% suspension in oil. An FDA alert in the USA suggests that topical application of this drug as a dermatologic preparation in humans, especially children, may be associated with development of lymphoma or squamous cell carcinoma. The FDA recommends that tacrolimus be used only when other drugs have failed or not been tolerated, and then with caution. I follow this guideline for our veterinary patients. Consider recommending that clients wear gloves when handling this product and that children do not administer the drug to their pets.

Topical corticosteroids

Ocular surface inflammation is a central component of dry-eye pathophysiology. Therefore, potent penetrating, topical steroids such as dexamethasone or prednisolone may help but caution is required since dry eyes are more prone to ulceration.

Pilocarpine & phenylephrine for neurogenic KCS

Pilocarpine may be used to provide parasympathetic stimulation of the lacrimal gland in neurogenic KCS. Topical use of this drug is very irritating, produces a noticeable uveitis, and may not provide adequate drug concentrations at the orbital lacrimal gland. This has led to the suggestion that oral dosing on an empirical but individualized basis is necessary. This requires that the dose be titrated to just below the level at which systemic signs such as vomiting, diarrhoea, or salivation are seen. Ophthalmic pilocarpine is used orally via a doctored food bolus. One dosage recommendation (credit Dr. Randy Scagliotti) is that 1% pilocarpine is used for dogs < 4 kg, 2% for dogs weighing 4-20 kg, and 4% pilocarpine for dogs > 20 kg. The initial dose is one drop PO twice daily for three days. This dose is increased by one drop every three days until the earliest signs of toxicity (usually vomiting or anorexia without diarrhoea) are observed. The drug is discontinued for 24 hours or until GI signs abate and then re-instituted at the highest dose which did not produce signs of toxicity.

Because of the different mechanism by which cyclosporine acts and because of its additional desirable effects, the two drugs are expected to be synergistic. There is a case report supporting the addition of a topical sympathomimetic eye drop to this regimen. I use 2.5% phenylephrine topically. There are allegedly smooth muscle fibres in the lacrimal glands that aid tear expression. Thus oral pilocarpine must be used initially to stimulate tear production followed by the addition of topical phenylephrine to stimulate tear secretion.

Artificial tears

Supplementation of tears has traditionally been provided in one of three forms: aqueous ("artificial tear") solutions, more viscous polymers or methylcellulose solutions, and ointments in a petrolatum base. However, no product currently available adequately replaces all of the functions served by tears, and so can have a dilutional effect on those tears being naturally produced. In addition, these products and their preservatives can cause surface irritation. Finally, tear supplement solutions may require extremely frequent application to be effective. I prefer hyaluronan-containing products as they are mucinomimetic, available in preservative-free formulations, and extremely well tolerated.

Secondary infection

Secondary infection is common when tear quality or quantity declines. This is best treated with a well-tolerated, reasonably broad-spectrum topical antibiotic but can be discontinued as soon as STT values improve and mucopurulent discharge declines since chronic topical antibiotic therapy is contraindicated for maximal ocular surface health.

Parotid duct transposition

Parotid duct transposition (PDT) is associated with significant complications in some patients and does not obviate the need for ongoing medical management. Therefore, I prefer medical management and reserve PDT for those cases in which protracted and multiple medical therapies have not worked – typically patients with congenital glandular aplasia/hypoplasia.

using the "DAMNIT" list to direct examination and testing

Finding and treating the cause remains the mainstay of KCS therapy. Here's a list of causes arranged according to the DAMNIT system:

Developmental KCS (acinar hypoplasia) is reasonably common in Yorkshire terriers and other toy breeds, can be unilateral, and is often associated with absolute sicca (STT = 0). This is unlikely to respond to topical cyclosporine and usually requires PDT.

Infectious diseases such as distemper virus in dogs and feline herpesvirus (FHV-1) in cats may reduce aqueous tear production. However, these diseases may also affect tear quality through destruction or dysfunction of the conjunctival goblet cells and meibomian glands. For example, conjunctivitis of any cause, is often associated with reduction in goblet cell density, an unstable tear film and worsening conjunctival (and sometimes corneal) disease – thus setting up a "vicious cycle". Likewise, bacterial blepharoconjunctivitis or orbital cellulitis may also extend to the tarsal and orbital lacrimal glands respectively. Surgical removal of the third eyelid gland following third eyelid gland prolapse (or cherry eye) can be an iatrogenic cause of KCS.

Traumatic disruption of the lacrimal gland, its blood supply, or innervation (CN V or VII) is a known cause of KCS. Trauma may be anatomically distant from the gland if the nerve or vascular supply is involved. Possibly one of the most common causes of neurologic KCS is injury to the facial nerve, particularly in association with middle ear disease. Neurogenic reduction or failure of blinking due to facial nerve dysfunction and/or dysfunction of the sensory fibres of the trigeminal nerve can exacerbate KCS in these cases. Concurrent desiccation and crusting of the ipsilateral nostril (xeromycteria) strongly suggests neurogenic dysfunction. The most commonly incriminated toxic causes of KCS are sulphur drugs and atropine. General anaesthesia and sedation can also cause a temporary depression of STT values.

WSV - 049

UPDATE ON DIAGNOSIS OF ATOPIC DERMATITIS

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Pruritus one of the most common presenting clinical complaints in veterinary dermatology. It is the first clinical sign to present in dogs with allergic dermatitis, even before erythema, papular eruptions, alopecia and other secondary lesions. Unfortunately, pruritus is not exclusive to atopic dermatitis. Pruritus is also associated with many other skin diseases including infectious, parasitic, immune-mediated, cutaneous manifestation of an internal disease and cutaneous neoplasia, making diagnosis of allergic dermatitis more complicated.

Diagnosis of canine atopic dermatitis (environmental allergies) is made by careful evaluation of the historical information, dermatologic examination and elimination of differential diagnoses. Before embarking on treatment for allergies, be certain to always rule-out other primary or confounding causes of pruritus such as parasitic infestation (Otodectes, Trombicula, Cheyletiella, Sarcoptes, Demodex injai, Lice); microbial infections/overgrowth (Staphylococcus, other bacteria, Dermatophytes, Malassezia, other yeasts); other hypersensitivity disorders (flea bite hypersensitivity, dietary hypersensitivity, allergic contact dermatitis, Malassezia or bacterial hypersensitivity); cornification disorders (metabolic diseases, zinc/vitamin A-responsive dermatoses); neoplastic diseases (epitheliotropic lymphoma, mast cell tumour); and other skin conditions (irritant contact dermatitis, cutaneous drug reaction). A common error in practice is to rely on serologic or intradermal allergy testing to confirm a diagnosis of allergies. As parasitic diseases such as Sarcoptes scabiei can lead to the increased production of non-specific or cross-reactive IgE false positive reactions on the allergy test, it is imperative to rule-out ectoparasites. In general, allergy testing is NOT used to diagnose atopic dermatitis, rather to aid in the identification of environmental allergens to include in immunotherapy treatment sets once all other differentials have been eliminated.

The following step-wise approach to pruritus will help to eliminate non-atopic differential diagnoses before pursuing allergy testing in your patient.

Step 1. Detailed History and physical/dermatologic examination

As per Favrot's Criteria, most atopic individuals will have an onset of clinical signs starting at <3 years of age with "alesional" pruritus, be mostly indoors, have an excellent response to glucocorticoids, have a history of chronic or recurrent yeast infections. The typical distribution pattern of canine atopic patients includes the front feet, concave surface of the pinnae sparing the ear margins, and have no clinical involvement of the dorsothoracolumbar region. Some of the other common areas included in the Canine Atopic Dermatitis Extent Severity Index (CADESI-04) evaluation of clinical symptoms include the face, ventral abdomen/ inguinal region, axillae, flexor surface of the elbow and hock joint, the skin between the accessory and metacarpal pad, and external ear canals. Predisposed breeds include most purebred dogs including French bulldogs, West Highland White Terriers, Shar Pei dogs, Labrador and golden retrievers and German shepherds. When a patient falls outside of these parameters and pattern of distribution, ruling out other pruritic skin conditions is imperative.

Step 2. Eliminate Ectoparasites

With the advent of isoxazolines, eliminating parasitic diseases including sarcoptic mange, cheyletiellosis, otodectic mange, demodicosis, fleas, ticks, and lice has never been easier. As part of a work-up of any pruritic condition, every patient should receive a course of either Bravecto®, Credilio®, Nexgard® or Simparica® as these are all safe and effective treatments. Treatment of all in-contact dogs and the environment (e.g. DustMiteX, drying bedding at high cotton heat) should be pursued. Oral corticosteroids may be used for short term symptomatic relief of pruritus. If the underlying etiology is attributable to a parasitic infection, a 90% reduction in pruritus should be seen after two weeks, 95% after 4 weeks and 100% after 6 weeks of treatments.
Skin scrapings, both deep and superficial, are still valuable diagnostic tools. A positive skin scrape allows the clinician to focus their efforts on the ectoparasite and postpone potentially unnecessary diagnostic tests including dietary trials, allergy testing and dermatophyte PCR.

Step 3. Eliminate Dermatophytosis

In general, dermatophytes tend to cause more of an asymmetric distribution pattern and are typically not pruritogenic except for Trichophyton mentagrophytes. As dogs are aberrant hosts for T. mentagrophytes (most often found in rodents), the fungal organism generates a foreign body reaction that can mimic the pruritus seen with atopic dermatitis.

If not diagnosed, patients may be mistakenly administered glucocorticoids to suppress the inflammation and pruritus, subsequently worsening the patient's condition. If an asymmetric pattern with easily epilating hairs is noted, submitting samples for Microsporum canis, Microsporum gypseum and Trichophyton mentagrophytes PCR testing is warranted.

Step 4. Eliminate Bacterial infections

Bacterial infections cause inflammation, which in turn results in pruritus. Skin cytology of pustules, crusts and epidermal collarettes will help confirm a diagnosis if bacteria are found engulfed within neutrophils. Skin cytology of staphylococcal folliculitis however, may not be as rewarding because the organisms are found deep within the hair follicle and not as readily sampled. At times, the presence of multifocal areas of alopecia with easily epilating hairs at the periphery in the absence of a positive skin scraping for demodicosis justifies empirical treatment with cephalosporins for a minimum of three to four weeks. If an incomplete response is noted, bacterial culture and sensitivity may be considered, given the increased prevalence of multi-drug resistant bacteria.

Step 5. Eliminate Malassezia infections

Malassezia pachydermatis can be found as a commensal organism in dog's skin but can also act as an opportunistic pathogen in the right microenvironment. Malassezia causes pruritus by releasing zymogen from the yeast cell wall that activates mammalian complement resulting in inflammation and glucocorticoid non-responsive intense pruritus. As well, Malassezia may elicit a hypersensitivity reaction that results in allergic inflammation, creating an ideal environment for more Malassezia growth,\ perpetuating a vicious cycle. Keys to diagnosing Malassezia by skin cytology include: 1) aggressive sampling from the skin surface and onto the glass slide as these organisms are keratinophilic; 2) heat fixing the glass slide as Malassezia is lipophilic and hence may be washed off the slide if using the first methanol dip when staining with Diff Quik®; and 3) viewing the slide in a 3-dimensional manner by using frequent fine focus adjustments. Treatment selection is based on correlating Malassezia numbers on cytology with the patient's clinical signs, especially the intensity of pruritus. One yeast found on cytology in a pet that is intensely pruritic and unresponsive to glucocorticoids, would warrant systemic anti-yeast therapy, including ketoconazole, itraconazole, fluconazole or terbinafine. Topical therapy should be considered in any therapeutic regimen to treat yeast infections and may be considered as the sole treatment modality if client compliance is exceptional. Lastly, Malassezia immunotherapy is another consideration, especially in those patients with adverse reactions to traditional topical or systemic anti-yeast protocols.

Step 6. Rule-out concurrent metabolic diseases

As recurrent bacterial and yeast infections can generate a significant level of pruritus, be certain to eliminate other potential metabolic conditions that may alter a patient's local immune response including endocrine diseases such as hypothyroidism, hyperadrenocorticism and diabetes. Interestingly, both hypothyroidism and allergies are antibody-mediated diseases to perceived foreign proteins, primarily thyroglobulins in the case of hypothyroidism and allergens in the case of food allergies and atopic dermatitis. Therefore, it is not surprising to find both conditions in the same individual.

Step 7. Eliminate Food Allergies

Although the incidence of pure food allergies encompasses only 10-20% of allergic patients, a combination of both food allergies and environmental allergies are more common. The percentage that each component contributes toward pushing a patient above their allergic threshold varies from patient to patient. A few clues help to determine whether food allergies are a serious consideration including: 1) a history of non-seasonality and steroid unresponsive pruritus; 2) a distribution pattern involving the ears, feet, rears and dorsothoracolumbar region; and if present 3) concurrent gastrointestinal signs (flatulence, vomiting, diarrhea, voluminous bowel movements), respiratory signs (rhinitis, asthma), neurologic (seizures, aggression, attention deficit disorder), or hematologic signs (AIHA, ITP). The only reliable way of identifying these patients at this point in time is by performing a strict elimination diet using a novel or hydrolyzed protein diet, anticipating at least a 50% improvement by 4 weeks and complete resolution of clinical signs by 8-12 weeks. Concurrent use of oral short acting corticosteroids or other anti-inflammatory medication and antimicrobial therapy during the initial phase of a dietary trial may be warranted to help provide immediate relief. Typically, as a positive response is noted to the dietary restriction, medications can be tapered, leaving the diet as the sole treatment modality toward the end of the trial, if food allergy is the primary underlying etiology. Confirming a diagnosis of food allergy is accomplished by controlled dietary challenges every 2 weeks, where a relapse of clinical signs may be noted within 30 minutes to 14 days with the majority of dogs relapsing between 24-48 hours. In general, most dogs react to one or two food antigens; it is uncommon to have a pet that reacts to 3 or more antigens.

Step 8. Eliminate Cutaneous T- Cell Lymphoma

Especially in a patient with a later onset of pruritus that is incompletely responsive to glucocorticoid therapy, a suspicion of cutaneous T-cell lymphoma must be considered. It can mimic clinical signs of atopic dermatitis including the presence of erythroderma and seborrhea and may progress to infiltrative depigmenting lesions including plaques and nodules involving mucocutaneous regions. Skin biopsies, dermatohistopathology and immunohistochemistry will help to confirm the diagnosis.

Step 9. Evaluate the response to a therapeutic trial

Identifying your client's desires and ability to treat their pet, may dictate that symptomatic therapy would be the ideal course for a patient. With the advent of safe and effective medications such as Atopica®, Apoquel® and Cytopoint®, exposure to glucocorticoids can be minimized. If the frequency and cost of medications are feasible, a client may wish to continue symptomatic therapy for their pet's atopic dermatitis. However, if the patient continues to require daily therapy year-long, allergen specific immunotherapy is a safer and more cost-effective approach that may result in a decrease or elimination of symptomatic therapy.

Step 10. Pursue allergy testing to identify allergens to include in immunotherapy

If allergen specific immunotherapy is the client's desired treatment modality, then allergy testing can be performed to identify allergens to incorporate into an immunotherapy treatment set. Serologic and intradermal allergy testing are currently the two readily available methods of identifying a patient's sensitivities to environmental allergens.

Several laboratories offer regional serologic allergy testing including Heska Corporation (Fort Collins, Colorado), Greer Laboratories (via IDEXX, Lenoir, North Carolina), Biomedical laboratory (Austin, Texas), Spectrum laboratories (Tempe, Arizona), Veterinary Allergy Reference Laboratory (Pasadena, California) and many others.

Background (nonspecific) binding, lack of standardization among the various company protocols, allergenic extract preparation, incubation, washing and blocking steps may result in aberrant reactions.

Intradermal allergy testing minimizes false negative reactions by evaluating the local immune response, including locally amplified IgE antibodies that may not make their way into the bloodstream. As well, since not all circulating IgE antibodies make their way from the serum into the skin, intradermal allergy testing minimizes false positive reactions.

Regardless of the testing method, positive reactions should always be interpreted in light of the patient›s likelihood of exposure to the allergen and the clinical signs.

Suggested reading

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WSV - 042

DENTAL THERAPY: THE NEXT LEVEL

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Restorative dentistry

Teeth are roughly broken up into three layers: enamel, dentin, and pulp.
The innermost layer is the endodontic system (root canal or pulp). It contains the nerves, blood vessels, and connective tissue which supply and nourish the tooth during life. The blood and nervous supply enters the tooth through the very bottom or apex of the root.
The outer layer of the tooth crown is enamel, which is an inorganic substance. It is virtually all (97%) calcium and phosphorus and is the hardest substance in the body. Enamel has no nervous or circulatory system. It is applied in a very thin layer (less than 1 mm thick in veterinary patients) over the tooth surface during development by a cell layer called amelioblasts. Once eruption has occurred, enamel cannot be replaced or repaired.

The central layer, which is the vast majority of the tooth structure in mature patients, is dentin. Dentin has roughly the same mineral content as bone. Dentin is a somewhat living structure which has a nervous supply and can occur can respond to stresses. Running at right angles to the root canal all the way around the tooth from the root canal out to the enamel are dentinal tubules. Each one of these dentinal tubules contains an odontoblastic process, which is basically a nervous supply; however they are only sensory and can only report changes as pain. There are approximately 50,000 dentinal tubules per mm2 coronal dentin. Therefore, a 1 cm area of enamel loss will expose 3-4 million odontoblasts!

Response to Damage:

Exposure of the dentinal tubules will lead to much quicker dentinal fluid flow out through these dentinal tubules via the capillary effect. This increase in fluid flow deforms the A-delta C-delta fibers and thus will be perceived by the patient as pain. Anything that will change the flow rate will cause the nerves to fire and result in pain (sensitivity). This includes heat, cold, and desiccation.

In addition to the sensitivity produced by the exposure of the dentinal tubules, there is a possibility of ingress of bacteria into the root canal system. In some cases this can result in endodontic infection and subsequent abscessation.

Therapy:

Diagnosis: First, perform a thorough visual exam to determine the presence of pulp exposure or other extensive damage. Finally, expose a dental radiograph to rule out endodontic disease. If there is radiographic evidence of endodontic disease root canal therapy or extraction is indicated.
Tooth Preparation: Scale and polish the surface of the tooth to be treated. Make sure to use fluoride free pumice for polishing to avoid interfering with future acid etching.

If treating a small uncomplicated crown fracture, no actual restoration will be placed. Therefore smooth the rough edges with a white stone or fine diamond bur. This can be followed with sanding discs if necessary.
In cases where a restoration will be placed, it is recommended to use a coarse diamond or carbide bur for the preparation. This will leave a rough surface and increase bond strength. Furthermore, all non-occlusal edges should be beveled. This will make a more gradual transition of color as well as increase the amount of enamel for bonding.

For EH cases, remove all weakened diseased enamel with a coarse diamond bur and bevel the edges
For caries cases remove all carious dentin as well as extend the prep into area where there is a high probability of extension. Then make sure that all of the unsupported enamel edges are removed. The bottom of the prep should be flat and the sides of the dentin parallel or very slightly undercut.

Bonding:

Acid etching: This step is performed with a 37% phosphoric acid. The purpose is to remove all impurities from the tooth surface and slightly demineralize the tooth surface of the tooth. This will lead to increased surface area for bonding. Place the supplied acid on the tooth surface and let stand for 10-30 seconds. After the prescribed time, rinse thoroughly (20 seconds) as insufficient rinsing will result in residual acid remaining in the dentinal tubules and result in sensitivity. Finally, dry the area lightly (do not desiccate) as over drying will weaken bond strength.

Place bonding agent

The bonding agent should be applied in a very thin layer. After it is applied, it is light cured with an intense blue light in the visible range for 10 seconds.

Restoration
For uncomplicated crown fractures, place a layer of unfilled resin over the bonding agent and light cure. This completes the therapy.

For defects to be filled, the composite is placed and then manipulated to fill the defect. This can be done with a plastic filling instrument or a beaver tail coated with unfilled resin. Once the defect is filled (to slightly overfilled) and the restoration roughly contoured, the restoration is light cured. After light curing, the restoration can be smoothed and shaped with white stones, fine diamonds, or sanding discs. Once finished. A layer of unfilled resin should be pace to fill in areas of polymerization shrinkage and smooth the final restoration.

Periodontal Flap Surgery
Introduction: Any pocket with depths greater than normal (for the species) are pathologic and in need of therapy. These are present in the vast majority of patients and represent not only an opportunity to improve patient health, but also to increase practice income. A thorough oral exam will elucidate these pockets and allow for proper therapy.

Periodontal therapy/surgery involves removing the infection from the root surface (i.e. plaque, calculus, and granulation tissue), as well as smoothing the diseased root surface. These steps allow for gingival reattachment leading to a decrease in pocket depth.
In dogs, pockets between 3 and 6 mm which are not associated with tooth mobility or other pathology (furcation, root caries) are best treated with closed root planing and subgingival curettage. This step is performed with a combination of mechanical and hand scaling. This should be meticulously performed in order to achieve as clean a tooth as possible to promote healing. Following this, periocuetic can be administered to improve attachment gain.

Pockets greater than 5 to 6-mm require advanced procedures for effective cleaning, owing to the fact that residual calculus is seen with regularity in pockets greater than 6-mm. In humans this is known as the 5-mm standard. In addition, periodontal surgery is indicated for teeth with even moderate alveolar bone loss, furcation level II and III, and inaccessible areas. Visualization is best accomplished via periodontal flap procedures, which should be offered if the clients are interested in salvaging the teeth. These are advanced procedures, but can be learned by general practitioners.

Surgical Preparation:
All surgery should initiate with a complete dental prophylaxis to decrease oral contamination. Ideally, this is performed a few weeks prior to the surgical procedure. Following this, a complete oral exam is performed. This should include the visual as well as tactile senses. Tactile evaluation consists of a combination of periodontal probing and sounding. Finally, dental radiographs should be exposed of the surgical area to document attachment levels.

Flap types:
There are numerous options for flaps, depending on the presentation. The most common flap used in periodontal surgery is a full flap, or one with vertical releasing incisions. This allows for increased exposure, however is somewhat more invasive. The other common flap for periodontal surgery is the envelope flap. This is created along the arcade, without vertical incisions.

Treating the exposed root/bone surface:
The goal of periodontal surgery is to create a smooth and clean tooth surface for reattachment. This is comprised of several steps.

The most important step is thorough root planing. This is best performed with a combination of ultrasonic and hand scaling. This author prefers utilizing the ultrasonic scaler on the root surface to remove the vast majority of the plaque and calculus. Following this, a sharp curette is used to plane the exposed root surface to as smooth as possible a finish.

If bone augmentation is indicated, it is mixed according to manufacturer's directions and placed in the defect. There are numerous products available; the practitioner must make their own decision based on cost. However, currently, the product with the best track record for regrowth is freeze dried, demineralized cancelleous cadaver bone.

A barrier membrane should be placed over the surgical site, if bone regrowth is desired. In veterinary medicine, absorbable membranes should be utilized. There are several types and manufacturers; this author finds that the lamellar bone membrane works well. Another option for the barrier membrane is to create one out of a periocuetic.

WSV - 025

CLINICAL APPROACH TO THE CAT THAT IS LOSING WEIGHT

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Ensuring a logical and step-wise process to work-up in a cat that is losing weight is vital to ensure that a timely diagnosis is made without excessive or expensive diagnostics. It is essential that a full and complete history is obtained, especially dietary history and a full physical examination is performed.
Weight loss in cats can often be tricky to detect, especially in cats with ventral fat pads, but frequent assessment and evaluation of the dorsal muscle tone is essential. The combination of history and physical examination will give you some major clues in your problem-solving approach and enable a quicker diagnosis to be made.

Step 1: Get the right information on your physical examination and history

Establish if the cat has an increased or decreased appetite.

If the cat can't or won't eat, there may be a physical reason for this such as oral/dental pain or a biochemical reason such as uraemia causing suppression of appetite. A thorough examination of the oral cavity is required, as well as further questioning of the way the cat eats is important. If the cat attempts to eat food but cannot prehend or chew, then oropharyngeal disease is more likely. If the cat asks for food, but then appears to refuse the food once offered, then anticipated pain due to oesphageal or intestinal disease may be present.
If the cat is eating more than normal, then some degree of maldigestion/malabsorption (i.e. intestinal or pancreatic disease) may be present, or there may be loss of nutrients (diabetes mellitus) or excessive utilisation of nutrients (hyperthyroidism).
Establish if the cat is drinking or urinating more than normal

This goes hand in hand with the information above. For example, a cat that is losing weight with an increased appetite and polydipsic/polyuric is more likely to have diabetes mellitus than other disease. Sometimes it may be difficult for owners to determine this, but they may notice the cat drinking out of more unusual places that normal.

Establish if there are any gastrointestinal signs
For some owners, vomiting is considered a normal event in cats. However, vomiting even as infrequently as once every 2 weeks in combination with weight loss may increase the index of suspicion. Therefore, it is important to specifically ask owners this question, along with determining if there have been any loose stools or other clinical signs.

Look for localising signs on the physical examination
As mentioned above, this may include evidence of oral or periodontal disease in a cat that is unwilling to eat. Other parts of the physical examination that should carefully attended to include the thyroid area (assessing for goitre), abdominal palpation (for lymph nodes and intestinal thickness) and the size of the kidneys. Again, each of these will help refine the problem list and move on to the next step.

Step 2: Determine the laboratory tests you want initially to run

Based on the problem list and differential diagnosis, it is highly likely that the differentials will be reduced to a small number. The body systems that are of concern may be the endocrine (hyperthyroidism, diabetes mellitus), renal or intestinal (including oral pathology). Generally, for most cats with weight loss it is usually important to perform haematology and serum biochemistry along with urine analysis to evaluate for kidney function and diabetes. Most external laboratory panels will include serum thyroxine (T4), but if not, this should also be performed. A urine to protein creatinine ratio may be useful if there is evidence of protein on the initial urine analysis. In the initial stages there is usually no indication to measure feline pancreatic lipase immunoreactivity. If the cat has diarrhoea and poor worming history, then faecal testing may be indicated prior to, or alongside, blood testing.

Step 3: Support the cat whilst waiting on or running diagnostics

Serum cobalamin is absorbed in the ileum of cats, and so cats with intestinal disease are likely to have cobalamin deficiency. It has been shown that cobalamin supplementation improves clinical signs in cats with GI disease regardless of the underlying cause. It is advisable to measure serum cobalamin if feasible, but if not, then the empirical dosage is 250 µg by injection once weekly for four weeks.

Intravenous fluid therapy should be administered if there are signs of dehydration, and careful attention to electrolyte deficits paid. If the cat is unwell and has not been eating, then a feeding tube should be considered. This is very important to prevent development of hepatic lipidosis as well as improve the nitrogen balance in unwell cats. If there is no coagulopathy then an oesophageal feeding tube is easily placed, but as this requires a general anaesthetic should be combined with other diagnostic testing. The resting energy requirement (RER) for the cat's current weight should be calculated (40 x BW) and feeding gradually increased up to that amount (i.e. 25% first day, 50% second day, 75% third day, 100% fourth day). The exact food to be fed depends on their clinical status and suspected underlying disease, however all the essential amino acids for cats should be provided.

Step 4: Decide whether to investigate further

If a diagnosis has been reached by this stage, then there is usually no indication to proceed further with investigations unless further staging is required.
The main differential diagnoses remaining after exclusion of extra-gastrointestinal disease and oropharyngeal disease include pancreatitis, inflammatory bowel disease, alimentary lymphoma, exocrine pancreatic insufficiency, and other rare causes of intestinal and/or central disease.

If the cat is sick enough to require fluid therapy or interventional nutrition, and there is no diagnosis reached on the initial blood work, then further investigation is warranted. This would generally start with abdominal ultrasound to assess the intestinal tract, pancreas, liver and mesenteric lymph nodes. If any abnormality is seen, then fine needle aspirates should be obtained (and consideration to culture of the bile should be considered). As mentioned above, if interventional nutrition is indicated then a feeding tube should be inserted at the same time. If no diagnosis is reached with this relatively "hands-off" approach, then biopsy of the intestinal tract and/or other abdominal organs should be considered. Either endoscopy or exploratory laparotomy could be considered, again targeted towards the main differential diagnosis.

If the cat is relatively well, then trial treatment could be considered, and exocrine pancreatic insufficiency ruled out prior to further investigation. In comparison to dogs, dietary therapy in these cases is challenging if the cats have a reduced appetite. However, dietary modification is very important in cats with chronic GI disease, and even more so if there is concurrent pruritis, as there is an increased index of suspicion for food sensitivity.

In one study, 50% of cats with chronic GI disease were food responsive, with a substantial sub-set of them not relapsing when re-challenged with their previous diet. Even cats with severe clinical signs may respond to dietary treatment alone, and so this should be the first step in targeted treatment. Response to diets typically occurs within 1-2 weeks. Diets generally consist of hydrolysed or novel protein sources and contain a moderate amount of soluble fibre. If diarrhoea is present, then the use of probiotics or synbiotics may be of some benefit as well.

If cats are not dietary responsive or there is evidence of liver involvement on the initial blood tests, then antibiotics could be considered. If the cat has evidence of hepatic encephalopathy or is very sick then the antibiotics should be given intravenously. If on investigation it is suspected that there is an infectious cholecystitis, then ideally the choice of antibiotics should be based on culture results.

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WSV - 111

KEEPING YOUR PATIENTS PAIN FREE IN THE POST-OP AND BEYOND

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During recovery each surgical patient should have a dedicated nurse responsible for supervising them until they are stable enough to be transferred to another area (ex: home, kennel) Patients should be monitored for any changes in temperature, heart rate, respiration rate & effort. Pain is also an important vital sign to monitor in the post-operative period. Post-operatively, patients' pain can be evaluated using a pain score system. Your clinic may choose to make their own numerical pain scoring system, or implement an already established system. See below for web links to pain scoring systems.

http://www.gla.ac.uk/schools/vet/research/painandwelfare/downloadacutepainquestionnaire

http://www.csuanimalcancercenter.org/assets/files/csu_acute_pain_scale_canine.pdf

In the post-operative period, it is often hard for the technician to distinguish pain from dysphoria or "emergence delirium". Analgesics should always be administered if the procedure was perceived as painful. Analgesics can be provided as intermittent injections or as a constant rate infusion (example: an MLK CRI for a post-splenectomy patient). Most patients require more than one analgesic to control the pain pathways. It is important that the post-operative analgesics also be multi-modal in nature. If hydration status is good and kidney values are adequate, adding an NSAID post-operatively can help relieve patient inflammation. It is safe to say that if opioid analgesics have been given post-operatively and at the appropriate doses, patient pain should be controlled. Some patients however will need the addition of sedatives or tranquilizers in addition to analgesics during the recovery period.

Pain should be treated as an individual experience and patients should receive analgesic drugs if they are exhibiting pain regardless of whether or not they have already received analgesic drugs. For many surgical and dental patients a low dose of an alpha-2 antagonist such as dexmedetomidine (1mcg/kg IV) can be a useful post-operative medication, as it not only provides sedation, but analgesia as well.

It is important to note that dexmedetomidine has potent cardiovascular effects and should be used on stable patients ASA 1-2. An anxiolytic drug such as acepromazine (0.01mg/kg IM or IV) can also be useful for the dysphoric patient emerging from anesthesia (Cheyne, 2011). But acepromazine should not be administered without first assessing pain since the drug provides no analgesia but can cause sedation profound enough to prohibit the animal from exhibiting pain. Animals that become fractious in the recovery period should be sedated for the safety of the animal as well as the technicians and staff.

Husbandry and Non-Pharmacologic Therapy

Post-operative patient comfort comes from many avenues, with analgesics being the cornerstone. After surgery some other important factors to consider are: dry, comfortable bedding, a quiet recovery area, and supplemental heat or oxygen if needed. If an animal underwent a particularly painful surgery, such as a limb amputation, a urinary catheter should be placed to minimize the number of times that patient is moved post-operatively.

Application of heat or cold can also be useful in the acute setting. After surgery, cold packs can be applied to postoperative sites to decrease swelling (Cantwell, 2010) Cold packs should be wrapped in a cloth covering and should not come into direct contact with the skin. Cold packs should be placed at incision sites for no longer than 20 minute intervals.

Low level laser therapy should also be considered for post-operative pain management. Laser therapy may help in normalizing nerve signal transmission in the autonomic, somatic, and sensory neural pathways (Moore, 1992) Laser therapy may optimize cell utilization of oxygen, helping to heal wounds faster. The cold laser therapy is a noninvasive procedure that uses light to stimulate cells and increase blood circulation. At the correct laser wavelength, pain signals are reduced and nerve sensitivity decreases. The procedure also releases endorphins, or natural painkillers, but it is not recommended for animals that have cancer because the device can stimulate blood flow to cancer cells.

In addition, forms of physical rehabilitation such as massage therapy and aquatic therapy can be added to create a balanced multimodal analgesic plan for the post-operative patient. Aquatic therapy provides an ideal low impact exercise for dogs with chronic pain.

The buoyancy of the water reduces the stress on painful joints. Water pressure itself can reduce swelling and edema, and water resistance is useful for muscle strengthening. (Millis et al, 2004) Hydrotherapy along with laser therapy and physical therapy exercises can be an important factor in increased healing after orthopedic surgery.

Case Study: Hind Limb Amputation Analgesic Protocol (canine)
-Gabapentin started two days prior
-Pure-mu opioid agonist + midazolam +/- dexmedeotomidine
-Ketamine/valium induction or
-Ketamine loading dose if alfaxalone used
-Lidocaine loading dose
-Bupivicaine/duramorph epidural
-MLK CRI intra operatively (if patient cannot be maintained at low levels of inhalant anesthetic)
-NOCITA injection
-MLK continued into post-op period, tapered off after 2-6 hours
-Oral meds started: NSAID, Gabapentin, and oral opioid of choice (oxycodone Rx, Tramadol) or fentanyl patch
-Start laser therapy immediately post operatively (provided the amputation was not due to osteosarcoma) and continue for at least two weeks post operatively every two-three days.
Managing pain rapidly and effectively in the post-operative period is the best way to reduce the risk of chronic pain developing.

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WSV - 319

MONITORING ANESTHESIA IN PET FISH

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Learning Objectives: Learn which veterinary anesthetics can be used with fish, how are they administered and at what dosages, and how to monitor depth of anesthesia by assessing the fish's heart rate, pulse and respiration. Sedation aids in handling fish during physical examination, for biopsy sampling or for purposes such as egg stripping during artificial spawning. Anesthesia and analgesia are required for surgical or invasive procedures. Surgery can be performed on anesthetized fish to repair wounds, remove skin and fin tumors, or to remove abdominal masses. And sometimes euthanasia is needed to end the suffering of a sick or injured animal, or for research or other purposes. Each of these techniques can be accomplished with fish by adding anesthetic medications to the water, and sometimes by injection or oral administration of anesthetics. Food fish have specific limitations to medications that can be used with them, and withdrawal times for approved medications must be observed. This paper will focus on anesthetics used for ornamental and pet fish.

Many chemicals have been used to induce tranquilization or anesthesia in fish. All have some element of risk, but when used carefully they have successfully induced sedation or anesthesia. Anesthetic agents used in lower doses produce tranquilization, and at higher doses they are used for anesthesia purposes. Care must be taken not to overdose the fish, or leave them anesthetized too deeply for too long of time. It is recommended to start with a lower dose and add more as needed if using a new drug or working with an unfamiliar species of fish. Monitor heart rate, blood oxygen concentration, and operculum (gill cover) motion during anesthesia to ensure fish is not too deeply anesthetized.

Most fish anesthetics are added to clean, well-oxygenated water in a suitable glass or plastic container. The water is thoroughly mixed to ensure all the chemical is dissolved and dispersed evenly. The anesthetic solution should be the same temperature and pH as the aquarium or pond water. Use a thermometer to monitor the water temperature during surgery, and if an oxygen meter is available, also monitor the dissolved oxygen concentration of the anesthetic solution. An aquarium air pump with and air stone should be placed into the water to circulate it to maintain adequate oxygen level, especially with a large fish such as koi. The water should be tested to ensure all the water quality parameters are in the correct range for the fish species.

A pulse oximeter can be clipped onto the caudal fin of large fish such as koi, near the tail base, in order to monitor the pulse and blood oxygen concentration. ECG monitors can also be used in large fish by attaching the monitor clips to hypodermic needles placed into the muscles on either side of the body by the pectoral fins. This will create a 2-lead ECG that will show the heart rate of the fish. It is important to get a baseline heart rate and monitor for slowing, rather than to see if the heart stops, as the heart in fish can continue to beat long after the fish is dead! When placed into the container with the anesthetic in the water, the fish will gradually begin to lie on its side and the respiratory rate will slow as the chemical induces anesthesia. In some cases, there may be an excitatory stage, so the anesthetic chamber may need to be covered to prevent fish from jumping out. After the fish is anesthetized in the anesthetic bath, it can be removed from the water for short-term examination or diagnostic procedures. If the fish is removed for longer procedures, anesthetic solution can be dripped across the gills through an IV bag and drip line, by hand with a syringe, or with a recirculating water pump or aquarium filter powerhead. Have oxygenated fresh water on hand to syringe across the gills if the plane of anesthesia becomes too deep. Keep the body moist if out of the water for examination or surgery. Use ophthalmic ointment on the eyes to keep them from drying. Monitor the respiration rate (operculum movements) to assess the depth of anesthesia.
Cardiac arrest - Death. Recuperation after anesthesia is accomplished by transferring the fish into a container of fresh, well-aerated water without any anesthetic. It is helpful to move the air pump and air stone to the recovery container to continue to aerate the water. Never leave a fish unattended while it is under anesthesia. Some large fish have a tendency to jump during induction or recovery from anesthesia. Moving the fish gently in a forward direction will aid the flow of fresh water across the gills, hastening anesthesia release from the gills. Do not slosh the fish back and forth in the water. Once there are steady operculum movements let the fish rest and gradually recover in a quiet, dim environment. The longer a fish is under anesthesia, the longer it will take to recover from the anesthetic. Monitor the fish until it has regained its equilibrium and is swimming normally and can be transferred back into the aquarium or pond.

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Table 1 Stages of Anesthesia in Fishes

I	1	Light sedation	Reduced motion, ventilation decreased
I	2	Deeper sedation	Motionless unless stimulated
II	1	Light anesthesia	Partial loss of equilibrium
II	2	Deep anesthesia	Total loss of equilibrium
III	1	Surgical anesthesia	Total loss of reactivity when stimulated
III	2	Deep surgical anesthesia	Decrease in respiratory and heart rates
IV	1	Medullary collapse	Cessation of respiratory movements
IV	2	Cardiac arrest	Death

Recuperation after anesthesia is accomplished by transferring the fish into a container of fresh, well-aerated water without any anesthetic. It is helpful to move the air pump and air stone to the recovery container to continue to aerate the water. Never leave a fish unattended while it is under anesthesia. Some large fish have a tendency to jump during induction or recovery from anesthesia. Moving the fish gently in a forward direction will aid the flow of fresh water across the gills, hastening anesthesia release from the gills. Do not slosh the fish back and forth in the water. Once there are steady operculum movements let the fish rest and gradually recover in a quiet, dim environment. The longer a fish is under anesthesia, the longer it will take to recover from the anesthetic. Monitor the fish until it has regained its equilibrium and is swimming normally and can be transferred back into the aquarium or pond.

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WSV - 021

CHOLECYSTECTOMY - THE GOOD, THE BAD, THE UGLY!

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Relevant Surgical Anatomy
The hepatobiliary system is most commonly evaluated at the time of celiotomy through a ventral midline approach. This organ system is found in the cranial abdomen sandwiched between the diaphragm and the gastrointestinal tract, and can be thoroughly inspected via palpation and gross visual appearance at the time of surgery.

A large volume of blood continuously flows through the liver at low pressures filtering through the hepatic sinusoids, eventually emptying into the hepatic veins and caudal vena cava. To prevent collapse of the liver lobes and subsequent vascular occlusion, the liver is required to be stiff in its material property. As a result of its stiffness, the liver is friable and easily fractured after trauma. Fortunately, the liver is protected by the caudal aspect of the ribcage in the cranial abdomen and further protected by a cushion of falciform ligament fat ventrally and a dome shaped diaphragm cranially. The liver has seven major lobes or processes: right lateral and medial, left lateral and medial, quadrate and caudate which has a caudate and papillary process. Deep fissures of the liver lobes allow them to collapse on top of each other or slide in a side-to-side fashion depending on movements of the animal. The liver is only partially fixed at its cranial extent where it surrounds the caudal vena cava. Triangular ligaments of the right and left liver lobes are attached to the peritoneal surface of the diaphragm. Histologically, the hepatic lobule is the structural unit of the liver. The lobule consists of hepatocytes arranged in a hexagon surrounding a central hepatic vein. A portal triad is found in each corner of the hexagon that is comprised of a bile duct and terminal branch of the portal vein and hepatic artery. Blood from the portal vein and hepatic artery is delivered to the hepatocytes via the hepatic sinusoids and is cleansed by the reticuloendothelial system.

The biliary system begins as microscopic cannaliculi in the hepatic lobule, which eventually coalesce into larger bile ducts that enter the extra-hepatic biliary system. This system consists of hepatic ducts, common bile duct, cystic duct and gall bladder. Upon entering the gall bladder, bile is concentrated and upon stimulation primarily by the hormone cholecystokinin, released into the cystic duct and eventually empties into the duodenum via the common bile duct.

The gall bladder is found centrally in the liver, bordered by the quadrate lobe and right medial liver lobe. There are key differences in the anatomy of the common bile duct between dogs and cats that explain the pathophysiology of various hepatobiliary diseases. In dogs, the common bile duct enters the dorsal wall of the duodenum and opens into the lumen at the major duodenal papilla alongside the pancreatic duct. The larger accessory pancreatic duct opens at the minor duodenal papilla, which is found a few centimeters aborad from the major duodenal papilla. The pancreas is intimately associated with the common bile duct, and inflammation/swelling can result in extra-hepatic biliary obstruction (EHBO). The feline common bile duct conjoins the only pancreatic duct in this species prior to entering the major duodenal papilla. Due to the fusion of the common bile and pancreatic ducts, the feline is at increased risk of ascending infection of the pancreas.

Extra-hepatic Biliary Obstruction

Extra-hepatic biliary obstruction leads to severe metabolic derangement in multiple organs, and often requires immediate surgical treatment. EHBO is caused by either intra-luminal common bile duct disease or extra-luminal compression. In dogs, extra-luminal compression is the most common cause of EHBO and diseases that can cause this include gall bladder mucocele and pancreatitis. Diseases leading to intra-luminal pathology include cholelithiasis (gall bladder stones), choledocolithiasis (stones in the common bile duct) and biliary sludge. Inflammatory diseases such as cholangiohepatitis, cholecystitis and pancreatitis are the most commonly implicated diseases leading to EHBO in cats. It has been suggested that the most common cause of feline EHBO is cholangiohepatitis.

Reviewing the pathophysiology of biliary obstruction is pivotal in understanding why patients with EHBO can have severe systemic compromise. One of the major functions of bile salts is to initiate lipid absorption in the small intestine. This includes fat-soluble vitamins A, D, E and K. The coagulation factors II, VII, IX, X are vitamin K dependant, therefore, biliary obstruction leading to deficiency in vitamin K can cause coagulation derangements. This can be evidenced by increases in activated clotting time, prothrombin time and partial thromboplastin time. In health, bile acids are conjugated to bile salts in hepatocytes and secreted continuously into bile canaliculi and eventually into the duodenum.

Approximately %95 of bile salts are re-absorbed in the ileum and then transported to the liver for re-secretion. With EHBO, the liver's ability to conjugate bile acids is impaired leading to increased levels of unconjugated bile acids in circulation. These substances are cytotoxic and can lead to tissue inflammation in various organs.

The intestinal mucosa is highly sensitive to the effects of unconjugated bile acids and increased levels can lead to intestinal mucosal injury and increased permeability. The latter allows bacterial translocation into the systemic circulation resulting in endotoxemia. Furthermore, reduced bile acids within the intestine leads to bacterial over-growth further compounding endotoxemia. In experimental studies performed in mice, EHBO has led to increased sensitivity of the body to endotoxin leading to a severe pro-inflammatory response predisposing the animal to systemic inflammatory response syndrome and multi-organ failure.

Abnormalties in laboratory tests are common in patients with EHBO. These include leukocytosis, hyperbilirubinemia, increased serum alkaline phosphatase, increased serum alanine aminotransferase and increased gamma-glutamyl and prolongation in clotting times. PT and proteins induced by absence of vitamin K test are the most sensitive coagulation tests, however, is not detected until 14 days post-EHBO. The clinician should keep in mind that while increased liver enzyme values are common in cases of EHBO, they are not specific for biliary obstruction.

Abdominal ultrasonography is a valuable imaging modality for evaluating the hepatobiliary system in small animals. Ultrasound can evaluate the gall bladder and the size and tortousity of the intra-hepatic biliary tree and the common bile duct. Progressive distention of the biliary tract viewed with ultrasound is consistent with EHBO. An enlarged gall bladder with a non-mobile stellate appearance (also termed the “kiwi” gall bladder) is characteristic of gall bladder mucocele. The Cocker Spaniel and Shetland Sheepdog appear to be overrepresented in cases of this disease. Ultrasound is also very useful for evaluating the biliary tract for choleliths and particular attention should be paid to the area surrounding the major duodenal papilla. Finally, ultrasound can also be used to evaluate the regional anatomy of the hepatobiliary system for predisposing causes of EHBO (e.g. pancreatitis).

Exploratory celiotomy is an important diagnostic procedure in cases in which imaging has provided equivocal results yet clinical and laboratory findings are consistent with EHBO. At the time of celiotomy, the gall bladder and the common bile duct can be visually inspected for enlargement/distention and palpated for choleliths/choledocoliths. The gall bladder can also be expressed to determine patency of the extra-hepatic biliary tree. A duodenotomy can be performed for retrograde catheterization of the common bile duct or normograde catheterization can be performed following cholecystotomy. The anatomical structures surrounding the common bile duct can be evaluated for lesions that could be causing EHBO.

As previously discussed, most patients with EHBO present in the later stages of disease and are systemically compromised at the time of presentation. Prior to surgical intervention many patients require aggressive hemodynamic resuscitation. Intravenous (IV) fluid therapy should be initiated following calculation of fluid deficit and administration rate will depend on the clinical assessment of the patients as some patients may present with hypovolemic shock. Depending on the response to initial IV fluid therapy, colloidal therapy may be required for maintaining intravascular volume. Several types of bacteria have been cultured from prations with EHBO including E. Coli, Clostridium spp., Enterococcus spp., and Bacteroides spp. An empirically selected antimicrobial with broad-spectrum activity should be administered promptly following diagnosis of EHBO. A second generation cephalosporin (Cefoxitin 20-15 mg/kg IV q8hrs) is preferred by the author and ampicillin (22 mg/kg IV q8hrs) can also be added to increase coverage to include Enterococcus spp. In cases where coagulation deficiencies are present, vitamin K supplementation (-0.1 0.2 mg/g SQ q12hrs) should be administered.

Furthermore, fresh frozen plasma transfusion can also be considered for these patients. In anemic patients, packed red blood cells can be considered, however, if concurrent coagulation deficiencies are present, whole blood transfusion should be administered as it contains erythrocytes and clotting factors.

The goal of surgical treatment of patients with EHBO is to re-estrablish biliary drainage into the intestinal tract as continued obstruction will lead to progressive metabolic derangements and eventually death. The most common surgical interventions include cholecystectomy (gall bladder removal) in cases of gall bladder mucocele or cholecystitis or a biliary re-routing procedure (cholecystoenterostomy – attaching the gall bladder to either the duodenum (cholecystotoduodenostomy or jejunum (cholecystojejunostomy)) for pathology of the common bile duct. The surgeon should keep in mind that these procedures can be technically demanding and are associated with high mortality rates (%64-28) despite improvements in surgical technique and post-operative supportive care. Refractory hypotension in the intra-operative period has been linked to a higher incidence of post-operative mortality.

It has been suggested that the presence of circulating unconjugated bile acids decreases the effect of vasopressors, which leads to the refractory hypotensive state during surgery. Other negative prognostic indicators include azotemia, coagulation deficiences and septice bile peritonitis.

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APPROACH TO ELEVATED LIVER ENZYMES IN CATS

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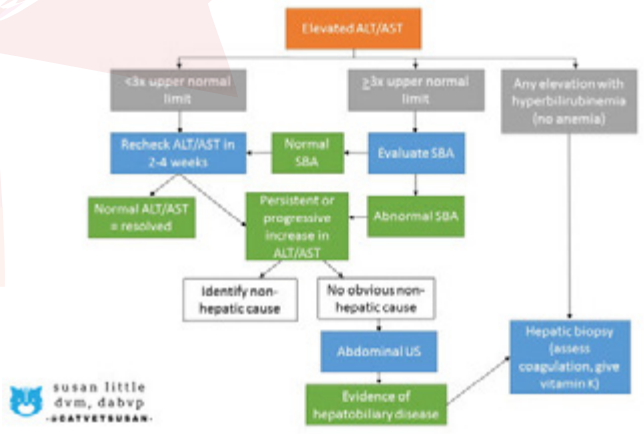
Liver function tests

-Serum bilirubin, especially when >51 µmol/L (3 mg/dL)
-Biomarkers that change late in disease include glucose, cholesterol, blood urea nitrogen, albumin
-Aminotransferase enzymes
-ALT: half-life in cats is 3-6 hours (vs 60 hours in dogs); hemolysis & lipemia will cause false elevations
-AST: Liver, skeletal & cardiac muscle; half-life in cats is ~1 hour (vs 12 hours in dogs)
-Cholestatic enzymes
-ALP: bone, kidney, intestine, liver; half-life in cats is 6 hours (vs 66 hours in dogs)
-GGT: kidney, pancreas, intestine, liver; half-life probably <1 hour
-Induction of liver enzyme increases secondary to drugs (corticosteroids, phenobarbital) rare in cats compared to dogs

Diagnostic approach

-Most common liver diseases in cats are cholangitis syndrome, hepatic lipidosis, neoplasia; other causes include parasites, FIP, abscess, amyloidosis, cystic disease, acute toxic insult, etc.
-Minimum database (complete blood count, serum chemistry panel, total T4, urinalysis, FeLV/FIV): necessary to determine if elevations are hepatic or non-hepatic in origin.
-Gastrointestinal function tests: cobalamin, folate, fTLI, fPLI
-Hepatobiliary causes of increases in ALT, AST include drugs, infection, inflammatory disease, inherited disease, neoplasia, portosystemic shunt, toxins, trauma
-Non-hepatic causes of increases in liver enzymes include
-Common: diabetes mellitus, hyperthyroidism, pancreatitis, inflammatory bowel disease, systemic infections (e.g., dental disease)
-Uncommon: congestive heart failure, severe hemolytic anemia, abdominal trauma, neoplasia
-Serum bile acids can be used to confirm hepatobiliary disease is present (don't perform if serum bilirubin is elevated); fasting (12 hours) + post-prandial (2 hours); does not give information on diagnosis or disease severity.
-Urine bile acids:creatinine ratio: single random urine sample (2 mL, no hematuria); ratio >4.4 is evidence of hepatic disease.
-Other diagnostic tests may be necessary to rule in/out hepatobiliary disease: imaging (radiographs, ultrasound), biopsy (percutaneous ultrasound-guided, laparoscopic, surgical laparotomy).
-Liver biopsy options:
-At least 6 portal areas necessary to diagnose inflammatory disease (~15 mg tissue)
-Consider evaluation of coagulation, administration of vitamin K1 before biopsy
-Fine needle aspirate: inexpensive, easy to perform; low risk, may only require sedation; small sample size (3-5 mg); only ~50% agreement with histopathology; best for diffuse lesions such as lipidosis, lymphoma, fungal disease
-Ultrasound-guided percutaneous needle core biopsy: requires general anesthesia; higher risk of liver trauma, fracture than with FNA, surgery, laparoscopy; use only manual or semi-automatic biopsy devices; good sample size, collect 2-3 samples from different lobes
-Surgical or laparoscopic biopsy: best visualization but most invasive, largest sample size, multiple sites and organs can be biopsied; best ability to monitor sites for bleeding
-Optimizing liver biopsy: collect multiple samples, collect bile for culture & cytology, give the pathologist a complete history.
-Contraindications for liver biopsy: platelets <80,000/mL, prolonged buccal mucosal bleeding time (>150 seconds), PT or APTT >2 times upper normal limit, infectious disease that could be disseminated, ascites.
-Post-biopsy patient care: monitor carefully for 6-12 hours (attitude, mucous membrane colour, capillary refill time, blood pressure, hematocrit), provide analgesia



Non-specific treatments

-S-adenosyl-l-methionine (SAMe): 'supernutrient' for the liver, essential part of 3 major biochemical pathways, helps increase hepatic glutathione, no known contraindications, appears to be safe
-Silymarin: anti-oxidant, free radical scavenger, inhibits effects of tumour necrosis factor, helps increase hepatic glutathione, no known contraindications, appears to be safe

WSV - 337

THE LATEST ON ANTIVIRAL MEDICATIONS FOR CATS WITH HERPESVIRUS

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Introduction

Due to subclinical shedding, the diagnostic tests for feline herpesvirus type 1 (FHV-1) are not terribly reliable in individual cats. Meanwhile, a number of relatively safe and highly effective antiviral drugs have become available. As a result I have started to use response to therapy as a "diagnostic test". This requires that I choose the optimum therapeutic approach possible for each cat.

Feline Herpetic Antiviral Therapy

Although a large variety of antiviral agents exists for oral or topical treatment of cats infected with FHV-1, some general comments regarding these agents are possible:
No antiviral agent has been developed for FHV-1; although many have been tested for efficacy against this virus. Agents highly effective against closely-related human herpesviruses are not necessarily or predictably effective against FHV-1 and all should be tested in vitro before they are administered to cats.
No antiviral agent has been developed for cats; although some have been tested for safety in this species. Agents with a reasonable safety profile in humans are not always or predictably non-toxic when administered to cats and all require safety and efficacy testing in vivo.
Many systemically administered antiviral agents require host metabolism before achieving their active form. These agents are not reliably or predictably metabolized by cats and pharmacokinetic studies in cats are required.

Antiviral agents tend to be more toxic than do antibacterial agents since viruses are obligate intracellular organisms and co-opt or have close analogues of the host's cellular "machinery". This limits many antiviral agents to topical ophthalmic use rather than systemic administration.
All antiviral agents currently used for cats infected with FHV-1 are virostatic. Therefore, they typically require frequent administration to be effective, should be initiated as early as possible in the disease course, and have no effect against the latent virus.
The following antiviral agents have been studied to varying degrees for their efficacy against FHV-1, their pharmacokinetics in cats, and/or their safety and efficacy in treating cats infected with FHV-1.

Trifluridine (TFU) is too toxic to be administered systemically but topically administered trifluridine is considered one of the most effective drugs for treating HSV-1 keratitis. This is in part due to its superior corneal epithelial penetration. It is also one of the more potent antiviral drugs for FHV-1. It is commercially available in the USA as a 1% ophthalmic solution that should be applied to the affected eye 5-6 times daily. Unfortunately, it is expensive and is often not well tolerated by cats, presumably due to a stinging reaction reported in humans.

Idoxuridine (IDU) is a nonspecific inhibitor of DNA synthesis, affecting any process requiring thymidine. Therefore, host cells are similarly affected, systemic therapy is not possible, and corneal toxicity can occur. It has been used as an ophthalmic 0.1% solution or 0.5% ointment. This drug is reasonably well tolerated by most cats and seems efficacious in many. It is no longer commercially available in the USA but, if it can be obtained from a compounding pharmacist, should be applied to the affected eye 5-6 times daily.
Vidarabine (VDB) affects a viral replication step different from that targeted by idoxuridine. Therefore, vidarabine may be effective in patients whose disease seems resistant to idoxuridine. As a 3% ophthalmic ointment, vidarabine often appears to be better tolerated than many of the antiviral solutions. If it can be obtained from a compounding pharmacist, it should be applied to the affected eye 5-6 times daily.

Acyclovir (ACV) has relatively low antiviral potency against FHV-1, poor bioavailability, and is often toxic when systemically administered to cats. Oral administration of 50 mg/kg acyclovir to cats was associated with peak plasma levels of only approximately one third required for FHV-1. Common signs of toxicity are referable to bone marrow suppression. However, acyclovir is also available as a 3% ophthalmic ointment in some countries. In one study in which a 0.5% ointment was used 5 times daily, the median time to resolution of clinical signs was 10 days. Cats treated only 3 times daily took approximately twice as long to resolve and did so only once therapy was increased to 5 times daily.

Taken together, these data suggest that very frequent topical application of acyclovir may produce concentrations at the corneal surface that do exceed the reported concentration required for this virus but are not associated with toxicity. There are also in vitro data suggesting that interferon exerts a synergistic effect with acyclovir that could permit an approximately 8-fold reduction in acyclovir dose. In vivo investigation and validation of these data are needed.

Valacyclovir (VCV) is a prodrug of acyclovir that, in humans and cats, is more efficiently absorbed from the gastrointestinal tract compared with acyclovir and is converted to acyclovir by a hepatic hydrolase. Plasma concentrations of acyclovir that surpass the IC50 for FHV-1 can be achieved after oral administration of this drug to cats; however it induced fatal hepatic and renal necrosis, along with bone marrow suppression, and did not reduce viral shedding or clinical disease severity. This shows how dangerous acyclovir is when notable plasma concentrations are achieved. Valacyclovir should never be used in cats. Ganciclovir (GCV) appears to be at least 10-fold more effective against FHV-1 compared with acyclovir. It is available for systemic (IV or PO) and intravitreal administration in humans, where it is associated with greater toxicity than acyclovir. Toxicity is typically evident as bone marrow suppression. It has been released as a new topical antiviral gel in humans. There are no reports of its safety or efficacy in cats as a systemic or topical agent, although anecdotal reports from Europe are very promising.

Famciclovir (Famvir® and generic) is a prodrug of penciclovir; however metabolism of famciclovir to penciclovir in humans is complex; requiring di-deacetylation, in the blood, liver, or small intestine, and subsequent oxidation to penciclovir by aldehyde oxidase in the liver. Unfortunately, hepatic aldehyde oxidase activity is nearly absent in cats. As a result, famciclovir pharmacokinetics in the cat are extremely complex and nonlinear. For example, an approximately 6-fold increase in dose produced only an approximately 3-fold increase in plasma concentration. This makes dose recommendation challenging; however, in a masked, prospective, placebo-controlled study of efficacy, experimentally infected cats, 90 mg/kg famciclovir given TID was associated with significantly reduced clinical signs, serum globulin concentrations, histologic evidence of conjunctivitis, viral shedding, and serum FHV-1 titers, as well as increased goblet cell density. Importantly, no important adverse clinical, hematologic or biochemical changes were associated with famciclovir administration. More recently, we have shown that 90 mg/kg PO BID produces almost identical plasma and tear concentrations as did the TID dose that was so successful. Do not compound this drug (it is very bitter and there are no reports of stability), and do not taper the dose when improvement is noted. Like all other antimicrobials, treat beyond clinical resolution and then stop. Transdermal famciclovir has not been investigated but, given the need for hepatic metabolism is unlikely to be successful.

Cidofovir (CDV) is commercially available only in injectable form in the USA but has been studied as a 0.5% solution applied topically twice daily to cats experimentally infected with FHV-1. Its use in these cats was associated with reduced viral shedding and clinical disease. Its efficacy at only twice daily (despite being virostatic) is believed to be due to the long tissue half-lives of the metabolites of this drug. There are occasional reports of its experimental topical use in humans being associated with stenosis of the nasolacrimal drainage system components and (likely for this reason) it is not commercially available as a topical ophthalmic agent in humans. However, this side effect has not been noted in cats.

Lysine

The literature regarding lysine has become very interesting recently with some data that at first glance appear contrary to earlier study outcomes which suggested efficacy. This requires a more detailed assessment. Lysine limits the in vitro replication of many viruses, including FHV-1. The antiviral mechanism is unknown; however, many investigators have demonstrated that concurrent depletion of arginine is essential for lysine supplementation to be effective. This finding suggests that lysine exerts its antiviral effect by antagonism of arginine. However, this effect is observed only at supraphysiologic concentrations of lysine. Meanwhile, results of 2 early independent in vivo studies in experimentally inoculated cats have supported a role for l-lysine. Lysine-treated cats undergoing primary herpetic disease had significantly less severe conjunctivitis than did cats that received placebo, while latently infected adult cats receiving lysine had reduced viral shedding. In both studies, plasma arginine concentrations remained in the normal range, and no signs of toxicity were observed, despite notably elevated plasma lysine concentrations in treated cats. A subsequent study examined the effects of lysine in 144 shelter cats receiving oral boluses of 250 mg (kittens) or 500 mg (adult cats) of lysine once daily for the duration of their stay. No significant treatment effect was detected on the incidence of infectious upper respiratory disease (IURD), the need for antimicrobial treatment for IURD, or the interval from admission to onset of IURD. A subsequent pair of studies assessed the safety and efficacy of l-lysine incorporated into cat food. Perhaps not unexpectedly, food (and therefore lysine) intake decreased coincident with peak disease and viral presence. As a result, cats did not receive lysine at the very time they needed it most. Surprisingly though, clinical signs and viral shedding in cats fed the supplemented ration were worse than in cats fed the basal diet. Taking all of this into account, I discuss with owners of cats that have frequent recurrences their administering 500 mg lysine per os q 12 hours over the long term as an adjunctive prophylactic measure. Cats should receive lysine as a twice daily bolus; not sprinkled on food.

WSV - 050

UPDATE ON TREATMENT OF ATOPIC DERMATITIS

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In order to effectively control a patient with atopic dermatitis, an understanding of the pruritic threshold, summation of effect and the three pathways of pruritus are key. Pruritic threshold, similar to the pain threshold, is variable between patients. Even clinically predisposed atopic patients from the same litter, living in the same house, exposed to the same allergens may have varying clinical appearances whereby the pet with the lower pruritic threshold will exhibit pruritus and allergic symptoms while its littermate may be able to tolerate the same allergen load because of its elevated threshold or tolerance levels. Summation of effect refers to the addition of multiple contributing factors (e.g. Malassezia or Staphylococcal infections, fleas, food or pollens during the peak allergy season, dust mites, mold spores) that push a patient above their pruritic threshold.

Treatment modalities that typically help decrease allergen load below a patient's pruritic threshold include avoidance (ectoparasite, food, environment) and allergen specific immunotherapy either by subcutaneous injection or daily oral administration for allergens that cannot be avoided.

Less specific symptomatic therapy typically focuses on controlling inflammation and itch. There are three pathways by which our patients may manifest their itch: 1) Inflammatory itch mediated by inflammatory cytokines and the complement cascade; 2) Neurogenic itch mediated by Interleukin-31 (IL-31) and other similar cytokine that mediate pruritus through Janus Kinase/STAT signal transduction at the nerve endings in the skin; and 3) Behavioural or anxiety-related itch, which may be mediated through learned behaviours and the serotonin receptors. When selecting medications for pruritic atopic patients, using a combination of therapies that address one or all three pathways of itch will be based on history and clinical signs.

CLIENT EDUCATION

Owner compliance and adherence to a treatment protocol is key to a successful outcome when treating any skin disease, especially a life-long condition such as atopic dermatitis. Compliance requires that the client understands both their pet's diagnosis, mechanisms by which their prescribed medications function, and that the goal of treatment is primarily to control their signs of atopic dermatitis, as opposed to curing it, using the safest and cost-effective therapy with the least amount of work for the owner. Setting aside enough examination time to educate your client on their pet's condition, written discharge summaries, client education handouts and web-based videos, along with follow-up visits and calendars all help to promote better understanding and compliance ultimately leading to successful management of your atopic patient.

AVOIDANCE

Avoidance of the offending allergen is the ideal approach to treatment of the atopic patient however it is often difficult to achieve. Aeroallergens floating into the yard from a 75 km radius, mold spores that are ubiquitous in both the outdoor as well as indoor environment, and dust mites on the owner's and pet's bed as well as the couch, carpet and heating ducts, make it impossible to eliminate all allergens from the environment.

The goal, in fact, is to minimize contributing factors to bring a pet closer to or below their allergic threshold. Interventions such as flea control, microporous mattress and pillow covers, room HEPA filters, frequent vacuuming, Dust Mite X® for carpets and upholstery, maintaining humidity levels between 40-45%, removal of carpeting and potted indoor plants when possible, heating duct cleaning, keeping pets indoors when mowing the lawn and outdoors when vacuuming, use of hypoallergenic detergents and cleaning supplies will all help and have little to no negative side effects for the patient.

Shampoo therapy has gained increased importance in the management of atopic dermatitis as percutaneous absorption is now likely the primary route of allergen exposure. Bathing using COOL to COLD water at least once weekly helps to 1) wash off superficial allergens that accumulate on the skin; 2) rehydrate the skin barrier; and 3) controls overgrowth of bacteria and Malassezia, minimizing allergen exposure to the dermal immune.

ALLERGEN SPECIFIC IMMUNOTHERAPY

Allergen specific immunotherapy (ASIT) is the only targeted approach for atopic patients that may lead to immunomodulation and the development of tolerance with little to no adverse effects. All other therapies provide temporary symptomatic relief and carry greater risk of adverse side effects.

ASIT is accomplished by the administration of increasing concentrations of allergens up to maintenance doses, using standard or rush protocols administered by subcutaneous, oral, or recently by intralymphatic route in veterinary medicine.

The ultimate goal is for ASIT to stimulate allergenspecific tolerance resulting in a curative effect for a long period of time. The methods by which ASIT elicit their response early in the process include desensitization of FcRI (highaffinity receptor for the Fc region of immunoglobulin E)-mediated basophil/mast cell responses along with allergen-mediated upregulation of H2R and downregulation of FcRI. Later responses involve upregulation of markers associated with dendritic cells driving differentiation of TGF-beta and IL-10-producing T-regulatory and B-regulatory tolerogenic cells and subsequent activation of B cells to synthesize allergenblocking factors, particularly IgG4 “blocking antibodies” and suppression of IgE antibodies.
The benefits of this therapy include the paucity of adverse effects, the cost effectiveness especially in large-breed dogs due to the weight-independent dosing regimen, and the potential to eventuate a cure.

Successful outcomes are dependent on concentration of ASIT being used (i.e. 10,000 pnu vs 20,000 pnu), inclusion of appropriate antigens into the ASIT, adjustments in the ASIT schedule based on clinical response and allergen load, as well as controlling any secondary factors that may arise (e.g. bacterial and/or Malassezia infections). It should be emphasized however, that clients choosing this therapeutic alternative should not expect an immediate “light-switch type” response, rather “re-training” of the patient’s immune response to environmental may take several months to years to achieve optimal results, and that treatment using a combination of immunotherapy and/or symptomatic therapy, may be lifelong in the majority of patients. Thus, it is common to incorporate anti-pruritic therapy especially during the induction phases of ASIT.

ANTIPRURITIC THERAPIES

Selecting an anti-pruritic therapeutic protocol for your patient will depend on the severity of skin signs, the owner’s ability to administer medications and the type of itch the patient is experiencing:
i) Inflammatory Itch - Itch induced by pro-inflammatory mediators including histamine, prostaglandins, and proteases as well as pro-inflammatory cytokines including IL4, IL5, IL13, TNF-alpha
ii) Neurogenic Itch – Centrally and peripherally mediated itch induced by neuropeptides such as Substance P and cytokines affecting the cutaneous nerve endings including thymic stromal lymphopoietin (TSLP), IL31, nerve growth factor (NGF), gastrin releasing peptide (GRP) and B-Type Natriuretic Peptide (BNP).
iii) Psychologic or anxiety-related itch – Activation of the hypothalamic-pituitary axis (HPA), as well as the sympathetic and serotonergic nervous systems in response to psychological stress, resulting in alteration of serotonin levels and increased expression and secretion of catecholamines, and a host of other molecules along with learned itch behaviour from negative reinforcement or anxiety-relieving habit.
Based on the suspected contributing mechanism of itch, monotherapy or sometimes a multimodal approach is necessary to provide relief for a patient.

a) Anti-inflammatory Itch

Patients that experience pruritus with INFLAMMATION and INFECTIONS require medications that address cytokine and complement-induced inflammation including antihistamines, cyclosporine, and/or steroids.
Antihistamines provide 18-32% efficacy in controlling allergic symptoms. They are best used as a preventative or in the early stages of the allergic response, or in combination with other therapies when trying to capitalize on their synergistic activity to taper the use of more potent anti-inflammatory agents such as steroids.

Sedation is the main adverse effect noted, especially when using first-generation antihistamines as they cross the blood brain barrier. There are several subclasses of antihistamines: Ethanolamine (e.g. clemastine, diphenhydramine); Ethylenediamine (e.g. tripelennamine); Piperazine (e.g. hydroxyzine, cetirizine); Piperidine (e.g. fexofenadine, cyproheptadine); Alkylamine (e.g. chlorpheniramine); and Phenothiazine (e.g. trimeprazine) with varying effects due to their active ingredient or metabolites. This is likely one of the reasons for the variable responses noted and explains why there are still over 20 different products available over-the-counter. In general, I tend to use cetirizine (Reactine®, Zyrtec®) 0.5-1.0 mg/kg in the MORNINGS and diphenhydramine (Benadryl®) 2.2-4.4 mg/kg in the EVENINGS.

Cyclosporine (Atopica®) is a macrolide derived from a fungus that targets T- lymphocytes binding immunophilin (cyclosporine binds cyclophilin, tacrolimus binds macrophilin) and thus inhibits calcineurin, thereby decreasing stimulation of Nuclear Factors of Activation (NF-ATp) resulting in decreased production of interleukin-2 (IL2) thus suppressing T-lymphocytes proliferation and the allergic response. Other cyclosporine effects that modulate the allergic response include: 1) decreasing Langerhans cell migration & ability to process antigen; 2) inhibiting the release of pre-formed mediators from mast cells and basophils; 3) decreasing synthesis of TGF-and -, IFN-, GM-CSF, IL-2, IL-3, IL-4, and IL-5; and 4) has a cytostatic effect on keratinocytes of the epidermis to help re-establish the skin barrier.

As cyclosporine's effects are targeted at inflammatory cells (unlike systemic steroids), the number and severity of adverse reactions is limited. As well, cyclosporine provides anti-neurogenic activity by calcineurin inhibition on nerves binding to capsaicin receptor TRPV1 resulting in a burn then cool sensation.

The dose of cyclosporine used to treat atopic dermatitis is 3-7mg/kg/day per os, an anti-inflammatory dose and carries fewer side effects than the immunosuppressive doses of 10-20mg/kg. Side effects include transient vomiting & diarrhea, anorexia, and reversible gingival hyperplasia. The GI effects can be mitigated by freezing the capsules and refrigerating the liquid formats. Once clinical signs are 100% controlled, cyclosporine is tapered by extending the interval between administration by 1 day per month (i.e. q48hrs for one month, then q 72 hours for one month) to the lowest effective dose, realizing that an increase to once daily may be necessary to control symptoms during peak allergy seasons. Annual bloodwork and urinalysis are recommended for any medications used for protracted periods. Dosage reduction of 50-67% may be required when cyclosporine is co-administered with medications that inhibit of P-450 microsomal enzyme metabolism including ketoconazole, itraconazole, fluconazole, metoclopramide, erythromycin, methylprednisolone, allopurinol, diltiazem and verapamil. As well, note that some medications may lower the efficacy of cyclosporine by increasing its metabolism or excretion including rifampin, phenobarbital, and phenytoin.

Glucocorticoids applied topically or given systemically have been the mainstay in the treatment of atopic dermatitis. A meta-analysis of therapeutics used to treat atopic dermatitis reported good evidence for high efficacy of oral and topical glucocorticoids and low harm of short-term treatment. Topical triamcinolone, betamethasone, mometasone and various forms of topical hydrocortisone have been used with success in veterinary dermatology. Oral glucocorticoids include methylprednisolone, prednisone and prednisolone (0.4-1 mg/kg), trimeprazine/prednisolone (Temaril-P® USA/Vanectyl-P® Canada; 1 tablet per 10 kg/day) and dexamethasone (0.05 mg/kg) are administered daily for 7 days then tapered to every other day or less pending response. Adverse effects included polyphagia, PU/PD, weight gain and/or intermittent GI signs. The benefit of long-term treatment with glucocorticoids must be weighed against the risk of adverse drug effects impacting on health and quality of life. Concurrent use of other anti-inflammatory and/or antineurogenic therapy has resulted in synergistic responses, permitting lowering or elimination of steroid use.

b) Neurogenic Itch

Pruritic patients with little to no inflammation, infection or otitis will benefit from either oclacitinib (Apoquel®) OR lokivetmab (Cytopoint®). These medications help to block IL31-mediated pruritus at both the cutaneous nervous system and the dorsal root ganglia hence eliminated traumatically-induced inflammation but have little to no effect on allergy-mediated inflammation at their current recommended maintenance doses.

Oclacitinib (Apoquel®) is a selective inhibitor of Janus kinase 1 (and 3) that quickly blocks IL-31 mediated itch at cutaneous nerve endings. Oclacitinib is dosed at 0.4-0.6 mg/kg twice daily for 14 days, then decreased to 0.4-0.6 mg/kg once daily or split twice daily as needed to control itch. Oclacitinib can rarely be tapered beyond once daily is using the medication as a monotherapy to control atopic dermatitis. At higher doses (0.4-0.6 mg/kg BID or greater), oclacitinib provides anti-inflammatory effects by decreasing the production of interleukin (IL)-2, IL-4, IL-6 and IL-13 as well as blocking inflammation caused by IL31-induced itch. Banovic et al (2019) noted that at lower maintenance doses, the effects on interleukin (IL)-2, IL-4, IL-6 and IL-13 mediated inflammation are negligible in vitro. Oclacitinib is not approved for dogs less than 12 months of age, should not be used in dogs with serious illness as it may alter local immune function increasing susceptibility to infections, allowing Demodex mites to proliferate and altering responses to neoplastic conditions. Rare gastrointestinal signs, interdigital cysts, histiocytomas, lethargy, polyphagia, weight gain, and increased aggression have been noted, with adverse reactions resolving with discontinuation of Apoquel. As it does not calm skin inflammation at the maintenance doses, bacterial and yeast dermatitis & otitis persists. CBC, chemistry panels and urinalysis are recommended for patients where Apoquel is chronically administered, and more frequently in patients with any concurrent metabolic abnormalities.

Lokivetmab (Cytopoint®) is an injectable monoclonal caninized antibody directed against IL-31 that it administered at 1-3mg/kg subcutaneously every 4-8 weeks as needed to control itch. Note, due to the targeted nature of this medication, it does not control pro-inflammatory cytokine induced inflammation. Anti-itch effects are typically noted with hours to days.

As lokivetmab is metabolized by protein reprocessing or degradation by the immune system, there are currently no labeled contraindications for its use with other medications, nor for use in puppies, patients on medications or with nephropathies, hepatopathies and neoplasias can benefit from its anti-itch effects.

About 1.5% to 2.0% of dogs can develop anti-Cytopoint IgG and negate its positive effects. As it is caninized, use in species other than dogs is not recommended. Anecdotal reports on the ACVIM listserv, cautions use of lokivetmab in patients with existing inflammatory bowel syndrome, autoimmune hemolytic anemia and immune-mediated thrombocytopenia. This may potentially be due to undiscovered functions for IL31 that have yet to be elucidated. Lastly, cost may be a factor in large breed dogs at the North American labeled dose of 2mg/kg every 4-8 weeks but is equivalent to a month's worth of Apoquel when the European dose of 1mg/kg monthly is administered.

c) Psychologic or anxiety-related itch

Atopic patients with anxiety may surmount the effects of anti-inflammatory and antineurogenic therapy. A history of thunderstorm, firework, or separation anxiety-related increased licking, scratching and chewing help to discern when to institute behavioural modification and anxiolytic therapy. Use of dog appeasing pheromones and anxiolytic medications such as tricyclic antidepressants, amitriptyline and clomipramine (1-2 mg/kg BID) or serotonin-reuptake inhibitors, paroxetine and fluoxetine (0.5-2 mg/kg q24h) must always be accompanied by behaviour modification techniques. Planned departure techniques minimizing and desensitizing to predeparture clues (picking up keys, mobile phones or shoes), counter conditioning the negative association with leaving, providing additional environmental, social and exercise enrichment should be customized to the patient's needs and incorporated as part of a multi-modal approach.

MULTI-MODAL ANTI-INFLAMMATORY THERAPY – A "FOREST FIRE" ANALOGY

Even with the introduction of non-steroidal alternatives such as cyclosporine with long-lasting effects equivalent to those of steroids, glucocorticoids remain one of the only treatment options that will give the patient immediate relief or "put out a fire" within 24-48 hours. If the analogy of a forest fire is used, the "fire retardant" dropped from airplanes is the steroid, while the other therapeutic options such as Omega-3 fatty acids, antihistamines, dietary restriction, flea control, epidermal barrier repair, cyclosporine and allergen specific immunotherapy are the "trench diggers" controlling the fire from spreading. I currently position the oclacitinib and lokivetmab in the "fire retardant" group. The incorporation of this multi-modal approach to control the allergic reactions prevents damage to the epidermal barrier, calms the inflammation and microenvironment, hence minimizes recurrence of secondary infections. I typically have client error on the side of giving a little extra steroid to prevent a secondary infection rather than to give too little steroid and have to return to 4-weeks' worth of antimicrobial therapy to treat infections.

Using a MULTIMODAL approach, all of the above can also be used in combination with adjunctive therapy such as topical anti-inflammatory agents (Tacrolimus (ProTopic® 0.1%); Hydrocortisone aceponate 0.0584% (Cortavance®) spray; Mometasone (Elocon®, Mometamax®); and Pramoxine local anesthetic (Relief®, ResiProx®, Gold Bond Anti-Itch Lotion®). Also, dietary restriction may be used longterm or during peak allergy seasons to minimize cutaneous adverse food reaction's contribution to the allergen load.

PREVENTATIVE USE OF ANTI-INFLAMMATORY MEDICATIONS

Lastly, once a pattern of seasonal reactions has been established and appears quite predictable, use of cyclosporine, steroids or other anti-inflammatory medications in advance of the allergy season may allow the owner to start at maintenance control doses as opposed to using high loading doses to put out the fire first before moving to maintenance therapy. Ultimately this approach will help minimize cost and side effects associated with high daily doses of allergy medications as well as prevent costly secondary infections such as Staphylococcus and Malassezia dermatitis.

Suggested reading:

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2. *Gortel K. An embarrassment of riches: An update on the symptomatic treatment of canine atopic dermatitis. Can Vet J. 2018 Sep; 59(9): 1013–1016.*
3. *Mueller RS. Updates on Allergen Immunotherapy. Veterinary Clinics: Small Animal Practice. 2019; 49(1): 1-7*
4. *Olivry T, et al. Treatment of canine atopic dermatitis: 2015 updated guidelines from the International Committee on Allergic Diseases of Animals (ICADA). BMC Veterinary Research 2015;11:210.*
5. *Santoro D. Therapies in Canine Atopic Dermatitis. Veterinary Clinics: Small Animal Practice. 2019; 49(1): 9 - 26*

WSV - 043

INCREASING DENTAL COMPLIANCE

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Why is marketing the dental department important?

1. Oral disease is by far the most common problem in veterinary medicine and there are generally only subtle to no clinical signs. However, patients afflicted with dental disease are quite often painful despite the lack of clinical signs. In addition, these disease processes cause significant localized and systemic medical problems. Ignorance abounds regarding dentistry both in the general public as well as in the veterinary field. This results in most patients being under treated. Therefore proper dental therapy is financially rewarding and good medicine.

2. Over the last decade or so, there has occurred a significant loss of traditional revenue streams due to many factors. Vaccine revenue has been markedly reduced by new studies. In addition, flea and heartworm prevention as well as other prescription revenue has been lost due to online prescriptions. Finally, increased reliance on the internet or other information decreases the client trips to the clinic

How to Increase Dental Revenue

Dental revenue can be improved in four distinct ways. However, they do not stand alone; all of them should be included in the marketing plan. In fact they are synergistic, by increasing more than one, they positively affect each other, further improving gains.

1. The first and most cost effective way to attain this goal is to increase the number of dental prophylaxis procedures performed.

a. Client education: This is best performed by enlightening the population about dental disease. This should come not only from the veterinarian, but the entire staff. This includes technicians and possibly most importantly, receptionists. By educating the veterinary staff, you educate the clients and provide more dentistry. This ideally is in person, but if time is an issue, handouts or qualified websites can be effective as well. There are can be in person, or via handouts and/or websites. Client educational videos are available at www.dogbeachdentistry.com

b. Superior, new equipment: Once the marketing plan is underway and the days are full, superior equipment will speed procedures.

A new drill, ultrasonic scaler, elevator, or curette can markedly cut down on surgical time and increase the number of procedures performed a day. If a practice can do one more procedure a day 5 days a week at an average of say $400 it will pay off $4,000 worth of equipment in a month. Moreover, this will result in shorted anesthetics, which is better for the patient.

c. Continuing education/training: By learning better techniques veterinarians and technicians can speed the dental procedures benefiting the practice and the staff. The staff can be more efficient, which will also allow for the possibility of additional procedures. Furthermore, this efficiency will decrease operator stain and stress. Finally, proper performance of dental procedures should result in less surgical trauma and superior patient care. Ask your AHI rep if a lab is scheduled in your area, or visit www.vetdentaltraining for a San Diego class schedule.

2. The next way to increase income is by increasing the per dental procedure charge. Increase the number of treatment options for the clients. This does not mean doing things like root canals, jaw fracture repair and major oral surgery since what most DVM's charge for these it is not efficient time usage. By spending that time doing office calls the practitioner will increase income with less stress. A more efficient way to do this is by offering superior "basic" care. This should include: dental radiology, root planing/doxirobe/clindoral, oravet, nerve blocks, proper pain management, bonded sealants, and fluoride therapy. All of these will greatly increase income without a significant investment of time or money. Practitioners, who have mastered the basics, can consider proceeding to composite restorations and periodontal flap surgeries, which are taught at the level 2 course in San Diego (See above).

3. Clinics can markedly improve their dental and income by improving their pre-operative testing protocol. Furthermore, perform the pre-operative testing the day the cleaning is recommended, this will help lock clients into the procedure.

A. Complete blood panel (renal (SDMA), hepatic, CBC, T4)

1. *B. Urinalysis*
2. *C. Chest radiographs*
3. *HCM is often not ausculted*
4. *Over 50% of patients over 6 have significant findings on chest films*
5. *4. Provide superior (and necessary!) post-operative treatment*
6. *a. Pain management: Opiates, NSAIDS, Local Anesthetics (nerve blocks)*
7. *b. MHome care*
8. *c. Rechecks*

WSV - 026

THE GUT MICROBIOME IN GI DISEASES: HOW AND WHEN TO MANIPULATE IT?

C. Mansfield

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It is estimated that the mammalian gastrointestinal tract harbors at least 1012-1014 organisms, in the same order as the number of mammalian cells in the body. Various host factors such as genetic background, age, sex, initial environmental exposure, diet and antibiotic usage contribute to the development and maintenance of the intestinal microbiota. For these reasons, the gut microbiota varies from individual to individual, over time and even between mucosa, luminal contents and faeces. The role of microbes associated with intestinal inflammation is gaining increased attention in people and in animals, with recent research concentrated on bacteria using culture-independent methods of next generation sequencing. Molecular studies have been conducted in dogs and cats to unravel specific organisms or dysbiosis that occur in chronic enteropathy (inflammatory bowel disease); however, results are mixed depending on the method used and population studied. Importantly, although the microbiome may be stable over time in healthy individuals, in inflammatory states there are often rapid changes, and it is uncertain whether the dysbiosis drives the inflammation or the inflammation causes the dysbiosis. Acute intestinal inflammation, either infectious or associated with stress/antimicrobial usage, is also associated with profound dysbiosis. In people following acute infectious diarrhea, the microbiome may take weeks to months to return to a baseline level.

Techniques used to characterise the GI microbiome include DNA sequencing and analysis (sequencing of the 16S ribosomal genes to identify bacterial species), metagenomics (the total genetic coding in the population), metatranscriptomics (RNA or function of the bacteria) and metabolomics (metabolites are produced by the bacteria or host). Full sequencing of individual animals presenting to a clinic is currently beyond the scope of possibility in veterinary medicine.

The canine dysbiosis index (CDI) measures the abundance of 8 bacterial groups using a faecal qPCR panel and is an alternative method for evaluating the microbiome in dogs. The results are summarised into a single number, with a CDI < 0 indicating normal faecal microbiota, and a CDI ≥ 0 indicating dysbiosis. In other words, CDI is negatively correlated with phylogenetic diversity.

There are three main ways to modify the microbiome: antibiotics, prebiotics/probiotics and faecal microbial transplantation (FMT). Prebiotics and probiotics affect the host microbiome by increasing diversity of species, decreasing pathogens and improving enterocyte health. Antibiotics eliminate pathogens and increase beneficial bacteria and concurrently decrease microbial diversity, whereas faecal transplantation attempts to replace the disrupted native flora and other constituents of faeces that may be beneficial.

Antibiotics

Antibiotics are frequently used in the treatment of chronic enteropathy/IBD in dogs and cats, particularly metronidazole, oxytetracycline and tylosin. This paradigm is now being challenged, particularly in dogs for several reasons. Firstly, studies from multiple centres show that dogs with enteropathy treated with antibiotics (even with concurrent dietary therapy) do maintain long-term remission times and/or require intermittent, long term antimicrobial treatment to remain in complete or partial remission. Secondly, the metabolic effects on the host of drugs like metronidazole are being recently recognized. These effects seem to persist long after cessation of the antimicrobials and do not appear to be simply due to bactericidal effects. Finally, the requirement for prevention of antimicrobial resistance in veterinary practice should make use of antimicrobials in this clinical situation questionable.

In cats with chronic enteropathy, if there is concurrent infectious cholangitis and/or cholecystitis then antibiotics should be administered for those identifiable problems. Targeted and judicious antimicrobials should be used (based on culture results from bile or liver aspirates), rather than broad-spectrum in all cats with chronic gastrointestinal disease though.

Acute causes of diarrhea are usually viral or dietary induced, and as such seldom require antibiotic administration unless there is a concern for bacterial translocation. In fact, studies of dogs with acute hemorrhagic diarrhea syndrome suggest that there is no benefit in giving broad-spectrum drugs like amoxicillin-clavulonate.

Prebiotics/Probiotics

Prebiotics are compounds that selectively stimulate the function or proliferation of beneficial bacteria in the colon. Prebiotics are often plant-derived carbohydrate compunds contained in the diet and include fructans (fructooligosaccharides [FOS] and inulin) and galactans. Many diets designed for intestinal disease in dogs and cats already contain prebiotics, and likely confer this advantage.Likewise, many commercial products also combine probiotics with prebiotics. Dietary fiber supplements such as psyllium have historically been laxatives only, as they increase faecal water content and increase motility.

However, recent research would suggest that psyllium does selectively and beneficially to a small degree alter the microorganisms in the colon. Research assessing prebiotics in clinical cases are difficult to evaluate, as it is seldom that they are used in isolation (i.e. usually in diet with other potential benefits, or in combinations with a probiotic). Regardless, as prebiotics are not harmful to the host it is likely that supplementation will be beneficial in most cases.

Probiotics are defined as live microorganisms that confer a health benefit on the host when administered in adequate amounts. In addition, probiotics should survive gastric acid and bile to reach and adhere to the intestine, be able to proliferate and colonize the colon, modulate the intestinal immune system, be active against pathogenic microorganisms and have no carcinogenic, toxic, pathogenic or mutagenic effects. The most common types of bacteria contained in probiotics that are used in veterinary medicine include Bifidobacterium, Lactobacillus, Enterococcus faecium and the yeast Saccharomyces boulardii.

In clinical trials in dogs with CE, the results have also been varied, as have the study populations and probiotics used. To date, there have been one two reported studies where there has been a modest benefit (faster time to resolution, improved inflammatory markers), but there is no substantial clinical benefit that has been shown. There have been no studies in cats with documented IBD and probiotics, but in one study of 22 cats with chronic diarrhea, 72% of owners reported and improvement in their cats' clinical signs.

In studies of probiotic administration in animals at shelters there appears to be a moderate benefit in reducing duration of diarrhea, particularly in cats. Likewise, studies have also shown a reduction in duration of clinical signs in dogs with acute (not parvo) gastroenteritis, including acute hemorrhagic diarrhea syndrome.

In summary, although the use of probiotics is gaining in popularity, there is still plenty unknown about this area of veterinary medicine. There may be some benefit in shelter animals (used prophylactically) and in some animals with acute (not parvoviral) enteritis. Care should be taken whenever administering probiotics to acutely ill animals, as it has been shown in people with severe pancreatitis that probiotics worsen prognosis substantively.

For chronic intestinal disease in dogs, the use of probiotics is probably is in its infancy. Ideally, we will reach a point where every individual animal, the individual GI microbiome (and its metabolic function) can be determined, and then matched to a specific probiotic (with specific strains). As the quality of probiotics on the market varies greatly, we can't know what strain is required, and even if the strains remain viable, at this stage probiotic administration for CE in dogs is not recommended.

Fecal microbial transplantation

Faecal microbial transplantation has been effectively used in people for treatment of C difficile infection. The benefits of FMT are probably not limited to the actual bacteria that are transplanted, but also to the bacteriophages and bile acids that are present in faeces. Despite dogs being coprophagic in nature, some individual studies suggest FMT may be useful in dogs. FMT is even less explored in cats, and so cannot be recommended at this stage. There are no studies to determine the exact protocol or donor requirements, but there are few extrapolations from human medicine that are used.

FMT should be considered when dogs have failed a dietary trial, at the stage where typically would be considering antimicrobial administration. This is not a procedure that should be done in a severely unwell animal, as medical therapy should be administered first, and then FMT considered following clinical improvement.

It is important that recruitment of the donor considers the body condition score (must be lean so as not to pass on an 'obese' enterotype), have no history of gastrointestinal, metabolic or infectious disease and ideally no behavioural abnormalities. We also recommend that the animal is fully vaccinated and wormed, fed a regular commercial diet without additives and has not been administered antibiotics or gastric protectants in the previous 3 months. Ideally, the donor should have a normal CDI.

Options for administration of FMT include rectally or via a catheter through an endoscope to the duodenum. At our institution, we administer into the colon, and to date have had good success with no side effects from this method. The frequency and volume of FMT is mainly extrapolated now, and highly variable between veterinary centres. It is hoped that in the next few months publications and consensus on treatment guidelines will be reached.

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C. Mansfield

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YOUR NEW FAVORITE ANALGESIC: USING ALPHA 2›S TO YOUR ADVANTAGE

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Learning Objectives:
1. To understand the function of dexmedetomidine as an analgesic
2. To understand proper patient selection with dexmedetomidine
3. To understand the different routes of administration of dexmedetomidine

Many clinics throughout the world use dexmedetomidine for sedation. But, did you know that dexmedetomidine is also labeled as an analgesic a fact that often gets overlooked in practice. Dexmedetomidine is the active S-enantiomer of the -2 agonist medetomidine. Removal of the inactive molecule, levomedetomide results in dexmedetomidine being a “purified” product with increased potency and decreased stress on the liver. Many practices are familiar with dexmedetomidine as an alpha-2 agonist sedative that is reliable, fast-acting, and reversible with antipamezole.

Dexmedetomidine and medetomdine’s main effect are to produce sedation with both somatic and visceral analgesia. Analgesic effects of dexmedetomidine are principally due to spinal anti-nociception via binding to non-noradrenergic receptors (heteroreceptors) located on the dorsal horn neurons of the spinal cord. (Stein, 2013) This mechanism of action inhibits the release of norepinephrine (a catecholamine released by the adrenal gland and part of the fight-or-flight response) and therefore prevents transmission of further nerve impulses. This provides both sedation and analgesia.

Dexmedetomidine is also being used frequently as an in hospital constant rate infusion for rough recoveries and breakthrough analgesia. Constant rate infusion of low dose dexmedetomidine (1 to 2 mcg/kg/hr); can be used in severely painful or anxious patients to provide sedation and analgesia. Dexmedetomidine can also be added to a preexisting opioid infusion for increased sedation and analgesia. Because dexmedetomidine has the potential to cause severe bradycardia and hypotension, these patients should be monitored very closely by a dedicated recovery technician. A loading dose of at least 0.5 µg/kg (0.0005 mg/kg) dexmedetomidine IV should precede the initiation of the dexmedetomidine CRI (Zeltman, 2013).

Epidural use of dexmedetomidine can enhance the analgesic effects of other agents given epidurally. Besides the previously mentioned action at heterotropic spinal receptors, dexmedetomidine also produces analgesia by stimulation of cholinergic interneurons when given epidurally (Gaynor & Muir, 2009) It acts synergistically with epidural opioids, improving the quality and duration of analgesia, and recent human studies have shown that the addition of 2 µg/kg dexmedetomidine epidurally to 2.5 ml of intrathecal bupivacaine prolongs the duration of analgesia, and decreases the requirement of rescue analgesics in patients undergoing lower-limb orthopedic surgery (Jain, 2012) It should be noted that, dexmedetomidine is highly lipophilic, and is rapidly absorbed from the epidural space, which can lead to systemic levels of the drug.

Dexmedetomidine is gaining some ground recently as more practices are experimenting with using it transmucosally in felines, in addition to the intra-muscular and intra-venous routes. Transmucosal dosing allows even fractious cats to receive sedation and analgesia. Often cats given transmucosal dexmedetomidine are not at a surgical plane of anesthesia but are sedate enough to allow physical exams, blood draws, and IV catheter placement. Dexmedetomidine can also be combined with buprenorphine and given via the oral-transmucosal route (Santos, 2010). Oral dosing can range from 20-40mcg/kg.

It should be noted that dexmedetomidine has serious cardiac side effects and seriously effects cardiac output. Dexmedetomidine and medetomdine should be reserved for patients that are heart healthy and have no exercise intolerance. □lpha-2 agonists are not intended for animals with respiratory or cardiovascular compromise.

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ASSISTING THE VET ON A POND HOUSE CALL

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Aquatic veterinarians can use much of the same equipment and medications used in any small animal veterinary practice. Most diagnostic tests in fish can be done using standard veterinary equipment, and surgeries performed with instruments typically used for ophthalmic work, such as iris scissors. Radiology equipment, especially digital or dental units, sonograms, endoscopes, and blood evaluating equipment used for other animals work well with fish patients, too. Many small animal drugs are also used in fish medicine, with only a few special medications needed to supplement other veterinary drugs.

Aquatic veterinarians often make house calls to examine fish, but there are also advantages of having clients bring in the fish to the veterinary hospital. Having a client bring a sick fish into the veterinary hospital allows treatment in a quarantine tank where all the conditions can be controlled and properly maintained. Regular daily observations can be made, and appropriate diagnostic tests and treatments performed. Sick fish are isolated from the remaining fish in the aquarium or pond. Once a diagnosis is made, the fish can be properly medicated, and the sick fish can be cared for until it is well enough to return home. Disadvantages include the lack of examination of the remaining fish and the aquatic environment (aquarium or pond) itself; having the owner transport the sick fish in plastic bags, buckets or ice chests to the clinic; and in many cases the unwillingness of the owner to catch and bring in their sick fish.

By making a house call, the fish can be examined in its own environment. The filtration units can be examined and water tests performed on the spot. Apparently healthy fish can be biopsied and checked for early signs of lesions that the owner might have missed. Suggestions on improving filtration, water quality and fish husbandry are easier to make when the facilities have been visited, rather than having just the owner's descriptions.

When making a house call, portable diagnostic equipment including microscopes, slides and coverslips, bacterial culturettes, and water test kits must be brought along. A "Doctor's Bag" of common medications and antibiotics can be made up for house calls. Some very important pieces of equipment to bring when visiting koi ponds are your own quality long-handled koi nets (many pond owners have only pool skimmer nets!), a plastic container for holding the fish for examination, and chest-high waders!

Drawing blood samples from larger fish, especially koi, can be done from the caudal vein below the spine in the caudal peduncle. Use a 1-ml tuberculin syringe with a 22 or 23-gauge needle of appropriate length. A butterfly catheter can be attached to the syringe to facilitate handling of the needle separately from the syringe. Fill the hub of the needle with a drop of lithium heparin to prevent the blood from clotting. This is preferable to ammonium heparin or sodium heparin, but they can also be used for hematology testing. The ammonium and sodium heparins will affect those blood values if used in samples for serology or electrolyte testing. Ethylenediamine tetra-acetic acid (EDTA) is not recommended to be used to prevent blood clotting in fish blood samples as it may cause erythrocyte lysis.
Some normal values for koi blood parameters, derived from Advanced Koi Care by Nicholas Saint-Erne (2002, 2010) and from Hematology and Clinical Chemistry of Cyprinid Fish by Groff and Zinkl (1999), are listed in the chart below.

KOI COMPLETE BLOOD COUNT (CBC):

Normal Range:
Red Blood Cells (Erythrocytes):
Red Blood Cells (10-13 µm cell length) 1-2 Million/µl
Hematocrit (Packed Cell Volume) 24-35%
Hemoglobin 8-13 g/dl
Methemoglobin 4.8-5.6%
Mean Corpuscular Volume 202 fl
Mean Corpuscular Hemoglobin 49.1 pg/cell
Mean Corpuscular Hemoglobin Concentration 0.24 g/dl
White Blood Cells (Leukocytes):
Total White Blood Cells 5-15 Thousand/µl
Neutrophils (10-15 µm) 750-1500/µl
Neutrophils (% of Total WBC) 12-20%
Band (immature) Neutrophils 0-4%
Small (Mature) Lymphocytes (6.6 µm) 3000-12,000/µl
Small (Mature) Lymphocytes 65-85%
Large (Immature) Lymphocytes (11.8 µm) 0-3%
Monocytes (10-16 µm) 100-600/µl
Monocytes 1-4%
Eosinophils (13.8 µm) 0-150/µl
Eosinophils 0-1%
Basophils (13.8 µm) 0-150/µl
Basophils 0-1%
Thrombocytes (4.6 x 7.7 µm) 50,000/µl

Serum Chemistries (Serology):

ALT(SGPT) 20-50 IU/L
AST (SGOT) 100-300 IU/L
Total Bilirubin 0.1-0.3 mg/dl
Alkaline Phosphatase 10-20 IU/L
GGT 1-3 IU/L
Uric Acid 1-2.5 mg/dl
Blood Urea Nitrogen 5-15 mg/dl
Creatinine 0.2-0.5 mg/dl
BUN/Creatinine Ratio 10-20

Creatinine Phosphokinase 14.5 IU/ml
Glucose 30-120 mg/dl
Cholesterol 200-400 mg/dl
Triglyceride 50-500 mg/dl
Amylase 25-50 IU/L
Lipase 25-50 IU/L
Total Protein 4-10 g/dl
Albumin 2-6 g/dl
Globulin 2-4 g/dl
A/G Ratio 0.7-1.2
Osmolality 220-420 mOsm/kg
Calcium 8.5-13.5 mg/dl
Phosphorus 10-15 mg/dl
Caciuml/Phosphorus Ratio 0.6-1.3
Magnesium 3-5 mEq/L
Sodium 100-140 mEq/L
Chloride 90-120 mEq/L
Potassium 4-30 mEq/L
Na/K Ratio 3-30
Commonly Used Medications in Ornamental Fish
Amikacin – 5 mg/kg IM, IP every 3 days
Aztreonam (Azactam) – 100 mg/kg IM, IP every 2-5 days
Butorphanol – 0.1 mg/kg IM for pain control post-surgically
Dexamethasone – 1-2 mg/kg IM, IP q12h
Diflubenzuron (Dimilin) – 0.06 mg/L once weekly for 3 doses
Enrofloxacin (Baytril) – 10-14 mg/kg IM, IP q48h, or PO q24h
Epinephrine (1:1000) – 0.2-0.5 ml IM, IP, IC
Fenbendazole (Panacur) – 50 mg/kg orally for 2 days, 2 mg/L water q7d x 3 doses
Formalin (37% formaldehyde) – 25 mg/L (1 ml/10 gal) in pond every other day
Florfenicol (NuFlor) – 30-50 mg/kg IM, IP, PO q24-72h
Furosemide – 2-3 mg/kg IM, IP q12-72h
Gentamicin – 3 mg/kg IM once only due to kidney toxicity
Hydrogen peroxide – 250-500 mg/L dip to prevent fungal growth on eggs
Levamisole – 10 mg/L for 12-24h bath; 50 mg/L for a 2h bath
Metronidazole – 50 mg/L bath, daily for 3-10 days, 10 mg/g of food daily for 5 days
Oxytetracycline – 50-75 mg/kg BW, added to food daily for 10 days
Praziquantel (Droncit) – 5-25 mg/kg IM, IP, PO, 10 mg/L for 6-24h bath
Sulfadimethoxine-ormetoprim (Romet, Primor) – 50 mg/kg IM or added to food
Tetracycline – 250 mg/100 g of food
Trimethoprim sulfa – 30 mg/kg IM, IP, PO q24-48h

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ASSISTING THE VET ON A POND HOUSE CALL

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Aquatic veterinarians can use much of the same equipment and medications used in any small animal veterinary practice. Most diagnostic tests in fish can be done using standard veterinary equipment, and surgeries performed with instruments typically used for ophthalmic work, such as iris scissors. Radiology equipment, especially digital or dental units, sonograms, endoscopes, and blood evaluating equipment used for other animals work well with fish patients, too. Many small animal drugs are also used in fish medicine, with only a few special medications needed to supplement other veterinary drugs.

Aquatic veterinarians often make house calls to examine fish, but there are also advantages of having clients bring in the fish to the veterinary hospital. Having a client bring a sick fish into the veterinary hospital allows treatment in a quarantine tank where all the conditions can be controlled and properly maintained. Regular daily observations can be made, and appropriate diagnostic tests and treatments performed. Sick fish are isolated from the remaining fish in the aquarium or pond. Once a diagnosis is made, the fish can be properly medicated, and the sick fish can be cared for until it is well enough to return home. Disadvantages include the lack of examination of the remaining fish and the aquatic environment (aquarium or pond) itself; having the owner transport the sick fish in plastic bags, buckets or ice chests to the clinic; and in many cases the unwillingness of the owner to catch and bring in their sick fish.

By making a house call, the fish can be examined in its own environment. The filtration units can be examined and water tests performed on the spot. Apparently healthy fish can be biopsied and checked for early signs of lesions that the owner might have missed. Suggestions on improving filtration, water quality and fish husbandry are easier to make when the facilities have been visited, rather than having just the owner's descriptions.

When making a house call, portable diagnostic equipment including microscopes, slides and coverslips, bacterial culturettes, and water test kits must be brought along. A "Doctor's Bag" of common medications and antibiotics can be made up for house calls. Some very important pieces of equipment to bring when visiting koi ponds are your own quality long-handled koi nets (many pond owners have only pool skimmer nets!), a plastic container for holding the fish for examination, and chest-high waders!

Drawing blood samples from larger fish, especially koi, can be done from the caudal vein below the spine in the caudal peduncle. Use a 1-ml tuberculin syringe with a 22 or 23-gauge needle of appropriate length. A butterfly catheter can be attached to the syringe to facilitate handling of the needle separately from the syringe. Fill the hub of the needle with a drop of lithium heparin to prevent the blood from clotting. This is preferable to ammonium heparin or sodium heparin, but they can also be used for hematology testing. The ammonium and sodium heparins will affect those blood values if used in samples for serology or electrolyte testing. Ethylenediamine tetra-acetic acid (EDTA) is not recommended to be used to prevent blood clotting in fish blood samples as it may cause erythrocyte lysis.

Some normal values for koi blood parameters, derived from Advanced Koi Care by Nicholas Saint-Erne (2002, 2010) and from Hematology and Clinical Chemistry of Cyprinid Fish by Groff and Zinkl (1999), are listed in the chart below.

KOI COMPLETE BLOOD COUNT (CBC):

Normal Range:
Red Blood Cells (Erythrocytes):
Red Blood Cells (10-13 µm cell length) 1-2 Million/µl
Hematocrit (Packed Cell Volume) 24-35%
Hemoglobin 8-13 g/dl
Methemoglobin 4.8-5.6%
Mean Corpuscular Volume 202 fl
Mean Corpuscular Hemoglobin 49.1 pg/cell
Mean Corpuscular Hemoglobin Concentration 0.24 g/dl

White Blood Cells (Leukocytes):
Total White Blood Cells 5-15 Thousand/µl
Neutrophils (10-15 µm) 750-1500/µl
Neutrophils (% of Total WBC) 12-20%
Band (immature) Neutrophils 0-4%
Small (Mature) Lymphocytes (6.6 µm) 3000-12,000/µl
Small (Mature) Lymphocytes 65-85%
Large (Immature) Lymphocytes (11.8 µm) 0-3%
Monocytes (10-16 µm) 100-600/µl
Monocytes 1-4%
Eosinophils (13.8 µm) 0-150/µl
Eosinophils 0-1%
Basophils (13.8 µm) 0-150/µl
Basophils 0-1%
Thrombocytes (4.6 x 7.7 µm) 50,000/µl

Serum Chemistries (Serology):
ALT(SGPT) 20-50 IU/L
AST (SGOT) 100-300 IU/L
Total Bilirubin 0.1-0.3 mg/dl
Alkaline Phosphatase 10-20 IU/L
GGT 1-3 IU/L
Uric Acid 1-2.5 mg/dl
Blood Urea Nitrogen 5-15 mg/dl
Creatinine 0.2-0.5 mg/dl
BUN/Creatinine Ratio 10-20
Creatinine Phosphokinase 14.5 IU/ml
Glucose 30-120 mg/dl
Cholesterol 200-400 mg/dl
Triglyceride 50-500 mg/dl
Amylase 25-50 IU/L
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Osmolality 220-420 mOsm/kg
Calcium 8.5-13.5 mg/dl
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Caciuml/Phosphorus Ratio 0.6-1.3
Magnesium 3-5 mEq/L
Sodium 100-140 mEq/L
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Sulfadimethoxine-ormetoprim (Romet, Primor) – 50 mg/kg IM or added to food
Tetracycline – 250 mg/100 g of food
Trimethoprim sulfa – 30 mg/kg IM, IP, PO q24-48h

WSV - 035

CANINE INFLUENZA - AN UPDATE ABOUT CANINE FLU

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Introduction

Canine influenza has caused much concern in veterinarians, dog owners and public health personnel. From the emergence of H3N8 canine influenza virus (CIV) in the US in the early 2000s, to the ongoing and broad international dissemination of H3N2 CIV, this disease has had a significant impact. The scope of disease is not known, but it is estimated that thousands (or, more likely, tens of thousands) of dogs have been infected in the US. Serious infections, including fatal infections, have occurred and while the overall medical and economic impacts are unknown, they are clearly substantial. CIV has also highlighted various areas such as risk of imported pathogens, spread of disease in a naïve population, the need for a coordinated human/veterinary response to this potentially zoonotic pathogen and the need to consider optimal vaccination strategies for an emerging disease.

Epidemiology/Transmission

Canine influenza refers to a influenza virus that is host-adapted to live in dogs and circulate in the dog population. Dogs are susceptible to a range of influenza viruses, including human influenza viruses,1 but infections with those are sporadic and not sustained in the dog population. Canine influenza viruses can spread readily between dogs, without the need for any other hosts. As is common for influenza viruses, CIV can be shed for a short time (e.g. 24h) prior to the onset of clinical signs, with peak shedding during early disease. Duration of shedding differs between H3N8 and H3N2, with H3N8 being shed typically for only a few days and H3N2 being shed for up to a few weeks. This may account for the wider and more sustained transmission of H3N2, as longer shedding creates more opportunities for infection.

Transmission of CIV can be via direct contact, droplet transmission (transmission over a short distance from infectious aerosols generated during breathing, barking or coughing) and indirect transmission via fomites or the environment. The relative roles of these results are not known, but direct contact is probably the most important route. Influenza viruses are not particularly stable in the environment and do not persist for long periods of time, so indirect transmission is probably short term and mainly involving items and surfaces that have direct contact with respiratory secretions (e.g. bowls, human hands).

Cats can be infected with a range of influenza viruses but appear to have low susceptibility to CIV and while infections have been reported, they are rare.

Clinical Disease

Most clinically affected dogs develop upper respiratory tract disease with varying degrees of cough, nasal discharge, ocular discharge, lethargy and anorexia. Fever may be present but is inconsistent. Secondary bacterial pneumonia may develop in a minority of cases. Severe peracute lower respiratory tract disease has also been reported and can result in rapid deterioration (including death) within a short period of time. How much of that is due to an abnormal presentation of primary viral disease versus severe peracute secondary bacterial infection is usually difficult to discern.

Diagnosis

Clinical signs are not adequate for diagnosis since CIV infection is not distinguishable from disease caused by other CIRDC pathogens. Suspicion should be raised in some situations, such as high morbidity outbreaks in groups of dogs vaccinated against Bordetella bronchiseptica and canine parainfluenza virus and in dogs imported from Asia, but diagnostic testing is required.

PCR is the most widely used test. Testing can involve one or more of nasal, pharyngeal and conjunctival swabs. Conjunctival swabs are likely the lowest yield and nasal swabs are most often used. Testing of 2 or 3 sites in parallel likely increases sensitivity of diagnosis. Serological testing is less useful clinically because of the need to test convalescent titres. A four-fold or greater increase in serum antibody titre in samples collected ~4 weeks apart is diagnostic in the absence of recent (probably within the past few weeks) vaccination.

Treatment

Most cases of CIV infection respond well to supportive care, such as cough suppression. The type and level of care that is needed (e.g. IV fluids, oxygen support) is dictated by the severity of CIRDC, not by the pathogen. Most affected dogs are easily managed at home. Secondary bacterial infections are not common but may occur, and should be managed as per standard approaches.7 Antiviral drugs are uncommonly used in humans and the approach should be similar in animals. While drugs such as oseltamivir might be useful in some situations, they are not likely indicated in the vast majority of cases. They could be considered in severe, acute cases, particularly in high risk (e.g. brachycephalic) patients, but evidence is currently lacking.

Vaccination

Monovalent H3N2 or H3N8, and bivalent vaccines, are available. It is questionable whether H3N8 vaccination is required since this virus seems to be very rare (if it is even still circulating). As is typical for killed vaccines, an initial two dose series is required.

The timeframe required for two doses and subsequent development of a protective immune response means that vaccination is not a highly effective initial outbreak response tool, since much transmission can happen during this window of developing resistance. While vaccination can be considered for any patient, vaccination is perhaps most important in dogs at higher risk of exposure (e.g. those exposed to imported dogs or dogs from other endemic regions, dogs that have frequent contact with other dogs) and those at increased risk of severe infection (e.g. seniors, dog with underlying respiratory or cardiovascular disease, brachycephalics).

Influenza vaccines are labelled to aid in reduction of disease. They are most reasonably expected to reduce the risk of severe disease and help establish herd immunity, to hopefully reduce the risk of transmission. It is not uncommon for vaccinated dogs to develop influenza after exposure, so client counselling must emphasize the reasons for vaccination (e.g. to reduce the risk of severe disease, rather than to provide a high likelihood that the dog will not develop influenza).

Zoonotic Concerns

The public health risks with H3N2 CIV seem to be very low. Human infections with H3N2 CIV have not been reported. However, it cannot be completely ruled out so practical infection control measures to improve hygiene (e.g. hand hygiene) and limit direct contact with respiratory secretions of infections dogs are prudent. The greater concern is the potential for dogs to act as a 'mixing vessel' for influenza viruses,

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WSV - 022

AN UPDATE ON LARYNGEAL PARALYSIS

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Idiopathic laryngeal paralysis has recently been renamed to Geriatric Onset Laryngeal Paralysis Polyneuropathy (GOLPP). This is based on the findings that over 2/3rds of dogs have esophageal dysfunction and ~1/3 of dogs have signs of neurological weakness at time of presentation. A thorough physical, neurological and orthopedic examination is recommended in all suspect GOLPP patients. The most common breed affected is the Labrador Retriever, however, other breeds such as the Brittany Spaniel, Golder Retriever and Australian Shepherd can be affected. Clinical signs as a result of the inability of the cricoarytenoideus dorsalis (CAD) muscle to abduct the arytenoid cartilage include inspiratory stridor, dyspnea, exercise intolerance and even collapse. Historical signs may include a change in bark. The diagnosis of GOLPP is not solely based on upper airway exam findings. The author strongly believes that the diagnosis should be made in the exam room while listening to the dog and matching with suspicious signlament and history. The upper airway exam prior to surgery is used as a confirmatory test and also to rule-out mass lesions.

Prior to surgery all GOLPP dogs should have three-view thoracic radiographs as a general health screening to rule out neoplasia but also as a baseline evaluation of the pulmonary parenchyma for evidence of aspiration pneumonia. Abdominal ultrasonography should be performed ideally in stable dogs to rule out evidence of any sinister disease. Complete bloodwork should be completed prior to anesthesia for surgery.

Laryngoscopic examination should be performed under a light plane of anesthesia. An assistant should be available to call out the phase of respiration. This is a critical step so as not to confuse paradoxical movement of the arytenoids with normal movement. During inspiration the arytenoids should abduct whereas with paradoxical movement, they adduct and then abduct during expiration due to the flaccid nature of the arytenoids. This author routinely used doxopram (1 mg/kg) which stimulates the respiratory centre and results in improved ventilatory efforts so that a more accurate evaluation of arytenoid function can be performed.

Surgical intervention is required for cases with bilateral laryngeal paralysis. This consists of unilateral crico-arytenoid («tie-back») which increases the diameter of the airway (rima glottidis).

The patient is placed in right lateral recumbency as it is easier for the right handed surgeon to operate on the left side of the larynx. The initial approach is made ventral to the jugular vein, just caudal to the bifurcation through the skin, subcutaneous tissues and platysma/cutaneous trunci muscles. Digital palpation reveals the wing of the thyroid cartilage and the thyropharyngeus muscle that overlies this cartilage is sharply incised in a cranial to caudal manner along the ridge of the thyroid cartilage.

A stay suture is placed in the wing of the thyroid cartilage and lateral traction is gently applied. Careful blunt dissection is made through to expose the muscular process of the arytenoid cartilage where the CAD muscle attaches. The muscle is atrophied in many GOLPP cases. This muscle is incised at its attachment on the muscular process of the arytenoid and the incised edge is used as a handle to provide lateral traction. This movement allows for careful dissection and exposure of the cricoarytenoid joint. This can be carefully penetrated with mosquito forceps. Once the circular joint surface on the arytenoid has been visualized, two sutures are passed from caudal to cranial from the cricoid cartilage through the muscular process of the arytenoid, mimicking the direction/angulation of the CAD muscle.

Author TIP: Over-tightening of the suture can result of increased risk of aspiration pneumonia post-operatively. The author recommends firm tightening of the suture. A large bore endotracheal tube is recommended and the arytenoid simply needs to be maintained to the opening created by placement of the endotracheal tube.
Author TIP: The author recommends intra-operative visualization of the laryngoplasty whichrequires extubation and then re-intubation following confirmation of appropriate lateralization. The second suture is tied to approximately the same tightness as the first suture and a splash block with local analgesia. The thyropharyngeus muscle is closed in a simple continuous pattern. The remainder of the soft tissues are closed routinely.

Post-operatively, opioid analgesia is minimized to reduce the risk of nausea and/or aspiration pneumonia by maintaining airway control. The author feeds these dogs balls of soft food for the first several days postoperatively and continues anti-emetic therapy. Discharge from hospital is performed within 24 hours post-operatively to minimize excitement and the potential for suture breaking and/or aspiration pneumonia.

Summarily, postoperative outcomes are positive with surgical treatment of GOLPP and dogs can enjoy a good quality of life. Aspiration pneumonia is the biggest risk of surgery perioperatively and for life and owners of GOLPP dogs should be made aware of this prior to surgery.

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TOP TIPS FOR BLOCKED CATS

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1. Stabilize

a. Provide analgesia, typically an opioid
b. Consider decompressive cystocentesis
c. Establish IV access

2. Evaluate

a. Hydration:
i. Balanced electrolyte solution, avoid normal saline
ii. Treat shock if necessary: weight (kg) x 10 = □ of shock dose
iii. Replace fluid deficit (80% over 24 hours): % dehydration x 1000 mL x weight (kg)
iv. Calculate maintenance fluid requirement: (weight (kg) x 30] + 70
b. Cardiac function: evaluate ECG for arrhythmia induced by hyperkalemia
i. Slow rate, absent P waves, short QRS complexes, tall spiked T waves
c. Minimum database: hematocrit, total protein, electrolytes, ionized calcium, BUN, creatinine
d. Survey radiographs: include entire urinary tract

3. Treat electrolyte disturbances

a. Hyperkalemia
i. Mild-moderate: may resolve with fluid therapy
ii. Dextrose 50%: 1 mL/kg
iii. Sodium bicarbonate: 1-2 mEq/kg IV over 10-15 minutes
iv. Calcium gluconate 10%: 0.5 mL/kg IV over 5-10 minutes, monitor ECG
v. Regular insulin + dextrose infusion

4. Relieve urethral obstruction once stable

a. Consider sedation + sacrococcygeal epidural
i. Lidocaine 2%: 0.1-0.2 mL/kg with 25G x 1 inch needle, sacrococcygeal space or coccygeal space 1-2
b. Clip hair around prepuce, surgical prep of area, wear gloves
c. Use the least traumatic catheter possible
i. Stainless steel olive tip catheters for distal obstructions
ii. Soft catheters for proximal obstructions and indwelling (e.g., MILA tomcat)
d. Check catheter position with radiograph, ensure tip is inside bladder
e. Use a closed collection system; keep catheter clean
f. Avoid antibiotics unless clinical signs of infection

5. Ongoing management and catheter removal

a. Monitor hydration, electrolytes, renal function, bladder condition, urine output & characteristics
b. When to remove catheter: resolution of clinical signs, diminishing or resolving hematuria, resolution of lab abnormalities, small firmly contracting bladder
c. Discharge patient with analgesia, appropriate long term therapy, schedule for re-evaluation

Resources and Reading

VetGirl videos:
- Treating the hyperkalemic obstructed cat: https://vetgirlontherun.com/how-to-treat-the-hyperkalemic-feline-urethral-obstruction-vetgirl-veterinary-continuing-education-blog/
- Urethral obstruction & unblocking cats: https://vetgirlontherun.com/feline-urethral-obstruction-part-1-vetgirl-veterinary-continuing-education-blog/
- Coccygeal epidurals: https://vetgirlontherun.com/veterinary-continuing-education-coccygeal-epidurals-feline-urethral-obstruction-vetgirl-blog/

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WSV - 338

WHICH EYES NEED THEIR PRESSURE TAKEN, AND WHAT DOES IT MEAN?

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Which eyes need their pressure taken?

Although it sounds trite, the answer to the question "Which eyes need their pressure taken?" is easy. Every patient which may have altered intraocular pressure (IOP)! Let's assess that answer a bit more closely.

This includes those which may have conjunctivitis (in which the IOP is always normal) uveitis (in which IOP tends to be low) or glaucoma (in which IOP is always elevated). Therefore, tonometry should be performed on any eye which is reddened, has discharge, is painful (blepharospasm in dogs or cats; lethargy in cats), has corneal opacity ("cloudiness"), vision loss, altered pupil size (anisocoria), or altered pupillary light reflexes. Once you have diagnosed uveitis or glaucoma, tonometry is one of the most important things to do at every recheck to guide adjustments in drugs administered and their dosages.

The Tono-Pen and the TONOVET

The availability of the easily-used and reasonably-priced tonometers such as the Tono-Pen Vet™ and the TONOVET™make measurement of IOP easy in all species, particularly cats. For both techniques, the patient is minimally restrained so as not to artificially raise IOP via direct pressure on the jugular veins or the globe itself. For the Tono-Pen but not for the TONOVET, a drop of topical anesthetic is applied to the corneal surface. I like to rest the hand holding the Tono-Pen onto the hand holding the eyelids or onto the patient's head itself and gently touch the central cornea with the Tono-Pen tip using minor "tremor-like" blotting or kissing movements. Particular attention should be paid to the "approach angle" of the Tono-Pen tip to the cornea so that the tip's flat surface is parallel to the corneal surface. This is best achieved by viewing the interface between the cornea and the tip from the side. The "reliability" (coefficient of variance) of the result should be 5% or tonometry should be repeated.

The TONOVET is a rebound tonometer which ejects a small probe at a fixed distance from the cornea and assesses the motion of the probe as it returns to the instrument after rebounding from the cornea. The probe should be held about 6 mm from the cornea and held horizontal (parallel with the floor). Eyes with higher IOP cause a more rapid deceleration of the probe and a shorter return time to the instrument.

This technique is affected to some degree by corneal thickness and ocular surface tension, and therefore should be performed before application of any topical medications, including topical anesthetic. Tono-Pen applanation tonometers are probably less susceptible to erroneous readings attributable to these variables than are the rebound tonometers. However, unlike the Tono-Pen the TONOVET has been calibrated for normal dogs, cats, and horses, allowing the operator to select the correct calibration curve for each species. Because of this species-specific calibration in normal animals, the TONOVET tends to estimate IOP very close to true manometric pressure. In contrast, the internal calibration curve of the Tono-Pen has been optimized for humans, not animals, and although the IOP estimates with this instrument are highly correlated with manometric pressure, the Tono-Pen applanation tonometer tends to overestimate pressure at lower IOPs and underestimate IOP at higher pressures.

Interpreting IOP

Across large populations, normal canine and feline IOP is reported as approximately 10-20 mmHg. However, significant variation is noted between individuals, technique, and time of day. Comparison of IOP between right and left eyes is therefore critical to interpretation of results. A good rule of thumb is that IOP should not vary between eyes of the same patient by more than 20%. The obvious application for tonometry is the diagnosis of glaucoma where IOP is generally elevated. However tonometry is also used to diagnose uveitis (in which IOP is lowered) and conjunctivitis (in which IOP is normal). Perhaps the most important role for tonometry is the monitoring and adjustment of therapy for.

WSV - 051

STRATEGIES TO PREVENT ALLERGIC DERMATITIS

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Some of the most common clinical complaints in veterinary medicine have an underlying allergic basis or share similar pathomechanisms of disease. Clients often ask why are we seeing so many pets with allergies in our generation. Several factors have changed from the days where the farm dog who was fed table scraps, kept in an outdoor dog house and never vaccinated never developed allergic dermatitis. The closing genetic pool of popular dogs, housing pets indoors as part of a family group, and development of multivalent vaccines are three factors that will result in up to 8 out of 10 members of a litter developing allergies and being constantly kept above their allergic threshold while the other 2 members of the same litter display no signs of allergic disease.

A) GENETICS

Nuttall (2012) and Bizikova et al (2015) summarized from the results of multiple studies that the development of allergic disease may be attributable to complex alterations in up to 54 genes (e.g. Canis familiaris chromosome 5 (CFA5), plakophilin 2 (PKP2), PTPN22, cytochrome P450 26B1, TSLP, PROM1 and RAB3C gene, etc.) that are involved in innate immunity and inflammation, cell cycle, apoptosis, barrier formation and transcription regulation. Shaw et al (2004) estimated the heritability rate of allergic dermatitis in Labrador and Golden retrievers from a study in the United Kingdom to be approximately 47%. They determined that mating of two allergic individuals can lead to 70-80% of the litter being affected with allergic dermatitis, while mating one allergic and one non-allergic will result in only 30-40% being predisposed to developing allergies. Hence, it stands to reason that purebred dogs are most predisposed as breeding non-clinical carrier pairs may result in a significant percentage of the litter being affected. The breeds with the highest number of diagnosed atopic animals are, in no particular order: boxer, Chihuahua, Yorkshire terrier, Chinese Shar-Pei, West Highland white terrier, Lhasa Apso, shih tzu, Dalmatian, pug, Boston terrier, golden retriever, Labrador retriever, cocker spaniel, Bull Terrier, Bichon Frisé, Tibetan Terrier, English and French bulldogs.

Genome-wide association studies have shown that allergic tendencies also vary with breeds within different geographical locations and may explain differences in clinical presentations and response to treatment.

Understanding the genotype will allow clinicians to better predict which treatment options work better in certain breeds and which breeds may not respond as well. Ideally, genotyping will help to identify young dogs with an atopic tendency so that implementation of environmental management and minimization of immunostimulation will help to reduce their risk of developing clinical atopic dermatitis.

Practice Tip: OUTCROSS
Based on the above information, a breeding strategy of outcrossing allergic breeding stock (breed an allergic to a non-allergic) may help dilute and lower allergic tendencies closer to that of mating of two non-allergic individuals (0-11%).

ENVIRONMENT

Allergens are introduced into the body via four main routes: inhalation, injection, ingestion and percutaneous absorption across a defective epidermal barrier. Individuals with allergic tendencies respond to commonly encountered substances in a hyper-reactive manner as a result of alteration to their ancestral microbiome. Feehley et al (2012) summarized that in humans, sanitation, antibiotic use, endoparasiticides, high fat (Western) diets, cesarean birth, formula feeding (devoid of Transforming Growth Factor-□) all alter normal immune system maturation decreasing immunoglobulin A (IgA) and T regulatory cell (Treg) production, leading to a shift toward the allergic T helper 2 cells (Th2) and their pro-allergic cytokines. This is highlighted by the increased prevalence of allergies in urbanized regions of Western society in compared to individuals in rural environments with two or more pets/animals. The beneficial effects of good bacteria and other microorganisms have been termed the “Hygiene Hypothesis” by Strachan in 1989. Rook et al (2003) modified the concept of “Hygiene Hypothesis” to “Old Friends Hypothesis”, focusing more on the positive effect of “friendly” microbes that interact with regulatory systems and keep our immune system in balance, and that sterilization may lead to chronic inflammatory diseases ranging from asthma and eczema to even more debilitating conditions such as type 1 diabetes, multiple sclerosis, some types of depression and cancer.

Supporting the notion of “Old Friends Hypothesis”, Hesselmar et al (2013) found 3X less eczema at 1.5 and 3 years of age in children whose parents sucked their soothers to clean them in comparison to those that had their pacifiers boiled or rinsed with tap water. Based on differences in salivary microbiota between the groups, the authors concluded that oral commensal microbes were transferred from parents that helped establish “Old Friends” in their immune environment shifting them away from allergic tendencies.

They also noted that natural child birth provided additive protection as compared to children born by Cesarean Section.

Environmental contributions to atopic dermatitis dogs have also been investigated. Similar to humans, a reduced risk for developing atopic dermatitis was noted in puppies being fed a noncommercial (and possibly microbe-rich) diet during lactation, in dogs that had an endoparasite burden, and in dogs living in northern rural environments with low annual rainfall.

Research, mainly done in humans, reveals that exposure to house dust mites and storage mites may result in damage to the epidermal barrier and promotion of inflammation. For instance, release of mite proteases increases epithelial permeability by degrading occludins, claudin and the tight junction protein zonula occludens as well as mite cysteine allergens facilitating the actions of serine proteases by degrading a1-antitrypsin compromising the epidermal barrier and resulting in increased percutaneous absorption of environmental allergens.

Non-IgE dependent mechanisms by which mites promote inflammation include the release of mite serine proteases that are potent activators of protease-activated receptor 2 (PAR-2) in human keratinocytes and lung epithelial cells, and may directly induce mast cell, basophil and eosinophil degranulation with the subsequent release of IL4 that stimulates a T-helper-2 response. Studies in dogs have also revealed the release of inflammation promoting granulocyte macrophage colony-stimulating factor (GM-CSF), IL-8/CXCL8 and tumour necrosis factor alpha from a canine keratinocyte cell line in response to mite antigens. Dust mite proteins also inhibit a T-helper-1 response by removal of the a-chain of the IL-2 receptor, an impairment of IL-12 secretion thus shifting the balance toward a T-helper-2 response.

Not only do mites release proteases but insect, fungal, and pollen extracts also have proteolytic activity that degrade tight junction proteins and enhance the development of a T-helper-2 response. Oxidative stress induced by environmental allergens can also result in the release of IL-8, IL-6 and tumour necrosis factor promoting inflammation. Lastly, smoke exposure has been correlated with an increased incidence of atopic dermatitis in dogs; the exact mechanism is still under investigation.

Practice Tip:
Try to avoid sterilizing our pets' environments during puppyhood by allowing natural birth and nursing when possible, and perhaps considering a later date of puppy sale so that natural mechanisms of immune defense can be passed along from the bitch via grooming and lactation.

If this is not possible, the use of PROBIOTICS may be warranted in those dogs may not have had natural exposure beneficial bacteria and for those dogs with greater tendencies toward allergic disease. An excellent review by Özdemir et al in 2013 presented several mechanisms by which probiotics help to modulate the immune response including:

1) Maturing Gut Barrier by probiotic regulation in intestinal epithelium and upregulation of host immune responses
2) Immunomodulation of the Th1/Th2 balance, IgE and cytokine production
3) Anti-Inflammatory effects on serum inflammatory parameters
4) Development of tolerogenic dendritic cells
5) Immunoregulation by T regulatory (Treg) cells
6) Lymphocyte subpopulations shift from CD4/CD25 to CD8
7) Toll-Like Receptor (TLR) stimulation

The authors also compiled numerous studies in humans that exist supporting the use of probiotics taken by individuals to help minimize clinical signs with existing allergies, as well as perinatal probiotics to prevent allergies in predisposed families.

Marsella in 2009 evaluated the efficacy of Lactobacillus rhamnosus strain GG for the alleviation or prevention of clinical signs of atopic dermatitis (AD) in genetically predisposed dogs. Two adult Beagles were bred twice, with a year between breedings. Lactobacillus rhamnosus GG was administered to the bitch during the second pregnancy and to the puppies of the second litter from 3 weeks to 6 months of age.

In comparison to the non-treated group, the second litter treated with probiotics had a significantly lower serum titer of allergen-specific IgE and milder reaction to intradermal testing, compared with the first litter. Hence, early exposure to Lactobacillus rhamnosus GG (LGG) significantly decreases allergen-specific IgE and partially prevents atopic dermatitis in the first 6 months of life. In a three-year follow-up after discontinuation of probiotics, Marsella et al (2012) noted that early exposure to probiotics had long-term clinical and immunological effects.

A pilot randomized double blinded placebo-controlled evaluation by Yamazaki et al (2019) evaluated Enterococcus faecium SF68 (Fortiflora®) as adjunctive therapy for adult atopic dogs that were controlled on oclacitinib (Apoquel®) over a 12-week supplementation period. The expectations were that concurrent use of probiotics would result in an oclacitinib dose reduction in the treated patients. Unfortunately, both the treated and placebo group were not able to reduce their use of oclacitinib during the study despite supplementation. As well, there were no significant difference in CADESI-04 and PVAS scores any of the 21 treated or placebo-controlled client-owned dogs with atopic dermatitis. Interestingly, patients in the placebo group responded better most likely due to more aggressive topical management of secondary infections. Perhaps other strains or probiotics (e.g. Lactobacillus acidophilus 21 (Ygia14®) may provide better immune modulatory effects and increased production of bioactive metabolites that can inhibit cell-to-cell communication in pathogenic bacteria to prevent and treat the infection that may contribute to inflammatory response in atopic patients. Other products that contain the refined and concentrated bioactive metabolites also show promise.

When evaluating research on probiotics, realize that mixed results in atopic patients may stem from the disease/condition that is being treated or prevented, the severity of the disease, the study design, the length of the study, compliance of the owners, the probiotic strain-specific effects and the quality of the probiotics. In a review by Weese et al (2011) of 25 probiotics on the human and veterinary market, only two products provided accurate bacterial content and label accuracy – Prostora (Iams) and Fortiflora (Purina) – both veterinary products. Several other veterinary probiotics were not assessed (Florentero (Candioli), Juvita Pro-B (Zoetis), Ygia14 (Ygia)), however, the study does highlight the need for owners to scrutinize the product quality before embarking on a long course of supplementation.

VACCINATIONS

Vaccines stimulate the production of protective antibodies against common bacteria and viruses. Unfortunately, stimulation of the immune system at the time of vaccination can also results in sensitization to food antigens (Tater et al 2005) and environmental allergens (Frick et al 1983; HogenEsch et al 2002) in allergy-prone dogs. Scott-Moncrieff et al (2002) also demonstrated that vaccines resulted in an increased production of anti-thyroglobulin antibodies, which in turn may lead to hypothyroidism.

Practice Tip

I therefore take precautions when vaccinating patients with allergic tendencies as follows:
i) Vaccinate outside of the pet's allergy season (e.g. midsummer or winter time = lowest allergen load)
ii) Move to a 3-year rotating vaccination protocol with labeled and licensed 3-year vaccines
iii) If not able to move to 3-year rotation, split-up vaccine injections by 2-4 week intervals (i.e. give rabies vaccine by itself, and follow 4 weeks later with the next set of vaccines)
iv) Consider titers in dog with severe reactions to vaccine as sanctioned by the World Small Animal Veterinary Association [VacciCheck (Biogal Laboratories) and the other is called TiterChek (Zoetis)]
v) Consider pre-/post-vaccination use of anti-inflammatory medication to prevent reactions
vi) If vaccinating in a peak allergen season, consider minimizing exposure to environmental allergens (e.g. keep puppies in a "clean room" – no carpet or plants, use of HEPA filters, isolate indoors, etc)

DIET

Currently the top food producing food allergens in North America includes beef, dairy, lamb, wheat corn, chicken and rice. Potential reasons that our pets are recognizing these common proteins found in most commercial dog foods may be a result of vaccine-induced sensitization to dietary antigens during the puppy booster series. Tater et al have demonstrated that allergen-specific IgE levels increase to food antigens being fed in allergy-prone dogs immunostimulated by prophylactic vaccines for at least three (3) weeks post-vaccination and subside to normal pre-vaccination levels in 8-9 weeks. Imani et al proposed that human vaccines induce the expression of IgE mRNA through the activation of an antiviral protein kinase. In a large Swedish study, Nooedtvet et al in 2007 noted that feeding a home-made diet to the bitch during lactation was found to decrease the likelihood of her offspring developing canine atopic dermatitis by 50% in three high-risk breeds, namely West Highland White Terriers, Boxers, and Bullterriers. Whether it was due to a reduction in allergen load or perhaps the presence of bacteria that promoted the "hygiene hypothesis" has yet to be elucidated.

Practice Tip

Based on the potential for sensitization to foods being ingested at the time of booster vaccinations during puppyhood, I typically advise the lactating bitch and puppies a homecooked "sacrificial protein" be fed during this stage of a dog's life especially in breeds with a predisposition toward allergies. Once the pet reaches adulthood and vaccines occur annually or less frequently, then switch to a different protein source; for example, start with a lamb-based diet in puppyhood, then move to a fish-based diet into adulthood.

After puppyhood, only alter the pet's diet when signs of adverse food reactions are noted to help preserve the pool of future novel protein sources.

ALLERGY PREVENTION RECOMMENDATIONS and PUPPY PACK

1. Outcross allergic breeding stock
2. Avoid Caesarean section when possible
3. Allow puppies to nurse for as long as possible
4. Avoid over-sterilization of the puppies internal and external environment
5. Minimize allergen exposure the week after each booster vaccinations
6. Minimize over-stimulation with vaccines
7. Feed a homecooked sacrificial protein during puppyhood to both the lactating bitch and pups mature pups.
8. Puppy Pack recommendations for dogs with allergic tendencies:

A. Epidermal barrier repair products
B. Omega 3 and 6 fatty acids (dietary and supplemental)
C. Mild cleansing shampoo to be used with COOL to COLD water
D. Probiotics (use only reliable veterinary source)

Using these strategies will help to minimize development of allergic disease in our pets. Obviously, clinical signs can develop despite these efforts. The earlier the treatment including allergen specific immunotherapy to address environmental allergens after the patient has experienced an entire allergy season, the more favourable the long-term outcome.

Suggested Reading:

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Marsella R, et al. Early exposure to probiotics in a canine model of atopic dermatitis has long-term clinical and immunological effects. Vet Immunol Immunopath, 2012;146(2):185–189.

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Özdemir Ö, et al. Preventative and Therapeutic Probiotic Use in Allergic Skin Conditions: Experimental and Clinical Findings. BioMed Research International, 2013, Article ID 932391, 17 pages. doi:10.1155/2013/932391

Rook GA, et al. Innate immune responses to mycobacteria and the downregulation of atopic responses. Curr Opin Allergy Clin Immunol. 2003;3(5):337-42.

WSV - 036

CASE-BASED STUDY OF ZOONOTIC DISEASE

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Pets play important roles in many peoples' lives and there is increasing evidence of positive health, emotional and social benefits of pet interaction. Yet, every animal harbours potential zoonotic pathogens, and some degree of zoonotic infection risk is inherent with pet ownership or other pet contact. As it is increasingly apparent that pets are important parts of the family both emotionally and microbiologically, efforts to minimize zoonotic disease risks while maximizing benefits are critical. Zoonotic pathogen exposure is an ever-present risk in veterinary medicine. Veterinarians play important roles in prevention and control of zoonotic infections. Further, while diagnosis of management of human disease lies within the realm of human medicine, veterinarians can provide important input to ensure that zoonotic infections are considered and to facilitate the physician's approach to the human patient.

All animals harbour multiple zoonotic pathogens; however, risks posed to people vary. Zoonotic diseases risks are generally low, but risks can be heightened in situations based on the pet (e.g. reptiles), person (e.g. immunocompromised) or interactions (e.g. management practices). Of particular concern is individuals whose immune systems are compromised because of age (i.e. <5 years of age or >65 years of age), physiologic state (e.g. pregnancy), disease or treatment (e.g. immunosuppressive therapy). "Immunocompromised individuals" do no belong to one clear and distinct group, as the degree of compromise can be highly variable between individuals, as well as within the same individual over time. Nonetheless, people with suboptimal immune systems have some elevated degree of infectious disease risk compared to the general population, but may also have the greatest benefits from pet interaction. To provide optimal guidance for zoonotic diseases, veterinarians must have a broad range of knowledge that includes understanding of the pathogen (e.g. sources, routes of transmission, disease), animal management practices, preventive measures for the animal species and for specific pathogens, and the role of the animal in the household (to help discuss cost-benefit), among other important factors.

A consideration of all of these is required to help owners select pets, identify optimal management practices, reduce the risk of zoonotic infection and understand disease risks.

Examples of cases and issues that may be discussed are provided below

A 10 yr old boy is presented to a physician with fever, rash and arthritis. After apparent clinical resolution following symptomatic therapy, the signs recur and the child is referred to an infectious diseases physician. The child has an unremarkable medical history and has had no previous problems. Upon further questioning, it is identified that the family had acquired a pet rat a few weeks prior to the onset of disease. The child had suffered a 'very minor' bite and had been licked by the rat. Things to consider include:

- What disease(s) might be of concern?
- Is this rat a potential source of disease?
- What factors may have contributed to disease?
- What should be done in this household to investigate the causes?
- What should be done to prevent this from recurring?
- What information should be provided by the veterinarian as part of this situation?
- Whose responsibility is it to provide current or prospective pet owners about zoonotic diseases and infection control practices?
- A client brings in their healthy, 4 yr old Pekingese for a wellness examination. The client is chatty and during conversation, she mentions that she had lost her spleen in a car accident a few years earlier:
- Is this of concern?
- What does the absence of a functional spleen do to the risk of zoonotic infections?
- What pathogens are of particularly concern?
- Is this information relevant enough to be recorded (and if so, how)?
- Are there are recommendations that should be made to the owner?
- Does this change your approach to management of this patient?

A pediatric oncologist calls you about a 5 yr old patient that is undergoing chemotherapy for leukemia. The family has 4 cats, 2 indoor and 2 outdoor. All are healthy, according to the information he has, but he has had a discussion with the family about the risks of toxoplasmosis since this child is highly immunocompromised:

- What are the concerns regarding toxoplasmosis in this individual?
- Are cats an important source of Toxoplasma?
- What is the likelihood that these cats pose a risk?
- What should be done with the cats?
- What should the owners be told?
- What else should be considered in this household?

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TOP TIPS FOR ANOREXIC CATS

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1. Hyporexia/anorexia is never a primary problem; the underlying cause must be identified

2. Fear and stress can inhibit appetite in hospitalized cats
a. Use feline-friendly handling techniques
b. Provide a hiding place in the hospital cage
c. Have the owner bring familiar bedding, bowls, etc from home
d. At admission, record body weight, body condition score, muscle condition score; weigh at least daily
e. Have a method to record actual amount of food eaten daily, estimate of water consumption, estimate of urine volume, fecal quantity and score, vomiting
f. Don't try to introduce a new diet while the cat is still hospitalized; feed a diet the cat is known to prefer
g. Don't offer food if nausea is present; wait until nausea is controlled (see table)
h. Have a consistent feeding routine; limit handling during feeding and cage cleaning (consider spot cleaning)
i. Provide non-medical interactions

3. Know how much to feed
a. Resting energy requirement estimate: 30 x body weight (kg) + 70; adjust as needed
b. Re-evaluate: if the patient is not eating at least 75-85% of RER daily, institute nutritional support; check serum cobalamin, supplement if required.

4. Advice for owners
a. Offer fresh and favourite foods
b. Small frequent meals in a quiet location; may need to isolate cat for feeding in a multi-cat home
c. Enhance smell by adding flavoured broth, moisten food
d. Encourage to eat with petting and praise; use hand-feeding
e. Warm food to just under body temperature
f. Teach owners to measure food intake: weigh dry food bowl morning and evening, keep track of amount of canned food eaten

5. Drug therapy
a. Appetite stimulants (see table): not effective in every patient; may not restore adequate food intake, monitor food intake daily; best for stress-induced or mild hyporexia, to find out if cat can tolerate food after surgery, transition to home; once a cat is totally anorexic, drug therapy seems less effective
b. Gastric acid blockers (H2 blockers, proton pump inhibitors) are rarely indicated in cats, no anti-emetic or appetite-stimulating effects

6. Assisted feeding
a. When to start assisted feeding
i. Anorexia/hyporexia three days or more (count from the first day owner noticed decreased food intake)
ii. Rapid weight loss (>10%) over a short period of time
iii. Eating <75-85% of RER daily
b. Syringe feeding, hand feeding: difficult to ensure sufficient food intake, can only feed small volumes at a time (oral capacity of the cat is 1-2 mL), may be stressful for the cat, potential for injury to cat and person feeding.
c. Nasogastric/nasoesophageal tube feeding:
i. Inexpensive, easy to place, may only require light sedation
ii. Best for short term use, difficult to maintain at home, can be dislodged by the cat
iii. Ideal for trickle feeding
iv. Liquid diets only: most liquid diets are not balanced and can only be used for a few days
d. Esophagostomy tube feeding:
i. Easy to place with equipment such as the MILA tunneller for esophagostomy tubes, short period of anesthesia required to place.
ii. Almost any diet can be blended with water and used
iii. Comfortable for the cat, able to eat with tube in place
iv. Long term use possible
v. Use with esophagostomy tube collar (e.g., Kitty Kollar) instead of bandages

Anti-emetic and appetite stimulant drugs for cats

Drug	Dosage	Comments
Anti-emetics		
Metoclopramide	0.2 – 0.4 mg/kg SC, PO q 8hr 1 – 2 mg/kg/day CRI	Poor anti-emetic in cats, not recommended
Maropitant	1 mg/kg IV, SC, PO q 24 hrs	Inhibits substance P binding to NK-1 receptors
Ondansetron	1 mg/kg, PO, SC, IM, slow IV q 6-8 hrs	5-HT3 receptor antagonist
Appetite stimulants		
Capromorelin: Entyce (Aratana)	1-3 mg/kg PO q 24 hrs	Ghrelin receptor agonist
Cyproheptadine	1.0 – 2.0 mg/cat PO q 12-24 hrs	Do not give with mirtazapine (can be used as antidote for serotonin syndrome)
Mirtazapine	1.88 mg/cat PO q 24 hrs Give q 48 hrs in liver or kidney disease	5-HT3 receptor antagonist Appetite stimulant & anti-emetic
Mirtazapine transdermal: Miratаz (Kindred Bio)	Apply 1.5 inch (~2 mg) to inside of pinna q 24 hrs (wear gloves); alternate ears	
Phenothiazines: Prochlorperazine, chlorpromazine	0.1 – 0.5 mg/kg SC q 8hrs	Centrally acting via multiple mech-anisms May cause sedation

Resources

1. *2012 AAFP/ISFM Feline-Friendly Nursing Care Guidelines: https://catvets.com/guidelines/practice-guidelines/nursing-care-guidelines*
2. *2011 AAFP/ISFM Feline-Friendly Handling Guidelines: https://catvets.com/guidelines/practice-guidelines/handling-guidelines*
3. *WSAVA Global Nutrition Guidelines: https://www.wsava.org/guidelines/global-nutrition-guidelines*
4. *Clinician's Brief – Nasoesophageal and Nasogastric Tube Placement: https://www.cliniciansbrief.com/article/nasoesophageal-nasogastric-tube-placement*
5. *Clinician's Brief – Esophagostomy Feeding Tubes: https://www.cliniciansbrief.com/article/esophagostomy-feeding-tubes*

WSV - 358

MY APPROACH TO NON-HEALING CORNEAL ULCERS IN DOGS AND CATS

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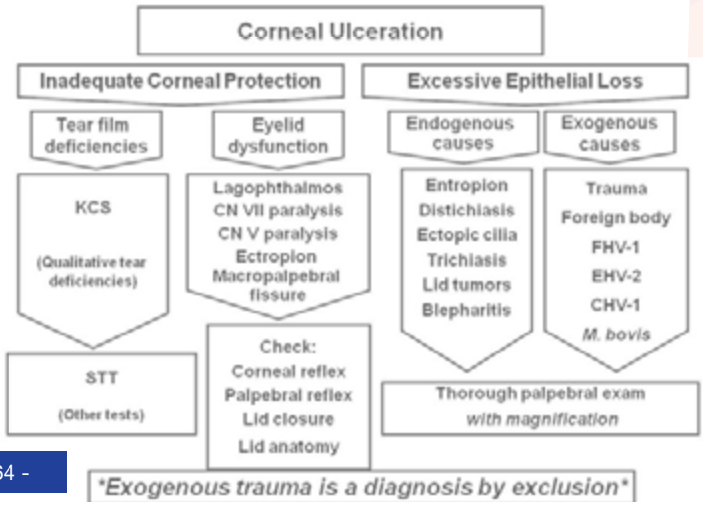
Introductory Philosophy

When an ulcer hasn't healed at the first recheck, there is a tendency to throw up our arms and become frustrated. However, ulcers within this group have actually helped us by identifying themselves as "complicated ulcers" with one of only 3 causes possible in dogs and one of only 2 causes possible in cats.

Reasons Feline and Canine Ulcers don't Heal
Based upon their clinical appearance including their fluorescein staining pattern, nonhealing ulcers can be defined as likely due to one of three causes in dogs:
The primary cause is still present
It is an indolent ulcer (also known as Boxer ulcers or superficial chronic cornea epithelial defects – SCCEDs)
It has become bacterially infected

The thought process is even simpler for cats. Because cats do not get SCCEDs, there are only 2 reasons an ulcer has not healed in cats – the primary cause is still present (and feline corneal ulcers are considered to be due to feline herpesvirus (FHV-1) until proven otherwise), or the ulcer has become bacterially infected.

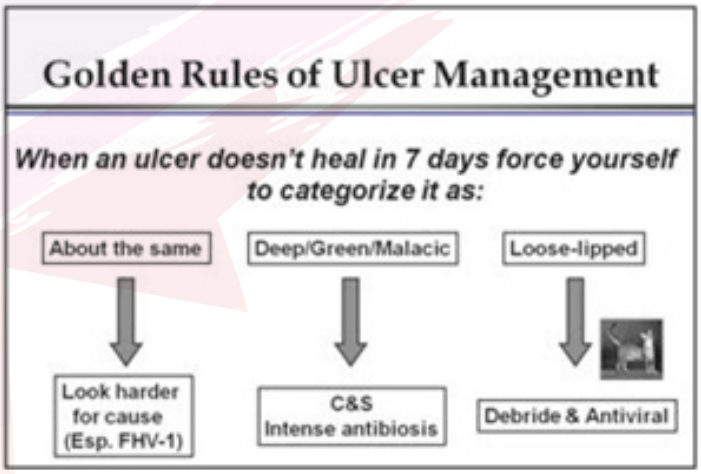
Fortunately, each of the ulcer complications has a characteristic appearance:
Ulcers in which the primary cause is still present typically appear like simple ulcers but remain chronic. That is, they don't necessarily worsen; they just don't heal. This should stimulate a detailed search for all of the known causes of ulcers (Figure 1)

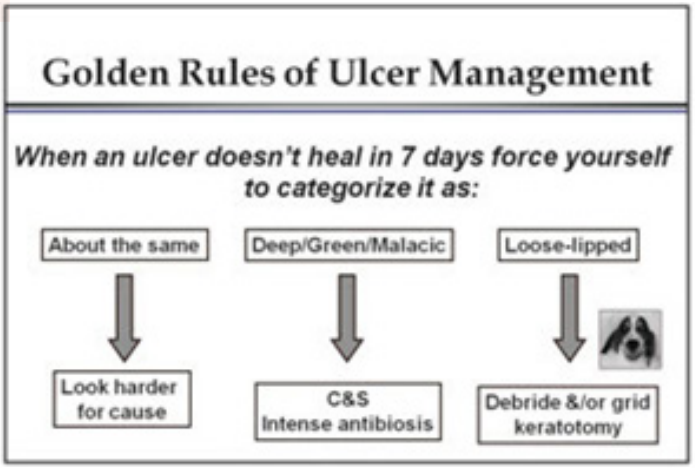


Indolent ulcers as defined by the failure of epithelium to adhere to stroma due to a primary adhesion defect are seen in dogs only, typically boxer dogs or corgis of any age or older dogs of any breed. By definition, they are superficial, uninfected, chronic (or will become chronic), and have a lip of redundant non-healing corneal epithelium that is easily debrided with a cotton-tipped applicator (CTA). This lip often produces a characteristic "halo" fluorescein staining-pattern due to leakage of stain under the non-adherent lip. They arise from a failure of replicating and migrating epithelium to complete the final step in healing – to adhere to the underlying stroma via the epithelial basement membrane. Diagnosis is reliant on characteristic signalment, chronicity, appearance and staining-pattern of the ulcer, as well as the ease with which the epithelium is manually debrided with a CTA.

Bacterially infected ulcers have one or more of 3 features in any combination - stromal loss (i.e., the ulcer is deep), corneal malacia (or "melting"), and/or infiltration of the stroma with white blood cells (which turns the stroma yellow-green).

Using these guidelines, Figure 2 outlines an algorithmic approach to nonhealing ulcers in dogs and cats.





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USING NUTRITIONAL ASSESSMENT OF DOGS AND CATS IN CLINICAL PRACTICE

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Incorporating nutritional assessment into patient care is critical for maintaining pets› health and their response to disease and injury. WSAVA lists nutritional assessment as the 5th vital assessment (after temperature, pulse, respiration and pain assessment. The American Animal Hospital Association (AAHA) guidelines for nutritional assessment are explained in the WSAVA Global Nutrition Committee toolkit (https://www.wsava.org/nutrition-toolkit). Nutritional assessment includes consideration of animal-specific factors, diet specific factors, feeding management, and environmental factors.
Animal specific factors include age, lifestage, activity, and nutrient sensitive disorders requiring specific dietary management (e.g. chronic kidney disease, obesity).
Diet specific factors include the safety and appropriateness of the diet and include nutrient imbalances, spoilage, and contamination. The feeding of an unbalanced homemade diet or a poor-quality commercial diet would be noted under this part of the assessment.

Feeding and management factors include the frequency, timing, location and method of feeding. Feeding management includes over- or under-feeding, feeding of treats, scavenging and hunting. Environmental factors include the pet's housing, presence of other animals, access to the outdoors, and environmental enrichment.

Screening Evaluation

The nutritional assessment has two parts: a screening evaluation and when needed, an extended evaluation. The screening evaluation should be performed for every pet at every visit as part of routine history taking and physical examination. It includes a diet history, body weight, body condition score, muscle condition score, and evaluation of the coat and teeth.
Body condition scores (BCS) using a 9-point scale show relatively good repeatability. Lower numbers indicate cachexia and higher numbers indicate obesity. For dogs 4 to 5/9 is ideal; 4/9 would be appropriate for leaner breeds (e.g. Greyhounds) or working dogs. For cats 5/9 is ideal. Body condition charts include profile and "top-down" pictures and verbal descriptions. Body condition is determined using a combination of visual appearance of the cat or dog, e.g. is a waist apparent, and palpation, e.g. the amount of fat over the ribs.

The BCS evaluates body fat; however, it is possible for a pet to be overweight but still have muscle loss. This is particularly seen in diabetic and other ill pets. Diseases can cause loss of muscle mass disproportionate to the loss of fat due to the cytokine and neurohormonal effects on metabolism. Muscle mass scoring systems are based on palpation of skeletal muscle over the skull, scapulae, spine and pelvis. Animals with no muscle wasting are scored as a 3, those with mild wasting are scored as 2, moderate wasting is a 1, and a 0 represents severe wasting.

Every pet should leave the hospital or appointment with a dietary recommendation, which should be written on a discharge sheet along with other instructions, e.g. for medications. If no change is recommended, the owners should be advised that the current diet is adequate and appropriate.

Extended evaluation

An extended evaluation should be performed if nutrition-related risk factors are found or suspected based on the screening evaluation or medical assessment. Additional animal factors in an extended evaluation include changes in food intake or behaviour such as problems with prehension or swallowing, changes in the amount of food eaten, and changes in the coat or skin e.g., dryness or alopecia. The diagnostic work up would usually include a minimum data base (haematology, serum chemistry, urinalysis and blood pressure) as well as other tests as indicated, e.g. serum folate, cobalamin, iron, taurine, T4, or feline/canine specific pancreatic lipase. The effect of nutrient wasting diseases such as diabetes mellitus or protein losing enteropathies should be considered, as well as medications that may affect serum electrolyte concentrations or appetite.

Diet factors in an extended evaluation include the food's caloric density. The provision of additional foods, e.g. treats, table food, food given to administer medications, and successful hunting or scavenging, should be evaluated for their effect on the diet balance and the caloric intake. If disease conditions exist which may be due to contamination of the food, testing should be performed.

The diet should be assessed to determine if it is complete and balanced. Some commercial diets are meant to be treats; they should be labelled a "complementary" food and not be fed as the sole diet. Foods which are complete and balanced should have this stated on the label.

Therapeutic diets may be indicated, and the use of the correct diet should be checked. Not all patients with a disease, e.g. hepatic, renal, or cardiac disease, need to be on a commercial therapeutic diet labelled for that disease. A concurrent disease may take precedence for diet choice or the diet may not be appropriate for that individual pet, e.g. some diets for liver disease are protein restricted, which is only appropriate when hepatic encephalopathy is present. In early (IRIS Stage 1) chronic kidney disease, an early renal diet or senior diet may be more appropriate than a severely protein restricted diet.

Diets should be appropriate for the lifestage of the pet. There is no life stage dietary profile for geriatric cats or dogs, and they should be fed as individuals as no single type of diet is suitable for all older pets.
Diets should be formulated to meet European Petfood Industry Federation (FEDIAF), Association of American Feed Control Officials (AAFCO), or National Research Council (NRC) nutrient requirements. Generally commercial foods use FEDIAF or AAFCO requirements. Ideally, appropriate feeding trials of commercial diets have been performed. The reputation and research of the company are also important. If the owner is feeding a homemade diet it should be evaluated to see if it is complete and balanced.

Feeding management factors in an extended evaluation include: who feeds the pet, are there multiple pets resulting in either competition or pets getting a diet which is only appropriate for one of the pets (e.g. everybody fed a renal diet). Environmental factors include the activity of the pet, whether it lives indoors, outdoors or both, availability of water (e.g. can an arthritic dog get upstairs to the bowl?), and access to the litter box (e.g. is one cat guarding the box, can the arthritic cat get into the box?). Stress due to other cats within the household or cats outside the house looking in a window, negative interactions with family members, especially children, or being left alone for long periods of time have an impact on the health of cats. Dogs may show competitive eating, coprophagy or obesity due to environmental factors.

An example of the effects of environmental factors has on feline health is that indoor confinement and inactivity are risk factors for overweight and the development of diabetes in cats, whereas feeding dry food is not a proven risk factor. Another example feeding management is feeding cats with feeding balls increases activity and decreases food intake.

Feeding management plan

Following the assessment, a written dietary and feeding management plan should be developed and provided to the owner. The plan depends upon whether the animal is healthy or ill and if it is to be hospitalized. Some factors that need to be considered include the animal's energy needs, protein requirements, special dietary needs for disease (e.g. kidney disease, diabetes mellitus, dietary sensitivity), nutrient losses via diarrhoea, urine (proteinuria, glucosuria) and chest or abdominal drains.
The owner should be taught to monitor the pet's weight and BCS, and adjust food intake appropriately. These factors should be considered at every veterinary appointment, and the type and amount of food changed as needed. It is usually recommended that diet changes take place over 5 to 10 days.

The owner's needs should be considered, e.g. if they work full time, feeding multiple times per day may not be feasible. Where treats and snacks are part of the owner's relationship with the pet, advice should be given for appropriate treats and the amount should not exceed 10% of the calorie intake. Asking an owner to completely stop feeding treats may result in poor compliance; better to accept that treat giving will occur and advice what will work for the owner and pet.

Feeding management may include weighing or, less ideally, measuring the amount of food. Many cats do well on free choice feeding, which mimics their natural frequent feeding pattern of 10 to 12 mice a day. Overweight cats may require meal feeding as they may over-eat even a low-calorie food with free choice feeding. Most dogs are fed meals once to several times per day. Other factors include the location of feeding, and how other pets and humans influence eating, such as conflict with another cat or toddlers dropping food. Environmental enrichment may also include increasing the predictability of the animal's life or increased opportunities for play or exercise.

When the pet comes into the clinic, all the veterinary healthcare and reception team are important for promoting the importance of nutrition. As noted by the American Animal Hospital Association, "Best results are achieved when every member of the pet's health care team - from practice owner to pet owner - pulls together to provide the best health care for the pet".

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INCREASING PRACTICE REVENUE THROUGH PERCEIVED VALUE

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I would like to begin this discussion of Delivering Perceived value to veterinary clients and support employees, by making a very simple statement; The veterinary practice which you own, manage or are employed by, is a representation of ownership, support staff and their combined relationship with the clientele. The level of veterinary medicine being delivered is representative of the owner and support staff's commitment to a joint veterinary medical delivery philosophy. In turn, the practice's clients are largely comprised of those individuals who feel accept with the practice's medical philosophy, services available and fees charged.

On arrival at the veterinary practice, new patients should begin to enjoy the service experience from the parking lot through the reception and intake and continuing consistently through the professional and compassionate health care delivery and persists through paying the invoice and departing the practice facility. Those who don't experience a positive reaction, will leave shortly seeking a practice that best represents their own preferences in veterinary care and service.
What makes this viewpoint so applicable to the veterinary industry is that the business aspect of veterinary management interacts with a special emotional bond between humans and animals in the delivery of the veterinary service

To effect change within an industry significantly influenced by emotional relationships, it takes a full commitment of the whole veterinary practice team. If one is not satisfied with the financial performance of their practice or there is a negative impact arising from increasing competition, it is not a simple matter of making a change like decreasing professional fees, but rather, a real shift in the practice's health care delivery philosophy.

"A shift that is not just adopted by the doctors themselves, but rather by all the practice employees in combination."
In considering how or what shifts have to take place, let's first address three very important factors about the veterinary industry that are influencing today's market place;

1. Fragmented Industry

In particular over the last fifteen years, the veterinary industry has evolved, but when one looks at the individual practices, I am going to suggest there has been no significant differentiation from one practice to the next. Most companion animal practices continue to be owned and operated by one to two veterinarians, practicing from premises comprising of 1,500 to 2,500 square feet, offering similar treatment plans, vaccinations, soft tissue surgery, dentistry, prescription pet food and of recent, undefined "wellness examinations". The doctors and staff wear uniforms or casual clothing with little or no branding and an over-abundance of "stock websites" which barely describe the veterinary practice and their defined veterinary health care delivery philosophy.

How does the pet owner choose their veterinarian to preserve their companion family member's health and who is going to make their pet better when it becomes sick or injured?

This environment of little differentiation is referred to in economic terms as a "fractured industry". To the consumer, every vendor is viewed as providing essentially the same service, from roughly the same type of building, using the same equipment and being assisted by the same type of people. In this type of economic environment, the client has no other choice but to make their decision based on price, which reacts with downward pressure on fees. As competition increases, as we have seen, the intensity of downward pressure on fees also increases.

2. What Do Veterinarians Sell?

The question,"What do veterinarians sell?" is a favorite question I ask most veterinary groups I talk to because, invariably the common answer is "veterinary medical attention, medicines, drugs, prescription food, etc." and yet, in my view, nothing can be further from the truth. The average pet owner does not understand what the animal is trying to communicate to them about their wellbeing, health or how much pain they may be experiencing. Thus, the client is placing their trust in the veterinarian to correctly diagnose and interpret their pet's condition and health needs. Most importantly, the client is looking for expert medical leadership in assisting the pet owner in how best to medically treat the animal, make them well again and stop hurting. In very simple terms, veterinarians sell a relationship based on trust and leadership.

A relationship based on trust and leadership is founded on effective communication, and when I see veterinary practices enjoying consistent revenue growth, I consistently see effective communication patterns being enjoyed throughout the practice.

3. Who is the client?

One cannot establish a relationship and effectively communicate with another, unless and until they have gathered information about who the other person is. In the veterinary industry, statistically we know who the client is and which can best be described as follows:

Female
Aged 35 – 55
Career Minded
Independent
Resourceful
Family banker
Health care supervisor

Knowing and understanding the client makeup is important to get to the Hello Stage, however when it comes to the relationship building, one must build the relationship based on inquiry into and understanding of the client expectations as well as clearly communicating veterinarian expectations of responsible pet ownership.

Once the trust relationship between the practice and the client has been established through various actions and effective communication, the ongoing doctor-client relationship moves forward with the Perceived Value flowing from the client's experience in the delivery of veterinary health care and their interaction with the practice facility, the support staff and the veterinarian themselves. When the client leaves the building with bill in hand, there is an immediate assessment of perceived value received. If Perceived value has been "enjoyed" in line with the invoice, the client will return with client compliance increasing in line with frequency in client visits and naturally average transaction fees.

Delivering Perceived Value diminishes clients' focus on fees, increases compliance and serves as the basis for future referrals.

4. What is Perceived Value?

Perceived Value is the customer's opinion of their experience with a product or service. It may have little or nothing to do with the product's actual market value but rather "value" in this instance depends entirely on the product's or service's ability to satisfy the customer's envisioned service requirements.

Once the consumer has recognized receiving perceived value, the trust level increases dramatically in turn motivating the client to return and accept health care recommendations. In short, the client diminishes their "fear of fees" and begins to relax knowing they and their pet are receiving the attention they require to maintain the veterinary relationship.

So, let's stop for a moment and go back to where we began this discussion. The veterinary practice reflects the collective relationship the owner and support staff share with the client.

If clinic's revenue is growing by double digits and the number of active clients in the practice is continuing to increase each year, I would suggest these are two great indicators the practice is delivering perceived value to their clients. For practices where revenue is remaining constant or decreasing, unfortunately the consumer is reacting to the lack of delivering perceived value as it once enjoyed. Perhaps there has been a shift in the client base and the practice didn't shift in a timely fashion. In order to continually meet the ever-changing expectations of the client, the veterinary practice has to continue to work on their client / practice relationship. "Working" in this instance, means maintaining an ongoing communication with the client; continually assessing their experience in the delivery of veterinary medicine, and reacting in a timely fashion in order to keep the experience innovative and fresh.

Perceived Value Inventory List

Increasing Perceived Value begins with knowing who the client is, and what is important to them.

1. Begin and continue the ongoing practice analysis by completing various (receptionist) surveys of who your clients are:

Sex
Age
Computer savvy
Career orientated / work hours
Family pet, children replacement
Working hours / days off
Their relationship with their pet
Compliance

2. Continually examine the physical space confirming the front entrance, reception, examination rooms, bathrooms exceed the expectations of the client.
3. Do reception staff meet the expectations of your clients and is there a "relationship" with these integral members of your staff?
4. Does your reception reporting system provide data with regards to how many telephone calls are received at various times during the day? Do reception staff exemplify the medical delivery philosophy representing the veterinarian and the support staff?
5. Does your reception have a reporting system to capture any negative reaction to the services? Is there a process to address any social media reviews (particularly negative ones)?
6. What discussion topics do reception staff engage clients to confirm the client's experience?
7. Does your practice know the top five reasons why clients visit the clinic and is there an ongoing attention to these five service delivery aspects?
8. How often does your practice extend a "Wow" experience to clients as opposed to offering price discounts?

9. What is your client's compliance rate with respect to recommended medical procedures, diagnostics and pet nutrition?
10. What is your practice's client screening process? How many clients do you refuse or terminate in a year?

How Can Your Practice Increase Perceived Value?

1. New Client Interviews
2. Animal Owner's Manual
(What can the owner expect with respect to health care for their animal, and how can they reduce their risks.)
3. Confirmation of practice "Health Care Philosophy"
(What you do and do not believe in):
- Alternative Modalities
- Vaccinations
- Prescription Food
- Raw Food

4. Reception Area should be treated like the living room of the client, from fresh decorating, furniture placement, color and noise. Fresh flowers and current "short story" magazines, medical resource area, including internet links, library books, etc. add to the "experience" with your practice.
5. Treat surgery as if you are doing surgery on the client's child, including written instructions, assignment of staff member, ongoing communication.
6. Monthly "New Client" Open House Meetings

Robin Sharma says do something every day to improve your practice one percent (1%). Can you imagine if your practice were to improve by 365% after a year?
Jim Rohn, an internationally acclaimed motivational speaker once said; "If you don't like the life you are living, change it and you, yourself, will change". If you don't like financial fortunes of your veterinary practice, change what you have been doing, and your practice, itself will change".

Robin Sharma, another internationally acclaimed leadership speaker suggests, improve your business every day by one percent (1%) and after a year you would have improved your business by 365%. What would your veterinary practice look like if you were to improve it by only a hundred percent (100%)?

DELIVERING VALUE TO EMPLOYEES

In today's employment market, particularly within the veterinary industry, one of the biggest challenges is attracting and retaining great support staff. Employee costs within a veterinary practice approximate between twenty and twenty four percent of gross revenues and when there are ineffective staff employed, the actual cost is astronomical! The average number of years worked for a practice by a qualified Animal Health Technologist is five years. Here's what Shawn McVey of McVey Management Solutions says;

"How your staff feel about working at your practice can impact your business performance by 20 – 30%."

"Roughly 50 – 60% of how employees feel about the practice can be traced to the actions of one person … the leader."

Again, we come back to the topic of Leadership that I spoke about in delivering value to the client. Whereas the client looks to leadership in advising the client on how best to medically treat the animal, the employee looks to the leader to inspire them to contribute to the business success. I have not met an employee yet who didn't simply want to do their best in doing their job. Give an employee opportunity to learn and to enjoy their work in a welcoming work environment, and compensation consideration will rank lower in the list of priorities. Like clients, employees have a Perceived Value of their working relationship with the practice and it begins with great leadership.

What is Leadership?
A book entitled "The Leadership Challenge" by Kouzes & Posner suggests the following five practices will lead to great leadership and I am going to suggest, by implementing each of these practices, you will in turn improve your relationship with employees;
1. Model the Way
Set the example by aligning actions with shared values. Great leaders are always asking for help.
2. Inspire a Shared Vision
Envision the future by imaging exciting and enabling possibilities.
Enlist others in a common vision by appealing to shared aspirations.
3. Challenge the Process
Experiment and take risks by constantly generating small wins and learning from the experience.
4. Enable Others to Act
Foster collaboration by building trust and facilitating relationships.
5. Encourage the Heart
Recognize contributions by showing appreciation for individual excellence.
As the owner and Leader, I believe you deliver value to employees by taking the time to determine what employees aspire to achieve and providing inspiration for them to achieve it.

I see a lot of similarities in the inter-relationship between clients and employees. They both come to the business in search of Perceived Value. In both cases, delivering value rests upon on the developing a relationship founded on trust and leadership and recognizing that relationships cannot exist unless there is open and honest communication.

Respecting and treating employees as if they were clients, will foster a strong relationship between the veterinarian and support staff, which will also improve your delivery of Perceived Value to the clients and in turn increase revenue and profitability.

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LUNG ULTRASOUND AND CONFIRMING PERICARDIAL EFFUSION

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Introduction

There are 5 key structures that can be identified during thoracic VPOCUS of the pleural space and lungs in healthy animals: Bat sign, Glide sign, A lines, B lines, Curtain sign.

Patient Position, Probe Selection and Settings for Thoracic VPOCUS

Patients can be in sternal (preferred position for dyspneic patients), standing or in lateral recumbency (the latter is reserved for patients that are not experiencing respiratory distress). Dorsal recumbency should be avoided.

Similar to VPOCUS of the abdomen, shaving is not required, the fur is parted, and alcohol is used as the coupling agent. Depth for pleural and lung ultrasound is generally set at 4-6 cm in most cases. A 6-10 MHz (7 MHz) microconvex probe is generally used. Remember that the two key enemies of ultrasound, bone and air, are encountered when performing ultrasound of the pleural space and lung. This is advantageous as bone and the subsequent rib shadowing provides landmarks to work with, and artifacts are often present when the ultrasound beam encounters air. These artifacts change depending on the underlying status of the lung and pleural space. Assess the patient to decide which clinically important binary questions need answering first. Make sure a thorough evaluation for the specific underlying pathology is undertaken for each question asked.

Normal Findings on Thoracic VPOCUS

Bat sign/Gator sign: When the ultrasound probe is placed over the lung and perpendicular to the ribs we can see the rib heads, rib shadowing, and the pleural line. The image obtained is called a “bat sign” or “gator sign” as the rib heads and pleural line resemble the wings and body of a bat, or a gator’s eyes peaking above the water line, respectively. Identifying the Bat sign assists novice sonographers in locating the pleural line; the first white line below the rib heads. The pleural line is essential to identify as it is the interface between the parietal pleura of the thorax and the visceral pleura of the lung, and is location we assess for most pleural and lung pathology.

Indolent ulcers as defined by the failure of epithelium to adhere to stroma due to a primary adhesion defect are seen in dogs only, typically boxer dogs or corgis of any age or older dogs of any breed. By definition, they are superficial, uninfected, chronic (or will become chronic), and have a lip of redundant non-healing corneal epithelium that is easily debrided with a cotton-tipped applicator (CTA). This lip often produces a characteristic “halo” fluorescein staining-pattern due to leakage of stain under the non-adherent lip. They arise from a failure of replicating and migrating epithelium to complete the final step in healing – to adhere to the underlying stroma via the epithelial basement membrane. Diagnosis is reliant on characteristic signalment, chronicity, appearance and staining-pattern of the ulcer, as well as the ease with which the epithelium is manually debrided with a CTA. Bacterially infected ulcers have one or more of 3 features in any combination - stromal loss (i.e., the ulcer is deep), corneal malacia (or “melting”), and/or infiltration of the stroma with white blood cells (which turns the stroma yellow-green).
Using these guidelines, Figure 2 outlines an algorithmic approach to nonhealing ulcers in dogs and cats.
Glide sign visualized as a shimmering along the pleural line (pulmonary-parietal interface), which represents normal to-and-fro motion of the lung sliding along the chest well during respiration. This normal.
There are two key rules to remember when assessing the glide sign: 1) the lining of the lung (visceral pleura) MUST be in contact with the thoracic pleura (parietal pleura) to create the shimmer of the glide sign and 2) the patient must breathe to create the shimmering glide sign.
A-lines: A stands for air.
Air is located below the pleural line when the lungs are filled with air and when there is air in the pleural space which occurs with pneumothorax. Therefore, A lines are seen with normal lung and when a pneumothorax is present.
A lines are horizontal white lines equidistant from the skin surface to the pleural line that project through the far field of the ultrasound image.
They are a type of reverberation artifact that occurs when ultrasound beams are reflected back and forth between the probe and pleural line due to the presence of air below the pleural line

B-lines:

Hyperechoic streaks originating from the lung surface of the pleural line, extending through the far field without fading, and swinging to-and-fro with the motion of the lung during respiration.
B lines occur as the result of air and fluid in proximity to each other at the lung surface.

The presence of a small number of isolated B-lines may be normal in healthy dogs and cats (noted in 10-30% of patients). Up to 3 at a single site can still be normal. Anything more than 3 B lines at a single site is associated with pathology.
Key criteria to identify a B line (ALL criteria must be present):
*Vertical white lines
*Originate at the lung surface
*Moves with the pleura
*Extends to the far field
Obscures A lines if present
Curtain sign (figure 5): The caudal border of the thorax is located by identifying the curtain sign; the transition between the thorax and abdomen, which is easily seen with sonography (see figure below).

Pneumothorax

It is essential that patient positioning and the underlying pathology be considered when it comes to diagnosing pleural space pathology.
Air and fluid accumulate in different regions of the pleural space depending on the position in which the patient is evaluated.
Fluid tends to accumulate in the most gravity dependent areas while air tends to rise to the non-gravity dependent areas of the pleural space.
There are 3 key findings that help identify the presence of a pneumothorax, two are exclusion criteria, one is an inclusion criteria.

Pneumothorax appears as the absence of a glide sign. The presence of a glide sign rules out pneumothorax with confidence. Lack of a glide sign should prompt consideration of pneumothorax but a glide sign is not always easy to identify, even in healthy patients.
The presence of B-lines excludes pneumothorax at those focal probe placement sites because B-lines originate from the lung surface.

Finding a lung point confirms a pneumothorax on that side of the thorax. If the glide sign is not seen and there is strong suspicion of a pneumothorax a search for the lung point should be undertaken as identification of the lung point is pathognomonic for a pneumothorax.

The presence of a glide sign excludes pneumothorax at the probe placement site, as the presence of a glide sign requires contact of the surface of the lung with the chest well (air or fluid in the pleural space will prevent the lung from contacting the chest wall and prevent shimmer of the glide sign from occurring).

Sonographically locating the most sensitive thoracic site to diagnose pneumothorax in a standardized manner:
Air will accumulate at the most caudal dorsal portion of the thorax when the patient is sternal recumbency or in the standing position.

Sternal is the preferred position in which to scan acutely dyspneic patients as it minimizes respiratory distress and subsequently the work of breathing associated with restraining the patient in lateral recumbency.
Identify the most caudal-dorsal site, which is the most sensitive site for air to accumulate with the patient in sternal, and also the region that has the most lung movement making it easier to identify a glide sign.

Defining the lung point:

If the glide sign is identified with confidence it rules out pneumothorax. Unfortunately, it is not always easy to identify a glide sign with confidence. If this is the case, a pneumothorax can be confirmed by identifying the lung point.
The lung point is defined as the site within the thorax where the lung recontacts the parietal pleura and creates an intermittent glide sign within half the ultrasound beam when the patient breathes. It is the exact point within the thorax where there is a return of the glide sign: movement of the probe from an area where there is no perceived glide sign, to an area where the glide sign reappears intermittently within a region of the ultrasound image. To find the lung point slide the probe cranially and ventrally until you note a point of lung reconnecting with the thorax wall OR you see a glide again.
In patients with extensive pneumothorax, there will not be a lung point if the lung does not recontact the parietal pleura on that side of the thorax. Most of these patients are sufficiently dyspneic to justify thoracentesis without the need to confirm a lung point.

Pleural effusion

The presence of a glide sign excludes pleural effusion at the site of probe placement, as the presence of a glide sign requires contact of the surface of the lung with the chest well (air or fluid in the chest cavity prevent the lung from contacting the chest wall).
Pleural effusion appears as the absence of a glide sign with anechoic fluid between the chest wall and the hypoechoic lung, or as anechoic triangles adjacent to the heart and outlining the diaphragm (outside the pericardial sac).
The two pleural VPOCUS techniques used to identify pleural effusion include 1) subxiphoid window and 2) the transthoracic windows in the ventral regions of the thorax
Patient positioning is important to consider when searching for pleural effusion and different techniques are required to identify small quantities of fluid with patients in lateral vs. sternal/standing positions.
In lateral recumbency, fluid accumulates at the widest gravity dependent sites of the thorax, generally at the pericardial window.
In sternal recumbency (preferred position to scan acutely dyspneic patients), effusion will accumulate ventrally.

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MEDICAL MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA

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Introduction

Benign prostatic hyperplasia (BPH) is a common disease of intact male dogs. It is expected that nearly all intact males will have prostate enlargement associated with advanced age. While neuter will resolve the condition completely by way of removing androgens associated with prostatic tissue activity, many circumstances exist in which surgery is not the best option for the patient. Medical treatment in uncomplicated cases of benign prostatic hyperplasia is often successful and should be a consideration depending on the clinical health of the dog, surgical risk for the individual, and the function or occupation of the animal.

Indications for Medical Treatment

Given the recent interest in the impact of gonadectomy on both male and female dogs relating to a variety of non-neoplastic and neoplastic conditions, many veterinarians have shifted their original views of gonadectomy as being an “easy” choice relating to general health and well-being of the animal involved[1]. While a large amount of study remains to be pursued, several papers have suggested a possible link to increased incidence of orthopedic, cancerous, behavioral, and autoimmune conditions[2,3]. Depending on the breed, age, and other predispositions, it is important to consider whether the presence of testosterone may have a favorable presence for some conditions for that individual. Additionally, many owners with high performance animals, such as working dogs, express concern for an observed decrease in their animal’s ability to perform its job. Breeding dogs and show dogs are often preferred intact for current or future exhibitions and breeding plans. Owners may also have cultural or religious concerns regarding surgical alteration of their animals.

Aside from the predispositionary viewpoint, a clinician may also find themselves opting for medical therapy because of other risk factors for this dog. If the doghas a known significant surgical risk, such as a heart condition, it may be preferred to suppress the hormonal status rather than elect for a surgical option. Additionally, medical therapy may provide an option for temporary management if surgery is preferred but cannot be pursued due to the animal’s current condition, but is desired in the future.

If the animal is an optimal surgical patient, and the owner would like to pursue castration to resolve the condition, this is the best option for permanent resolution with no need for regular medication or follow-up. In some cases, castration may be required for resolution, despite medical attempts.

Diagnosis

Classic BPH signalment is in middle-age to older intact male dogs. It has been demonstrated that 50% of dogs have histologic evidence of BPH by 5 years of age[4]. Neutered dogs are generally not affected by BPH or subsequent prostatitis. While some breeds appear anecdotally more commonly affected, such as the German shepherd dog, all dogs are at risk for developing clinical BPH.

History alone may give a clinician a high suspicion of BPH as a possible diagnosis. Hematuria is commonly noted incidentally by the owner and brought as the primary concern. The owner may describe stranguria, or noting pulsatile, long urination as compared to previous urinary patterns. In extreme cases, the prostate may be large enough to cause flattened stools or difficulty defecating.

On physical examination, prostatic enlargement can sometimes be palpated transabdominally, especially in larger males with significant prostatic enlargement. Digital rectal exam should reveal a bilobed prostate, which is generally symmetric, smooth, and non-painful. In larger dogs, the prostate may be easiest to palpate when the non-dominant hand is used to pull the prostate toward the rectal examination hand transabdominally.

The most useful sample to assess prostatic health is prostatic fluid during semen collection or prostatic wash. The third fraction during canine ejaculation is normally clear, but is often red, pink, or orange in color in dogs with prostatic concerns. Visual observation can be supportive evidence, but centrifugation of this sample to collect cellular components into a pellet is excellent practice, in order to concurrently evaluate for possible prostatitis as part of the disease process. Culture of the prostatic fluid may also better define involvement of prostatitis as part of the prostatic enlargement.

Imaging can be performed to support diagnosis of BPH in a patient. Radiographs and ultrasound can both be useful tools, though ultrasound is preferred for measuring the prostate, evaluating for cystic changes, and evaluating echotexture. Ultrasound measurements can be performed by longitudinal or transverse approach transabdominally, but it is advised to perform multiple approaches to optimize accuracy of measurements[5].

Treatment

Dogs with BPH need only be treated if symptomatic, or if cystic disease is present on ultrasound. Presence of prostatic enlargement is considered a normal finding in older intact males. Severe BPH may be responsive to medical therapy, but the best candidates for long-term medical treatment are those with milder ultrasonographic findings.

Medical therapy includes regular oral administration of 5-a reductase inhibitors. This family of drugs will prohibit conversion of testosterone to dihydrotestosterone (DHT)[6]. DHT is the primary modulator of growth and secretory prostatic function, so by reducing conversion, the hyperplastic nature of the prostate is decreased at a cellular level in both men and dogs with BPH[6].In the United States, the most inexpensive and commonly available 5-a reductase inhibitor is finasteride.

Initially, finasteride dosing for medium and large dogs is advised at 5mg every 24 hours, while smaller dogs may receive 2mg daily with positive clinical response. While undergoing initial treatment, once daily oral dosing is advised for the first three months. Ultrasonographic assessment should be repeated at this time, and dosing frequency reduced to every other day or twice weekly if prostatic health is improved and size is reduced. Rechecking patients every 3 months should be performed until stable clinical picture is observed on a given regimen; at this time, frequency of assessment can be reduced to every 6 months. 5-a reductase inhibitorshave no significant side effects reported in dogs and can be tolerated safely long-term, and are recommended as long as the dog remains intact. Removal of medications will result in return of clinical prostate disease.

Surgical management of BPH may be required in refractory cases, or non-responsive cases. The best and most effective option for resolution of BPH is castration[6]. Reduction in prostatic size after the removal of hormones is expected within 2-3 months.

Impact on Fertility

The prostate contributes a large component of the fluid relating to the normal canine ejaculate. As a result of reducing prostatic activity and secretory function, the ejaculate will often become more concentrated, and prostatic fraction may be reduced or absent. Varied opinions exist as to whether drugs should be reduced or spared temporarily to increase ejaculatory volume for natural breeding, however, samples for artificial insemination and collection for cryopreservation should not be negatively impacted. No impact on daily sperm production or fertility have been documented in dogs[6].

Conclusions

Benign prostatic hyperplasia is a common diagnosis in dogs worldwide. The disease may be non-clinical and found incidentally on examination or through diagnostic testing, or it may present clinically and require treatment. While surgical treatment should be a first-line option for treatment for most patients, medical management can be an excellent alternative to resolve the clinical signs or disease risk for developing subsequent prostatitis.

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STATE-OF-THE-ART LECTURE: MANAGEMENT OF ORAL TUMORS

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Oral tumours in dogs and cats are commonly malignant. The approach to the initial work up and treatment are very important for a successful outcome. A lot of oral tumours are discovered during dental prophylaxis. This is because the halitosis caused by the oral tumour may be the catalyst that makes the owner seek a dental. Dental prophylaxis is also the best opportunity to fully examine the oral cavity as many dogs and cats will not allow a full examination when they are awake.

It is important to have a plan to systematically work up an oral mass if one is discovered during dental. When an oral mass is found, a great first step is to take digital radiographs for the patient file. This will help to monitor if there is any growth in the mass and also to help communicate the size, shape and location of the mass to any other veterinarians seeing this pet. The next step is to call the owner to discuss this finding. An incisional biopsy should be recommended to determine the definitive diagnosis. Cytology can also be considered, but if the patient is under anesthesia, an incisional biopsy should be performed to give the best chance of a definitive diagnosis. Whether or not to proceed with the dental prophylaxis should be discussed with the owner. There are pros and cons to this approach. Some owners might prefer to determine the diagnosis before the additional costs of a dental prophylaxis, while others may want to take the opportunity to complete the dental prophylaxis when their pet is under anesthesia. For patients that present for an oral mass, the principles are the same, an incisional biopsy is recommended to achieve a diagnosis. This can often be done under heavy sedation.

The most important step is taking an incisional biopsy to determine the diagnosis. In general, an incisional biopsy, rather than an excisional biopsy recommended. It is tempting the shave the mass off or to attempt to fully remove it. However, this strategy may lead to issues when planning a definitive treatment if this is a malignancy. The oral mucosa has a strong potential to heal quickly, and in cases where an oral mass has been removed by an excisional biopsy, the site of removal may not be evident by the time that the histopathology report is back. This can be problematic when trying to plan a wide resection of the tumour to include bone or radiation to the site because there are no landmarks of the previous mass. Another great idea is to take digital photographs of the mass when the patient is under anesthetic or sedated. This will help greatly with planning surgery and discussing a plan with clients. Especially in cases where the patient does not allow for oral examination when awake.

Other diagnostic tests to consider when working up an oral mass include dental radiographs, bloodwork, three-view thoracic radiographs for staging and lymph node aspirates. Also, don't forget to do a rectal exam! The tumour type will dictate the staging that is necessary. The primary differential diagnoses for malignancies include malignant melanoma, fibrosarcoma, osteosarcoma and squamous cell carcinoma. Benign oral masses that are common in dogs include epulides and gingival hyperplasia. Except for gingival hyperplasia, all of these oral masses will require wide or radical excision, likely including bone if they involve gingiva. Lip or tongue masses may be managed with wide excision of soft tissues (lip excision or partial glossectomy). In cats, squamous cell carcinoma is the most common oral tumour, with osteosarcoma another relatively common tumour type.

Part of staging for oral tumours will include a CT scan of the head and thorax for local and distant staging and for surgical planning.

Dogs:

Maligant melanoma is the most common oral tumour in dogs. It commonly metastasizes to regional lymph nodes and lungs, but can also spread to the parenchymal organs in the abdomen or other sites. Larger size, evidence of vascular or lymphatic invasion on histopathology or a mitotic index of >5 (# of mitotic figures per hpf) are associated with shorter survival times. Aggressive surgery is recommended when feasible for tumour control, which often involves the removal of the tumour and >1cm margins of normal tissue and bone around the tumour. If aggressive surgery is not feasible, a marginal excision combined with radiation or radiation alone can be considered Hypofractionated radiation is the preferred treatment course for melanoma, which usually involves weekly doses of radiation for 4 weeks. It is extremely well-tolerated and although it does not afford a cure, this tumour type responds well to radiation in 80% of dogs, with MST of 210 days. The MST for melanoma depends on the tumour size, with reported survival times of 630 days, 240 days, and 173 days for tumours that are <2cm, 2-4cm, and >4cm, respectively.

Death is usually due to metastatic disease if a form of local control is employed. Immunotherapy of differing types is being pursued for malignant melanoma in dogs, with encouraging results. A tyrosinase vaccine (Oncept) may allow improved survival times over traditional treatments, particularly in dogs with local disease control. One study reported a median survival time of more than 500 days in dogs with stage I-III disease, with a one-year survival rate of >75%. Chemotherapy is generally not recommended for melanoma as it has not been shown to improve survival times.

Squamous Cell Carcinoma (SCC) is the second most common oral tumour in dogs. These tumours tend to be locally aggressive, with a low metastatic potential. This means that with wide surgical excision, there is the potential to cure a lot of these patients, with a reported one-year survival time of 94% with surgical treatment. Rostral, smaller masses that are more amenable to surgery will have a better prognosis. Tonsillar SCC is a more aggressive form of this disease, with a high metastatic potential. One peculiarity of this disease is that it often metastasizes to the draining lymph nodes and often mandibular lymphadenopathy is the presenting complaint. Combination therapy with surgical excision, radiotherapy and chemotherapy is recommended for this disease, with a reported MST of 180-240 days. NSAIDs have been shown to have a beneficial effect for oral SCC. Piroxicam is often reported as a treatment for this disease. This is controversial, but I tend to recommend a selective NSAID rather than piroxicam due to the improved side effect profile with selective NSAIDS.

Oral fibrosarcomas are locally invasive but with a relatively low metastatic potential (20%). It is very important to keep a specific type of oral FSA on your radar called a high-low FSA. These tumours are biologically high grade and very aggressive locally and histologically low grade. This means that under the microscope, these tumours appear quite bland and may not be diagnosed as a tumour at all. They are sometimes read out as fibroplasia and/or inflammation. If you see this histopathological diagnosis in the maxilla of a medium or large-breed dog, keep you index of suspicion high. These tumours are extremely aggressive locally and it is difficult to achieve clean margins. The best chance of achieving clean margins is early diagnosis. These tumours are also not very radiation responsive, so aggressive surgery is the best chance of a successful outcome. The MST is 18 months with surgical treatment. Death is usually due to local recurrence.

Osteosarcomas are locally invasive and have a metastatic rate of around 50%, usually to the lungs. Wide surgical excision is recommended when possible. Follow up with radiation can be considered if clean margins are not achieved.

Chemotherapy with this disease is somewhat controversial as it does not metastasize in every case and may depend on the individual histopathology characteristics.

Acanthomatous ameloblastomas are locally aggressive and require wide excision with bone, but do not metastasize. If a marginal excision is used for treatment, one source reports a recurrence rate of 91% with a disease-free interval of only 32 days. Wide excision is typically curative.

Dogs do very well with mandibulectomy and maxillectomy. It is important to be in a facility that can provide a blood transfusion and 24-hour care. The mandibular and retropharyngeal lymph nodes are routinely biopsied during surgical excision for staging. This can result in a seroma, but otherwise does not cause any issues. Dogs that have mandibulectomy or maxillectomy require soft or canned food for one month post operativey and may require some assistance with feedings. I do not routinely place feeding tubes in dogs for these surgeries.

The most common oral tumour in cats is SCC. This can be a devastating disease in cats because it is difficult to achieve clean margins of excision. This disease is not very responsive to radiation alone, with MST reported in the order of 3 months. The current literature suggests that cats do not do well with maxillectomy or mandibulectomy. Although they do not do as well as dogs and the require more aggressive supportive care, successful outcomes are possible with maxillectomies and mandibulectomies in cats. A feeding tube must be placed at the time of surgery and these cats require more nursing care. A recent study by the author reports 8 cats treated with radical mandibulectomy for oral neoplasia. Six of these cats ate on their own within one month. The estimated mean survival time was 651 days, with three cats that lived over one year.

It is critical that primary care veterinarians and specialists work together to achieve an early diagnosis and the best possible outcomes in cases of oral tumours in dogs and cats. Most often, an incisional biopsy is recommended as the first step, followed by local and distant staging. In most cases, wide surgical excision via mandibulectomy or maxillectomy is recommended.

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EXOTIC ANIMAL PRACTICE TIPS

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Obesity is a common problem for all of the pets that we see. It can also be a problem with our exotic animal patients and can create issues with mobility, grooming, gastrointestinal issues and other medical problems. Obesity affects quality of life and longevity of our patients as well. Clients are often fascinated by seeing their hedgehog eat waxworms (which have an excessively high fat content) or their monitor eat live prey. Practitioners should counsel their clients not only about what should be fed but also how much and how often to feed and to encourage them to provide foraging opportunities for food to increase exercise and mental stimulation.

Collecting urine can be a challenge in small mammals and more so with herbivores that have a very large thin walled cecum making ultrasound and cystocentesis much more difficult and potentially dangerous. I recommend taking radiographs first to make sure that cystic calculi are not present (especially in guinea pigs) before gently manually expressing the bladder onto a clean plastic sheet or divider. Some small mammals will readily urinate when placed in a clear plastic box. Ferrets will readily urinate and defecate in the corner of the exam room or in the exam room sink.

Growing reptiles will shed regularly and often. Dry shed that remains on feet, legs and toes can cause constriction and necrosis of feet, digits and even tails. 3-5 minute soaks in a small amount of baby's bath warm water once per day during shedding can help to prevent this. Correct temperature and humidity for that species is also important to prevent dysecdesis.

Pain in reptiles can be evidenced by the dark beard, increased respiratory rate and stinting on palpation as seen in this bearded dragon who experienced obstruction secondary to the ingestion of many grasshoppers 3 months prior to presentation. The heads of the grasshoppers, which were not digestible, slowly made the way down the gastrointestinal tract until they became lodged as a group creating and obstruction. People will often feed inappropriately sized prey and vegetables, or too many prey items at once that can create obstruction in reptiles. Two examples are given here including the bearded dragon with the grasshopper heads and a bearded dragon with a large rectangular shaped piece of carrot that created an intestinal obstruction.

Reptiles frequently experience reproductive issues including pre-ovulatory stasis and egg binding. When they are having issues they will stop eating and may become lethargic if they are already suffering from environmental and nutritional inadequacies including a low calcium diet, inappropriate calcium:phosphorus ratio, or hpervitaminosis D. Advising owners to spay reptiles while they are young and healthy can be a good idea if they are not planning on using them to breed.

Nutritional Secondary Hyperparathyroidism in young reptiles, a very painful disease, can create significant deformities in those who survive as they become adults. This should be taken into consideration when opting to treat those that are severely deformed on presentation.

Many reptiles, and other species, can be tricked into staying still for radiographs by pacing their head in a plastic box. Because reptiles lack a diaphragm the best lateral radiographs are obtained by taking a standing lateral. When having digital radiography equipment installed you can have the company provide longer cables that allow you to place the detector plate in a vertical position so the radiograph can be taken with the reptile is in a standing position. This allows better visualization of lungs and air sacs and the ability to distinguish gas in the intestines from air in the lungs and air sacs.

-When taking radiographs of any exotic species it is important to take views that extend beyond the pelvis so that a diagnosis is not missed if a calculus is present in the trigone, pelvis or distal urethra.

-Iguanas and other reptiles are more easily intubated if slight pressure is put on the gular or dewlap area to elevate the trachea for better visualization. Intermittent positive pressure ventilation is needed during anesthetic procedures. For very small patients we replace the reservoir bag or rebreathing bag with a small balloon so the pressure they have to breathe against is lessened. It is important not to keep reptiles on pure oxygen during recovery from anesthesia as they need CO_2 to stimulate breathing. We use an ambubag to provide IPPV with room air as we are recovering them from anesthesia. A tongue depressor is used to stabilize the patient's head, endotracheal tube and its connection to the breathing tubes. To decrease torque on the patient's head the breathing tubes are secured to the table with tape.

Don't give up on the more difficult cases without trying as long as the owners know that you may not be successful but they still want you to try. The owners of this prolapsed hedgehog knew the prognosis wasn't very good because the tissue was already becoming necrotic. When it was discovered that it contained the reproductive tract a ventral midline incision was made and an exploratory/OVH was performed which saved the hedgehog.

Adult male guinea pigs often have hair and sebum trapped around the penis. Routine exams should include examination of this area to prevent future problems. Older intact boars are notorious for developing deep perianal crevices that will fill with old feces, sebum and hair. In this case the boar would come in with paper bedding trapped in the perianal folds.

Hands off exams can decrease the stress associated with being in the exam room and having the owner's help with this is essential. As we have become Fear Free at our practice with dogs and cats, we have implemented Fear Free techniques with our exotic patients too. Food is your friend when you are doing exams, weighing, ultrasound, acupuncture and even recovering sugar gliders from surgery to distract them from surgery sites.

Baytril injections can create damage to soft tissues. The effect is especially evident on light skinned reptiles. The lowest concentration possible should be used and it should be diluted with saline before being injected. I recommend a maximum of 1-2 injections before seeking an alternative route or antibiotic. The owner of this snake was given undiluted 100 mg/ml enrofloxacin by another veterinary clinic for the owner to inject the snake with daily and permanent damage to the skin is evident.

Guinea pigs not on a Vitamin C supplement can develop DJD quickly especially if they are not eating and have been on an improper diet for an extended period of time before they became ill. Be sure to supplement Vitamin C whenever a guinea pig is hospitalized or being boarded for more than a day or two. Counsel owners to provide Vitamin C daily in the form of a pill or tablet and to syringe feed a crushed tablet in water if needed. Vitamin C should not be put in the water.

Reproductive issues including uterine adenocarcinoma, hydrometra, pyometra, leiomyoma are common in small mammals and clients should be counseled to have them spayed preventatively. Many practitioners tell clients that anesthesia and surgery is too risky but it is a bigger risk to take a small mammal to surgery after it is ill than to do it preventatively.

Remember to examine the whole patient and not just the symptoms it presents for. This sugar glider came to us for a second opinion after it had been on antibiotics for 2 years for a periodontal infection. The issue was created because of a peri anal gland infection that caused the sugar glider to suckle on the anal area. The infection was treated and a hemimandibulectomy was performed to remove the lower incisors allowing the glider to live a more comfortable life.

Patients that are difficult to examine awake like hedgehogs that roll when scared can be placed in a clear plastic container for better hands off visualization.

ANY disease process or procedure that is considered painful in other species should be considered painful in all exotic species. Always provide analgesics before doing any diagnostic or other procedures if it is appropriate.

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EVIDENCE FOR CANINE REHABILITATION AND PHYSIOTHERAPY

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Introduction

Canine rehabilitation is a relatively new discipline with interest starting initially in the 1980's throughout the 1990's and resulting in the formation of the Animal Physical Therapy Association (APTA). The current practice now draws from the knowledge and skills of veterinarians, veterinary technicians, human physiotherapists and physiotherapy assistants. Many of us have experienced first hand the benefits of physiotherapy following injury and/or surgery and thus it would seem logical that our veterinary patients would experience the same benefits. That being said, there is a paucity of quality publications in the literature that provide strong evidence that rehabilitation is beneficial. With increasing client interest in veterinary rehabilitation, the availability of training courses for veterinarians and veterinary technicians and the recent formation of the American College of Veterinary Sports Medicine (ACVMSR), hopefully we see strong evidence supporting this practice. This evidence will move the discipline forward to better treat our veterinary patients and make rehabilitation an important option just like prescribing a medication or performing surgery.

Why is Rehabilitation Important?

Our veterinary patients are no different than the human population with regards to the need for rehabilitation. They experience injury and degenerative processes that result in changes in structure and function in the body. Our patients undergo surgery for fractures, ligament ruptures, neurological conditions and soft tissue excisions. They also are affected by non surgical soft tissue injuries and conditions such as obesity and osteoarthritis. Many of these conditions are devastating and complete recovery may not be possible but rehabilitation can help to improve day to day function and improve quality of life.

Benefits of Rehabilitation

The following are perceived benefits of rehabilitation:
- Increased speed of recovery following injury or surgery
- Improvement in quality of movement and performance
- Increased strength and endurance
- Improvement in flexibility and biomechanics
- Reduction in the incidence of future injury both due to restoration of normal biomechanics and through client/owner education
- Reduced pain
- Positive psychological effect for both the pet and for the owner
- Minimally invasive approach
- Minimal complications if administered properly

Rehabilitation Techniques and Modalities

Cryotherapy

When tissues are inflamed, pain management and rehabilitation starts with cryotherapy. Cryotherapy is an inexpensive and readily available modality that is effective for reducing swelling and inflammation for tissues that are chronically inflamed, recently injured or post operatively. It can consist of ice packs, ice wraps, and cold compression wraps and can be as simple as a bag of frozen peas a Ziplock™ bag with two parts water and one part alcohol or as complicated as a Game Ready™ cold compressive therapy unit. Using compression such as an elastic wrap can further decrease the temperature of the deeper tissues. Cryotherapy is most effective when inflammation is present.

Investigation of dogs undergoing extracapsular repair for cranial cruciate ligament rupture found that cold compression and cold compression with bandaging were found to be equally beneficial in reducing stifle swelling in the first 72 hours.1 Cold compression was applied for 20 minutes by wrapping the leg from the stifle to the hock with a large cold pack and holding it in place with an elastic bandage once daily. Another recent study reported that CCT decreased signs of pain, swelling, and lameness and increased stifle joint range of motion in dogs during the first 24 hours after TPLO.2

Therapeutic Ultrasound (TUS)

Therapeutic ultrasound has been used widely in human rehabilitation as being an effective treatment modality for rehabilitating musculoskeletal conditions such as restricted range of motion (ROM) resulting from joint contracture, pain and muscle spasm, and wound healing. Many protocols for the administration of US are based on tradition or extrapolated from basic science research and remain to be tested in controlled clinical trials.

Proposed Mechanism of Action

Energy within a sound beam decreases as it travels through tissue, because of scatter and absorption. Scattering is the deflection of sound out of the beam when it strikes a reflecting surface. The transfer of energy from the sound beam to the tissues is through absorption. Absorption is higher in tissues with high protein content and relatively low in fatty tissue. The creation of a thermal effect is a major indication for the use therapeutic US.

Increasing tissue temperature may increase collagen extensibility, blood flow, pain threshold, and enzyme activity, as well as mild inflammatory reactions, and changes in nerve

conduction

velocity. Treatment with US for 10 to 20 minutes at high intensities, skeletal muscle temperature and blood flow increase. Thermal effects of TUS can be effective in addressing scar tissue, joint restriction associated with periarticular structures, muscle spasm, and non-acute soft tissue injuries. Nonthermal effects of TUS can facilitate healing of acute soft tissue injuries and peripheral nerve injuries.

Low Level Laser Therapy (LLLT)

Over the past 6 or 7 years this modality has been gaining popularity for treatment of a variety of conditions in veterinary medicine. In 2015, it was estimated that close to 20% of veterinary hospitals in North America were using a therapeutic laser in their practice. This is likely due to an increased awareness and deployment of veterinary rehabilitation services, availability of educational resources on therapy lasers, and the development of products and protocols that have resulted in more consistent clinical outcomes. Laser therapy is considered a noninvasive, drug-free treatment option, providing clients with a nonpharmacologic treatment option. Quality research in the area of photobiomodulation in veterinary medicine is scarce. Much of the information advocating use of lasers is extrapolated from in vitro studies or from studies performed in other species. Published, well-designed studies are for the most part not available in veterinary species.

Proposed Mechanism of Action

It is proposed that LLLT modulates cellular functions by a process known as photobiostimulation. Therapy lasers induce a nonthermal interaction of monochromatic radiation with the tissues requiring treatment. The physiologic effect of this type of energy application on tissue is still not completely understood. LLLT has been reported to modulate various biologic processes, such as mitochondrial respiration and adenosine triphosphate (ATP) synthesis, to accelerate wound and joint healing, and to promote muscle regeneration. Acute and chronic pain control has been reported using this type of low-energy photon therapy. Treatment of chronic and acute edema, neurologic conditions, and postoperative care are some other popular conditions treated with laser therapy.

Indications for use of LLLT

The efficacy of LLLT remains controversial in veterinary medicine. Some veterinary studies have shown some promise for use of LLLT for preservation of cartilage properties, improvement in peripheral nerve injuries, and as a possible adjunct to managing pain in patients with osteoarthritis. Laser therapy may have some benefit in early wound healing.

Extracorporeal shock wave therapy (ESWT)

Extracorporeal shock wave therapy (ESWT) was initially introduced in human medicine in the early 1980s as a noninvasive method for reducing the size of nephroliths. Increasingly ESWT is being suggested as treatment for certain musculoskeletal conditions in humans and veterinary patients. Reported benefits include pain relief, antibacterial properties and improved wound, bone, tendon, and ligament healing. Proposed Mechanism of Action

The exact mechanism of action of ESWT is not well understood. One theory proposes that mechanical stimulation from soundwaves results in the expression of growth factors and cytokines involved in the healing process. ESWT applied to chronically injured tissues may restart the inflammatory process and facilitate healing by causing the release of inflammatory mediators. The proposed mechanism believed to be responsible for pain relief is related to increased serotonin activity in the dorsal horn, and descending inhibition of pain signals

Indications for use of ESWT

ESWT has been reported to be beneficial as an ancillary treatment in cases of osteoarthritis. One study reported improved weight bearing and passive range of motion are similar to results expected with NSAID treatment. On occasions when NSAIDs cannot be prescribed, extracorporeal shockwaves therapy may provide an alternative for treatment of osteoarthritic conditions. Anecdotal reports indicate that conditions affecting the elbow, hip, or back treatment of conditions may be more responsive to ESTW than other joints. Other reported indications for ESWT include delayed or nonunion fractures, wound management, tendinopathies and ligament injuries.

Evidence for the effectiveness of ESWT in treating dogs

with hip and elbow OA is equivocal. Dogs treated with ESTW for these conditions showed improvement with objective measures but were not statistically significantly better when compared to controls.3-5 Another group reported that dogs with elbow OA improved with ESWT is similar fashion to what would be expected when treated with a nonsteroidal antiinflammatory drug (NSAID), although these dogs were already receiving treatment for their arthritis, including NSAIDs.6

Electrical Stimulation (EStim)

Electrical stimulation (EStim) is commonly used in human physiotherapy to increase muscle strength, improve joint range of motion, re-educate muscles, and decrease edema and pain. There are both pain management and muscle stimulation modes for this modality. Transcutaneous electrical nerve stimulation (TENS) is commonly used to treat a specific area of pain or to stimulate a particular muscle in order to combat muscle atrophy. These TENS units are readily available, battery powered and inexpensive. Neuromuscular electrical stimulation (NMES) resulted in hypertrophy of the vastus lateralis muscle in dogs after induced muscle atriopy using immobilization in one study. Although there was no difference between dogs receiving NMES and untreated controls regarding thigh circumference, cross-sectional morphometry of vastus lateralis fibers of treated dogs was greater on day 90 compared with that observed at the time of immobilization and untreated controls. Treated dogs also had improved goniometric measurements 30 days after immobilization ended.7 TENS has also been investigated for treatment of osteoarthritic stifle pain and was shown to improve ground reaction forces in treated dogs but only for a short duration of 210 minutes.8

Hydrotherapy

Hydrotherapy in the form of the underwater treadmill is one of the most effective methods of providing controlled and targeted therapy for our patients. It's benefits in pain relief in postoperative, neurological, and chronic OA patients are a result of the effects of buoyancy, hydrostatic pressure and temperature. It provides safe, controlled, supportive and non explosive activity that is ideal for weight loss, hip dysplasia, FHO patients. The one unfortunate drawback of underwater treadmills is the expense, space requirement and maintenance of the equipment.

Therapeutic Exercises

The true gains made in any rehabilitation protocol are made through exercise. Most of the modalities mentioned previously are intended to provide better quality and more comfortable movement allowing our patients to exercise to regain strength, range of motion and muscle mass whose loss is associated with injury, disuse or chronic conditions. Unlike the underwater treadmill, these activities can be done with little financial investment with a bit of ingenuity and creativity. Activities as simple as walking and trotting over different inclines and terrain, walking over cavaletti rails, walking with resistance provided by water, elastic bands, sand, snow and sit to stand exercises are all exercises that can be incorporated in to a dry land rehab program. Many of these activities are essential to a well-directed home exercise program. Stairs, exercise balls and peanuts, orange safety cones and broom sticks can all be modified and used inexpensively to set up a dry rehabilitation area.

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DIAGNOSIS AND TREATMENT OF URINARY TRACT INFECTIONS

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Introduction

Urinary tract disease is commonly in dogs and cats, and a leading reason for antimicrobial use. Proper diagnostic and treatment plans are critical for optimal patient care and prudent (and effective) antimicrobial use. In human medicine, detailed guidelines are available and provide excellent guidance to physicians on management of various infectious diseases, including urinary tract infection. Practice guideline development is a relatively new phenomenon in veterinary medicine and is hampered by a relative lack of adequate research.

However, a combination of available data, general principles of infectious diseases and antimicrobial therapy and expert opinion have been used to develop preliminary guidelines for urinary tract infections.11 All urinary tract infections are not alike, and the approach to diagnosis and management can be different.
Sporadic bacteriuria cystitis Previous often referred to as 'simple uncomplicated urinary tract infection, sporadic bacterial cystitis is a more accurate term that highlights the presence of inflammation (as opposed to subclinical bacteriuria) and acknowledges that our understanding of complicating factors may be limited.

This category has been previously used to only describe patients that a) that are otherwise healthy non-pregnant females or neutered males; b) with no known urinary tract anatomical and functional abnormalities or relevant comorbidities (e.g. endocrinopathy, spinal disease); and, c) that have had fewer than 3 episodes of known or suspected urinary tract infection in the preceding year. However, patients with urinary tract abnormalities or comorbidities can develop sporadic cystitis and not necessarily be at substantially increased risk for complications or recurrence or have infections that are more difficult to treat. Initial or rare (<3 episodes of cystitis in the preceding year) sporadic cystitis in individuals with urinary tract abnormalities or comorbidities should be approached as is described here. Sporadic cystitis is rare in intact male dogs but should be approached as described here if there is no evidence of concurrent prostatitis.

Diagnosis is based on the presence of clinical signs of lower urinary tract disease and urinalysis, ideally with bacterial culture results. Urine culture is preferred for all cases but empirical therapy in lieu of culture can be justified in dogs with sporadic disease, particularly in animals with limited previous antimicrobial exposure and in situations where the likely pathogens and susceptibility patterns are well known. Diagnosis in cats should be confirmed by aerobic bacterial culture in all cases due to the low likelihood of bacterial disease in cats with clinical signs of lower urinary tract disease

Ideally, specimens for culture should be collected by cystocentesis unless there is a contraindication (which would rarely be present in animals with sporadic bacterial cystitis) or significant difficulties in sample collection (e.g. large morbidly obese dog) are anticipated. Samples should be refrigerated and processed by the diagnostic laboratory within 24h of collection. Culture of voided samples should only be performed when cystocentesis is not possible because of the potential for both false positive and false negative cultures. Voided samples should only be cultured if they are refrigerated and processed by the diagnostic laboratory within a few hours.12 The level of growth (>100,000 CFU/ml), bacterial species and whether mixed growth is present are important factors to assess when evaluating any culture results from voided samples.

Clinical signs are a result of inflammation. In dogs, a decision to start antimicrobial therapy while awaiting culture results (if samples are submitted) is reasonable. However, there is evidence from humans that analgesics alone may be as effective as antimicrobials in uncomplicated cases.13,14Consideration can be given to prescribing an initial course of analgesics and adding antimicrobials 3-4 days later if clinical signs persist or worsen. Regardless, analgesics should be considered during the initial treatment period to help ameliorate clinical signs. To avoid overtreatment in cats, withholding antimicrobial treatment pending the result of aerobic culture is reasonable, unless there is clear evidence on urine sediment analyses to support bacterial infection.

Optimal empirical choices vary based on the pathogen and resistance patterns in the region. However, amoxicillin is a reasonable first choice in most areas. If amoxicillin without clavulanic acid is not readily available, use of amoxicillin/clavulanic acid is reasonable. Evidence of a need for clavulanic acid is lacking and it may not be necessary, even in infections with beta-lactamase producing bacteria, because of the high amoxicillin concentrations that are achieved in urine. Trimethoprim-sulfonamide is another first tier option but may be associated with greater adverse event concerns and is difficult to recommend over amoxicillin or amoxicillin/clavulanic acid.

The recommended duration of therapy is 3-5 days. The short end of that dosing period may be optimal, but veterinary research is currently limited.

There is no indication for measures beyond monitoring of clinical signs. Provided the full course of antimicrobials is administered correctly, there is no evidence that intra- or post-treatment urinalysis or urine culture is indicated in the absence of ongoing clinical signs of cystitis.

Recurrent bacterial cystitis

In human medicine, recurrent bacterial cystitis implies a diagnosis of ≥ 3 episodes of recurrent bacterial cystitis in the previous 12 months or 2 or more bladder infections in six months. 15-17 This definition has also been adopted in veterinary medicine. Recurrent cystitis may result from relapsing or persistent infection, or reinfection. Refractory infections are defined when there is no response or incomplete clinical response to a course of treatment.

Since recurrent cystitis is almost always associated with an underlying cause, identification and management of relevant risk factors and comorbidities is critical for longterm success. Repeated antimicrobial administration is unlikely to provide longterm cure and can be associated with antimicrobial resistance, treatment costs and risks of adverse effects of antimicrobials. Contrast imaging or cystoscopy may be considered for refractory clinical recurrent bacterial cystitis cases if biopsy of the bladder mucosa is warranted or to investigate further to underlying comorbidities.

Urine culture, ideally from a sample collected via cystocentesis, should be performed. If the pathogen isolated from a patient with recurrent infections is different from previous organisms isolated, reinfection is likely and efforts should be undertaken to identify and address any predisposing factors. If the same bacterial species (e.g. E. coli) is isolated again from a patient with clinical signs of lower urinary tract disease but the isolate has a different antibiogram than a previous isolate, advanced molecular studies would be required to conclusively determine if the patient had a new infection, as opposed to selection of a resistant subpopulation of the initial infection that was never fully eradicated.18 However, re-infection is likely or at least possible. If the isolate has the same antibiogram as a previous isolate, it is likely that relapsing or persistent infection is present, but advanced molecular studies would still be required to conclusively determine if bacterial species present is identical to that previously isolated.

Recurrent cystitis encompasses a broad patient range, some that develop repeated and relatively uncomplicated infections that likely respond quickly to antimicrobials and others that have marked bladder pathology that complicates treatment.

In human medicine, several studies support short-course therapy for acute and recurrent bacterial cystitis. 15 Long-term therapy is not automatically warranted for recurrent bacterial cystitis. Short (3-5d) durations should be considered for cases where re-infection seems to be occurring. Longer courses (7-14d) may be reasonable in persistent, and potentially relapsing, infections, if factors that inhibit response to antimicrobials, such as bladder wall invasion, are suspected to be present.

Upper Urinary Tract Infections (Pyelonephritis)

Given the potential severity, accurate and prompt diagnosis is required to institute effective treatment as soon as possible. Whenever pyelonephritis is suspected, culture and susceptibility testing should always be performed. Immediate treatment is indicated, using an antimicrobial with good activity against Gram negative Enterobacteriaceae. Fluoroquinolones are the main recommendation based on their spectrum and efficacy for tissue-associated infections. Knowing resistance trends in urinary E. coli isolates in the practice can be helpful to guide initial therapy. Combination therapy can be considered initially, with changes potentially made based on culture results. If combination therapy was initiated and the isolate is susceptible to both drugs, one might be discontinued if supported by evidence of clinical response. If resistance is reported to one of the drugs, that antimicrobial should be discontinued. A second drug to which the isolate is susceptible should be substituted if the patient has not responded sufficiently; substitution is not necessary if patient response has been sufficient. There is little evidence to guide duration of treatment. Treatment of 4-6 weeks is often recommended and that is reasonable, although a shorter duration of therapy might be effective. Treatment of 4-6 weeks has previously been recommended for veterinary patients.11 However, the recommended duration of therapy for acute bacterial pyelonephritis in children is 7-14 days. 31 For adult humans, 10-14 days for beta-lactams or trimethoprim-sulfamethoxazole and 7 days for ciprofloxacin are recommended.32 There is no reason to suspect that a longer duration would be necessary for dogs and cats. In the absence of veterinary-specific data, the 10 to 14 days of treatment has now been recommended.

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MEDICAL MANAGEMENT OF PYOMETRA

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Introduction

CPyometra is a common disease of intact female dogs and carries with it a concern for mortality as a result of disease. According to one study in colony beagles, almost of female dogs will develop pyometra by 10 years of age [1]. In some countries, this disease is primarily managed aggressively by ovariohysterectomy, while other countries choose a medical approach to therapy.

Indications for Medical Treatment
Given the recent interest in the impact of gonadectomy on both male and female dogs relating to a variety of non-neoplastic and neoplastic conditions, many veterinarians have shifted their original views of gonadectomy as being an “easy” choice relating to general health and well-being of the animal involved[2]. While the necessity of surgery can be easy to argue against in the male dog for prostate disease, the recurrence of pyometra on subsequent cycles in bitches makes long-term management of this condition a poor choice for a large number of cases.Although the presence of estrogen may have a favorable impact for some conditions for that individual relating to cancer, orthopedic, autoimmune, and behavioral conditions, the potential health risk of recurrent pyometra relating to these hormones at each subsequent cycle is a serious concern. Severity of condition at presentation may limit medical management despite owner’s intentions to preserve the uterus for breeding or show, or other suspected health benefits.

A clinician may advise medical therapy because of certain risk factors for this dog. If the dog has a known significant surgical risk, such as a heart condition, it may be preferred to medically manage a pyometra, and after resolution elect to promote an anestrus state via GnRH injections or implants, or treatment with other cyclic suppressing options. Additionally, medical therapy may provide an option for temporary management if surgery is preferred but cannot be pursued immediately due to the animal’s medical condition.expense is generally much higher with medical treatment options versus surgical options. If the owner would like to pursue ovariohysterectomy to resolve the condition, this is the best option for permanent resolution and in many cases best prognosis. Ovariohysterectomy is curative of the condition[2], though prognosis may vary depending on secondary disease processes.

In some medically managed cases, ovariohysterectomy may be required for resolution, and this should be an end-point all owners should be prepared for.

If the intention is to keep the dog intact for showing or breeding purposes, medical management of the cycle may be an option, if breeding follows on the next cycle. In regard to owner’s intention, the value of the animal to stay intact is often considered, since the potential

Diagnosis

Clinical presentation of pyometra may range widely. Often dogs will present with lethargy, inappetence, and fever, with or without the presence of purulent, foul-smelling vulvar discharge. The uterus may be palpably enlarged on palpation; however, manipulation should be gentle given the potential for rupture of the uterus. Cytology and culture of the fluid, if present, can provide further diagnostic evidence. Cytology generally reveals highly cellular fields of degenerative neutrophils with proteinaceous material covering much of the slide. Intracellular organisms may be noted.Escherichia coli is the most commonly isolated organism in canine pyometra[3]. Radiographic images can suggest pyometra, but the best option for sensitive diagnosis of a fluid filled uterus is ultrasound. Ultrasound should reveal a hyperechoic swirling fluid within a distended uterus. Diameter of the uterus can vary widely based on animal size and severity of condition.

Treatment

Ovariohysterectomy is generally offered as a primary recommendation for pyometra management. Ovariohysterectomy is considered curative[2].
For medical treatment, the patient generally will require hospitalization and monitoring, intravenous antibiotics, tocodynamic drugs (prostaglandins), and luteolytic drugs[4].In some countries, drugs with antiprogesterone effect are an excellent compliment for treatment. Many of the drugs involved in medical pyometra management will result in an inappetant patient, who may have other gastrointestinal side effects such as vomiting and diarrhea. In open pyometra cases, immediate evacuation of fluid from the uterus should be observed following tocodynamic drug administration. Fluid replacement and maintenance may be required.

As a compliment to treatment, serial blood panels should be observed for improvements. Complete blood count and chemistry panel may be normal at presentation for some pyometras, but continued assessment is still important if electing to manage medically. Ultrasound should be utilized to monitor progressive evacuation of the uterus daily. If fluid volume is not reducing over time, surgical intervention and ovariohysterectomy may be more effective for this patient.

For closed pyometras, medical management can be more challenging. Prostaglandin E can be used to encourage relaxation of the cervix, via intravaginal deposit. Milder treatment with tocodynamic drugs is required, as uterine rupture is at higher risk. Once discharge is noted from the vulva, the protocol can be adjusted to mirror the open pyometra patient.
A novel approach using endoscopic-guided lavage of the uterus to remove pathogenic material more aggressively is being attempted in some practices, however, study of effectiveness or risk for uterine rupture is yet to be established.

Prognosis

Mortality rates for pyometra are reported as 0% and 17% in dogs, and 8% in cats[5]. Prognosis varies widely and is significant affected by severity of clinical presentation. In general, closed pyometra carries a lower prognosis for successful medical management, though both closed and open pyometras may be managed successfully through proper treatment. Any animals with kidney enzyme derangements are poor medical management candidates.

Prognosis for fertility for future breeding is fair for bitches that are relatively young when affected. Pyometra in most cases shares a close association with cystic endometrial hyperplasia, which itself can be a cause for infertility. Fertility will in most cases be negatively impacted by the presence of pathogenic fluid, but often these bitches can be bred back successfully if proper management is pursued.

Following treatment, it is important that the animal be bred on the cycle immediately following treatment, otherwise pyometra may occur again. As soon as the animal's reproductive needs are fulfilled, it is advised to ovariohysterectomized these animals given their risk for recurrent pyometra manifestation.

Conclusions

Pyometra is a common disease of bitches worldwide. The disease in many cases can be managed medically, as an alternative to surgical intervention and ovariohysterectomy. While surgical treatment should be a primary option for treatment for most patients, medical management may provide an alternative approach to resolve the clinical signs to allow the animal to remain intact, at least temporarily.

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DIAGNOSIS AND MANAGEMENT OF RESISTANT STAPHYLOCOCCAL INFECTIONS

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Introduction

Despite being inherently susceptible to virtually every known antimicrobial class, staphylococci are notorious antimicrobial resistant pathogens. The ability of staphylococci to become resistant was repeatedly demonstrated as the introduction of new drugs was typically followed (sometimes rapidly) by emergence of resistance. Included in this pattern was resistance to methicillin, which emerged not long after the use of methicillin began in 1959. While resistance to methicillin itself is not a major concern, methicillin-resistance is caused by production of an altered penicillin binding protein that has a poor affinity for beta-lactam antimicrobials and confers resistance not just to methicillin, but to virtually all beta-lactams (penicillins, cephalosporins, carbapenems). Methicillin-resistant staphylococci are also often resistant to a wide range of other antimicrobials, severely limiting treatment options. While was first noted as a problem in humans, methicillin-resistance has emerged as a pressing issue in companion animals, and there have been striking recent changes in the epidemiology of methicillin-resistant staphylococcal infection and colonization in dogs and cats.

There are two main groups of staphylococci; coagulase positive and coagulase negative. Coagulase positive species (e.g. S. aureus, S. pseudintermedius, S. schleiferi coagulans) are the most virulent and of greatest clinical relevance. Differentiation of these, or at a minimum, differentiation of S. aureus from other coagulase positive staphylococci is needed for both interpretation of zoonotic risks and the use of proper antimicrobial susceptibility testing methodology (since there are different standards for S. aureus versus other staphylococci). Coagulase negative staphylococci, apart from S. schleiferi schleiferi, tend to be of lesser or limited virulence and after often considered together as a single group, although there is some evidence of variation in virulence and clinical relevance. Knowing the type of Staphylococcus that is involved, therefore, is critical for proper management.

Methicillin-resistant S. pseudintermedius (MRSP)

Staphylococcus pseudintermedius is the most clinically important Staphylococcus in dogs and a common commensal that can be found in or on a large percentage, if not all, healthy dogs, and a smaller percentage of cats. As with methicillin-susceptible S. pseudintermedius, MRSP can be found in or on healthy dogs and cats, and it appears that the rate of colonization is increasing in many regions. MRSP appears to have emerged and disseminated internationally in companion animals at a truly amazing rate, with rapid development of a very high level of drug resistance. MRSP infections are being identified virtually everywhere that people are looking, and the increase in incidence of disease, while not objectively reported, seems to be dramatic, particularly among dogs with pyoderma. Most infections are community-associated, particularly involving dogs with pyoderma and otitis, but hospital-associated transmission does occur and is of particularly concern among surgical patients.

MRSP is an opportunistic pathogen and colonization does not necessarily lead to disease. Indeed, it is likely that the vast majority of colonized animals never develop a clinical infection. Pre-operative MRSP carriage has been associated with increased risk of MRSP surgical site infection following TPLO.1 The risk of infection in MRSP carriers in other situations has not been reported, but it is reasonable to assume that MRSP carriers are at some increased risk of MRSP infection when they are increased risk of any opportunistic infection. MRSP carriage is probably of limited concern to individual healthy dogs in the general population, but of greater relevance in dogs with comorbidities that increase the likelihood of any opportunistic infection (e.g. atopy) and those that undergo surgery. Additionally, MRSP carriers also presumably pose a risk to veterinary facilities as a source of hospital-associated transmission.

There is no indication that MRSP infections are inherently more serious than infections caused by methicillin-susceptible strains, however they could ultimately be associated with increased morbidity and mortality because of failure of initial empirical antimicrobial therapy and limited treatment options.

Methicillin-resistant S. aureus (MRSA)

MRSA tends to receive a higher profile than MRSP because of its huge impact in human medicine, however it is a much less common cause of infection in dogs and cats than MRSP. Regardless, attention must be paid to this organism because of the potential for serious and difficult-to-treat infections, and the greater zoonotic implications.

As with MRSP, MRSA causes opportunistic infections and can be found in a small percentage of healthy dogs. It is assumed that the emergence of MRSA in companion animals is directly related to MRSA in humans, and humans are likely the source of most MRSA infections in dog and cats.

High MRSA carriage rates can also be found in specific dog populations such as households where another pet has an MRSA infection,2 or during outbreaks in breeding or rescue kennels. 3,4 Being owned by a human healthcare worker and participation in hospital visitation programs have been identified as risk factors for MRSA colonization in dogs, and are logical based on the increased likelihood of exposure to colonized people. 5,6 Contact with children has also been identified as a risk factor.6 While these, and potentially other, risk factors should be considered, MRSA can be identified in any animal and absence of known risk factors should not lead to excluding MRSA from consideration.

Methicillin-resistant S. schleiferi (MRSS)

Staphylococcus schleiferi consists of two subspecies, the coagulase positive S. schleiferi subsp coagulans and coagulase negative S. schleiferi subsp schleiferi. These are less common causes of infection compared with S. pseudintermedius and S. aureus, but a large percentage of diagnostic laboratories do not attempt to different S. schleiferi coagulans from S. pseudintermedius or S. schleiferi schleiferi from other coagulase negative species, so there are limitations in understanding of the role of these species in disease. S. schleiferi coagulans is most commonly implicated in pyoderma and otitis externa in dogs, but other opportunistic infections such as urinary tract infection and pneumonia have been reported. Less in known about S. schleiferi schleiferi, but has been increasingly implicated as a cause of pyoderma and otitis, and there is increasing concern that it may be more virulent than other coagulase negative staphylococci.

Therapy

Management of MRS infections follows the same principles of any other opportunistic infection. Indeed, there is no evidence that MRS infections are inherently more severe than susceptible staph infections; however, outcomes could be worse because of the failure of empirical antimicrobial therapy. It is reasonable to assume that MSSP and MRSP infections should have no different of an outcome if MRSP is quickly diagnosed and appropriately treated.

Systemic antimicrobial selection (when needed) should be based on in vitro susceptibility testing whenever possible because of the potential for highly drug resistant strains and the limited treatment options that may be available. MR-staph are resistant to all beta-lactams (penicillins, cephalosporins, carbapenems) and often many other drug classes. While there are often a variety of options for MRSA, choices may be few (and not optimal) for MRSP. Aminoglycosides and chloramphenicol are drugs to which MRSP is commonly (but not universally) susceptible, but there are potential issues with both of those.

Additional options may be available for cystitis, such as nitrofurantoin or Fosfomycin. Drugs such as clindamycin, trimpethoprim-sulfa, doxycycline and minocycline may be useful in some situations.

There is no evidence that infections caused by methicillin-resistant strains need longer or otherwise different treatment compared to infection caused by susceptible strains once appropriate antimicrobial therapy is started.

Local or topical treatment may be useful as an adjunctive or sole therapy. Topical antimicrobials or biocides are commonly used for superficial folliculitis and other focal, external infections. These facilitate delivery of high drug concentrations to the infection site, without systemic exposure, and can bre highly effective.

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COMPARATIVE ONCOLOGY- AN INTRODUCTION AND THE STATE OF THE FIELD

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Cancer Drug Development is Difficult and Fraught with High Failure Rates

DFewer than 3% of cancer drugs entering human trials advance to human approval. It is critical that the conventional approach to oncology drug development be improved, so that new medications are available for use faster. Many development failures occur late in drug development (so-called late attrition), moving disproportionate costs to patients and drug developers as compared to a “fail-early model” of clinical development. Moreover, promising innovations are often stuck between early research and discovery and clinical trials due to lack of convincing data in support of their potential efficacy, or a perception that preclinical cancer models are not predictive to justify the risks of human trials. Unfortunately, this is to the great loss of cancer patients.

Comparative Oncology: A Game-Changing Approach to Better, Cost Effective Oncology Drugs

When developing new cancer drugs, Comparative Oncology involves the inclusion of dogs with naturally occurring cancer in clinical trials, as compared to novel or repurposed drugs that are tested to answer questions that cannot be answered in conventional animal models of cancer or human clinical trials. Comparative Oncology seeks to address the current challenges in oncology drug development through the study of naturally occurring cancers, primarily in dogs, that share the same biological complexity seen in human cancers. Given the unquestioned need for the translational and clinical infrastructure that currently exists to deliver the promise of Comparative Oncology medicine, there is an urgency to expand the use of a Comparative Oncology process with a parallel/integrated cancer drug development path.

Even though thought-leaders and experts in the field believe that dogs with cancer provide a unique opportunity to improve the development path of new cancer drugs, this modeling approach is underutilized. This is despite significant investments in the field, such as the launch of the NCI-Comparative Oncology Program, as well as similar efforts and research supported by the extramural NIH, academic research centers, and comprehensive cancer centers across the US with the endorsement of the Institute of Medicine through its hosting of a strategic meeting focused on this opportunity, as well as by the launch of several internal programs in Comparative Oncology within the pharmaceutical and biotech industries.

Comparative Oncology is an untapped resource.

Quantification of the value of the comparative approach to cancer drug development includes financial proforma models as well as assessment of the value of not guessing in answering previously unanswered questions. Nonetheless, defining this value is not simple because of the inherent complexity of cancer drug development and the many data inputs that advance a given drug development path.

Given the interest and investment in Comparative Oncology, it is attractive to believe that more widespread adoption of this approach will simply come from more examples and/or greater awareness (i.e., “more chances at bat”). An alternate view of the field may recognize a potential pitfall that results from the perspective that Comparative Oncology is merely a preclinical strategy that is considered before human phase I entry, rather than as a parallel integrated strategy for clinical development teams using data from studies with canines to answer questions and optimize Phase II and Phase III human trials. Furthermore, solely positioning Comparative Oncology as a preclinical opportunity results in increased competition at the tail end of conventional preclinical discovery/development in what may be described as a shrinking market, where most development resources may have already been utilized. Viewing Comparative Oncology as a parallel and integrated approach with human trials results in a distinct and potentially broader strategic approach with better use of financial resources. This approach may promote collaborative relationships between human and animal health drug development/ commercial teams with preclinical R&D. This alternate focus on parallel/integrated drug development, that seeks to optimize Phase II/II trials, will result in better definitions of dose, schedule indication/biomarkers of response, and drug-target mechanisms of action. This will collectively increase the chances of success in human Phase II and beyond.

Additionally, this approach will de-risk human R&D in many ways, and may create new streams of revenue to support these critical parallel and integrated translational studies. Disrupting cancer drug development redefines roles and reduces costs of conventional animal health R&D and provides early exits for human cancer drug development. Such early exits will result from animal health interests in early data from human health assets.

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AN UPDATE ON VASCULAR FAST ULTRASOUND: PREDICTING VASCULAR VOLUME, RESPONSE TO FLUID THERAPY AND GUIDING DIFFICULT PERIPHERAL VASCULAR CATHETER

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Introduction

The goal of vascular VPOCUS is not an extensive evaluation of the great vessels. Rather, vascular VPOCUS, in conjunction with other clinical, history and VPOCUS findings (cardiac assessment of volume status, contraindication suggestive of volume overload), is used to assess changes in vena cava volume that can help us assess if we should be giving a bolus of fluids.

Caudal vena cava volume estimation

Emergency and critical care patients are often at risk to develop hypo and hypervolemia. Unfortunately, predicting which patient can be challenging.
Although results are preliminary, evaluating the caudal vena cava (CVC) shows promise in estimating the intravascular volume status in veterinary patients.
By placing the probe longitudinally at the subxiphoid site and slowly tilting/fanning the probe to the right of midline the CVC can be seen crossing the diaphragm.
The caudal vena cava diameter and the change in the CVC diameter between the expiratory and inspiratory phases of respiration can be detected at this site.
The diameter and change in diameter with the respiratory cycle reflect the patient›s volume status.
The CVC has a larger diameter at the end of expiration than it does at the end of inspiration.
The changes between expiration and inspiration varies but is approximately 25-60%.
The opposite is true in hypervolemic patients, or patients with increased right atrial pressures (i.e. pericardial effusion, right sided heart failure, etc.), where the CVC becomes «fatter» than normal, hardly changing (<20%) between expiration and inspiration.
This is important because if the vena cava is “fatter” than normal, we should ask ourselves why and if IV fluids would be detrimental.

If the hepatic veins are visualized (often seen at the site, they enter the CVC just caudal to the diaphragm) they are often distended as well in cases with increased right atrial pressures and/or hypervolemia. There are a number of artifacts that can make the CVC appear smaller than normal. This includes 1) pressure artifact, that occurs when too much pressure is placed on the probe when trying to visualize the CVC, 2) increased abdominal pressure which may occur with organ enlargement or significant abdominal effusion and 3) increased respiratory effort which creates greater negative pleural pressure and therefore more collapse of the CVC.

Although these factors are likely to impact euvolemic or hypovolemic patients, they are less likely to change the findings noted in patients with hypervolemia or right atrial pressure increases (FAT CVC).
For these reasons the author tends to ask the questions, “if the patient has clinical signs suggestive of hypovolemia (tachycardia, pale mucous membranes, weak pulses etc.) is it likely to be a fluid responder”?
If the CVC is consistent with euvolemia or hypovolemia, then a bolus of fluids is administered provided there is no contraindication to giving a bolus (e.g. no increased B lines, normal left atrial: aortic ratio, no cerebral edema etc.). If the patient has a FAT CVC, further work up is required to determine if a fluid bolus is contraindicated.
Ultrasound guided vascular access for difficult IV access
The following study (Costantino et al, Ultrasonography-guided peripheral intravenous access versus traditional approaches in patients with difficult intravenous access. Ann Emerg Med. 2005 Nov;46(5):456-61) is just one of many in the human literature demonstrating the value of ultrasound guided vascular access when traditional percutaneous IV access attempts fail.
The summary of this study is as follows:
If a nurse failed to place an IV catheter after 3 attempts…
Emergency physicians attempt to place percutaneous IV catheter One group using ultrasound guidance
One group using ”blind” traditional techniques
Success rate was greater for the ultrasonographic group (97%) versus traditional (33%)
Less time to successful cannulation from first percutaneous puncture (4 minutes versus 15 minutes)
There is emergency veterinary evidence that ultrasound guided peripheral vascular access is also helpful in small animal veterinary patients.
Advantageous of ultrasound guided vascular access include the fact the vessel can be assessed for thrombosis prior to attempting placement of an IV catheter In cases of hematoma or perivascular fluid (edema) the vessel can still be visualized making ultrasound guided access easier.
It should be pointed out that in an emergency unstable patient presenting in shock venous cut downs and automated intraosseous devices (EZIO) are preferred and ultrasound guided catheter placement is generally reserved for difficult IV catheter patients that are cardiovascular stable (figures 4-6).
Either longitudinal (in plane) or transvers (out of plane) vascular access ultrasound guided peripheral IV catheter placement can be used, although the author prefers out of plan/transverse placement, which will be demonstrated in the lab.
Ultrasound guided arterial blood gas sampling is also advantageous to help ensure an artery and not a vein is punctured during sampling.

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SURGICAL ONCOLOGY PRINCIPLES, GETTING BACK TO THE BASICS

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Introduction

Tumors in pets are often best approached with a multimodal approach, considering options in medical, surgical and radiation oncology. Surgery, however, is often a critical part of achieving a diagnosis and is often necessary in treatment. Surgery is also one method that is available that can cure some forms of cancer in animals and people. When thinking through cancer diagnosis and treatment, it is very important to manage the work up in a logical, stepwise fashion to achieve the optimal treatment pathway. When faced with a patient with a tumor, the clinician should ask themselves three questions and work through answering these questions in order. These questions are:

What is it?

Where is it?

How bad is it?

What is it?

This question refers to the tumor type. It is essential that this question is answered before any treatment is initiated. Removal of a neoplastic mass without knowing the tissue type will rarely give rise to a favorable result. This question can be answered by several different methods, including cytology, biopsy for histopathology and a presumptive diagnosis based on classic patterns of disease.

Cytology is generally achieved by performing a fine needle aspirate. The advantages of this test are that it is quick, easy, inexpensive and can often direct us towards a diagnosis. It is a very good first step towards achieving a diagnosis. It can often diagnose lymphoma and mast cell tumors and it can help to differentiate between an inflammatory and a neoplastic process. The disadvantages are that it may be nondiagnostic in some circumstances, it can also give us a vague diagnosis or even an incorrect one. For dogs that present every year with a large number of masses, it is recommended that their skin masses are mapped. This can be done using a standard histopathology submission form dog map and enlarging two of these pictures on one page. This sheet should be incorporated into the patient's record and should include patient information and a place to write information about each mass that corresponds to a number and location of the mass on the picture.

The information about the mass should include the location (if there is any potential confusion based on the chart), size of the mass, mobility, firmness and whether the mass is in the skin, SQ tissue or deeper.
It should also include the cytologic description of the mass and whether cytology was performed in-house or by a pathologist. Starting early with mapping masses will save a lot of time in the future and will allow you to keep track of your patient's masses so that new masses can be addressed and masses that were diagnosed as being benign (eg lipoma) can be monitored for growth. This method is very important in multi-doctor practices where different doctors may see a patient for their annual physical examinations, but is also important for single doctor practices because it is impossible to remember the exact character of a dog's masses over the years. If the mass is neoplastic, there are three possibilities for the types of cells present. Rounds cells, spindle cells and epithelial cells. With practice, you may become very adept at categorizing these cells and recognizing characteristics of malignancy, such as multiple nuclei or nucleoli, anisokaryosis, aniscocytosis and mitotic figures.

If the cytology or the clinical impression of the mass is suspicious for a malignant process, a biopsy for histopathology is recommended. There are several different ways to achieve a histologic diagnosis and the method for achieving a biopsy should always be chosen with the eventual definitive resection in mind. Options for a biopsy include an incisional biopsy or an excisional biopsy.

An incisional biopsy can be achieved by taking a sample of the mass without disrupting the architecture of the mass. For subcutaneous masses, care must be taken to go deep enough into the mass so that the biopsy does not include only skin, SQ and muscle, but actually contains a portion of the neoplastic tissue. A result of normal muscle or fat is likely an indication that the biopsy technique did not go deep enough, rather than that the mass is a benign process. An incisional biopsy can be achieved using a skin punch, taking care to penetrate deep enough into the mass. A wedge of the tissue can also be taken. If the mass is completely SQ, you can make a small incision in the skin directly over the mass and then take a wedge or punch of the mass underneath. A Tru-cut biopsy can also be used very effectively to obtain a representative sample of the mass. Keep in mind that the centre of a large mass may be necrotic due to the lack of a blood supply and biopsies in this area may not be diagnostic.

It is also important to keep in mind that if the tissue is a malignant process, the biopsy tract must be resected with the definitive resection, so the biopsy should be in a location that will be easily removed with the definitive resection. As well, the biopsy tract should be small (2cm maximum) and should be in one location only. For example, multiple incisions taken from multiple locations around the mass could result in multiple areas needing to be resected in a definitive surgery and this may compromise the ability to achieve clear margins of resection. The sutures used to take a biopsy should be left in place until definitive surgery so that the biopsy tract can be removed. Another area to keep this principle in mind is oral tumors. A mass arising from the maxilla may appear to be most easily biopsied by going through the upper lip. This will, however, result in the need to resect the lip when, in most cases, this is not necessary for oral masses of the maxilla. The need to remove a portion of the upper lip would lead to a less cosmetic end result for the patient. Osteosarcoma is another tumor type where the biopsy location may be important if a limb spare procedure is the owner's choice for a definitive tumor resection. If you are unsure of the best method of biopsy for one of your cases that you think will eventually require a major resection, contact your friendly neighborhood surgical oncologist to discuss the case and biopsy techniques before you biopsy.

An excisional biopsy may be performed in certain instances. It is, however, very important that a curative intent resection is not compromised by this technique. Examples of excisional biopsy that are appropriate include:

A 2mm mass on the lateral aspect of the digit in a large dog. The mass is removed as a marginal excision. If the mass is benign, there will be no further treatment. If the mass is malignant, a digit amputation will be necessary and the biopsy tract will not affect this definitive surgery.

A 1cm mass over the flank of a dog. Cytology was non-diagnostic. Options would include an incisional biopsy or an excisional biopsy. The owner just wants the mass removed. You explain to the owner that you will remove the mass with large margins (2-3cm laterally and one fascial plane deep to the mass). If the mass is malignant, it has been removed appropriately. If the mass is benign, you have given a larger dose of surgery than necessary, but the mass is gone.

In cases of a presumptive diagnosis, such as hemangiosarcoma of the spleen or osteosarcoma, the tumor is often excised (eg splenectomy or amputation) without a definitive histopathologic diagnosis. This is appropriate in cases where the histopathologic diagnosis will not change the treatment of the patient and the pattern of disease is extremely suggestive of a common form of neoplasia.

An example of when an excisional biopsy is not appropriate for the patient is removal of a mass with moderate margins with no knowledge of the tissue type. If this mass is then diagnosed as a malignant process, the definitive resection has been compromised. A very dangerous logic is "removing as much as you can", without knowing what the mass is. If you do not know what the mass is, remove as little as you can and do not disrupt the tissues around the mass. This is because the tissue surrounding the mass contains tumor cells and the excision will disrupt the tissue architecture and the fascial planes, making it more difficult to determine and achieve clean margins of resection. The resection also becomes much larger than it would have been prior to mass removal because the entire scar must be removed using 3cm and a fascial plane deep. If the fascial plane below the mass was already disrupted, you must go another fascial plane deep to achieve clean margins. This next fascial plane could be the body wall. It is also possible that a patient who would not have required radiation may need radiation to clean up the field. The potential consequences of a dirty resection of an unknown tumor include: a significant increase in morbidity to the patient, a significant increase in cost to the client, and the potential to lose the ability to cure the patient. The logic of "just removing the mass and then finding out what it is" is very dangerous and can have serious consequences. Do not be surprised by your results. The pitfalls of this approach are not always apparent to the doctor who has made this error because the problem is then referred on. It is also very important not to be completely guided by the client by the decision to just remove a mass. Most clients "just want the mass removed". They do not like looking at it, it bothers the dog and they do not want to think that their dog might have cancer. However, when clients are educated about the reasoning behind a logical, step-wise approach to tumor diagnosis and treatment, most of them are relieved to have this knowledge and will pursue more diagnostics, even if this is more costly up front. It is almost never more costly overall to take this approach.

It is important to remember that when multiple masses are biopsied, the surgeon must change gloves and instruments to prevent seeding tumor cells to multiple sites. As well, it is critical to keep a very good record of where each biopsy came from, the use of a tumor map can be very helpful in these cases.**

A presumptive diagnosis is sometimes made in cases where the pattern of disease points very strongly to the diagnosis and/or the mass is in an area that is difficult or impossible to biopsy. As mentioned earlier, this type of diagnosis is also made in cases where the treatment will not change based on the type of tumor.

Examples of this include a primary bone tumor. If the radiographic diagnosis is consistent with a primary bone tumor and the signalment of the patient is also consistent with the diagnosis, bone biopsy is considered unnecessary by some surgical oncologists. If, however, there is a bone lesion in a location or patient that is not consistent with a primary bone tumor, a biopsy is recommended. A bleeding splenic mass will need to be removed regardless of whether it is hematoma or hemangiosarcoma. A lung mass will need to be removed regardless of whether it is an abscess, granuloma or tumor. The advent of advanced imaging can help us to characterize these tissue types better in a noninvasive manner, but will only allow us to reach a more educated presumptive diagnosis.

Where is it?

Once the question of what is it? Has been answered, the next question is where is it? This refers to staging of the disease. Staging of the tumor determines where exactly the tumor is locally and also if the tumor has metastasized to other sites. Local extent of tumor can be determined by palpation and ultrasound. Generally speaking, this question is most commonly answered by three-dimensional imaging such as CT scan or MRI prior to a large definitive surgery.

The methods for staging for metastatic disease will depend largely on the tumor type. For a benign mass, such as an epulis, no staging is required. For other masses, the staging tests performed will depend on the biologic behavior of the tumor type. In general, carcinomas tend to metastasize to lymph nodes and sarcomas tend to metastasize to lungs, however, this just a generalization and the reverse can be true in some cases. Three-view thoracic radiographs are always a good first step in staging. It is inexpensive and it is a very common site for metastasis. Although it does sound academic, three-views of the thorax are necessary to avoid missing a metastastic nodule. The upper lung field will be more aerated and therefore a nodule will be more apparent due to the contrast with the air in the lung. A nodule in the upper lung will also be more apparent due to magnification because of an increased distance from the plate. Multiple views will also allow the visualization of a nodule that was hidden by other thoracic structures. CT is becoming a tool that is much more sensitive for the assessment of pulmonary metastatic disease. However, thoracic radiographs should be performed as the initial screening test.

Staging can also be performed by evaluating regional lymph nodes. The local lymph nodes should be palpated in all cases and should be aspirated in cases that have a tendency to metastasize to lymph nodes. Any questionable lymph nodes should be biopsied (incisional or excisional biopsy).

For some masses, the abdominal lymph nodes may need to be assessed using ultrasound or CT. An example of this is anal sac adenocarcinoma, which has a very high rate of metastasis to the sublumbar lymph nodes.

Abdominal ultrasound may also be appropriate in some cases, or as a method of evaluating older patients for overall health status prior to a major surgical intervention. Bone scan or long bone survey radiography should be performed in cases of osteosarcoma and should be considered in cases that have a tendency to metastasize to bone (for example TCC and other carcinomas).

For cancers that have a tendency to metastasize early in the course of disease, such as hemangiosarcoma or osteosarcoma, it is very important to explain the significance of the staging tests to clients. Most clients have a hard time understanding that if their pet is deemed clear of gross metastasis, they still have a high risk of microscopic disease. Spending time explaining this to clients early on will save a lot of confusion for them later in the course of disease. It is the reason why chemotherapy is recommended in these cases and why it extends their lifespan, but, unfortunately, does not cure their disease.

How bad is it?

This question refers to both the stage of the disease and the grade. Grade refers to the histologic grade of the tumor. This is often designated as grade I, II or III, with I having the least aggressive biological behavior and III having the most aggressive biological behavior. The grading system is particular to each tumor type and every pathologist may have a slightly different approach to tumor grading. It is important to keep in mind that although the grading system helps us to predict the biological behavior of the tumor, each tumor type has a continuum of histological appearance and they are being categorized somewhat arbitrarily. It is also possible that the grade may shift from the incisional biopsy to the definitive resection because the pathologist will have more tissue to work with.
Information regarding the tissue type, stage of disease and histologic grade can now be assessed to give the owner a prediction of prognosis and a plan for treatment.

Treatment Plan

The treatment plan will be based on the information from asking the three questions: What is it? Where is it? And How bad is it? From this point, recommendations and options can be presented to the owner. These plans will vary in aggressiveness of treatment and in cost and all options should be discussed with the owner. In general, the goals of therapy may be curative intent, palliative, or the owner may not wish to pursue further treatment and may elect for euthanasia when the patient's quality of life declines.

Surgical Principles

Based on the correlation of the information regarding the disease and the owner's wishes for treatment, a dose of surgery can be determined. There are four doses of surgery that can be administered to a tumor:

1. Intralesional – This involves removal of the mass leaving microscopic or gross disease behind. Examples of when this would be considered an appropriate treatment would be a benign lipoma, where the mass is shelled out. Another example would be a low grade sarcoma in a very geriatric patient. In some cases the mass is extremely large and over the body wall. If the owners goal is palliative, it may be appropriate to cytoreduce the mass to reduce discomfort in the patient. This will not cure the patient and the mass will certainly recur.

2. Marginal resection – The mass is removed with minimal margins. This therapy may be considered appropriate in a location where a wide resection is not possible. Example of this would include removal of a brain tumor or removal of a large anal sac adenocarcinoma. Another example of this would be a malignant mass (eg. Soft tissue sarcoma or mast cell tumor) that is removed from the distal extremity with minimal margins, with a plan to treat with full course radiation post operatively.

3. Wide resection – Removal of a mass with curative intent. Although recommendations may vary with tumor type, this generally involves the removal of the mass with 2-3cm margins laterally and a fascial plane deep to the mass. The mass is removed en bloc and the tumor capsule is not invaded or handled at the time of surgery.
4. Radical resection – Removal of an anatomic segment with curative intent. The best example of this is an amputation for osteosarcoma. Other examples may include thoracic wall resection and hemimandibulectomy.

Wide and radical resection are reserved for curative intent surgeries and generally are performed for patients that are negative for metastatic disease. These surgeries take a great deal of planning. Three-dimensional imaging (CT or MRI) is usually necessary to evaluate the extent of the neoplasm and plan the surgical resection. The use of three-dimensional imaging will greatly increase the chances of achieving a surgical cure. Tumor cells are able to take on characteristics of muscle cells, meaning that they have the ability to contract and move throughout the tissues. This is how tumor cells metastasize (by moving into blood and lymphatic vessels) and how they invade the surrounding tissues locally. The cells that are in the periphery are the most aggressive cells in the tumor cell population. If these cells are left behind, the tumor will regrow and will contain a more aggressive population of cells.

Prior to surgery, a general plan of how the defect that is created will be reconstructed should be made. A skin flap may be necessary to replace a defect in the skin. It is critical that the flap is planned for preoperatively and that this area is clipped, prepped and draped in the field at the time of surgery. At the time of surgery, the use of a sterile ruler and pen can be very helpful to trace out the mass, the proposed margins of resection and the planned flap. Mark your margins around the mass with 3cm margins laterally and trace this around the mass. This will result in a circular or oval shaped incision. Do not create an ellipse at this time. This will create one of two problems: it will either compromise the margins by taking less tissue than is required, or it will commit you to reconstructing in one direction. The reconstruction and the removal of "dog ears" should be done once the mass is removed and the defect is being closed.

During resection, it is very important to continue with an en bloc resection that does not "cone down" to remove less of the deeper tissues. This can be prevented by suturing the skin to the deep fascia to prevent it from slipping and to maintain the appropriate orientation. The problem with coning down is that the deep tissues are critical to remove, as they may contain tumor cells. If this tissue is not removed then the difficult closer created by a large skin defect was created in vain because dirty margins are a very real possibility. The fascial plane refers to either a layer of muscle or the fascia around a muscle. This does not include a layer of fat or subcutaneous tissue, as tumor cells can readily penetrate these tissues. Tumor cells move via the path of least resistance, they can generally move laterally more easily (through fat and SQ) and will stop when they reach the fascia of a muscle. The decision to take the fascia around the muscle or the muscle itself depends on the regional anatomy. If it is possible to remove the fascia only, this is preferable, as it will result in less morbidity to the patient. However, it is not always possible and in most cases, our patients adjust well after removal of a single muscle. One notable example of an excellent fascial plane is the antebrachial fascia, which can be used as the deep layer when removing soft tissue sarcomas in this area.

Although the surgeon should have a reconstruction plan in mind preoperatively, it is important not to focus on how to close the defect during resection, as it may cause you to take less tissue than is necessary for a cure. It is possible that some resections will not be 100% reconstructed at the time of surgery and that some open wound management may be necessary. This possibility should be discussed with owners prior to surgery.

Whether or not to change the instruments and gloves after the mass has been removed is somewhat controversial. The reasoning behind this action is that there may be tumor cells on the surgeon's gloves or instruments and that this may result in further tumor seeding. If surgical oncology principles are strictly adhered to, the surgeon should not come into contact with tumor cells during resection because the incisions are well outside the tumor capsule with a healthy margin of tissue around this tumor. That is to say, the surgeon should be working in normal tissue that is free of gross and microscopic tumor. If the surgeon has not followed these principles, or if the tumor cells exist outside of the proposed margin, then the surgery is compromised whether gloves and instruments are changed or not.

There are two instances when I will change gloves and instruments:

The mass has been removed and I am going to elevate a skin flap. I will change the gloves in this case because if the margins do come back dirty and radiation or a recut is an option, it is possible that the field will not have been contaminated. Having said this, when the histopathology comes back dirty, technically the entire scar should be considered dirty.

If the tumor capsule is inadvertently entered, the surgeon should close the area where the tumor capsule was breached with a simple continuous pattern. The area should be lavaged and gloves and instruments should be changed. The tumor resection should be continued to include a larger area of tissue (usually deeper). In this case a second change of instruments/gloves could be considered once the tumor has been removed. If the tumor capsule is inadvertently opened, the risk of recurrence increases.

Part of the surgical planning should be based around decreasing patient morbidity. Because wide and radical resections are by nature, painful, it is critical that an appropriate analgesic plan is made for perioperative and post operative pain control. This may include a cox-2 sparing NSAID (such as Meloxicam) if it is not contraindicated; opioids, such as a fentanyl CRI for intraoperative and postoperative use; hydromorphone prn; and a ketamine CRI for perioperative use (to prevent wind up) and post operative use. Another very useful mode of pain control for major resections is a pain diffusion catheter. (Mila) These catheters come in various sizes and the size corresponds to the length of tubing that is to remain in the wound. The end of the catheter in the wound is closed ended, with multiple holes along the catheter. The dark line on the catheter delineates the end of this region of the catheter.

The catheter is laid in the wound and bupvicaine is administered every 6-8 hours (1-2mg/kg) in a sterile fashion to give a local anesthetic to the wound bed. This company also makes a pump which will administered the bupivicaine as a CRI to the wound. Administer the first dose as the patient is recovering from surgery. Do not administer with bicarbonate, as this can clog the holes in the catheter.

It is also critical to plan for the potential for a large volume of rapid blood loss. The patient should be typed and a blood transfusion should be readily accessible. For high-risk cases, the blood should be in the OR and ready to administer when it is needed.

The use of drains is traditionally contraindicated in surgical oncology. This refers to Penrose drains. The reason that a Penrose drain should not be used is because it will need to exit ventrally and this will require tunneling the drain to a distant site. Theoretically, if the resection is not clear of tumor cells, these tumor cells may be transferred along the drain. If a further definitive resection or radiation is required, it will be necessary to resect or irradiate the drain tract, which may not be readily detectable and will increase morbidity. A closed suction drain, however, may be useful in large resection/reconstruction cases where there is a lot of dead space. This type of drain can exit just adjacent to the incision and does not create a new tunnel in the tissues, and should not therefore be a concern when placing a closed suction drain. The same logic should follow when a pain catheter is used.

One the tumor has been removed, it should be inked for margin assessment. Although India ink and suture tags can be used, I would recommend the use of a commercial tissue inking system. Discuss the color that the pathologist prefers, generally black or yellow is preferred and blue or red is discouraged, because it is difficult to see with H&E stain. The lateral margins and the deep margin should be marked. Blot the tissue so it is dry and paint a small amount of ink on the tissue using a Qtip. If too much ink is used, the ink may run into the lateral tissues and create an artifact that is difficult for the pathologist to interpret. Although tissue inking is very important and can give us important information regarding the presence or absence of tumor cells at the margin (clean or dirty margins), it is by no means perfect. It is not recommended to paint the entire mass with ink because it is not practical or possible for the pathologist to make slides of this entire region of tissue (it would likely amount to hundreds of slides). Ink a representative area (ie four quadrants of tissue laterally and the fascia deep to the tissue) unless there is an area that you are particularly concerned with, then focus on that area and mark it with a different color.

It is absolutely critical that you communicate well with the pathologist regarding the location of the tumor, the type of resection and the way that the margins were inked. Once the mass is inked, breadloaf it to allow the formalin to fix the tissue. This involves slicing the mass partial thickness in 1cm slices to allow for complete fixation. Then place the mass into a large formalin jar. If the mass is sectioned into smaller pieces to allow placing it into smaller jars, the orientation of the mass will be lost and margin evaluation will be difficult, if not impossible. If the pathologist can see tumor cells extending to the inked area, it is likely that there are still tumor cells remaining in the tissue and a recut surgery or radiation may be necessary. It is important to interpret the results of the lateral and deep margins differently. If the pathologist sees tumor cells within 1-2mm of the lateral margins, then this is either a dirty margin or a clean but close margin. If the pathologist sees tumor cells within 1-2mm of the deep margin ink, but there is a fascial plane (layer of fascia) between the tumor cells and the ink, then It should be considered clean. If there are tumor cells within 2cm of the deep inked margin but there is no fascia removed deep to the tumor and this is 2cm of SQ fat, it is possible that this margin will be called “clean” could in fact be dirty.

By following the principles of surgical oncology, an optimal treatment pathway for every cancer patient can be reached. The decisions should be made in a logical, stepwise fashion, taking into account the characteristics of disease and the wishes of the pet owner. It is very important for general practitioners to work in concert with their pathologist and surgical oncologist to develop the best possible plan for each patient.

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NUTRITIONAL MYTHS AND CASES THAT WENT WRONG

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Introduction

Over the years, awareness of the importance of diet in the maintenance of optimal pet-health has become increasingly appreciated, not only to the veterinary profession, but also in the eyes of the public. Unfortunately, there also is information circulating based on myths or fads and often fear-based, and scientifically unsubstantiated, and seemingly following similar myths and fads in human nutrition.

NUTRIENT BASICS

Animal require nutrients, not ingredients. Sometimes those essential nutrients are found as freely occurring mineral in nature (such as sodium chloride), sometimes those essential nutrients are found only in plants (such as linoleic acid), and sometimes those essential nutrients are only found in other animals (such as taurine). Dogs are classified in the Order Carnivora, but are omnivores in their nutrient requirements, meaning that with proper planning and formulations they can survive and thrive on plant-based diets, whether vegan or vegetarian. Cats, on the other hand, are Carnivora in classification and dietary requirements and need animal-based nutrients in their diet to ensure optimal health.

When evaluating a new diet brand or food type it is important to ensure the diet in question is providing a complete and balanced intake of all essential nutrients, irrespective of the food form. Despite metabolic differences between dogs and cats, they have similar requirements for essential amino acids (dogs have 10 essential amino acids while cats require the same 10+taurine); fatty acids (dogs require the long-chain omega-6 fatty acid linoleic acid (LA) and cats not only require LA but the longer-chain omega-6 arachidonic acid (AA) as well); minerals (though the specific amounts will vary between the two species); water-soluble vitamins (though again the amounts vary between the two); and fat-soluble vitamins.1,2 Some specific adaptations that make dogs and cats different than people include the ability by dogs and cats to synthesize vitamin C in the liver; their inability to create vitamin D from UV exposure no matter how much sunlight they bask in; and their lack of salivary amylase as the initial step in carbohydrate metabolism, but presence of pancreatic amylases and glucose receptors on enterocytes for carbohydrate digestion and absorption.2,3 Altogether dogs require about 37 essential nutrients in their diets to cats 41 and it is important that the diet selected and fed on a regular basis meets these ongoing nutritional needs to prevent disease associated with nutritional deficiencies and to optimal health for longevity.

SOME COMMON MYTHS AND FREQUENTLY ASKED QUESTIONS

I heard/read that grain-free diets are better and that grains are just "fillers".

This is what grain-free diet makers and marketers want you to believe, but this is one pet food myth that is FALSE. Dogs and cats require nutrients, not ingredients, and unless an individual animal has an allergy (rare) or intolerance (still uncommon, but more prevalent than true allergies) there is no proven benefit to avoiding grains. Selective pressures over thousands of years have allowed dogs to adapt to a more omnivores diet, and that includes being able to breakdown and digest carbohydrates from properly cooked grains readily. Avoiding high intake of carbohydrate for an otherwise health adult cats in general is recommended, no matter if that carbohydrate comes from grains, potatoes, or legumes as these obligate carnivores are less efficient at digesting plant-based ingredients.

Dogs and cats CAN digest cereal grains in species appropriate amounts as long as they are properly cooked and the overall diet is nutritionally balanced. Every ingredient in a pet food must have a purpose, whether nutritionally (cereal grains provide energy in the form of carbohydrates as well as nutrients such as essential fatty acids, vitamins and minerals). Cereals also provide dietary fiber that while considered "non-essential" in the diet is functionally essential for optimal intestinal function. True "fillers" in pet foods are things like chamomile, dandelion, and blueberry that are in such small amounts or have been so highly processed that any phytonutrients are long denatured before the diet is fed. These are used as "label filler" to appeal to people and provide little to no health benefit to dogs or cats.

In addition, there is currently an ongoing investigation by the Food and Drug Administration Center for Veterinary Medicine (FDA-CVM) and a number of veterinary universities in the United States looking into links between grain-free diets and dilated cardiomyopathy (DCM) in dogs. Until the causative link between feeding grain-free diets and DCM is determined, going "grain-free" may actually cause more harm than good for some patients.

I'm a vegan/vegetarian, can I feed a similar diet strategy to my dog or cat?

For dogs, going vegetarian (a plant-based diet that still includes egg and/or dairy) is pretty easy as egg has a complete amino acid profile and for an adult, non-reproductive dog, dairy works quite nicely, too. Vegan diets (avoiding ALL animal-sourced ingredients) is a bit trickier, but not impossible. Dogs are able to manufacture adequate amounts of taurine from methionine and cysteine (though breed and diet factors may alter this), can split □-carotene from root vegetables and fruit into vitamin A, and are also able to convert LA found in plant seeds and grains into AA.[1] Cats have unique metabolic adaptations that do not allow for transition to completely vegan or vegetarian diets.3 The idea behind feeding vegan/vegetarian diets can be TRUE for dogs, but FALSE for cats.

Ideally a selected vegan or vegetarian diet would have gone through feeding trials (fed to a group of healthy adult dogs to prove that the nutrients in that plant-based diet are digestible and absorbable), but whether this has been done or not, high inclusion of plant-based fibers and ingredients can decrease the overall digestibility of the diet and commercial diets can have variable quality control standards.5,6 Routine checkups (at least annually) should to be performed on any dog eating a vegan or vegetarian diet.

I heard that "by products" don't provide any real nutrients into the diet.

Sorry to break it to you, but this is another myth promoted by pet food companies and their marketing departments. The term "by-product" comes from the human food perspective and designates a food that is a secondary product made during the processing or refining of the primary food. Molasses, for example, is the "by-product" of refining sugar; wheat germ is a "by-product' of wheat milling; and peanut hearts are "by-products" of making peanut butter. When that "by-product" comes from an animal it is specifically referring to the internal organ meats that are left over after the muscle meat is removed for human consumption. These organ meats are edible and highly nutritious, but there is little to no demand for them on the human food market (at least in North America). As such, it is more cost effective and convenient for meat processors to group them together than package them individually. Some pet food companies claim "no by-product" but instead will list out "liver", "kidney", "spleen", "tripe" (stomach), and "lung" individually; these are all by-products.

By-products can come from a single species such as chicken or beef, or a combination of animals such as poultry (chicken, turkey, and/or duck) or meat (beef, pork, lamb, and/or goat).

These can only be the edible parts (no hooves, horns, beaks, skin, feathers, or feces allowed) other than the muscle meat. The term "by-product" has no bearing on the nutritional quality of the said ingredient and is often a superior source of essential nutrients in the diet compared to only including muscle meats. Using these highly nutritious "by-products" in dog and cats food also reduces food wastage, is better for the environment (all that unused organ meat would otherwise end up in a landfill or incinerated), and helps reduce the number of food animals that would need to be raised just to provide muscle meat into the pet food production chain.

OTHER COMMON PET FOOD MYTHS

Home-made diets are better than canned or kibble:7-9 False AND True (depends on the patient)
Home-made diets are easy to make: 7-9 False (though easy to make wrong)
The more expensive diets are the most nutritional: False (most definitely false)

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SOME COMMON MYTHS AND FREQUENTLY ASKED QUESTIONS4

I heard/read that grain-free diets are better and that grains are just “fillers”.

This is what grain-free diet makers and marketers want you to believe, but this is one pet food myth that is FALSE. Dogs and cats require nutrients, not ingredients, and unless an individual animal has an allergy (rare) or intolerance (still uncommon, but more prevalent than true allergies) there is no proven benefit to avoiding grains. Selective pressures over thousands of years have allowed dogs to adapt to a more omnivores diet, and that includes being able to breakdown and digest carbohydrates from properly cooked grains readily. Avoiding high intake of carbohydrate for an otherwise health adult cats in general is recommended, no matter if that carbohydrate comes from grains, potatoes, or legumes as these obligate carnivores are less efficient at digesting plant-based ingredients.

Dogs and cats CAN digest cereal grains in species appropriate amounts as long as they are properly cooked and the overall diet is nutritionally balanced. Every ingredient in a pet food must have a purpose, whether nutritionally (cereal grains provide energy in the form of carbohydrates as well as nutrients such as essential fatty acids, vitamins and minerals). Cereals also provide dietary fiber that while considered “non-essential” in the diet is functionally essential for optimal intestinal function. True “fillers” in pet foods are things like chamomile, dandelion, and blueberry that are in such small amounts or have been so highly processed that any phytonutrients are long denatured before the diet is fed. These are used as “label filler” to appeal to people and provide little to no health benefit to dogs or cats.

In addition, there is currently an ongoing investigation by the Food and Drug Administration Center for Veterinary Medicine (FDA-CVM) and a number of veterinary universities in the United States looking into links between grain-free diets and dilated cardiomyopathy (DCM) in dogs. Until the causative link between feeding grain-free diets and DCM is determined, going “grain-free” may actually cause more harm than good for some patients.

I’m a vegan/vegetarian, can I feed a similar diet strategy to my dog or cat?

For dogs, going vegetarian (a plant-based diet that still includes egg and/or dairy) is pretty easy as egg has a complete amino acid profile and for an adult, non-reproductive dog, dairy works quite nicely, too. Vegan diets (avoiding ALL animal-sourced ingredients) is a bit trickier, but not impossible. Dogs are able to manufacture adequate amounts of taurine from methionine and cysteine (though breed and diet factors may alter this), can split -carotene from root vegetables and fruit into vitamin A, and are also able to convert LA found in plant seeds and grains into AA.[1] Cats have unique metabolic adaptations that do not allow for transition to completely vegan or vegetarian diets.3 The idea behind feeding vegan/vegetarian diets can be TRUE for dogs, but FALSE for cats.

Ideally a selected vegan or vegetarian diet would have gone through feeding trials (fed to a group of healthy adult dogs to prove that the nutrients in that plant-based diet are digestible and absorbable), but whether this has been done or not, high inclusion of plant-based fibers and ingredients can decrease the overall digestibility of the diet and commercial diets can have variable quality control standards.5,6 Routine checkups (at least annually) should to be performed on any dog eating a vegan or vegetarian diet.

I heard that "by products" don't provide any real nutrients into the diet.

Sorry to break it to you, but this is another myth promoted by pet food companies and their marketing departments. The term "by-product" comes from the human food perspective and designates a food that is a secondary product made during the processing or refining of the primary food. Molasses, for example, is the "by-product" of refining sugar; wheat germ is a "by-product' of wheat milling; and peanut hearts are "by-products" of making peanut butter. When that "by-product" comes from an animal it is specifically referring to the internal organ meats that are left over after the muscle meat is removed for human consumption. These organ meats are edible and highly nutritious, but there is little to no demand for them on the human food market (at least in North America). As such, it is more cost effective and convenient for meat processors to group them together than package them individually. Some pet food companies claim "no by-product" but instead will list out "liver", "kidney", "spleen", "tripe" (stomach), and "lung" individually; these are all by-products.

By-products can come from a single species such as chicken or beef, or a combination of animals such as poultry (chicken, turkey, and/or duck) or meat (beef, pork, lamb, and/or goat). These can only be the edible parts (no hooves, horns, beaks, skin, feathers, or feces allowed) other than the muscle meat.

The term "by-product" has no bearing on the nutritional quality of the said ingredient and is often a superior source of essential nutrients in the diet compared to only including muscle meats. Using these highly nutritious "by-products" in dog and cats food also reduces food wastage, is better for the environment (all that unused organ meat would otherwise end up in a landfill or incinerated), and helps reduce the number of food animals that would need to be raised just to provide muscle meat into the pet food production chain.

OTHER COMMON PET FOOD MYTHS

Home-made diets are better than canned or kibble:7-9 False AND True (depends on the patient)
Home-made diets are easy to make: 7-9 False (though easy to make wrong)
The more expensive diets are the most nutritional: False (most definitely false)

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CANINE DYSTOCIA MANAGEMENT

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Introduction

Dystocia and need for Caesarian section in bitches is a fairly common occurrence in both general practice and emergency practice. Canine dystocia has varying rates of occurrence, depending on the reference, but a recent prospective study suggested only 46% of dogs whelped naturally without assistance.[1] Distinguishing whether fetuses are term, as well as determining urgency of the need for medical management verses surgical intervention for fetal delivery is a skill every small animal practitioner should have some familiarity with.

Defining Dystocia

During triage of a possible dystocia, determining whether fetuses are term is critical before proceeding with assistance via medical or surgical means. Canine gestation lasts approximately 62-64 days from ovulation[2], with a very narrow window of fetal survival if delivery occurs prior to 48-72 hours before due. Ovulation timing to determine acceptable due date ranges is ideal, though not always available. Days from breeding date, transient rectal temperature decreases, presence of mammary development or lactation, radiographic appearances, and nesting behavior are not observations that are absolute for determining safety for delivery, though some can be supportive. Ultrasonographic evaluation is an excellent choice to determine fetal maturity if a dystocia presents in practice, in order to better determine if the bitch is aborting rather than having a dystocia at term pregnancy[2]. This would warrant a very different approach to management.

Canine eutocia consists of three stages. The first stage of parturition generally on average lasts for 6-12 hours, but can range widely, with 36 hours observed in some primiparous bitches[3]. Common notes during this stage include restlessness, nesting behavior, panting, and inappetance, but precedes obvious contractions or lochia. The presence of contractions, abdominal contractions, passage of lochia or burst of fluid associated with ruptured fetal sacs will clearly denote second stage labor. Third stage labor in litter bearing species is often following each puppy, with passage of placenta at the time of birth of each fetus.
In the event of dystocia, the bitch may show obvious signs of distress, or may simply not be progressing within timelines that would be associated with normal whelping behaviors.

Although the bitch in obvious distress may appear more urgent, both scenarios may require haste to result in successful delivery of live puppies.

Maternal Causes of Dystocia

Uterine inertia can occur as a primary issue, presenting as a bitch that lacks progress into stage two labor. This may present in bitches with singleton or two-fetus pregnancies, or alternatively may present in a bitch that carries past term with a normal litter size. Secondary inertia can also occur, which occurs as a result of prolonged uterine contractions during whelping.
Breed-related predispositions are widely associated with brachycephalic-type breeds, but can also extend to those with extremely large or small litters, as well as breeds that have more frequently been managed with elective c-sections in recent years. Brachycephalic breeds are 11 times more likely to have a c-section as compared to other breeds[2].

Conformation of the bitch can impact her ability to naturally whelp. History of pelvic trauma, pelvic size, and pelvic shape can all impact the patency of the birth canal for natural whelping. Soft tissue structures may also cause dystocia, such as a vaginal stricture or band that may have gone unnoticed during artificial insemination. Other common vaginal impediments include excessive perivaginal fat, vaginal hyperplasia or prolapse, and congenital structural anomalies. Aside from the reproductive tract structures, additionally a ruptured diaphragm or disrupted abdominal wall may indirectly result in non-productive contractions and may present as a dystocia.

Metabolic concerns may prevent normal labor, such as gestational diabetes and pregnancy ketosis. Although these are commonly associated with pregnant bitches specifically, other endocrine or metabolic conditions may result in a primary inability to produce normal contractions and subsequently puppies. Exogenous progesterone supplementation will prevent the normal progression of labor in most bitches. Other causes for maternal whelping failure include pain and fear.

Fetal Causes of Dystocia

Many of the maternal causes of dystocia have some relation to fetal causes in relation to feto-maternal mismatch. Large fetal size compared to the birth canal may be due to litter size, breed predispositions, prolonged gestation, or genetic factors[3].
Fetal presentation, position, and posture can be abnormal and result in dystocia. It should be noted that 60% of canine fetuses are cranial presentation, with 40% caudal presentation.[3] Caudal presentation in this species is not considered a risk factor for stillbirth, and doesn›t generally require a different approach to resolution, as it does in some other species.

Transverse presentation is the only form of presentation considered abnormal in the dog, and is rare. Position describes the relation of the mother›s pelvis to the fetus›s spine, and is normally dorsosacral. Posture describes the extension or flexion of head and limbs, and all should be extended in normal whelping progression.

Schistosomas reflexus, anasarca, and other fetal structural abnormalities may result in difficulty of the dam to whelp naturally. Alternatively, some fetal abnormalities may result in a normal birth, but would need attention immediately post delivery.

Physical Examination and Fetal Assessment

Routine physical examination of the bitch›s state upon arrival at the clinic is important to determine more serious complications as a result of dystocia, and assess for the stability of the patient depending on need for surgery. Digital examination of the vaginal tract should be peformed, with special attention to lochia color, presence of fetus, and ability of the bitch to contract when manipulated. Many bitches who can produce strong contractions will do so as a response to vaginal manipulation during labor.

If a fetus is present in a canal, assessing for the subjective assessment of size, position, and cause for dystocia should be performed quickly. Fetal viablity is often difficult to observe, as compared to livestock, due to patient size. Still, immediate delivery of the fetus if past the pelvis can be assisted using lubricant and traction synchronized at the time of uterine contractions. Two handed manipulation of a fetus using one hand vaginally and the other either rectally or by transabdominal pressure can sometimes provide extra help to extract the fetus[4]. It is important to be gentle with all manipulations, as decapitation or dismemberment are possible if using excessive force.
If a fetus is not present in the canal, assessment of ionized calcium can be pursued. Practical assessment of calcium availability can be obtained by stimulating contractions vaginally. If contractility is strong, transient hypocalcemia is less likely a cause for dystocia. If calcium is low, supplementation via intravenous administration. Oxytocin may be used at microdoses (0.25-2 units) intramuscularly to assist in fetal explusion if calcium needs appear satisfactory. In the event both calcium and oxytocin therapy fail, c-section should be considered imminently.

Indications for Proceeding to C-section

If a bitch presents in labor, condition of the fetuses for maturity and stress should be assessed upon arrival. Fetal distress is defined differently amongst varying practitioners, however, any fetus that has a fetal heart rate of less than 180 should be observed repeatedly and is cause for concern. If found to be consistent, considering a C-section should be stressed as best for fetal survival.

Obstructive dystocias should be aggressively moved to surgery if the obstruction is not easily relieved by manipulation measures. Color of lochia should be used as an indication for placental separation, and green fetal fluids should be an indicator for concern if no fetuses have been passed. After fetuses have been delivered, green vulvar discharge is considered normal, and is no longer a way to evaluate the health of the fetuses. Normal progression of fetuses should not exceed 2 hours between deliveries in most healthy bitches.
It is important to remember to assess for the remainder of fetuses. On occasion, owners may have not witnessed the birth of a puppy, and radiographic count of fetuses may not have been accurate. In either case, remaining fetal presence is important to confirm, prior to pursuit of Caesarian section.

Post-delivery Considerations

In many species, dystocia may create an increased risk for post-delivery concerns such as metritis and future fertility. No thorough studies exist describing outcomes; however, the cause of dystocia may have a large impact on expected recurrence or negative impacts.
Fetuses delivered under stress may have undergone a period of hypoxia, and require more attention immediately after birth than their littermates. Stillbirths may be more frequent in situations where prolonged intervals between puppies are observed.

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WHAT›S UP DOC? WORKING UP SMALL MAMMAL CASES

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A 3 year-old female dwarf rabbit presented to me with a grossly distended abdomen and the owners said that it hadn't eaten or defecated in more than a week. The patient had seen by 2 other veterinarians during that time and they each gave the rabbit an enema, based on the presumptive diagnosis of constipation, without benefit of radiographs or other diagnostic tests. The rabbit was dyspnic and kept its body in an upright standing position on the hay bin in order to breathe because the distended abdomen was pushing on the diaphragm. Radiographs evidenced a fluid filled mass in the caudal abdomen pushing the other viscera cranially. A severe hydrometra of both uterine horns was discovered on exploratory surgery but the patient died during the OVH. This case made me realize that if practitioners didn't know what normal behavior was in rabbits that they wouldn't recognize abnormal behavior and it began my quest to disseminate information about exotic animal behavior, medicine and surgery.

This is the advice that I would give to all practitioners in order to make them more successful in treating their small mammal patients.
Look at the Whole patient:
-Watch how the patient acts before the exam and recovers after the exam – this can be more important than the exam itself as signs can be very subtle (esp. in prey species)

-Full physical exam, looking at the affected part last
-Often the patient will appear normal but the owner has noticed changes in behavior that indicate a problem, listen to the owner
-Obtain a full history including diet and environment and recent changes that may have been made in these things

-Don›t overlook issues not in presenting complaint
A case is described where a ferret presented with a swelling on its face. A tooth root abscess was discovered in the upper right canine tooth. By performing a full physical exam to assess the whole patient and by performing appropriate diagnostic bloodwork it was discovered that the patient also had insulinoma which without diagnostics might have been missed.

A second case is described where a sugar glider had been being treated with antibiotics for over 2 years for a non-responsive periodontal infection of the lower incisors. A full exam uncovered an infection in the peri anal sacs and after this was discovered the owner disclosed that the patient often suckled on the peri anal area as a result of the discomfort. When the anal sac infection was resolved a hemi -mandibulectomy was performed to remove the lower incisors and the patient now lives more comfortably.

Wellness Exams

-Insist on Annual exams for NT's
-Rec. 2-4 exams/year since most of your small mammals have fast metabolisms, shorter lives and are great at hiding illness until it is advanced

-This gives you greater familiarity with the patient
-It gives you the opportunity to catch problems earlier
-It gives you more opportunity to reiterate recommendations on diet, environment and enrichment

Regular exams give you and the owner the opportunity to work better as a team and gives the patient more opportunity to live a longer, more comfortable life. A case is described about an abdominal mass that was detected in a rabbit that presented for a nail trim. When the owners allowed a work up and surgery it was discovered that the rabbit had a pyriform appendix infection. The affected portion of the GI tract was resected and the rabbit did well – all because a full exam was performed before the nail trim could be done.
Perform Diagnostics to guide your treatment choices and monitor resolution of problems

-Radiographs
-Blood work
-Culture and Sensitivity
-Ultrasound
-Fine Needle Aspirates
-Cytology

Often practitioners call for advice on cases and just provide the signalment and clinical signs noted. As with any species, diagnostic tests are needed to determine diagnosis, prognosis and to develop and effective treatment protocol that will address the whole patient.
Look at the Whole Patient
-Watch for clues outside the scope of your exam and the history taken
-Bedding
-Pictures and videos that the owner has taken
-Size and consistency of stool

A case is described where the size and shape of the stool led to a diagnosis of a urethral plug. The importance of taking radiographs that include the entire distal urethra of small mammals is discussed.

-Don't overlook the less obvious problems by focusing on the obvious

A case is described of a rabbit with a large abdominal mass that turned out to be a torsion of the uterus secondary to hydrometra. Upon further inspection of the radiographs and during the exploratory a torsion of the stomach was also discovered. The stomach was de-rotated and then a gastropexy was performed.

Don't Be Afraid to Try!!

If the owner knows the risks but wants you to try:
- Don't be afraid to try
- Don't hesitate refer to someone who has more experience and will try

Two examples are given of advanced cases where the prognosis is guarded to poor but the outcome was good with surgery. These include a guinea pig with a huge abdominal mass that turned out to be a uterine Leiomyoma corrected with OVH, and a hedgehog with necrotic prolapsed tissue that turned out to contain reproductive tract and was also corrected with OVH.

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OBESITY AND OSTEOARTHRITIS – ARE THEY RELATED?

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Introduction

The World Health Organization has declared obesity to be the most important human health problem facing the Western world. Most of us would agree that a similar scenario is found in small animal veterinary practice. Recent literature would suggest that more than 50% of dogs and more than 70% of people are overweight or obese. Osteoarthritis (OA) has also become an increasing concern in human and veterinary medicine.

Literature from human medicine would indicate that approximately one quarter of adults have OA and veterinary literature suggests a similar percentage of dogs are affected.

Anecdotally, many people believe OA is under diagnosed in small animal veterinary practice. The comorbidity that exists between obesity and osteoarthritis has been established. Reports indicate that 40% of dogs and 31% of people with OA are also overweight. 1,2 In spite of the knowledge of this comorbidity, the mechanisms by which obesity and OA are related are less clear.

What is Osteoarthritis?

An understanding of OA and the current treatments is relevant to this discussion.

Osteoarthritis (OA) can be described simply as a deterioration of a joint associated with pain and dysfunction. In reality OA is a much more complex condition with biochemical, physical and pathological alterations. All of these factors require consideration when approaching treatment. Traditionally the treatment approach has been to palliate painful symptoms. In fact the pathologic changes including bone and soft tissue alterations that result in lameness and clinical signs may not coincide with the degree of pathologic or radiographic change. This makes utilization of multimodal techniques essential for the essential treatment of OA. As obesity contributes to both biomechanical and biochemical changes throughout the body, both need to be considered when attempting to draw a line between obesity and OA.

It is not difficult to understand that increased load on joints due to being overweight will have an impact on articular cartilage as well as the periarticular structures. The proinflammatory state induced by an excess of body fat is something that is not considered as frequently and these biochemical changes must be considered when discussing and treating OA.

Biomechanical Factors

It is well established that joints need to be loaded in order to maintain healthy articular cartilage. Too much of a load or too little of a load will result in detrimental changes in cartilage believed to contribute to the development of OA. Both overweight/obese dogs and people have been exhibit alterations in their gait. This alteration in joint kinematics and increased ambulatory load likely contributes to the initiation and progression of OA.

Dogs that are overweight/obese produce higher ground reaction forces as well as increased range of motion during the stance phase documenting both increased compressive loads on their joints along with additional strain on the periarticular structures.3,4

Biochemical factors

Obesity has been identified as a risk factor for development of osteoarthritis in people with effects on the weight bearing joints due to the biomechanical factors present well documented. Convincing evidence exists that obesity is also a risk factor when considering non-weight bearing joints leading to the conclusion that systemic factors are also involved.5 The concept of 'fat as an organ' has been well discussed and cytokines produced by adipocytes have been implicated in many chronic diseases. Adipocytokines such as leptin and adiponectin have been documented in both human and canine adipocytes.6 These cytokines have been shown to have effects on articular cartilage but may also affect the synovial membrane, subchondral bone and infrapatellar fat pad.7 In fact, elevation of cartilage degradation biomarkers may be detected in the serum of overweight/obese dogs prior to development of clinical lameness and radiographic signs associated with OA.8

Weight Loss – Improved Function? Increased Activity?

The questions of whether or not maintenance of an ideal body weight can reduce the incidence of OA or whether or not weight loss is an effective treatment for OA become very important when discussing this relationship. One study showed that an 8% increase in body weight in dogs resulted in reduced weight bearing as measured by force plate analysis. The same study showed that dogs with radiographic OA show clinical improvement and a measureable increase in peak vertical force after a 3% decrease in body weight.4 Two studies have shown that weight loss improved function in dogs with radiographic evidence and clinical lameness associated with hip OA.9,10 In terms of reducing the incidence of OA by maintaining an ideal body weight, Kealy et al demonstrated that a 25% reduction in diet delayed the onset of chronic disease, including OA, increased the age at which radiographic sign of OA were detected as well as increased the age when dogs required NSAID treatment for OA. The lifespan of the dogs in the lean control group was also longer.11

Summary

The relationship between obesity and osteoarthritis and the associated mechanisms are becoming increasingly well understood in human medicine. There is an increasing interest in investigating this relationship in veterinary medicine as the impact of weight management in the prevention and treatment of many chronic diseases in small animal practice is great. Weight management and weight loss should be discussed with our clients as an integral part of a wellness plan for all of our patients. Weight management is an important topic of discussion for reducing the incidence of and a treatment for osteoarthritis.

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NEW IDEAS IN THE NUTRITION FOR THE CRITICAL CARE PATIENT

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Introduction

The WSAVA nutrition committee has spent a large amount of effort trying to increase the awareness of nutrition as the fifth vital assessment in all patients1. Nutrition tools have been published describing standardised nutritional assessments and nutrition planning 1. Despite this, various publications have documented malnutrition in hospitalised patients in small animal veterinary hospitals 2. It is suggested that unless starvation is planned for surgical reasons all hospitalised animals should have their resting energy requirements (RER) calculated, an appropriate diet prescribed and feeding instructions written for them on their hospital chart 1. Actual amount eaten must also be recorded, and if insufficient, an assisted feeding plan must be implemented 1. Importantly total water intake is also monitored to avoid over or under hydration. In a survey conducted by the WSAVA nutrition committee in 2018 in Clinicians Brief only 4.1% of respondents (98 of 2388) used a systematic nutritional assessment in hospitalised patients. In the same survey only 54.7% of respondents (1339 of 2390) did any form of nutritional assessment as part of the routine assessment of patients' general health status. These findings are far from ideal, given the benefits of appropriate nutrition, and indicate that a more objective assessment of risk of malnutrition may be necessary in our veterinary hospitals, as has been attempted in human medicine 3,4.

Assessing a critical care patient for risk of malnutrition:

The eight parameters that place critical care patients at risk have been identified and are listed below 5: Each parameter scores a minimum of 0 and a maximum of 3. A total score of ≥6 points is a call to action. Scores vary from 0 to a maximum of 24 points and are assessed daily.

1. Days of hyporexia, as defined by < 80% RER intake, is a historical parameter where RER or resting energy requirements are determined using the following equation 6:

RER (kcal/day) = 70 X BM (kg)0.75

This parameter is divided into 3 risk levels. RER intake of < 80% for less than 3 days scores 1 point towards the NSI, 3-5 days scores 2 points towards the NSI, and > 5 days score 3 points towards the NSI. Once a patient has exceeded 5 days of < 80% of RER intake they continue to score 3 points until 80% or greater RER intake is met voluntarily, through tube feeding, or a combination of tube feeding and parenteral feeding. At this point the patients scores 0 points towards the NSI for hyporexia indicating an adequate nutritional plan has been implemented or the patient's appetite has returned. If a patient has begun tube feeding but is still at < 80% of RER they will still score 3 points towards their NSI for this parameter and 6 points if any other major risk factor is present forcing a re-evaluation of the nutritional plan each day.

2. Presence of anorexia for 24 hours:

The patient scores 3 points towards the NI for the presence of anorexia if there is a total refusal of food intake for a 24-hour period even if tube feeding or parenteral feeding has been instituted, it is also a historical parameter. If the patient has any voluntary intake of food, they score 0 points towards the NI but still score points according to the presence of hyporexia in parameter 1. It is therefore important to offer patients a small amount of a highly palatable diet appropriate for the patient's disease just prior to tube feeding each day to assess this parameter.

3. ≥ 10% weight loss from original weight prior to illness:
This parameter is somewhat subject to a recorded previous weight history which if present becomes simple mathematics and if not available is left to subjective assumption, therefore again it is a historical parameter. If a patient is deemed to have lost more than 10% of body weight, they score 3 points towards the NSI until at least 1% weight gain is achieved for 2 consecutive days.

4. Severe vomiting or diarrhoea:
Severe vomiting negates the benefit of most oral or tube feeding with perhaps the exception of a jejunostomy tube; for this reason, every effort is made to control vomiting symptomatically or by treating the underlying disease mechanism causing the vomition, this course of action is assumed for every disease state involving nausea and / or vomition. Several disease states have been shown to benefit from a "feed through the vomiting" approach, or at least an "early return to feeding" approach, such as canine parvoviral gastroenteritis and canine pancreatitis.

Severe vomiting is defined as ≥ 3 vomiting episodes per day for which the patient will score 3 points towards their NSI and continue to do so until it is resolved as it reduces nutrient intake. Severe diarrhoea can be defined as ≥ 250 ml watery stool per 10 kg per day, it decreases nutrient absorption, and everything should be done to treat any underlying patho-mechanism of this symptom. The presence of severe diarrhoea will add 3 points to the NSI unless this has already been added due to severe vomition.

5. Body condition score 4/9
Body condition is scored (BCS) according to the WSAVA nutrition guidelines, it is a clinical parameter. If the patient has a body condition score less than 4/9 they score 3 points towards their NSI until their BCS shows improvement.

6. Muscle condition score ≤ 2/3
Similarly, to BCS, muscle condition score (MCS) is scored according to the WSAVA nutrition guidelines, it is a clinical parameter. If the patient has a MCS condition score ≤ 2/3 they score 3 points towards their NSI until their MCS shows improvement.

7. Hypoalbuminaemia
Hypoalbuminaemia is defined as a serum albumin less than the laboratory reference range for dogs and cats, it is a biochemical test. A patient with hypoalbuminaemia scores 3 points towards their NSI until their albumin starts improving. Albumin is a crude reflection of decreased protein and energy intake in cases with a functional liver 7.

8. Length of expected course of illness: (Low risk) < 3 days(Moderate risk) 2-3 days(High risk) > 3 days OR un-resolving CRP > 30 mg/l

An accurate diagnosis and knowledge of likely disease progression are essential in determining the expected course of illness. Chronic diseases continue to score 3 points towards their NSI until they are resolved. Unresolvable diseases will continue to score 3 points towards their NSI. His means that patients with unresolvable diseases need only have one other parameter present to be at risk of malnutrition.

An initial or un-resolving canine C-reactive protein >30 mg/l is also useful to determine risk of malnutrition. This inflammatory marker can be used to help determine the severity of inflammatory diseases and monitor their progression 8. A CRP of > 30 mg/l reflects significant systemic inflammatory levels which could correlate to a higher risk of malnutrition. CRP levels increase within 6 hours of significant systemic inflammation and begin to decrease 24 hours after resolution. The higher the CRP the more severe the systemic inflammatory disease and the more likely that the expected course of illness will persist for more than 3 days.

An increasing CRP is an indication that the underlying disease process is not controlled. CRP will not be raised in chronic inactive diseases such as chronic renal failure and is also not yet available for cats, for this reason it is proposed that CRP is added to the NSI as an alternative to duration of disease in appropriate cases where it is being monitored.

Conclusion:
Given our recent WSAVA survey has highlighted the risk of continuing malnutrition in hospitalised animals it is hoped that a better understanding of the parameters that place them at risk will lead to improve attention to their nutritional needs and therefore improve patient care. It is also hoped that by placing objectivity to their assessment a nutrition plan can be monitored for how successful it is.

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EMPLOYEE INCENTIVE PROGRAMS

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Introduction

In today's employment market, particularly within the veterinary industry, one of the biggest challenges is attracting and retaining great support staff. Employee costs within a veterinary practice approximate between twenty and twenty four percent of gross revenues and when there are ineffective staff employed, the actual cost is astronomical! The average number of years worked for a practice by a qualified Animal Health Technologist is five years. Here's what Shawn McVey of McVey Management Solutions says;
"How your staff feel about working at your practice can impact your business performance by 20 – 30%."
"Roughly 50 – 60% of how employees feel about the practice can be traced to the actions of one person … the leader."

Again, we come back to the topic of Leadership that I spoke about in delivering value to the client. Whereas the client looks to leadership in advising the client on how best to medically treat the animal, the employee looks to the leader to inspire them to contribute to the business success. I have not met an employee yet who didn't simply want to do their best in doing their job. Give an employee opportunity to learn and to enjoy their work in a welcoming work environment, and compensation consideration will rank lower in the list of priorities. Like clients, employees have a Perceived Value of their working relationship with the practice and it begins with great leadership.

What is Leadership?

A book entitled "The Leadership Challenge" by Kouzes & Posner suggests the following five practices will lead to great leadership and I am going to suggest, by implementing each of these practices, you will in turn improve your relationship with employees;

1. Model the Way
Set the example by aligning actions with shared values.
Great leaders are always asking for help.

2. Inspire a Shared Vision
Envision the future by imaging exciting and enabling possibilities.
Enlist others in a common vision by appealing to shared aspirations.

3. Challenge the Process
Experiment and take risks by constantly generating small wins and learning from the experience.

4. Enable Others to Act
Foster collaboration by building trust and facilitating relationships.

5. Encourage the Heart
Recognize contributions by showing appreciation for individual excellence.

As the owner and Leader, I believe you deliver value to employees by taking the time to determine what employees aspire to achieve and providing inspiration for them to achieve it.

I see a lot of similarities in the inter-relationship between clients and employees. They both come to the business in search of Perceived Value. In both cases, delivering value rests upon on the developing a relationship founded on trust and leadership and recognizing that relationships cannot exist unless there is open and honest communication.

Respecting and treating employees as if they were clients, will foster a strong relationship between the veterinarian and support staff, which will also improve your delivery of Perceived Value to the clients and in turn increase revenue and profitability.

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ABDOMINAL FAST ULTRASOUND: GALL BLADDER WALL OEDEMA IN THE COLLAPSED PATIENT, ABDOMINAL EFFUSION AND PNEUMOPERITONEUM

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Introduction

The FAST abdominal exam, described in 2004 (Boysen et al 2004), was the first VPOCUS exam to be validated in small animals. The goal was to detect free peritoneal fluid following blunt abdominal trauma, and therefor concentrated on 4 key sites of the abdomen; sites where target organswere most likely to be injured following trauma; liver, spleen, kidneys and urinary bladder, and where fluid is most likely to accumulate based on patient positioning and gravitational forces. The study demonstrated that this FAST abdominal protocol was sensitive and specific for the detection of free abdominal fluid. The study also demonstrated that abdominal FAST can be performed during resuscitation, was rapid (<5 minutes), required minimal experience, was repeatable, and was noninvasive. Abdominal VPOCUS has now been demonstrated to be sensitive for finding effusion in non-trauma patients.

Abdominal VPOCUS patient position, probe and coupling agent

Patients are placed in either left or right lateral recumbency. In some instances, abdominal VPOCUS can be performed in a sternal or standing position (consider the effects of gravity and patient positioning when looking for pathology). Minimal restraint is required.

A microconvex/curvilinear probe is used for all abdominal VPOCUS scanning, with a frequency generally between 5 MHz (patients >15 kg) and 7.5 MHz (patients < 15kg).

Gain is adjusted to maximize detection of anechoic fluid using either bile in the gall bladder or urine in the urinary bladder as a reference echogenicity for fluid.
Depth is adjusted as needed during the abdominal VPOCUS with the greatest depth setting generally at the subxiphiod location which allows evaluation of the pleural and pericardial spaces.

It is not wrong to shave the patient, but shaving is not required unless the patient's fur coat is too thick to allow good image resolution (e.g. Husky and Northern breeds with thick undercoats).

Alcohol is used but it is important to part the fur before or after applying the alcohol. Gel is not necessary (but can be used with shaving if higher resolution is desired or can be applied after the fur is parted and alcohol is applied). Hand sanitizers that combine alcohol and gel can be used.

Patients should NOT be placed in dorsal recumbency as this can compromise the patient (increased work of breathing, decreased venous return and cardiovascular collapse).

Abdominal VPOCUS (abdominal FAST) Protocol

The probe is placed on 4 regions of the abdomen in a consistent systematic approach. At each site, the probe is fanned and rocked through an angle of 45

NOTE a 5th umbilical region view can be performed (5th site, see description below) prior to the gravity dependent renal view as it might detect smaller quantities of fluid that would be displaced when the ultrasound probe is slid under the patient when trying to find the gravity dependent kidney (the authors prefer to examine all 4 original sites as well as the umbilical site essentially making the exam a rapid 5-point evaluation).
The original 4 sites:

Subxiphoid or Diaphragmatico-hepatic (DH) site: just caudal to the xiphoid process

Key structures to identify include the diaphragm, liver, gallbladder, caudal vena cava, pleural and pericardial spaces (see later sections on volume status for more detail on the vena cava evaluation, and the respective sections on pleural and pericardial space evaluation).

Mirror image artifact distal to the diaphragm can only occur when there is air distal to the diaphragm, and therefore can be used to rule out pleural effusion at that location if it is noted.
It is important to consider patient positioning and the effects of gravity when evaluating any VPOCUS sites, including the subxiphoid location. Be sure to fan the probe through all liver planes to ensure a thorough evaluation of the liver is complete, and to rock the probe to assess the most ventral and cranial parts of the liver, where small accumulations of fluid may gather between the liver and diaphragm.

Urinary bladder or Cysto-colic (CC) site: Key organs and structures to identify include the urinary bladder, the gravity dependent body wall and the apex of the bladder. Fluid tend to accumulate between the body wall and the bladder, at the apex of the bladder and between the bladder and the body wall. The probe is placed in long axis to the body between the pelvic limbs.

Once the bladder is found, it is important to manipulate the depth to see both dorsal and ventral walls of the bladder, and then to slide the probe to find the apex.

Once at the apex, fanning, rocking, and then rotating the probe to short axis (and fanning, rocking in short axis) will allow visualization of abdominal effusion. The probe should also be placed on the non-gravity dependent lateral side of patient and the ultrasound bean angled through bladder and fanned to catch fluid in deeper gravity-dependent sites at the body wall. Pushing too hard will compress and can displace the bladder making it a challenge to identify.

Right paralumbar or Hepato-renal (HR) site: Key organs/ structures to identify include the liver, right kidney, body wall and intestines. This view can be difficult to obtain as often it is necessary to go between ribs to visualize the normal structures. It may sometimes be necessary to start in short axis to the body so that the probe can be placed within an intercostal space between ribs. In smaller dogs and in cats, the probe can be placed in long axis to the body caudal to the 13th and final rib. In dogs, if the liver is visualized in the right paralumbar region, or between ribs, the probe can be slid caudally until the kidney is visualized. The right kidney is located quite lateral relative to midline.

Left paralumbar or Spleno-renal (SR) site: Key organs and structures to identify include the spleen and left kidney, and to evaluate regions between the kidney, body wall, spleen and intestines. The probe has to be placed quite lateral to midline to find the left kidney and spleen. The spleen is located cranial and often lateral to the left kidney. The probe is placed in long axis to the body often mid abdomen and lateral to start. It is often easier to find the spleen at first, and then to slide the probe caudally until the left kidney is found. Fanning and rocking the probe helps to find the organs of interest.

Free fluid in the abdomen typically appears as dark (anechoic or hypoechoic) triangles between organs, commonly visualized at the apex of the bladder, between the bladder and the body wall, at the poles of the kidneys, between the spleen and left kidney, between liver lobes, between the liver and diaphragm, between the liver and right kidney, and/or surrounding small intestinal loops.

Is there free abdominal air in the abdomen Y/N?
Free abdominal air can be detected in many sites of the abdomen; however, it is most commonly identified at the left and right paralumbar locations with the patient in right or left lateral recumbency.

Again, it is important to consider patient positioning and where free air will accumulate when searching for free abdominal air. The author prefers to have the patient remain in lateral recumbency for a few minutes to allow air to track to the non-gravity dependent locations before trying to identify pneumoperitoneum. Steps:
The peritoneal lining must be identified. This is essential so as not to confuse free air within the GI tract for free air in the abdomen.

Identify the presence of reverberation artifact that originates at the peritoneal lining. This is very important to differentiate from reverberation artifact contained within the GI tract, which again, emphasizes the importance of clearly identifying the peritoneal lining.
Identify the enhanced peritoneal stripe sign. This sonographic finding occurs when free abdominal air comes in contact with the peritoneal lining. At the point where free abdominal air comes in contact with the peritoneal lining it will cause the peritoneal lining to become more hyper-echoic.

Does the patient have a gall bladder halo sign Y/N?
A study by Quantz et al 2009 demonstrated that patients with acute anaphylaxis often have a halo (double rimmed gall bladder wall) sign (the gall bladder wall is normally very thin or not easily visualized on ultrasound), and this can be seen during abdominal VPOCUS. A thicker gallbladder wall (often due to edema with or without surrounding fluid) can be seen with a “halo” effect. However, this is not specific for anaphylaxis and can be seen in patients with a number of conditions (anything that causes edema). However, with unstable patients presenting for collapse, the finding of a “halo” sign should prompt consideration of anaphylaxis, right-sided heart failure, pericardial effusion, fluid overload or changes to vascular permeability and sepsis.

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CANINE CAESARIAN SECTION - TIPS AND TRICKS

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Introduction

Every small animal practitioner should be comfortable with management of canine Cesarean sections (C-sections). The procedure will often be required on an emergency basis and requires immediate attention. The urgency of the procedure in many cases requires quick thinking; tailoring your procedure and protocols for both doctors and support staff can help maximize smooth recovery of the puppies as well as best possible recovery of the dam and acceptance of her new role as a mother.

Anesthetic Options

All choices for medications should be carefully examined for safety relating to pregnancy and lactation. The most common choices for induction currently in use are propofol and alfaxalone, and both of these agents also can be used for maintenance until fetal delivery is complete[1]. After the delivery is complete, conversion to an inhalant anesthetic can be elected.

Pre-oxygenation appears optimal for both the dam and puppies. Intravenous fluids are advised for all c-section patients, who are commonly hypotensive. Epidural anesthesia may reduce the requirements for injectable and inhalant options, but should only be performed if a skilled technician can place it quickly. Speed from induction to delivery should be optimized, and any non-essential tasks should be performed ahead of time or aborted if problematic.

Surgery

The patient should be placed in dorsal recumbency and abdomen should be clipped and scrubbed for surgical entry. In the case of pregnant animals, tilting the dog slightly off position can benefit the animal's ventilation as well as vascular return. The animal can then be "straightened" immediately prior to draping by the technical staff. Line block using local anesthetic agents (i.e. lidocaine 2%) may be performed on the midline in the area of anticipated incision. Using line blocks may lessen the overall need for anesthesia[1].

The surgeon should be aware of the vascularity of the mammary glands, as often large vessels will cross midline and can be a significant source of hemorrhage. Initially, quick ligation or hemostats should be used for control, in order to enter the abdomen as efficiently as possible for fetal delivery.

Care should be taken to enter the abdomen very carefully; the abdomen is under pressure, and uterus and its enlarged vasculature are often pressed toward the linea.

When possible, the uterus should be elevated in its entirety. The loops of uterine horns may be convoluted and confusing in orientation, and it is important to confirm that no structures are twisted once resting on the exterior. Vascularity is impressive in the gravid uterus, so great care and a gentle hand should be used during manipulation. Using a blade, incision may be made in the least vascular area over the uterine body or base of a uterine horn. In most cases, puppies can be milked from either horn through a single incision. Care should be taken to place laparotomy sponges or gauze to prevent uterine contents from entering the abdominal cavity[2].

Fetuses should be extracted as quickly as possible. Fetal sacs may be ruptured by the surgeon or handed off with the fetus as a unit. Placentas should be removed with gentle traction if possible. Microdoses of oxytocin may be used to reduce hemorrhage associated with the uterus and maternal placentas, though it can cause uterine contraction and alter the ease of closure. Closure can be performed via appositional or inverting patterns[2], with two-layer closure having been the preference of most practitioners. One-layer closure has in recent years shown to be an effective option as well. If oxytocin has not already been implemented, it may be given after incision completion to help further bury the incision and reduce the uterine size.

Thorough examination of the tract should be performed before replacement into the abdomen, to ensure all fetuses have been delivered, and no pathology exists. Resorptive lesions noted in mid pregnancy are often observable at surgery, both visually and by palpation. These lesions will often be associated with a mucoid whitish yellow colored discharge within the uterus. If observed, culture of this discharge is indicated, to rule out presence of infectious causes of resorption of early pregnancy.

Lavage of the abdomen (if needed) and routine abdominal closure can follow. All types of closure are acceptable, including internal or external suture patterns, and staples. Although it seems puppy interaction would cause tangling in external suture, this is not typically observed. Cleaning with a wet cloth of all of the mammary glands post operatively will help to remove the taste of the sterilizing agent used during preparation for surgery; this practice will improve nursing post-operatively. As soon as the dam is in recovery, monitored nursing efforts should commence.

Arguments for Concurrent Ovariohysterectomy
Many circumstances can present in which removal of the ovaries and uterus may be indicated at the time of c-section. Uterine disease, uterine rupture or tear, or presence of fetal autolysis can be appropriate situations to perform concurrent ovariohysterectomy. When the uterine health is optimal, some practitioners will still advise spay for bitches without plans for remaining intact for future breeding. While in many cases this is elected by owners, it should be cautioned given the risks relating to post-operative complications. Removal of a massive and vascular organ can create shock in the post-operative period, as well as put the patient at higher risk for post-operative bleeding, and thromboembolism.

Neonatal Resuscitation

Prior to delivery of the puppies, a resuscitation station should be created. A shallow wet sink, towels, and heat sources can be used as a makeshift station in most hospitals. Items that should be readily available include suction bulbs, small hand towels (at least two per puppy anticipated), 25g needles or acupuncture needles, umbilical disinfectant, stethoscope, and suture material[3]. Hand towels should be kept warm prior to use, and providing new warm towels during resuscitation can make recovery of puppies progress much more smoothly than previously observed. Emergency drugs, such as epinephrine, and 22g catheters should be available for intraosseous catheter placement.

Handing off puppies can be stressful for the surgeon and the assistant, relating to protecting sterile field. The design of the surgical area will lend itself to certain methods, but in some hospitals, it may be possible to lightly lay the puppies onto a sterile towel.

Although “swinging” puppies via centrifugal force was formerly adopted by some clinics, this practice has since been discontinued due to documented cases of cerebral hemorrhage and death relating to the force applied[4].

Post-operative Recovery

It is critical to monitor the bitch at all times during recovery when puppies are nursing or interacting. Bitches may be reluctant to accept puppies, become aggressive or cannibalistic, or crush puppies unknowingly[5]. Owners should be advised to manage bitches with constant supervision for at least 48 hours post operatively, even if maternal behaviors have developed. Dog appeasing pheromone (DAP) products can be used to help foster optimal maternal behaviors. In extreme cases, oxytocin delivered via intranasal spray can help to improve maternal behaviors in the event of poor litter acceptance.

Long-term Considerations

In general, the procedure does not cause a decrease in fertility on future cycles in the dog, if management of the bitch is optimized in surgery and post operatively. If a significant dystocia occurred, perhaps with autolyzed fetuses, fertility may be impacted. Abdominal adhesions may form on some individuals relating to the uterine incision, but anecdotally, aren’t associated with future infertility, and are often found at the time of c-section in breeds who have elective c-sections.
Although often advised against in human medicine, C-sections can be performed on an elective or emergency basis in dogs and subsequently be followed by natural whelping on later pregnancies[6]. If the C-section involved a dystocia, close examination of the causes of the need for C-section should follow, and may indicate need for repeated c-section on any subsequent pregnancies. The offspring of bitches requiring c-section may also need to be monitored for similar trends, as familial concerns may warrant adjustment of the breeding program’s selection criteria.

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FELINE INJECTION SITE SARCOMAS – WHAT ARE WE DOING?

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Feline Injection Site Sarcoma (FISS) is a highly aggressive variant of sarcoma that arises at sites of chronic inflammation. Commonly this is secondary to vaccines with adjuvant, but not always. The incidence of the development of FISS after vaccination is 1 in 1000 to 1 in 10,000. There is some evidence that there may a genetic predisposition to developing these tumours. It involves the transformation of cells involved with the inflammatory process into malignant fibrosarcoma. The veterinary literature on the treatment of FISS indicates that this tumour has a high recurrence rate with marginal excision or even with standard wide excision with 3cm margins and a fascial plane deep.

This tumour type should be diagnosed via incisional biopsy. Cytology can be deceptive and be more indicative of inflammation than of neoplasia. Excision biopsy may result in the disruption of fascial planes and a more difficult and less successful excision and should be avoided. Once a diagnosis of FISS has been made, staging should be performed. Local staging with MRI or CT should be performed. MRI will give a more accurate reflection of the tumour. However, practically, CT is more often used because it allows for thoracic staging and radiation planning, if indicated.

Current recommendations for are 5cm margins with 2 fascial planes deep. This is more aggressive than the strategy for sarcoma resection in dogs and humans. This technique has resulted in tumour control in 86% of the cases in one study in the absence of radiation, which is much higher than previously reported. Unfortunately, the location and size of the tumour will limit this technique to relatively small tumours at sites that are amenable to 5cm margins. The common sites of FISS have shifted over the years from the intrascapular region to the hip area. This is because of recommendations for vaccine sites in cats. Unfortunately, the recommendations and feline vaccinations practices have not gone far enough to help make this disease more amenable to surgery. If a vaccine is administered above the stifle, it is often near the hip and flank area and resection will result in remove of the hemipelvis, limb and lateral abdominal wall if 5cm margins are taken. If vaccination is performed below the stifle or elbow and the mass is worked up by incisional biopsy expediently, it is feasible that a limb amputation would provide adequate margins and local control.

Educating veterinary students and general practitioners on appropriate vaccination protocols and sites and work up of these cases is likely to have much more impact on the disease than any advances in surgical or radiation techniques. I would elated if I never treated another case of FISS again because it could be managed with limb amputation alone. #LifeGoals #NoCatLeftBehind

For cases where 5cm radial margins and 2 fascial planes deep is no feasible, surgery and radiation can be used in combination to achieve local control of tumor. Radiation alone is unlikely to obtain complete tumor control in most cases. This is because tumor control by radiation is proportional to the volume of the tumor. Cytoreductive surgery prior to radiation is the most classical application of these treatment modalities together. In general this still will involve 2-3cm margins and one fascial plane. The limb should be salvaged if possible as this is a major advantage of combining modalities. The anticipation is that microscopic disease will be left behind and that the tumour will recur without post operative radiation. The surgeon should attempt to create simple incisions with straight or curved lines. Multiple angles and flaps should be avoided.

When approaching these cases, it is important that the surgeon and radiation oncologist have made a comprehensive plan for the patient prior to the initiation of surgery, radiation or chemotherapy. If the plan is a marginal excision followed by radiation therapy, the goal should not be to take as much as possible or to see if margins could be achieved, as this will inevitably result in a larger incision, more potential for wound healing complications and a larger radiation field, which will increase the morbidity to the patient. The goal of this excision should be to remove all macroscopic disease and to close the wound in a tension-free, compact, flat scar with a simple linear closure. Tissues lateral and deep to the mass should be disrupted as little as possible. In general, drains are avoided with type of surgery. However, a drain is preferable to seroma formation, as this can cause the complications of delaying the onset of radiation and the radiation field necessary is larger and hard to define because of the high potential for tumor cells to move to the periphery of a seroma after marginal excision. If a drain is used, a closed suction drain is ideal. The drain should exit adjacent to the incision so that it is included in the radiation field. Penrose drains should be avoided because in order to function, they must exit ventrally and this can lead to the driving viable tumor cells along the drain tract and it may be difficult to locate this drain tract and include it into the radiation field.

It is also useful to mark the surgical site with metal hemostatic clips to assist the radiation oncologist in planning. From the exterior, the scar appears to be the central part of the affected wound bed. However, it may be that the deep surgical site is not located directly central to the scar once the wound has been closed and has healed. Failure to mark the tumour bed may result in a geographic miss with radiation.

The advantages of post operative irradiation are:
There is no delay in surgery. This will be appreciated by many owners who will feel that they are making more progress if the mass is no longer present.
Wound healing is not impaired

Decrease in tumor burden for radiation therapy
The disadvantages of postoperative irradiation:
All tissues handled at the time of surgery must be irradiated

At least a theoretical risk that handling tumor cells at the time of surgery could increase the risk of metastatic disease. This has not been proven either way in veterinary studies

Damage to vasculature at the time of surgery may result in increased radioresistance of residual tumor
If there are complications with wound healing, this may result in treatment delay

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COMMON TOXINS IN COMPANION BIRDS

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Toxin cases are common in pet birds because their small size and fast metabolic rate make them easy targets for even small amounts of exposure. The curious nature of birds makes them more likely to explore their environment with their mouths and to be attracted to shiny things. Also, the intricate and delicate air sacs in birds are easily disrupted by aerosolization of toxic fumes. Finally, not all owners are aware of the many items, foods and fumes that can be toxic to birds. According to the Pet Poison Hotline the top five toxins in birds have been lead, zinc, avocado, Teflon exposure and other inhaled toxins.

Currently zinc is the most commonly found metal toxicity in birds. Lead and Zinc toxicity diagnosis is made by history of exposure (although this is not commonly recognized by the owners), clinical signs, evidence of radiopaque material in the gastrointestinal tract and bloodwork to check for zinc and or lead levels. Blood smears may evidence hypochromic regenerative anemia, vacuoles in red blood cell cytoplasm. Increased white blood cells, and more specifically increased heterophils indicating inflammation. Elevated liver enzymes (LDH and AST), muscle enzymes (CPK), and Kidney values (UA) might also be found.

Zinc toxicity sources include:

- Fertilizer
- Some paints
- Zinc pyrithione shampoos
- Zinc oxide (Desitin ointment)
- Pennies minted after 1992
- Galvanized Products – 98% zinc used to coat metal to keep from rusting
- Wire cages, mesh, nails, screws, wingnuts, washers, staples, toys
- Snap fasteners
- Costume jewelry
- E cigarette parts
- Containers and dishes
- Monopoly game pieces
- Hardware cloth
- Lead toxicity sources include:
- Antique or imported metal cages
- Lead based paint – old homes
- Foil wrap on some wine and champagne bottles
- Curtain weights
- Bells with lead clappers
- Imported bird toys
- Stained glass
- Sun catchers
- Tiffany lamps
- Solder – used to weld things
- Solder – jewelry
- Chandeliers
- Fishing weights
- Shotgun pellets
- Linoleum
- Plaster
- Caulking compounds
- Hardware cloth
- Batteries
- Plumbing materials
- Lead toys and bird toys with lead weights
- Mirror backs
- Improperly glazed ceramics
- Contaminated feed and bone meal
- Some welds on wrought iron cages
- Lead putty
- Golf Balls
- Costume Jewelry
- Imported bird toys
- Lead and Zinc Toxicity Clinical Signs:
- Depression/lethargy
- Weakness
- Anorexia
- Vomiting or regurgitation
- Drinking more and increased urination (PU/PD)
- Seizures
- Incoordination/tremors
- Diarrhea
- Hemoglobin in urine
- Green or black stools
- Discolored urates
- Blindness
- Feather picking
- Weight loss

All of these signs can be seen to a varying degree and not all of the signs may be present in every case. Many times birds are presented lethargic and weak and unable to stand as their cases are severe and chronic and earlier signs were not noted by the owners.

Treatment for Lead and Zinc toxicity is multimodal and determined case by case and may include:

- Removing objects via crop lavage
- Medical treatment with cathartics to empty gizzard
- Endoscopic removal
- Surgical removal
- Chelation therapy with Calcium EDTA

Two cases of zinc toxicosis are described including a duck that ate coins and many metal toy pieces that were removed endoscopically and a chicken that ingested 55 pellet gun pellets that were removed surgically. Both birds were also treated with Calcium EDTA injections.

Avocado ingestion is also very toxic to birds and signs are believed to be caused by the compound persin. All parts of the avocado are toxic including the leaves and the bark of the avocado tree. Signs of exposure include:

- Agitation
- Feather pulling
- Lethargy
- Food refusal or anorexia
- Dyspnea
- Pericardial effusion
- Pleural and hepatic congestion
- Sudden Death

Avocado toxicity diagnosis is made based on history of exposure and clinical signs and lethal doses are fairly small including 3.5 gm in a 35 gm budgie and 20-30 gm in an 80-100 gm cockatiel. There are no known antidotes and treatment includes supportive care, fluids, sedatives, removal from the crop and proventriculus via lavage, and activated charcoal.

Teflon toxicity (Polytetrafluoroethylene or PTFE) is an issue due to the delicate air sacs and respiratory system unique to birds and efficient gas exchange so that more oxygen in transferred into the blood with each breath. It is the most common aerosolized poisoning found in pet birds. Teflon sources include:

- Stain-guard treatments for upholstered furniture
- Surfaces heated to 535 F such as when an empty pan is heated on high or when a pan boils dry
- Nonstick surfaces on Teflon cookware
- Drip pans
- Heat lamp covers
- Irons and ironing board covers

Teflon toxicity clinical signs include acute death due to respiratory failure in severe cases and dyspnea, ataxia, depression, and anxious behavior with mild exposure. Diagnosis is made based on history of exposure, clinical signs and pathological lesions found on postmortem exam including fluid and blood in lungs/air sacs. There is no antidote for Teflon toxicity and prognosis is guarded to poor, depending on level of exposure, but treatment can include:

- Supportive care
- Oxygen
- Anti-inflammatory drugs
- Antibiotics
- Bronchodilators
- Topical ophthalmic ointments
- Other inhaled toxin sources include:
- Carbon monoxide and other harmful gases
- Smoke from tobacco products
- Glues
- Paints
- Hair spray and nail polish
- Fumes from new carpets and furniture
- Air fresheners
- Scented candles
- Mothballs
- Household cleaning products
- Fumes from illicit drug production

Protection from inhaled toxins include:

- Don't use sources of inhaled toxins around birds
- Consider how airflow in house will transfer fumes despite where bird is located in the house
- Remove bird from household as soon as fumes or fume source noted – don't wait for signs to occur
- Use VOC (Volatile organic compounds) free paints
- If using products that give off fumes:
- Remove bird from household
- Move bird to a separate room
- Open windows
- Place a towel under the door or the room bird is in
- Consider long term effects of low level exposure that the bird seems to do ok with when used in your household

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BIOLOGICAL THERAPY – PLATELETS, STEM CELLS AND EYE OF NEWT – EVIDENCE?

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Introduction

The terms regenerative medicine and biologic therapy refer to treatments that allow the body to restore form and function by relying on biological mechanisms that exist in the body. These mechanisms include growth factors and cells that can differentiate to repair and restore injured tissue. Since this concept has been introduced there has been great pressure to initiate treatment with these therapies as they hold such great promise. As such, the commercial opportunities to develop these therapies has lead to techniques and product being introduced in advance of the availability of meaningful scientific evidence supporting these treatments. In order to show that use of regenerative therapies should gain widespread use in our veterinary patients a number of challenges must be addressed.

There must be evidence that these treatments are safe and efficacious. Standardized protocols and standardization of the terms describing both scientific methods and products are essential. Challenges in the current literature related to treatment protocols include questions such as what cells are being injected?; How many cells should be administered?; What growth factors are known to be present?; Have cells been activated?; and the list of questions goes on. Outcome measures are also extremely variable in studies related to these therapies. Owner evaluation, veterinary assessment, questionnaires and objective data such as use of force plates. Many factors will make evidence based practice related to use of biologic and regenerative therapies in veterinary practice challenging. The effort and expense in designing proper research trials to evaluate these emerging therapies is required to determine if the perceived benefits of this approach are worth the effort and provide a benefit to our patient's health. This discussion will look at the most commonly available biologic therapies. The term 'stem cells' will include stromal vascular fraction (SVF) and cultured stem (stromal) cell therapy. 'Blood-derived' products include platelet-rich plasma (PRP), autologous conditioned serum (ACS)/interleukin-receptor antagonist protein (IRAP) and autologous conditioned protein (APS).

'Stem Cell' Products

Stromal Vascular Fraction

Stromal vascular fraction (SVF) is usually a point-of-care therapy that is typically prepared by the harvest of autologous adipose tissue followed by mechanical and chemical digestion followed by centrifugation allowing isolation of the cellular SVF pellet from the remaining lipid and extracellular components. No further processing such as culture expansion or homogenization of the cells takes place. Much less than 5% of the cells remaining in the SVF could even loosely be classified as true stem cells with pluripotent capacity. Cultured stem cell therapy involves the harvest of fat or bone followed by culture expansion over a period of weeks, resulting in homogenization of a stem cell population and greatly increased the number of available cells. In spite of these differences, SVF therapy is often incorrectly called 'stem cell therapy'. Advantages of SVF therapy include the ability to use this product patient side as well as SVF administration does not require the laboratory, expertise and time required for cell culture.

There are a number of published reports describing intra-articular SVF injection for treatment of treating intra-articular cartilage damage and OA in dogs for over a decade.1,2 Two recent prospective, randomized, controlled trials with objective functional outcome measures failed to provide consistent evidence of the benefit of SVF injection based upon those objective kinetic data.3,4 A more recent study looked at SVF treatment in canine stifle joints with OA and found no statistically significant improvements in function, cartilage biochemical composition, or histology for SVF-treated knees.5 As a result, there remains uncertainty as to whether the use of SVF is truly beneficial in terms of symptom relief, functional improvements, disease modifying effects or cartilage regenerative capacity. In turn, there remains a need to evaluate the efficacy of SVF more thoroughly and augment its potential regenerative benefits.

Stem (stromal) Cells

Stem cells derived from harvesting of fat are known as adipose derived stromal cells (ASC). These cells have gained interest as an osteoarthritis treatment and several recent studies have examined their efficacy in clinical cases. Patient improvement of lameness when compared to placebo control groups have been reported in a number of these studies using both visually assessed lameness scores and owner evaluation of lameness and quality of life.6,7 Some reports of improvement following administration of ASCs have been based on objective force plate data.8,9 ASC therapy in OA is reported to be based on the immunomodulatory capacity and trophic effects that mesenchymal stem cells (MSC) provide. ASCs are thought to have immunomodulatory effects that make

them an ideal therapy for active inflammatory conditions. ASCs are also thought to have ability to recruit local host cells that can induce a response that is deemed beneficial to reducing inflammation. These immunomodulatory properties mean that ASCs are well
tolerated and incorporated into the local environment. \
The potential for use of cultured stromal cells requires a more thorough investigation to determine potential for treatment of inflammatory diseases and to determine the potential regenerative capacity.

Platelet-Rich Plasma (PRP)

There is no fixed definition of platelet-rich plasma but the most commonly used is a plasma preparation that contains a higher concentration of platelets than that found in the whole blood from which the PRP was prepared. The proposed mechanism by which PRP
may be beneficial is the provision of growth factors, stored within the platelet alpha granules. These factors are thought to reduce inflammation and initiate anabolic processes and tissue healing. The growth factors stored in the alpha granules include that are most commonly associated with facilitation of tissue healing include vascular endothelial growth factor (VEGF), platelet-derived growth factors (PDGF) AA, AB, and BB, and transforming growth factor (TGF). The applications for which PRP has been used in human and veterinary medicine include injection into injured tendons/muscles/ligaments, use in fractures to facilitate bone healing, and intra-articular injection for symptomatic management of osteoarthritis. Several studies have been published supporting the use of PRP as a treatment for OA. A prospective, randomized, controlled study compared the efficacy of PRP to saline injection for treatment of OA in
20 dogs. The study included objective force plate data for half the dogs in addition to using validated subjective outcome measures for all dogs. Significant improvements in objective and subjective outcomes over a 12-week follow up period with intra-articular use of the PRP was found when compared to the control saline group.10 Franklin et al assessed a number of intra-articular treatments including PRP for treatment of OA created using an osteochondral defect model. Changes in blinded subjective lameness scores and objective kinetic weight bearing were both significantly improved with use of PRP in comparison to the sham (saline) treatment group.5 There is growing evidence in
support of intra-articular use of PRP in dogs for the management of OA.

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PATIENT CENTRIC ANTIMICROBIAL STEWARDSHIP

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Introduction

Antimicrobials revolutionized human and veterinary medicine; however, the parallel emergence and dissemination of antimicrobial resistance continues to compromise these gains. Antimicrobial resistance (AMR) has been called the global health crisis of our time. Effective antimicrobials are required for the health and safety humans and animals, and AMR puts modern healthcare at risk, with challenges ranging from complications treating common and simple conditions such as urinary tract infections or resistance that threatens the use of complex conditions such as cancer care and surgery. Antimicrobials are also important for the health and welfare of food producing animals, facilitating humane, safe and economically viable food production and helping assure food security. The dire economic consequences of AMR cannot be overstated. The World Bank estimates that, by 2050, AMR will result in global economic damage at least equivalent to the financial collapse of 2008 if left unchallenged, and no country will be spared.

WHAT IS ANTIMICROBIAL STEWARDSHIP?

Antimicrobial stewardship is a coordinated approach to optimizing the use of antimicrobials, maximizing patient care and while minimizing the risk of resistance, toxicity or other adverse events. This involves a multifaceted approach to determine when to prescribe antimicrobials, what drug, dose and duration, how they are administered and whether other approaches are needed in addition to or in lieu of antimicrobials (e.g. surgery, wound care, management of underlying disease).
While the concept of antimicrobial stewardship is now attracting much attention, there is sometimes the perception that an antimicrobial stewardship program (ASP) is meant to be restrictive and will therefore negatively impact the practice of veterinary medicine. While some aspects of an ASP may implement controls, an ASP is not meant to complicate patient care, remove access to needed antimicrobials or decrease practice efficiency. Rather, a well structured and functioning ASP can improve patient care and facilitate timely and effective treatment.

Despite the increasing attention being patient towards antimicrobial stewardship, there has been limited specific implementation of ASPs in veterinary clinics and limited practice- or patient-level guidance.

While general statements about the need for 'prudent' use of antimicrobials have existed in veterinary medicine for some time, 1-4 practical clinical guidance has been limited. However, in recent years, there has been an increase in available information, including broad national treatment guidelines, as well as detailed guidelines for specific diseases (e.g. urinary tract infections in dogs and cats).5

In human medicine, the field of antimicrobial stewardship has evolved into comprehensive program run by people specializing in the field, using a multifaceted approach to address a range of issues related to antimicrobial use. While some aspects of human stewardship programs do not apply to veterinary medicine, or are most relevant for large referral facilities, a large percentage of the core human strategies can be effectively and practically implemented in veterinary medicine. The state of antimicrobial stewardship in veterinary medicine is perhaps similar to the situation in community medicine in humans, an area where stewardship activities have lagged far behind hospitals. Many of the issues faced by community healthcare are similar to those faced by veterinary practices, and as the ASP field advances in human community care, there should be increasing potential for cross-application of new ideas and approaches. Regardless, there are initiatives that virtually any veterinary clinic can undertake now. Further, as there is increased scrutiny on antimicrobial resistance and antimicrobial use in veterinary medicine, development and implementation of practical ASPs will be necessary to optimize patient care and as a method of due diligence, to help ensure that veterinarians have access to antimicrobials.

Components of antimicrobial stewardship

Antimicrobial stewardship is a multi-modal approach to the practice of medicine that goes beyond specific aspects of antimicrobial use. An ASP obviously has a major emphasis on specific aspects of drug prescription and use. However, a strong ASP has broader aspects to reduce the need for antimicrobials through preventing disease and promptly identifying patients that require antimicrobials and those that do not. It also fosters been communication and education of all players in the prescribing cascade (attending clinician, diagnostic laboratory, pharmacy, owner) to facilitate optimal use and remove pressures to use antimicrobials in situations where they are not indicated.

Virtually all clinicians practice some form of antimicrobial stewardship on a daily basis, through decisions about when and how to use antimicrobials, and through measures taken the reduce the risk of disease. Therefore, implementation of an ASP should not be approached as a paradigm shift, but rather an evolution of core principles of medicine.

There is a wide range of potential components of an antimicrobial stewardship program (Table 1). The feasibility and potential benefits of these vary, with some representing rather easy-to-implement and potentially high yield measures, and others that can be categorized as useful to more complex and lower priority.

Antibiogram data collection and use	Automatic stop orders
Cascading microbiology susceptibility reporting	Checklists (e.g. surgical)
Computerized decision support systems	De-escalation and streaming
Disease-specific treatment guidelines	Surgical prophylaxis guidelines
Dose optimization	Formulary restriction
Formulary restriction with pre-authorization	Formulary restriction with authorization
Computer-based identification of inappropriate pathogen/drug combinations	Improved antimicrobial documentation
Improved diagnostics	IV to oral conversion
Prescriber education	User (owner) education
Prevention of treatment of non-infectious conditions	Promotion of timely and appropriate microbiological sampling
Prospective audit with feedback (clinician/service/facility)	Scheduled antimicrobial re-assessments (antibiotic time-outs)
Strategic microbiology results reporting	Targeted review for redundant therapy/therapeutic duplication
Therapeutic drug monitoring	

Implementation of an antimicrobial stewardship program

The approach to an ASP will vary greatly between facilities, based on a range of factors such as the nature of the caseload, the prevalence of resistant pathogens, the current state of antimicrobial use, access to specialists, access to a pharmacist, clinician motivation, management motivation and level of understanding of the issues. Yet, any practice can implement some components of an effective ASP with little effort, time, cost or access to other personnel. Often, starting with some easy measures (low hanging fruit) is useful to facilitate acceptance of change, with addition of new measures over time as people realize the potential benefits, have increased awareness and understand that an ASP is meant to help, not hamper, patient care.

Resources

While clinical antimicrobial stewardship is still in its infancy in veterinary medicine, a variety of resources are available. These include general position statements, 4,6-8 disease-specific diagnosis and treatment guidelines, 5,9-12 human healthcare ASP resources and ASP program websites (Table 2). There are also national broad treatment guidelines, such as those from the Australian Infectious Disease Advisory Panel (http://www.ava.com.au/sites/default/files/AVA_website/pdfs/AIDAP%20prescribing%20guidelines.pdf) and Danish Small Animal Veterinary Association (http://www.fecava.org/sites/default/files/files/DSAVA_AntibioticGuidelines%20-%20v1-1_3(1).pdf). These can provide the foundation for a facility-specific ASP in any veterinary practice, although more specific and practical guidance for veterinary facilities will hopefully be increasingly available in the near future.

Table 2: Examples of antimicrobial stewardship program resources

Source	Access
Australian National Centre for Antimicrobial Stewardship	https://www.ncas-australia.org/
BSAVA	https://www.bsava.com/Resources/Veterinary-resources/PROTECT
Centers for Disease Control and Prevention	https://www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html
European Centre for Disease Control	https://ecdc.europa.eu/en/publications-data/directory-guidance-prevention-and-control/antimicrobial-stewardship
Infectious Diseases Society of America	http://www.idsociety.org/Stewardship_Policy/
Public Health Ontario	https://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/AntimicrobialStewardshipProgram/Pages/Antimicrobial-Stewardship-Program.aspx
Society for Healthcare Epidemiology of America	https://www.shea-online.org/index.php/practice-resources/priority-topics/antimicrobial-stewardship

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QUALITY OF LIFE ASSESSMENT ASSESSING HEALTH RELATED QUALITY OF LIFE IN DOGS AND CATS

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Introduction

TSuffering and Quality of Life (QoL) are widely used terms in veterinary medicine, but what do they mean and how do we assess these in our patients? The prerequisites for suffering are sentience and consciousness and our patients meet these criteria. Suffering is a mental state associated with unpleasant physical and emotional experiences. Suffering in turn, disrupts an animal's QoL. Quality of Life is a balance between positive and negative inputs; put simply it is "how an animal feels about its current circumstances". The challenge for us, as animal caregivers, is how do we "measure" something that is multifactorial and cannot be directly accessed? We cannot always appreciate what is going on in a person's mind, so it is even more difficult to determine the internal states of animals who cannot self-report. In addition, what constitutes a good or bad QoL is unique to each individual. Although rigorous scientific proof of suffering is difficult to obtain, we can make logical arguments for its existence in different patients under a wide variety of conditions. Historically, veterinary medicine has focused on physical health, but we are now embracing the impact of mental health on an animal's overall enjoyment of life. This is reflected in the veterinarian's oath which states that will use our "scientific knowledge and skills for the prevention and relief of animal suffering".

Because dogs and cats are living longer, and we can provide more advanced medical and surgical procedures, monitoring QoL is essential – we must always remember that if we prolong a pet's life it should never be at the cost of quality. As new treatments and procedures become available always ask yourself "just because I can, should I?" One key factor to keep in mind is that we may opt for a radical procedure or an unpleasant round of therapy for ourselves because we can rationalize that temporary suffering may lead to a long and good life. Animals on the other hand "live in the now" so QoL needs to be good on many more days than it is bad. Monitoring over time will help you and the owner make difficult decisions including electing euthanasia.

Our goal should be the best quality of life possible, not just the absence of a poor QoL. QoL is a team effort involving the veterinarian, veterinary staff and the owner.

There are multiple inputs to physical and mental health, and some are shown in Table 1.

Table 1. Examples of physical and mental states that cause suffering and a poor QoL.

PHYSICAL	MENTAL / EMOTIONAL
Pain caused by surgery(acute) or osteoarthritis (chronic)	Anxiety and phobia
Nausea and vomiting secondary to chemotherapy of chronic kidney disease	Fear
Constant pruritis	Isolation and loneliness
Breathlessness due to respiratory disease, brachycephalic syndrome or cardiac disease	Boredom or frustration
Thirst due to diabetes mellitus or chronic kidney disease	Stress

Quality of Life Assessment Tools

In animals all assessments depend on clinician or owner (a proxy) so are "observer related outcomes [OROs]". There are many tools, instruments and questionnaires in the literature, some are disease specific and some are generic to "overall health". Disease specific tools for dogs include but are not limited to those for atopic dermatitis(1), cancer(2), cancer related pain(3), obesity(4, 5), and osteoarthritis(6). These, and others are critically reviewed by Belshaw et al.(7) Quality of Life tools for cats with diabetes mellitus(8), cardiac disease(9) and degenerative joint disease have been published.

In many cases the dog or cat does not have a single ailment but several comorbidities, and sometimes adverse side-effects from treatment so another approach is to use Health-Related Quality of Life (HRQofL) instruments which are more generic and capture overall physical and emotional wellbeing. (10-12).

Technology

With today's rapidly advancing technology and how we now communicate with each other, including veterinarians and clients, web-based or "app" based tools are gaining popularity and have many benefits including speed, ease and reliability of assessment. Examples of these tools are those developed by NewMetrica (www.newmetrica.com) which take as little as 5 minutes for the owner to complete in the comfort of their home.

For cats the major domains assessed are vitality, comfort and emotional well-being (20 owner questions) and in dogs, energy, happiness, comfort and calmness (22 questions). The patient is compared to healthy animals of the same age and breed, and to itself over time. The interval between assessments and alerts can be individualized for each patient.

Where does the owner fit in?

When a pet has a chronic disease that negatively affects it's QoL, this can also affect the owner. For example, dogs that scratch all the time, or have night time restlessness may disrupt the family's sleep. Owners have four budgets that must all be considered when making treatment plans; these are outlined in Figure 1. The "weight" of these will vary among different owners and these, combined with the pet's QoL will guide clinical decisions.

Where do veterinarians fit in?

Veterinarians may have a different perspective to the owner about a particular pet's quality of life, or prospects for quality of life. We must remember the four budgets that owners have when helping them make decisions.
Clinical example

No two cases are the same and owners and veterinarians will have very different opinions about an individual pet. There may be outright dismissal of the option to have a non-ambulatory dog fitted with a cart (see Figure 2), there may be uncertainty and there may enthusiasm. This decision will depend on many factors but at the heart of the discussion should be the question "is it the right thing for the pet"?

Figure 1. "Pup-Tart" the chihuahua suffered a traumatic spinal cord injury and is non-ambulatory despite surgery and medical treatment. He is 7 years old and continent (fecal and urinary) – is fitting him for a cart the right thing to do?

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A DERMATOLOGIC EXAM - RECOGNIZING WHAT YOUR PATIENTS ARE TRYING TO TELL YOU

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Dermatology cases make up a huge part of patient caseload in general practice and can be very frustrating for everyone involved. Many different dermatologic conditions can present with a similar clinical appearance, making it difficult to get a diagnosis in a timely manner. So how are you to figure out what's what? You have to piece together the big picture, and veterinary technicians can be the key to success.

Technician's role: In a busy practice the technician is usually the main contact for clients, and usually the first health team member to examine the patient, and gather the all important, patient profile and case history. The technician is usually the one to call clients with test results, usually the one to call clients for case follow up, and usually the first team member to triage any client questions (and there are lots of questions with derm patients!)

Patient profile: can immediately point toward differential diagnosis; Breed, sex, age, coat colour – all have disease predelections; History; Appropriate diagnostics - cytology!!!!!!!

Patient Profile: Breed – certain conditions more common in certain breeds ie: atopy (allergic dermatitis) in golden retrievers, tumors in boxers, seborrhea in cocker spaniels and hypothyroidism in dobermans

Age – some conditions more common at certain ages. Young animals may present with congenital or hereditary problems, like Ehlers Danlos syndrome. Young animals may present with conditions that are prevalent in patients with an immature immune system. Allergies tend to occur in more mature animals because of repeated exposure to allergens is necessary before becoming sensitized or allergic to an allergen. Hormonal problems or neoplasia tend to occur in older animals.

Sex – some conditions more common in one gender – Sertoli cell tumour of the testicle in male dogs. Anal adenomas more common in males than females.
Coat colour – some inherited alopecia problems like colour dilution alopecia in diluted coat colours like blue and fawn. White cats have higher incidence of solar dermatitis and squamous cell carcinoma.

Patient History: Duration - when did problem first start? Age of onset? Rate of progression?

Lesions – are there lesion predelection sites? (ie. Sarcoptic mange will affect edge of pinna, elbows and hocks) How do lesions look now? Have they changed?
Degree of pruritus (itching) – are they pruritic? Where on body? How often are they scratching? Allergic dogs may itch at the face, feet and ventrum. Some conditions develop pruritus over time, but are not pruritic at first. Scratching, rubbing, licking, and biting may all indicate pruritus

Treatment history – what's been used? What was the dose given and how long of a course? Any affect? It's important to note whether the drug worked or not. A good response to low dose courses of corticosteroids will suggest an environmental allergy. Partial or total response to antibiotic therapy suggests that a bacterial infection is at least part of the problem. Find out when the last treatment was given as it may affect the clinical presentation.

Seasonality – is this a recurrent problem at the same time of year? Insect problems are frequently an issue during summer months, while house dust mite allergy may affect an individual all year round.

Diet – what are they eating? Any changes to diet? What are previous diets given?

Food allergies in older animals are typically seen when the animal has been fed the same diet for years. Be specific – was a diet trial strict? Any treat or snacks? Any other vehicles for pilling? Any supplements being given? Flavoured toothpaste? Flavoured medications? Licking plates?

Environment – How much time spent indoors vs. outdoors? Where does pet sleep? What type of bedding is used? What type of flooring is in the environment? Any potted plants?

Parasites – Is there any history of fleas or other parasites causing a problem? Are they on a preventative program?
Contagion or zoonosis – Is any other animal or person in the home affected? If suspicious of sarcoptes, the magic words to the owner are "You don't have to show me, but do any people in the house have any skin lesions?"
Pay attention to diet, or any dietary indiscretions.

Other clinical signs – sneezing, coughing, wheezing and conjunctivitis may accompany environmental allergies. Diarrhea may be associated with adverse food reactions.
For dermatology cases a client questionnaire filled out prior to seeing the patient, is a very useful tool.

Dermatologic Exam: brief general exam to look for any medical problems, followed by a more specific exam of the skin.

Pay attention to skin temperature, quality of hair coat and odour.
Examine ears, eyes, mouth, mucous membranes, nail beds, interdigital spaces (including between foot pads), nail beds, axillary and inguinal regions, ventral neck and under the collar, perineum, the vulva or prepuce, the perianal region and the entire dorsum.

Consider whether problem is localized or generalized. Localized problems may be due to infectious organisms that penetrated the skin at that point, while generalized conditions suggest hypersensitivity disorder, endocrine problem or immune mediated disease.

Lesion distribution: symmetric lesions suggest an internal disease process (endocrine, immune mediated), while asymmetric lesions suggest infection or parasites
Look for evidence of itching or self-inflicted trauma. Try to incite the animal to itch. Gauge the level of pruritus on a scale from 1 to 10. Check how your estimation fits with the client's own impression
Lesions to look for: alopecia, hypotrichosis, erythema, edema, macule, wheal, vesicle, pustule, papule, epidermal collarettes, nodule, mass, cyst, scale, hyperkeratosis, crust, ulcer, erosion, excoriation, lichenification, hyperpigmentation.
Alopecia: loss of hair. Pay attention to any patterns. Symmetric hair loss is seen with endocrine diseases like Cushing's or hypothyroidism. Consider breed predispositions: Boxers with recurrent seasonal flank alopecia, Greyhounds with bald thigh syndrome, Chihuahuas with pattern baldness.
Erythema: redness, inflammation. Look for any patterns. Erythema of the elbow flexure surfaces is classic for environmental allergies, while perianal erythema is most often seen with food allergies.
Edema: swelling. Hypothyroidism can result in facial mixedema known as a "tragic expression" +/- mixedema at the tail base.

Macule: circumscribed flat spot characterized by a change in colour of the skin (freckle). When > 1cm, a macule is called a patch. Can be footprints left behind from a previous skin condition, but can also be natural markings.
Wheal: sharply circumscribed, raised lesion consisting of edema. AKA hive, as in urticaria. Most often seen during an allergic reaction.

Vesicle: sharply circumscribed elevation of the skin up to 1cm in diameter, filled with clear fluid. Uncommon - may indicated an immune mediated disease. Large vesicles (blisters) are called a bulla.

Pustule: small circumscribed elevation of the skin filled with pus - intraepidermal or follicular. Usually associated with bacterial infection. If a pustule incorporates more than one hair follicle, it may indicate an immune mediated disease vs. a single affected follicle with pyoderma.

Papule: small circumscribed elevation of the skin up to 1 cm in diameter. A larger flat-topped elevation is called a plaque. A "rash" is a group of popular eruptions. Distribution patterns can be helpful to distinguish between environmental and food allergic patients: environmental most often have papules on the ventrum, while food allergic most often have papules over the dorsum.

Epidermal collarette: circular lesion with a torn appearance to outer edge. Usually the footprint of bacterial infection.

Life span of a pustule: starts as a papule (erythema, irritation in a follicle); inflammation results in pus; body clears the infection and removes dead cells and debris, leaving a crust or epidermal collarette, as a footprint.

Nodule: circumscribed, raised, solid lesion, no more than 1 cm in diameter that usually extends into the deep layers of the skin. Possible indication of neoplasia.
Mass: circumscribed, raised, solid lesion, larger than 1 cm in diameter, may extend into dermis or deeper; often neoplasia

Cyst: fluctuant mass usually filled with fluid; often seen in allergic patients on dorsal and palmar aspects of interdigital spaces.

Scale: accumulation of loose fragments of the stratum corneum (dander); may indicate nutritional deficits. If accompanied by pruritus, consider parasitism (Cheyletiella spp or D injai)

Hyperkeratosis: increased stratum corneum on nasal planum or foot pad. Some hyperkeratosis can be normal with aging, but it can also be seen with Canine Distemper, Leishmaniasis, Pemphigus, Zinc Responsive Dermatosis, and Hepatocutaneous Syndrome

Crust: dried lesional exudate on the skin surface. If yellow crusting present (along with pruritus) consider sarcoptic mange. Gold crusts also seen with pemphigus.

There is a wide range of potential components of an antimicrobial stewardship program (Table 1). The feasibility and potential benefits of these vary, with some representing rather easy-to-implement and potentially high yield measures, and others that can be categorized as useful to more complex and lower priority.

Antibiogram data collection and use	Automatic stop orders
Cascading microbiology susceptibility reporting	Checklists (e.g. surgical)
Computerized decision support systems	De-escalation and streaming
Disease-specific treatment guidelines	Surgical prophylaxis guidelines
Dose optimization	Formulary restriction
Formulary restriction with pre-authorization	Formulary restriction with authorization
Computer-based identification of inappropriate pathogen/drug combinations	Improved antimicrobial documentation
Improved diagnostics	IV to oral conversion
Prescriber education	User (owner) education
Prevention of treatment of non-infectious conditions	Promotion of timely and appropriate microbiological sampling
Prospective audit with feedback (clinician/service/facility)	Scheduled antimicrobial re-assessments (antibiotic time-outs)
Strategic microbiology results reporting	Targeted review for redundant therapy/therapeutic duplication
Therapeutic drug monitoring	

Implementation of an antimicrobial stewardship program

The approach to an ASP will vary greatly between facilities, based on a range of factors such as the nature of the caseload, the prevalence of resistant pathogens, the current state of antimicrobial use, access to specialists, access to a pharmacist, clinician motivation, management motivation and level of understanding of the issues. Yet, any practice can implement some components of an effective ASP with little effort, time, cost or access to other personnel. Often, starting with some easy measures (low hanging fruit) is useful to facilitate acceptance of change, with addition of new measures over time as people realize the potential benefits, have increased awareness and understand that an ASP is meant to help, not hamper, patient care.

Resources

While clinical antimicrobial stewardship is still in its infancy in veterinary medicine, a variety of resources are available. These include general position statements, 4,6-8 disease-specific diagnosis and treatment guidelines, 5,9-12 human healthcare ASP resources and ASP program websites (Table 2). There are also national broad treatment guidelines, such as those from the Australian Infectious Disease Advisory Panel (http://www.ava.com.au/sites/default/files/AVA_website/pdfs/AIDAP%20prescribing%20guidelines.pdf) and Danish Small Animal Veterinary Association (http://www.fecava.org/sites/default/files/files/DSAVA_AntibioticGuidelines%20-%20v1-1_3(1).pdf). These can provide the foundation for a facility-specific ASP in any veterinary practice, although more specific and practical guidance for veterinary facilities will hopefully be increasingly available in the near future.

Table 2: Examples of antimicrobial stewardship program resources

Source	Access
Australian National Centre for Antimicrobial Stewardship	https://www.ncas-australia.org/
BSAVA	https://www.bsava.com/Resources/Veterinary-resources/PROTECT
Centers for Disease Control and Prevention	https://www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html
European Centre for Disease Control	https://ecdc.europa.eu/en/publications-data/directory-guidance-prevention-and-control/antimicrobial-stewardship
Infectious Diseases Society of America	http://www.idsociety.org/Stewardship_Policy/
Public Health Ontario	https://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/AntimicrobialStewardshipProgram/Pages/Antimicrobial-Stewardship-Program.aspx
Society for Healthcare Epidemiology of America	https://www.shea-online.org/index.php/practice-resources/priority-topics/antimicrobial-stewardship

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Ulcer: exposure of the underlying dermis - can be seen with deep pyoderma; infections with rod bacteria; some dermatophytes (Trichophyton mentagrophytes).

Erosion: shallow ulcer of epidermis

Excoriation: scratch mark

Lichenification: thickening of skin characterized by exaggeration of the superficial skin markings - result of chronic inflammation; often associated with Malassezia (yeast) infection.

Hyperpigmentaion: darkening of the skin - footprint lesion from inflammation.

With a list of differentials, the next step is doing some diagnostics. Only by confirming with cytology, can you know what the appropriate treatment for secondary infections should be. I have been surprised on many occasions after doing cytology!

The vast majority of derm patients require life long management. This means lifelong relationships with your clients. You can keep these clients in your clinic, just by using the information outlined here.

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THE REWARDS OF A REWARD PROGRAM

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Alt make come as a surprise to you but I have never dealt crack cocaine. But, after starting a loyalty program at my practice I think I might know what it's like. Loyalty programs can be found in almost any business these days anywhere from restaurants to retail stores to marijuana shops. What's all the hype about? Customer retention. It's a big deal.

Loyalty programs work for a variety of reasons. Let's explore a few.

Endorphin release- When you get a reward, dopamine and oxytocin levels surge in brain. These are the same hormones that increase when you get a compliment, hit the slot machine at the casino or pop out a baby. The purpose of these hormones is to increase trust and bonding. It's the body's way of saying "This is a good thing. Let's do more of this." When customers get rewarded for spending money, the positive hormone release influences their decision about the purchase which helps keep them coming back for more.

Fear of missing out- The fear of missing an opportunity to save yourself some money, get something for free, or have a better outcome is a very powerful feeling and one that can be leveraged in a loyalty program. If you have ever been shopping online and realized that if you spend $15 more, you will get free shipping then find yourself buying something for $50 that you didn't even need, you have FOMO'd. You feel like you beat the system when in all reality you just made a purchase you didn't mean to. Don't feel bad. It happens to all of us and we justify the action with the thought "Well, I was going to buy it anyway. Someday."

Don't be fooled though, not all loyalty programs are created equal and if you aren't strategic about it, you can easily build a fancy discount program. When it comes to creating a successful loyalty program, be sure to follow these 5 crucial rules:

1. Keep it simple. If your customer doesn't know or understand your program because it's too complicated, they won't engage with it. A good rule of thumb is that if you can't explain your program in 15 seconds, it's probably too complicated. The simpler, the better.

2. Be universal. Creating a program that targets your entire customer base will be more successful. Everyone will want to play whether they own a 6 month Golden Retriever or a 16 year old hyperthyroid cat. Programs that only focus on a particular segment of the customer base don't have as much impact as programs that target everyone.

3. Make it attainable. If your customers do everything you ask, they should get the reward in a reasonable amount of time. If the goal is too hard to reach, or has too many blackout dates and exclusions, your customers will wonder why they should bother and their behavior won't change.

4. The reward needs to be something everyone wants. Admittedly this is a hard one. If you are like a normal veterinarian, at first you will probably experience some anxiety to think about giving a cash reward (recommended as a credit towards a future visit) but what you must realize is that people don't actually want a free T-Shirt with your logo on it, or a gift basket of dog toys, or a free wellness exam. The clearer the value is of the reward, the more excited your customers will be to participate in your program.

5. Gamify it. When the customer is required to play a game or take action to participate in the program to "unlock" the reward, it has more value to them because effort was required and it feels more special. This is a big differentiator between rewarding and discounting. Creating a feeling that the customer earned the reward by following the rules and winning at the game will keep them coming back for more.

As our industry faces declining visits and and competition from online providers and big box retailers, adding a loyalty program can definitely be a strategic move for your business . Plus, it's just plain nice. There is quite a bit of joy in giving back to clients that take the best care of their pet. Our existing customers have significant potential to spend more with us. A lot more. It's just up to you to capture it.

WSV - 055

HEALTHY PETS, HEALTHY PEOPLE: ONE HEALTH IN ACTION AT THE CDC

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Saving Lives By Taking A One Health Approach

One Health recognizes that the health of people is connected to the health of animals and the environment. It is a collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment.
https://www.cdc.gov/onehealth/index.html

Connecting human, animal, and environmental health

A One Health approach is important because 6 out of every 10 infectious diseases in humans are spread from animals. Diseases like rabies, Salmonella, and West Nile virus infections are examples of zoonotic diseases (or zoonoses)—diseases that can be shared between animals and people.

Every year, tens of thousands of Americans will get sick from diseases spread between animals and people. Animals can sometimes serve as early warning signs of potential illness in people. For example, birds often die of West Nile virus before people get sick with West Nile virus fever.

CDC's One Health Office

recognizes that the health of people is connected to the health of animals and our shared environment. A One Health approach encourages collaborative efforts of many experts (like disease detectives, laboratorians, physicians, and veterinarians) working across human, animal, and environmental health to improve the health of people and animals, including pets, livestock, and wildlife.
https://www.cdc.gov/healthypets/health-benefits/index.html

What The One Health Office Is Doing In The U.S.

- Working with multiple partners to educate rural youth in agricultural organizations like 4-H and the Future Farmers of America about preventing the spread of diseases shared between people and animals like zoonotic influenza viruses. These newly formed One Health teams have reached thousands of young people and their families in states across rural America.
- Responding to outbreaks and public health emergencies, such as examining the risk of Ebola and Zika viruses to pets and other animals.
- Protecting Americans by preventing diseases they can get from their pets like Salmonella infection and rat bite fever.
--- Due to an increasing number of outbreaks, the One Health Office is leading the Zoonoses Education Coalition. This public-private partnership is developing evidence-based recommendations to prevent diseases for pet owners, breeders, and stores.
--- These recommendations were used during an outbreak of Seoul virus that was spread to people by pet rats.
--- The One Health Office shares tips about how to stay healthy while enjoying pets on CDC's Healthy Pets, Healthy People website.

Each year around the world, it is estimated that zoonoses (diseases shared between people and animals) cause 2.5 billion cases of sickness and 2.7 million deaths

What The One Health Office Is Doing Around The World

Diseases can spread around the world very quickly, so it's important for CDC's One Health Office to work closely with other countries to build strong partnerships with human, animal, and environmental health organizations. This protects Americans from illnesses that cross borders and affect travelers.

Globally, the One Health Office is taking a strategic, targeted approach to control and prevent infectious diseases. For example, experts from the One Health Office lead One Health Zoonotic Disease Prioritization Workshops so that countries can focus limited resources on their top zoonotic diseases of greatest national concern. Zoonotic diseases commonly prioritized include viral hemorrhagic fevers such as Ebola virus and Rift Valley fever, zoonotic influenza viruses, rabies, and anthrax.

- Workshop participants include a wide-ranging group of people who protect health—of people, animals, or the environment—and they identify a country's top 5 diseases to target for One Health collaborations. Rabies has been prioritized in nearly 100% of countries that have conducted One Health Zoonotic

Disease Prioritization Workshops.

- Workshop participants develop strategies to tackle the newly prioritized zoonotic diseases. For example, having a dog vaccination campaign for rabies can lead to fewer human rabies deaths in a country.

- Prioritizing diseases means countries can more efficiently build lab capacity, conduct disease surveillance, plan outbreak response and preparedness activities, and create disease prevention strategies to reduce illness and death in people and animals.

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FELINE RESPIRATORY EMERGENCIES

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Cats presenting with respiratory distress have minimal reserve and frequently present as emergencies.1 The initial assessment must be stress free, brief, and must not exacerbate the patient's condition.

Regardless of etiology, immediate oxygen supplementation is appropriate. Sedation is also paramount, and butorphanol is preferred; if pain is suspected, then a more potent mu opioid agonist is selected. Benzodiazepines can be added with minimal cardiovascular depression.

Emergency intubation should always be prepared for when dealing with patients with respiratory distress. Intubation allows the provision of 100% oxygen and positive pressure ventilation. Further stabilization and diagnostics e.g. thoracocentesis / radiography can be performed under controlled conditions.

Sedation/Induction agents with minimal cardiovascular suppression:

Butorphanol (0.2-0.4 mg/kg IM/IV)
+/- Midazolam (0.2 mg/kg IM/IV) OR Diazepam (0.2 mg/kg IV)
+/- Alfaxalone (1-2 mg/kg IM; 0.5 mg/kg IV) OR Propofol (0.5-1 mg/kg IV)
Alternatively, +/- Ketamine:Valium (1:2 ratio), 0.1 ml/kg IV
A cursory physical examination is performed on arrival, or following sedation, with minimal handling, and while receiving supplemental oxygen. Assessments include respiratory rate and character, and thoracic auscultation noting pulmonary crackles, wheezes, dullness, and cardiac abnormalities such as murmurs or a gallop rhythm.2 Perfusion parameters including mucous membrane colour, capillary refill time (CRT), temperature of the extremities, and pulse assessment are noted. A rectal temperature is strongly advised, as is evaluation of the robustness of the jugular veins. Blood pressure is recorded. In the respiratory distressed patient, a full physical examination is postponed until the cat is more stable.

An intravenous catheter should be placed as soon as the cat is able to tolerate such handling. An IV catheter will allow for IV drug administration which optimizes the drugs' onset of action. An IV catheter also allows for quick induction should emergency intubation be required.

Thoracic point-of-care ultrasound (POCUS) is exceedingly helpful to quickly establish the presence of pleural effusion. Emergency room echocardiography is also helpful in the diagnosis of feline CHF. Cardiac assessment is based on images acquired from the right thorax. A short axis view at the base of the heart allows assessment of the left atrial-to-aorta size ratio (LA:Ao).3 An LA:Ao ratio > is 1.5 considered abnormal (normal LA:Ao ratio ~ 1:1).4

Thoracocentesis should be performed immediately in a dyspneic cat if pleural effusion is noted on POCUS or is suspected based on physical examination prior to radiographic assessment or further manipulation of the patient.5

Fluid administration is contraindicated for patients with respiratory distress associated with heart failure. Conversely feline trauma patients may demonstrate increased respiratory effort secondary to hypovolemic shock; if lung sounds are audible, +/- POCUS examination reveals no pleural effusion, fluid resuscitation using 10-15 ml/kg fluid boluses are advised for trauma patients. For all other patients with respiratory signs, fluid administration is conservative with fluid deficits (dehydration) corrected over a full 24 hours.

Radiography must be postponed in a patient with significant respiratory distress, until stabilized. Thoracic radiographs clarify the degree of lower airway disease, pulmonary parenchymal disease, and pleural space disease.

CARDIAC DISEASE

On physical examination patients with CHF are often hypothermic (rectal temperature 36.5-37.5°C), and tachycardic (HR>200 beats/min) although bradycardia (HR 130-140 beats/min) has also been reported.5 Cold extremities, a prominent jugular vein, and prolonged CRT are noted. Thoracic auscultation will sometimes reveal a heart murmur, gallop or an arrhythmia (up to 40% of cases).4,6 Pulmonary crackles may be auscultable. Thoracic radiographs – Heart size is invariably difficult to assess. Assessment of the major pulmonary vessels is preferred. Pulmonary venous congestion (pulmonary vein larger than the artery), and/or hazy bordered vessels suggests pulmonary congestion. In cats with CHF, the distribution of pulmonary edema is highly variable - diffuse, focal, multi-focal, caudal, ventral, or peri-hilar.7 Pleural effusion is also frequently noted with cardiac disease. Point of Care Ultrasound – An LA:Ao ratio ≥ 2 is very suggestive of CHF.3 Left atrial enlargement is consistent with a cardiac cause of pulmonary infiltrates and respiratory distress (cardiogenic pulmonary edema). 4,5 Even a trace amount of pericardial effusion is also highly suggestive of CHF.4

Biomarker testing – Markedly elevated serum NTproB-NP and cardiac troponin (cTnI) concentrations are suggestive of cardiac disease as a cause of respiratory distress.3,4,8,9 However, further diagnostic testing is advised to differentiate cardiac from non-cardiac disease. 4,8,9 These tests are best used to rule out cardiac causes of respiratory distress in the emergency patient.

Treatment

Diuretics – Furosemide 1-2 mg/kg IV (IM if IV access not obtained) every 1 to 2 hours until the respiratory effort has improved. Rarely do cats require more than a total of 4-6 mg/kg of furosemide in the initial hours of presentation. Thereafter, furosemide can be reduced to 2 mg/kg IV q 4 hours for the remaining 24 hours, before further tailoring of daily furosemide. Cats are more sensitive to furosemide than dogs, readily developing severe hypokalemia, metabolic alkalosis and renal compromise. Vasodilators are indicated for patients with CHF however, oral medications (e.g. benazepril, pimobendan) are not initiated during the initial stabilization of the cat in heart failure. Volume of IV medications / flushes should be minimized. Free access to water should be provided.

FELINE ASTHMA

On history cats with asthma often have a history of a cough.

On physical examination – cats are normothermic (generally ~38.5C), and tachycardia is not a prominent clinical feature. The dyspnea is characterized by an expiratory pattern where an exaggerated expiratory effort is noted.5 Thoracic auscultation often reveals pulmonary crackles or wheezes. Mucous membranes are usually pink, and CRT <2 seconds. Pulses are strong and the extremities are usually warm. The jugular vein is not prominent.

Thoracic radiographs – An over-expanded, hyperinflated lung field with a flattened diaphragm is noted. On close inspection, a bronchial pattern is usually evident. In chronic asthma the right middle lung lobe may be collapsed.

Treatment – Oxygen supplementation is indicated as are corticosteroids (dexamethasone 0.25 mg/kg IV q12 to 24 hours). In severe cases, bronchodilation is recommended. Selective beta-2-agonists are preferred for severe bronchoconstriction. Bronchodilation can be provided by Salbutamol puffer (Ventolin™), in combination with the Aerokat™ chamber, which delivers 100 mcg/metered dose. For respiratory distress, 2 puffs of Ventolin™ are recommended.

This can be repeated every hr for 2-4 hrs as needed in crisis and subsequently delivered BID. Cats should breathe the drug through the mask and spacer for 7-10 seconds. Positive clinical effect should be seen within 5-10 minutes. In addition, beta-2 agonists can also be administered intravenously, intramuscularly or subcutaneously. Terbutaline is dosed at 0.01-0.02 mg/kg IV, IM, or SQ. Salbutamol injectable is dosed at 4 µg/kg IV diluted and repeated in 15 minutes if required. Side effects of the beta-2-agonists include tachycardia, hypotension and muscle tremors. Alternatively, aminophylline can be used at 10 mg/kg IV, given slowly, (or 5 mg/kg orally).

PLEURAL EFFUSION

Patients presented secondary to trauma are more likely to have pleural space disease.
On physical examination the respiratory pattern is characterized by short, shallow breaths on both inspiration and expiration. Severe pleural effusion may cause inspiratory distress and abdominal breathing.

Auscultation reveals quiet lung sounds ventrally. Cats with pleural effusion secondary to heart failure will present with similar signs to those outlined under the heart failure section. Other etiologies for pleural effusion include venous occlusion due to mediastinal or thoracic masses, neoplastic effusions, idiopathic (e.g. chylothorax), pyothorax, and less frequently hemothorax.2

Thoracic radiographs or POCUS are diagnostic for pleural effusion. Neither the presence, volume, nor distribution of pleural effusion is useful in discriminating between CHF and non-cardiac disease.4

Treatment – Cats with pleural effusion require thoracocentesis, alleviation of clinical signs is dramatic post-thoracocentesis. Cytology and further fluid analysis may provide a diagnosis. Multiple thoracocenteses (>2X / 24-hour period, or repeat thoracocenteses over multiple days) should prompt chest tube placement.

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TAKING FELINE MOBILITY EXAMINATIONS BEYOND THE EXAM ROOM

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The story: 15 minute to 30 minute appointments. Cat in carrier, cat stressed, cat hides at home or is viewed by the client as inactive or lazy. Weigh the cat in the carrier. Remove cat from carrier. Weigh carrier. Cursory physical examination because cat is challenging and requires minimal restraint, minimal handling.
Do we ever really, truly see our feline patients move? How often do we complete a detailed, accurate, and thorough mobility examination of our feline patients? The message we want to send our clients is: Mobility Matters. Every Pet. Every Time.

Recommendations:
1. Think outside the box (unless they are having difficulty using the litter box - add mobility and pain to your rule out list)

2. Spacious feline only examination room with hiding spots, dim lights, and mobility assessment tools, feline friendly practice, feline appointments spaced out so cats have ample time to become comfortable in room before examination.

3. Apply Fear Free approach to examination including prescriptions for fear, anxiety, and stress before travel to clinic.

4. Have kitten socialization options in room.

5. Option for clients to submit video of their pet moving. Provide example and set time limit 15-30 seconds

6. Mobility tracking chart for client to complete

7. Small land treadmill and cavaletties available to assess mobility.

8. Promote mobility examinations – if you have concerns while having an examination for another issues let the client know you want to see their pet to discuss mobility.

9. Choose pain assessment, grimace scales, fear, anxiety, and stress scales to be used consistently within your hospital. If everyone on the team is speaking the same language communication about patient needs becomes simple and effective.

10. Set yourself and your patients up for success. Designate a feline strategy team and pet experience team in your hospital. Clients appreciate a game plan before an appointment. Explore fear free approaches.

Case Example: 7 year old male neutered domestic shorthair referred to rehabilitation service for osteoarthritis and/or potential soft tissue injury. Clients heard I swim cats and thought it would be a fun thing to try with their cat. History involved declining mobility and less activity. Cat typically hides in carrier during veterinary visit. Primary care clinician consents to hydrotherapy, therapeutic laser, and therapeutic exercise.

Cat booked for 45 minute sessions (half hour of treatment time, 15 minutes to get accustomed to my office and de-stress after car ride. Feliway spray and hiding spots available along with low litter box and reduced lighting.

Cat willing to explore office. Walking with crouched posture but curious. I am unsure if crouched posture is pain, osteoarthritis, fear, or combination.
Underwater treadmill (in other room) set before cat arrives (approximate water depth selected and moving at selected speed) Make friends with cat, calmly put cat in underwater treadmill. Once cat was buoyant he began to take proper strides. Marked left proprioceptive deficit. Client frustrated the family veterinarian did not observe this. Discussed with client that cats are a challenge to exercise and in the physical rehabilitation setting I was able to observe the proprioceptive deficit because I was able to put his cat into a situation where his gait could be truly evaluated.

Discontinued treatment and reported finding to veterinarian and assisted client in scheduling recheck. Veterinarian completed neurologic examination, radiographs, and pain assessment. Began same rehabilitation program again with the understanding that if neoplasia was present therapeutic laser was contraindicated. Client and veterinarian agreed that the therapeutic laser could be effective in treating nerve damage and painful lumbar spine and compensatory pain in shoulder area. Proprioceptive deficit was only ever observed consistently on underwater treadmill and on land treadmill and did improve. Cat gained muscle mass in hind end, improved hip extension, and spinal mobility. Original treatment plan was twice weekly for 6 weeks, weekly for 6 more weeks, biweekly thereafter. If misses a week mobility does decline. Catch up with weekly sessions for two weeks in a row. Clients have invested in small land treadmill for daily exercise.

Therapeutic exercises consist of spinal extension and hind end contractions and extensions over a 30cm Toto Fit Infinity, low cavaletties with socks on.
Pain management includes gabapentin and an anti-inflammatory.

Lessons Learned From This Case:

1. Technicians – objective observations and physical examinations that vary from a veterinarian are not a diagnosis. Embrace a difference of opinion within your scope of practice. Objective and reportable findings can lead to a diagnosis, a more accurate and effective treatment plan, and better patient outcomes including reduced pain and improved mobility and quality of life.

2. Collaboration within client ability or desire to obtain diagnostics. We do not have an MRI for this cat. We are treating based on clinical signs and response to treatment.

3. Feline mobility matters. A physical rehabilitation professional can assist in making observations that can guide diagnosis and treatment plan.

4. Set yourself and your patients up for success. Designate a feline strategy team and pet experience team in your hospital. Clients appreciate a game plan before an appointment. Explore fear free approaches.

5. Choose pain assessment, grimace scales, fear, anxiety, and stress scales to be used consistently within your hospital. If everyone on the team is speaking the same language communication about patient needs becomes simple and effective.

6. If you are a physical rehabilitation veterinary technician, objective observations and collaboration build trust with referring/consenting clinicians.

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THE LINK BETWEEN BEHAVIOR, HEALTH AND WELFARE OF OUR CANINE AND FELINE PATIENTS

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The question “Is it medical or behavioral?” is often part of our clinical reasoning. However, this question does not always have a simple answer. The reciprocal link between behavior and the inflammatory and immune response has been extensively documented in the scientific literature, and it is known to be influenced by the host microbiome.1,2,3 Activation of proinflammatory cytokines induces a depressed state (sickness), which helps the individual to cope with the disease (e.g., an infection by exogenous pathogens) that triggered the inflammatory response. Circulating proinflammatory cytokines can enter the brain, where they have a direct inflammatory action and stimulate the production of other pro-inflammatory cytokines and prostaglandins. Although this inflammatory response does not produce tissue damage, it induces a negative behavioral change. Circulating pro-inflammatory cells also exercise their action on the brain indirectly through neuronal pathways, for example, activating a vagal response.1 The endogenous microorganisms constituting the intestinal microbiome may influence the behavior of their animal hosts through a similar action.

The presence of pain (e.g. osteoarthritis, trauma, otitis, neuropathic pain) is of particular relevance, not only because of the involvement of inflammation, but also because of the possible learned association between touching/handling an animal and triggering pain. The animal may therefore learn that interacting with other individuals is a potential source of pain (classical conditioning) and may display fear and defensive pain-related aggression. Painful condition, e.g. hip dysplasia, have been associated with an onset of aggressive behavior in dogs with no history of aggression. When compared with dogs in pain with a history of aggression preceding the pain-inducing condition, dogs with no previous history showed less warning signs preceding aggression, were more likely to display aggression when handled, and showed more defense signs in their body posture.4. Dogs with a late onset of fear of loud noises should be screened for possible presence of musculoskeletal pain, as suggested by Fagundes et al.5 Radiological signs of osteoarthritis are very common in cats, even in absence of clinical signs,6 and acute or chronic pain has to be considered as a possible contributing factor to behavior changes observed in cats, e.g. housesoiling.

Metabolic disease should also be ruled out as a possible cofactor for observed behavior changes in dogs and cats. Aggression has been reported to be a sign of hypothyroidism in some cases,7 but no significant difference has been found between aggressive and non-aggressive dogs in the concentrations of biomarkers most commonly used to diagnose canine hypothyroidism.8

Pathologies that alter perception and/or proprioception, i.e. neurological and sensory problems, should be investigated as possible causes of or contributing factors to behavioral changes, including aggression. Because of the link between immune response and behavior changes, inflammatory diseases (e.g. dermatitis, gastroenteritis…) comorbid to aggression or other behavior problems should be adequately treated.
Feline interstitial cystitis (FIC) represents the perfect example of a disease in which it is not possible to draw a clear line between behavior and medical causes and symptoms. The environmental distress experienced by cats with FIC contributes to the creation of painful lesions in the urine bladder that in turn worsen the distress, creating a syndrome that can be effectively addressed only through a multimodal (behavioral and medical) treatment.9

Treatment that affect the immune response may cause long-term changes in the behavior of dogs.3 Dogs with a history of corticosteroid treatment (of at least one week) are significantly more likely to be in a negative affective state and to exhibit aggression towards people than dogs that did not receive corticosteroids.10 A late onset of behavior changes in geriatric patients can be secondary to a comorbid medical problem or a sign of canine cognitive dysfunction.

Behavioral changes can be a sign of medical diseases and, therefore, should not be overlooked even in absence of typical medical symptoms, in order to maximize the health and welfare of our patients.

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CLINICAL REPTILE ANATOMY

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In general, all reptiles are covered with scales. They can have four legs, or none. There are no snakes with legs, but there are lizards without legs. Thus, it is important to be able to distinguish a snake from a legless lizard. Snakes do not have eyelids. Lizards and turtles do have functional eyelids (with some exceptions such as some members of the gecko family). The snake eye is protected by a transparent scale called the spectacle. When a snake goes through ecdysis, or shedding, it will slough this spectacle with its skin. Occasionally this spectacle will not come off with the skin, and results in a retained eye cap.

A second obvious difference between snakes and legless lizards is that snakes do not have ears. But, to complicate matters, not all lizards have ears. Fortunately, all legless lizards do! The snake lacks not only the external ear, but also the middle ear cavity, tympanic membrane and eustachian tube. They do have an internal ear which functions in detecting motion, static position and sound waves which travel through the ground. Lizards and turtles lack external pinnae, but most have a conspicuous tympanic membrane. There are a few species of lizards which lack this feature.
Snakes and some lizards have a special sensory structure called the vomeronasal or Jacobson's organ. Its paired openings are just rostral to the choana. The flicking tongue picks up minute scent particles in the air and places them in direct contact with this organ.
The teeth of snakes and lizards are both acrodont (attached to the bone) and polyphydont (capable of having several sets throughout life). Turtles do not have teeth, but instead, they have a horny beak which they use for biting. Non-venomous snakes have four rows of upper teeth: two rows on the maxilla and two rows on the palatine-pterygoid bones. There are only two rows on the lower jaw, one attached to each mandible. Venomous snakes substitute fangs for the maxillary teeth.

There is a small opening caudal to the tongue called the glottis. Unlike mammals, the reptile glottis is always closed unless it is taking a breath. It forms a vertical slit in the closed position. Snakes are able to extend their glottis out the side of their mouth while they are eating to allow for respiration.

The trachea is usually long and is supported by cartilaginous rings. These rings are complete in the turtle and the crocodile, and incomplete in the lizard and snake. The trachea usually terminates just dorsal to the heart. In the lizard and turtles the trachea bifurcates into two bronchi which then enter the left or right lung. In the snake the trachea branches into a short left bronchus which terminates in a vestigial left lung. The size and functional capacity of this left lung varies from species, and can be complete in some of the water snakes where it is used for hydrostatic purposes. The right bronchus terminates in the functional right lung.

All reptiles, except the crocodile, lack a diaphragm. Breathing (inspiration and expiration) is accomplished principally by the intercostal muscles. These are assisted by other muscles of the trunk and abdomen, as well as smooth muscles in the walls of the lungs themselves. The three chambered reptilian heart is composed of two atria and a large ventricle. There is an incomplete ventriclar septum which allows the heart to function as a four chambered heart.

Reptiles have a renal portal system. In the snake the parietal veins from the body wall and the caudal vein from the tail pass through the kidneys before anastomosing with the ventral abdominal vein. In the lizard the caudal tail vein and the internal and external iliac veins all feed through the kidneys before returning to the heart. In the turtle the renal portal system receives veins from the carapace, the musculature posterior to the kidneys and the external iliac veins.

Reptiles, except the snapping turtle, do not have lymph nodes. However, the lymphatic system in reptiles is complex. There is an extensive network of perivascular lymph channels around the major vessels and perivisceral lymph spaces which drain the viscera.

The spleen is a small, spherical, reddish organ located between the gall bladder and the pancreas. It is usually tightly adhered to the pancreas, and the two organs collectively are often referred to as the splenopancreas. The pancreas is found caudal to the gall bladder on the mesenteric border of the duodenum. It has both endocrine and exocrine functions much the same as in mammals.

The single or double lobed thymus is found craniolateral to the thyroid gland, closely associated with the vagus. It does not involute when the animal matures as it does in higher vertebrates. Just caudoventral to the thymus is the thyroid. It is a spherical reddish-pink structure cranioventral to the heart and ventral to the trachea.

Reptiles have one or two pairs of parathyroid glands which can be found either cranial or caudal to the thyroid. In turtles the glands may be found imbedded in the thymus. These glands are difficult to find and are often obscured in the adipose tissue.

All reptiles have a pair of adrenal glands. They are found closely associated with the gonads and urogenital structures of the lizard and snake and with the kidneys in the turtle. The adrenals are pinkish filiform structures found medial to the gonads. Unlike mammals, the medullary and cortical tissue is indistinguishable, but nonetheless still produces the appropriate hormones.

For the most part the mouth does little more than catch the food. Very little mastication, if any, occurs. The saliva that is produced has little digestive significance, its role being mostly lubricatory. The esophagus has a special adaptation of several longitudinal folds which allow for great distensibility of the gut to accommodate large food items. The esophagus is dorsal to the trachea and extends from the pharynx to the stomach.

The stomach of the snake is fusiform, and in the lizard and turtle its shape grossly resembles the mammalian stomach. The stomach is rather short in the snake. Its junction with the esophagus is clearly noted at a site approximately equal to three-fourths the length of the liver. The stomach ends in a stricture, the pylorus, at the pyloroduodenal junction.

The small intestine may be either straight or have short transverse loops. The small intestine in the lizard and turtle has many loops and convolutions much the same as in the mammal. The small intestine terminates at the ileocolic junction. A cecum is present in some snake species. A cecum is present in both the lizard and the turtle.

The large intestine terminates at the cloaca. It is a short, straight tube. As in the bird, the reptilian cloaca has three chambers. The feces are discharged into the anterior chamber called the coprodeum. The next, or middle chamber, called the urodeum, receives the urogenital ducts. The posterior proctodeum acts as a general collecting area for digestive and excretory wastes. The male intromittent organs open into this compartment, and both the male and the female have scent glands which also open here.

The reptile has a metanephric kidney. It is situated in the posterior part of the body positioned adjacent to the body wall, with the right kidney anterior to the left. They are brown in color and consist of twenty-five to thirty lobes.

Since the snake lacks a bladder the ureters enter directly into the urodeum. The lizard and turtle the ureters enter the bladder, which then empties directly into the urodeum.

Both the male and female gonads are found in the posterior half of the body. They are medial to the kidneys and in the snake, the right is cranial to the left. The testes are off-white to yellow, and the ovaries are a yellowish pink.

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UPDATE ON FELINE HEMOPLASMAS

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UPDATE ON FELINE HAEMOPLASMAS

The haemotropic mycoplasmas (haemoplasmas) are small bacteria that parasitise red blood cells (RBCs) and can induce haemolysis, causing anaemia. A recent review has been published, focusing on feline haemoplasma species 1. A resumé of currently recognised feline haemoplasma species is shown below.

Feline haemoplasma species, their prevalence and pathogenicity

Haemoplasma species	Reported prevalence	Pathogenicity
Mycoplasma haemofelis	0 – 46.6% (median 4.8%)	Acute infection often results in haemolytic anaemia
'Candidatus Mycoplasma haemominutum'	0 – 46.7% (median 14.4%)	Acute infection can induce a drop in RBC parameters but not usually severe enough to cause anaemia unless cat has concurrent disease or is immunocompromised e.g. chemotherapy
'Candidatus Mycoplasma turicensis'	0 – 26% (median 2.0%)	

In most studies, feline haemoplasma infections are more common in male, non-pedigree cats with outdoor access. Infection with 'Ca. M. haemominutum' is usually more prevalent in older cats, presumably because the chance of acquiring chronic subclinical infection increases with time. Some studies have shown an association between haemoplasma infection and feline immunodeficiency virus (FIV) infection2,3 whereas others have not4. Most studies have failed to show an association between haemoplasma infection and feline leukaemia virus (FeLV) infection2-4, but variable results are seen in different reports.

Prevalence studies have been performed worldwide with very varied results. 'Ca. M. haemominutum' is usually the most common species found in prevalence studies. M. haemofelis and 'Ca. M. turicensis' infections generally are less common, although occasionally high prevalences are reported. Interestingly, some Canadian studies have reported very high prevalences of haemoplasma infection in cats, with one study documenting that 46.6% of stray cats were M. haemofelis infected5.

Outcome of Haemoplasma infection

Mycoplasma haemofelis is the most pathogenic of the feline haemoplasma species. Acute infection often results in severe haemolytic anaemia although in some cases only mild anaemia results. Chronic infection is not usually associated with significant anaemia. Cats do not need to be immunocompromised or splenectomised to succumb to clinical disease with M. haemofelis, unlike dogs for the canine haemoplasmas. Persistent autoagglutination or positive Coombs' testing, indicating the presence of RBC-bound antibodies, have been demonstrated in anaemic cats with acute M. haemofelis infection. Although 'Ca. M. haemominutum' infection can cause a drop in RBC parameters, anaemia is not usually induced except in cats with concurrent problems e.g. FeLV infection. However cases of so-called primary 'Ca. M. haemominutum' anaemia, without any apparent concurrent disease or infection present, have also been reported6,7. 'Candidatus M. turicensis' infection has resulted in anaemia or a small drop in RBC parameters in some experimental studies, but generally anaemia is uncommon following infection. Concurrent disease and immunosuppression are both thought to be involved in the pathogenesis of 'Ca. M. turicensis' disease, in a similar way to 'Ca. M. haemominutum'8. Long-term asymptomatic carrier status can occur, especially with 'Ca. M. haemominutum' and M. haemofelis infection4. Clinical disease associated with reactivation has been reported7,9,10.

TRANSMISSION

The natural route of transmission of hemoplasma infection between cats in the field has not yet been determined. Vectors have been implicated, as have biting and fighting, but neither have been proven. Vertical transmission has not been definitively shown for feline haemoplasma infections but has been strongly suggested for other haemoplasma species11,12. Blood transfusion can result in transmission, and blood donors should be screened for haemoplasma infection13,14.

CLINICAL SIGNS

These include lethargy, weakness, reduced appetite, dehydration, weight loss and intermittent pyrexia (which can be high). Pallor, associated with anaemia, is also reported. Splenomegaly may be evident in some cats. Severe anaemia may result in tachycardia, tachypnoea and weak or bounding femoral pulses with haemic cardiac murmurs. Icterus is uncommon despite the haemolytic nature of the anaemia.

DIAGNOSIS

Pathogenic haemoplasma infections typically cause a regenerative macrocytic hypochromic anaemia although pronounced reticulocytosis is not always evident15. Positive Coombs' test results can occur. Hyperbilirubinaemia is seen occasionally, due to haemolysis, and hypoxic liver damage may result in increased activities of alanine aminotransferase.

Haemoplasmas are currently unculturable in vitro. Cytology of blood smears may show haemoplasmas on the surface of RBCs but this is known to be very insensitive and non-specific for diagnosis. PCR assays are now the diagnostic method of choice for haemoplasma infection, being far more sensitive and specific than cytology. Real-time quantitative PCR (qPCR) assays allow quantification of haemoplasma DNA in the sample being analysed. Some M. haemofelis-infected cats show very large fluctuations in M. haemofelis copy number over time; this should be considered when interpreting qPCR results. In contrast, 'Ca. M. haemominutum'- and 'Ca. M. turicensis'-infected cats show little fluctuation in copy number over time. The reasons for the marked fluctuations in blood M. haemofelis copy number over time is not known but may be due to antigenic variation.

Differential Diagnoses

Haemoplasmosis should be considered as a differential diagnosis in cats presenting with regenerative (although occasionally non-regenerative) anaemia and possibly associated pyrexia. Other diagnoses to consider are primary immune-mediated haemolytic anaemia, secondary immune-mediated haemolytic anaemia (e.g. secondary to drugs, neoplasia, infections), cytauxzoonosis, retroviral infection, babesiosis, Heinz body associated haemolysis, hypophosphataemia and inherited RBC disorders such as pyruvate kinase deficiency.

TREAMENT FOR HAEMOPLASMOSIS

1. Antibiotics

Antibiotic treatment is indicated for cats with clinical signs and clinicopathological abnormalities consistent with haemoplasmosis. Treatment should also be considered for cats that test positive for M. haemofelis in certain situations in view of the potential for recrudescence of anaemia with this haemoplasma species, which is the most pathogenic.

Antibiotics are typically given for 2-4 weeks. Doxycycline is often used as 1st line treatment and is adequate to induce a clinical response in M. haemofelis cases, but it does not consistently eliminate infection16,17. Unfortunately, controlled doxycycline treatment studies have not been performed for either 'Ca. M. haemominutum' or 'Ca. M. turicensis' infection. Fluoroquinolones are usually used as 2nd line treatments for haemoplasmosis; marbofloxacin treatment for 4 weeks significantly lowered 'Ca. M. haemominutum'18 and M. haemofelis copy numbers19, but the 'Ca. M. haemominutum' copy numbers only plateaued at a relatively high level during treatment, with no negative PCR results seen, and copy numbers rose back to near pre-treatment levels (very high) within 7-10 days of finishing marbofloxacin treatment. Conversely the fall in M. haemofelis copy numbers during marbofloxacin treatment was progressive with intermittent negative PCR results obtained at the end of the marbofloxacin treatment period and thereafter. Pradofloxacin has also been effective for haemoplasmosis in cats20, with one study suggesting that 2 weeks of pradofloxacin treatment may be more effective at clearing M. haemofelis than doxycycline. The author has found pradofloxacin to be effective in the treatment of 'Ca. M. haemominutum' infection in clinical observational cases but again no controlled studies have yet been performed.

A goal of treatment should be to eliminate infection, although proving infection has been eliminated is difficult without performing PCR on the whole cat! Repeatedly negative PCR results on blood samples are probably most reliable to indicate elimination. If negative PCR results do not result from treatment, control of clinical signs and a reduction of copy numbers in the blood indicates efficacy of treatment even if elimination is not possible. However, recrudescence of disease remains possible in cats that remain haemoplasma positive. A recent study21 reported that to facilitate clearance of M. haemofelis, when this is required, doxycycline treatment is given for 28 days followed by monitoring of copy numbers in the blood by quantitative PCR. If the cat remains PCR positive and clearance is needed, treatment should be switched to a fluoroquinolone (marbofloxacin was used in the published study) for 14 days, as this was associated with apparent clearance of infection in the study. So, although no antibiotic treatment regime that predictably eliminates haemoplasma infection with any species has yet been described, this study suggests that the use of doxycycline followed by marbofloxacin may be useful for clearance of M. haemofelis.

2. Corticosteroids

Corticosteroids have been recommended as adjunct treatment for haemoplasmosis, to treat any immune-mediated component of anaemia, although their efficacy has not yet been proven. In our experience, clinically ill cats, including those that are Coombs' positive, respond to antibiotic treatment and supportive care alone without the need for corticosteroids. Indeed, immunosuppressive doses of corticosteroids have been used experimentally to exacerbate haemoplasma infection, so their routine use is not advised.

3. Supportive care
Supportive care is also required for acute haemoplasmosis treatment. This should include correction of dehydration with fluid therapy, and blood transfusion if the anaemia is severe.

PREVENTION

Blood donors should be screened for haemoplasma infected by PCR to help prevent inadvertent transmission by blood transfusion from asymptomatic carrier cats. Keeping cats indoors is also likely to prevent infection, as outdoor status has been identified as a risk factor, but this will often be unpractical. In view of the potential for vector transmission, preventative flea and tick treatment is recommended. Recent work suggests that protective immunity develops following M. haemofelis infection22, opening the way for future haemoplasma vaccination.

REFERENCES AVAILABLE ON REQUEST

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DECISION-MAKING AROUND EUTHANASIA AND CHRONIC PAIN

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Introduction

There are multiple causes of chronic pain in dogs and cats including but not limited to osteoarthritis, oral and dental disease, neoplasia and pain related to its treatment, persistent post-operative pain and long-term dermatologic disease. Of these, the most common cause in both dogs and cats is osteoarthritis which is associated with pain and varying degrees of disability. Chronic pain is usually more prevalent in older pets but can affect any age group.

Advances in veterinary medicine have resulted in pets living longer and living with diseases that in the past were untreatable or surviving surgeries or trauma that would not have been previously attempted. As a result, more animals may be living with long-term pain. We must never lose sight of our duty to animals which is to preserve quality of life and we must ensure that our ability to make ethical and welfare decisions keeps in step with medical advances.

A good quote to keep us focused on our approach to treating animals comes from the physician Atul Gawande who states that “we’ve been wrong about what our job is in medicine. We think our job is to ensure health and survival. But really it is larger than that. It is to enable well-being.”A

Pain and Quality of Life

It is difficult to describe in words exactly what quality of life (QoL) is – it is subjective and unique to each individual. One approach is to ask, “how does the animal (or person) feel about their circumstances?”. This must consider health, physical and mental states and in animals assessment requires input by proxy respondents. Pain can have a detrimental impact on QoL based on the following definition of pain; “pain is a distressing experience associated with actual or potential tissue damage with sensory, emotional, cognitive, and social components”.(1)

Comfort, which we can take to mean “absence of pain” or “pain which is within a tolerable threshold for the individual” features as an important domain in health-related quality of life (HRQL) assessments in dogs and cats (Figure 1).(2-4)

Figure 1. Key domains used for assessing HRQL in dogs and cats.

The contents of our pain management toolbox are continuously expanding and contains both pharmacologic and non-pharmacologic tools. Despite these advances there are specific cases or a time in a specific patient that we can no longer control pain within a tolerable level for an individual. Pinpointing when we are at that point is essential for preventing unnecessary suffering. There are specific tools available for assessing pain related to OA in dogs and cats.(5-8). However, pain should not be considered in isolation; it’s impact on QoL or its contribution to the overall wellbeing of the animal must be considered when comorbidities exist. For example, if a cat has OA and chronic kidney disease each will have an impact, and these may vary from day to day. It is important to assess QoL over time by keeping a diary or using an online tool (e.g. HRQL assessments by Vetmetrica).B Mapping progression also helps with decision making.

The individuality of QoL adds to the complexity of assessing whether or not an animal is enjoying life. Just as with people what animals like to do varies. Some of us are happy and content doing very sedentary things such as enjoying being outdoors and reading a book, but others are only happy on an adventure that is physically demanding such as mountain climbing. The impact of pain and mobility impairment on these different individuals will be markedly different. Although we try to avoid anthropomorphism in veterinary medicine it is difficult; consider the impact of osteoarthritis on the following dogs and cats shown in Figure 2.

Figure 2. Images of dogs and cats with different life-styles.

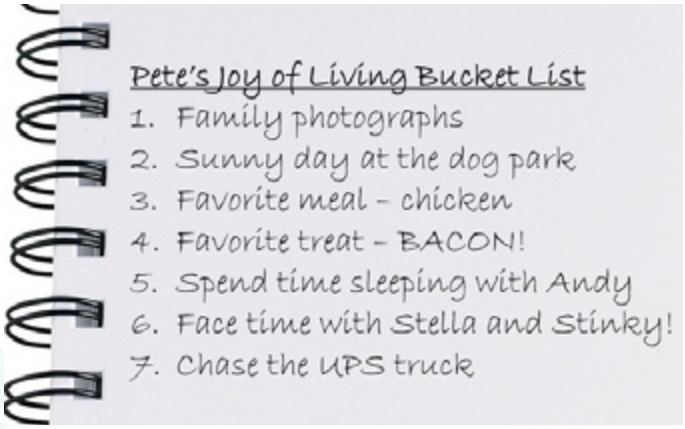
In some cases, it is clear we should not assume certain things about animals. When the impact of osteoarthritis on cats' lives was considered, the hypothesis was "that items contributing to QoL in cats are predominantly items requiring mobility".(9) In fact, when owners were consulted on what was important to their cat's quality of life, 40% of items listed involved mobility, while 60% were ‹inactive› items, which resulted in rejection of the hypothesis.(9)

Euthanasia and anticipatory grief

"How we seek to spend our time may depend on how much time we perceive ourselves to have." Atul Gawande.A Once owners know that their pet has chronic pain or an incurable disease – the focus is on alleviation of pain, enhancing quality of life and dealing with comorbidities. But at this point they begin to understand that time with their pet is limited and as with people begin to wonder how they can make the time left the best it can be. This is also the time that anticipatory grief can surface. Anticipatory grief refers to a feeling of grief occurring before an impending loss; understanding this issue in human caregivers and those with sick parents, spouses and children is advancing, and its occurrence in pet owners is now recognized.C Unlike most situations in humans, there is the added issue of discussing and performing euthanasia.

In my experience, creating so-called "Bucket Lists" can be quite powerful for owners. It reaffirms and strengthens the human-animal bond and gives the owners purpose and happy memories to focus on after they have said goodbye to their dog or cat. An example of a bucket list is shown in Figure 3.

Figure 3. One family's bucket list for their dog Pete.



Owners need our support and help with difficult decisions and we must guide them and be part of the decision-making team. This requires excellent communication skills, time and empathy. One think that makes a big difference to owners is how you phrase things (verbal priming). Here are some simple ways to make a positive impact:

Instead of...	Try...
You are doing the right thing	We are doing the best thing
Don't worry about him	He is in good hands
There's nothing more you can do	You have done an amazing job

Euthanasia

Euthanasia is often thought of as a failure, but it should be looked at as a treatment option which is a unique gift that veterinarians can offer. Each decision to euthanize an animal will be different; factors to consider are the owner's budgets which include financial, emotional, physical and time. Euthanasia can be a planned procedure and it is always better to euthanize a day to early than a moment too late. In this situation the owners along with the veterinarian can decide where, when and how.

If we monitor HRQL and perform euthanasia well – i.e. truly provide a "good death" then life for a pet can be good from start to finish. This will reduce the owner's grief and increase the likelihood of them becoming pet owners again.

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DERMATOLOGY: STRATEGIES FOR SUCCESS WITH YOUR DERM CASES

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Set yourself up for success… 20 minutes is not enough time for a derm case. What to do?
- book two time slots. Be creative with billing - that extra time is going to allow time for diagnostics, which can be billed for

- have the animal dropped off for the day with a detailed history - it can be examined, have diagnostics run, and a treatment plan can be formulated by your team throughout the day, then have a discharge appointment to keep things ticking along
Dermatology cases often have long convoluted histories. Many of them will have recurrent ear or skin infections. If someone's skin and immune system is working properly, they should not be getting recurrent infections, so be sure to ask yourself why this happening. Don't just keep treating symptoms. Often the patient will respond, then relapse and continue to cycle over and over, until the owner loses faith in your practice and they move on to a different clinic for help.

An accurate history is of paramount importance!
History questionnaire - A good history should include:
Age of onset (the first time they ever had any issues with their skin, ears or itchiness)
Seasonality – any time of year that seems better or worse for symptoms

Pruritus: itching can look like rubbing, scratching, biting, scooting, licking… sometimes we even have closet lickers and just see evidence of barbering
- Level of pruritus on a scale of 0-10
- Other animals in the house hold affected?
- Humans in the household affected?
- On any medications? Have there been any medications that they feel have made a difference?
- Heartworm/flea/tick preventatives?
- What diet are they on? Supplements? Flavoured toothpaste? Pilling vehicles? Treats?
- How many bowel movements are passed per day? Consistency?

Any history of adverse gastrointestinal signs? Can include bad breath even though oral health is good, vomiting, burping, borborygmus, flatulence, diarrhea, anal gland issues, scooting, butt licking

How did condition start, and how has it progressed?
Any possible trigger? Vaccination, medication, diet change, etc.
Any body parts the animal really concentrates on?
Any other symptoms? (respiratory, exercise intolerance, changes in weight, etc.)
That's a lot to get through, and that's why a history questionnaire so helpful. We even use history questionnaires for our recheck appointments, and ask our owners to include those with any update emails that they send us.

Recheck history questionnaires should include: Any concerns?
- Current diet?
- Current treats? Anything for pilling?
- Any additional supplements? Toothpaste?
- Consistency and number of bowel movements per day?
- Any adverse gastrointestinal signs (same list as above)
- Current medication schedule: medication; concentration; how much and how often
- Itch level
- Any lesions on skin? What do they look like and where are they? Are they bothering your 4 legged friend?
- Any adverse reactions noted since starting a new medication (which medication?)
- Any other information you feel is important for us to know:
- Please attach any photos of affected areas on your pet if you feel these are relevant.
- Yup! Still a lot of information to go over, which highlights just how useful having a questionnaire is.

When performing your dermatologic examination, always look at your entire patient from stem to stern, including a quick look in the mouth (immune mediated skin diseases often have oral lesions), check eyes for episcleritis, conjunctivitis, corneal opacities, check the nasal planum and dorsal muzzle, check lip margins and lip folds, check ears (canals, pinnae, palpate ear canals), check facial, neck and tail skin folds, examine coat and skin over entire dorsum and ventrum, include nipples, check claws and beds, interdigital spaces between toes and foot pads, genitalia, anus and perianal region, and tail.

Look for any patterns. Many derm conditions have specific distribution patterns. Symmetric lesions suggest an internal disease process or endocrine disorder, while asymmetric lesions suggest infection. Describe any lesions. If you are able to describe lesions, you might find your diagnosis easier! For example, bilateral flank alopecia. If you combine that with a history of seasonal recurrence you have your definitive diagnosis of Seasonal Flank Alopecia. Sometimes, it's really just that easy.

There are a few general Rules of Thumb that are helpful to keep in mind :

Pustules that span more than one hair follicle may indicate immune mediated skin condition

Consider vasculitis if extremities are affected

Consider hypothyroidism with any of the following: recurrent infections, hypotrichosis or alopecia over dorsal muzzle, facial or tail base edema, waxy exudate around nipples, corneal lipid deposits

Consider food allergies in animals less than a year of age, or in those 6 years and older

Food allergies may have little or no response to corticosteroids

Environmental allergies in animals 1 to 4 years of age

Environmental allergies have a good response to corticosteroids

Animals with food allergies often have ears, feet and rears affected (environmental allergies often have ears and feet affected)

Food allergies often have lesions over the dorsum
Environmental allergies have lesions on the ventrum

Consider breed predelections. (1)

Treat empirically for ectoparasites.

And the absolute best strategy, bar none, is to perform cytology on every patient you are working up. This can be billed for, to bring in extra income for your clinic. The results are nearly instant, and it is invaluable in guiding treatment for you patients. I can't tell you how many times we have had an animal referred to our practice for a recurrent pyoderma that is refractory to antibiotics, and it turns out that it is a yeast infection. Don't waste your patient's time and your client's money by guessing. Take 10 minutes to DO CYTOLOGY!!!!!

All of the above will get you to a treatment plan.

This plan will have it's best chance of working if we have owner compliance. The best way to achieve owner compliance is to take the time to educate your clients, and, have them be part of the decision making when formulating the treatment plan. The best treatment for your patient, is the one that your client will administer faithfully, so help set your clients up for success, starting with treatment selection.

If bathing is not a realistic option, consider other topicals like sprays, mousse, pipettes, or wipes.

Review how to actually give a therapeutic bath, or how to apply topical products to ensure your treatment will be delivered.

If pilling is a challenge, consider injectables, oral liquids, or medications that can be administered once daily to make life easier.

Do they need appropriate treats, pill pockets or canned food to be successful?
If your patient is on a diet trial and treats are important, then help the owner choose a diet that has some associated treats with it,or point out what the ingredient list is and have them stay within the confines of that diet. Send them home with recipes for acceptable treats, even point out that most dogs love icecubes! Make sure there aren't any items sabotaging a diet trial, like flavoured toothpaste, anything in gelatin capsules, animals licking dishes before they go into the dishwasher, care givers, and so on.

This all seems very basic, but it's often missed, leaving everyone frustrated and worst of all, leaving our patient uncomfortable.

Put everything in writing so your owner can refer to it, or, share it with the rest of the family.

The final strategy for working with dermatology cases, is to follow up: specific dates to hear back from clients, listed on your visit summary;

technician appointments for repeat cytology to ensure infections are clearing.

Have your clients contact you if anything worsens prior to their scheduled appointment. It may seem crazy, but when wrapping things up with a client, I tell them that things should only get better, not worse. We have all seen clients continue on with treatment for 4 weeks until their scheduled recheck appointment, even though the treatment protocol made their pet more uncomfortable.

Success with derm patients, hinges on owner compliance. The more informed an owner is, the better they understand their role and how they can help their furry friend. Now, more than ever, owners want to be knowledgeable about their pet's condition, and they will come armed with a lot of questions about information they read online.

It takes time to go through things with your clients. Plain and simple!

The majority of dermatology patients are not cured, but rather are managed. This means a long patient/practice relationship. By training technicians to excel in the recognition of dermatologic diseases, and diagnostics needed, clinicians will be able to get a rapid, and accurate diagnosis to facilitate the early start of an appropriate treatment plan. This is where a technician can truly have an impact on patient care, client service and the reputation of a practice.

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CREATIVE WAYS TO USE TECHNOLOGY TO DRIVE COMPLIANCE

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Introduction

Compliance, whether starting a new workout routine or giving Tapazole to your cat twice a day, is all about reducing friction to create a path of least resistance. Most people will find excuses to fail so removing as many barriers as possible will increase your chances of compliance. Since our patients can't talk or make their own choices, driving compliance in veterinary medicine is all about educating and enabling the pet owner to make good choices. So let's take at look at how to raise our game with by adding a new twist to our traditional methods.

1. Communicate with storytelling.

Verbal communication at time of visit is a critical part of the game plan. But, the reality is that people only retain about 20% of a conversation and even lower in stressful situations. So the moment you need them to hear the most, they hear the least. Consider this new approach: Educate with story telling. Research shows that messages delivered with a story are 22 times more memorable than just delivering facts. [1] Instead of telling your client how efficacious the parasite prevention is and how the organism is killed, try telling a story about one of your clients that had first hand experience with their pet and the disease. People can relate and remember a story much easier than basic facts.

"I definitely want you to get Fido on heartworm prevention. I recently had to treat this cute little Dachsund named Elvis that moved here from Texas after the hurricane and got adopted from our shelter and had heartworms. And since heart worms are transmitted by mosquitoes, and they can fly 7 miles, it is important that you give the medication every single month so Fido won't try to pull an Elvis on us."

2. Get on the smartphone

Assume that no one remembers anything after you walk out of the exam room. Your job is to arm your client with enough information that they can confidently explain the plan to their family and since 80% of our clients have a smartphone, digital strategies can be very helpful. A new way to share information to reach clients effectively is by having a mobile app for your practice so that you can send a push notification summary of the visit or bullet point action items to the client's smartphone. Members in the household can all share the same account in a practice app so everyone will have the information you sent over instead of getting lost in the classic game of "telephone."

3. Embrace technology for reminding

People are over scheduled and drowning in responsibilities so it is important that we find ways to give our clients tools to remember to give their medication, bring their pet back in for a followup test or recheck exam. Email reminders have lost their effectiveness for several reasons. Email is a saturated platform that has been overused to where many clients have either abandoned their emails in hopes to get away from spam or don't read the majority of the ones in their inbox. The average person gets 29 emails per day and you are very likely lost in the crowd.

One of my favorite things to do in the exam room is to ask the client if they have a smartphone. Then I just tell Siri all of the directions that I want my client to remember and she will put the reminders in the client's calendar for me. I like to think of Siri as my personal pet assistant for my clients.

Another huge advantage is to have a mobile app built for your practice that connects to your practice management software so when the pet is due for an upcoming visit or lab work, the app will trigger a push notification to wake up the device and show the client. This is particularly strong messaging because it is coming from practice branded with your logo and hospital name. Push notifications have a view rate of 70-90% (compared to email at 24.7%) which helps assure that clients will not only receive, but will also notice your message.

4. Set the client up for success

One of the main ways to reduce friction is to make sure the client has all the resources they need to get the job done. If this means giving medication, be sure to offer the pill pockets. If the job is to collect a stool sample, be sure to give the collection container ahead of time. Just look at this study by VetSuccess and Elanco [2], compliance skyrocketed when the fecal container was mailed to the client ahead of time.

Any new program is going to require some shift in behavior until it becomes a habit. Habits form faster when there is a direct payoff or consequence for the action. For example, if a client misses giving their arthritic dog a dose of Rimadyl and then the dog can barely get up the next day, the habit of compliance will most likely form faster. Alternatively, if the chore is give heartworm medication each month, to prevent something you can't see, touch or hear, the habit is harder to develop making the requirement for education even bigger. Consider compliance a multimodal plan of attack and don't be afraid to try new strategies and think outside of the box. When your clients succeed, everyone wins but especially your patient!

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WHAT YOU CAN CATCH AT WORK: ZOONOSES FROM THE DVM AND MD PERSPECTIVES

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Zoonotic diseases are defined as being common to, shared by, or naturally transmitted between humans and other vertebrate animals. Humans are infected with zoonotic agents from direct contact with the infected pet, contact via contaminated food or water, from shared vectors, and from the shared environment. Direct contact with animal feces (enteric zoonoses), respiratory secretions, urogenital secretions, or infected skin and exudates, as well as bites and scratches can result in human infections. Some zoonotic agents are transmitted between animals and man by shared vectors like fleas, ticks, or mosquitoes. Rickettsia rickettsii (ticks), Ehrlichia spp. (ticks), Borrelia burgdorferi (ticks), Rickettsia felis (fleas), Bartonella spp. (fleas, ticks), Anaplasma phagocytophilum (ticks), Dirofilaria immitis (mosquitoes), Dipylidium caninum (mosquitoes), and West Nile virus (mosquitoes) are examples of vector borne zoonoses. The pet brings the vector of the organism into the environment resulting in exposure of the human.

Bartonella spp. are notable examples as some species like B. henselae survive in flea feces for days. Flea and tick control should always be maintained on our client's animals and infested animals that are seen in the clinic should be treated immediately. Use of flea control products have been shown to block transmission of B. henselae amongst research cats and so theoretically could lessen transmission to humans. Neurobartonellosis (headaches, blurred vision) in veterinary health care providers is now recognized as an important zoonotic disease syndrome related to Bartonella spp. in flea frass.

Some zoonotic agents including Sporthrix schenkii, Histoplasma capsulatum, Coccidioides immitis, Blastomyces dermatitidis, Cryptococcus neoformans, and Aspergillus spp do not usually infect humans from direct with the infected pet but are acquired from the same environmental source.

Most of the agents discussed in this lecture can infect and cause disease in anyone, but disease is generally more prevalent or more severe in those that are immunodeficient. Humans with AIDS are discussed most frequently, but there are many more immunodeficient individuals including the very old, the very young, and those receiving chemotherapy for immune-mediated diseases, organ transplantation, or neoplasia.

Humans are unlikely to contract zoonotic diseases from contact with their pets and so in most cases do not need to relinquish their animals. The Centers for Disease Control of the United States online site, Healthy pets Healthy People (http://www.cdc.gov/healthypets/index.html) is a great resource for veterinarians and owners. The American Association of Feline Practictioner's Zoonoses Guidelines states 'All human or animal care providers should provide accurate information to pet owners concerning the risks and benefits of pet ownership so that an informed decision about acquiring and keeping pets can be made' (www.catvets.com/uploads/PDF/ZooFinal2003.pdf). The Companion Animal Parasite Council also provides great information to help with decision making about zoonotic parasitic diseases (www.capcvet.org; www.petsandparasites.org/). The WSAVA encourages veterinarians and physicians to work closely together to determine the risks associated with pet ownership for individuals and their families.

Enteric zoonoses. There are multiple infectious agents of the gastrointestinal tract that potentially can be shared between pets and humans. Since some enteric zoonotic agents are infectious when passed with feces (Campylobacter spp., Salmonella spp., Giardia spp., Cryptosporidium spp. and others), direct contact with infected animals can result in human infections. However, it is felt that most enteric zoonoses result from ingestion of the infectious agent in contaminated food, water, or other environmental sources. Giardia spp., Cryptosporidium spp., Toxocara spp., and Toxoplasma gondii are notable examples. Toxoplasma gondii, hookworms, and roundworms require a period outside the host prior to becoming infectious. While on the zoonoses list, Giardia and Cryptosporidium spp. of dogs and cats are rarely detected in people and human strains have not been associated with illness in pets. Prevalence rates for enteric zoonoses have been reported multiple studies of dogs and cats and generally are generally greater in those with diarrhea. These findings emphasize that diagnostic workups for enteric infections are indicated due to potential human health risks. The minimal diagnostic plan to assess for enteric zoonoses in pets with diarrhea includes a fecal flotation, Giardia spp., screening procedure, and fecal wet mount. Fecal culture should be considered if Salmonella spp. or Campylobacter spp. are on the list of differential diagnoses. In the United States, heartworm preventatives that control hookworms and roundworms are recommended year round (http://www.capcvet.org). Dogs and cats with normal stool are not considered human health risks.

Bite, scratch, or exudate exposure zoonoses. Approximately 300,000 emergency room visits per year are made by people bitten by animals in the United States.

Most of the aerobic and anaerobic bacteria associated with bite or scratch wounds only cause local infection in immunocompetent individuals. However, 28% to 80% of cat bites become infected and severe sequelae including meningitis, endocarditis, septic arthritis, osteoarthritis, and septic shock can occur.

Immunodeficient humans or humans exposed to Pasteurella spp., Capnocytophaga canimorsus (DF-2), or Capnocytophaga cynodegmi more consistently develop systemic clinical illness. Splenectomized humans are at increased risk of developing bacteremia. Mycoplasma spp. and L-form bacteria infections of people has been associated secondary to dog or cat bites.Bartonella spp. Yersinia pestis, and Francisella tularensis infections of humans can be associated with bites and scratches but these agents are also vector-associated zoonoses. Of the many fungal agents that infect both humans and animals, only Sporothrix spp, and the dermatophytes have been shown to infect humans upon direct exposure. Histoplasma, Blastomyces, Coccidioides, Aspergillus, and Cryptococcus infections of humans and animals can occur in the same household, but infection of humans generally results from a common environmental exposure rather than by direct contact with an infected animal. Rabies is still the only significant small animal viral zoonosis in the United States. Psuedorabies is a herpesvirus that infects pigs; dogs and humans can develop self-limiting pruritic skin disease following exposure. Feline retroviruses are not zoonotic.

Respiratory and ocular zoonoses. Bordetella bronchiseptica and Chlamydla felis cause mild respiratory disease and C. felis has been associated with conjunctivitis in people. Most people with Bordetella infections are infected by B. pertussus but some immunocompromised people develop infection by B. bronchiseptica. Humans are the principal natural hosts for Streptococcus group A bacteria, S. pyogenes and S. pneumon¬iae, which cause “strep throat” in people. Dogs or cats in close contact with infected humans on rarely develop transient, subclinical colonization of pharyngeal tissues and so theoretically can transmit the infection to other humans. Yersinia pestis and F. tularensis can be transmitted from cats or dogs to people in respiratory secretions.

Genital and urinary tract zoonoses. Leptospira spp. (dogs more than cats), Brucella canis (dogs), and Coxiella burnetii (cats more than dogs) are the most common zoonotic agents in this group. Whether Leptospira spp. of cats are associated with illness in people has not been studied extensively. Coxiella burnetii is a rickettsial agent found throughout the world, including North America. Many ticks, including Rhipicephalus sanguineus, are naturally infected with C. burnetii and so this agent is also a shared vector zoonoses. It most commonly is associated with respiratory disease in infected humans that come in contact by inhaling the organism which is shed in high numbers in some cats during parturition. Brucella canis (dogs) is not known to infect cats.

Table 1. General guidelines for veterinarians

- Vaccinate all dogs and cats in rabies endemic areas that have products available.
- Routinely administer drugs that kill hookworms and roundworms.
- Provide flea and tick control to pets year round.
- Teach pet owners how to avoid being bitten or scratched.
- Evaluate clinically ill animals for agents with zoonotic potential.
- Familiarize the veterinary staff about zoonotic issues.
- Provide pet owners information concerning public health aspects of zoonoses.
- Refer clinically ill pet owners to a physician for additional information and treatment.
- Volunteer to speak to the pet owner’s physician to clarify zoonotic issues when indicated.
- Document public health related advice in the medical record.
- Contact appropriate public health officials with reportable diseases.
- Make it clear that the veterinary staff understands conditions associated with immune deficiency, is discreet, and is willing to help; use of

signs or posters can be effective for this purpose.

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NEW OPTIONS FOR OXYGEN THERAPY AND RESPIRATORY DISTRESS

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Oxygen is a frequently recommended therapy – for respiratory disease, shock, heart failure and severe anemia. It should be a readily available therapy in any veterinary practice. Oxygen is used most frequently, in the non-anesthetized patient, for treating hypoxemia.
Hypoxemia is defined as a partial pressure of oxygen (PaO2) < 80 mmHg and corresponds to pulse oximetry (SpO2) of ~<95%; a PaO2< 60mmHg denotes severe hypoxemia and corresponds to an SpO2 < 90%.

The fraction of inspired oxygen (FIO2) in room air is 21%. During oxygen supplementation, FIO2 is increased. Clinically, the FIO2 is frequently difficult to measure in the conscious, non-intubated patient. Patients, on a variety of methods of oxygen supplementation, breathe an admixture of 100% oxygen and room air combined. Excessive oxygen has deleterious effects.1 Monitoring for animals receiving supplemental oxygen includes patient parameters (respiratory rate and effort, heart rate, mucus membrane colour), blood gases and pulse oximetry. Oxygen therapy aims to maintain an adequate PaO2 (>65, optimally ~80 mmHg) with the lowest FIO2 possible. Oxygen supplementation adjusted to SpO2 readings between 94-96% ensure adequate oxygenation without excessive supplementation. In the face of severe respiratory distress normalization of oxygenation is not always possible, however maintaining PaO2 > 60 or SpO2> 90% is critical.1

Multiple means of oxygen delivery are available to the practicing clinician. Traditional methods include flow-by-oxygen, oxygen by face mask, oxygen hoods, or nasal prongs and cannulas. The latter methods only support low oxygen flows - 50–100 ml/kg/min unilateral cannula, up to 200 ml/kg/min for bilateral supplementation. Oxygen supplementation in veterinary medicine has routinely been provided with cold air bubble humidifiers despite lack of evidence for their efficacy.2

For patients who fail traditional oxygen supplementation, options have been limited to the need for endotracheal intubation +/- positive pressure ventilation, or euthanasia. An augmented intermediate non-invasive respiratory support modality that successfully achieves continuous positive airway pressure (CPAP) with predictable, controlled FIO2 delivery has been sorely needed for veterinary patients.

High flow nasal cannula oxygen supplementation
Two high-flow nasal cannula (HFNC) oxygen therapy systems are currently developed for human use in North America – Fisher Paykels' Optiflow™ system, and Vapotherm High Velocity Nasal Insufflation (High-VNI®). Heated, humidified, HFNC oxygen therapy is a non-invasive intermediate method for providing oxygen supplementation as well as promoting improved respiratory function.2,3,4,A,B The HFNC system delivers oxygen flow rates up to 10x higher than traditional oxygen supplementation methods. The high flows achieve pressure to the airways known as continuous positive airway pressure (CPAP).

The HFNC system involves specifically designed nasal prongs (neonatal to adult sizing). These prongs are adapted for high gas flows (up 60 L/min using adult prongs). Oxygen (21-100%) is delivered heated and humidified (100% relative humidity) using a medical air/oxygen admixer, with an in-system humidifier, and wire-heated tubing (set to 37°C).2 The high gas flows are well tolerated by patients because of the heated, humidified air.2 The high gas flows meet the patients peak inspiratory flows, minimize entrainment of room air, and alleviate work of breathing. When compared to traditional methods of oxygen supplementation, HFNC therapy increases FIO2 values with increasing flow rates and successfully provides CPAP in people and dogs.2,4 Recommended flow rates in dogs range from 0.5 to 2 L/kg/min up to 60L.4 CPAP is observed at flow rates of 1-2 L/kg/min, and most consistently achieved using 2 L/kg/min.4 Even in the awake open-mouth breathing healthy dog, CPAP is achieved, though to a lesser extent. Flows should be gradually increased for improved tolerance. Flows above 2 L/kg/min are not tolerated.4

The HFNC facial interface developed for human patients, is reasonably adaptable and generally well tolerated by dogs, sedation may be necessitated.3,4 Due to the high gas flows, risk of airway overdistension is possible, without ensuring a leak in the system. Nasal prongs should be selected to occupy only 50% of the internal diameter of the nares. Commercial pediatric devices (providing 1-8 L/min) have a pressure relief valve built into the circuit or are designed to sense excessive circuit pressure and reduce gas flow accordingly. This is not included in adult commercial circuits.

The HFNC system is used in neonatal, pediatric and adult human patients, its use is currently adapted to the emergency department, during bronchoscopy, and in the post-extubated patient, as well as in the palliative do-not-intubate setting.2,5 Indications of HFNC are broad, encompassing most if not all causes of acute hypoxemic respiratory failure.5,6 This new oxygen support system has been successfully adapted to deliver augmented oxygenation support to dogs.3,4

A case series of six dogs reports successful delivery of HFNC in dogs failing traditional oxygen therapy.3 Another case series of HFNC in 22 dogs with hypoxemic respiratory failure of varying etiologies found that 60% of dogs responded to HFNC use (improved clinical respiratory parameters) by 30 minutes, and 45% ultimately responded to HFNC use and survived.A Similarly, HFNC has been trialed in 5 brachycephalic dogs that developed increased work of breathing +/- hypoxemia in the recovery phase of anesthesia.B Respiratory rate and dyspnea scores were decreased in 3/5 dogs following HFNC application.B

Safety implications:

HFNC is not a ventilatory support system. Changes in CO2 (increasing or decreasing) following HFNC application may be noted. Washout of CO2 may allow a decrease in CO2, alternatively the high flow rates provided by the HFNC system can impede exhalation in some patients. Hypercapnia is infrequently observed with HFNC therapy in people and dogs.1,A,B HFNC did not negatively impact CO2 elimination in healthy dogs,4,7 or dogs with acute hypoxemic respiratory distress3,A but hypercapnia (pCO2 >50 mmHg) was noted in 3/5 brachycephalic dogs when HFNC was applied.B Regardless, the effects of high flows on CO2 elimination may become deleterious in the compromised respiratory patient.4 CO2 monitoring is advised. Abdominal distention is also possible, and was noted in normal dogs trialed with HFNC; all developed radiographic signs of aerophagia, with no apparent clinical signs.4 One brachycephalic dog treated with HFNC developed clinically significant aerophagia that required clinical intervention.B Air-leak syndromes are also potential complications, with a low rate of ≤ 1% for pneumothorax secondary to HFNC.8Radiographic assessment of the thorax of healthy study dogs found that no dogs experienced pneumothorax, pneumomediastinum or other ill effects when flow rates were trialed up to 2.5 L/kg/min.4 However, a persistent pneumothorax while on HFNC has been reported in veterinary med.3

Some important issues remain to be resolved, such as definitive indications for HFNC and criteria for timing of its initiation, discontinuation and need for escalating treatment. Despite these issues, HFNC is an effective modality for early treatment of dogs with respiratory failure with diverse underlying diseases.4
Selecting HFNC - Patients meeting criteria for emergency intubation should be treated accordingly (unless owners decline endotracheal intubation). For patients who are not responding favourably to traditional oxygen supplementation a trial with HFNC is advised.

The potential for early application of HFNC is also to be considered (in lieu of traditional methods). Failure to respond to HFNC within 30-60 minutes or active deterioration should prompt immediate endotracheal intubation +/- ventilation.

Indications for mechanical ventilation include:
PaO2 < 60 mmHg despite oxygen supplementation
PaCO2 >50 mmHg
Increased work of breathing

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FOOTNOTES

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SWIM CATS: A MULTI-MODAL APPROACH TO FELINE MOBILITY, WEIGHT LOSS, AND PAIN MANAGEMENT

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What is S.W.I.M Cats? SWIM Cats Coast to Coast is a Canadian Feline Weight Loss & Improved Mobility initiative providing physical rehabilitation and weight loss programs.
S = Safe
W = Weight Loss
I = Improved
M = Mobility
The SWIM Cats Program was created by Dr. Anne Watson, DVM, CCRP of The O›Sullivan Animal Hospital in Barrie, Ontario and Jenn Panko, RVT/CCRP, OCMC, CAPMC of The SPAW Pet Rehabilitation and Fitness in Aldergrove, British Columbia.
Our Program: The Metabolic Prescription Diet «Meow and Purr Plan» for Feline Weight Loss and Improved Mobility
M = Morphometric Measurements
E = Exercise
O = Osteoarthritis Management
W = Weight Loss
P = Pain Management
U = Underwater Treadmill
R = Rehabilitation Therapy
R = Regular Body Fat Index and Ideal Weight Calculations
Rockin' Rhonda: A Story of Team Work to Achieve Feline Weight Loss and Pain Management, and Improve Mobility
Subjective Assessment
Rockin' Rhonda Surrey Animal Resource Centre, Fostered by Jenn Panko (SPAW) and Dr. Jeff Bowra (Aldergrove Animal Hospital) 13 year old female spayed calico domestic shorthair found as a 10kg stray in August 2016. Began weight loss program in shelter. 8.1kg November 10, 2016. Assessed using Hill's Body Mass Index and Nutrition Plan formulated and re-evaluated using Healthy Weight Protocol as weight loss occurred. Target Weight is 3.8kg. Blood work consistently within normal limits. Had dental prophy and extractions (208, 307) at local veterinary technology school October 15, 2015.

Objective Assessment

1. Painful - all signs except 18, 24, 25 observed from 25 Signs considered to indicate pain in cats 11 (Merola and Mills, 2016)
2. Morbidly Obese
3. Radiographs: Osteoarthritis, Left Stifle worse than Right (both show severe DJD), suspected previous bilateral cruciate ligament tears
4. Fully plantigrade stance bilaterally in hindlimbs, marked weight shift to front limbs. Takes maximum of 5 steps before sitting down. Suspected diabetic neuropathy. Bloodwork and urinalysis within normal limits. Attributed to excessive weight, loss of core strength, and degenerative joint disease.
5. Activities of Daily Living: Cannot fit in cat sized kennel. Cannot step up into litter box. Requires soft padded bedding. Cannot groom self. Requires regular nail trims to improve mobility. Shelter reports 'picky eater.'
Physical rehabilitation, pain management and weight loss plan set in collaboration and under the direct supervision of Dr. Jeff Bowra, DVM, CCRP

Pain Management and Joint Health Plan:

1. Onsior 6mg PO SID, evaluating efficacy daily and reducing dose in correlation with weight loss.
2. Therapeutic laser
3. Glycoflex Chews (loading dose of 3 chews per day for 6 weeks) then 2 chews daily, reducing dose in correlation with weight loss.
4. Cartrophen Injections (0.33cc subcutaneously every 7 days for 4 doses, then one dose every 30 days reducing dose volume according to weight loss)

Nutrition Plan:

1. Assess body fat index and create a safe weight loss and management plan using The Hill's Healthy Weight Protocol
2. Monthly weigh-ins. Recalculate Nutrition Plan Monthly
3. Measured and Controlled Hill's Metabolic Wet and Dry + Glycoflex Chews

Physical Rehabilitation Plan:

1. Low impact exercise sessions 2-3 times daily for up to 5 minutes increasing length of sessions and reducing buoyancy as tolerated.
2. Swimming in pool to improve cardiovascular fitness and assist with weight loss.

3. Environmental Modifications: Low litter box with 1" step in. Padding bedding, Medium Sized Dog Kennel, as hindend strength improves raise feed bowls to promote weight shifting to hind end and engagement of core muscles while eating and return to normal litter box use to promote flexion of stifles and hips.

4. K-Laser stifles, elbows, and shoulders, 3 watts, 1 cycle each joint, twice weekly for 3 weeks, then re-evaluate.
Move to weekly laser sessions when mobility improves.

5. As pain and weight diminish incorporate therapeutic exercise program to increase core strength, build hind limb muscle mass, improve hind limb strength and plantigrade stance, overall mobility, and ability to complete activities of daily living.

6. Monthly re-evaluations with Dr. Jeff Bowra, DVM, CCRP or as concerns arise, progress stops, or plan needs modification. Approximate 1lb/month weight loss program recommended.

7. Breaks from rehab at Jenn's house. Provide opportunities to be a 'normal cat' and have a break from hospital environment.

Clinical Outcome

Pain: Moving with ease around clinic and at Jenn's house. Jenn noted maximum of five steps, fully plantigrade stance at intake, November 2015. Now able to run around house, jump on sofa, beds, and shelves, able to go up and down stairs, and stand on hind limbs supported by front limbs on screen door to watch horses and dogs at the farm Jenn lives at. Still challenged by uneven surface activity and hill work. Enjoys laser therapy and hydrotherapy sessions. Signs 1, 3, and 5 intermittently present from Signs Considered to Indicate Pain in Cats 11 (Merola and Mills, 2016) Increase in signs determines use of Onsior 5mg PO PRN and re-evaluation with Dr. Jeff Bowra, DVM, CCRP.

Mobility:

November 10-18 2015: Able to complete 3-4 minute underwater treadmill sessions twice daily.
November 19-26 2015: Able to compete 5-7 minute underwater treadmill sessions three times daily. Introduced swimming laps in pool
November 26-December 3 2015: Able to complete 10-15 minute underwater treadmill sessions 2-3 times daily combined with swimming in pool. Plantigrade stance began to improve.
Began therapeutic exercise program:
1. Weight shifting with front limbs on balance pad, progressing to front limbs on balance disc
2. Raised feed bowls to promote weight shifting to hind end. Progressed to having front limbs on yoga block while eating to increase challenge of hind end weight shift.

3. Introduced cavaletties with poles flat on ground progressing to 2" then 3" off ground to promote front and hind limb weight shifting, flexion, and extension.

4. Gradually increased depth of litter box until able to use normal litter box.
December 4-11 2015: Able to competed 15-20 minute underwater treadmill sessions 2-3 times daily combined with assisted swimming in pool. Holding head up in treadmill and appearing stronger.

December 11 2015-Present:
Able to complete up to 30 minutes on underwater treadmill combined with swimming 4-5 times weekly combined with unassisted supervised swimming in pool. Enjoys working out and shows enthusiasm for underwater treadmill workouts. Achieved weight of 4.1kg (9lbs) September 2016.
Added slight incline to underwater treadmill for 2 minute intervals.

Therapeutic exercise program modifications:

1. Supervised outdoors time on a variety of surfaces including, grass, sand, uneven terrain, and hills
2. Time spent a Jenn's home just 'being a cat.'
3. Free time to be mobile around clinic when hospitalized for rehabilitation program.
Long Term Lifestyle and Mobility Plan:
Ongoing Pain Management, Weight Management, Joint Health Management and Physical Rehabilitation with Jenn Panko, RVT/CCRP, OCMC, CAPMC, under the supervision and direction of Dr. Jeff Bowra, DVM, CCRP. Bi-annual wellness visits (or more frequently as required) to monitor blood values due to off label use of Onsior.

Discussion and Summary:

Team Work: A team approach to Rhonda's care has made success possible. The SPAW Physical Rehabilitation Team, Aldergrove Veterinary Hospital Medical, Client Care Teams, Cleaning Staff, and Surrey Animal Resource Centre all played critical roles helping Rockin' Rhonda overcome her obesity, improve her mobility, reduce her pain, and improve her quality of life. Surrey Animal Resource Centre identified Rhonda's condition and pain and provided her with an oversize kennel and started her on a weight loss program. They promoted her story via the local news. When Jenn saw the news segment on social media she knew she had to help! Daily care, kennel cleaning, and exercise has been shared between The SPAW and Aldergrove Animal Hospital staff. She is a favourite at the Hospital and has many client fans that check in on her progress. We have a poster in The SPAW, in the hospital entrance, and at Surrey Animal Resource Centre that documents her progress. The use of social media to share Rockin' Rhonda's story has been a great way to raise awareness of the importance of a multi-modal approach to treat feline pain and obesity concurrently to improve mobility.

Hydrotherapy Rationale and Indications: Underwater treadmill was used to provide buoyancy reducing the impact on the joints while increasing the stance phase of the gait and increasing range of motion in the hindlimbs while building strength to reduce plantigrade stance and promote correct gait patterning and core strength.

When plantigrade stance began to improve underwater treadmill put on incline to increase weight bearing on hind end and increased hip extension. Water height adjusted in intervals to shoulder level to provide resistance and build muscle mass and reduced to stifle level to improve strength and endurance. Swimming was used to promote cardiovascular endurance and core strength. Assisted until hind end and core strength improved, then unassisted and supervised.
Therapeutic Exercise Rationale and Indications:
Therapeutic exercise goals included:
1. Develop core strength
2. Correction of posture (plantigrade stance)
3. Improve ability to weight shift to hind end
4. Increase hip extension
5. Increase ability to complete activities of daily living.

Therapeutic Exercises Used:
Crunches: Reaching for food from lateral recumbency (left and right and forward) progressing to doing so on a TotoFit Infinity Inflatable.
Transitions from lateral to sternal, from sternal to sit, and sit to stand supported from behind.
Raising food bowls on 3 “yoga block improved weight shift to hind end. Progressed to standing on 3” yoga block while food bowl placed on two 3” yoga block to simulate exercise of standing on stairs. Incorporated reaching

Cavaletties: Starting at 1”height 9” apart progressing gradually to 3” height 4” apart to increase stifle and hip flexion and promote weight shifting alternating back to 1” height and 7” apart to promote hind limb and front limb extension.

TotoFit Kore Exercise Work:
1. Walking up Kore Wedge and weight shifting with front limbs on Kore Roller
2. Weight shifting and crunches on Infinity Inflatables. Practices reaching for ground and flexing hind limbs and pulling self up on to Infinity Inflatable.
Supervised outdoors time on a variety of surfaces including, grass, sand, uneven terrain, and hills

Recommended Resources:

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THE GUT-BRAIN AXIS – USING THE BRAIN AND THE GUT TO DECIDE

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Introduction

The reciprocal link between behavior and the inflammatory and immune response has been extensively documented in the scientific literature. This reciprocal interaction between the immune system and behavior is also influenced by the host microbiome, i.e. the skin and gut microbiome.1,2Activation of proinflammatory cytokines induces a depressed state (sickness), which helps the individual to cope with the disease (e.g., an infection by exogenous pathogens) that triggered the inflammatory response. Circulating proinflammatory cytokines can enter the brain, where they have a direct inflammatory action and stimulate the production of other pro-inflammatory cytokines and prostaglandins. Although this inflammatory response does not pro-duce tissue damage, it induces a negative behavioral change. Circulating proinflammatory cells also exercise their action on the brain indirectly through neuronal pathways, for example, activating a vagal response.1 The endogenous microorganisms constituting the intestinal microbiome may influence the behavior of their animal hosts through a similar action. The microbiota is capable of modulating the stress response via the HPA-axis, or directly through vagal neuronal stimulation, cytokine action, or modulation of metabolites with an inhibitory or excitatory action on the brain.2,3,4,5 An increasing body of evidence about the direct influence of the gut microbiome on behavior is being produced. In humans, butyrate-producing Faecalibacterium and Coprococcus bacteria were consistently associated with higher quality of life indicators in a study. Dialister and Coprococcus spp. bacteria are depleted in people with depression,3 while-aminobutyric acid-modulating bacteria have a protective role against depression.3,4 GABA-modulating Bacteriodies bacteria are elevated in the gut microbiome of non-aggressive dogs, while Lacotobacillus bacteria were more abundant in aggressive dogs.5 Chronic gastrointestinal conditions that alter the microbiota might therefore influence the behavior of an individual, beyond the changes associated with discomfort and nutritional compromise.

The link between the skin microbiome and the inflammatory and immune response has been documented,6,7 and chronic stress may play a role in the pathogenesis of dermatologic disease. However, the direct influence of the skin microbiome on behavior has not yet been determined.

In clinics, inflammation of both the gastrointestinal tract and the skin has been associated with abnormal repetitive behaviors. Inflammatory diseases of the gastrointestinal tract (eosinophilic and/or lymphoplasmacytic infiltration, irritable bowel syndrome, chronic pancreatitis, gastric foreign body, giardiasis) have been diagnosed in 74% of dogs presented for excessive licking.8 Inflammatory skin conditions (atopy, adverse food reactions, parasitic hypersensitivity) were detected in 90% of cats presented for self-induced alopecia.9 A protective action of probiotics and antioxidants has been suggested. Supplementing the diet of anxious dogs with Bifidobacterium longum BL999 resulted in a reduction of stress-related behaviors jumping, spinning, pacing, and barking, as well as in an increase of exploratory behavior. In addition, salivary cortisol decreased and heart rate variability increased in dogs that received BL999.10

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SWIM CATS: A MULTI-MODAL APPROACH TO FELINE MOBILITY, WEIGHT LOSS, AND PAIN MANAGEMENT

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There is no question that the most common health problems associated with captive reptiles are diet related. These can be from nutritional deficiencies, such as is so commonly seen in the Green Iguana, excessive calorie consumption, as in overweight animals, or the most common problem, anorexia, or a lack of appetite. There are numerous causes for a reptile to lose its appetite. These underlying causes must be identified and corrected before the problem will be resolved.

When an animal is «off-food» there has to be a reason for it. It may be psychological, or it may be medical. Although this may seem elementary to most readers, it bears mentioning. It is essential that the veterinarian understands the natural history and biology of the particular type of reptile that they are treating. If they do not know, they must have a ready reference source. If one is not available, then, ethically, they should refer it to someone that has the proper training.
In order to more easily arrive at a proper diagnosis, a brief discussion of the normal feeding response is in order.

An animal normally eats to satiety. The cessation of the feeding response prior to the satisfaction of caloric needs is termed anorexia. Clinically, this is referred to as an «absence of hunger.»
The body is naturally, continuously in a state of hunger. Eating is the process that satisfies or controls that hunger state. The hunger and satiety centers are located in the brain.

Stimulation of the lateral hypothalamus initiates the feeling of hunger. Activation of the ventromedial hypothalamus results in satiety. Several neuroendocrine and metabolic factors affect these feeding control centers. Of clinical importance, the senses of taste and smell play major roles in the triggering of these responses.

There are several factors that play a role in anorexia. The major task of the small mammal clinician when faced with an anorectic reptile is to determine whether the condition is caused by pathologic, physiologic or psychologic embarrassment.

There are many diseases that can disrupt the normal neurologic, endocrine or mechanical processes involved in the feeding response. A pure division into categories is not possible, as many diseases have components that overlap. In some situations, the cause is obvious (such as gross malocclusion in turtles), and in others, elusive (cancer cachexia).

Categorizing signs and laboratory data may help in assessing the problem. In general, anorexia may be classified as either primary or secondary with respect to disease. In addition, there is a third, more category, called pseudoanorexia, which is not directly related to suppression of the feeding centers in the brain.

Primary anorexia should be considered in any case where the inciting factor directly involves the feeding centers of the hypothalamus, or from psychological disorders that have a direct impact of neural control of the feeding response.

Any cranial injury or insult, such as trauma, cerebral hemorrhage, cerebral edema or hydrocephalus (acquired or congenital) may cause anorexia. In humans, severe headaches, such as migraines, may be directly responsible for appetite suppression. Diseases or pathology within the cranial vault, such as encephalitis/meningitis or neoplasia, can have a direct or indirect effect on the hypothalamus.

Any such condition, whether primary to the hypothalamus or merely affecting the hypothalamus, may also have other neurological manifestations in addition to anorexia. Thus, a thorough neurological examination, as part of a complete physical evaluation of the patient, is imperative.

Psychological disorders are more easily characterized in people, as our veterinary patients are less likely to articulate their emotional state. As a result, at the risk of anthropomorphizing, it is often necessary to attempt to interpret what the anorectic patient may be «feeling» in a given situation. For instance, although an owner may enjoy taking their pet reptile to the movies, the reptile may respond differently to the darkened, air conditioned interior of the theater, the bright flashing lights of the projector, the laud responses of the audience and the artificially buttered popcorn.

Anorexia nervosa, a disease common to young human females, has not been documented in animals. «Maladaptation Syndrome,» a condition common to recently captive animals, may have some psychological or physiological similarities, but, this is not a likely problem in the captive reptile.

Any external influence that incites stress or anxiety (identified as fear or depression in people), such as changes in the environment (temperature, caging, air exchanges, noise etc.) can result in anorexia. Two common psychological influences include the alteration of social structure within the animal›s environment (addition of a new animal to an established group) and the offering of a new food type.

Secondary anorexia includes diseases or influences from outside the brain and have a direct effect on the neuroendocrine control of hunger. Some conditions or diseases may produce signs associated with anorexia such as nausea and vomiting (although the latter is not seen in reptiles). It is believed that the stimuli associated with these conditions are similar and the controlling centers within the brain are most likely neuronally interconnected.

Abdominal pain is a common cause of anorexia in reptiles. Constipation may contribute.
Inflammatory conditions, such as coelomitis, hepatic, renal, pancreatic or visceral inflammation can all lead to anorexia by directly or indirectly stimulating the appetite centers.

Exogenously or endogenously produced toxins can affect the appetite by either directly affecting the feeding centers, or indirectly by affecting other areas of the body, such as the abdominal organs. Drugs and toxins can also affect the chemoreceptor trigger zone which produces nausea and anorexia, or can act directly on the hypothalamus.

Endogenously produced toxins, such as azotemia or hyperammonemia, as seen in renal or hepatic failure, respectively, have serious consequences on appetite. Hypercalcemia, by yet an unidentified factor, also leads to anorexia.

Neoplasia and cachexia are frequently associated together. However, oftentimes, the cachectic patient still has an appetite. Cancer patients may not always desire food, as the peptides and nucleotides associated with certain neoplastic diseases are known to cause anorexia. Neoplasia should be on the differential list for anorectic patients.

Miscellaneous causes of anorexia should include any systemic illness. Cardiac, pulmonary or pancreatic disease (eg. diabetes - although not well documented in reptiles) can be contributing factors.
Lastly, pseudoanorexia, which is a physical inability to eat, rather than the lack of desire to eat, must always be considered with the clinically anorectic patient. Dental disease, or malocclusion as seen in many turtles, is a frequent contributing factor in reptiles.

A thorough physical examination is warranted for every case, including cases with apparent obvious explanations for the anorexia. In addition, a proper cranial nerve examination must be conducted. An open mouth oral examination (using sedation as needed) must be performed.

Equally important as a the physical findings is the collection of a thorough history. Discern if there have been any changes to the animal›s environment, including caging, food, conspecifics, ambient temperatures etc.

Radiographs, laboratory analysis (including complete blood counts, serum chemistry analysis and urinalysis) should be a part of every minimum data base.
Anorexia and food deprivation has serious consequences on a patient, especially to those that are convalescing.

Tissues such as the brain, the red blood cells, renal medullary cells and neural tissue has an obligate glucose requirement. To maintain blood glucose, body protein is rapidly affected. The ramifications of food deprivation are far beyond the scope of this discussion, but it is obvious that it will have serious consequences.

Anorectic reptiles need to be supported with appropriate diets. Appropriate gruels can be administered via syringe feeding, and when necessary, nasogastric tubes. Attention must be given to the animal›s fluid balance and other medical needs, such as the administration of antimicrobials and analgesics, as required.

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PRACTICAL OVERVIEW OF FELINE MYCOBACTERIAL DISEASE

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What are Mycobacteria?

Mycobacterial infections are a global health problem in animals and humans with geographical variation worldwide. They are intracellular acid-fast aerobic bacilliform bacteria (AFB), usually slow-growing, organisms that can be resistant in the environment. Those of feline importance1,2belong to the following groups:
Tuberculosis (TB) complex – these form tubercles seen on pathology

Non-tuberculous mycobacteria (NTM) including feline leprosy (FL) organisms

1. Tuberculosis (TB) Complex
These result in tuberculosis (TB), forming tubercles, and comprise three species, all of which are obligate pathogens and slow-growing: M. tuberculosis, M. bovis & M. microti. Cats are primarily affected by M. bovis and M. microti with M. tuberculosis cases very rare as cats are naturally resistant to infection.

Epidemiology

M. bovis and M. microti are thought to be most commonly acquired via bites from infected rodents (voles/mice), but M. bovis can also be acquired via ingestion of unpasteurised milk or infected meat (ingestion of infected carcasses may be a reason M. bovis infection hunting dogs3,4) and via direct or indirect contact with badgers. Recently a short report5 has described suspected6 M. bovis infection in 3 young (< 2 years old) indoor only pedigree cats in England that were fed a commercial raw diet, inferring that this could have been involved in transmission. Indirect contact/environmental transmission is possible as M. bovis and M. microti can survive for several months in organic material (e.g. faeces, carcasses) although they generally survive poorly outside mammalian hosts (4 days in summer, up to 28 days in the winter). Despite M. bovis being zoonotic and infecting humans7, cat-to-human transmission is of very low risk and very rarely reported8. M. microti is less of a zoonotic concern than M. bovis and cat-to-human transmission has never been reported9.

TB is primarily seen in adult male cats with outdoor access (likely due to hunting and fighting). M. bovis tends to affect younger cats (median age 3 years) than M. microti (median age 8 years). No evidence of immunosuppression is present in most cats with TB.

Clinical signs

Cats usually present with cutaneous signs: nodules (± ulceration) or non-healing draining wounds, primarily on the head, extremities or tail base, possible sites of rodent bites. Regional or generalised lymphadenopathy is common. Systemic pulmonary involvement occurs quite frequently, although outward signs of respiratory disease (coughing, tachypneoa/dyspneoa) may not be present. Pulmonary involvement is usually via haematogenous spread of infection c.f. inhalation. Weight loss and anorexia may occur with systemic disease. Bone involvement can result in lameness and/or pain. Recently joint involvement has been reported in 4 cats (2 with M. bovis and 2 with M. microti)10. Occasionally ocular uveitis is seen. Systemic involvement is more common with M. bovis than M. microti.

2. Non-tuberculous mycobacteria (NTM), INCLUDING FELINE LEPROSY (FL)

These are opportunistic environmental bacteria (in the soil, water and decaying plants), comprising many species. Some are slow-growing (> 7 days to grow in culture) e.g. M. genavese whilst others are fast-growing (≤ 7 days to grow in culture) e.g. M. fortuitum. Mycobacterium avium (a member of the Mycobacterium avium-intracellulare complex [MAC]) is also a slow-growing NTM; MAC infections are important as they can be zoonotic. FL was assumed to be due to only M. lepraemurium11 but other species are now known to be involved e.g. Mycobacterium visibile, and others more recently12,13. FL organisms are also opportunistic environmental and are usually unculturable14 – FL organisms are also NTM organisms as they do not form tubercles 15.

Epidemiology

Infection usually occurs following soil contamination of wounds, especially when adipose tissue becomes infected. MAC transmission may be possible via ingestion of infected meat or via contact with bird faeces. Infection with FL organisms occurs following rodent bites or soil contamination of wounds. Of the NTM, only M. avium can be zoonotic (immunosuppressed people) but there are no records of cat-human transmission of NTM. Outdoor cats, and those that are obese, are at increased risk of infection of non-FL NTM infections. Occasionally infection is associated with immunosuppression (e.g. retroviruses, toxoplasmosis). Siamese, Abyssinians and Somalis are at increased risk of disseminated MAC infection. Adult male cats with outdoor access are most at risk of FL.

Clinical signs

NTM infections usually present as cutaneous/subcutaneous nodules ± ulceration (which resembles localised TB) and/or granulomatous panniculitis (multiple punctate draining tracts; 'pepper pot' appearance) which can progress to involve significant areas of painful, ulcerated and non-healing tissue (inguinal fat pads, flanks and/or tail base). Systemic signs are uncommon other than with M. avium infection, which tends to be particularly pathogenic, causing cutaneous skins in association with lymphadenopathy and other systemic (e.g. neurological16, pulmonary) signs. Cats with FL NTM have nodular cutaneous signs; typically alopecic or ulcerated non-painful nodules that are mobile on palpation on the head or limbs. Regional lymphadenopathy may occur.

Approach to Diagnosis

Most cats affected by mycobacterial disease are outdoor cats, often with a history of hunting or fighting, from a non-urban area, although a recent report suspected M. bovis infection in three indoor only cats5, possibly via ingestion of raw food. The clinical presentation is similar with all mycobacterial species; cutaneous lesions (especially around the 'fight and bite' sites: face/legs, areas bitten when playing with prey), which may be multiple due to local or haematogenous spread. Local or generalised lymphadenopathy (often submandibular and/or prescapular) is common. Systemic signs, typically involving the lungs, are far less common than cutaneous signs, but may occur with M. bovis or M. avium (and occasionally M. microti). Systemic signs include generalised lymphadenopathy, splenomegaly, hepatomegaly, renal abnormalities, ocular signs and bone lesions. Pyrexia is not a consistent feature. Abdominal lymphadenopathy was r the primary sign in the indoor only cats reported with suspected M. bovis infection5.

An anaemia of inflammatory disease may occur. Hypercalcaemia can occur with extensive disease or severe panniculitis. Testing for retroviruses may be indicated for NTM cases.

Imaging is useful. Thoracic radiography may show pulmonary involvement and/or osteolytic/proliferative changes with overlying soft tissue changes. Abdominal radiographic changes are less common but include hepatomegaly and/or splenomegaly. Ultrasonography may show abdominal lymphadenopathy, hepatomegaly, splenomegaly or renal changes, and may provide a window for sampling tissues for diagnostic purposes. Computed tomography (CT) abnormalities17 are primarily pulmonary but abdominal or peripheral lymphadenopathy, osteolytic/proliferative lesions and cutaneous/subcutaneous soft tissues masses and nodules are reported. Mild lymphadenopathy was more appreciated in post-contrast CT studies, so use of contrast should be considered.

Feline interferon-gamma (IFN-) release assay blood testing shows promise for the ante-mortem diagnosis of TB. The test 18 measures the T-cell response (IFN-production) in peripheral blood mononuclear cells to three different antigens; the pattern of any positive results is said to identify whether the cat is infected with a pathogenic or less pathogenic TB complex species or whether it has been exposed to environmental NTM species. It is useful to determine whether M. bovis and M. microti infection is most likely to determine the zoonotic risk to guide treatment in suspected cases. The test may also be useful for monitoring treatment15.
Mycobacterial organisms may be visible following Ziehl-Neelsen (ZN) staining for AFB in fine needle aspirates or biopsies collected from affected tissues (e.g. lymph nodes, skin, liver) or bronchoalveolar lavage (BAL) or draining wound/cutaneous lesion samples. Cytology and histopathology from affected cases reveals pyogranulomatous/granulomatous inflammation ± AFB in macrophages. If no AFB are present, but cytology or pathology changes are consistent with mycobacterial infection, mycobacterial disease should remain a differential diagnosis and culture should be performed. Whenever biopsies are taken from cats in which mycobacterial disease is suspected, some should be reserved out of formalin (wrap in sterile gauze moistened with sterile saline) and frozen at -20°C for mycobacterial culture and polymerase chain reaction (PCR) if required, pending other investigations. NB. Gloves and aseptic practice are required to handle the biopsy (and biopsy site) – zoonotic risk. Culture is required to confirm a diagnosis and is done in specialist laboratories but can take a long time (2-4 months) and is costly. Some species (e.g. FL NTM and some M. microti) are impossible to grow. Culture is performed on the same samples obtained for cytology or histopathology. PCR may allow diagnosis whilst awaiting culture or with unculturable organisms but is costly.

Treatment

It is important to discuss whether cases should be treated at all, especially cases of disseminated M. bovis infection due to zoonotic implications and worries around antimicrobial resistance developing in human TB cases as a result of antimicrobial use in feline cases. The current advice in the UK is that cats diagnosed with M tuberculosis and M bovis should be euthanased, but this can be hard to persuade owners to do. The cat should be kept indoors and the costs and compliance issues of treatment need to be carefully discussed with owners. It is recommended that specialist advice is sought before embarking on treatment. Additionally, owners should be advised to contact their doctor, informing them of the diagnosis in their pet cat so that screening can be arranged.

REFERENCES AVAILABLE ON REQUEST

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CANNABIS FOR PET PAIN

S. Cital

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Veterinary medicine has historically lagged behind human medicine since its inception. Veterinarians and veterinary technicians are cautious creatures that often have not only a human as the owner to deal with but a patient that cannot speak and tell you how treatment is or isn't working. We also see less uniformity in regulations and practice acts in veterinary medicine compared to our human counterparts. What veterinary medicine and human medicine do have in common is the lack of education on the topic of cannabis as a legitimate medical therapy in veterinary school. Yet, the bias persists. However, the use and demand for cannabis products in veterinary medicine is growing rapidly, mainly by pet owner demand. 2, 3 Unfortunately, it is growing faster than most practitioners can educate themselves on. Another confounding factor feeding a negative bias in veterinary medicine is the all too often THC toxicity in companion animals. Since the legalization of medical marijuana in the United States began the Animal Poison Control and Pet Poison Hotline has seen a 330% increase in THC toxicities. 4 There is no question to the risk and occurrence of THC toxicity in animals, yet it should be noted there are no reported deaths that can be definitively attributed to THC or other phytocannabinoids without other factoring chemicals also present in the system. The suspected lethal dose of THC in dogs is >9g/kg, a nearly impossible dose to achieve. The most common route of exposure to THC in companion animals is via ingestion. Approximately 66% of exposures involve pets ingesting homemade or commercial edible goods. The second most common source of cannabis exposures involves ingestion of plant material, followed by cannabis oils/tinctures. Symptoms of THC toxicity include lethargy, central nervous system depression, ataxia, vomiting, urinary incontinence/dribbling, increased sensitivity to motion or sound, dilated pupils, hypersalivation, and bradycardia. Less common symptoms include aggression, agitation, low blood pressure, low respiratory rates, elevated heart rates, and nystagmus (continuous abnormal movements of the eyes).

There are some fundamental distinctions one must make on the topic of medical cannabis, and even specific terminology used when approaching medical cannabis as a valid medical therapy. The first distinction is between a "marijuana" plant versus a "hemp" plant. The hemp plant has much lower levels of THC (less than 0.3% by dry weight) and has found favor among veterinary professionals since there is a reduced risk of THC toxicity. 7 This distinction is particularly important for recommendations made by veterinary professionals.

At the time this article was written there are no states that allow for medical marijuana prescriptions with many states also denying veterinarians the ability to even "recommend" an over the counter hemp-based product. California was the first state to pass legislation at the end of 2018 with AB2215 that allows veterinarians to discuss cannabis as a therapeutic option. The legislation still prohibits veterinarians from prescribing, dispensing or recommending marijuana or hemp products to animals.

To date, we have an ever-growing list of relevant studies for practical use of cannabis in companion animals. Most notably we now have the results from two studies, one conducted at Colorado State University (CSU) and one from Cornell University to help shed light on effective and safe dosing of CBD dominant cannabis products in dogs. In the Colorado State University study, conducted by Dr. Stephanie McGrath we see dogs give three different dosing strategies. A group of 30 healthy beagle dogs was randomly assigned to receive a cannabidiol dominant product in the form of a capsule, oil, and CBD transdermal cream at a dose of 10 mg/kg/day or 20 mg/ kg/day for 6 weeks. In the study, the dogs had complete blood counts, chemistry panels, urinalysis, and bile acids were performed at 0, 2, 4, and 6 weeks. The most notable effect was elevations in serum alkaline phosphatase (ALP) occurred in some dogs. All of the dogs in the study also experienced diarrhea, while the dogs that received the transdermal formula had reddened skin after application that was not of clinical concern. Because the products used in the study were plant-based the variability between batches were measured. Variability was <10% for the CBD-infused transdermal cream and CBD-infused oil. There was considerable variation, 28-31% between the CBD concentration in the capsules and the amount stated on the label. Higher systemic exposures were observed with the oral CBD-infused oil formulation, and the half-life after a 75mg and 150mg dose was 199.7 +/- 55.9 and 127.5 +/- 32.2 min. Exposure was dose-proportional, and the oral CBD-infused oil provides the most favorable pharmacokinetic profile. While the study mentions the diarrhea was not related to the formula, it should be noted that this assertion cannot be made with certainty. The study concluded that this particular CBD dominant product, with no terpenes, appeared to be well tolerated in dogs. 9

Also, at CSU are two continuing studies. One on osteoarthritis (OA), the other on canine epilepsy. The OA study at CSU is using a 5mg/kg daily dose for six weeks. The manuscript is currently under review. In the pilot epilepsy study utilizing a hemp-based product, preliminary results show 8 out of 9 dogs had a reduction in the frequency of seizures at 5mg/kg once a day. A long-term study over 3 years will follow this study. A similar study is also being conducted at the University of Florida. 10

In a canine study conducted at Cornell University under the direction of Dr. Joseph Wakshlag we see similar, yet more favorable results with no diarrhea, utilizing a product made by ElleVet Sciences. A single dose pharmacokinetic study was performed using two different doses of CBD enriched oil. The initial investigation into single-dose oral pharmacokinetics was performed with 4 beagles. Each dog received a 2 mg/kg and an 8 mg/kg oral dosage of CBD oil. The dogs were fed 2 hours after dosing. Blood was collected at 0, 0.5, 1, 2, 4, 8, 12, and 24 hours after oil administration. Pharmacokinetics demonstrated that CBD half-life of elimination median was 4.2 hours for the 2 mg/kg dose 8mg/kg dose. These results led to dosing during the clinical trial at 2 mg/kg body weight every 12 hours.
For the clinical efficacy study which assessed the use for dogs with radiographically confirmed osteoarthritis (OA) was a randomized placebo-controlled, veterinarian, and owner blinded, cross-over study. Dogs received CBD oil (2 mg/kg) or placebo oil every 12 hours. Hematology, serum chemistry, and physical examinations were performed on every visit. A canine brief pain inventory and Hudson activity scores showed a significant decrease in pain and an increase in activity with CBD oil. Veterinary assessment showed decreased pain during CBD treatment. Owners reported no adverse side effects; however, serum chemistry showed an increase in alkaline phosphatase (ALP) similarly to the CSU study during CBD treatment which normalized over time. Conclusions of the clinical study suggest that 2 mg/kg of ElleVet Sciences CBD product twice daily can help increase comfort and activity in dogs with OA. It should also be noted that some dogs in the study were also on traditional non-steroidal anti-inflammatory drugs with no adverse effects. 11

Data has shown in both studies that the other non-psychotropic cannabinoids, primarily CBD, has a wide safety margin with only minimal side effects. In both studies conducted the elevated ALP was notable. Interestingly, the increase in liver values was not associated with any other elevated liver values (GGT, Bile Acids or ALT) and maybe a response to cannabinoid metabolism through the CYP450 pathway. 12, 13

Animal models of CBD utility for anxiety or panic attacks are supported by studies placing a prey species in front of a predator species and conditioned escape responses in mice and rats. According to these studies, anxiety or panic attacks would be related to the flight and freezing defensive responses elicited by threats which expression was decreased in both models. 14 Canopy Growth has announced the completion of their anxiety study in companion animals that are currently awaiting publication. The author is aware of other anxiety-related research being conducted in cats and birds with hopeful publication in the next year.

Aside from pharmacokinetic, pain, seizure and anxiety studies, we have seen scientific articles looking at cannabinoid receptor proliferation in feline and canine epidermal tissues suggesting the efficacy of topical and systemic applications for atopic dermatitis in dogs and hypersensitivity dermatitis in cats. 19 & 20

Just like in human medical cannabis circles the veterinary side of things will continue to evolve, looking for specific cannabinoid and terpene profiles for various ailments or ECS support. As scientists, consumers and animal lovers we must pressure cannabis manufacturers to produce products following good manufacturing guidelines, use safe ingredients for animals and be transparent with what is in their products. To that end, manufacturers should suggest dosing regiments based on science instead of anecdotes. Lastly, we must encourage the veterinary profession to educate themselves on this topic.

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DRUGS AND DERM – UNDERSTANDING THE DRUGS WE REACH FOR AND WHY

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Itching is the most common pet owner complaint in dermatology. Itch can look like licking, biting, nibbling, rubbing, and of course the good old scratch using a hind leg. Intensity can range from very mild to self mutilation. There are three types of pruritus: psychogenic (altered brain chemistry), inflammatory (seen with atopic dermatitis, infectious etiologies and ectoparasited) and neurogenic (seen with adverse cutaneous food reactions).

Psychogenic itching is usually be discerned by taking a thorough history. This is a type of chemical addiction (licking will release endorphins in the brain, but prolonged licking will damage the skin in the area, causing inflammation and often secondary infection, which will further increase pruritus, inciting more licking, which becomes a vicious cycle of needing to lick to feel better) Treatment options can include stress-reducing pheromones, and “Happy pills” like fluoxetine, clomipramine and amitriptyline to help regulate serotonin levels. Clomipramine and amitriptyline also have antihistaminic properties, and help with neuropathic pain, which can be very helpful when treating a patient that also has inflammatory or neurogenic pruritus. Some cases may even need mu-opioid receptor antagonists, like gabapentin.

Inflammatory itching is evoked directly by mechanical and thermal stimuli, and indirectly through chemical mediators, like histamine released from mast cells, neurotransmitters, and cytokines. This is the most common presentation of environmental allergies. The process of inflammation is a very complicated cascade, which involves the release of multiple chemical messengers (cytokines). These include interleukins: IL-2, IL-4, IL-5, IL-6, IL-10, IL-12, IL-13, IL-21, IL-22, IL-23, IL-31, IL-35.

Treatment for inflammatory itching includes anti-inflammatory medications like corticosteroids, antihistamines and cyclosporine. All of these treatments block, or decrease, different chemical interactions to suppress or prevent inflammation.
Let’s take a closer look at the inflammatory cascade:
it starts with tissue injury (from scratching for instance) this causes the release of phospholipids

Phospholipids react outside of cells with phospholipase to become arachidonic acid
This is further processed into prostaglandins, which cause inflammation by recruiting white blood cells, sensitizing skin pain receptors, and stimulating hypothalamic fever response

Corticosteroids inhibit phospholipase which in turn prevents the cascade that results in inflammation.

Antihistamines work by stabilizing the cell walls of mast cells, so that they are not able to degranulate.
When triggered by cytokines, mast cells will expel histamine granules, along with more cytokines, granulocyte macrophage colony-stimulating factor (GM-CSF), leukotrienes, heparin, many proteases, and metabolites of arachidonic acid, into the environment.
These act on vasculature, smooth muscle, connective tissue, mucous gland and inflammatory cells, causeing inflammation and fluid release as part of an allergic reaction

Cyclosporine is an immunosuppressant that works by tricking the immune system into not paying attention T cells, based on information received from other cells in the body, decide what type of a reaction to have when presented with an antigen

Cyclosporine is a calcineurin inhibitor, which stops information being transferred in the T cell, which would direct the T cell to start an allergic or inflammatory cascade. IIf the message doesn’t get through, then there is no adverse response

Neurogenic pruritus also results from a complicated cascade of chemical releases, including several of the interleukins (IL-2, -4, -6, -13 and -31) and neurotransmitters, called Janus kinase (JAK-1 and JAK-3). IL-31 is directly involved in the sensation of itch. JAK signaling occurs when a cytokine binds to a receptor on the surface of a cell. Oclacitinib works as a JAK inhibitor to prevent the “chemical messenger” from telling the nerves, to tell the brain that the body is itchy. JAK signaling is also an important messenger involved in other processes in the body, including bone marrow production.

Lokivetmab is another treatment option used for neurogenic itching. Lokivetmab is a monoclonal antibody which specifically targets the cytokine IL-31. If IL-31 is bound to an antibody, it is not able to deliver it’s “message,” which stops cascade leading to itch.

In allergic patients we often see a combination of the different types of pruritus, which can make things complicated and is why a multimodal approach is necessary to achieve success.

Pruritus can be caused by many things, including parasites, infections and allergies, so a diagnosis of allergy is a diagnosis of the exclusion of all other possible causes for itching. Namely ectoparasites and secondary infections.
.
By definition, an allergy is a "hypersensitive immune reaction to a substance that normally is harmless and would not cause an immune response"(1).
The most common hypersensitivities seen in private practice are: flea allergy dermatitis, food allergies and environmental allergies (atopic dermatitis). For food allergies, restricted diet trials are necessary with long term dietary management. For environmental allergies, allergy testing and subsequent treatment with immunotherapy offers excellent long term management for many animals, but management of symptoms will need to addressed medically while working through induction. Immunotherapy can take up to 12 months before seeing a patient's maximum response.
Treating most dermatology patients requires multimodal therapies. This is often a combination of systemic as well as topical treatments.

When working topically, we can help the prevention of antibiotic resistance, as well as work to improve the integrity of the skin barrier.
There is a vast array of topicals on the market today, all having a place in treatment protocols.
When treating dermatology patients our goals are to make our patient more comfortable by addressing pruritus, inflammation and secondary infections. We also work to improve the integrity of the skin barrier so that our patient's comfort is continued, and the chance of recurrent secondary infections is decreased.

Topicals

Topical therapy can be a very beneficial adjunctive treatment
Clients need to know the rationale for the treatment and what to expect. It is important that clients understand this part of the treatment protocol and not an "extra" thing to do. Client education equals owner compliance.
Make certain this is something the owner can actually do (consider a spray or mousse if bathing is not feasible)
Because of the plethora of shampoos now available, it is important to understand their ingredients, concentrations and actions.
Consider spot treatment for focal problems
Consider ear medications for focal lesions – most are combos for bacteria, fungus and inflammation
Contact time, Frequency and Technique are paramount for success

The aim of topical therapy is to promote a return to the "normal" microclimate of the skin surface. Products should be selected with the specific purpose in mind: cleansing, antiseborrheic, antimicrobial or antipruritic action. Product selection – depends on knowledge of the product attributes, product vehicle, response time as well as any risks or side effects.

Contact time – a contact time of 5-10 minutes is required to rehydrate the epidermis, 10-15 minutes contact time is preferable to allow penetration and achieve a treatment effect. Cool water will rehydrate, while warm water will dehydrate.

Frequency – during induction phase this would be every 2-3 days. Maintenance may be moved to once a week, depending on the individual.

Technique – owner compliance can be improved if clients are shown to how to bathe their pet using either handouts, videos, or by demonstration. Heavy-coated dogs may need to be clipped to allow the product to reach the skin surface. A shorter coat can significantly decrease the amount of shampoo used. Using a primer shampoo to remove initial dirt or grease, will allow a second stage bath with medicated shampoo to more easily reach the skin. Thorough rinsing is important as some products may have an irritant effect if left on the skin. A moisturizing rinse or humectant spray might be needed. Water temperature is also an important consideration, as stated above, warm water will dehydrate the skin and further irritate an already compromised skin barrier.
Ingredients: understand the ingredients to best select the appropriate product **Cheat sheets for veterinary shampoos and veterinary otic products currently available in Canada are available to members on the Canadian Academy of Veterinary Dermatology website: www.cavd.ca This is a great resource!

For Shampoo/Mousse/Spray Selection:

Shampoo Ingredient	Attribute	Indication
Sulfur	Keratoplastic	
	Keratolytic	
	Mildly antimicrobial	Seborrhea
	Mildly antiparasitic	Pyoderma
	Mildly antipruritic	
	Synergistic with salicylic acid	
Salicylic acid	Keratoplastic	
	Keratolytic	
	Mildly antimicrobial	Seborrhea
	Mildly antiparasitic	Pyoderma
	Mildly antipruritic	
	Synergistic with sulfur	
Benzoyl peroxide	Antimicrobial	
	Follicular flushing	
	Keratolytic	Seborrhea
	Mildly antipruritic	Pyoderma
	May stain fabric	Folliculitis (including demodicosis)
	May be irritating/ drying because of excellent degreasing properties	
Phytosphingosine	Antimitotic	Seborrhea
	Anti-inflammatory	Pyoderma
	Antimicrobial	Pruritus
	Increases ceramide production	Erythema
Chlorhexidine	Antibacterial	Pyoderma
	Mildly antifungal	Mild fungal infection
Miconazole	Antifungal	Fungal/Yeast
Boric acid	Antibacterial	
	Keratolytic	Seborrhea
	Keratoplastic	Pyoderma
Acetic acid	Antifungal	
	Keratolytic	Seborrhea
	Keratoplastic	Pyoderma
Colloidal oatmeal	Antipruritic	
	Anti-inflammatory	Pruritus
	Moisturizing	Erythema
Hydrocortisone (*aceponate has no systemic absorption)	Anti-inflammatory Anti-pruritic	Erythema Pruritus

Ear Medication Selection for Topical Use on Skin Ear Medication Selection for Topical Use on Skin:

Findings on Cytology	Therapeutic choices	Therapeutic choices cont'd
Yeast (Malassezia)	Miconazole	Nystatin
	Clotrimazole	Silver sufadiazine
	Terbinafine	
Cocci	Gentamicin	Nystatin
	Neomycin	Silver sufadiazine
	Dethanolamine fusidate (fusidic acid)	
	Marbofloxacin	
Rods	Gentamicin	Marbofloxacin
	Neomycin	Enrofloxacin
	Polymyxin B	Silver sulfadiazine
	Framycetin	
Inflammation	Mometasone **minimal systemic absorption	Dexamethasone
	Hydrocortisone	Prednisolone
	Betamethasone	

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1. National Library of Medicine (online April 2018) from https://www.ncbi.nlm.nih.gov/pubmedhealth/PMHT0030652

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THE SECRET TO BONDING MILLENIALS TO YOUR PRACTICE

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The Issues

It's no wonder that millennials struggle with in-person communication. Most millennials were raised with a smartphone accessory compared to other generations whose primary communication involved landline telephones and drop-in visits. One of the most exciting times in technology was email and AOL's popular "You've got mail!". Mention this to a millennial and it is likely they will have no idea what you are talking about. For these reasons, just the thought of a sit-down in-person conversation will inspire an anxiety attack in any millennial. It is important to recognize this when considering common veterinary-client conversations such as a sick pet or end of life decisions. Allowing a millennial alternatives such as texting after the visit can enable them to communicate in an easier and more comfortable way.

Millennials often struggle with top-down orders. Growing up in a digital age with access to as much information as needed results in the ability to investigate problems and discover options rather than just accepting what is stated as "fact" to actually be fact. Traditional top-down style management such as "This is how we have always done it." will frustrate a millennial. Instead, explain the goal of the task and current operating procedures, then invite them to suggest alternatives if they see opportunities for improvement. This will result in an employee that feels inspired and mission-focused.

As a pet owner, millennials have the same desires for their pet as any other client but the way they differ is in their perception of value. Traditional communication methods will likely result in a decreased perception of value with millennials as they have a completely different language that centers around digital interactions. Therefore standard practices may send the wrong message to a millennial. Here are a few examples:

- The standard operating procedure: You send a postcard to remind them of when their pet is due for services.
- Millennial impression: You are very old school and don't have the latest equipment to provide top level care to their pet. Plus they may not even have a mail box.
- The solution: Push notification or text reminders delivered to their smartphone.
- The standard operating procedure: You call with a post op update to let them know their pet is ready for pick up
- Millennial impression: You didn't care enough to give an update earlier. They've been worried all day. And since most millennials don't answer their phone, it is likely they won't receive your message in a timely fashion.
- The solution: Frequent digital updates with pictures via push notifications or text.
- The standard operating procedure: Delivering great care is all you need to get client engagement and referrals.
- Millennial impression: You don't appreciate loyal customers like other businesses they frequent with reward programs.
- The solution: Offer a reward program to reward top performing clients

The Solution

The secret to bonding millennials is to create an emotional connection that will strengthen the bond to your practice. The key elements are:
Get personal. A little effort goes a long way with a millennial. By focusing on ways to recognize and celebrate the uniqueness of them or their pet will result in massive loyalty. And don't be scared because a little effort will go a long way since most businesses fail on this point miserably.

Send a "Get well soon" or "Nice to meet you" box.
This is a very simple and massively effective way to create a strong bond with your millennial client. Send a toy or bone in the mail to the client with a handwritten note to the pet.

"Dear Fluffy, I hope you feel better soon. Make good choices. Love, Aunt Stacee"
Send a Bonjoro video-gram.

Bonjoro was named one of the best apps of 2017 and allows cloud based transmission of video-grams via email. The innovation is that the video is stored in the cloud so there is no upload/download time which allows videos to easily be shared. One of many ways to use this in practice is to send a Bonjoro after a new client visit.

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"Hi Mary! It was so nice to meet you and Fluffy today. Please know we are only a phone call away if you ever need anything for Fluffy. Thank you for choosing our hospital. We look forward to seeing you again.»

Selfies

Ask your client to share a selfie of their pet with you! If you have a mobile app, clients can share their selfie through the app then all the selfies of the practice can be seen in the app and even projected to a monitor in the lobby or exam room. This is one way to show the love and celebrate the human-animal bond.

Allow clients to do business without having to call

In the last few years technology has evolved so rapidly that many people now prefer to do business without having to talk on the phone. This allows them to knock off items on their to-do list while in a meeting, in a loud environment or even after hours when the business is closed. Here are a few things veterinarians should allow clients to do without having to call:

Request or book an appointment.

Widgets can be installed on our website to allow clients to enter their name, pet name and type of appointment they would like to request. The most simplest version of this results in an email to the practice containing the details of the client's request. Unfortunately more steps will be needed to firm up the appointment date and time so consider direct appointment booking.

Direct appointment booking, currently offered by Rapport for Henry Schein practice management systems and Vetstoria for Cornerstone systems, allows the client to see the real-time appointment availability and secure their date and time. These systems allow the veterinarian to customize what dates and times are visible to the public which will allow blocks for urgent care appointments.

It is now common and affordable to have a mobile app for your practice. After a client downloads your app, they will be able to request or book an appointment (depending on the practice's preference) directly from the app which keeps all the communications in one place.

Prescription and food refills

One of the most powerful features of having a mobile app for your practice is allowing clients to use the camera of their smartphone device to snap a picture of their product to trigger a refill request. Clients can place orders easily from their phone for same day or next day pickup. On the practice side, orders can be processed in bundles without interruption resulting in higher efficiency and less prescription errors.

Take it to the next level by allowing clients to securely store their credit card on file in your practice management system, or use a third party like Gravity Payments, to create a "grab and go" experience.

Engage millennials with a loyalty program

Millennials love, love, love loyalty programs and incentives to shop certain brands over others. 80% of millennials participate in loyalty programs and are more likely than other generations to remain loyal to a brand because of loyalty rewards. When millennials spend money, they prefer to spend money with brands that reward them for their choice. Loyalty programs are gaining traction in veterinary medicine in the last few years as practices are seeing increased visits and increased ATC with clients that are earning rewards. In 2017, the first report for loyalty programs in veterinary practice was issued by Vet2Pet solidifying the ROI of a well-crafted program. Read the study here <https://vet2pet.com/annual-loyalty-program-report>

In the end, millennials aren't really that different from other generations with their expectations of pet care. Perhaps all that is really happening is that they are challenging veterinary practices (and nearly every other business) to raise their game and join the modern world to deliver more of a client experience than a service.

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WHAT YOU CAN CATCH AT WORK: ZOONOSES FROM THE DVM AND MD PERSPECTIVES

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Zoonotic diseases are defined as being common to, shared by, or naturally transmitted between humans and other vertebrate animals. Humans are infected with zoonotic agents from direct contact with the infected pet, contact via contaminated food or water, from shared vectors, and from the shared environment. Direct contact with animal feces (enteric zoonoses), respiratory secretions, urogenital secretions, or infected skin and exudates, as well as bites and scratches can result in human infections. Some zoonotic agents are transmitted between animals and man by shared vectors like fleas, ticks, or mosquitoes. Rickettsia rickettsii (ticks), Ehrlichia spp. (ticks), Borrelia burgdorferi (ticks), Rickettsia felis (fleas), Bartonella spp. (fleas, ticks), Anaplasma phagocytophilum (ticks), Dirofilaria immitis (mosquitoes), Dipylidium caninum (mosquitoes), and West Nile virus (mosquitoes) are examples of vector borne zoonoses. The pet brings the vector of the organism into the environment resulting in exposure of the human.

Bartonella spp. are notable examples as some species like B. henselae survive in flea feces for days. Flea and tick control should always be maintained on our client's animals and infested animals that are seen in the clinic should be treated immediately. Use of flea control products have been shown to block transmission of B. henselae amongst research cats and so theoretically could lessen transmission to humans. Neurobartonellosis (headaches, blurred vision) in veterinary health care providers is now recognized as an important zoonotic disease syndrome related to Bartonella spp. in flea frass.

Some zoonotic agents including Sporthrix schenkii, Histoplasma capsulatum, Coccidioides immitis, Blastomyces dermatitidis, Cryptococcus neoformans, and Aspergillus spp do not usually infect humans from direct with the infected pet but are acquired from the same environmental source.

Most of the agents discussed in this lecture can infect and cause disease in anyone, but disease is generally more prevalent or more severe in those that are immunodeficient. Humans with AIDS are discussed most frequently, but there are many more immunodeficient individuals including the very old, the very young, and those receiving chemotherapy for immune-mediated diseases, organ transplantation, or neoplasia. Humans are unlikely to contract zoonotic diseases from contact with their pets and so in most cases do not need to relinquish their animals.

The Centers for Disease Control of the United States online site, Healthy pets Healthy People (http://www.cdc.gov/healthypets/index.html) is a great resource for veterinarians and owners. The American Association of Feline Practictioner's Zoonoses Guidelines states 'All human or animal care providers should provide accurate information to pet owners concerning the risks and benefits of pet ownership so that an informed decision about acquiring and keeping pets can be made' (www.catvets.com/uploads/PDF/ZooFinal2003.pdf). The Companion Animal Parasite Council also provides great information to help with decision making about zoonotic parasitic diseases (www.capcvet.org; www.petsandparasites.org/). The WSAVA encourages veterinarians and physicians to work closely together to determine the risks associated with pet ownership for individuals and their families.

Enteric zoonoses. There are multiple infectious agents of the gastrointestinal tract that potentially can be shared between pets and humans. Since some enteric zoonotic agents are infectious when passed with feces (Campylobacter spp., Salmonella spp., Giardia spp., Cryptosporidium spp. and others), direct contact with infected animals can result in human infections. However, it is felt that most enteric zoonoses result from ingestion of the infectious agent in contaminated food, water, or other environmental sources. Giardia spp., Cryptosporidium spp., Toxocara spp., and Toxoplasma gondii are notable examples. Toxoplasma gondii, hookworms, and roundworms require a period outside the host prior to becoming infectious. While on the zoonoses list, Giardia and Cryptosporidium spp. of dogs and cats are rarely detected in people and human strains have not been associated with illness in pets. Prevalence rates for enteric zoonoses have been reported multiple studies of dogs and cats and generally are generally greater in those with diarrhea. These findings emphasize that diagnostic workups for enteric infections are indicated due to potential human health risks. The minimal diagnostic plan to assess for enteric zoonoses in pets with diarrhea includes a fecal flotation, Giardia spp., screening procedure, and fecal wet mount. Fecal culture should be considered if Salmonella spp. or Campylobacter spp. are on the list of differential diagnoses. In the United States, heartworm preventatives that control hookworms and roundworms are recommended year round (http://www.capcvet.org). Dogs and cats with normal stool are not considered human health risks. Bite, scratch, or exudate exposure zoonoses. Approximately 300,000 emergency room visits per year are made by people bitten by animals in the United States. Most of the aerobic and anaerobic bacteria associated with bite or scratch wounds only cause local infection in immunocompetent individuals.

However, 28% to 80% of cat bites become infected and severe sequelae including meningitis, endocarditis, septic arthritis, osteoarthritis, and septic shock can occur.

Immunodeficient humans or humans exposed to Pasteurella spp., Capnocytophaga canimorsus (DF-2), or Capnocytophaga cynodegmi more consistently develop systemic clinical illness. Splenectomized humans are at increased risk of developing bacteremia. Mycoplasma spp. and L-form bacteria infections of people has been associated secondary to dog or cat bites.Bartonella spp. Yersinia pestis, and Francisella tularensis infections of humans can be associated with bites and scratches but these agents are also vector-associated zoonoses. Of the many fungal agents that infect both humans and animals, only Sporothrix spp, and the dermatophytes have been shown to infect humans upon direct exposure. Histoplasma, Blastomyces, Coccidioides, Aspergillus, and Cryptococcus infections of humans and animals can occur in the same household, but infection of humans generally results from a common environmental exposure rather than by direct contact with an infected animal. Rabies is still the only significant small animal viral zoonosis in the United States. Psuedorabies is a herpesvirus that infects pigs; dogs and humans can develop self-limiting pruritic skin disease following exposure. Feline retroviruses are not zoonotic.

Respiratory and ocular zoonoses. Bordetella bronchiseptica and Chlamydla felis cause mild respiratory disease and C. felis has been associated with conjunctivitis in people. Most people with Bordetella infections are infected by B. pertussus but some immunocompromised people develop infection by B. bronchiseptica. Humans are the principal natural hosts for Streptococcus group A bacteria, S. pyogenes and S. pneumon¬iae, which cause “strep throat” in people. Dogs or cats in close contact with infected humans on rarely develop transient, subclinical colonization of pharyngeal tissues and so theoretically can transmit the infection to other humans. Yersinia pestis and F. tularensis can be transmitted from cats or dogs to people in respiratory secretions.

Genital and urinary tract zoonoses. Leptospira spp. (dogs more than cats), Brucella canis (dogs), and Coxiella burnetii (cats more than dogs) are the most common zoonotic agents in this group. Whether Leptospira spp. of cats are associated with illness in people has not been studied extensively.
Coxiella burnetii is a rickettsial agent found throughout the world, including North America. Many ticks, including Rhipicephalus sanguineus, are naturally infected with C. burnetii and so this agent is also a shared vector zoonoses. It most commonly is associated with respiratory disease in infected humans that come in contact by inhaling the organism which is shed in high numbers in some cats during parturition. Brucella canis (dogs) is not known to infect cats.

Table 1. General guidelines for veterinarians

- Vaccinate all dogs and cats in rabies endemic areas that have products available.
- Routinely administer drugs that kill hookworms and roundworms.
- Provide flea and tick control to pets year round.
- Teach pet owners how to avoid being bitten or scratched.
- Evaluate clinically ill animals for agents with zoonotic potential.
- Familiarize the veterinary staff about zoonotic issues.
- Provide pet owners information concerning public health aspects of zoonoses.
- Refer clinically ill pet owners to a physician for additional information and treatment.
- Volunteer to speak to the pet owner’s physician to clarify zoonotic issues when indicated.
- Document public health related advice in the medical record.
- Contact appropriate public health officials with reportable diseases.
- Make it clear that the veterinary staff understands conditions associated with immune deficiency, is discreet, and is willing to help; use of signs or posters can be effective for this purpose.

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TRAUMATIC BRAIN INJURY

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Patients with traumatic brain injury (TBI) must be appropriately assessed to determine the extent of their injuries, to localize the lesion and to determine prognosis. Crucial elements for evaluating the TBI patient are: level of consciousness, cranial nerve examination (particularly pupillary light response, and physiologic nystagmus), motor activity, and systemic signs.1

Modified Glasgow Coma Score (MGCS) - assesses neurological function in 3 categories (motor activity, brainstem reflexes, level of consciousness) and attributes a score 1-6 for each category with a maximum score of 18 (no neurologic dysfunction) to a minimum score of 3 (abysmal neurologic function). The MGCS has shown a strong association with survival in dogs up to 48 hours after hospital admission,2,3 and is a good tool for assessing, and trending, TBI patients.

Systemic signs

Cushing's reflex – defined as hypertension and bradycardia associated with markedly elevated ICP and impending brain herniation. In the face of elevated ICP and poor perfusion to the pons and medulla, massive sympathetic discharge causes marked elevation in blood pressure with ensuing baroreceptor mediated bradycardia.
Respiratory pattern – the respiratory centers are located within the brainstem. Markedly abnormal respiratory patterns suggest a brainstem lesion and carry a poorer prognosis.

TREATMENT

Normotension - Cerebral blood flow is critical for patient survival. The goal for the brain injured patient is to maintain systolic blood pressure at least ≥ 90-100 mmHg.4 Blood pressure should be supported with crystalloid, colloid or hypertonic saline. Low volume resuscitation is recommended, large volumes of crystalloid solutions should be avoided as fluid overload may exacerbate brain edema.1

Oxygenation - For patients with concurrent respiratory compromise, oxygen should be supplemented using the lowest fraction of inspired oxygen to achieve pulse oximetry (SpO2) of 94-98%.1 Hyperoxia (paO2 > 150 mmHg) should be avoided due to deleterious effects of excessive oxygen.1

Optimized venous drainage - Elevate the head – approximately 15-30° degree angle. Ensure that the jugulars are not kinked. Prevent coughing, sneezing, or vomiting. Provide smooth induction by premedicating the patient and using lidocaine spray on the larynx. Avoid nasal cannulas. Consider antiemetic therapy to prevent nausea.

Pain management - Opioids are the mainstay of therapy for TBI patients.5 These should be titrated to effect to decrease the risk of hypoventilation or nausea. Short acting opioids, i.e. injectable fentanyl, are preferred. Alternatively, buprenorphine or mu agonist opioids (morphine, hydromorphone) are administered in incremental doses to avoid unwanted side effects. Only once the patient is stabilized are NSAIDs considered. Gabapentin is an analgesic option recommended in human medicine.6

Glucose Control - Normoglycemia is optimal. Hyperglycemia should be avoided as it has been associated with worsening neurological outcome.1 Conversely, hypoglycemia should be fiercely avoided as hypoglycemia in the TBI patient will have deleterious cerebral metabolic effects.

Seizure Regulation - Patients presenting with TBI may exhibit seizures. Approximately 14% of TBI patients have early onset seizures within 24 hours of injury, or develop seizures within 1 week of injury.7 Seizures should be aggressively managed with diazepam bolus (0.5 mg/kg IV) followed by diazepam infusion (0.5-1.0 mg/kg/hr). Preferentially levetiracetam (20 mg/kg PO TID), or phenobarbitol (2-4 mg/kg q 12 hours) should be initiated for continued seizure management.1,7 TBI patients are predisposed to post traumatic epilepsy (PTE) generally noted within one year of injury.7The risk of PTE increases with TBI severity with an overall incidence of 6.6%, increasing to 14.3% in dogs with skull fractures.
Temperature regulation - Studies have failed to demonstrate improved outcome with active cooling of the TBI patient.8,9 However, hyperthermia/pyrexia will cause vasodilation which can worsen ICP and should be avoided.

Nursing care - Extensive nursing care may be required for these patients. Regular turning and physiotherapy are necessary for the recumbent patient. Eye-lube may be necessary for patients unable to blink. Suctioning of the mouth may be required for patients with difficulty swallowing. Nutritional requirements should be addressed. Placement of a feeding tube – esophagostomy tube or gastrostomy tube should be considered if there is an inability or lack of voluntary intake.

Glucocorticoid Therapy - No benefit has been noted with the addition of glucocorticoid therapy in the TBI patient, and glucocorticoids are not recommended.1,8 Frequent re-evaluation of the TBI patient is necessary as changes in neurological status can happen abruptly.

TREATMENT OF ELEVATED INTRACRANIAL PRESSURE

Any patient showing a combination of ≥ 2 clinical signs: decreased level of consciousness, abrupt change in pupil size, absent physiologic nystagmus / PLR (unilateral or bilateral), or the Cushing's reflex should be treated for elevated ICP and imminent brain herniation.

Hyperosmolar therapy – Mannitol or hypertonic saline (HTS) both provide an osmotic gradient to draw edema fluid from the brain parenchyma. Mannitol and HTS can be used interchangeably. Reviews in the literature slightly favour HTS.10 The duration of effect following administration is variable and repeat dosing is necessary.

Mannitol should be administered at 0.5 g/kg intravenously over 10 minutes for impending brain herniation.1 Higher doses of mannitol 1-2 g/kg may be required and have recently shown improved effect in comatose patients. Constant rate infusion (CRI) of mannitol should be avoided.

Hypertonic saline dose recommendations vary based on the concentration of HTS used. A 3% solution is administered intravenously at 5-10 ml/kg over 10-30 minutes depending on acuity. This can be followed by an infusion at 0.5-1.5 ml/kg/hr, which is titrated to effect. Other recommendations include 4-6 ml/kg of 5% HTS at a rate of 1ml/kg/min or 4 ml/kg of 7.5% HTS administered slowly.5 Concerns when using hypertonic saline include hypernatremia. Sodium levels should be maintained under 160mmol/L.

General anesthesia/intubation/ventilation - Anesthesia will decrease cerebral metabolic oxygen consumption. In addition, intubation with mechanical ventilation allows manipulation of carbon dioxide (CO_2) levels. Hyperventilation and hypocapnia ($PaCO_2$ 30-35 mmHg) promote vasoconstriction and may temporarily alleviate elevations in ICP while other treatment options (e.g. hyperosmolar solutions /surgical intervention) take effect. Hypercarbia should be avoided in the TBI patient, optimal $PaCO_2$ is near 40 mmHg.5 With normal lung function, this coincides with an end tidal CO_2 around 35.

Decompressive craniectomy should be considered in veterinary patients failing aggressive medical therapy or with a compressive lesion from fracture or hemorrhage.1

Sedative and anesthetic considerations - Sedation and pain management should be provided to TBI patients to treat agitation and sympathetic stimulation. Note that sedation can make patient assessment more difficult. The benzodiazepines have no effect on ICP and are good sedatives for the TBI patient. The alpha-2-agonists at high doses cause decreased cardiac output and the potential for decreased cerebral perfusion, and should only be used at ultra-low doses if selected e.g. dexmedetomidine 1-2 ug/kg/hr.5,6 For general anesthesia, propofol and the barbiturates are good choices. Hypotension and respiratory depression must be anticipated and addressed when using propofol.5 If ICP is already elevated, inhalant anesthetics should be excluded and propofol infusion selected instead.

PROGNOSIS

Poor prognostic indicators for dogs presenting with TBI include signs of shock, severe concurrent injuries, and decreased MGCS or requirement for endotracheal intubation or HTS administration.3 Patients with significant brainstem injury have a grave prognosis. However, for patients with thalamocortical injury, and minimal brain stem injury, prognosis is excellent. Prognosis improves markedly once patients have survived the 24 hours following their initial insult. Patients can change neurological status abruptly and >72 hours are necessary before the patient is considered to be 'out-of-the-woods'. Overall prognosis is dependent on the site and extent of neurological damage. Time and extensive nursing care may be required. These patients may require prolonged hospitalization and time for return to normal function.

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PURRRRRFECTION: APPLICATION OF FEAR FREE AND LOW STRESS TECHNIQUES IN THE PHYSICAL REHABILITATION SETTING

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Fear Free Feline Rehab Tips and Tricks:

1. Implement a Fear Free approach to practice, avoid "white coat syndrome"
2. Identify fear, anxiety, stress, before and during appointment and adjust plan after every session
3. Offer pharmaceutical interventions before and during appointment and for travel
4. Address pain management concerns concurrently with fear free approach
5. Use pheromone options
6. Have equipment ready and set up before cat arrives
7. "Cat proof room" hiding places
8. Provide appropriate safe hiding places.
9. Schedule time for cat to arrive early and have private time with owner to get comfortable in facility, exit kennel on own, use litter box
10. Have owner present at appointment if appropriate (make game plan for owner role and behaviour and address concerns before beginning treatment)
11. Reduce lighting and noise ie/ barking dogs, fluorescent lights, washing machine and dryer use, traffic in and out of treatment area
12. Keep clinician/practitioner/technician consistent
13. Change clothes from "dog clothes" if possible
14. Use minimal restraint, minimal handling
15. Underwater treadmill – have depth of water and speed set before starting appointment
16. Offer cat safe "jump out spot"
17. Keep sessions short (15-30 minutes)
18. Offer breaks during appointment
19. Provide food rewards if desired
20. Set up equipment in small area to inspire use and direct pattern of travel to reward ie/ safe place, owner, food reward
21. Offer kitten socialization times in your practice
22. Send equipment home with clients, have feline specific therapeutic exercise equipment
23. Have dedicated fear free planning time and evaluation of cases with practice team
24. Provide owner with opportunity to provide feedback after and between sessions
25. Celebrate success!

How Does Rehabilitation Benefit Your Practice?

- Constant development of the client-technician-patient relationship
- Technicians monitoring progress and reporting back to veterinarian decreases veterinarians recheck appointment schedule.
- Increased visits to the clinic = increased confidence in the clinic = increased loyalty to the clinic
- Can be a completely technician driven service similar to nutrition program = great technician job satisfaction

Constant monitoring and re-evaluation by all team members is a key component to success. Veterinary physical rehabilitation must not be performed without an assessment, diagnosis, and rehabilitation prescription being provided by a licensed veterinarian. Please review The Model of Standards for Veterinary Physical Rehabilitation Practice provided by The American Association of Rehabilitation Veterinarians (AARV) published February 7th, 2011.

Without Rehab?

Muscle mass deteriorates. Muscle mass deterioration continues during recovery period. *Make sure your clients are aware of this when setting goals* With disuse and loss of range of motion painful trigger points and spasms can develop.
Bones that are non-weight bearing loose density.
Tendons and ligaments contract if unable to use full range of motion tendons.
Cartilage in a non-weight bearing limb becomes brittle and thin.

Synovial Fluid in a non-weight bearing limb loses viscosity.

Without rehab mass deteriorates and continues during recovery period. With disuse and loss of range of motion painful trigger points and spasms can develop. Bones that are non-weight bearing lose density. Tendons and ligaments contract ie/ quadriceps contracture may develop if unable to use full range of motion. Cartilage in a non-weight bearing limb becomes brittle and thin. Synovial fluid in a non-weight bearing limb loses viscosity. Osteoarthritis, obesity, injury and surgery can cause muscle atrophy and weakening, decreased range of motion, and exercise intolerance. The goals of a complete rehabilitation program include: increasing range of motion, developing muscle mass, reducing pain, improving functional use of affected limb or area etc. Goals vary from case to case and should be determined by the client, attending clinicians, and support staff. Incorporate weight loss, weight maintenance, and cardiovascular fitness into all programs.

The "Tech-Centric" Model puts technicians at the centre of the practice and programming and streamlines communication between team members. The veterinarian can focus completely on the role of clinician and provides direction to the technician as required. The practice manager concentrates on growing and managing the practice and gives all necessary direction to the technician who is responsible for communicating with other team members and the clients. This creates technician job satisfaction by increasing responsibility and allowing technicians to develop long term and meaningful client relationships. Veterinary and client communication is still present but minimized with everything falling into the scope of RVT practice being delegated to the RVT.

The Benefits of The "Tech-Centric" Model Include:

- Increased Revenue – Clinicians able to provide more revenue generating services and billable hours (able to confidently delegate other tasks)
- Increased Client Satisfaction - Consistent communication and perception of being attended to by a variety of team members in a consistent manner
- Reduced Technician Turnover – Technicians having their own clients and increased responsibility = increased job satisfaction and ownership of job
- Increased Sense of Team Roles and Defined Responsibilities
- Streamlined Efficient and Seamless Communication
- Increased Efficiency Due to Improved Communication and Delegation of Tasks to Appropriate Staff

What is the "Tech-Centric" Tech Made Of?

CREATIVITY, ENTHUSIASM, and EXCELLENT CLIENT RELATION SKILLS

- Variety of 'tools' in their 'tool box' relating to all aspects of nursing skills, diagnostics, technical skills, client relation abilities
- Compassion
- Problem Solving Skills
- "Can-do" Attitude
- Sense of Humour
- Dedication
- "Jack of All Trades"
- Combination of Leadership and Team Player Skills
- Dedication to Professional Development
- Dedication to Practice Growth and Development
- Willingness to Educate Colleagues and The Community

.....The List Goes On.....

Recommended Resources:

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12. *University of Tennessee www.canineequinerehab.com*
13. *Canine Rehabilitation Institute www.caninerehabinstitute.com*
14. *International Association of Veterinary Rehabilitation and Physical Therapy www.iavrpt.org*
15. *American Association of Rehabilitation Veterinarians www.rehabvets.org*
16. *Academy of Physical Rehabilitation Veterinary Technicians www.aprvt.com*
17. *International Veterinary Academy of Pain Management www.ivapm.org*
18. *Debbie Torraca www.wizardofpaws.net*
19. *Toto Fit www.totofit.com Follow their blog and like their Facebook Page!*
20. *Therapaw - boots, braces, supplies and advanced rehabilitation symposiums www.therapaw.com*

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COMMON INFECTIOUS DISEASES IN REPTILES

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It has been well established that the majority of bacterial pathogens affecting reptile patients are of the gram negative type. However, proper isolation of the pathogens and evaluation of the resulting laboratory data can often times be somewhat confusing. The practice of treating all gram negative isolates is no longer acceptable as it is now realized that many reptiles harbor gram negatives as part of their normal flora, and are either commensals or opportunists.

The decision to treat or not to treat depends on many factors. The source of the isolate, the type of animal patient, its physical or clinical condition, the pharmaceuticals available, owner compliance, experience of the clinician, and of course, the isolate itself.

Proper sample collection for bacterial culture and sensitivity data is a critical step in initiating appropriate clinical care. It is often the practice to collect bacterial culture samples, and then while waiting for the results, start the patient on an empirically selected antibiotic. This practice is wise as it gives the clinician a head start in treatment while waiting for results. Improperly collected samples will offer little information towards tailoring antibiotic therapy.

An old, but still performed practice is to collect a combo culture from the oral cavity and cloaca in a sick animal as a screening tool. While this may be easy, it does not always give very specific information regarding bacterial pathogens. The oral cavity contains a garbage can of bacteria from the environment. Although the actual pathogen might be included in the culture sample, it is often dwarfed by a myriad of other microorganisms. A similar problem is encountered when randomly culturing the cloacal region.

Site specific bacterial sampling is preferable to random sampling. Snakes presenting with infectious stomatitis, or mouth rot, will benefit from appropriate antimicrobial therapy based on proper bacterial isolation. However, as mentioned, a sample collected by swabbing a culturette over the affected gingiva will usually yield a mixed-bag of oral cavity and environmental flora. Some sort of gram negative isolate is almost always found, but its significance is nebulous at best.

A better technique would be to prep the area with alcohol, make a small stab incision through the infected area with #11 scalpel blade, and then using a micro-culturette swab, sample the affected tissue from within the incision. An isolate here will have far greater clinical significance.

Cloacal cultures can be used in patients with diarrhea or other gastrointestinal disturbances. Proper diagnostics and rule-outs should be executed prior to the testing. Fecals for ova and parasites, including protozoal pathogens, is a must. Interpretation of the culture results can be confusing since many different bacterial are normally present. However, certain isolates should be cause for immediate concern. These will be discussed later in the manuscript.

Patients displaying respiratory signs should be cultured. Again, random culturing of the saliva or tracheal exudate within the mouth will be non-diagnostic. If time and cost restraints are imposed, a preferable sampling site would be high within the choanal slit. Since, anatomically, this is the area where the glottis opens, you are more likely to identify a real pathogen. An even better technique would be to perform a tracheal wash. An appropriately sized sterile, red-rubber catheter is inserted transglottally and directed into the lung region. Sterile saline (approximately one percent of the animal›s body weight) is infused through the catheter. The patient is then gently inverted, rolled side to side, or in some way rocked to allow mixing and washing of the saline within the lung. After this, as much fluid as possible is withdrawn. It is not uncommon to only get back a small portion of the infused saline. Do not let this alarm you. Any remaining fluid will be readily absorbed through the lungs.

Occasionally, in cases of severe pneumonia, quantities greater than the amount infused will be retrieved. The fluid collected can now be used for both cytology and bacterial culture and sensitivity testing.

Open abscesses should be debrided and the cultures taken from deep within the lesion. Closed abscesses can be sampled by aspirating material using sterile techniques. Cystic and vessicular fluid can cultured in a similar fashion.
Cultures can be taken from body fluids such as blood and urine using standard techniques. Properly collected samples, either via cystocentesis or direct venipuncture, yield invaluable diagnostic information.

A study on the bacterial flora of infirmed reptiles revealed that approximately 50% of all bacterial cultures contained anaerobic bacteria. This could account for laboratory reports of «NO GROWTH» even when you know that you collected an adequate sample.

A second reason for a lack of bacterial growth on sampling results from an excessive collection of sample material, thus overgrowing the transport medium prior to getting plated at the diagnostic laboratory. Technical difficulties, such as prolonged storage, overheating of the sample, and inappropriate or out-dated culture media are just a few reason for sampling failure.

Fungal infections, such as CANV, can be diagnosed by several methods. Skin scrapings, skin biopsies and skin cultures are possible.

As mentioned, the gram negative bacteria are most frequently implicated as pathogens. Deciding which bacteria to treat can often be confusing. Arbitrarily starting a patient on antibiotics just because gram negatives are present is not appropriate. A review of the most common bacteria will help the clinician decide which isolates require treatment.

Salmonella/Arizona - Most of the Salmonella spp., and Salmonella arizona group (fomerly Arizona arizonae), are considered pathogenic. Many reptiles harbor these organisms as part of their normal flora, and interpreting their presence can oftne be difficult. This group has public health significance because of their zoonotic potential.

Pseudomonas spp. - Pseudomonas spp., such as P. aeruginosa, are commonly found as part of the normal flora in the oral cavity and intestinal tracts of reptiles. As such, it is often considered an opportunistic pathogen. In cases of poor husbandry, such as sub-optimal environmental temperatures and malnutrition, can predispose to pseudomonas infections. Pseudomonas has been isolated from cases of ulcerative stomatitis, pneumonia, cutaneous lesions and septicemias. Pseudomonas cultured in light numbers from the oral cavity or gastrointestinal tract in healthy patients probably need not be treated.

Aeromonas spp. - Aeromonas has been associated with pneumonias, oral cavity and cutaneous lesions, and septicemias. The snake mite, Ophionyssus natricis, has been implicated as a common vector of this bacteria. Aeromonas isolated from healthy animals in light growth may be part of the normal flora. However, where there is significant growth, or in patients with questionable clinical health, treatment should be considered.

Serratia spp. - Is part of the normal flora of the oral cavity in reptiles. It is commonly isolated from cutaneous lesions, and appears to be introducted from traumatic sources, such as bite wounds. Cutaneous infections with Serratia typically cause caseated abscesses which require surgical curretage for appropriate treatment.

Mycobacteria spp. - Mycobacteria are common environmental bacteria. Of significance to reptile patients are M. marinum, M. chelonia and M. thamnopheos. Although commonly isolated from cutaneous lesions. Mycobacteria can also cause systemic illness with nonspecific signs such as anorexia, lethargy and wasting. Acid fast organisms are readily identified with either skin scrapings or biopsies. There are no reported successful treatments. This disease may also have some zoonotic potential.
Providencia spp. - Commonly isolated from the oral cavity of healthy snakes. This is believed to be an opportunistic pathogen. Treatment should be considered in view of the clinical status of the patient.
Klebsiella spp. - K. pneumonia is commonly associated with pneumonia and hypopion. These organisms are considered normal flora by some authors. When isolated from clinically ill reptiles the organism should be treated.

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FELINE INFECTIOUS PERITONITIS – HOW TO CONFIRM THE DIAGNOSIS

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Where we are with understanding the cause of FIP?
Feline coronavirus (FCoV) infection is very common in cats. Infections with FCoV are usually asymptomatic but result in FIP in around 5-10% of cats1. Asymptomatic FCoV infection was previously believed to be confined to the intestinal tract, but healthy FCoV-infected cats can have systemic FCoV infection, albeit with lower viral loads than cats with FIP2-4. Why FCoVs result in FIP in some cats and not in the majority of FCoV infected cats is not clear. Viral factors are important. FCoVs have a transmembrane spike (S) protein that binds to the host (feline) receptor, mediating host cell entry. Mutations in the S gene can result in amino acid substitutions in the transcribed S protein that influence the tropism of FCoV, and these are believed to be associated with the ability of FCoV replication to occur outside of the intestinal tract (monocyte/macrophage tropism) as systemic FCoV infection5, which is a prerequisite to the development of FIP. Other viral factors are also likely to be important following systemic FCoV infection6. Host factors are also very likely to play an important part in FIP development.
Can I make a definitive diagnosis of FIP in A suspected case?

This requires histopathological examination of tissues with detection of FCoV antigen within lesions by immunohistochemistry. Immunostaining of FCoV antigen in effusion samples showing biochemical and cytological features consistent with FIP is also likely to be adequate to definitively diagnose FIP in effusive cases.
Evaluating any background evidence for FIP
Are the clinical signs consistent with FIP?
Are haematology and biochemistry consistent with FIP?
IS AN EFFUSION PRESENT TO SAMPLE?
These are important to consider and are described in detail in one of the author's publications7.

FCOV reverse-transcriptase (RT)-PCR
RT-quantitative (q)PCR assays detect and quantify FCoV RNA. These assays detect any FCoV RNA and so are not specific for FIP-associated FCoVs and cannot be used to definitively diagnose FIP as both cats with and without FIP can show positive RT-PCR results. FCoV RT-PCR can be used to detect FCoV RNA in tissue (biopsy or [ultrasound-guided] fine needle aspirates [FNAs]), effusion, CSF or aqueous humour samples from suspected cases of FIP.

Selection of appropriate samples to submit for RT-PCR can be guided by clinical signs such as presence of effusions, ocular/neurological signs, imaging, cytology and non-invasive sampling methods are generally preferred, particularly in sick cats. Tissue samples from cats with FIP are significantly more likely to be FCoV RT-PCR positive8,9, and have significantly higher FCoV loads by RT-qPCR5, than tissues samples from cats without FIP, although cats without FIP can still be positive for FCoV by RT-PCR in tissues. A recent extensive study evaluating FCoV RT-PCR in 260 tissue samples from 57 cats with FIP, and 258 tissue samples from 45 cats without FIP8, 90.4% of tissue samples from cats with FIP were FCoV RT-qPCR positive compared to only 7.8% of tissue samples from cats without FIP. In cats with FIP, Thus, the presence of high levels of FCoV RNA in tissue samples is highly supportive of a diagnosis of FIP. Effusion samples in FIP cats often contain FCoV RNA10, which can be detected by RT-PCR. Published studies have amplified FCoV RNA in most (72-100%) effusion samples from cats with FIP9,11-13 but usually not in any non-FIP effusion samples11-13. However recent studies have challenged specificity; one study8 amplified FCoV RNA, albeit at a low level, in abdominal fluid from one (out of 29) control cats that did not have FIP and another14 amplified FCoV from 3 (2 of these had low levels of FCoV) of 24 control non-FIP cat that had effusions tested. Lastly a recent study9 amplified FCoV (FCoV levels not reported) from the effusion of one cat with an intestinal carcinoma (out of 6 control cats with effusions tested). Despite this, the presence of FCoV RNA, particularly moderate to high levels, in an effusion that also has cytological and biochemical features consistent with FIP, is highly supportive of a diagnosis of FIP. Successful RT-PCR is possible on MLN FNAs in cats with FIP15; 18 of 20 cats with non-effusive FIP were positive for FCoV by RT-qPCR with the remaining 2 cats giving negative results, although these presented primarily with neurological signs. Of 26 non-FIP cats, 25 showed negative FCoV RT-qPCR results. In this study, the sensitivity of MLN FNA FCoV RT-qPCR was 90% and specificity 96.1%. Not all cats in this study were confirmed as having FIP using histopathology with or without immunohistochemistry and samples were often collect post-mortem. Nevertheless, the study suggests that RT-PCR on MLN FNAs collected from cats with (non-effusive) FIP could be useful to support a diagnosis of FIP.

FCOV RT-PCR FOLLOWED BY S GENE MUTATION ANALYSIS

Following the detection of FCoV RNA in a sample by RT-PCR, it may be possible to then characterise targeted sequences of the FCoV genome, especially the S gene, using molecular techniques. Such sequence characterisation would be extremely useful if FIP-specific mutations existed.

Although research16,17 documented so-called FIP-specific S gene mutations; these were identified by comparing the sequences of FCoVs found in the tissues of FIP cats with those found in the faeces of healthy non-FIP cats. We hypothesized that these sequence mutations could reflect systemic FCoV (i.e. monocyte/macrophage-associated FCoV compared to intestinal epithelium-associated FCoV) rather than being specific for FIP, knowing that non-FIP cats can have systemic FCoV infection. We therefore compared the S gene sequences of FCoV detected in the tissues of FIP cats with those detected in the tissues of non-FIP cats5. This allowed us to evaluate the S gene sequences of FCoVs associated with systemic FCoV infection in both non-FIP and FIP cases. We found that the S gene mutations present in most of the FIP tissues were also present in most of the tissues of non-FIP cats that had systemic FCoV infection. A recent more extensive study confirmed the same findings8, and calculated that if the identification of S gene mutated FCoVs was included as an additional confirmatory step to the detection of FCoV by RT-PCR alone, this only slightly increased specificity for the diagnosis of FIP in tissue samples (from 92.6% for FCoV RT-PCR alone to 94.6% with the addition of S gene mutation analysis) but moderately decreased sensitivity (from 89.8% to 80.9%, respectively, mainly because mutation analysis was not possible in all tissue samples). Other studies on mutation analysis11,14,18 have reported lower sensitivities but higher specificities compared to FCoV RT-PCR alone than those in our studies. One should remember that if a mutation assay is heavily reliant on having a significant FCoV load in the sample to enable sequencing, its sensitivity can appear to be quite poor as some samples from FIP cats may not have adequate FCoV loads on which to perform successful sequencing. Conversely, such assays may appear to have good specificity as they are unable to sequence mutated sequences in cats without FIP, and thus don't generate false positives. Hence significant increases in specificity for mutation assays over FCoV RT-PCR alone may be due to their inability to identify mutated FCoV in cats without FIP.

Immunostaining for FCoV antigen should be performed if possible

Immunostaining is performed on formalin-fixed tissues using immunohistochemistry (IHC) or on cytological (typically effusion) samples using immunocytochemistry (ICC) or immunofluorescence. Positive FCoV antigen immunostaining of tissue biopsies is said to confirm a diagnosis of FIP (i.e. it is very specific) but a negative result does not exclude FIP as a diagnosis as FCoV antigens may be variably distributed within lesions19 and thus are not detected in all histopathological sections prepared from lesions from FIP cases6.

This may be overcome by taking multiple and/or large samples with confirmed pathology, as well as possibly requesting additional sections of biopsies with pathology to be cut and stained. Immunostaining of effusion samples has shown variable sensitivity (57-100%)20-22. Since this technique relies on staining FCoV within macrophages in the effusion, and the effusion is often cell-poor and/or the FCoV antigen is masked by FCoV antibodies in the effusion, a false negative result may be obtained. Effusion immunostaining is thought to be very specific; recent studies questioning specificity20,21 may be due to the methodology used causing non-specific staining. The use of immunostaining has recently been described in MLN FNA samples obtained at post-mortem examination from 41 cats with suspected FIP23. FIP was confirmed in 30 cats by histopathology and positive IHC whilst 11 cats were confirmed as having diseases other than FIP by histopathology and negative IHC, although MLNs were not necessarily evaluated. Of the 30 cats with FIP, 17 (53%) were MLN FNA ICC positive, and of 11 cats without FIP, 1 (9%) was MLN FNA ICC positive; thus ICC had a sensitivity of 53% and a specificity of 91%. The ICC technique described23 could have been insensitive due to the antibody type used and degradation of FCoV and/or cells due to the post-mortem collection. Further evaluation of ICC on MLN FNA samples collected ante-mortem from cats is required.

REFERENCES AVAILABLE ON REQUEST

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INTRA-ARTICULAR OPTIONS IN PRACTICE

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Intra-articular administration (IA) of analgesic drugs is considered useful specifically in diseases that affect a single or only a few joints, such as osteoarthritis. Current pharmacological treatment options are limited. Regarding disease modifying OA drugs (DMOAD's) there are more gaps in the arcade of treatment options then options themselves. Systemic applications on the other hand may present with lack of effectiveness in the later stages of OA and with side effects- sometimes related to the chronic nature of the disease (OA) and the consequent requirement for long-term administration. A major unmet need in OA treatment consequently is represented by the limited options for intra-articularly administered drugs with long duration of action, since too frequent intra-articular administration presents some problems of itself (for example: need for sedation/anesthesia, risk of infection). Most drugs that are used for IA nowadays, however, have a very short residence time in the joint (for example: plasma and tissue concentrations of meloxicam are not different after IA or IV application in dogs). Careful aseptic conditions need to be applied for all intra-articular drug applications and the maybe altered anatomical layout of a joint with OA needs to be taken into consideration in order to not damage the articular cartilage further by accidental insertion of the needle and possibly ultrasound or radiographic guidance may represent useful techniques to reduce the incidence of such damage. This may become more of a requirement for deeper joints such as the hip or facette joints. Furthermore, aspiration of synovial fluid during the time of needle placement is also a useful technique as it helps acertain correct needle placement, prevents injection of a tissue cylinder (of synovial membrane and other tissues) into the joint, and may diminish the dilution of an injected drug. The latter effect becomes more important when synovial effusion is present and may actually of itself contribute to an improvement of pain. Resting the joint for some time after IA may further increase the residence time of the injectate and enhance (analgesic) effects.

One of the more prevalent benefits of IA is the ease of achieving an effective tissue-site concentration without the need for high plasma concentrations, potentially decreasing the incidence and amount of systemic side effects.

Local Anesthetics

These drugs are the most commonly applied drugs in the perioperative period even though their intra-articular application, particularly in situations of chronic/maladaptive pain is not undisputed. There is a variation in their effectiveness and safety among the different local anesthetics. However, on the basis of issues with chondrocyte toxicity, of limited duration of effect and even plasma concentration i.e. safety at this point of time the repeated or continuous administration over time cannot be recommended.

The use of local anesthetics, particularly mepivacaine as a diagnostic tool to assess joint disease (like in horses for lameness diagnosis), however, is recently receiving more attention and dosing schemes have been developed.

Opioids

Of all opioids morphine is certainly the most commonly used drug for intraarticular administration, even though some investigations studied other opioids as well. In many studies, morphine has been shown to be overall safe and effective in reducing postoperative pain after intra-articular application. After a single intra-articular application most studies have provided evidence of delayed onset (approx.. 3-5 hours) but a prolonged duration of analgesic action (up to 2 days). The long-term use of morphine using other routes of application has been associated with amplification of pain, however, reducing its usefulness in chronic pain situations.

Hyaluronic acid

Hyaluronic acid (HA) chemically is a very long glycosaminoglycan structure that in the healthy joint is produced by the type B synoviocytes, the prevalent cell type of the synovial intima. HA and a plasma-ultrafiltate provided by the extracellular matrix together with lubricin form the synovial fluid. HA builds protein links with aggrecans. The HA-aggrecan complex then binds water and type II collagen fibers to build the extracellular matrix of articular cartilage, particularly in diarthrotic synovial joints. In the healthy joint, the high concentration of these complexes are responsible for the viscoelasticity required for joint homeostasis. HA is further involved in anti-inflammatory processes as it inhibits PG E2 synthesis and leukocyte adherence. It also seems to have direct antinociceptive effects. There may be some chondroprotective effects in clinics, but they have been demonstrated so far only in-vitro.

HA-preparations show different molecular weights affecting strongly their degree of effect and their residence time. Different dosing regimens are available for human patients only, however most involve cycles of weekly injections (3-4),

then an interval of at least 4-6 weeks. More than 6 injections in 6 months should not be performed. Whether or not such dosing schemes may apply to veterinary patients is unclear.

It is currently still debated whether HA has DMOAD-effects with some studies in dogs and rabbits showing are more pronounced tissue repair and other studies pointing more towards HA-treatment rather producing an acceleration of joint damage in OA. Species differences may further complicate the picture.
Other than that, HA in IA seems to be one of the better tolerated treatment options, with a rather low incidence of adverse effects (some may show benign, short lived local reactions).
HA in IA is still today one of the most commonly administered drugs in OA, particularly in the "dry" joint.
HA may be and is commonly combined with other drug formulations such as steroids (and botox and vanilloid receptor agonists/antagonists).

Steroids

This group of drugs represents a very commonly applied treatment in IA for OA in human patients. It mainly remains a short lived (1-6 weeks), symptomatic treatment option in cases of severe pain. They are mostly well soluble agents such as betamethasone when in acqueous solution or in the case of triamcinolone or rimexolone which are poorly water soluble, suspensions and emulsions are available. Particularly with the latter ones it is crucial to mix (shake) the vial sufficiently in order to enhance homogeneity of dispersion. Also, there are liposome formulations of dexamethasone are available to produce slow-release formulations. These liposomal formulations should not be mixed with other drugs/solutions.
The non-water soluble formulations have been developed out of a clinical necessity, as water-based solutions have such short residence times that they are sometimes associated with systemic side effects.
Overall, the risk of cartilage defect due to IA corticosteroid seems low, however the sometimes strong pain alleviating effect seems rather short. The use of these drugs in larger joints (elbow, stifle) does not seem to prove better results than systemic NSAIDs and is therefore not very common practice in small animals.
In smaller joints, particularly facette joints, there are anecdotal reports of strong, prolonged action when liposomal formulations are used. The application into these joints is being performed under radiographic control. In human patients, the use of corticosteroids is more common when OA-diseased joints present with effusion.
The WSAVA Global Pain Council has decided to not list corticosteroids as analgesic drugs in their guidelines.

Platelet-Rich Plasma (PRP)

PRP is a natural concentrate of autologous blood growth factors (TGF-b1, platelet-derived growth factor and other inflammatory modulators) that has been used in a variety of species including humans and dogs to treat degenerative joint disease. For this venous fresh whole blood is collected ind an ACD-A anticoagulant solution and centrifuged.
An amount plasma adjacent to the erythrocyte-plasma interface is collected and activated with calcium gluconate. The resulting solution represents the injectate. In dogs a typically used injection volume is 2 mL/joint. The application is currently recommended to be repeated two times at a two-weeks interval.
While this IA-technique is being increasingly applied to clinical cases due to anecdotal reports, scientific evidence of statistical improvement of lameness or pain remains to be clearly shown. Particularly placebo controlled studies have so far failed to demonstrate clear benefit.

Stem cells

Adipose-tissue derived mesenchymal stem cell (AD-MSC) usage is a rapidly expanding medical and veterinary field. It has been demonstrated that AD-MSC can be helpful in the repair of damaged joint structures including cartilage. The idea, infact, is to recruit endogenous cells to exert trophic functions. Apparently MSC seem to show a tropism for fibrillated articular cartilage when applied IA.
PRP may act as a potentiator for MSC also prolonging the beneficial effects to a period of at least 6 months after a single IA application.
AD-MSC have been applied IA in OA dogs, and significant improvement of peak vertical force and vertical impulse have been demonstrated.
Other studies have demonstrated adequate homing of AD-MSC in partial cartilage defects in dogs and MSC-transformation into chondrocytes with collagen I and II and lubricin expressions

Botox

Purified Botulinum toxin type A, an extremely potent food-borne toxin has been used in human patients to treat severe joint pain. It is associated with inhibition of various neurotransmitters secreted during peripheral nociceptive stimulation. It may block peripheral and central sensitization. There are suggestions that it may be helpful in treating inflammatory and chronic pain, a combination frequently observed in OA.
In a preliminary study botox has been used in IA in elbow and hip joints of 5 dogs with severe OA causing only moderate to significant improvement in 4 of 5 dogs over an 8-12-week duration as measured by owner assessment, peak vertical force and vertical impulse. The dose used was 25 units per joint in a single joint application.
The botox application caused transient slight-moderate side effects, such as mild swelling and redness at the injection site and mild increase in lameness within the first days after application.
The authors of the study concluded that the IA of botox in OA dogs may not be associated with as profound and prolonged clinical improvements as has been demonstrated previously in humans.
However, further controlled studies are needed and may identify different dose requirements in dogs.

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DIAGNOSTIC TECHNIQUES FOR DERMATOLOGY: GETTING AN ACCURATE DIAGNOSIS THE FIRST TIME 'ROUND

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Skin scrapings: Know your distribution patterns! Best lesions to scrape: Demodex – alopecia with hyperpigmentation; Sarcoptes – golden crusts or papules

Trichoscopy (hair plucks): growth phases of hair (anagen - active, catagen - finishing growth, telogen - resting); integrity of hair (evidence of barbering, dermatophytes), melanin clumping – colour dilution alopecia, follicular casts – sebaceous adenitis, demodicosis, folliculitis, seborrhea, Vitamin A responsive dermatosis

Wood's lamp: good screening tool (false negatives, false positives) *M. canis will fluoresce apple green from root up the hair shaft ~ 50% of time

Fungal culture: collect hair and scale (especially if fluorescent green); face, ears, tail, paws – sterile plucks from edges of lesions; MacKenzie tooth brush technique for asymptomatic carriers; hold up to 4 weeks; consider

PCR testing – very sensitive so not great for monitoring response to treatment.

Cytology ** with diff quick staining, allow double time in purple stain to highlight yeast, mast cells & acantholytic keratinocytes

Direct Smears: collected using a dry cotton-tipped applicator - use like a crayon and "colour" in the area of interest. Gently roll sample out in a line on a microscope slide. Heat fix and stain. Intact pustules can be lanced with a sterile 25g needle to allow for collection.

Otic cytology: ideally collected from the junction of the horizontal and vertical canals - heat fix. It's often helpful to massage the opposite ear while collecting samples. Impression smears: performed on moist, oily skin, or exudative lesions. Best for assessing presence of acantholytic keratinocytes. Crusts can be lifted with the edge of a microscope slide. Slide is then gently pressed to the moist lesion below, or removed crust as a stamp. Superficial skin scraping with a dulled blade or spatula (no oil): dry blade is used to collect surface scale or exudates. Debris is spread on slide and heat fixed prior to staining.

Acetate Tape Preps: great for ectoparasites and cytology. Use clear acetate tape. Handle the tape carefully to allow yourself a "sacrificial finger print end" – keep the tape stuck to your finger and use your thumb to press tape to lesion. Press to lesion repeatedly until the tape no longer sticks, then stain and examine under microscope.

There are many ways to stain tape, I prefer to stick "sacrificial end" to clear edge of slide then dip into the eosin stain in a Diff-Quik stain set. Hold in stain and wobble back and forth for a count of 10, then allow excess to run off back into vial. Dip in purple stain and wobble back and forth for a count of 20, then allow excess to run off back into vial. Rinse thoroughly with a gentle stream of water on both sides of tape until water runs clear. Do not use the blue fixative as it will eat the glue on the tape, taking your sample with it! Lay the rinsed tape, sticky side down, on microscope slide with "sacrificial finger print end" towards frosted end of slide. Place slide inside folded paper towel and press tape down to remove air bubbles and excess water. Apply one drop of immersion oil on top of dried tape, then coverslip and examine under microscope.

Skin Biopsy: Send to pathologist with a special interest in skin disease - include history, clinical presentation, differential diagnosis. Detail the number of biopsies, type of biopsy, sites of biopsy. Include lesion diagram and photos if possible. Often, a specific diagnosis is not forthcoming - this may be because the biopsy did not show the primary lesion or characteristic lesions of the disease, such as pustules or bullae, were not available at the time of biopsy. Even under these circumstances, skin biopsy can still be an effective diagnostic tool as it may allow you to eliminate potential differentials, allowing the investigation to focus in other areas. Proper biopsy technique and provision of detailed clinical findings allows you to optimize results. Take 3-5 skin biopsies from lesions in all stages of development. Ulcerations are avoided since the dermis is damaged and won't provide information to the histopathologist. Depending on the stage of a disease process, biopsies may need to be repeated. Always inform your clients of this possibility.
Hypoallergenic Diet Trials: Several types of testing, including serum allergy testing exists, but we are still unable to correlate serum test results with actual patient clinical signs so PLEASE DON'T WASTE YOUR CLIENT'S MONEY ON SERUM TESTING FOR FOOD ALLEGIES. (1,2,3,4,5,6,7,8,9)
The vast majority of adverse food reactions in animals are caused by the protein source in a diet. A hypoallergenic diet to rule out food allergy ideally contains a single, novel source of protein with generally a single source of novel carbohydrate. In theory any protein may be suitable, provided the patient has not been exposed to the protein significantly before.

Homemade diets are preferred to commercial diets where possible as they do not contain any additives (preservatives, binders, etc.). Commercial limited ingredient veterinary diets, and hydrolyzed diets are also options. In theory, hydrolyzed diets have the protein chopped up so finely, that the body does not recognize it and an allergic response is avoided. In my experience, I have seen many animals still react to these diets, so we usually reach for them when we have a patient with chronic GI symptoms. Having the protein hydrolyzed is very similar to it being partially digested, allowing for easier absorption in the gut. Another train of thought is to avoid an animal based protein all together and go with a vegetarian diet. Response is very individual – there is no magic diet that will work for all cases.

A 2010 study (10) showed 100% of over the counter hypoallergenic diets were contaminated with protein sources not listed on ingredients. This is a result of cross contamination from other diets manufactured at the food plant. The same study showed veterinary prescription diets were not cross contaminated, so preference is given to prescription diets when doing a diet trial.

Diet trials must be STRICT, for a minimum 8 weeks. Warn clients that it could take several attempts before finding THE diet that works for that particular individual.
Intradermal Allergy Testing: Still regarded as the gold standard since we see what the skin reacts to.

Very specialised procedure – only available through veterinarians with a special interest and training in skin disease. Intradermal skin tests can be significantly affected by medications such as corticosteroids, anti-histamines and fatty acid supplements
Serum Allergy Testing: Tells us what antibodies are being produced in the bloodstream. This result gives an accurate assessment of how ready the immune system is to react to a given allergen, but not whether you will actually have a reaction. This is very useful if intradermal testing is not available or possible due to drug withdrawal periods. These tests may still be affected by medications, but usually less so. Results need to be interpreted by comparison with the environment and history of the pet. Currently our serum allergy test of choice at Yu of Guelph Veterinary Dermatology is VARL Liquid Gold. This test is done at the Veterinary Allergy Reference Laboratory in California. Serum allergy testing is currently of no benefit when testing for food allergy.

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TEAM COLLABORATION TOOLS

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Sick of the never-ending thread of group emails? Thinking of getting another dry erase board? Then you definitely need to read this first!
It really doesn't matter who you are or what business you are in, the success (or failure) of your business will largely depend on how well your team communicates. In a veterinary practice, this is critical in every sense of the word. But are you using the most effective tools? If you are still emailing or printing memos, then you aren't. Technology has come along way in the last few years for team collaboration tools. Prior to these innovations, teams were at the mercy of signing memos as proof that you had received the information. Not anymore….life is much better because everyone knows the better you communicate, the happier your team will be, the more productive your business will be and the better care your patients will get. Let's take a review of the top team collaboration tools on the market that have a relevant position in veterinary medicine.

Trello

Trello is like the virtual mother of all dry erase boards. Multiple boards can be created and each board has columns called "lists". Each list contains "cards". The cards hold conversations from multiple team members about a specific topic. A team member can flag a card with their image to indicate they are taking the lead on the topic. Each card can hold additional information such as due dates, check lists, and labels. Cards can be referenced in other cards if the conversations crossover. If you need to get a team member's input, just "tag" them on the card and they will receive an email and/or notification that they have been mentioned.
Pros: Free. Very customizable and can fit most situations. Task/goal oriented. Easy to use. App and web platform. Integrates with many other platforms such as Dropbox, Google Drive and Slack.
Cons: Not very conducive to general chatting.

Slack

Slack builds teams around topics. Using a #, you can create channels (topics) and invite certain members of your team to that channel. Then inside you can discuss, upload files, and have conversation threads. "Bots" can be integrated into Slack and there are some really fun ones! Hey Taco allows each employee 5 virtual tacos to give away each day to other team members for a job well done.
A taco leaderboard can be displayed and tacos can be cashed in for prizes. It is amazing how much a person enjoys receiving a taco! This is especially helpful if you are looking for ways to compliment members on your team.

Pros: Lots of integrations available. Conversation threads inside of conversations. Great search feature. Easy to see all conversations at once.
Cons: Free version is fairly limited, Higher learning curve to use, there is a lot going on so easy to lose sight of tasks/conversations if you aren't checking regularly. Unable to assign tasks to other people easily.

Zoom

Zoom is a virtual meeting room that uses webcams to host a "Brady Bunch" style meeting. Using wifi, up to 100 participants can meet for 40 minutes on the free plan. Audio is easy to access by using the headphone jack on your computer thereby avoiding cell charges. But, you can call in for audio too if needed. Sharing your screen is no problem and you can easily record your meeting to the cloud and share the link afterwards without having to convert the file to a sharing platform. Great for meetings when team members can't be on site.
Pros: Free version is very good. International access. Easy to use. App for iPhone or iPad.
Cons: The meeting will end abruptly at 40 minutes unless you go with a paid plan.

Glip

Glip is very similar to Slack but easier to use and free. Instead of topic oriented approach of Slack, the conversations are team oriented. The task feature is very powerful with due dates, assignees and the ability to sort and reorder your tasks based on priority and due dates. Tasks can also be assigned to groups and easy to tell when completed. Team members calendars can be integrated and shared which makes scheduling a meeting much easier. Files and links can be stored and each member has a personal note taking section. Conversations can be converted to video chats with the click of a button. The giphy feature is hilarious and gives this a fun twist.

Pros: Free. Easy to use. Powerful task feature. Links and documents are stored in one place. Calendar integration.
Cons: Unable to have conversation sub-threads inside a team chat.

Google Docs

Google Docs (and Google Sheets) are live documents that can be shared and edited by multiple users. By simply sharing your document with another person, you can allow them to edit a live document. When the edits are made, the form is immediately updated for everyone.

Hot links can be embedded in the document and comments can be attached to specific parts of the document. Since the form is live, it is easy to embed links which makes it easy for the reader to access information.

Pros: Free, easy to get started, easy to mark up and read input from multiple team members
Cons: Not particularly user friendly but once you figure it out, it's easy to use.
Whether you are the boss or the employee, nobody likes to be in the dark. Sharing information is a key component for every team. Tools like these make it easy (and fun!).

WSV - 058

ONE HEALTH AND DOMESTIC VIOLENCE

M. Merck
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Statistics show that most veterinarians will encounter incidences of animal abuse at some point in their careers. Researchers have recognized and documented that violence towards animals can be both a component and a symptom of child, spousal and elder abuse. Veterinarians are increasingly being called upon to be responsive to suspected animal abuse as a sentinel indicator of other violence against human and non-human family members. This has enhanced the veterinarian's role in One Health and public health responses to family and community violence.

Domestic violence is a community issue that requires community support. Studies report that 88% of pets in domestic violence homes have been threatened, injured or killed. According to the World Health Organization, 1 in 3 women will experience domestic violence globally [1]. In 2016, the WHO passed a resolution on violence against women and children and instituted a response plan, one which does not include a plan for pets. This is a unique opportunity for the veterinary community to work with the WHO to educate and develop a plan for pets. Studies from Canada and the U.S. report that 48-75%[2][3] domestic violence victims will delay leaving the home if they cannot take their pets. Pets that are left behind are at risk for being injured or killed in retaliation by the abuser or may be threatened to coerce the survivor to return.

Many domestic violence shelters do not have programs that include providing a safe place for the pets. This poses a significant barrier to the victim from leaving and continues to endanger the pet. The pets coming from these environments have suffered emotional and mental abuse with the majority having been physically abused. Many pets may not have received basic veterinary care and their owners may not have been educated on routine pet care. A common missing link in many programs is conducting a veterinary examination of the pet for signs of abuse, especially chronic abuse.

The ideal situation for survivors and their pets is to remain together as a co-living shelter arrangement. This requires designing a program within the existing shelter structure.

There is a need for a foster program for all shelters in response to needs that exceed housing capacity and as an alternative when co-living shelter options are not viable. There are several existing programs that serve as templates and resources around the world to assist with community planning.

The DV shelters consistently lack funding and resources to institute pet programs. The veterinary community can play a vital role in initiating and developing a well-rounded, collaborative program that involves all the community stake-holders. The veterinary community and allied animal service organizations together can provide free and low-cost support to the pets of domestic violence victims sharing the burden while providing critical services for people and their pets.
Domestic Violence Pet Program: Key Points
-The Domestic Violence Pet Program needs to be based on the existing community resources and programs.
-The veterinary community is in a unique position to initiation and collaborate with stake-holders on developing the most appropriate program.
-Animal welfare/shelter organizations may be invited to participate during the program planning or after the needs have been identified and participation requirements established.

-Provide education on the Link between domestic violence and animal abuse to partners and stakeholders in the domestic violence response community
Pet Abuse in Domestic Violence: Suspicious Indicators and Findings

Researchers have recognized and documented that violence towards animals can be both a component and a symptom of child, spousal and elder abuse [4][5][6]. In 1983 study, Deviney et al [5] studied 53 families who met the legal criteria for child abuse and neglect. 60% of these families abused or neglected companion animals. In 88% of the families where there was physical abuse of the children, there was animal abuse. In a Canadian study, [7], 56% of pet-owning women seeking refuge in women's shelters reported that their abuser had threatened or had harmed their pet.

Domestic violence is the primary source of physical abuse cases seen in veterinary practice. The owner may bring to pet to their primary vet or try to hide by going to other veterinary hospitals, emergency hospitals. The abuser may come to hospital with partner, or alone with animal. Potential indicators include unexplained death or sudden death with no medical history to support; request for euthanasia without sensible reason; desperation to find new home without good explanation; the owner appears afraid to authorize diagnostics, treatment especially for routine care; may decline necropsy, especially abuser.

These pets are often have been subjected to multiple types of abuse and chronic abuse, physical and emotional. History may include unexplained self-resolving lameness, swellings or neurologic signs.

There may be animal behavior clues such as sudden behavior changes in the home, house soiling, gastrointestinal problems, extreme fear reactions. The most pathognomonic feature of chronic abuse is repetitive injuries such as healing fractures, especially in different stages of healing. Exam findings can include:

- Dislocations in the tail, legs
- Spiral fractures due to rotational forces without consistent history or explanation
- Head trauma: identified in the eye or ear exam
- Thoracic trauma: rib fractures most frequently found but most commonly missed on radiographs

Veterinarians must do a complete examination making sure to look for subtle findings of abuse. Radiographs are critical in cases of all suspected abuse cases. The examination of pets of survivors of domestic violence and having a proper community program can play a critical role in the future safety of the pets and their human family.

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Handout for veterinary hospitals and posting on website: Example for Texas, USA

SAFTEY PLANNING FOR PETS IN DOMESTIC VIOLENCE

Statistics show that up to 65% of domestic violence victims are unable to escape their abusive partners because they are concerned about what will happen to their pets when they leave. Animals that are left behind are at high risk for being severely harmed. Fortunately, there are more and more resources in place to assist with this difficult situation.

If you are creating a safety plan of your own to leave an abusive relationship, safety planning for your pets is important as well. If possible, do not leave pets alone with an abusive partner. If you are planning to leave, talk to friends, family or your veterinarian about temporary care for your pet.
The Animal Welfare Institute developed the Safe Havens Mapping Project, an integrated and comprehensive state-by-state listing of sheltering services for the animals of domestic violence victims. Safe havens operate differently from community to community relying on foster networks, humane societies and veterinarians. In some cases, domestic violence shelters house victims and pets together.

Create a Safety Plan that Includes Your Pet

If you are planning to stay...
Keep emergency provisions for your pet in case your abuser withholds money
Keep the phone number of the nearest 24-hour emergency veterinary clinic
Establish ownership of your pet by creating a paper trail (e.g. obtain a license, have veterinarian records put in your name, have microchip placed or info on microchip changed to your name)
If you are planning to leave...
Obtain safe emergency shelter for pet, somewhere that will not be disclosed to your abuser (e.g. veterinarian, friend, family, a safe haven for pets program)
Establish ownership of your pet by creating a paper trail (e.g. obtain a license, have veterinarian records put in your name). Ideally visit the veterinarian prior to leaving and have a microchip placed or info on microchip changed to your name
Pack a bag for your pet that includes:
Food and medicine
Documents of ownership (receipts from adoption or purchase of pet, license to establish ownership, receipts for animal purchases, microchip paperwork)
Health documents (veterinary or vaccination records)
ID and rabies tag info, if a dog or cat (these will also help establish ownership)
Leash, carrier, toys, bedding
*If you must leave without your pet, remember to leave enough food, litter, etc. for your pet
If you have left...
Keep pets indoors and do not let the pets outside alone
Pick a safe route and time to walk your pet. Do not exercise/walk pet alone
Change your veterinarian
If you are getting a protective order, Texas [insert your region] allows pets to be included in that order and police can assist in removal of the pet if he/she was left behind
Important Resources: [list resources in your region and country]
National Domestic Violence Hotline: 1-800-799-7233 / 1-800-727-3224 (TTY)
Online chat: www.thehotline.org
http://www.awionline.org/safe-havens

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HOW TO PERFORM AN EMERGENCY VENOUS CUT DOWN IN THE EMERGENCY PATIENT

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Introduction

Emergency venous cutdowns are a rapid, non sterile technique used to surgially expose superficial peripheral veins for rapid visual IV catheter placement. Indications include patients presenting in shock where IV access is hampered or patients in which multiple percutaneous IV catheter attempts have failed (often defined as more than 5 minutes to place a peripheral catheter and/or more than 3 attempts to pass a percutaneous IV catheter). If vascular access is not achieved with these guidelines, an emergency venous cutdown should be attempted. With practice (cadavers are good models to practice), most clinicians, can perform this procedure faster and more reliably than placing an intraosseous catheter manualy. Newer automated IO techniques (EZIO) however are faster than cut downs. In puppies or kittens with small vessels, the manual IO route is preferred because the cotex of the bone is soft in these patients and the IO space easily accessed with manual IO catheters. In more stable cardiovascular patients, ultrasound guided IV catheters can be placed into peripheral veins.

Any peripheral vein can be used for a cut down, including the saphenous, jugular and cephalic, however, the saphenous is often used in dogs, while the medial cutaneous saphenous vein (using a smaller 22 – 25 ga catheter is often used). If peripheral veins are difficult to find a jugular cutdown can be used in either cats or dogs.

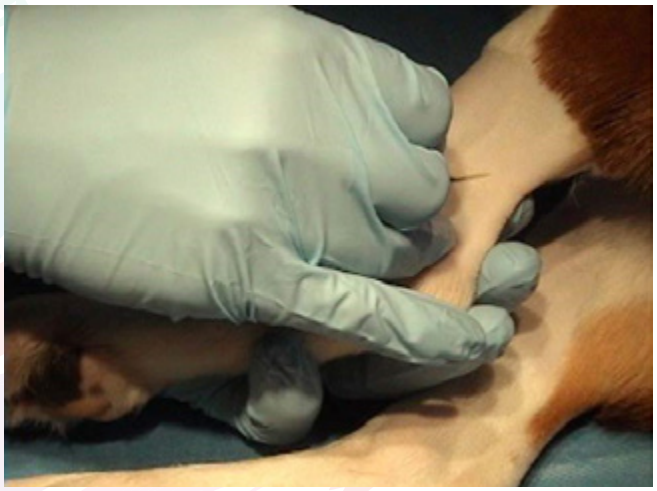
Given the contaminated nature of cutdowns, once the patient is resuscitated and a sterile catheter can be place the cutdown catheter should be removed. Liberal flushing of the incision site with the catheter in place, before removal, is recommended. If the vein bleeds continuously following removal (rare in the absence of coagulopathies) the vessel can be ligated. The wound should not be fully closed to allow drainage and can be covered with a bandage for 48 hours, checking the incision and changing the bandage as needed.

Equipment

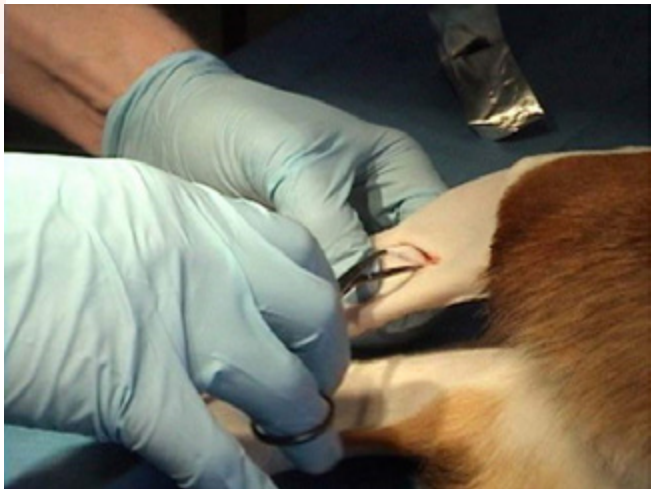
Clippers
Surgical scrub solution
Examination gloves
Vetrap
White tape
Sterile gloves
Needle: 20 and 22 G
IV fluid bag and extension set
IV catheters
Scalpel blades (#11)
Suture material (3-0 and 4-0, absorbable and non-absorbable)
Sterile hemostats for blunt dissection

Procedure:

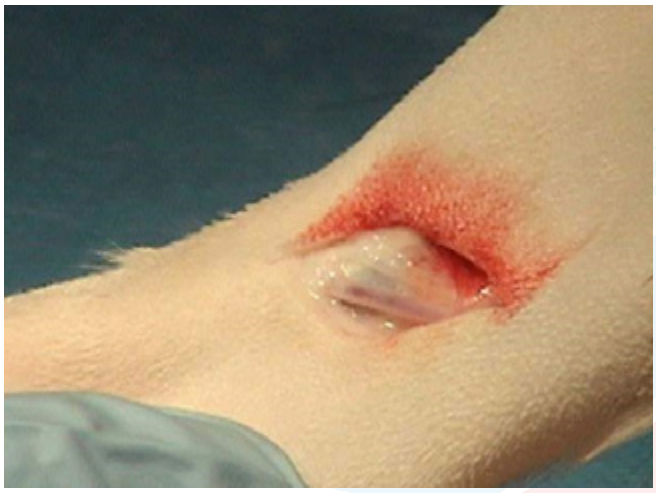
Make a 2-3 cm incision alongside or transverse to the lateral saphenous vein



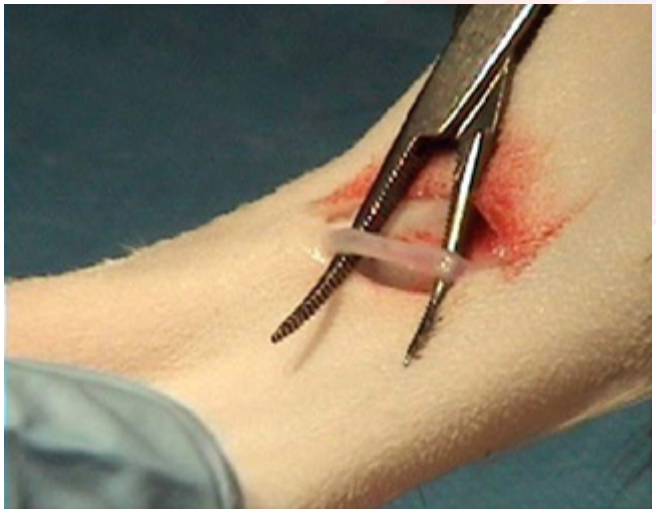
- Retract skin edges to expose the vein
- If the vein is still distended with blood, a cathetermay be inserted directly into the vein in a similarfashion to passing it through the skin
- If the vein is collapsed or direct passage of thecatheter fails, then the following technique should be used
- Use curved tip mosquito forceps to bluntly strip the perivascular fascia away from the vein



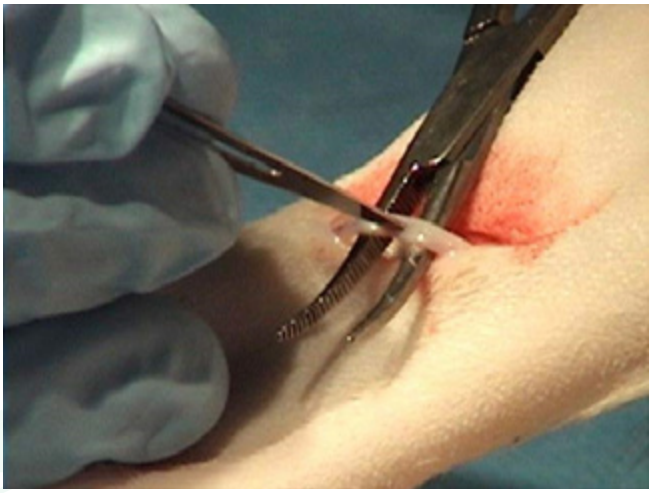
- With the forceps in a closed position, apply firm aggressive pressure to the fascia with the tip of the forceps
- While maintaining pressure on the fascia, open the forceps which should strip the perivascular fascia from around the vein
- Repeat above procedure until fascia is removed (failure to dissect sufficient perivascular tissue is a common cause of failed attempts at venous cut downs)



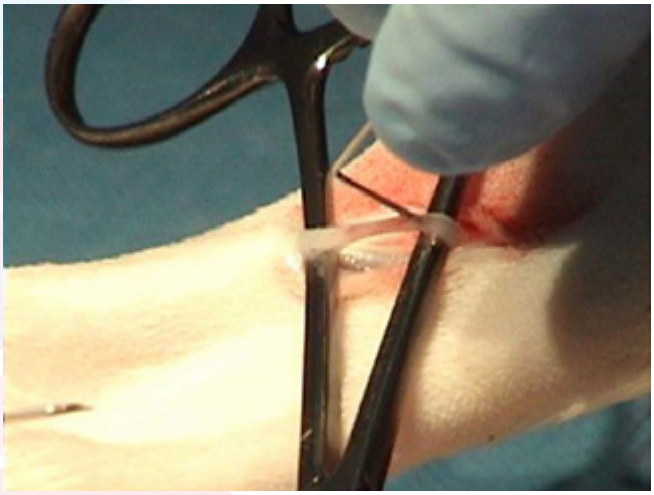
- Pass tip of forceps under the vein



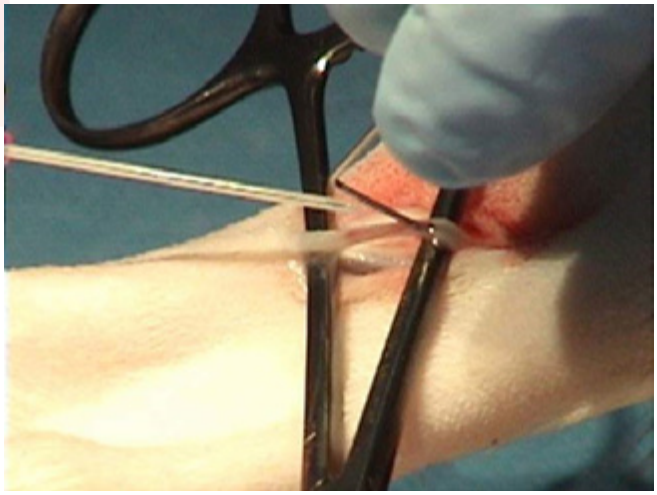
- Incise the vein with a scalpel blade – it is ok to pass a # 11 blade through both sides of the vein

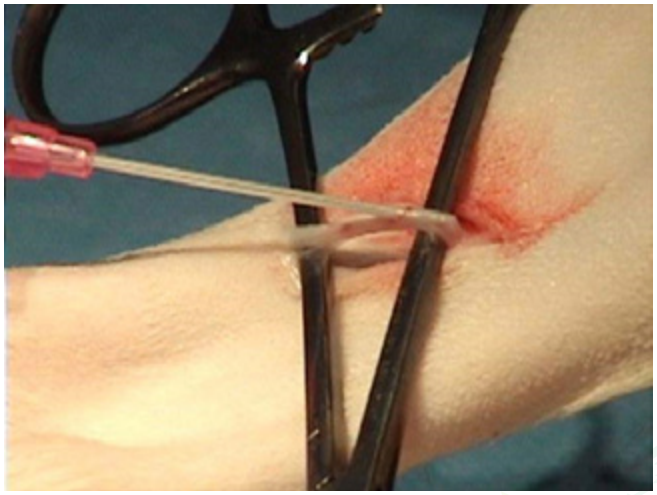


A catheter introducer can be passed into the venotomy, or a bent 22 gauge needle can be used to hold the] incision open and facilitate the passage of the catheter

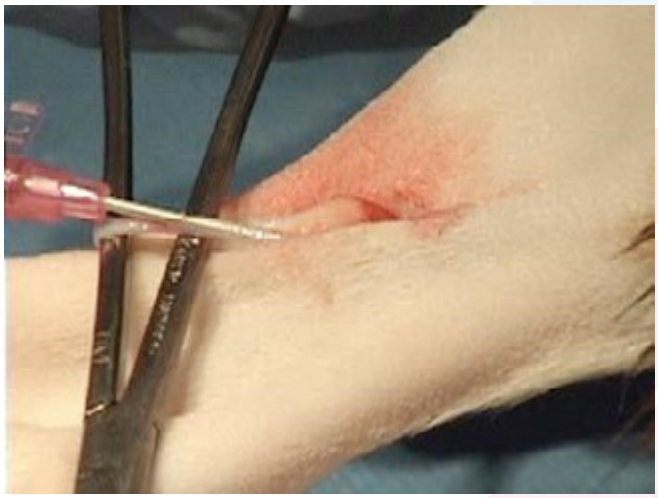


Use an over the needle catheter with the stylet slightly drawn back into the catheter



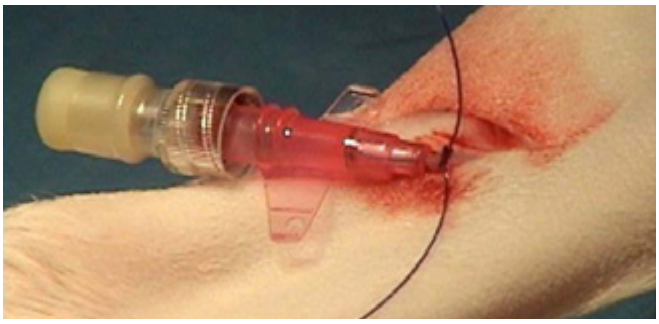


Once the tip of the catheter is in the vein, the introducer is removed and the forceps are pulled toward the paw to straighten and stretch the vein



The catheter is advanced off the stylet, the stylet withdrawn, and an intravenous fluid line is connected directly to the catheter

After placement, the catheter can be sutured to the vein or the wound edges can be pulled together and white tape may be used to hold the skin together and to secure the catheter in place



When the animal is stable a sterile catheter should be placed in a different limb and the cut down catheter removed

When the catheter is removed, firm pressure should be applied to the area for 2-3 minutes.
o If hemorrhage continues, the vein should be ligated
o The skin edges can be partially closed leaving the distal portion of the incision open to drain

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CLIENT EDUCATION: IT›S TEACHABLE! EFFECTIVE COMMUNICATION TO IMPROVE PATIENT OUTCOMES IN PHYSICAL REHABILITATION

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Communication

In the role of veterinary physical rehabilitation, physical fitness, and sports medicine the practitioner assumes the role of both treatment provider and educator. The length and frequency of treatment required provides the ideal environment to develop a strong relationship between patient, client, provider, and clinic. The opportunity to interact consistently with a client can build trust and credibility and place the entire practice in a position to build a lifelong relationship with a client, their current pet(s), and future pets.
Communication research in veterinary medicine has proven that the 'level of pet care received (is directly) linked to communication skills—Communication by the veterinarian plays a significant role in the strength of the bond between a veterinarian and pet owner. The strength of this bond, or relationship, has a direct impact on the loyalty of a pet owner to a veterinarian and the care pets ultimately receive.5'
Research indicates that the relationship centered 'communication model is recognized as an important framework for an ideal health-care system because it identifies the nature of relationships as a fundamental component of the successful delivery of high-quality health care.4'
'Relationship-centered veterinary care is a collaborative veterinarian-client partnership in which there is mutual understanding and recognition of the client's perspectives and expertise in the pet's care through shared negotiations and balance of power.4'

Roles in Communication

The physical rehabilitation provider in practice may assume the role of guardian, teacher, or collaborator based on type of communication or interaction taking place or communication style preference.
Guardian: 'As a guardian the veterinarian is viewed as an expert who makes recommendations that the client is obliged to follow. In this type of interaction there is little discussion of what the client is capable of, desires, or requires. The benefit of this role for the veterinarian is that the clients, theoretically, will do what the veterinarian considers best. An important disadvantage of this role, however, is that because decision-making power is not shared responsibility for treatments outcomes is also not shared. In other words, if the outcome of the treatment is unsatisfactory, the client will likely hold the veterinarian solely accountable.3'
Teacher: 'As the teacher, the veterinarian is merely a source of data and services. No opinion or recommendation is provided, leaving the client to assimilate the information and make decisions according to the data provided. Veterinarians who serve only in the capacity of teacher may find that their clients seek out multiple opinions from possibly questionable sources. This may adversely affect the health of the patient.3'
Collaborator: 'Viewed by many as the optimal choice for both veterinary and client, collaborators provide information and education regarding diagnostic and treatment options, and make explicit their professional opinions. Of equal importance collaborators acquire information regarding client preferences, desires, and needs. These perspectives of the client are actively sought, thus allowing any barriers that may impact the diagnosis, treatment, and adherence process to be more readily identified and negotiated. Because collaborators actively encourage client participation in decision making, a partnership in care is formed. Termed relationship-centered care, this partnership is one of shared decision-making responsibility and outcome accountability. Because clients become equal stakeholders in the decision making process, they are more committed to co-developing feasible strategies for treatment. Ultimately, a collaborative process may produce higher rates of client adherence to proposed treatment plans.3'

Communication Skills

Creating engagement while applying reflective listening skills has been proven to improve the relationship between client and care provider and empower the client to become an active participant in the care team. 'Engagement is the process of making a connection with a client to facilitate the exchange of information. Reflective listening is a skill that uses summarizing, paraphrasing, or hypothesizing to review the information the client has shared, allowing the client to hear his/her own story as understood by the veterinarian. Reflective listening allows the client to add further information, clarify points where the story may be unclear, and correct misconceptions. Perhaps most importantly, the use of reflective listening skills communicates to the client that his/her perspective is recognized and valued, and emphasizes that they are being heard. Empathy is the expression of active concern for and curiosity about the emotions, values, and experiences of another. Empathy suggests an appreciation for what an experiences may be like for the client through seeing, hearing, and accepting the client's perspective and concerns. Open-ended questions allow clients to tell their story in their own words without leading or prompting. The procedure of enlistment includes two processes: decision-making and encouraging adherence.

The goal of these is to encourage client responsibility in making decisions and implementing treatment. Client 'buy-in' to the diagnosis promotes great success in treatment adherence and treatment outcomes. The education portion of the interaction process includes providing medical facts, opinions, and options. This includes assessing the client's perspective of the problem, providing answers to questions clients may have, and assuring the client understanding of what has been discussed in the visit.3'

The Ask-Tell-Ask Technique 1
This approach is based on the notion that client education requires identifying what the client already knows and building on that knowledge. It also works as a way to build a relationship because it shows that you are willing to listen to and negotiate the client's agenda.

#1 Ask: The goal of this first step is to ask your client to describe his or her current understanding of the issue. This will help you craft your message to account for the client's level of knowledge, emotional state, and degree of education.

#2 Tell: Chunk and check. Give a portion of the information and then check in with the client to see how he or she is doing. Example 'Whether a dog develops hip dysplasia is influenced by many things. It might be due to genetics, something in the environment, or even diet. So it's possible that Chance may even be the only dog from his litter to have clinical signs of hip dysplasia. Does that make sense to you?' Acknowledge non-verbal cues. 'You look a little confused, which is not unusual. Many of my clients have a hard time digesting all of this at once, and it's even more difficult now because it's happening to Chance.' Pace yourself and speak in terms clients will understand. Keep in mind that the information is new to them and that medical terminology is frequently like a foreign language.

#3 Ask: Use a rating system to assess understanding. 'On a scale of 1 to 10, how comfortable are you that you understand wat a total hip replacement will mean for you and Chance?' Offer to help them clarify what they will share with loved ones about the condition. 'I know you'll be talking with your wife about this visit later. Do you want to go through it once so I can help you with anything that you are unclear about?' Encourage questions by normalizing reactions. 'That's a pretty complex topic and most people have many questions about it. It is pretty challenging to explain too, so I want to make sure we are on the same page. Do you have any questions?1

'Ineffective communication has been found to produce a lack of client understanding or belief in the importance of the veterinarian's recommendation.4' How well veterinarians explain the reasons for their recommendations drives the clients' perceptions of the value and quality of care. Survey results reveal the strong, positive impact that communication and pet interaction have toward clients following the recommendations of a veterinarian. In fact, a main reason cited by pet owners for not following recommendations was that they felt the recommended treatment was not necessary.5'

'Research suggests that veterinarians' perceptions of their clients' needs and expectations with respect to veterinary health care may differ from what those clients actually need or expect when they bring their animals in for care. Pet owners expected their veterinarian to educate them and be an accessible source of information with respect to their pets' care. A number of participating pet owners expressed an expectation that information related to the process, diagnosis, treatment, and cost be presented up front. Many of the participating pet owners expected veterinarians to provide additional information in the form of written discharge instructions, handouts, pamphlets, or information packets for new pet owners. In particular, owners were seeking information about their pets' condition or disease, the cost of care, insurance coverage, and emergency contact information in a form that could be readily accessible. On the other hand, not every participating pet owner felt it was the veterinarian's responsibility to provide this information, and some owners felt they had a responsibility to educate themselves. Some veterinarians suggested that the emerging expectation among pet owners for additional sources of information on procedures, conditions, and medications was being driven by other health-care professionals, such as pharmacists and dentists.2'

Importance of the bond between a client and veterinarian—Findings of the study reveal that communication skills of a veterinarian are a key driver of a strong relationship between pet owners and their veterinarians. The bond between a client and veterinarian is defined as the tangible relationship between a pet owner and veterinarian as a result of the experience the pet owner has had with the veterinarian on the basis of the veterinarian's communication skills, interaction with pets, and ability to educate the owner about his or her pets' needs.

Clients who have favorable opinions about their veterinarians in these key areas have a strong relationship and are more loyal. They are also more likely to keep the same veterinarian even if they move 45 minutes away. And, they are less inclined to change veterinarians to get less expensive care. Most importantly, they are significantly more likely to do what their veterinarian recommends, regardless of cost. By far, the most crucial component of a strong client-veterinarian bond is communication, which has a tremendous impact on the care pets receive. Clients who believe their veterinarian does a good job communicating and feel they receive enough pet-care information are more likely to have a strong bond with their veterinarian. Importance of veterinarian communication on the care pets receive—Nearly all owners (98%) agreed that their veterinarian does an excellent job of interacting with their pets. However, this study included several questions to determine what role, if any, other forms of communication with the client might play in the quality of care pets receive. Findings of the study revealed a direct link between how well the client perceived that a veterinarian communicated with their propensity to follow recommendations. Study results indicated that the cost of care was not a major obstacle in preventing most owners from following the advice of veterinarians. Instead, confusion, uncertainty, and misunderstanding played far greater roles in noncompliance. Many clients may not have enough information to make the best decisions for their pet. It may be that pet owners do not grasp the importance or the value of the treatment. This uncertainty and lack of perceived value far outweighed concerns about cost. Approximately 7 in 10 (71%) pet owners who believed their veterinarian did a good job communicating followed the orders of their veterinarians. That number decreased significantly (51%) for clients of veterinarians who were not good at communicating. This demonstrates that good communication can produce a 40% increase in clients who follow recommendations.5'

'Adherence has been described as an outcome that arises from a collaborative and mutual relationship with the health professional and implies that clients make intentional choices concerning treatment regimens on the basis of the diagnosis and their beliefs about the illness and the accompanying treatment options.4' 'To achieve adherence the veterinarian must also assure there is client understanding. Steps the veterinarian may take to help increase the likelihood of adherence include: keeping the regimen simple, writing the regimen out in clear and simple terms, providing pictures if necessary, motivating the client by giving specific information about the benefits of treatment and the risks of not treating or treating inappropriately, preparing the client for side-effects, thoroughly discussing any obstacles they perceive regarding the mutually agreed upon plan, and finally, asking the client for their input and evaluating their conviction to the plan.3'

Multiple Intelligences

The theory of multiple intelligences was developed in 1983 by Dr. Howard Gardner, professor of education at Harvard University. It suggests that the traditional notion of intelligence, based on I.Q. testing, is far too limited. Gardner's theory initially listed seven intelligences which work together: linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, interpersonal and intrapersonal; he later added an eighth, naturalist intelligence and says there may be a few more. The theory became highly popular with K-12 educators around the world seeking ways to reach students who did not respond to traditional approaches, but over time, 'multiple intelligences' somehow became synonymous with the concept of 'learning styles.8' Although very different 'both multiple intelligences and learning styles can work together to form a powerful and integrated model of human intelligence and learning—a model that respects and celebrates diversity and provides us with the tools to meet high standards.9'

Learning Styles

Style or Learning Style: A style is a hypothesis of how an individual approaches the range of materials. When researchers have tried to identify learning styles, teach consistently with those styles, and examine outcomes, there is not persuasive evidence that the learning style analysis produces more effective outcomes than a 'one size fits all approach.1

The Mastery Style Learner absorbs information concretely; processes information sequentially, in a step-by-step manner; and judges the value of learning in terms of its clarity and practicality.

The Understanding Style Learner focuses more on ideas and abstractions; learns through a process of questioning, reasoning, and testing; and evaluates learning by standards of logic and the use of evidence.

The Self-Expressive Style Learner looks for images implied in learning; uses feelings and emotions to construct new ideas and products; and judges the learning process according to its originality, aesthetics, and capacity to surprise or delight.

The Interpersonal Style Learner, like the mastery learner, focuses on concrete, palpable information; prefers to learn socially; and judges learning in terms of its potential use in helping others.9

Applying Effective Communication Techniques and Education and Multiple Intelligence Theory and Learning Styles to Improve Therapeutic

Exercise Outcomes
'Therapeutic exercises are a daily part of the rehabilitation veterinary technician's routine. The therapist chooses the exercises, and the technician carries them out. Exercises may focus on improving proprioception, balance, speed, endurance, focal strength, pelvic limb function, forelimb function, neurologic function, or land treadmill endurance training.7'

We know that 'clear client communication and education are also essential to successful rehabilitation. The owner/handler must be well educated on the exercise program, especially the home exercise program. However, each client's needs and expectations can vary depending on the time available for home exercises. The client needs guidance for home exercises, and the completion (or not) of home exercises should be documented in the record. Often, printed instructions, as well as verbal and physical directions, need to be provided for the client to completely understand what each exercise entails. This is also documented in the record.6'
Based on the previously discussed research findings the physical rehabilitation practitioner, client, and pet all benefit when the practitioner makes the conscious choice to provide relationship centered care by taking on the role of collaborator in communication combined with the use of reflective listening skills. By acquiring information about client perspective, preferences, and needs the practitioner is able to address barriers to treatment and develop a partnership to formulate a collaborative plan that encompasses shared decision-making responsibility and adherence to treatment plan. This approach increases the potential for successful outcome of the treatment plan.

Relationship centered care allows for the development of trust between client and practitioner. Addressing client learning styles by providing a variety of resource tools and communication methods allows clients to take charge of their own education regarding their pets diagnosis and treatment plan. Providing educational resources in a variety of formats allow clients to choose their preferred format for receiving information. Use of words (written and recorded) will appeal to linguistic intelligence, facts, numbers, statistics, protocols, flow charts will appeal to logical-mathematical intelligence, clients strong in bodily-kinesthetic intelligence will appreciate a see one, do one hands on approach to therapeutic exercise, clients with spatial intelligence may prefer to see diagrams, build therapeutic exercise equipment, or rent equipment to create own therapeutic exercise activity environments. self-expressive style will take the goals and create o

Clients with high interpersonal intelligence may like to attend group classes or spend time in your centre helping others or write blogs to share their experience. Intrapersonal intelligence focused clients will appreciate a practitioner that is focused on how they directly can impact their pets recovery and mobility. These clients may appreciate being provided with a chart or diary to record their pets progress and details of what they personally did to impact their pets recovery. Clients with high naturalist intelligence may appreciate environmentally friendly and natural choice of care for their pet and environmentally friendly choices within your facility. The mastery style learner will appreciate concrete, sequential information. They will appreciate a clear and practical approach to therapeutic exercise. The understanding style learner will appreciate starting with a goal, known as the 'idea' and will learn through questioning, reasoning, and trying a variety of approaches to reach the goal. The riginal ways to reach the goal and delight in surprise and celebrate when they find a way to achieve the therapeutic exercise goal. The interpersonal style learning will focus on concrete information, learning socially and provide the practitioner with feedback in the interest to potentially help others.

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ANTIMICROBIAL THERAPY IN REPTILES

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Most of the antimicrobial research in herps has been limited pharmacokinetic, NOT pharmacodynamic studies. What that means is that although several drugs have been evaluated in several different herp species, only drug levels and suggested dosages have been evaluated, NOT the actual effect on the patient or the pathogens within the patient. Also to note, what little information that is available shows that different species respond differently to the same drug at the same dosages. So we may know, based on limited research, that you should give a snake a loading dose of 5.0 mg/kg of Amikacin, followed by 2.5 mg/kg every 72 hours, we actually have no idea what effect it has on the animal's physiology or even it is going to work to rid the infection. There are a number of factors that must be considered when choosing an antibiotic. The results of microbiological culture and sensitivity testing, the species being treated, physical condition of the patient, fre¬quency of administration, cost of the therapy, owner compliance, and a host of other factors are all important.
The veterinary clinician must have a thorough understanding of reptile physiology and biology prior to administering medications. Since all reptiles are ectotherms, and their metabolism is temperature dependent, they will often react unpredictably to the same drug in different settings. A good working knowledge of the more common species of reptiles, their life histories and their peculiarities will help prevent potential disasters during therapy.

General Considerations

Dehydrated or hyperuricemic patients should be properly rehydrated prior to initiating therapy. It is the rare case that cannot wait one to two days to assure appropriate hydration prior to treatment. However, if for some reason treatment must be instigated immediately, it would behoove the practitioner to choose a non-nephrotoxic drug.

Pharmacokinetic studies have shown that an in¬crease in ambient temperature tends to increase both the volume of dis¬tribution and body clearance of the drug. A decrease in ambient tempera¬ture with a resultant decrease in body clearance could potentially allow a build up in concentration of the drug to a point where it might reach toxic levels if dosing is not decreased accordingly.

When reptile pathogens are treated at higher temperatures the Mean Inhibitory Concentration (MIC) needed to achieve effective treatment significantly decreases. This allows for a lower dose of antibiotic to be given, another positive factor when dealing with potentially nephrotoxic drugs.
Most researchers feel that it is best to treat sick reptiles near the higher end of their preferred optimum temperature zone. Not only is it beneficial for reasons already mentioned, but elevated ambient tempera¬tures have been shown to stimulate the host›s immune system and aid in fighting disease in other ways already discussed.

In critically ill or immuno-com¬promised reptiles, bactericidal, rather than bacteriostatic antibiotics are preferable. In cases of gram negative sepsis, especially with Pseudomonas infections, the reptile patient is often severely immuno¬compromised.

In many cases the animals are infirmed because they have been im¬munocompromised due to improper husbandry conditions. The most com¬mon cause is from being maintained at suboptimal environmental tem¬pera¬tures.

Methods of administration

There are very few instances where oral antibiotic therapy is re¬quired. Enteric infections often warrant oral administration of appropri¬ate drugs. There are two common methods for administering oral antibi¬otics. If the patient is still feeding, the antibiotic can be mixed with the food or injected into the dead prey and fed to the animal. Gavaging, or stomach tubing, is a second technique which can be used to administer oral medications.

Topical anitbiotic therapy

Although oral dosing of systemic antibiotics is not commonly done, it is not uncommon to actually treat the oral cavity itself. This is often done in cases of severe Infectious Stomatitis where the oral cavity is ab¬scessed. Since the vascularity to an abscessed oral cavity is usually compromised, antibiotics given systemically may not be able to reach ad¬equate therapeutic levels in the infected tissues. Aminoglycoside an¬tibiotics have decreased activity in anaerobic or acidic environments. When treating with a drug like enrofloxacin systemically you can also use topical flouroquinolone on the lesions in the oral cavity. Daily application of Ciloxin® ophthalmic solution, one drop on each affected area, works well.

Silvadene® is a soft, white, water-miscible cream containing the antimicrobial agent silver sulfadiazine. This bactericidal cream is ef¬fective against a broad range of both gram positive and gram negative bacteria, including Pseudomonas aeruginosa, as well as some

of the yeasts. Silvadene® is easily applied with a cotton tipped swab or other applicator. A dressing is not necessary unless the area being treated is in a location where the cream may be rubbed off. Otherwise, the cream will last for two to three days before a new application is re¬quired.

Injectable antibiotic therapy

Injectable antibiotics are probably the best form for assuring proper delivery of the drug. The antibiotics are either injected intramuscularly, or less commonly, subcutaneously. The intravenous route is often limited by the availability of venous access. The size and species being treated will determine whether intravenous infusion is possible.

An important consideration when selecting an antibiotic is its abil¬ity to penetrate the target tissue site. In cases of severe Infectious Stomatitis, the vascular supply may be compromised to the oral cavity in the area of the lesions. This may prevent good pene¬tration of the antibiotic to the site of infection.
Another method of assuring adequate antibiotic levels to the af¬fected tissue is to calculate the total systemic dose, draw it into a sy¬ringe, and then add an equal volume of bacteriostatic water to dilute it out to half concentration. Inject three-fourths of the dose intramuscu¬larly, and the remaining quarter dose directly into the region of the mouth where the infection is present. If you need to inject in more than one place in the mouth it is a good idea to switch needles to prevent seeding of bacteria from one site to another.

Renal and Hepatic Portal Systems

Reptiles have both renal and hepatic portal systems. Thus, unless it is known how the particular drug is cleared from the body, it is best to use the front half of the body when administering systemic medications.

Fluid therapy

Since reptiles are uricotelic, that is, they excrete uric acid as the end product of protein metabolism, they are readily susceptible to vis¬ceral gout.
The patient should be supplemented with physiologic fluids at 15-25 ml/kg on the days it receives antibiotic treatment. The fluids can be given orally, intracoelomically, or subcutaneously in the lateral sinus. The latter is located at the junction between the epaxial musculature and the ribs.

TABLE 1 - Common bacterial isolates, their pathogenicity and the antimicrobials recommended.

ORGANISM	PATHOGENIC†
Acinetobacter spp.	+++
Actinobacillus spp.	+++
Aeromonas spp.	++++
Bacteroides	+++
Citrobacter freundii	++++
Clostridium	+++
Corynebacterium spp.	++++
E. coli	++
Edwardsiella spp.	+++
Enterobacter ssp.	+++
Klebsiella spp.	++++
Micrococcus spp.	No
Morganella spp.	++++
Mycobacteria	++++
Pastuerella spp.	+++
Proteus spp.	++++
Providencia spp.	+++
Pseudomonas spp.	++++
Salmonella	? to ++++
Serratia spp.	++++
Staphylococcus spp.	+++
coagulase positive	NO
Staphylococcus spp.	NO
coagulase negative Streptococcis spp.	NO
alpha-hemolytic Streptococcus spp.	NO
beta-hemolytic	+++

†(+)not pathogenic; (+) to (++) opportunist to varying degress of pathogenicity; (++++) pathogenic

*nn - none needed; A - Aminoglycoside; C - Cephalosporin; F - Floroquinolone; M - Metronidazole; P - Penicillin
Table 2: 10 Steps for Rational Antimicrobial Use

1. Initial assessment - Always perform a proper, thorough physical examination, including evaluation of the animal›s state of repletion (starvation plays a significant role in antibiotic choice due to catabolic effects and an increase in uric acid production), and hydration.
2. Warm the animal up to its POTZ (it is the RARE case that cannot wait for the patient to be properly warmed prior to initiating antibiotic therapy). Monitor the patient›s body (cloacal) temperature.
3. Fluids as needed.
4. Diagnostic sample collection - blood for (CBC/chem, culture), urine (microscopic analysis, culture), specific specimen cultures (lung wash, cloacal or colon wash), aspirate of masses, etc. (if possible, obtain blood samples prior to fluids).
5. Determination of method of administration (oral, systemic, topical). Coordinate your choice with owner experience/compliance.
6. Choice of drug - general vs. specific, single drug vs. combination therapy - see later.
7. Adjustment of dosages (correction for dehydration, renal function, bacterial culture and sensitivity results, etc.).
8. Proper follow-up and patient monitoring (recheck and progress checks, serial uric acid measurements).
9. Author›s first drugs of choice: amikacin (caution renal patients), ceftazidime, enrofloxacin, trimethoprim-sulfa.
10. Drugs for combination therapy: metronidazole, piperacillin. Example, combine amikacin with metronidazole.

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IS IT POSSIBLE TO TREAT FELINE INFECTIOUS PERITONITIS?

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Since FIP is in part immune-mediated in pathogenesis, treatment aimed at controlling the immune response has been used, using prednisolone at 2-4 mg/kg/day, with a tapering of dose slowly if the cat responds to treatment. However, there are no controlled studies to prove any beneficial effect of corticosteroids, although they are frequently used.

One uncontrolled study suggested that feline interferon omega (IFN-w) (given with glucocorticoids) treatment could be beneficial in FIP but the diagnosis was not confirmed in those cats that survived1, and a subsequent randomized placebo-controlled double-blind treatment study in 37 cats with confirmed FIP2 showed no benefit of IFN-w and immunosuppressive levels of glucocorticoids than glucocorticoids alone, although the cases treated were likely very late in the course of disease.

As long ago as 2009, a small study3 described the use of oral polyprenyl immunostimulant (PPI), which upregulates Th-1 cytokines, in the treatment of 3 cases of non-effusive FIP. In two of the cats the FIP diagnosis was based on the finding of pyogranulomatous lymphadenitis on lymph node aspirates whereas the third was confirmed as FIP by positive FCoV antigen immunostaining on histopathology of a lymph node. Two of the three cats remained alive and well on treatment 2 years after diagnosis whilst the third cat survived 14 months but was treated for only 4.5 months. A larger study evaluating oral PPI treatment three times per week in 60 non-effusive FIP cases (16 gastrointestinal, 18 mixed, 11 non-localised, 9 ocular, 5 neurological, 1 with no clinical signs) was recently published4; this study did not include untreated controls for ethical reasons. In this study the diagnosis of non-effusive FIP was largely made by the attending 1st opinion veterinarian, sometimes with the help of veterinary specialists, but only 13 of the 36 cats that had so-called specialised laboratory testing had FCoV immunostaining performed, although it is recognised that sampling for the diagnosis of non-effusive FIP cases is notoriously difficult. Of the 60 cats, 8 survived for over ~6 months, including 1 cat for 2 years and 1 cat for just over 5 years. During this study, cats could be treated with additional drugs, and it was found that the survival of the cats that were given corticosteroids concurrently with PPI was significantly shorter than those given PPI without corticosteroids. No side effects were reported with PPI treatment. The author recommend that a controlled study is performed to verify PPI's benefit. PPI is commercially available, although costly.

Recent studies have focused on the use of novel anti-viral agents as treatment. These anti-viral agents have included protease inhibitors, which inhibit proteases that normally process FCoV polyproteins into mature proteins during FCoV replication, and nucleoside analogues, that act as an alternative substrate for RNA synthesis for FCoVs, resulting in RNA chain termination during viral RNA transcription. None of the in vivo studies with protease inhibitors or nucleoside analogues described later have included untreated control cats for ethical reasons.

Protease inhibitor agents, such as 3CLpro inhibitors, have been shown to have activity against FCoV in vitro5,6, prompting in vivo studies7. One 3C-like protease inhibitor compound, GC376, showed great promise in an experimental study in young cats with effusive FIP7 where 6 of 8 cats with induced clinical FIP recovered from disease following 2-3 weeks of 5-10 mg/kg BID SQ GC376 treatment. The 6 recovered cats all remained healthy during an observation period of 8 months, although a subsequent publication documented that one of these cats had succumbed to neurological FIP 6 months later8. It is know that experimentally induced FIP differs markedly from naturally occurring FIP (e.g. experimental infection is usually induced by intraperitoneal inoculation of a laboratory-derived FIP-associated FCoV which results in acute effusive disease in 80-100% of infected cats, rather than naturally occurring FIP which arises following initial enteric FCoV infection in up to 10% of infected cats and can take weeks to develop and manifests in different forms of FIP). Thus it is important to evaluate potential treatments in naturally occurring FIP and GC376 treatment was thus then evaluated in naturally occurring FIP8.
In the study of naturally occurring FIP, 20 cats with effusive or non-effusive FIP8 were recruited. Cats were confirmed as having FIP based on signalment, history, prior test results, clinical examination, repeat of blood and effusion testing and ultrasonography and ophthalmological examinations when necessary. The study describes that the presence of 'FIP virus' was confirmed by reverse-transcriptase (RT-)PCR in effusions at admission or at post-mortem examination. But the number of cats on which these diagnostic methods were used was not stipulated and a lack of reference to the use of histopathology or effusion cytology and immunostaining for diagnosis is a possible limitation of the study.

However, the difficulties in obtaining a definitive diagnosis in such a study is acknowledged. The 20 cats with FIP were administered GC376 SQ BID; the dose (15 mg/kg) used was higher than that used in the experimental FIP study7 due to treatment failure occurring after 9 days of treatment in the 1st of the natural cases of FIP treated. The 1 st 5 cats in the study were treated for 2 weeks, similar to the experimental study, but due to relapse of clinical signs (typically 1-7 weeks after primary treatment), repeat treatments, and longer treatment courses (of ≥ 12 weeks), were used on cats showing relapses and in newly recruited cases. Of the 20 treated cats in the study, 6 cats (these were mostly young acute effusive FIP cases) showed long-term remission of ≥ 18 months (this duration was stipulated in a subsequently published study9 rather than being in the original paper) following GC376 treatment. Those successfully treated cats had usually had a long course (12 weeks) of GC376 treatment. A sustained remission was not seen in all cats following GC376 treatment and some side effects were reported; injection reactions and abnormal eruption of permanent teeth. The cats that showed relapses of FIP often showed signs of neurological FIP.

A more recent study9 has described treatment using the nucleoside analogue GS-441524 in an experimental study in young cats with effusive FIP. In this study 10 cats that developed effusive FIP were treated with GS-441524 SQ SID for 2 weeks and showed a rapid reversal of clinical signs. Two of the 10 treated cats required a 2nd treatment course following a relapse at 4 and 6 weeks post-treatment, respectively, and both improved again. All 10 treated cats remained clinically healthy until the time of publication, at least 8 months post-infection. No signs of toxicity were noted besides a transient «stinging» injection reaction in some cats9 and a treatment dosage of 2 mg/kg SQ SID was recommended for use in future studies.

This GS-441524 treatment has just been evaluated in a field study of 31 cats with FIP10. Cats were confirmed as having FIP based on signalment, history, clinical examination, prior test results, repeat testing and/or effusion analysis, with FCoV RT-PCR performed on effusions when possible. Cat with neurological or ocular signs were discouraged from the trial due to previous concerns of poor penetration of GS-441524 into the brain and/or eye9. Of the 31 cats with FIP recruited into this study10, 26 had evidence of effusion. Cats ranged from 3.4-73 months of age (mean 13.6 months). The cats were started with a primary treatment course of GS-441524 at a dosage of 2 mg/kg SQ SID for ≥ 12 weeks (with > 12 weeks of treatment given if serum protein levels remained elevated). The dosage was increased to 4 mg/kg SQ SID for secondary treatments later in the trial for when cats showed a relapse or when a ≥ 12 week treatment course was deemed necessary due to persistence of clinical signs.

Five of the 31 cats died or were euthanized within 26 days of primary treatment. The remaining 26 cats completed ≥ 12 weeks of GS-441524 treatment and showed rapid clinical improvement within 2 weeks. Of these 26 cats, 18 remained healthy, while eight others showed FIP relapses (6 non-neurological and 2 neurological) at a mean of 23 days following treatment. Three of the eight relapsed cats were treated again with GS-441524 at 2 mg/kg SQ SID; one of these three cats relapsed with neurological disease and was euthanized whilst the two remaining cats responded well but relapsed with FIP again and were treated again with GS-441524 but at a higher dosage of 4 mg/kg SQ SID. Of the original 31 cats, 25 long-time survivors that underwent successful treatment were described, but one of these cats was subsequently euthanized due to presumed unrelated heart disease, while 24 remain healthy at the time of publication (published February 2019, and some of the cats had started on the trial spring 2017).

Neither GC376 nor GS-441524 are currently available but both are undergoing approval for commercial sale. However illegal/non-licensed production of these products has been reported in some parts of the world but the lack of biological safety data and information on the purity of such compounds means that their use cannot be recommended.

REFERENCES AVAILABLE UPON REQUEST

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EMERGENCY APPROACH TO DKA

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Diabetic ketoacidosis (DKA) is a severe alteration of metabolism caused by an insulin deficiency and is a sequela of uncontrolled diabetes mellitus. The insulin deficiency causes a lack of cellular uptake of glucose, which leads to cellular starvation in the face of hyperglycemia. Negative energy balance results in hepatic production of ketones as an alternate energy source. Ketones are organic acids, and a severe metabolic acidosis ensues. Hyperglycemia overwhelms the renal threshold for glucose reabsorption and glucosuria follows. Glucosuria and ketonuria promote an osmotic diuresis with water and electrolyte losses that exceed intake in the ill patient. Severe dehydration and electrolyte disturbances follow.

Ketone bodies include acetone, acetoacetate, and ß-hydroxybutyrate.1 During treatment of ketoacidosis, ß-hydroxybutyrate is converted to acetoacetate.

FLUID THERAPY

The first priority in treating DKA patients involves rehydration. An intravenous isotonic crystalloid solution is recommended (PLA, Normosol R, LRS) or 0.9% NaCl (if Na+ is below the reference range). Hypotonic fluids e.g. 0.45% NaCl, are reserved for rehydrated patients. Fluid deficits should be corrected within the initial 24-hour period. Prompt rehydration is vital to restore circulating volume and tissue perfusion, clear ketones, and correct electrolyte imbalances.2 Early re-assessment to establish appropriate response to fluid therapy is critical as ongoing losses (e.g. polyuria, vomiting) can be profound.

BLOOD GLUCOSE REDUCTION

Frequent blood sampling for glucose monitoring is necessary; a sampling catheter is strongly advised. Blood glucose (BG) will initially decrease with rehydration, and subsequently with insulin administration. Insulin drives glucose into the cells eliminating the stimulus for ketone production. Insulin also promotes ketone metabolism. The goal of DKA therapy is to maximize insulin administration until resolution of ketonemia/ketonuria.

Regular insulin is the most widely used and recommended insulin for the treatment of DKA. Protocols for intravenous (IV) sliding-scale infusion, or intramuscular/subcutaneous regular insulin administration have proven successful to resolve ketosis.

Veterinarians are urged to use whatever regular insulin protocol they are most comfortable with.1 The goal of insulin therapy is to reduce and maintain serum glucose concentration between 5.5 - 14 mmol/L (100 to 250 g/dL), while maximizing insulin administration. When the animal's BG falls below 14 mmol/L, dextrose (2.5-5%) is added to the crystalloid fluids so as to continue to allow administration of insulin without causing hypoglycemia.3 Regular (Toronto) insulin, when delivered intravenously via constant rate infusion (CRI) has an almost immediate onset of action; its effects cease rapidly upon its discontinuation.4

Intravenous Insulin CRI Sliding Scale (example)

Blood glucose mmol/L	Blood glucose mg/dL
	>250
11 - 14	200-250
8 - 11	145-200
5 - 8	90-145
<5	<90

*Prepare a dedicated insulin infusion line – regular insulin - 0.1 U/kg/hr diluted in 10 mls of 0.9% NaCl. Prepare several hours in a syringe or buretrol for patient delivery.
**Dextrose is supplemented in the patient's intravenous fluids

When regular insulin is administered intramuscularly (IM) or subcutaneously (SC), its duration of action ranges from 2-4 hours to 4-6 hours respectively.
Emerging considerations regarding insulin administration:

- Early initiation of insulin therapy is associated with a more rapid resolution of DKA in cats and dogs without significant differences in complication rate.5 In human medicine insulin is initiated after the first hour of intravenous volume resuscitation, pending a serum potassium concentration $\geq$ 3.3mmol/L.2

- Omitting an initial intravenous regular insulin bolus prior to starting a CRI, as this practice had no added benefit, and may precipitate or aggravate the development of hypokalemia.6
- Transitioning to subcutaneous long-acting insulin PRIOR to regular insulin discontinuation. IV insulin should be continued for 1–2 hours after the first administration of SC basal insulin.4

- Continuation of the patient's SC long-acting (basal) insulin during the management of DKA is currently a very HOT topic in human medicine. Concomitant administration of long-acting, basal insulin with regular insulin infusion accelerates ketoacidosis resolution and prevents re-bound hyperglycemia.7

A pilot study compared intermittent administration of glargine (0.25 U/kg SC every 12 hours) and regular insulin (1 unit/CAT, IM up to every 6 hours) to a CRI of regular insulin in cats with naturally occurring DKA. The investigation identified that intermittent short- and long-acting insulin injection was useful for the treatment of cats with DKA.8

A second study explored glargine IM +/- concurrent SC glargine for the treatment of feline DKA. This protocol was effective in the management of feline DKA and may provide an alternative to regular insulin CRI.9
A recommended protocol for cats ensues: 1
- 2 U glargine/CAT SC on initiation of fluid and electrolyte replacement.
- Begin 1 U/CAT glargine IM, 1–2 h later (up to 4 h if persistent hypokalemia).
-Repeat IM glargine 4 or more hours later if glucose is >14 mmol/L (252 mg/dL).
-Continue SQ glargine every 12 h.
-Provide IV dextrose as described in the sliding scale table to maintain blood glucose levels 12–14 mmol/L (216–255 mg/dL) in the first 24 h.

MANAGEMENT OF ELECTROLYTE DISTURBANCES

Hypokalemia is anticipated within 2 - 4 hours of initiating insulin therapy and must be closely monitored and proactively supplemented. A guide to potassium supplementation in the patient's total fluid rate follows:

Patient's potassium (mEq/L)
3.7-5.0
3.2-3.7
<3.2

Hypophosphatemia is also expected and anticipated within 12-24 hours of initiating insulin therapy. Severe hypophosphatemia (phosphorus <0.3 mmol/L, 0.93 mg/dL) can precipitate a hemolytic crisis and should be actively avoided and treated. Phosphorus is supplemented with NaPO4 or KPO4 . Consider using KPO4 to address the hypokalemia and hypophosphatemia concurrently; decrease KCl administration accordingly.3 Recommended doses for KPO4- supplementation range from 0.03-0.12 mmol/kg/hr; typically 0.04-0.06 mmol/kg/hr of phosphorus for 12 hours achieves normalization of phosphorus during insulin administration. Once the patient is rehydrated and no longer receiving variable fluid rates, KCl and KPO4 can be combined with 20 mEq KCl/L and 20 mEq KPO4/L (each delivering 20 mEq of potassium) added to a 1L bag of IV fluids and delivered safely at regular hourly fluid rates. Sodium bicarbonate is discouraged. Only if a metabolic acidosis with a pH < 6.9 is noted, do human guidelines recommend supplementing bicarbonate until pH > 7.0.2 Conservative doses are selected. Administer 1/3 to of a calculated bicarbonate deficit.

Bicarb deficit = 0.3 x BW (kg) x (24 – patient bicarbonate).

OTHER THERAPIES

If urinalysis is suggestive of urinary tract infection, a first line antibiotic such as ampicillin is recommended pending results of urine culture and sensitivity.
Antiemetics are frequently warranted in patients with DKA. Patients can receive metoclopramide, maropitant, ondansetron or a combination for the management of severe nausea.
Nasoesophageal or nasogastric enteral nutrition should be initiated as soon as emesis is under control.
Other treatments are directed at the underlying causes that may be precipitating the DKA crisis.

PATIENT MONITORING

Patients diagnosed with DKA require 24-hour care and close monitoring. Vital parameters should be monitored continuously until the patient is stable, and then at least once every 12 hours. Blood glucose monitoring should be performed initially every 2 hours and subsequently extended to every 2-6 hours once a stable glucose is achieved. Electrolyte and blood gas assessment should initially be performed every 4 hours and once stable q12-24 hours. With resolution of acidosis, and ketonuria (~2-3 days),5 nausea and vomiting abate, and appetite resumption is expected. Once patients are eating voluntarily, regular insulin is discontinued.

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HOW TO MANAGE FELV AND FIVA

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General treatment

Management wise, retrovirus-infected cats should be kept indoors, neutered and not fed raw meat or allowed to hunt (risk of toxoplasmosis) and preventative ecto- and endo-parasite treatment should be given7,8. Ideally they should be kept in single cat households. If the latter is not possible, the retrovirus status of in-contacts should be considered in optimising care. As FIV is primarily transmitted by fighting and biting, cats in stable multicat households may not transmit infection between them although the risk is always there. Cats in contact with FeLV infected cats, that do not show any evidence of FeLV infection (regressive as well as progressive infection) should be vaccinated, although protection cannot be guaranteed.

Close monitoring of retrovirus infected cats is encouraged via scheduling of veterinary/nursing appointments every 6 months for a full clinical examination and subsequent investigations as required. Weight loss, lymphadenopathy, clinical signs of upper respiratory infection (e.g. ocular or nasal discharge) and oral health are particularly important to note, as well as ophthalmic examination. Routine haematology, serum biochemistry, urinalysis, urine culture and faecal examination may be indicated and should be done routinely at least once a year.

Vaccination is reserved for cats that are likely to contact other cats and should ideally comprise inactivated vaccines9; the potential benefits and risks of vaccinating FIV (and FeLV)-infected cats should be weighed up in individual cats7. The vaccination of FeLV-positive cats against FeLV is of no benefit8.

Supportive care is obviously important. Cats in the terminal phase (acquired immunodeficiency syndrome - AIDs) of FIV infection may require fluid therapy, nutritional support, dental care and treatment of opportunistic infections (i.e. dentistry, mouth washes, antibiotics etc). Opportunistic infections need to be treated appropriately but prolonged treatment may be required for retrovirus infected cats. FeLV-associated lymphoma can undergo chemotherapy/radiotherapy; studies variably report that FeLV is a negative prognostic indicator for cats with lymphoma so chemotherapy can still be given10. Blood transfusions may be indicated for anaemic cases but the ethics of collecting blood from a donor cat needs to be carefully considered.

Retrovirus-infected cats with immune-mediated diseases (e.g. immune-mediated haemolytic anaemia, immune-mediated polyarthritis) can benefit from the cautious use of prednisolone (2 mgs/kg/day; lower end of immunosuppressive dose range in cats)

Specific treatments

Human interferon-□ (hIFN-□) and recombinant feline interferon-w (rIFN-w; Virbagen Omega; Virbac) are both type I IFNs that have immunomodulating effects due to interaction with specific cell receptors and induction of gene expression for cytokines involved in innate immunity. Type I IFNs are produced by virally infected cells. rIFN-□ is preferentially used in cats as neutralising antibodies can be induced by hIFN-□. The beneficial action of IFN in retroviral infected cats is believed to be due to modulation of innate immunity as clinical improvements occur without changes in levels of viral DNA/RNA or immunological (e.g. CD4/CD8 ratio) parameters11, and decreased pro-inflammatory stimuli12 and increased acute phase proteins13 are seen.

Two IFN-□ treatment regimens have been described; high dose SQ injections (1 million units/kg SQ SID for 5 consecutive days for 3 courses starting on days 0, 14 and 60; the licensed protocol for Virbagen Omega) or low doses PO (0.1 million units/cat PO SID for 90 days). A placebo-controlled double-blind study using the SQ IFN-□ treatment regime in FeLV or dual FeLV-FIV naturally infected cats14 showed a significant improvement in clinical scores at 4 months (not reassessed thereafter) and survival at 9 months (non-significant at 12 months) in treated c.f. untreated cats. All cats also received supportive care (but not glucocorticoids). No significant changes in haematological parameters were seen. Another study with SQ IFN-□11 in FeLV or FIV naturally infected cats found a significant improvement in clinical score in treated (~9 months after starting treatment) c.f. untreated cats, especially those that were sick, as well as improved haematological variables, although significance was not reported for these. The length of the positive effect seen in this study suggested that the effect of IFN-□ persisted beyond the treatment period. Another study15 reported SQ IFN-□ treatment in FeLV, FIV or dual FeLV/FIV naturally infected cats in a shelter environment; significant improvements in clinical scores were seen in the cats following treatment (c.f. before treatment as the cats acted as their own controls), but when cats were more closely evaluated according to infecting agent, only those infected with FIV alone (and especially those showing more marked clinical signs of gingivitis/gingivostomatitis) showed a significant improvement. A recent study16 used oral IFN-□ treatment in naturally FIV-infected cats and compared this to previous SQ IFN-□ treatment results15 (i.e. this was the control group used,

and no placebo control group was used in the study); it found no significant difference in results and thus suggested that oral IFN-□ treatment could be considered over SQ IFN-□ as it is cheaper and easier to administer. However the SQ route was said to induce a marked clinical improvement in a larger proportion of cats and so may be preferable when cats with more severe signs are treated16.

Zidovudine (AZT) (5 mg/kg PO or SQ BID; some use 10 mg/kg PO or SQ BID and this higher dose should be used carefully as side effects can develop – see below). For SQ injection, the lyophilised product should be diluted in isotonic saline solution to prevent local irritation. For PO application, syrup or gelatin capsules can be given. AZT is a nucleoside reverse transcriptase inhibitor; it can reduce plasma viral loads, increase CD4/CD8 ratios and improve clinical status, particularly in FIV-infected cats with stomatitis or neurological disease; results have not been as favourable in FeLV-infected cats although some mild benefits have been reported. However, a non-regenerative anaemia and neutropenia can result and cats with bone marrow suppression should not be given AZT. Haematology should be monitored weekly in the 1st month and monthly thereafter if counts are stable; treatment is stopped if PCV < 20%. AZT-resistant mutant FIV viruses can arise during long-term (years) treatment17. Fozivudine, an alternative agent without haematological side effects that showed promise for acute experimental FIV infection18 did not show benefits in chronically FIV-infected cats19.
Plerixafor, a selective antagonist of the CXCR4 receptor, which FIV binds to, given SQ BID resulted in significantly decreased FIV proviral load without side effects in a placebo-controlled double-blind study of naturally FIV-infected cats, but no improvement in clinical or immunological variables (CD4/CD8) or RNA loads was seen20.

Raltegravir, an oral integrase inhibitor, has recently been evaluated in the treatment of experimental FeLV-infected cats21; 9 weeks of treatment, started 15 weeks post-infection, was associated with significantly reduced plasma FeLV RNA loads (although to a lower level than seen with this agent in other host species such as humans) but FeLV RNA load levels rebounded 4 weeks following termination of treatment, and prevention of viraemia did not occur.
Recombinant human erythropoietin (rHuEPO) may be effective in retrovirus infected cats with non-regenerative anaemias, which is surprising as endogenous EPO levels are likely to be high. Experimental FIV-infected cats treated with rHuEPO showed a gradual increase in erythrocyte and white blood cell counts without increases in viral loads22, whereas the same study found that cats treated with recombinant human granulocyte macrophage colony stimulating factor (rHuGM-CSF) showed increased viral loads (& formation of anti-GM-CSF antibodies).

No studies have been done in FeLV-infected cats. However rHuEPO (e.g. Epoetin) have been associated with anti-EPO antibody formation in cats (~30%), worsening the severity of anaemia, but recent successful reports of a longer acting rHuEPO, called darbepoetin, in renal cases23 has not yet been associated with the formation of anti-EPO antibodies, so this may be promising for retroviral infected cats too.

Antioxidants to combat oxidative stress have been suggested as treatment for FIV-infected cats, as oxidative stress has been implicated in the progression of HIV infection in humans. The antioxidant superoxide dismutase was found to be associated with an improvement in the CD4+ to CD8+ ratio in FIV-infected oral supplemented cats over the short 30-day period studied24 but further studies are required.

REFERENCES AVAILABLE UPON REQUEST

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FEAR FREE IS BETTER MEDICINE – PREVENTING AND ALLEVIATING VETERINRY FEAR

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Practicing Fear Free is about preventing fear, anxiety and stress (FAS), making the veterinary experience positive, and calmly and safely managing pets that are fearful or anxious. Studies clearly demonstrate the negative impact of FAS on the physical and emotional well- being of our patients, and on the delivery of veterinary health care.

1. The stress response is a normal adaptive mechanism. In fact, the initial stressor may be immune enhancing when it is acute, precedes the challenge and there is a return to homeostasis. However, when the stressor is intense, persists or follows a challenge to the immune system, the immune response is suppressed, wound healing and recovery may be delayed, susceptibility to infection is increased, and both fear and pain responses are heightened and intensified. Following veterinary visits most cats are stressed on returning home, sometimes for days.1,2.

2. Stress during veterinary visits in cats and dogs impacts on both physiological measures and laboratory findings including a stress leukogram in response to corticosteroids, a more acute response to noradrenaline and adrenaline, increased blood pressure, heart rate, temperature and respiratory rate (panting in dogs) and glucose in cats.3,4

3. FAS negatively impact on the delivery of veterinary care. As many as 58% of cat owners and 38% of dog owners report their pets hate going to the veterinarian and 38% of cat owners and 26% of dog owners are stressed thinking about it. Pet owners report that they would visit the veterinarian more frequently if it wasn't so stressful.5

PRACTICING FEAR FREE

Fear free is about making positive associations and insuring positive outcomes from travel to clinic and home again; gentle control to prevent and manage emerging stress; identifying potential stressors to prevent and avoid what might be negative; reading and recognizing signs of FAS; keeping an emotional record to guide current and future visits; and responding to signs of FAS by stopping, modifying and/or medicating. Use of an FAS scale provides a mechanism for continuous monitoring to immediately stop and modify plans should FAS escalate.

PREVENTING FAS

a) Putting the treat into treatment – Accentuate the Positive
Make positive associations by pairing highly valued treats (and toys or play) from carrier to travel, through all aspects of the veterinary visit (reception, examination room, handling/procedures, equipment, hospitalization) and home again. Repeatedly offering small morsels or continuous delivery will increase the frequency of reward, help to keep the pets focus, and aid in ongoing monitoring. Ceasing to take treats or play can be a barometer of fear.

b) Gentle control - how to comfortably and safely position the pet for veterinary care
Monitor the pet's body language and determine the approach, location (where the pet prefers), and handling (what the pet prefers) that keeps the pet comfortable and secure, and proceed calmly and positively using motivating treats (or play or petting) to distract, and make positive associations, while continually assessing level of stress and insuring safety.

c) Touch gradient
Begin gentle physical contact with what the patient most readily accepts and maintain contact while moving gradually to more stressful parts of the body or more unpleasant procedures. While handling tolerance and pain sensitivity vary between individuals, for most dogs the shoulders and neck are most accepted with feet, face, ears and tail the least. Temperature, injections, and blood collection are the most stressful procedures.6 Cats generally prefer between the ears, cheeks and chin and are most resistant of the belly and caudal.5 Injections, temperature and blood collection are most stressful.

d) Considerate approach
Approach and interact with the pet in a way that is calm and non-confrontational. Consider all of the senses to maintain a calm, positive atmosphere and attitude, while identifying and avoiding social (veterinary staff, owners, other animals) and environmental (auditory, visual, odor, surfaces) stimuli that might be fear or anxiety evoking. Allow cats to come out of their carrier on their own or examine in carrier with the top removed. Cats may be least stressed facing their owners. Avoid reaching or moving quickly. Approach dogs from the side. Pheromones and classical or species modified music may help to calm and facilitate handling. Having the owner remain with the pet reduces FAS for most pets, provides a secure base, avoids separation distress and can help to calm and reward.

e) Emotional Record – Read, recognize and record
Veterinarians, staff and pet owners must observe, read and recognize body postures and facial expressions that indicate the pets emotional state from relaxed to increasing levels and intensity of fear and anxiety. Provide education and resources. While most owners can identify obvious signs of FAS (fight, flight, soiling), they are poorly able to recognize subtle signs. Record what are stressors (dislikes) and what works (likes) in an emotional record to plan and guide future visits.

e) Home care
Provide guidance for travel and reintroduction into the home (environment, people, other pets) taking into consideration the pet, the procedures, and the environment. Recommend pheromones and medications if indicated for fear, anxiety, nausea, intestinal upset or pain.

THE FEARFUL PATIENT

If the pet stops taking treats or signs of FAS begin to escalate, then STOP, REVIEW and REVISE either to a) make modifications to be able to resume calmly and positively b) avoid some or all of the procedures that are not immediately necessary to reschedule for a later visit with a modified approach or c) to use medication immediately, prior to a future visit, or both.

1. Stop, review, revise and resume
If the pet stops taking treats or FAS escalates then STOP, give the pet a chance to habituate, and identify what caused the increase in fear (visual, auditory, odor, tactile). By modifying the handling (gentle control), avoiding negatives (considerate approach), using more motivating treats and proceeding more slowly (gradient of touch), fear might be reduced to be able to positively proceed. Products such as towels, blankets, muzzles and head halters might provide safer control, although it is best if these are familiar and positively conditioned in advance. Use sufficient and appropriate pain medication before any procedure that might be uncomfortable or painful.

2. Stop, review, reschedule and revise
If the pet continues to display moderate to marked FAS, consider whether to reschedule with a new plan of action or to use medication to complete the procedures on the same day. Determine whether some or all of the procedures can be postponed in order to implement strategies to achieve future successful visits, including modifications to the scheduling (to avoid negative outcomes), location (where the pet might prefer), environment (to make more pleasant and avoid unpleasant), gentle control, maximizing positives (fasting, favored treats or toys), pre-conditioning to products that might help to calm or improve safety and pre-medication.

Pet owners can work with staff, trainers and resources that can guide the pet through desensitization and counterconditioning in advance of future visits based on the needs of the pet, the procedures, and the abilities and limitations of the owners and pets. Identify each stimulus that evokes fear to eliminate and avoid what might be negative and desensitize and countercondition to make them positive including, carrier, travel, veterinary facility, personnel, products (e.g. muzzles or head halters), instruments, and body regions and handling and procedures (ears, eyes, injections) with a goal of effectively treating OR to be able to administer sedation. Pre-visit nutraceuticals and pharmaceuticals should be dispensed where needed.

Training of cues that are predictive of interactions and reward training of focused and relaxed behaviors can also provide a foundation for communicating, achieving desirable outcomes, calming, distracting, maintaining focus, and rewarding throughout the visit including touch (targeting), chin rest (with focus), and relaxing on a “bed” or “mat”.

Additional resources
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INTEGRATIVE VETERINARY MEDICINE PROTOCOLS FOR INTERNAL MEDICINE AND MUSCULOSKELETAL CONDITIONS

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Integrative Veterinary Medicine is defined as the integration of conventional and complementary and alternative diagnostic and therapeutic approaches into a comprehensive preventive and therapeutic approach to disease. Integrative veterinary medicine also considers the mind, body and other relationships in its approach to the prevention, diagnosis and treatment of disease and maintenance of good health. It integrates preventive medicine and health programs, conventional medical and surgical approaches with acupuncture, botanical medicine (herbs, phytotherapy),chiropractic, homeopathy, physical therapy including cold lasers, magnetic therapy and others , nutritional supplements and nutraceuticals, behavior management, environmental medicine and other miscellaneous therapies (1).

INTEGRATIVE APPROACH TO GERIATRIC MEDICINE

An integrative approach to geriatric medicine often addresses numerous geriatric conditions including musculoskeletal, neurologic, cardiovascular, metabolic, gastrointestinal and other issues. An integrative approach to geriatric medicine includes a comprehensive conventional diagnostic workup incorporating the physical examination, blood chemistry, urinalysis and diagnostic imaging techniques where appropriate. Based on the diagnosis, a comprehensive therapeutic approach is offered to the client. In addition to conventional approaches, other CAVM therapies are offered. Physical therapy for musculoskeletal conditions including massage, stretching, swimming, low level laser therapy, magnetic therapy and others may be integrated as well. Western botanical medical formulas, (3) nutraceuticals, nutritional supplements may also be prescribed. Vitamin and mineral supplements, digestive enzymes, amino acid supplements, essential fatty acid supplements such as fish oil, flaxseed oil and others, antioxidants such as Vitamin E, selenium, alpha-lipoic acid as well as others should be considered. Adaptogenic herbs such as ginseng, ashwaganda and astragalus may be appropriate. They help support hypothalamic-pituitary-adrenal axis function (3). Herb/drug interactions must be considered when precribing these in addition to conventional medications. Medicinal mushrooms have been found to benefit the immune system in geriatric patients.

Low level photobiomodulation laser therapy is being integrated into geriatric protocols to assist in increasing circulation, relieving pain, modulating cellular health and improving quality of life overall.

INTEGRATIVE APPROACH TO DEGENERATIVE JOINT DISEASE

An integrative approach to degenerative joint disease can be quite rewarding for the patient and the veterinarian. This goes beyond prescribing analgesic and anti-inflammatory medications to the incorporation of proactive chondroprotective supplements such as injectable and oral glycosaminoglycans. The development of a proactive approach including an appropriate exercise program is essential to proper maintenance of the musculature without overdue stress on the joints. Physical therapy including under water treadmills, stretching exercises magnetic and low level laser therapy, have been found to be extremely beneficial as well. Acupuncture and physical manipulative therapies can be very beneficial for degenerative joint disease. (4) Manipulative therapies may be added to treat secondary compensatory problems. Stem cell therapy, PRP and other regenerative approaches may be added as well. Acupuncture may be synergistic with these approaches by increasing the local microcirculation to arthritic areas and thereby increasing the availability to affected areas.
Low level photobiomodulation laser therapy is rapidly being integrated into musculoskeletal protocols to assist in increasing circulation, relieving pain, modulating cellular health and improving quality of life overall.

INTEGRATIVE APPROACH TO CARDIOVASCULAR CONDITIONS

Acupuncture has been found to be beneficial in the treatment of various arrhythmia's as well as in the treatment of cardiac arrest (5). Acupuncture for various cardiovascular conditions will be discussed as well.in addition to acupuncture certain nutritional supplements may be added such as Co-enzyme Q-10, fish oils, magnesium, potassium, amino acids such as l-carnitine,, taurine, Vit E, selenium, as well as western herbal medicines such as hawthorn.

INTEGRATIVE APPROACH TO GASTROINTESTINAL CONDITIONS

Numerous gastrointestinal conditions may be responsive to an integrative approach including inflammatory bowel disease, megasophagus, feline obstipation syndrome and others (6). The key to an integrative approach to gastrointestinal conditions, as with most conditions, is proper diet. Acupuncture has been found to be beneficial in the treatment of vomiting and diarrhea. Acupuncture helps regulate gastrointestinal motility.

Nutritional support to support the protective layers of the gastrointestinal tract have been found beneficial as well. These include N-acetyl glucosamine, digestive enzymes, lactobacillus acidophilus as well as other probiotics.

INTEGRATIVE APPROACH TO NEUROLOGIC CONDITIONS

With the improved ability of diagnostic imaging equipment including CT scans and magnetic resonance imaging, veterinary neurologic diagnostics have greatly progressed and we are able to have much more specific neurologic diagnoses. With this ability, we are now able to be much more specific in the treatment of neurologic disease with integrative approaches. In additional to conventional medical and surgical approaches, acupuncture, Chinese herbal medicine, physical therapy and nutraceutical's have been found to be clinically beneficial in the treatment and management of neurologic conditions including various causes of paralysis, paresis, seizures, coma, etc. (7,8,9,)

INTEGRATIVE APPROACH TO CANCER

Acupuncture may be used as an adjunct therapy for cancer in order to decrease the side effects of chemo and radiation therapy as well as having immunoregulatory effects. Clinically, I have used an integrative approach for the treatment of cancer for 30 years and in numerous cases I have seen an improved quality of life as well as an extended life span beyond the prognosis based on just conventional veterinary medicine.

MIND/BODY MEDICINE APPROACH

Mind/Body Medicine is a rapidly expanding field in human medicine and its applications for veterinarians are just beginning to be explored. In its simplest definition, Mind/Body medicine is the use of our mental activity, thoughts and feelings to help prevent and treat various "dis-eases". Studies in mind/body medicine document the effects of thoughts on the release of various neurotransmitters and neurohormones and the impact that has on our physical, mental and emotional health (10). I have found that integrating various practices of mind/body medicine into a comprehensive integrative approach is beneficial for veterinarians, their staff, their clients and patients. Workshops and training on mind/body medicine have been offered at the World Small Animal Veterinary Conference as well as the Canadian Veterinary Medical Association Annual Conference. Mind/body medicine can be of benefit by creating an atmosphere of calmness, compassion and mindfulness when working with animals and their human caretakers. It can help prevent compassion fatigue and burn out for veterinarians and their staff.

CONCLUSIONS

No one form of medicine has all the solutions to all diseases. The future of veterinary medicine should include the most successful approaches to specific conditions including conventional western medicine and surgery along with CAVM. An individualized specific integrative approach to a patient will allow the animal to live a longer, quality life with their human caretaker.

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ETHICAL ASSESSMENT OF THE THOROUGHBRED FLAT RACING INDUSTRY: FROM FOALS TO RETIREES

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Equine scientists are often asked their opinions about the ethicality and welfare status of the Thoroughbred racing industry. Using ethical framework assessments discussed by Heleski and Anthony in 2012 ('Science alone is not always enough: The importance of ethical assessment for a more comprehensive view of equine welfare: …') [3], we will work through a discussion of the Thoroughbred flat racing industry in North America. We will holistically examine the industry and consider all life stages of the horses.

The public cites the following as their primary concerns: breakdown rates, racing of 2-year-olds, whip use, race day medication and "throw away" retirement horses, but there are counterpoints to many of these arguments. On the one hand, the racing industry likely needs to listen to public perception in some areas, e.g. whip use, where increasingly strong evidence shows it does not help horses run faster [1] and is increasingly offensive to spectators [5]. In other areas, such as the racing of 2-year-olds, most evidence actually supports that connective tissue benefits from the early conditioning and rational racing commitments at that age. Increasingly, welfare scientists are asked to address issues of 'what positive mental states can the animal experience'? Is it a good 'quality of life' [6]? Is it 'a life worth living'? If we process the elements of an ethical assessment, we find evidence of many positive aspects of a Thoroughbred's life. For example, in the majority of cases, Thoroughbred brood mares and foals live a life that is very horse-centric [4] and attentive to the horse's nature. The majority of mare and foal dyads experience well over 12 hours per day of turnout, in social groups, with significant grazing opportunities. Health protocols tend to be state of the art. We will explore more deeply the public's concerns about racehorse welfare [2], using scientific evidence where available.

Public concerns regarding horseracing have increased over the past few decades. Horse people from other disciplines also cite equine welfare concerns. We will discuss the concerns point by point, providing scientific evidence where available. Positive aspects of the Thoroughbred industry will also be discussed. For example, significant time and money resources have been going toward Thoroughbred aftercare efforts over the past decade with impactful results [7] .

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NO MORE STONES: APPROACH TO CATS WITH UROLITHS

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Causes of lower urinary tract signs

-Top common causes in dogs: incontinence, uroliths, bacterial infection
-Top causes in cats: idiopathic cystitis, uroliths; bacterial infection is rare
-Most common stone types worldwide are struvite and calcium oxalate

DOG	CAT
Struvite -77% in females -Almost all due to bacterial infection -Upper & lower urinary tract	Struvite -57% in females -Not infection-induced -Lower urinary tract only
-57% in females -Not infection-induced -Lower urinary tract only Calcium oxalate -69% in males	Calcium oxalate -58% in males -Lower & upper urinary tract; only stone type in the upper tract

Struvite: average age <7 years, overweight, inactive, high urine specific gravity, alkaline urine, Persians

Calcium oxalate: average age >7 years, overweight, inactive, high urine specific gravity, acidifying diets, hypercalcemia, certain breeds (Persian, Siamese, Burmese, Devon Rex, etc)

Proportion of stone types varies by country

Clinical signs: pollakiuria, dysuria, hematuria, inappropriate urination, urethral obstruction (males)

Diagnostic testing

Most common causes in cats 1-10 years old: idiopathic cystitis, uroliths; important to do survey radiographs

Most common causes in cats >10 years old: bacterial infection (with concurrent diseases), uroliths, neoplasia; important to do full health workup and urine culture

Urine should be collected by cystocentesis: 21-23G needle, 5-10 mL syringe; ultrasound guidance is not needed

Urine pH and crystal type is not reliable for prediction of urolith type

Survey radiographs vs ultrasound

Purpose	Survey radiographs	Ultrasound
Diagnose bladder uroliths	Yes, if radiopaque and >2-3 mm diameter	Yes
Assess urolith characteristics (size, number, density, shape)	Yes	Poor
Assess bladder wall accurately	No	Yes, if bladder is distended
Identify anatomic abnormalities	Usually no	Possible

Radiographic appearance of uroliths

	Struvite	Calcium oxalate
Density	Moderately radiopaque	Very radiopaque
Contour	Smooth to slightly rough edges	Smooth (monohydrate) or irregular sharp edges (dihydrate)
Number	Usually <3-5	Usually >3-5

Treatment options

Three step approach
1. Perform survey radiographs
2. If a urolith is present that might be struvite, start therapy with a diet proven to dissolve and prevent struvite uroliths
3. Recheck radiographs in 2 weeks; if urolith is at least 50% reduced in size, continue dietary therapy; if urolith is unchanged, check compliance, re-evaluate urolith type

Methods of bladder urolith removal

	Technique	Comments
Least invasive	Medical dissolution	Struvite only
	Voiding urohydropropulsion	Stones ≤4mm Female cats Best for smooth stones
	Cystoscopy & basket retrieval	Stones ≤4mm Female cats Best for smooth stones
Most invasive	Surgery	When no other option possible

Resources and reading

ACVIM Small Animal Consensus Recommendations on the Treatment & Prevention of Uroliths in Dogs & Cats
https://onlinelibrary.wiley.com/doi/full/10.1111/jvim.14559
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MANAGE PETS OF IMMUNOCOMPROMISED OWNERS

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Introduction

The role that pets play in many peoples' lives and the close contact that is inherent with this relationship can be highly beneficial, but is also associated with some risk of pathogen transmission. Few would argue that pets are part of the family socially and emotionally. At the same time, it is becoming increasingly clear that pets are part of the family microbiologically, and that transmission of microorganisms between people and pets is probably a common event.. Zoonotic diseases are an inherent risk of any contact with animals and are generally considered an acceptable risk by most pet owners, considering the low incidence of serious zoonoses and the positive social and emotional benefits of pet contact. However, there are certain situations where people may be at higher risk for zoonotic diseases or be more prone to serious outcomes. One such group is people with compromised immune systems. Advances in medicine have been able to sustain lives of such individuals but leave them in a more susceptible state for infectious diseases, including zoonotic diseases. Others who may be at increased risk include infants, pregnant women and the elderly. The aging population, in particular, increases the pool of individuals with waning immunity.

A 'knee-jerk' reaction sometimes occurs when issues regarding zoonotic diseases and immunocompromised individuals are discussed. The simplest way to reduce the risk of zoonotic disease exposure from pets is to avoid all contact with pets. However, this is generally not an acceptable course of action, nor is it commonly (if ever) required. The importance of the human-animal bond and its benefits are also documented in individuals who are immunocompromised, and this fact must not be lost amongst infectious disease concerns. It is clear that while there must be consideration of potential health risks associated with pet contact, the emphasis should be on determining the cost-benefit of pet ownership and implementation of methods that may be able to reduce (but never eliminate) the risk of zoonotic disease transmission.

What is "immunocompromised"?

While all people with some degree of compromise of their immune system are often lumped into the generic 'immunocompromised' category, it is critical to recognize that there are marked differences between different conditions and even between individuals with the same condition.

Acquired immunodeficiencies are the most common causes of immune dysfunction. These can include numerous biologic disorders, normal physiologic states (e.g., pregnancy), and drug-induced effects on the immune system. Different conditions have different effects on the immune system, both in terms of severity of compromise and the component of the immune system that is affected. Both of these are critical factors since certain components of the immune system are critical for preventing or eliminating certain infections. A person with a drug-associated immunosuppression may have markedly different risks compared to someone without a functional spleen, despite the fact that both are at increased risk of infection in broad terms.

Pathogens of concern

There are various types of pathogens that are of concern in immunocompromised individuals. These include organisms that are also of concern in immunocompetent individuals, those that do not typically cause disease in immunocompetent individuals but can cause disease in immunocompromised individuals, and pathogens where disease is potentially much more severe in immunocompromised individuals. There are not always clear delineations between these groups.

Organisms that are primarily pathogens only in immunocompromised individuals or select populations

People are constantly exposed to various bacteria, viruses and fungi. Some are primary pathogens that typically cause disease when they are encountered. More are opportunistic pathogens that can cause disease under appropriate circumstances. Others are organisms that rarely cause disease in otherwise healthy people but can cause disease in individuals with compromised immune systems. For some organisms, diagnosis of infection essentially indicates that immunocompromise is present, even if it has not been previously diagnosed. Zoonotic pathogens in this category include Capnocytophaga spp, Rhodococcus equi and Toxoplasma gondii.

Organisms that are more likely to cause disease and/or to cause more severe disease in immunocompromised individuals

Some infectious agents may cause disease in immunocompetent people; however, disease tends to be mild and either self-limiting or readily treated. The same pathogens may cause severe or life-threatening disease in immunocompromised individuals. These include organisms such as Cryptosporidium spp, Salmonella and a host of other common enteric or oro-pharyngeal inhabitants.

Risk reduction

Absolute elimination of risk is impossible. However, practical measures can be taken to reduce the risk. Some examples are outlined below.

Client communication
This is perhaps the most important aspect and the one for which veterinarians are the least trained. A key component is simply raising the subject, as many high risk owners may not appreciate potential zoonotic disease concerns or have any concept of basic infection prevention measures.

Animal selection
Zoonotic risks wary between and within species. Reptiles are particularly high risk because of Salmonella and are generally not recommended to be present in high risk households.

Young animals and animals from shelters or similar facilities are more likely to shed various infectious agents, so they are not the best choice of a pet. Further, younger animals are more likely to bite and scratch, and it is more difficult to assess their temperament. Older animals that are already in households are ideal. Species such as rabbits where there is moderate information about infectious disease risks and management are relatively low risk. Birds are a somewhat controversial area. Rates of shedding of some potential pathogens can be high, including serious pathogens such as Chlamydophila psittaci. There are also concerns about shedding of organisms such as Cryptococcus spp, although the risk various geographically. There has been little objective evaluation of risks associated with pet bird ownership and some degree of risk must be considered, although it can probably be minimized by safe management practices, particularly those involving avoidance of fecal material.

Owners should be made aware of certain syndromes that might indicate an infectious process. These include diarrhea, vomiting, coughing and skin lesions. In households with immunocompromised owners, earlier or more comprehensive diagnostic testing may be indicated to allow for prompt identification of potentially zoonotic pathogens.

Training
Bites and scratches are probably the most common adverse events from animals and associated with the greatest morbidity and mortality. While good animal training and handling are important in any household, they are critical in households where the implications of those events can be higher.

Preventive medicine
Optimizing animal health is required to reduce the risk of infections that could pose a zoonotic risk. Regular examination is critical to detect problems that could put the owner at risk. A thorough veterinary examination should be performed at least yearly, if not more frequently. A proper preventive medicine program is important.

Animal disease management
A more aggressive approach to diagnostic testing may be indicated in some cases, particularly when an infectious process is suspected. Identifying pathogens of higher concern (e.g. MRSA) in animals can help counsel owners on prevention measures. Further, pets owned by high risk individuals may be at increased risk of infections caused by certain human-associated multidrug resistant bacteria.

Another aspect is controlling underlying disease processes. While this is important for all patients, it is of particular need in high risk households as a means of preventing secondary infections that could be caused by zoonotic pathogens. For example, control of allergic skin disease is important to reduce the risk of pyoderma, which could be caused by a zoonotic pathogen.
Conclusion

A large percentage of households contain at least one higher risk individual, and pet ownership by immunocompromised people, including highly compromised individuals, is common. Veterinarians have an important role as part of the family health team. Rarely, if ever, are pets inappropriate for high risk people. However, certain pets, certain management practices and certain activities may be contraindicated. Veterinarians need to engage higher risk owners to maximize animal health and counsel owners on optimal practices to reduce their exposure to important zoonotic pathogens.

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BITE SIZED DISASTERS -WHEN NUTRITION GOES WRONG

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Introduction

Complete and balanced dog and cats foods, whether they come in the form of canned, dried, or a fresh-food diet, are known to promote health and wellness in dogs and cats. A growing appreciation for the role of diet in health and disease, as well as a number of highly publicized pet food recalls over the last decade, has many caregivers questioning the use of commercial pet foods to meet this end. Additionally, pet advice columns and pet food marketing companies have been guilty of using fear-based marketing to promote their foods or philosophies, often with little to know scientific support. These marketing tactics have stirred concerns and controversy over the use of certain ingredients, such as corn or wheat, and have caused some owners to become leery of manufacturers that incorporate these ingredients into their foods. Many owners, and some veterinarians, also advocate feeding dogs and cats home-prepared foods exclusively (raw or cooked, or both) and either cite perceived health benefits or a general mistrust of the pet food industry. It is important for veterinarians to understand the motivations, risks and benefits of each diet type to ensure that the nutritional needs of the individual animal are being met.

DOG AND CAT NUTRIENT BASICS

Whenever evaluating a new maintenance food for a dog or cat it is important to ensure a complete and balanced intake of all essential nutrients are being provided, irrespective of the food form. Despite metabolic differences between dogs and cats, they have similar requirements for specific essential amino acids, essential long-chain fatty acids, macrominerals, trace minerals, water-soluble vitamins, and fat-soluble vitamins.1 Both dogs and cats can synthesize vitamin C in the liver; neither species can synthesize vitamin D from UV exposure of skin; and both lack salivary amylase for the initial step in carbohydrate metabolism but have pancreatic amylases activity and glucose receptors on enterocytes for further carbohydrate digestion and absorption. Altogether dogs require about 37 essential nutrients in their diets and cats require 41 and it is important that the diet selected and fed on a regular basis meets these ongoing nutritional needs.

Commercial Diets:

Complete and balanced commercial diets (dry, moist, pasteurized, cooked, or raw-meat based frozen or dehydrated) are designed to be fed as a sole source of nutrition to dogs and cats. European Pet Food Industry Federation (FEDIF) and Association of American Feed Control Officials (AAFCO) have established model guidelines for the countries and states regarding pet food labels, ingredient definitions, what can and cannot go into pet foods, and levels of specific essential nutrients required for a given life-stage.2,3 Any pet food with an FEDIAF or AAFCO label of adequacy must have met these guidelines, though it is up to individual nations or states to regulate and enforce these recommendations. Commercial diets will then be labeled as having gone through “feeding trials” to ensure nutrient adequacy or as having been “formulated” to meet these requirements. Again, any commercial diet lacking a nutrition adequacy statement should be viewed with caution.

Home-Prepared Diets – Cooked & Raw:

Home-prepared diets have grown in popularity over the last decade. For some pet owners it is in response to concerns about the production of commercial diets, for others feeding home-prepared foods reinforces the human-animal bond, and for still others a home-prepared diet is required to manage a medical condition.4-6 Fresh meat whether it is fed raw or cooked is palatable to most dogs and cats, can be highly digestible, and depending on the cut of meat selected is higher in fat than most dry kibbles.7 The result is an animal that readily eats its food, has low stool volume, and a shiny coat and these direct visual features are often held up as “proof” of nutritional superiority to commercial canned or dry foods. Proponents of home-prepared foods claim that these diets are a safe and natural way to feed animals,8 but largely ignoring the potential negative consequences.

The detrimental aspects of raw meat diets in particular can be disastrous for the animal and the people in the household. Any raw meat ingredients can be a potential source of parasitic and bacterial exposure, which can include Neospora, Toxoplasma, Salmonella, E. coli, Campylobacter, and Cryptosporidium;9-11 raw and cooked bones specifically carry a risk of gastrointestinal obstruction/perforation and oral trauma;12,13 and are a poor source of essential minerals (such as calcium, phosphorus and magnesium) due to the poor digestibility of larger bones within the canine and feline digestive tract.14 Ultimately, the animal’s acceptance of a home-prepared diet does not change significantly when the meat is cooked or when more bioavailable sources of nutrients are used.

Published reviews of the nutritional adequacy of home-prepared (cooked and raw) diet recipes in recent years found that less than half of the recipes used by the pet owners provided a complete and balanced source of nutrients.15-19 Most home-prepared diets for dogs and cats are lacking a sufficient source of calcium; a source of trace minerals (such as iodine, selenium, copper, and zinc); a source of linoleic acid; and a source of essential fat-soluble and water-soluble vitamins. While the perceived benefits of home-prepared diets are reinforced daily to the owner, nutrient deficiencies in adult animals are insidious and can lead to long-term complications, which can vary from poor skin and coat health to chronic diarrhea, osteopenia, anemia, altered drug metabolism, and hepatic lipidosis depending on the specific nutrients lacking in the diet.

SUMMARY

Individual animals may vary in their response to specific commercially-available diets and there is no one diet-that-fits-all. If an owner elects to feed a home-prepared diet they should be counseled on the risks of this feeding strategy and cautioned that nutritionally-related disease can mimic other forms of chronic illness. Any animal eating a home-prepared diet should have at least an annual physical exam and health screening, including serum biochemistry (with T4), hematology and urinalysis profiles. While blood work and urinalysis results will give you a general overview of the animal's health status, it will not pick-out specific deficiencies or excesses. A complete diet history (all foods and supplements) should be collected from the owner at each visit. Any home-prepared diet recipes should be obtained from a reputable, trained source. Additional resources, including a list of Board-certified Veterinary Nutritionists, can be found through the European Society of Veterinary & Comparative Nutrition (www.esvcn.eu) or American College of Veterinary Nutrition (www.acvn.org).

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PERSONAL CULTURE-IT›S NOT ABOUT YOUR YO-GHURT -PERSONAL CULTURE/SELF-AWARENESS

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Culture is a current buzzword in the veterinary profession. We are bombarded with advice on how to address poor clinic culture. We blame poor culture on toxic employees, intergenerational conflicts, and a host of other causes. There is a key underlying cause which does need to be considered when attempting to remedy a problem with clinic culture, and that is the inconsistent personal culture of leadership.
The Merriam-Webster dictionary defines "Culture" as "the set of shared attitudes, values, goals, and practices that characterizes an institution or organization". Key points which result from this definition:
Leaders in a practice need know what the practice's values are
Leaders in a practice need to know what the practice's goals are
Leaders in a practice need to know how to implement policies that speak to the values and goals of the practice
Leaders in a practice need to share this information with their teams
Leaders in practices include owners and managers, but it is important to remember that key members of your team, not just those in management positions, play a critical role in shaping the culture of your practice. Team members in practices will be guided by the personal culture of leaders, and will emulate their behaviour, both good and bad.
Formula for establishing personal culture

Step one:
Define your personal culture
Consider what is meaningful to you (core values)
Consider whether you have any "lines in the sand"
Just remember – this should be your ideal personal culture – what you aspire to.

Step two:
Determine how consistent you are at maintaining your ideal personal culture
Consider a family who has spent their entire holiday savings to go to Disneyworld so their daughter can meet Cinderella. What happens if Cinderella is having a "bad day"? As an aside, the folks at Disney go to great lengths to ensure that Cinderella never has a bad day.
There's a reason that they are able to charge the prices that they do (excellent (repeatable) experience, each and every time, with each and every guest).
Be honest with yourself now… do people skirt around you on certain days, you know, when you're having a "bad day"? Does your team consistently try to emulate your awesome behaviour or do they adopt your bad habits instead?

Step Three:
If you are like most people, you need to fix your personal culture before you can start to fix your clinic culture. Leaders need only remember one simple phrase when it comes to personal culture. Be Consistent. While we would prefer that you are consistent with your ideal culture, it's almost better to be consistently grumpy (so people know what to expect!). Unpredictability leads to guessing amongst your team, and an inability to progress with their day to day workflow. Making a decision to change your personal culture will not be noticed at first. For most leaders in practice, you will need to be extremely consistent for 4-6 months before your team will start to trust that you have changed!
The unfortunate thing is that during this period, even a small slip up means that your team may not trust that you have succeeded in changing your behaviour.
Once you are consistent with your own behaviour, bringing the other leaders on board is the next step. Leaders in the practice all need to agree on the goals and values, and how to implement them. They also need to behave in a consistent manner. It is at this time that you need to review the Core Values of the practice (and make sure that they align with your personal ones!

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CONTROVERSIES IN THE PERI-OPERATIVE USE OF NSAIDS

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Introduction

Non-steroidal anti-inflammatory drugs (NSAIDs) are widely used for analgesia in the peri-operative period with a recent UK survey showing that around 98% of dogs and cats receive NSAIDS for routine procedures such as neutering peri-operatively [1]. There are also many studies that support the analgesic benefit of administering a NSAID for acute pain relief after different types of surgery. However NSAIDs are not without side effects, and although some risk factors for adverse events have been identified, it remains difficult to identify in advance which individual patient may develop side effects as a result of peri-operative NSAID administration. In order to reduce the likelihood of adverse effects it is important to understand the mechanism of action of NSAIDs and their potential side effects on organ function. This knowledge, combined with an understanding of factors that may increase the risk of side effects in an individual patient can be used to determine which patients should receive NSAIDs peri-operatively and overall reduce the likelihood of NSAID related adverse events.

What are the advantages of NSAID administration peri-operatively?

The clear and obvious advantage of NSAID administration in the peri-operative period is analgesia with NSAIDs making a valuable contribution to both preventive and multi-modal analgesia. Preventive analgesia aims to decrease the impact of the nociceptive barrage associated with noxious stimuli in the peri-operative period, in particular with a focus on decreasing the development of peripheral and central sensitisation. Multi-modal analgesia refers to the use of different classes of analgesic drug in combination, so that the pain pathway is obtunded at multiple different receptors and targets, overall increasing efficacy of the analgesic protocol compared to using a single class of analgesic drug in isolation. Multi-modal techniques may also allow a reduction in dose of each individual class of drug and therefore reduce side effects; a factor that may be particularly pertinent for opioids where sedation or dysphoria and nausea can be problematic in the post-operative period. Multi-modal analgesia techniques incorporating opioids and NSAIDs are widely used in dogs and cats undergoing routine procedures such as neutering and there is good evidence to support their efficacy over unimodal techniques in these species.

NSAIDs are also the only class of drug that is licensed to be administered by owners in the home environment after surgery. The optimal time duration for the administration of analgesics after different types of surgery is currently unknown. There is a trend in the UK for the administration of tramadol instead of or in combination with NSAIDs peri-operatively but it should be noted that the evidence for the efficacy of oral tramadol is very limited [2], therefore tramadol should not be used as a NSAID substitute unless NSAIDs are contra-indicated in a particular patient. Therefore peri-operative NSAIDs play a pivotal role in the provision of post-operative analgesia following surgery.

What are the disadvantages of NSAID administration peri-operatively?

The major disadvantage of NSAID administration in the peri-operative period is the risk of adverse effects. Probably the most important consideration for NSAID administration is whether there is a significant risk of hypotension during anaesthesia, because of the potential for renal ischaemia and acute kidney injury when production of renal prostaglandins is inhibited in the face of reduced renal blood flow. One might argue that hypotension is always a risk factor during anaesthesia and therefore NSAID administration should always be delayed until after anaesthesia when the patient is awake and likely to be normotensive but this might be disadvantageous in terms of optimising analgesia. The author takes a pragmatic approach to this conundrum. NSAID administration is delayed until after anaesthesia and surgery if there is considered to be a greater likelihood of hypotension during anesthesia, whereas NSAIDs are administered pre-operatively to healthy patients undergoing routine surgery. This approach should maximise the analgesic benefit of NSAIDs in healthy patients while avoiding adverse events in patients that are cardiovascularly unstable or patients where significant blood loss is anticipated.

Monitoring and supporting blood pressure during anaesthesia: When administering a NSAID before anaesthesia and surgery it is best practice to monitor and support blood pressure during anaesthesia to ensure that animals do not become hypotensive during the peri-operative period (mean arterial blood pressure (MAP) < 60 mmHg).

What about patients with chronic kidney disease? There is some evidence to suggest that prostaglandins produced in the kidney via cyclo-oxygenase enzyme are not important in maintaining renal blood flow and GFR under conditions of euvolemia and normotension in cats and dogs. However it is also known that COX expression in the kidney is altered in chronic kidney disease (CKD) in cats and dogs and in humans with CKD there is an increased risk of nephrotoxicosis from NSAIDs [3].

A recent study in cats with IRIS stage 2-3 CKD given meloxicam found no effect of meloxicam administration on GFR suggesting that maintenance of GFR was not dependent on cyclo-oxygenase derived prostaglandins [4] and studies in cats with osteoarthritis administered meloxicam have not shown a detrimental effect of chronic NSAID (meloxicam) administration on renal parameters or longevity [5,6] However in these studies cats were not anaesthetized and blood pressure was presumably maintained within normal limits; therefore it is difficult to extrapolate these findings to an anaesthetized patient where hypotension is common.

The author errs on the side of caution in terms of peri-operative NSAID administration to cats and dogs with CKD; in the peri-operative period adequate analgesia can usually be provided with opioids or adjunctives such as ketamine. A NSAID can be considered once the animal is normotensive and fully recovered from anaesthesia, although complete data on the safety of NSAIDs in CKD patients are currently lacking and this must be considered in the decision making process.
Animals undergoing gastro-intestinal surgery: There are no data describing the clinical effects of NSAIDs on the healing of the gastrointestinal tract after surgery in dogs and cats. However, given that cyclo-oxygenase derived prostaglandins are important in angiogenesis and healing in the GI tract it would seem sensible to avoid NSAID administration to cats and dogs undergoing GI surgery. At the authors institution, in dogs, such cases are commonly administered paracetamol intravenously, although it is important to be aware that the intravenous preparation of paracetamol is not licensed in dogs and there no data to compare the safety of paracetamol with NSAIDs in animals with GI disease. Similarly the author would avoid NSAID administration to dogs and cats with pre-existing ulcerative GI disease that may be at a higher risk of GI perforation compared to the healthy animal.

Animals with disorders of haemostasis: NSAIDs with effects on the COX-1 enzyme will decrease production of thromboxane A2in platelets therefore it is prudent to avoid NSAID administration to animals with disorders of haemostasis in the peri-operative period.
Animals undergoing orthopaedic surgery:The author considers that there is currently insufficient clinical evidence to indicate that NSAIDs should be withheld from animals undergoing orthopaedic surgery involving bone healing and that NSAIDs should be used peri-operatively as part of a multi-modal analgesia technique.
Timing of NSAID administration in the peri-operative period

NSAIDs that are licensed for administration in the peri-operative period can be given before surgery at around the time of premedication, during surgery or post-operatively once the animal is fully recovered from anaesthesia and normotensive.

There is some evidence that administering NSAIDs pre-operatively provides superior analgesia and reduces secondary hyperalgesia, a cardinal sign of central sensitisation, after surgery, compared with post-operative administration (Lascelles and others 1998). This would suggest that the optimal time of administration in terms of pain-relief is pre-operatively. However, side effects should always be considered and if there is concern over blood pressure management during anaesthesia then administration of any NSAID should be delayed until the animal is normotensive and fully recovered from anaesthesia.

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WELFARE FOR ANIMAL WELFARE LEADERS

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Introduction

Capacity for Care (C4C) is a term used by sheltering professionals to determine the specific capacity that any particular animal welfare organization has to care for the animals that it serves. According to the Association of Shelter Veterinarian's Guidelines for Standards of Care, operating beyond this capacity is an unacceptable practice.[1] Yet, we as individuals, are often operating beyond our own capacity to care, pushing limits that lead to feelings of overwhelm and burnout. This lecture will relate tools available as they pertain to managing our time and developing a sense of vision and purpose as it relates to our work.

Habits – Learning New Tricks

Habit formation is at the core of improving productivity. When new tricks we learn become habits, our brain activity to perform these habits is greatly reduced, leaving room for making more important decisions.[2] The reward may be a key component of habit formation as we see with dogs we are clicker training. The cue-habit/action-reward loop is one that humans can use as well, to develop habits that improve overall productivity, but is still being studied by scientists to best understand the modulators at play.[3] Not all habits are viewed equally, according to authors such as Charles Duhigg in The Power of Habit, and there are certain "keystone" habits that are better than others, and actually increase your adherence to other habits. Small changes in certain points in your day, will have a positive downstream impact on the rest of the day. Key routines discussed in this lecture including the following: morning routine, pre-work, post-work, and evening routines.

Setting Personal Values, Mission, Vision

It is likely that the animal welfare organizations that we work with have an organizational mission or vision. It is as important for us, as individuals, to outline our own personal mission, values, and vision. Outlining our thoughts around our path will lead to us being happier. When we are misaligned in our work and our personal lives, there is internal conflict that keeps us from achieving of full potential. This session will present templates for starting the process of outlining a personal mission, vision, and list of values.

Technology Tools for Creating Sanity

There are many online tools and apps available to simplify life, but how to choose and how best to utilize them? Some of these tools will be outlined as they pertain to organizing one's life. Specific tools highlighted will be the following:

Project Management Software: These include Gantt based platforms, Kanban style platforms, Team/Communication centric platforms (examples: Asana, Outlook, Todoist, Trello, workzone, smartsheet)
Task Programs: Ideally this app will integrate with calendar and project management tools. (examples: Todoist, Things, Remember the Milk, Wunderlist, GoogleKeep, Habitica, Omnifocus, Reminders, Microsoft ToDo)

Note taking platforms: The best ones make all your notes accessible to you across devices. (examples: Evernote, Bear, Boostnote, Microsoft OneNote, Paper, Quib, Zoho Notebook)

Password Management tools: This is an excellent way to keep all your passwords on file and out of your head. (examples: LastPass, Dashlane, KeePass, Master Password, Sticky Password)
File Storage: Keep all your files in the same place and share documents across platforms with your team. (examples: DrobBox, Google Drive, Box, Amazon Drive, OneDrive)

Scanning Apps: Scanning gives the ability to move from paper to file storage seamlessly. There are some apps that are associated with file storage systems and others that are shared. (examples: Evernote Scannable, Abbyy Fine Scanner, DropBox Business, Genius Scan Plus, Adobe Scan, Shoeboxed)

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A QUICK AND EASY INCISIONAL GASTROPEXY, THE "SMEAKOPEXY"

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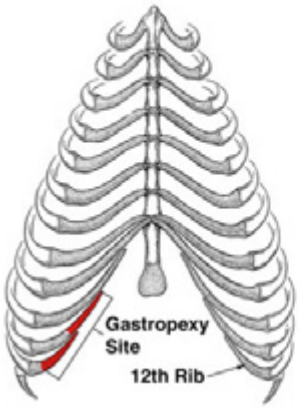
Gastropexy for treatment of Gastric Dilatation Volvulus (GDV) is often performed as an emergency procedure, therefore, an ideal method for gastropexy should be quick, safe and easy to perform. This article describes an incisional gastropexy technique designed to be readily performed by a surgeon without assistance for treatment of acute GDV and to prevent this condition. Like other successful permanent gastropexy techniques, this method apposes incised surfaces of the right abdominal wall and pyloric antrum. Illustrated technical details are included that allow the surgeon to readily create these incised surfaces while avoiding potential complications such as inadvertent perforation of the gastric mucosa or diaphragm. In addition, standard gastropexy incision sites are described and shown to help prevent gastric malpositioning or outflow obstruction following surgery. Technique With the animal in dorsal recumbency, aseptically prepare the ventral abdomen. The surgeon stands on the LEFT side of the patient for the best exposure to the gastropexy site; the figures in this article are viewed from this perspective. Create a linea alba incision from the xiphoid to umbilicus. This incision should be long enough to perform the gastropexy and allow complete abdominal exploration. If more cranial exposure is needed in deep-chested dogs, continue to cut the linea incision (cranial but superficial to the xiphoid cartilage) with Mayo scissors. Remove the falciform fat to access the abdominal wall gastropexy site. Grasp the right side of the cranial abdominal wall incision, evert and roll the wall to allow palpation of the chondral aspect of rib twelve. The twelfth rib can be identified by palpating its cartilaginous margin that ends several centimetres caudal to the xiphoid cartilage. The reader should note that there are individual breed differences in the location of the chondral aspect of ribs eleven and twelve. The eleventh rib can be used alternatively if the cartilaginous end of this rib is located several centimetres caudal to the xiphoid (Fig. 1). Remove the falciform fat and isolate the twelfth rib with your thumb and index finger and pull the rib away from deeper structures (Fig. 2). Place two towel clamps around the isolated rib approximately five to six centimetres apart from one another (Fig. 3). The cranial clamp should be positioned at the end of the twelfth rib approximately 5 centimetres caudal to the xiphoid (Fig. 1). Elevation of this rib by the towel clamps helps stabilize the rib and retracts it away from the diaphragm. In one stroke, directly incise over the twelfth rib with a scalpel blade between the towel clamps (Fig. 3). The abdominal wall incision is about midway between the dorsal and ventral aspects of the right abdominal wall (Fig. 4). The stomach incision site is made midway between the pylorus and base of the antrum (Fig. 5). Orient the stomach incision parallel to the long axis of antrum, and midway between lesser and greater curvatures to avoid damage to stomach vasculature. Thoroughly wipe and dry your left thumb and index finger with a dry sponge. Carefully wipe the surface of the proposed antral gastropexy site (Fig. 6). Pinch about 4 centimetres of the antral site (full-thickness) between the thumb and index finger (held parallel to the long axis of the antrum) (Fig. 6). Lift the pinched stomach wall until the mucosa distinctly slips out from between the fingers. What remains grasped after this manoeuvre is just the serosa and muscular layer of the stomach wall. With Metzenbaum scissors, create a partial thickness gastric antral incision by cutting to the base of the pinched wall towards the tips of the fingers (Fig. 7). Since the gastric mucosa has been squeezed away from the pinched wall, no perforation into the stomach is possible and only the seromuscular layer is incised (Figs. 7 and 8). The stomach incision should be 3-4 centimetres in length. Bring the stomach wound in apposition to the rib incision so that the PYLORUS is pointing in a CRANIODORSAL direction. Fasten stay sutures to both ends of the incisions thorough the seromuscular stomach layer and transverse abdominal muscle. (Fig. 9) Use 2-0, prolonged absorbable or nonabsorbable monofilament suture material (i.e. polydioxanone) on a taper needle. When stay-sutures are placed and tied, the incised edges of the stomach and abdominal wall are brought in apposition so the edges are easy to suture (Fig. 9). Leave the needles attached to the stay sutures so that they can be used to appose the incision edges for the gastropexy. With the cranial stay suture needle, begin suturing the caudal edge (greater curvature side) of the incised stomach wall to the dorsal edge of the abdominal wall incision (the two muscle edges between stomach mucosa and rib) with a simple continuous suture pattern (Fig. 10). At least 3-4 mm bites of tissue should be included on either side of the suture line. Avoid entering the stomach lumen with the needle if possible. The first suture line is ended and tied to the knot ears of the stay suture at the other end of the incision. Using the needle from the caudal stay suture, appose the remaining (lesser curvature side) free edge of the stomach incision to the ventral part of the abdominal wall incision using the same suture pattern (Fig. 11). Tie this suture line to the knot ears of the cranial stay suture knot. After both suture lines are completed, both incision edges of the stomach and abdominal wall are firmly apposed (Fig. 12). Close the celiotomy incision in a routine fashion.

Figure 1: The gastropexy site over the 11th or 12th rib is highlighted in red (Top). (Bottom) On a ventral thoracic view in a cadaver, the abdominal wall incision site is 5 cm caudal to the tip of the xiphoid cartilage and is about 5 cm in length (yellow line)



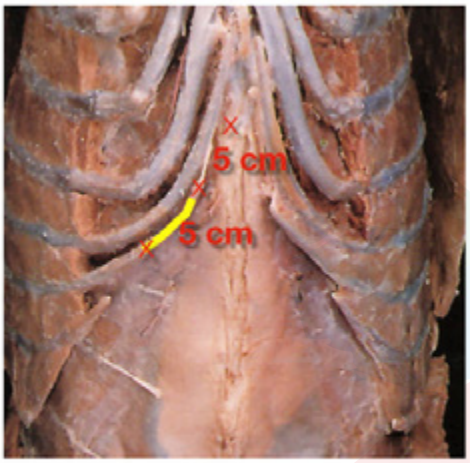


Figure 2: The falciform fat is removed from the celiotomy incision (dotted line) and the full-thickness right abdominal wall is pulled forcibly to the right to expose the rib margin seen under the peritoneal surface (Top) "X" marks the cranial part of the celiotomy incision, the base of the xiphoid cartilage. (Bottom 2 images) While holding the abdominal wall to the right, the 12th rib is palpated and fixed between the surgeon's index finger and thumb.

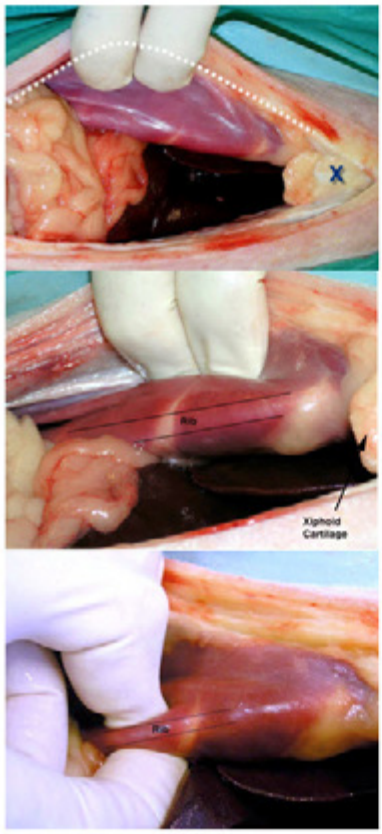


Figure 3: Towel clamps are placed through the transverse abdominal muscle and around the isolated pinched rib. Transverse abdominal muscle is incised directly over the isolated rib which is held up and exposed by towel clamps.

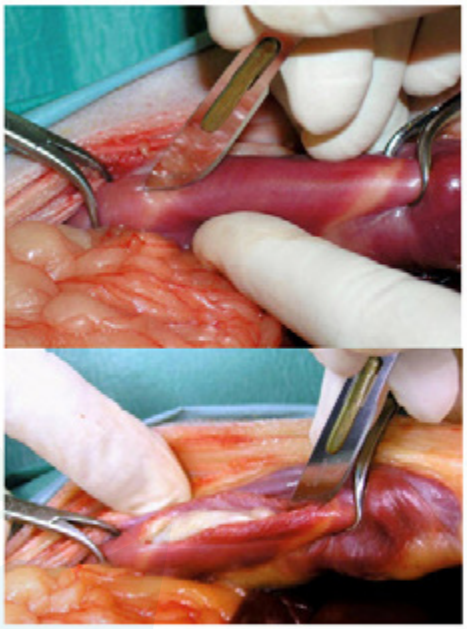


Figure 4: Towel clamps are removed (just for illustration purposes) after the incision is completed to show the location of the abdominal incision when it is completed. Note the correct site of the 5 cm incision is about 5 cm caudal to the xiphoid cartilage. In a real clinical case, the towel clamps are left in place to hold and expose the incision site until the gastropexy is completely sutured.

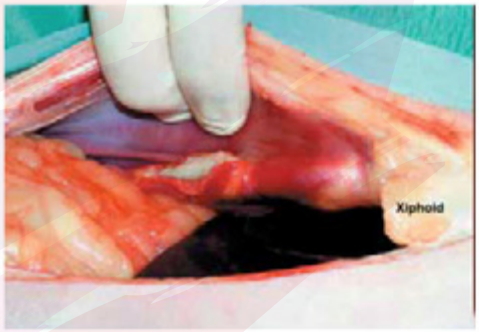


Figure 5: The correct antral site for the stomach wall incision (oval black mark). The site is midway between the lesser and greater curvatures, and midway between the pylorus and antral-body line (black line).

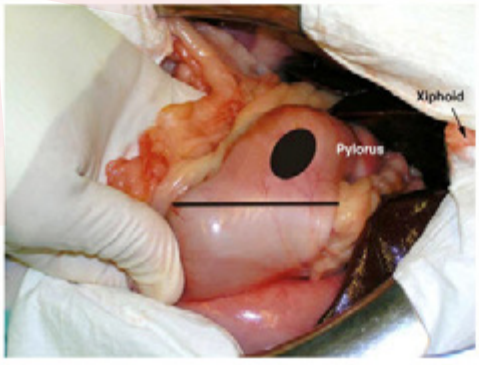
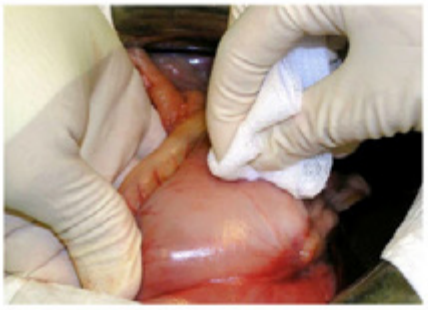


Figure 6 (top and bottom): After the surface and fingers have been wiped dry (top), the full-thickness stomach wall is pinched between the thumb and index finger at the correct antral site denoted in Figure 5 (bottom). The area is pinched and lifted such that the mucosa is felt to slip out away from the grasped (isolated) serosal and muscular layers.



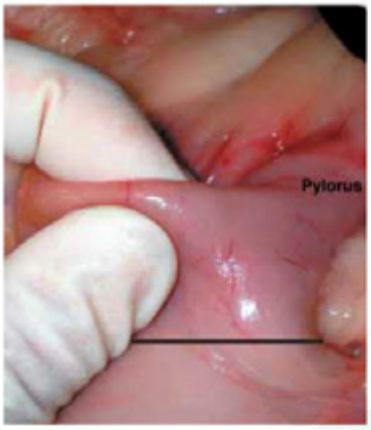
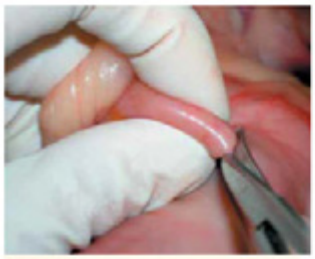
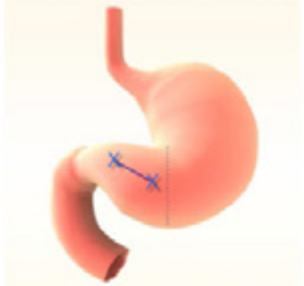


Figure 7: The mound of stomach wall held with the index finger and thumb is cut just adjacent to the fingers (top) with Metzenbaum scissors. Since the mucosa has slipped out of the grasped stomach wall the cut simple cannot penetrate the stomach lumen. (Middle) Thumb and index fingers are placed at the "x" marks. The incision is oriented as depicted as the purple line between the "x" marks. Completed incision (bottom)





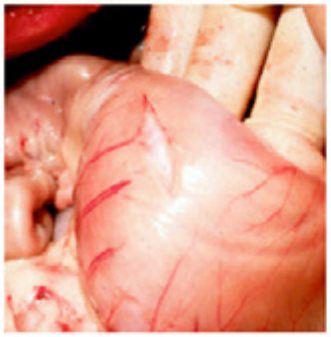


Figure 8: After cutting the serosal and muscular layers, the intact whitish bulging mucosa is exposed. The incised stomach wall edges are now ready to be sutured to the abdominal wall incision margins.

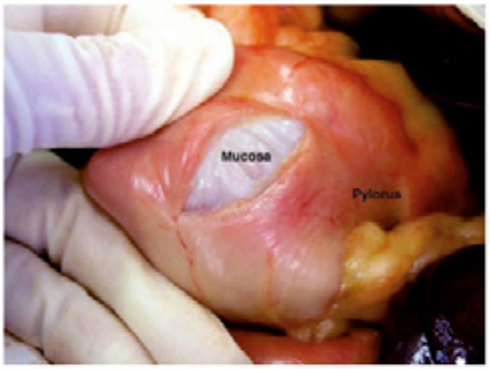


Figure 9: Position the pylorus in a craniodorsal direction and knot preplaced stay sutures at the opposite sides of the incision, holding the stomach and abdominal wall incisions in apposition.

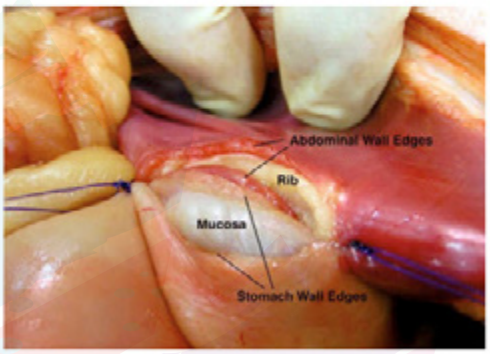


Figure 10: The "deep" (greater curvature side) edge of the stomach incision and dorsal edge of the abdominal wall incision are sutured together with continuous 2-0 prolonged absorbable monofilament suture.

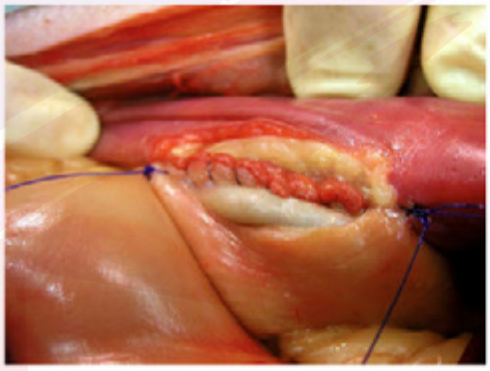


Figure 11: The ventral portion of the abdominal wall incision is opposed to the adjacent stomach wall incision.

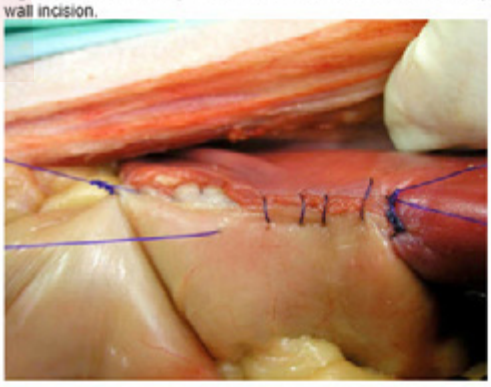
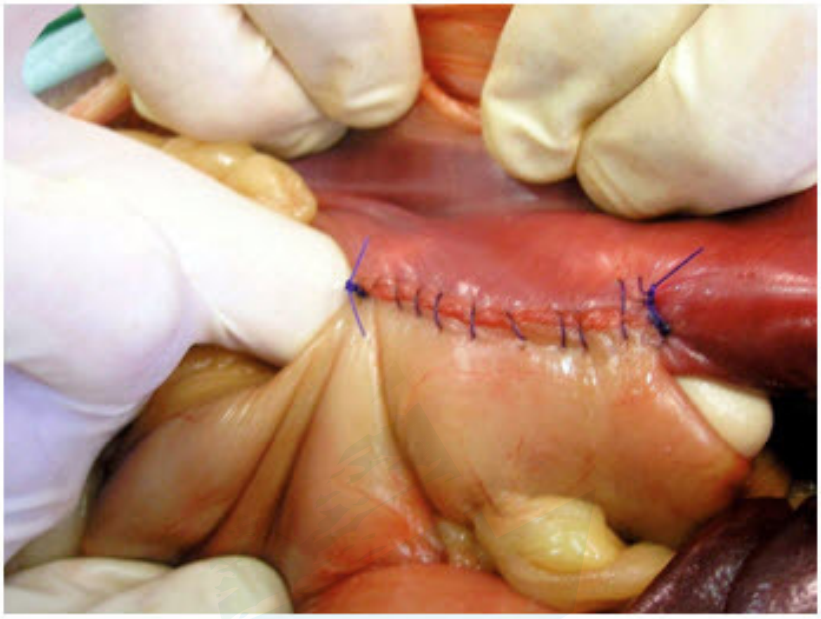
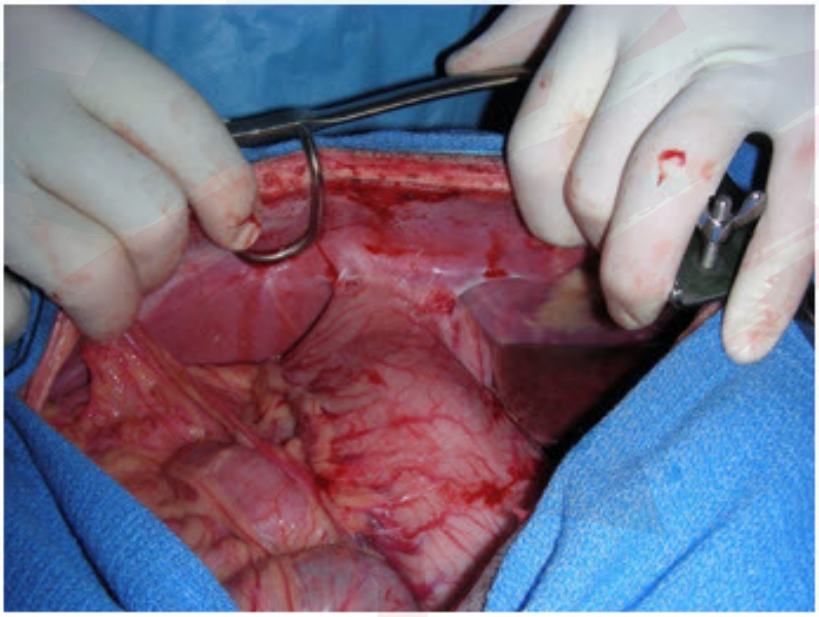


Figure 12: Completed gastropexy closure (Top). Two continuous suture lines hold the stomach to the abdominal wall securely. (Bottom) "Smeakopexy" site one-year after treatment for acute GDV in a German shepherd dog.





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DIAGNOSE CAUSES OF PULMONARY PATTERNS

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Pulmonary patterns attempt to assign an anatomical location of the lesion based on the morphologic changes expected grossly and histopathologically within the lung. It is an attempt to correlate radiology and histopathology. The anatomical locations are grouped into four categories: vascular, bronchial, interstitial, and alveolar. Once the anatomical disease is assigned to one of these locations, the route of entry (aerogenous, hematogenous, or direct extension) and the underlying etiology (e.g. bacteria, virus, fungal, inflammation) can better predicted so that appropriate testing and sampling can be performed and definitive diagnosis obtained (1).

Histological

type of pneumonia- Port of entry & Location of lesion
Broncho-
pneumonia- Aerogenous: bronchi, then alveoli with interstitial hyperemia
Interstitial pneumonia- Aerogenous or hematogenous: alveolar walls and interstitium
Granulomatous pneumonia- Aerogenous or hematogenous: randomly distributed
Embolic pneumonia- Hematogenous: centered in arterioles and capillaries

Additionally, specific diseases are often not limited to a single, “typical” radiographic pulmonary pattern. For example, edema can range from having an interstitial, alveolar, or even peribronchial pulmonary pattern as fluid shifts and severity of disease progresses or resolves, which reduces the value of using patterns solely as a means of differentiating disease. Pulmonary patterns can be a continuum of each other.

Pulmonary Patterns Defined

Regardless of the deficiencies of the patterned approach to pulmonary description, it remains relevant for differentiating lung disease and remains in the literature. It should be understood that the anatomical implication of each pattern is inaccurate. As mentioned, the pulmonary patterns are alveolar, bronchial, interstitial, and vascular.

Alveolar Pattern

The alveolar pulmonary pattern was defined to describe diseases that are affecting the alveolar lung spaces only (2). It is now known that abnormalities are not limited to just the alveolar lung space, but can affect the interstitium, bronchial, and vascular spaces, as well. However, the term persists as a more appropriate term has not been agreed upon (3). Regardless of what the pattern is called, the alveolar lung pattern has a specific set of criteria that must be met in order for pulmonary diseases to be categorized as such. A set of differential diagnoses for the pattern can be narrowed down when taking other descriptors into consideration such as regional distribution and volume of affected lung.

To be classified as an alveolar pattern, the first necessary criterion is that the lung must be more opaque than normal. Alveolar lung disease is one of the most intense/opaque per unit area of the pulmonary patterns. Options for this decrease in aeration are that the alveoli are simply collapsed and do not contain air (atelectasis) or the air is replaced by soft tissue opaque material: fluid, cells, hemorrhage, or pus. This material accumulates in the smaller airways initially and can progress to include lobar bronchi.

Three descriptive hallmarks are seen with alveolar disease of any cause: air bronchogram, lobar sign, and border effacement. Having any one of these three would classify the pulmonary pattern as alveolar – often not all hallmarks are present. An air bronchogram occurs when alveoli are not aerated, i.e., they contain fluid (edema, hemorrhage, pus) or are collapsed while the bronchi remain aerated. Its appearance is likened to a “tree in a snowstorm,” where the branching lucent bronchus is evident against a white backdrop. A lobar sign occurs when alveolar disease is peripheral relative to lobar margins and inconsistent among lung lobes. This allows the margin of the lung lobe to be evident as a relatively distinct line between an affected lobe that is adjacent to a more aerated lobe. Border effacement is the most consistently present hallmark of alveolar disease, and often times, one of the most forgotten. When objects are effaced, their margins can no longer be delineated. In order for this to occur, the objects have to be identical in opacity (usually both are soft tissue/fluid opaque) and they have to be in direct physical contact with each other. In the case of alveolar disease, fluid within alveoli, which is identical in opacity to the heart, pulmonary vasculature, and bronchial walls, contacts any of these structures such that their margins are no longer distinguishable.

When not caused by atelectasis, alveolar disease is typically caused by fluid accumulation (edema, hemorrhage, or pus) within alveoli (2). The regional distribution is the most effective means of distinguishing these as shown in the following table.

Histological

type of pneumonia- Port of entry & Location of lesion
Lesion distribution
Broncho-
pneumonia- Aerogenous: bronchi, then alveoli with interstitial hyperemia- Ventral
Interstitial pneumonia- Aerogenous or hematogenous: alveolar walls and interstitium- Diffuse
Granulomatous pneumonia- Aerogenous or hematogenous: randomly distributed- Multifocal
Embolic pneumonia- Hematogenous: centered in arterioles and capillaries- Multifocal

Interstitial Pattern

The designation of pulmonary abnormalities into this category implies that the fluid, cells, or fibrosis exists in the supporting connective tissue surrounding vasculature and bronchi. The location of the disease likely includes regions other than the interstitium and, as severity progresses, the abnormality can appear alveolar, radiographically. The interstitial pulmonary pattern is subcategorized into structured and unstructured. The unstructured interstitial pulmonary pattern is notoriously difficult to diagnose as the appearance of the interstitium is greatly influenced by technical factors; additionally, it may indicate active or past disease (4). An unstructured interstitial pulmonary pattern is described by an increase in pulmonary opacity that is less intense per unit area when compared to alveolar disease such that margins of vessels are less delineated, but not totally effaced. Any disease resulting in an alveolar pulmonary pattern can appear as an unstructured interstitial pulmonary pattern with a similar regional distribution. Additionally, in cases of an unstructured pulmonary pattern that is distributed diffusely, fibrosis, neoplasia (lymphoma, hemangiosarcoma), or pneumonitis (infectious/non-infectious inflammatory) should be considered.

The structured pulmonary pattern is reserved for any nodular or mass lesion(s) seen within the lung. This pattern can be relatively intense per unit area, depending on size of the nodule. The difference between a nodule and a mass is strictly size, where a mass is 3 cm or greater. Masses and nodules are best delineated from other lesions of high intensity per unit area (i.e. alveolar lung disease) by the rounded, often well-defined margins seen with structured interstitial disease.

Bronchial Pattern

The bronchial pulmonary pattern implies disease limited to the bronchi. In most cases, the ailment affecting the bronchus extends into surrounding peribronchial interstitium. It is a common mistake for beginning interpreters to assign a bronchial pattern when bronchi are noticed. Of course, this is inappropriate as bronchi must be present in order for air conduction to occur. Seeing bronchi does not make the study abnormal. Disease can be assumed, however, when the bronchi are thickened, irregular, and/or indistinct in margination. As with many interpretations, there can be pitfalls when the normal radiographic appearance of the lung is not well recognized. Interpreters often mistake small pulmonary arteries and veins as bronchial walls and misinterpret the appearance as bronchial disease. All suspected cases of bronchial pattern should be scrutinized at a distance for a general increase in opacity, then close-up to determine where the true bronchial wall is located. A bronchus, in most cases unless bronchiectasis is present, should taper as is approaches the periphery. Vascular pairs will diverge. Additionally, a bronchial wall that is thickened enough to be of similar size to peripheral vasculature will often be much more irregular.

Vascular Pattern

This pattern is reserved for cases where pulmonary vasculature are too big or too small. Many do not consider this a true pulmonary pattern. If both arteries and/or veins are enlarged, causes of cardiovascular disease should be pursued.

Conclusion

Differentiation of pulmonary disease is best accomplished by incorporation of pulmonary patterns, regional distribution, and recognition of changes in lung volume into formation of an appropriate list of differential diagnoses. The pulmonary pattern is not the only descriptor that will assist with diagnosis, and to some degree, it is not even the most important. At the very least, recognizing whether abnormalities are associated with airway or not will help the interpreter determine the most useful sampling technique (airway wash v fine needle aspiration) to diagnose and treat.

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TREAT PERIOPERATIVE NAUSEA AND VOMITING

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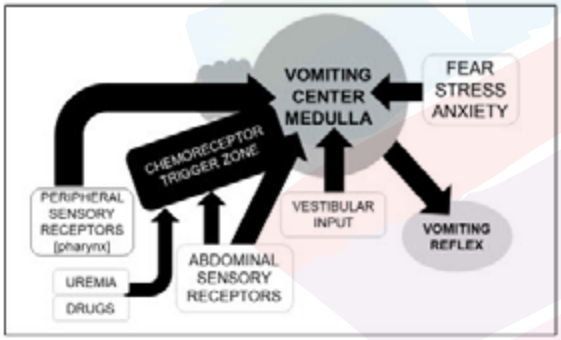
Vomiting

Vomiting is defined as vigorous and coordinated contractions of the diaphragm and abdominal muscles; stomach contents are ejected from the mouth. There are multiple causes of vomiting which may be acute and short lived or chronic and protracted (Figure 1). In the perioperative period this is unpleasant for the patient and associated with adverse consequences including but not limited to increased intraocular and intracranial pressure and aspiration of stomach contents.

Figure 1. Summary of the multiple inputs to the chemoreceptor trigger zone and vomiting center.



Treatment

Table 1. Drugs used to treat vomiting and their mode of action.

DRUG	MODE OF ACTION
Metoclopramide	D_2-Dopaminergic antagonist
Maropitant	NK_1-antagonist
Ondansetron	5-HT_3-antagonist
Chlorpromazine	Dopamine receptor blockade
Acepromazine	Dopamine receptor blockade
Meclizine	H_1- antagonist

Maropitant citrate (Cerenia®, Zoetis) is the most widely used anti-emetic drug in the perioperative setting. It is a potent anti-emetic agent and has the advantage of being available in an injectable and oral formulation. It is a highly specific Neurokinin-1 (NK-1) antagonist and is effective against centrally and peripherally mediated vomiting by blocking the actions of Substance P at the NK-1 receptor. It is an impressive anti-emetic drug, but it should not be relied upon if gastro-esophageal reflux is a concern.1 If dogs and cats suffer from motion sickness the owner can administer maropitant citrate at home prior to the journey to the clinic; this is beneficial for the pet, and owners are less distressed.

Despite its anti-emetic efficacy maropitant does not appear to be as effective for nausea.2 The timing of administration is important and suggestions for dosing are shown in Table

Table 2. Dosing suggestions (route, dose and timing) for maropitant citrate.

SPECIES	INDICATION	ROUTE / DOSE	COMMENTS
DOG	Prevention of acute vomiting e.g. emetogenic opioids	IV 1mg/kg	60 minutes prior to triggering event. Give over 1-2 minutes
		SC 1 mg/kg	45-60 minutes prior to triggering event
	Prevention of motion sickness	PO 2 mg/kg	≥ 2 hours before the triggering event
CAT	Prevention of drug induced vomiting e.g. morphine, dexmedetomidine	IV 1 mg/kg	Timing is as for the dog
		SC 1 mg/kg	If given IV administer over 1-2 minutes
	Prevention of motion sickness	PO 8 mg/CAT	

IV = intravenous SC = Subcutaneous PO = Oral

Nausea

Nausea is an unpleasant subjective experience that is difficult to assess in dogs and cats. Humans report it as one of the most unpleasant feelings, often ranking it above pain in the perioperative environment. As with vomiting there are multiple causes; opioid and alpha2-adrenergic agonists are common causes in the perianesthetic setting. Treatment for the signs of nausea should be initiated quickly to prevent anxiety and stress for the patient. Nausea scores and response to treatment should be monitored and recorded in a pet's record so it can be prevented or treated prophylactically during future clinic visits. One example of a scoring system is given in Table 3.

Table 3. A tool for monitoring nausea – designed for dogs2 but can be adapted for cats.

	1	2	3	4
Lip licking or Swallowing	None	Occasional	Moderate	Frequent
Salivation	None	Slight	Moderate	Excessive
Panting	None	Occasional	Increased	Most of the time
Attitude, mentation posture	Normal	Mild restlessness Depressed Sitting, standing Lying down	Moderate Restlessness Depressed Standing, walking, lying	Very restless Pacing Head extended Looks uncomfortable

Ondansetron, a 5-HT3 receptor antagonist, is an effective anti-emetic and anti-nausea drug in many species including humans. Because 5-HT3 receptors are present on abdominal vagal afferent nerves and in the chemoreceptor trigger zone ondansetron has both a peripheral and central effect. In cats it is very effective for preventing vomiting, nausea and salivation caused by dexmedetomidine – it is only effective when co-administered with dexmedetomidine.3

Ondansetron is available in oral and injectable formulations. In cats, the bioavailability via the subcutaneous and oral route are 75% and 32% respectively.4 Although an attractive route of administration in cats, transdermal application of ondansetron in a

lipoderm gel did not result in clinically relevant absorption as measured by serum concentrations.5

Fear, stress and anxiety

One of the commonly overlooked causes of vomiting and nausea is related to emotional states such as fear, stress and anxiety (Figure 1). This underpins the need to embrace low stress and fear free techniques at all times during a patient's hospital stay.

The role of acupuncture for vomiting and nausea

There is a long history on the use of acupuncture (AP) for the prevention and alleviation of nausea and vomiting. In humans it has helped reduce the severity of morning sickness and chemotherapy related gastrointestinal side-effects. The main point of interest is Pericardium (PC) 6, sometimes referred to as the "sea sickness" point or Neiguan (Inner Gate). In dogs electroacupuncture at PC 6 significantly reduced the number of vomiting and retching events following morphine administration compared to treatment with saline or stimulation of a sham AP point.2 In the same study, acupuncture and acepromazine were more effective in mitigating nausea than maropitant.2 Another study reported that pretreatment with AP at PC 6 reduced the incidence of vomiting in dogs given hydromorphone from 74% to 37%.6 Even with no training in acupuncture this is a site that is easy to locate and utilize; the use of acupuncture needles is not essential and acupressure can be applied here (Figure 3).

Figure 3. Electroacupuncture at PC6 (left), location of PC 6 (center and right).

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MICROBIOLOGICAL FOOD SAFETY

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The pet food and treat manufacturing industry is highly variable. It includes large multinational corporations, small single-site manufacturers, small manufacturers that contract production to other companies and small scale (including in-home) commercial processing. Further, some pets receive food or treats prepared in the household. The foodborne pathogen challenges can vary greatly between these types, as do preventive measures. Approaches to regulation of pet food vary and the range of national regulations is beyond the scope of this review. As an example, in the US, The Food and Drug Association (FDA) requires that food be 'safe to eat, produced under sanitary conditions, free of harmful substances and truthfully labelled'. Manufacturing facilities must have a food safety plan that assesses potential food safety hazards and establishes good manufacturing practices for manufacturing, processing, packing and storage.

Pathogens of concern

Most of the attention has focused on Salmonella, but a variety of pathogens are of concern, Listeria and shiga toxin producing E. coli (e.g. E. coli O157), with the latter of greater health concern in humans exposed to the food. Campylobacter is an important pathogen but of somewhat lesser concern because of its relatively poor tolerance to environmental stressors such as freezing. Additional bacteria, ranging from minimally relevant spoilage organisms to serious concerns such as Clostridium botulinum, can thrive in inadequately processed food (e.g. improper canning). Some pathogens are of broad concern, involving many different food types and production systems, while others are very narrow, such as infection by the bacterium Neorickettsia helminthoeca within the parasite Nanophyetus salmincola in raw salmonids. Parasites, most notably Toxoplasma gondii, are also of potential concern. Disease concerns include both animals and humans, since pet food associated human infections with Salmonella and E. coli O157 have been identified.(1-3)(https://www.fda.gov/AnimalVeterinary/NewsEvents/ucm596555.htm, https://www.fda.gov/animalveterinary/newsevents/ucm596071.htm, http://www.health.state.mn.us/news/pressrel/2019/salmonella012819.html)

Incidence and impact of foodborne disease

The incidence of foodborne disease in dogs and cats is unclear. Outbreaks receive most of the attention and are undeniably important. However, they may not represent the main burden of disease, particularly associated with raw diet or boutique manufacturers, where small batch contamination is less likely to be identified because of the lower likelihood of large numbers of cases. Sporadic disease can go unidentified but represent the main disease burden. The true impact of foodborne disease on animal and human is almost impossible to accurately identify. Investigation is most often to occur when humans develop a reportable disease (e.g. salmonellosis, E. coli O157 infection).

Potential sources of contamination

Contamination can occur at many steps in the food preparation process. This includes raw ingredients, palatability enhancers, manufacturing equipment, post-manufacturing storage, contamination during retail storage and contamination in the household after containers are opened. A range of preventive measures at different levels may be required to identify and eliminate these risks.

Preventive measures

Prevention of contamination and monitoring is a complex process that can involve multiple steps, each of which is designed to achieve a particular goal. Examples are discussed briefly below.

Heat

Heat is one of the most effective and reliable pathogen elimination methods, and is a key component of foodborne pathogen elimination. Canned (wet) food undergoes high temperatures during the cooking and canning process, with temperatures that are adequate to render the food sterile. Pet foods are considered to be low-acid foods, which carry an increased risk of Clostridium botulinum growth if improperly cooked and canned, so canned food must follow low-acid canned food regulations that dictate time and temperature, along with the type of monitoring and monitoring equipment that is required. Dry foods undergo cooking, with heat and dessication eliminating many pathogens. The extrusion process also results in generation of heat and pressure that can inactivate many pathogens.

Irradiation

Irradiation is a highly effective means of eliminating pathogens, particularly from items that are not amenable to heat treatment but cost and consumer perceptions limit widespread use. Irradiation of cat (but not dog) food was banned in Australia after an outbreak of neurological disease in cats fed a specific imported diet that had been irradiated,(4) potentially because of irradiation-induced reduction in vitamin A.(5) While this phenomenon has not been reported elsewhere, it is an important consideration if whole diets are being irradiated, as opposed to treats.

High-pressure pasteurization

This process involves pressurizing foods to 100-800 MPa, with only a slight (approximately 30C/100 MPa) increase in temperature.(6) Some raw food manufacturers use this process, largely to reduce Salmonella contamination. The bacterium, food matrix and pressurization conditions will impact efficacy of high-pressure pasteurization. Published data regarding the efficacy of methods used on pet foods are lacking and recalls of treated diets have occurred. Companies using this process should ensure that proper testing is done with their raw food, batch size and pressurization conditions, ideally with experimentally contaminated food, and make that information available publicly.

Preservatives

A variety of preservatives may be added to pet food. Regardless of whether they are 'natural' or 'artificial' (a marketing designation rather than a microbiologically relevant factor), preservatives are not typically intended to kill contaminants. They are mainly added to prevent oxidation of the food and associated discolouration or spoilage. Bacterial inhibition by commonly used preservatives is not adequate to be relied on as a pathogen control method.

Freezing

While not a method used in commercial food preparation, freezing will eliminate some pathogens and have little effect on others. Freezing is most often used to eliminate parasites. For example, freezing (e.g. 2 days at -200C) can effectively eliminate Toxoplasma.(7) Campylobacter spp are also relatively intolerant of freezing, although freezing is not a tool that can be used with confidence to eliminate the risk of campylobacteriosis.

Freeze-drying

Freeze-drying does not eliminate most pathogens. In fact, freeze-drying is a common and effective tool for longterm preservation of bacteria. The freezing component of the process may eliminate pathogens such as parasites or Campylobacter that are susceptible to freezing.

Cleaning and disinfection

Persistence of Salmonella in processing facilities has been implicated in large Salmonella outbreaks involving commercial dry food, from combination of poor equipment, poor maintenance and inadequate cleaning and disinfection. Detailed protocols and practices are used in well-run manufacturing facilities, but deficiencies can be present and can lead to contamination. Key aspects of cleaning and disinfection are the use of proper cleaners and disinfectants, the presence of surfaces amenable to cleaning and disinfection, provision of adequate time, and, perhaps most importantly, actually performing the task thoroughly.

Pathogen Testing

Testing can allow for detection of contamination before food reaches the consumer, as well as provide an indication that something may have gone wrong in the food preparation process (with subsequent investigation). However, testing does not cover all potential pathogens. Sporadic testing may not be adequate to determine uncommon (but still relevant) contamination. The quality of results also depends strongly on the methods (i.e. if you don't really want to find Salmonella, you can use a protocol that is poorly sensitive). Specific pathogen testing practices and thresholds are typically proprietary. However, the FDA has a zero tolerance policy for Salmonella in pet food,(8) so any positive Salmonella test would result in a recall.

Hazard Analysis and Response

This is a standard food safety procedure that identifies and evaluates potential (foreseeable) hazards encountered during the manufacture, processing, packing and storage of food. The concept of hazard and critical control point (HACCP) analysis is well established and an expectation of any manufacturer. This approach is designed to identify key control points in the production system and to employ preventive and/or monitoring measures at those points to prevent and detect contamination. Thorough description of HACCP and individual control points is beyond the scope of these proceedings.

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ANIMAL HOARDING ANIMAL WELFARE - EXPERIENCES FROM DIFFERENT COUNTRIES AND CULTURES 1

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The psychology of animal hoarding and the underlying behaviors that lead to this mental disorder are ones that have been speculated on but are not completely understood. The Hoarding Animals Research Consortium (HARC) formally defined animal hoarding using the following criteria

• Having more than the typical number of companion animals.
• Failing to provide even minimal standards of nutrition, sanitation, shelter, and veterinary care, with this neglect often resulting in illness and death from starvation, spread of infectious disease, and untreated injury or medical condition.
• Denial of the inability to provide this minimum care and the impact of that failure on the animals, the household, and human occupants of the dwelling.
• Persistence, despite this failure, in accumulating and controlling animals.[1]
There are three basic classifications of animal hoarding that have been proposed to describe different forms of hoarding behavior and potential ways to engage with each of these types of individuals:

1) The overwhelmed caregiver - This person is often most responsive to working with authorities because they are the less likely to deny that a problem exists. As the name implies, this is the person who had initial positive relationship with animals and authorities. Often a particular circumstance leads to them becoming overwhelmed and unable to care for the animals. They are less likely to be resistant to authorities and more likely to hand over animals to willing parties when offered assistance.

2) The rescue hoarder (which I combine with institutional hoarding) - This may be the largest component of hoarding behavior to date, with more cases coming from institutional and rescue hoarders than other sectors. This person falls into the subcomponent of hoarding that is well described by Dr. Gary Patronek and Jane Nathanson in the book, Pathological Altruism. A pathway to attachment disorder is described as one potential model for understanding the psychology of the hoarder. This pathway will be described in the lecture.

Nearly one quarter of cases have been described as institutional hoarders or rescue hoarders. This person is more challenging for authorities because they work with others and are often fall under the guise of a legitimate non-profit organization.

3) The exploiter hoarder – This person is the sociopath that does not have an emotional attachment to the animals that are being harmed. From this standpoint, it may not fit the diagnostic criteria of hoarding disorder as described in one study. This person is extremely challenging for authorities and has no regard for the animals in their care.

Hoarding disorder is now a mental disorder in the Diagnostic Manual of Mental Disorders V and is no longer a subcomponent of other disorders. This lecture presents different case examples and studies currently highlighting approaches to animal hoarding.

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ANIMAL HOARDING ANIMAL WELFARE - EXPERIENCES FROM DIFFERENT COUNTRIES AND CULTURES 1

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Medical conditions in hoarded animals are the predictable result of overcrowding, poor sanitation and failure to provide appropriate medical and emotional care.1–5 Upper respiratory infection (URI) is an almost-universal problem in hoarded cats. Other conditions are found less consistently but may be present in most or all animals in a given setting. They include matted coats, emaciation, wounds and other physical injuries, dermatophytosis, fleas, ear mites, demodicosis, scabies, oral and dental disease, ticks and tickborne diseases, intestinal parasites, diarrhea and retroviral infections. Polydactyly or heart murmurs can reflect inbreeding.
A study of 371 cats from 14 different groups, surrendered to the Toronto Humane Society (THS) over a 3-year period, showed a spectrum of prevalence of medical conditions, with URI (38%) and dermatological disease (30%) being the most common overall (Figure 1; manuscript submitted for publication). The odds of URI at intake (4.35) and chronic URI (23.7) were significantly higher for cats from institutional hoarding environments compared with home environments (Figure 2).
Veterinarians should suspect hoarding if animals are presented with medical conditions consistent with those outlined above, particularly if these occur in multiple animals from the same home or rescue/ shelter. Practitioners who are knowledgeable about shelter medicine are a valuable resource for community veterinarians dealing with animal hoarding.
Unpublished data on behaviour in hoarded cats described a group of cats housed in a compound in the Nevada desert.5 Most of these cats were very friendly, probably in response to having been deprived of normal human contact. Compared with control cats, they were friendlier toward unfamiliar people and cats. There were no significant differences between hoarded and control cats for litterbox use, aggression, night-time vocalization or a variety of fearful behaviours.

Hoarded cats at the Toronto Humane Society show a range of socialization levels, behaviours and temperaments (manuscript in preparation), as would be expected depending on intrinsic factors, the previous life experiences of the cats and the type of hoarding environment. Cats from one large-scale institutional hoarder were dubbed “Velcro cats” because of their obvious need for human contact. Inappropriate elimination has not been frequently identified compared with the general population, and was only rarely a concern in the new home in hoarded 100 cats followed post-adoption.

Long-term confinement in a hoarding setting can result in the establishment and persistence of unusually severe disease and/or unusual opportunistic infections.2,4,7 These include chronic infectious or parasitic diarrhea and unusual causes of respiratory disease. Streptococcus equi subspecies zooepidemicus (“Strep zoo” or SEZ) and other streptococcal infections have been reported in cats in institutional hoarding settings. Beta-hemolytic streptococcal infection caused multiple pyogenic syndromes in hoarded cats, including abscesses, purulent rhinitis, septic arthritis and meningitis. SEZ was found in 4/4 large-scale hoarding investigations.

The Toronto Humane Society has identified chronic rhinosinusitis and otitis media caused by SEZ in cats from two different institutional hoarders. This condition is typically found in long-stay cats. Cats that were removed after a short stay did not shown signs of SEZ infection, suggesting that it might become established secondary to chronic URI. Despite reports of acute SEZ epidemics in shelter dogs, SEZ appears to be a rare cause of acute disease in cats and in our experience does not appear to be contagious in a well-run shelter setting. Otitis media should be suspected in cats with persistent nasal congestion and in those with purulent otitis externa or friable dark aural discharge, particularly in the absence of ear mites. Most cases seen at the THS gave been severe and have required ventral bulla osteotomy for effective treatment. SEZ has been regularly cultured from the tympanic bulla at surgery despite previous courses of appropriate antibiotics.

Emotional suffering in shelter settings is profound, given the combination of crowding, illness, abnormal interactions between animals and limited opportunity for normal interactions with people.5,6 Long-term emotional consequences will vary depending on the level of early socialization, behavioural issues prior to entering the hoarding environment, severity and duration of stress and psychological trauma, and the animal’s internal resilience.

Many previously hoarded dogs suffer from high levels of fear.6 When compared with normal dogs, they showed higher average scores for stranger-directed, dog-directed and non-social fear, increased sensitivity to touch, more attention-seeking and separation-related behaviours, a higher rate of inappropriate urination and defecation and more repetitive behaviours. They also showed less aggression towards strangers, lower trainability and less excitability, energy and persistent barking. Persistent fear may be due to poor socialization, limited exposure to novel stimuli during the sensitive development period, and psychological trauma.

Fear of other dogs might result from negative experiences in the hoarding setting. Lower scores for aggression and energy may be due to inhibition of competitive behaviour and learned helplessness in the face of ongoing stress.

Most previously hoarded cats that enter the THS shelter are ultimately adoptable, with high adopter satisfaction scores from 100 adopters who were contacted at least a month after adoption. However, significant medical, behavioural and foster resources are typically required to restore an acceptable level of medical and behavioural health to animals that have suffered in hoarding environments.

Figure 1. Disease prevalence (%) in 371 hoarded cats from 14 sources, surrendered to the Toronto Humane Society over a 3-year period.

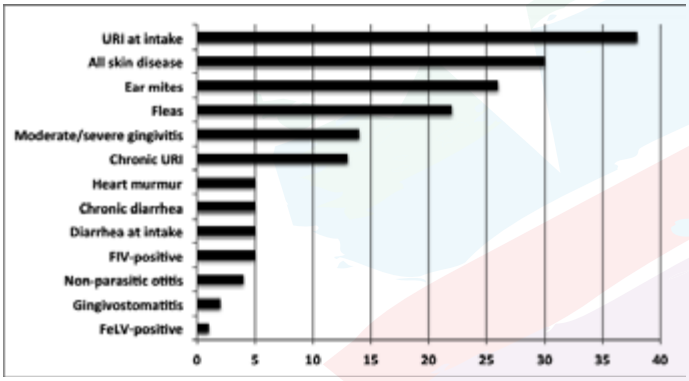
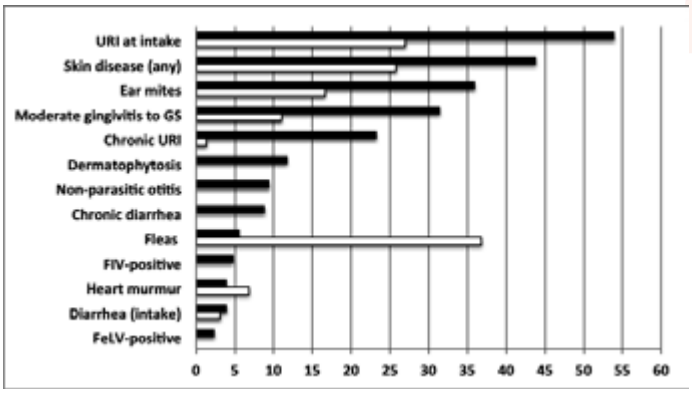


Figure 2. Comparison of disease prevalence (%) between 128 cats from institutional hoarding environments (IH; black bars) and 163 cats from non-institutional hoarders (NIH; white bars). GS = gingivostomatitis. Comparisons could not be made for conditions not present in the NIH cats. After accounting for clustering within groups, significant differences were found between IH and NIH for URI at intake and chronic upper respiratory infection (URI).



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WSV - 233

HOW TO MAKE YOUR SKIN INCISIONS LOVELY; THE ROLE OF THE HYPODERMIS

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Objectives of the Presentation

Review the factors involved in cosmetic skin closures.

Key Points

Skin incisions should be made perpendicular to the skin surface, without any serrations or dog-ears.
The keys to cosmetic skin closure, are atraumatic handling of the skin, no tension on the skin edges, perfectly apposed skin edges both vertically and horizontally, and consistent, loosely applied skin sutures.

ATRAUMATIC SKIN HANDLING

Avoid handling skin during subcutaneous suturing.
When skin adjustment is necessary, use DeBakey thumb forceps since they force the surgeon to be delicate and handle skin gently.
Do not grab the skin edges and lift the skin while suturing, simply lightly hold the skin when driving the needle into the skin.
Try not to undermine skin edges excessively.

NO TENSION ON THE SKIN EDGES

A well-placed subcutaneous suture line that incorporates the hypodermis is important to reduce skin tension.
Place subcutaneous sutures as close as 0.5 cm apart to bring skin edges within 0.2-0.3 mm from one another.
Pick up the same level of subcutaneous tissues with each bite to avoid vertical “stepping” of the skin.

PERFECTLY APPOSED SKIN EDGES

Examine the skin edges before skin closure to determine if there will need to be adjustments.
When suturing the skin, watch to appose edges both in the vertical direction as well as between edges.
If there is vertical stair stepping, drive the needle more superficial on the higher side, and deeper in the tissue on the lower side.
Needle bites should not incorporate deeper subcutaneous tissues, but strive to take only the dermal and hypodermal layers only.

CONSISTENT SKIN SUTURES

Sutures should be placed identically with each tissue purchase.

The same needle direction, amount of skin, and distance between skin bites are taken.
Suture knots are pulled to the same side of the incision.
Sutures are placed without causing excessive intrinsic suture tension.
Needle bites are taken perpendicular to the skin surface.

SUTURE MATERIALS

A rapidly absorbable suture (no larger than 3-0; 4-0 is preferred) is used in the subcutaneous tissues.
Skin sutures are nonabsorbable (no larger than 3-0; 4-0 is preferred).

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TREAT GASTROESOPHAGEAL REFLUX AND HIATAL HERNIA

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Hiatal herniation is a relatively uncommon but increasingly recognized problem in dogs causing regurgitation of food and water, discomfort and the potential for the development of esophageal inflammation, esophageal stricture and aspiration pneumonia. In veterinary medicine there is a relatively rudimentary understanding of the function of the canine gastro-esophageal junction (GEJ), which forms the natural barrier for reflux of food, water and stomach acid back up into the esophagus. The lower esophageal sphincter (LES) is created by the muscular tone within the circular smooth muscle of the muscularis mucosa of the distal esophagus as well as the mechanical support provided by the attachments of the esophagus to the diaphragm as it passes from the chest into the abdominal cavity.

Surgical techniques for the treatment of hiatal herniation (HH) in people have been extensively studied and have received rigorous evaluation over the years in the scientific literature. The same cannot be said for HH in dogs. Of the group of gastroesophageal junction (GEJ) anomalies that are seen in the dog (which includes sliding hiatal hernia, paraesophageal hernia and gastroesophageal intussusception) sliding hiatal hernia is by far the most common. This condition can arise as a congenital anomaly and has been reported most commonly in this form in young Shar Peis.1,2Acquired HH can be seen secondary to airway obstructive disease or neuromuscular disorders affecting the diaphragm.3In brachycephalic breeds it is thought that increased inspiratory effort leads to a reduction in intra-esophageal and intrapleural pressures possibly leading to the distal esophagus and stomach being pulled into the thoracic cavity during inspiration.4Clinical observations have been made to substantiate this proposed pathophysiology where a population of bulldogs with HH were shown to exhibit the more severe manifestations of brachycephalic syndrome compared to Bulldogs without HH.3

A multitude of treatment recommendations for HH have been made in the literature over the years. Medical management has been aimed at inhibition of normal gastric acid secretion to reduce its ulcerogenic effects on the esophagus when GERD occurs and is centered around the administration of antacids or proton pump inhibitors. Mucosal protectants such as sucralfate have been recommended in slurry form to coat and protect the distal esophagus from the effects of reflux. Some studies have suggested that medical management is often unsuccessful in controlling clinical signs1whereas others have suggested that medical management should always be attempted as it alone can be successful in over 50% of cases.5These discrepant results may be partially attributable to differing case populations or to the lack of standardized reporting of outcomes for this condition. However, it is safe to say that there is an important role for surgery in the treatment of HH as treatment failures following medical management occur with some frequency. Furthermore, some authors believe that if there is a deficiency in barrier function of the GEJ that can be surgically treated this may be a better approach to management than attempts at medically alleviating the consequences of GERD. To that end several surgical therapies have been in common usage for many years for treatment of HH in dogs. The most common approach is a combination of treatments using diaphragmatic hiatal reduction (phrenoplasty or crural apposition), esophagopexy and left-sided gastropexy.1,2,5,6Outcome data for this combination of therapies is quite variable and the ability to formally evaluate the procedure is adversely affected by small case numbers, combination therapies and inconsistent outcome measures.1,2,5,6Fundoplication procedures, often used in humans with GERD have also been reported for use in dogs with less encouraging results and a possibly higher incidence of complications.5

There are currently a number of objective methods for assessment of LES function and hiatal herniation, some of which have been used for some years and others that have only recently become available. Positive contrast videofluoroscopic studies have been the gold standard for non-invasive diagnosis of hiatal hernias for many years. While clear evidence of the gastric cardia crossing the diaphragm into the thorax can be taken as reliable evidence of a hiatal hernia being present, it is likely that false negatives are common using this approach given the often intermittent nature of the condition and the possibility of missing an episode of herniation when only a short series of swallows is observed in any given study.7Objective assessment of barrier function has been reported in the literature in experimental canine studies and a variety of factors have been shown to influence LES tone including, patient position, type of surgery as well as injectable and inhalant drugs.8-10These studies have mainly relied on either single channel manometry or pull-through pressure transducer techniques. However, currently more sophisticated modalities for assessment of esophageal tone and anatomical constraints of the GEJ have become available and are in use by the authors group. High-resolution manometry (HRM)

allows accurate assessment of neuromuscular activity within the esophagus and esophageal sphincters using a probe incorporating 36 pressure sensors. The device allows the creation of spatiotemporal plots of esophageal pressure activity along the entire length of the esophagus and helps to elucidate the functional anatomy of the structures involved in HH.

The authors research group have been studying two populations of dogs with hiatal hernias using one or more of these modalities as well as a clinical dysphagia assessment tool (CDAT) to evaluate the owner's perceptions of clinical signs pre- and post-operatively. Dogs that have not responded or responded insufficiently to medical management have undergone surgical management using the technique described by Prymak6and subsequently reported by others.5These dogs have been prospectively enrolled in a study evaluating pre- and post-operative clinical evaluation questionnaires (CDAT), positive contrast video-fluoroscopy and intraoperative geometric analysis of the LES using impedance planimetry. The results of this study were recently published and showed that in 80% of dogs with pre- and post-operative clinical assessments completed postprandial regurgitation improved. Hiatal hernia severity scores from videofluoroscopic swallow studies improved significantly although the frequency score did not reach statistical significance.11 However, it is important to note that although improvement was seen in a majority of dog's clinic signs, many of them did not have complete resolution of clinical signs.

Minimally invasive surgery is the standard of care for treatment of hiatal hernia and GERD in humans and development of these techniques for dogs with these conditions should be advanced. The authors group have now performed laparoscopic hiatal hernia repair on 16 dogs at UC-Davis with generally good but also variable results.12 The outcomes in these dogs are being carefully evaluated as was done in the study of the traditional open surgical approach. This will allow some degree of comparison to be made between open and laparoscopic approaches to ensure that a minimally invasive approach is at least as good as the traditional approach. This data will be published in the future.

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M IS FOR MEDICATION: PHARMACOTHERAPY FOR CANINE FEAR AND AGGRESSION

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Medication is an essential part of treatment for many behavioral problems in combination with Environmental Management, Behavior Modification and Monitoring. The only licensed veterinary behavior drugs include clomipramine and fluoxetine for separation anxiety, selegiline for cognitive dysfunction and emotional disorders, and dexmedetomidine oro-mucosal gel and imepitoin for noise phobias. Most medications used in the treatment of pet behavior problems are the off-label use of these medications or human drugs, most of which have only been assessed in open label and retrospective case studies.

There are no behavioral medications licensed for canine aggression. What medication does is to help to alleviate the underlying fear, anxiety, arousal, panic, impulsivity, reactivity, and hyperactivity, normalize the pet's mental state, improve the pet's emotional health, and create an environment in which the pet can learn and behavior can be modified.

Drugs do not change the pet's relationship with the stimulus. However, when combined with prevention, training, and reward-based behavior modification, medication plays an integral role in reducing fear, anxiety, and stress to improve problem behavior.
The selection and use of each drug requires a sound understanding of its indications, mode of action, adverse effects, contraindications and potential drug interactions. For drugs that increase serotonin, counsel owners to monitor for serotonin syndrome (respiratory, cardiovascular, neurological and gastrointestinal signs) for which increased heart and respiratory rate might be early signs. Before dispensing medications, a cbc, biochemical profile and thyroid status should be evaluated to diagnose medical conditions that might be contributing to the signs and as a baseline for future comparison.

Canine Aggression

For the treatment of aggression related to fear, anxiety, reactivity and impulsivity, drugs that enhance serotonin transmission including selective serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants (TCA) are most commonly used. Adjunctive medication to further reduce anxiety either for situational or ongoing use include benzodiazepines, trazodone, imepitoin, beta-blockers, alpha-2 agonists, clonidine,

Mucosal protectants such as sucralfate have been recommended in slurry form to coat and protect the distal esophagus from the effects of reflux. Some studies have suggested that medical management is often unsuccessful in controlling clinical signs1whereas others have suggested that medical management should always be attempted as it alone can be successful in over 50% of cases.5These discrepant results may be partially attributable to differing case populations or to the lack of standardized reporting of outcomes for this condition. However, it is safe to say that there is an important role for surgery in the treatment of HH as treatment failures following medical management occur with some frequency. Furthermore, some authors believe that if there is a deficiency in barrier function of the GEJ that can be surgically treated this may be a better approach to management than attempts at medically alleviating the consequences of GERD. To that end several surgical therapies have been in common usage for many years for treatment of HH in dogs. The most common approach is a combination of treatments using diaphragmatic hiatal reduction (phrenoplasty or crural apposition), esophagopexy and left-sided gastropexy.1,2,5,6Outcome data for this combination of therapies is quite variable and the ability to formally evaluate the procedure is adversely affected by small case numbers, combination therapies and inconsistent outcome measures.1,2,5,6Fundoplication procedures, often used in humans with GERD have also been reported for use in dogs with less encouraging results and a possibly higher incidence of complications.5

There are currently a number of objective methods for assessment of LES function and hiatal herniation, some of which have been used for some years and others that have only recently become available. Positive contrast videofluoroscopic studies have been the gold standard for non-invasive diagnosis of hiatal hernias for many years. While clear evidence of the gastric cardia crossing the diaphragm into the thorax can be taken as reliable evidence of a hiatal hernia being present, it is likely that false negatives are common using this approach given the often intermittent nature of the condition and the possibility of missing an episode of herniation when only a short series of swallows is observed in any given study. 7Objective assessment of barrier function has been reported in the literature in experimental canine studies and a variety of factors have been shown to influence LES tone including, patient position, type of surgery as well as injectable and inhalant drugs.8-10These studies have mainly relied on either single channel manometry or pull-through pressure transducer techniques. However, currently more sophisticated modalities for assessment of esophageal tone and anatomical constraints of the GEJ have become available and are in use by the authors group. High-resolution manometry (HRM)

and gabapentin. In addition, natural products including dog appeasing pheromone, and nutraceuticals and diets containing l-theanine, alpha-casozepine, valerian, GABA, and melatonin might also be considered adjunctively for improved control of anxiety and reactivity. While drugs are most commonly dispensed when behavior problems are severe or ongoing, early intervention is best as each recurrence further intensifies the problem.

SSRI's and TCA's

SSRIs particularly fluoxetine are most commonly used to reduce reactivity, impulsivity, and some forms of fear and anxiety, as well as to improve trainability and address the dog's behavioural well-being. SSRI's are selective in blocking the reuptake of 5HT1A into the presynaptic neurons. For fluoxetine, decreased appetite is the most common side effect. Fluvoxamine, paroxetine, sertraline, citalopram and escitalopram are also options. Paroxetine is moderately anticholinergic. Due to their effects on the hepatic cytochrome P450 enzyme system, delayed breakdown and increased levels of concurrent drugs must be considered.

Tricyclic antidepressants (TCAs) have differing effects on blocking the reuptake of both serotonin and noradrenaline and in their anticholinergic and antihistaminic effects which may contribute sedation, urine and stool retention. Clomipramine and amitriptyline may be useful in controlling underlying anxiety and impulsivity associated with aggression. Clomipramine is the most potent of the TCA's in blocking the reuptake of serotonin with less profound effects on noradrenaline reuptake. Noradrenaline reuptake inhibition might be useful in dogs with generalized anxiety and hypervigilance.

Side effects might include gastrointestinal upset, increased agitation, and the serotonin effects. While antidepressants reach peak plasma levels within hours, reuptake inhibition may induce down-regulation of postsynaptic receptors that are responsible for clinical effects. Therefore, 4 weeks or longer is generally recommended to fully assess therapeutic effects. When behavior is stable for at least two months, gradually wean to determine if the medication can be discontinued or the dose lowered; however, long term use may be required.

Serotonin Agonist Reuptake Inhibitor (SARI)

Trazodone is an SARI which blocks serotonin receptors and serotonin reuptake. In humans, it has anxiolytic, antidepressant and anti-compulsive applications and is commonly used together with SSRI's and TCA's. It is also used for insomnia. Because of its potential calming effects after each dose, it may be used for a) as needed use prior for fear evoking events such as with noise phobias or separation anxiety either alone or together with ongoing SSRI's or TCA's b) for as needed or short term treatment for behavioral calming such as car rides, veterinary visits and post-surgical confinement or c) as adjunctive ongoing therapy with SSRI's or TCA's to reduce arousal, reactivity and anxiety.1,2 Side effects include lethargy, gastrointestinal signs, mild sedation, and potential serotonin effects.

Anxiolytics

Buspirone (an azapirone) is a serotonin (5HT1) partial agonist. It is used for mild fear and anxiety or to augment serotonin in combination with an SSRI or TCA. It is non-sedating, does not stimulate appetite, does not inhibit memory and has minimal side effects, other than gastrointestinal upset and potential serotonin effects. It takes a week or more to reach effect.

Benzodiazepines potentiate the effects of (GABA), an inhibitory neurotransmitter. They cause a decrease in anxiety, hyperphagia, and muscle relaxation. They can be used alone or adjunctively on an as needed basis or for ongoing therapy alone or in conjunction with an SSRI or TCA.3 They may cause paradoxical excitability, increased activity, sedation and may have an amnesic effect. Alprazolam may be particularly useful for panic. Benzodiazepines may increase appetite for counterconditioning and reward training.

Alpha 2 agonists including clonidine and dexmedetomidine oro-mucosal gel (OMGI) bind to presynaptic alpha-2 receptors in the locus ceruleus to inhibit the release of noradrenaline to reduce sympathetic response, and for analgesia, and sedation. Bradycardia, hypotension, ataxia and sedation may be seen at higher doses. Dexmedetomidine OMG is licensed in some countries for use in noise phobias at 125 micrograms/m2. The product might be given to the dog 30-60 minutes prior to a fear evoking event such as car rides or veterinary visits and repeated every 2 to 3 hours (up to 5 times as necessary).4 Dogs should be pre-conditioned to dosing with the syringe. Clonidine has been used in combination with ongoing SSRI's for situational use or for repeated adjunctive use in fear or territorial aggression, separation anxiety, or noise phobias.5

Beta blockers such as propranolol and pindolol were developed for the treatment of cardiac disease in humans. As they inhibit the action of noradrenaline they may reduce physiologic signs of anxiety (heart rate, respiratory rate, trembling) and may inhibit the consolidation of memory in fear evoking situations.

Gabapentin

Gabapentin is an anologue of GABA, but does not act to bind GABA. Its anxioytic effect is believed to be due to activation of calcium channels in the amygdala to block the effects of glutamate and reduce excitatory transmission. Peak levels are seen about 90 minutes after dosing. Gabapentin is used for complex partial seizures as an adjunct in seizure control and for neuropathic pain. Adverse events include ataxia and sedation on initial dosing. Sedation, particularly at higher doses may be useful prior for fear evoking events such as car travel, veterinary visits and noise aversion. Gabapentin might be used adjunctively with serotonin reuptake inhibitors or tricyclic antidepressants on an ongoing basis to help control or reduce reactivity and arousal.

Selegiline is an MAO inhibitor for use in cognitive dysfunction in dogs, which has also demonstrated an effect on emotional disorders in which prolactin levels might be elevated.6

Drug doses

Drug	Dose
Alprazolam	0.02-0.1 mg/kg prn to qid
Clonazepam	0.1-1.0 mg/kg prn to tid
Diazepam	0.5-2 mg/kg prn to q6h
Lorazepam	0.02-0.1 mg/kg prn
Amitriptyline	1.0-4.0mg/kg bid
Clomipramine	1-3 mg/kg bid
Fluoxetine, Paroxetine	1.0 – 2.0 mg/kg q24h
Fluvoxamine	1.0 -2.0 mg/kg q24h to bid
Sertraline	1-4 mg/kg q24h or divided bid
Clonidine	0.01-0.05mg/kg prn to tid
Propranolol	0.5-3.0 mg/kg bid or prn
Buspirone	0.5-2.0 mg/kg bid - tid
Trazodone	3 to 10 mg/kg prn to tid
Gabapentin	10-30 mg/kg bid to tid
Imepitoin	20-30 mg/kg bid
Selegiline	0.5-1 mg/kg q24h

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SCIENTIFIC BASIS AND CLINICAL APPLICATIONS OF VETERINARY ACUPUNCTURE: HOW DOES IT REALLY WORK AND FOR WHAT CONDITIONS?

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During the past few decades of research pursuing an understanding of the physiological and anatomical basis, a number of theories have been proposed to explain all the varied effects of acupuncture. Science-based acupuncture may be defined as the stimulation of specific predetermined points on the body to achieve a therapeutic or homeostatic effect. Acupuncture points (acupoints) are areas on the skin of decreased electrical resistance or increased electrical conductivity. Acupoints correspond to four known neural structures. Anatomically, all of these four structures are wrapped in connective tissue.

Each proposed theory only explained a limited number of the effects of acupuncture. Dr. Mae-Won Ho›s Liquid Crystalline Collagen Continuum Theory (LCCC) of acupuncture integrates all the other theories as well as the classic TCM into a cohesive, practical explanation of the scientific basis of acupuncture. As we entered into the 21st century, there has been increased research documenting the LCCC Theory and fascia-based acupuncture theory. The western medical theories, such as the gate theory and multiple gate theory, vascular and neuroanatomical theory, autonomic theories, humeral mechanisms theory, and the bioelectric theories are all integrated more clearly based on the LCCC Theory. The integration of all these theories and their clinical applications in veterinary practice are discussed in this paper The Liquid Crystalline Collagen Continuum Theory was proposed by Dr. Mae-Won Ho in 1998, which ties the previous theories together (1). Dr. Ho proposes that the acupuncture system and the direct current (DC) bioelectrical body field are both located, in part, in the continuum of the liquid crystalline collagen fibers that constitute the majority of the connective tissue (1). Collagen fibers' bound water layers provide proton conduction pathways for rapid intercommunication throughout the body, enabling the organism to function as an integrative circuit (1). Water and collagen are two of the best conductors of electrical currents. This offers further validation to the bioelectric theory of acupuncture, that "Chi," or one component of it, is based on a bioelectrical body field located within the liquid crystalline collagen continuum of the connective tissue.

Clinical Applications

Acupuncture has been found to be beneficial therapeutically in the treatment of various musculoskeletal, gastrointestinal, neurological, reproductive and respiratory conditions in veterinary practice.

Musculoskeletal conditions that may benefit from AP include chronic degenerative joint disease, nonsurgical cervical and thoracolumbar disc disease, immune- mediated myopathies, trigger point patterns and soft tissue injuries (2). Neurological conditions treatable with AP include nerve paralysis, epilepsy, coma, cerebrovascular accidents, various neuropathies, neuritis and neurogenic deafness (3,4). AP may be beneficial in the treatment of most immune-mediated conditions via its immunomodulatory effects, both stimulating or suppressing immune responses (4). Cardiovascular conditions such as cardiac and respiratory depression and arrest, shock, arrhythmias and congestive heart failure may benefit form AP as an adjunctive therapy (5). AP has a normoregulatory effect on GI motility, thereby being an excellent adjunct to the treatment of any vomiting or diarrhea (6). It also can be of benefit in the treatment of pancreatitis and various hepatopathies. AP can help with various reproductive disorders through its neurohormonal regulatory effects (7). AP is also being used as an excellent perioperative and postoperative analgesic therapy (8). Acupuncture does not just relieve the pain and mask a problem but actually may accelerate the healing process, restore homeostasis and resolve many conditions through its normoregulatory effects. Acupuncture is an exciting new (yet ancient) diagnostic and therapeutic technique that one can incorporate into a conventional veterinary practice. It offers an additional approach to diagnostic and therapeutic dilemmas that may not have adequate answers based on conventional western medicine. It may also be of benefit when conventional medicine and surgery are not available. Further research will continue to explain the physiologic basis of acupuncture. Acupuncture will continue to be incorporated into veterinary practice as an additional complementary therapy and as an adjunct to our therapeutic armamentarium as we develop a further understanding its mechanisms of action. The latest textbook on veterinary acupuncture offers comprehensive descriptions and references on all aspects of veterinary acupuncture.

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A REVIEW OF STEREOTYPIC BEHAVIOR: COPING BEHAVIOR OR A VICE?

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Stereotypic behaviors are defined as repetitive, relatively unvarying patterns of behavior with no obvious goal or function [1]. A horse that displays stereotypic behavior tends to perform the behavior in nearly the exact same way every time, and many horses also perform the behavior in a preferred location, e.g. in a specific area of the stall. The performance of stereotypic behavior has been used as an indicator of poor welfare, although it is often difficult to determine whether the behavior is the result of poor welfare in the past or due to current unfavorable conditions. This presentation will introduce horse owners to stereotypic behaviors in horses, what has been learned about stereotypic behaviors through science, and how this information can be applied in order to better manage and thus improve the welfare of horses with stereotypic behavior.

Stereotypic behaviors (STBs) are often referred to as "stable vices", e.g. in popular press equine publications and in older equine textbooks. However, we are now moving away from using this terminology to describe stereotypies, as research studies aimed at further investigating STBs in horses are demonstrating that these behaviors are not simply the result of boredom. These behaviors are not attempts by the horse to be a nuisance to their owner and should not be considered to be the fault of the horse. Although the exact, underlying cause(s) of STBs remain unknown, we have gained a better understanding of how, or rather why, stereotypic behaviors develop in horses. The development and continued performance of stereotypic behaviors appear to have a physiological or psychological basis.

Oral Stereotypies

Most survey studies conducted to date [4] show 4-5% of the average horse population engage in an oral STB, such as cribbing, crib-biting or wind sucking. The typical cribber places its front teeth on an object, such as a fence board, pulls back while sucking air inward, and then emits a grunting noise. This behavior is distinctive both to see and to hear. Some evidence suggests that these behaviors are the result of 'feel good' neurotransmitters in the horse's brain, which may be why the behavior seems so addictive and so challenging to stop once started.

It should be noted that cribbing and wood chewing are NOT the same thing. Wood chewing is actually a normal, natural behavior that even horses in the wild will perform. On the other hand, feral horses have never been observed cribbing. Wood chewing is sometimes classified as a redirected grazing behavior, particularly in horses on limited forage diets. There is a possibility that wood chewing behavior will precede a horse becoming a cribber, but evidence of this is limited.

Locomotor Stereotypies

There are two reasonably common locomotor STBs observed in horses. One is called weaving, where horses shift their weight back and forth on their front legs (a repetitive, side to side swaying motion). This is often performed when standing at the front of the stall or next to a paddock gate. It often coincides with anticipation of something, e.g. awaiting morning turn out or while waiting to receive feed. The second is called box walking or stall walking, and it literally means to walk part or all of the horse's box stall (or paddock) perimeter.

Risk Factors for Developing STBs

Though direct cause and effect research on this topic is limited, multiple studies involving thousands of horses have consistently found the following factors to be associated with increased likelihood of engaging in a STB [4]: insufficient/very limited turnout time, insufficient/very limited opportunities to socialize with other horses, insufficient/limited grazing/foraging opportunities – this factor often goes hand-in-hand with high concentrate diets, which have also been implicated.
Stressful weaning, particularly an abrupt method with individual housing, has been associated with increased STBs in several studies [3]. Additionally, there has been evidence that young stock with gastric ulcers are more likely to be crib-biters. Some differences in brain physiology responsible for goal directed and reward seeking behavior have also been demonstrated between horses with STB and horses who do not show these behaviors.

Commonly Held Beliefs

Contrary to popular opinion in the industry, there is no scientific proof that horses learn STBs from one another. Anecdotally, when stereotypic horses are turned out to pasture with non-stereotypic horses (those horses who do not display a STB), the non-stereotypic horses do not pick up the STBs. There is however less consistent evidence when it comes to housing non-stereotypic horses next to or across from stereotypic horses in environments involving the risk factors mentioned above.

Do STBs Cause Damage?

Cribbers may cause damage to their teeth, and as such may need additional dental care. Cribbing can be hard on fencing and stall boards. Weavers and stall walkers may cause more wear and tear to their feet, thus potentially needing more farrier care. They may also cause ruts or wear in the flooring in their stall or paddock. In general, though, these potential damages tend to be exaggerated by many in the horse industry leading to some horses with STBs being turned away from certain boarding or training centers. Hopefully, with increased understanding of STBs, this bias will subside.

Should I try to stop it? And if so, how?

If you own or manage a horse with a STB, the recommendation is to learn as much as possible about that particular behavior. Stereotypic behaviors are recognized as both a welfare and a management concern and many owners attempt to physically prevent the behavior. Attempts to physically prevent STBs can result in reduced welfare for the horse and additional strain on the owner's pocket book. Therefore, strategies aimed at addressing the behavior should include consideration of potential causal factors and implementation of management practices known to help reduce the behavior (e.g. increased opportunities to socialize with other horses and to graze/consume forage).

Always remember that somewhere along the way, the horse developed this STB because it was likely trying to 'cope' with a suboptimal husbandry situation. If we view it as a coping mechanism, how certain are we that we should take away the horse's ability to cope? Multiple studies have shown that, when presented with a stressor, the horses who handled it least well were crib-biters who were prevented from cribbing; non-cribbers did fine, and cribbers who were allowed to crib were fine, but cribbers who were thwarted were more stressed [2].

With respect to the locomotor stereotypies, some owners have had success in reducing their horse's weaving or box-walking by increasing the visual horizons; e.g. placing the horse in a stall with a window to the outdoors or with an acrylic/shatter-proof mirror, adding an anti-weave stall front that allows the horse to have its head and neck out to the aisle, or simply keeping the horse out at pasture more of the time. Based on the authors' experience and anecdotal reports from owners it appears much easier to reduce the time a horse spends engaged in a locomotor STB than an oral STB.

Conclusion

Just because your horse performs a stereotypic behavior, such as cribbing or weaving, does not mean its current state of welfare is suboptimal, but more likely, that at some point in the horse's history, the horse was trying to cope with stressors outside the behavioral demands of the horse's nature.

Managing stereotypic behaviors can be very challenging. The best management strategy continues to be prevention by trying to optimize turn out time, social interaction and grazing/foraging opportunities. Minimizing stress during the weaning process is important, and working hard to enhance natural behaviors when horses are on stall rest for injuries or illness can help reduce the chance that your horse will develop a STB.

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LEARN TO COMMUNICATE NATURALLY - PERSONALITIES/COMMUNICATION STYLES

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What would the world be like if everybody communicated exactly the same way? On one hand, everybody would know what was expected of them and where they stood with one another. On the other hand, the world would be so boring!! We know that people communicate differently but we don't always think about why that is. We often judge how people communicate, questioning why they behaved or said something in a certain way in a given situation, instead of really appreciating that at the heart of it, we all have a communication preference and we default to it as that is what is most comfortable for us. In between the communication styles of two people, there may be complete alignment, a sliver of a confusion, or a canyon of misunderstanding. It doesn't make either preference "wrong" necessarily, but it does highlight the need for us to take more time to understand each other so that we can appropriately interpret the differences. Without that understanding, differences can seem quite negative when they are not, or may be taken as positive or neutral, when something negative is in fact going on! You would think that, on a personal level, we tend to attract people who communicate similarly to ourselves but this is not the case. We have friends and loved ones who are quite different to us and we take them for who they are. Somehow, when it comes to co-workers, employees and employers we often have a different tolerance level for those same differences. This is where the danger lies.

There are many different "tests" and "programs" for identifying personality styles. The variety is endless, as are the outcomes. There is a significant difference that lies between assessing personality style and communication preference. The fear in discussing personalities is that it can feel accusatory, forcing team members into categories that may not fairly represent the totality of who they are.

A quick google search will bring up all sorts of assessments and quizzes. While many of these are entertaining to do on your own, they are not evidence based in their approach and are really better left for fun. Even with the more well-known programs, much information can be found on the pitfalls of personality analysis if not put in the proper context, or if the outcomes are not presented and managed correctly.

Keep in mind that whatever program you choose, the outcomes do not assess skill level or intellect and therefore should never be used as a way of judging workplace ability.

While some programs have elements available at no cost online, most have some sort of pay-for-use/pay-for-interpretation/pay-for-facilitation element. Buyer beware, invest when you have the time, commitment and ambassador for the program in place (and the majority of your team interested in growth and development in this area). You will get what you pay for, and this type of learning should be considered crucial for most teams.
Just like with Personal Culture, looking inward is the first step. The more you understand about your own personal style, the easier it will be to understand why you do what you do, say what you say, think what you think and react how you react. Deeper learning should layer on top of this foundation.

A few things to look for when selecting a program for your team:
1) The assessment isn't so short that it cannot give you an accurate (or consistent) outcome, or so long that it is tedious to implement.
2) The assessment language is easy to understand, using words that will lead to consistent and reliable answers.
3) Results can be utilized with new team members as a way for them to better understand the team, and for the team to understand them.
4) Results doesn't deal in absolutes. Just because a person has a specific communication preference, it doesn't mean they cannot communicate in a way that is more comfortable for somebody else. Everybody is technically capable of almost anything if they put their mind to it and understand what the goal is. Saying one person "cannot" communicate or be a certain way is simply unfair to both the person communicating, and the person being communicated with.
5) Outcomes should be memorable. If it takes a novel to remember what everything means, you are not going to see long-lasting success or the ability for team members to implement on what they have learned.

The entire team must understand Why they are undertaking this type of learning:
1) Gaining insight into themselves and those around them; allowing them the opportunity to be their best self with their team and clients.
2) Understanding how they come across; allowing them the opportunity to alter this should they want/need to.
3) Allowing team leaders, supervisors and managers to set their people up for success by improving engagement and customizing their approach with each team member.

4) Engaging a variety of people with different communication strengths and approaches – knowing who we are as a team allows us to be our best selves.

The team must personally understand a few things in participating in this type of exercise:
1) Your communication preference is not an excuse for your negative behaviours.
2) Your understanding of your preference is meant to allow for self-reflection and self-awareness.
3) Better understanding preferences different to your own allows you to work on how to best communicate with people who are different to yourself.
4) There are no secrets as to assessment outcomes – we expect people to be different and we will share individual outcomes with the team. Being different is a good thing.
5) There are no "good" or "bad," "right" or "wrong" preferences – you are not better, neither is anybody else.

After the initial outcomes are determined, build on them:
1) Begin with a solid understanding of oneself.
(a) What was your own outcome?
(b) What does it mean about who you are and how you behave?

2) Understand the other outcomes.
(a) What does it mean to be each of them?
(b) How do they interpret the world similarly to you, and differently to you?

3) Consider your team, assess the Big Picture.
(a) Share the outcomes of the individuals you work with.
(b) Do your interactions with each other to-date make sense when the individual outcomes are considered?
(c) What is working well? What isn't? Why?
(d) Are there specific team members best suited to certain situations/conversations?
(e) What are personal next steps and who might be best suited to help you with your learning?

4) Take a deeper look.
(a) What motivates and energizes each individual? What discourages and exhausts them?
(b) How might we appear to others and what might people assume about us (rightly and wrongly)?
(c) What will you commit to doing as an individual, to have smoother interactions and minimize confusion or drama?
5) Apply your knowledge to the outside world.
(a) What cues or tells exist that will help us in better understanding what people need from us and how best we can communicate with them?
(b) How will we elevate everything from history taking to compliance, sales, recommendations and customer service?

A program that resonated with me many years ago is by a company called Learn2, and is appropriately named "Communicate Naturally." I enjoyed this program so much when I was first introduced to it that I became a facilitator of the program so that I could impart its wisdom on those around me and utilize the content as part of my team's everyday vernacular. There is a significant benefit to using a facilitator with your team – somebody from outside who understands the complexities and can determine insights specific to your team. In this program there are 4 approaches, Gold Mine, Green Planet, Blue Ocean and Orange Sky. The use of both colours and environments allows for a more memorable experience for participants, setting an automatic stage for fun and learning combined.
While everybody has a primary approach, the idea is that everybody is all four, just in a different order and with different ratios. Understanding all approaches means that you can better appreciate your own and also adapt your style to the people around you. It is this type of awareness that allows for more fluid interactions and less resistance. Information on Communicate Naturally can be found at https://www.learn2.com/programs/communicate-naturally/.

At the end of the day, having a team with varied styles is to everybody's benefit. The main thing is to realize that people don't have to change for you, you have to shift for those around you. If everybody makes this effort there will be more harmony both within the team and because of them!

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USING VALIDATED TOOLS TO ASSESS ACUTE PAIN IN PRACTICE

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Introduction

Despite advances in pain management for companion animals, pain is still undertreated. One of the reasons for this is the difficulty in "measuring" pain in populations that cannot "self-report". To treat pain, we must look for it, recognize it and quantify it in some way so that the efficacy of our interventions can be assessed. Pain is a complex multidimensional experience with both sensory and psychological components. Pain is a conscious emotion and is always unpleasant. In humans who can self-report, pain is what the patient says it is but in neonates, cognitively impaired people and animals, pain is what the observer says it is. As animal caregivers, we make "proxy" assessments on the patient's behalf.

Acute pain assessment

There have been attempts to correlate objective measurements (e.g. heart rate and blood pressure) with pain. In cats, no study has found a consistently reliable objective measure, which is not surprising.1,2 Animals suffer from "white coat" syndrome just as humans do. The fear and the stress of a journey to a veterinary hospital will alter heart rate, respiratory rate and blood pressure.3 Mechanical nociceptive threshold testing is a useful technique for evaluating both primary and secondary hyperalgesia and can differentiate between treated and control groups of animals.4 This suggests that testing wound tenderness should be incorporated into the assessment of post-operative pain. Observation from a distance and interacting with the animal are both essential components of an evaluation. A painful dog or cat may remain very still and quiet because moving hurts; without interaction these patients are overlooked.
Any system that is used must be valid, reliable and sensitive. Without strictly defined criteria and instructions to follow during assessment many scoring systems are highly variable. Basic pain scales include simple descriptive scales, numerical rating scales and visual analogue scales; these are unidimensional scales as they do not assess all the complex aspects of pain. Holton and others compared these scales for assessing pain in dogs following surgery and reported significant variability between observers, which was as high as 36%.5
The quantitative measurement of behavior, posture and facial expressions is the most reliable method for assessing pain in animals. If the methodology used to develop and validate these instruments is rigorous, they minimize observer bias and improve inter-observer agreement. Composite systems are particularly important when self-reporting is not possible. However, these systems must utilize components that have been proven as sensitive and specific indicators of pain in the species being studied. Normal behaviors should be maintained post-operatively if a patient is comfortable. Grooming is a normal behavior but licking excessively at a wound or incision can be an indicator of pain, so the two should be differentiated.

Acute pain assessment tools for cats

Brondani and colleagues developed a multidimensional composite scale based on observing cats that underwent ovariohysterectomy.6,7 This tool along with explanatory videos is available at http://www.animalpain.com.br/en-us/
The Glasgow Composite Measures Pain Scale-Feline (rCMPS-Feline) includes facial expressions and was developed using cats undergoing different types of surgery or with medically related pain.8-10 It can be downloaded at: www.newmetrica.com/acute-pain-measurement/

The major assessment domains in cats include:
-Vocalization
-Posture
-Attention to the wound
-Response to people
-Response to palpation of the wound or painful area
-Facial expressions
-Overall demeanor
The facial expressions of pain in cats include changes in ear position, half-shut or "squinty" eyes, tension in the muzzle which alters whisker position and the position of the head. A feline Grimace Scale is currently under development.11

Acute pain assessment tools for dogs

Firth and Haldane developed the Melbourne Pain Scale which incorporates physiologic data (heart and respiratory rates) and behaviors (response to palpation, activity, mental status, posture, and vocalization).12
The Glasgow Composite Measures Pain Scale is another tested tool for use in dogs and the short-form (CMPS-SF) is user-friendly and quick to perform.13 This version can be downloaded in several different languages at: www.newmetrica.com/cmps/. There are 6 categories for assessment: vocalization, attention to the wound or painful area, how easily they rise and walk, response to palpation, overall demeanor and posture. Even if a dog cannot get up (e.g. after spinal cord injury) the tool can be used and is valid. If all 6 categories are scored the maximum score that can be achieved is 24 and an intervention level of 6/24 is suggested; if mobility cannot be assessed the maximum score is 20 with 5/20 recommended for intervention.

The Colorado State University Canine Acute Pain scale is widely used and is derived from the Melbourne Pan Scale, the Glasgow scale and a numeric rating scale. It requires both observation and "hands-on" evaluation to complete the assessment. It provides drawings of dogs that fit into its 5 categories (0, 1, 2, 3, 4) which enhances its utility. It has not been fully validated but has proven to be a useful teaching tool for veterinary students.14

Using pain assessment tools in practice

Each clinic should choose a scoring system that fits their specific needs, and this may require some trial and error. Whichever one is chosen should be user friendly, quick to complete and easily performed by all team members and it should be an integral part of the animal's evaluation.

The severity of surgery or trauma, the patient's response to analgesic therapy and the expected duration of action of the analgesic drug(s) administered will help to determine the frequency of evaluations. For example, if an animal is resting comfortably following administration of an opioid, it may not need to be re-assessed for two to four hours. Animals should be allowed to sleep following analgesic therapy. Vital signs can often be checked without disturbing a sleeping patient. In general, animals are not woken up to check their pain status; however, this does not mean they should not receive their scheduled analgesics. Undisturbed observations coupled with periodic interactive observations are likely to provide more information than the occasional observation of the animal through the cage door. Routinely using a pain assessment tool enhances the care of patients in the perioperative period.

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THE SCIENCE OF CANINE COGNITIVE DECLINE AND DYSFUNCTION: PREVALENCE, DIAGNOSIS AND CLINICAL SIGNS

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Cognitive dysfunction syndrome (CDS) is a neurodegenerative disorder of senior dogs and cats characterized by gradual and progressive cognitive decline. Advancing brain pathology is expressed behaviorally by signs related to learning, memory, perception, awareness, social interactions, sleep and activity. The diagnosis is based on clinical signs described by the acronym DISHAA including Disorientation, altered social Interactions and Sleep-wake cycles, and loss of Housetraining and other learned behaviors, altered Activity (including an increase in spontaneous activity with greater severity of CDS) and Anxiety. Other signs might include altered responsiveness to stimuli, altered appetite or self-hygiene and altered feeding or drinking.
While a decline in learning and memory may be the hallmark signs, the average pet may appear minimally challenged until the dysfunction becomes severe. However, using neuropsychological tests, executive function, attention, and memory impairment can be objectively quantified in the laboratory.1-3 These tests also provide a mechanism by which the effect of therapeutic agents can be assessed. While pet owners most commonly report changes associated with cognitive decline beginning around 11 years or older, deficits in learning and memory in both dogs and cats have been demonstrated as early as 6 years of age.2,3

Prevalence

Both prevalence and severity of signs increase with age. In one study of 28% of dogs aged 11-12 years had at least 1 category of DISHA and 10% had 2 or more categories, while in dogs aged 15-16, 68% had 1 category and 36% had 2 or more.4 In another study of 479 dogs using online screening with a validated CCDR questionnaire, the overall prevalence was 14.2% with 41% of dogs over 14 affected.5 More recently in a prospective screening study prevalence ranged from 13-16% in dogs 8-11 to almost 100% of dogs >13.6 Over the course of 6 months 42% with no impairment progressed to mild impairment and 24% with mild progressed to moderate. Over 1 year, 71% converted from none to mild and 50% from moderate to severe.5 The most common reported signs in dogs with CDS were sleeping more during the day and restlessness at night (57%), altered social interactions (51%), disorientation (49%) and anxiety (46%).6 For dogs with mild CDS, the principal sign was increased daytime sleep (70%) and anxiety 11%. By contrast anxiety was reported in only 4% of dogs with no CDS.7.

Biannual screening

As initial signs of cognitive decline may be subtle, most cases go undiagnosed until signs become sufficiently problematic for the pet or the owner, with mild signs seldom reported.5 In one study that identified a prevalence of CDS of 14.2% in dogs over 8 using a validated questionnaire (CCDR), only 13% had been diagnosed.7 As signs can emerge or progress over the course of 6 months, and behavioral signs may be the first or only indication of disease and pain, senior dogs should be scheduled for twice yearly visits and owners counselled on prompt reporting any change in health or behavior. While the CCDR and CADES questionnaires have been validated for diagnosis of CDS, the DISHAA questionnaire may provide a more sensitive tool to identify all clinical signs that might be caused by CDS.5,6

The combination of behavioral screening (owner identified signs), physical examination (veterinary identified signs and blood, urine and blood pressure screening (laboratory identified signs) offers a comprehensive approach to early identification and diagnosis and treatment of health and welfare In fact, physical examination and laboratory screening in senior pets can identify abnormalities before they are clinically apparent. In a recent trial of 100 healthy senior and geriatric dogs, 53 had increased systolic blood pressure, 22 had heart murmurs, over 20% had hypophosphatemia, leukopenia, increased serum creatinine, ALT, or alkaline phosphatase, leukopenia, and 4 had bacterial cystitis. Platelets were significantly higher and temperature, HCT, albumin and TT4 were lower in geriatric compared to senior dogs.8

Age related pathology and risk factors

With increasing age in dogs, frontal and temporal lobe volume decreases, ventricular size increases and there is meningeal calcification, a reduction in neurons, and an increase in toxic free radicals1,2,9,10 Circulatory changes in dogs and cats including microhemmorhage and infarcts may also be responsible for signs of CDS. As in humans, impairment in cholinergic function has also been identified which may contribute to declining cognitive and motor function and a disruption in sleep-wake cycles. In dogs, cats, and humans there is an accumulation of diffuse beta amyloid plaques and perivascular infiltrates with increased age.1,2,9-10 In dogs, the amount and location of Ab plaque deposition may be linked to the severity of cognitive deficits.1,10

Soluble A can also be measured in the cerebrospinal fluid (CSF) of dogs making it a useful marker for aging and cognition studies.

A recent study found that high levels of CSF A in dogs coincide with lower cognitive performance prior to amyloid deposition. Cognitive decline has also been shown in dogs to be related to tau hyperphosphorylation.11 Taken together, the pathological changes, clinical signs, learning and memory impairment and age- related progression, are analogous to the changes seen in the aging human brain and in early Alzheimer's disease. However, in contrast to humans, there is an absence of senile plaques, neurofibrillary tangles are rare and CDS seldom progresses to mortality.1,9,11

Risk factors

Multiple risk factors have been associated with accelerated brain aging and risk of AD, including DHA deficiency, high homocysteine, low vitamin B6, vitamin B12, and folic acid, high blood pressure, chronic oxidative stress, and chronic low-grade inflammation. Therefore, nutrients which reduce risk factors might enhance brain function and retard decline.

Diagnosis

With the identification of any behavioral signs of CDS, a diagnosis is made by exclusion of all possible medical causes of the signs. Neurological disorders, sensory decline, endocrine and metabolic disorders and pain such as with musculoskeletal or gastrointestinal disease are the primary rule-outs. In one study, of 300 dogs visiting the veterinary clinic for preventive care or health complaints, 85 were excluded with underlying medical problems and 159 (53%) had displayed signs of CDS.7 In a clinical trial in which 100 senior dogs were identified with signs of cognitive dysfunction on DISHAA screening, 15 had markedly abnormal laboratory findings including 6 with significantly increased alkaline phosphatase and/or ALT, 3 with kidney disease, 5 with bacterial cystitis, and 1 with marked hypercalcemia.2 In addition, as medical health conditions are increasingly more common with advancing age (including but not limited to sensory decline, osteoarthritis, elevated alkaline phosphatase and heart murmurs) a concurrent diagnosis of cognitive dysfunction must also be considered. For a comprehensive reference on the science of Canine and Feline Dementia see Landsberg, G.M., Madari, Al, Zilka, N. (eds). Canine and Feline Dementia. Molecular Basis, Diagnostics, and Therapy. Cham, Switzerland: Springer, 2017

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ACUPUNCTURE AND INTEGRATIVE MEDICAL APPROACHES FOR NEUROLOGIC CONDITIONS

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With the improved ability of diagnostic imaging equipment including CT scans and magnetic resonance imaging, veterinary neurologic diagnostics have greatly progressed and we are able to have much more specific neurologic diagnoses. With this ability, we are now able to be much more specific in the treatment of neurologic disease with integrative approaches. In additional to conventional medical and surgical approaches, acupuncture, Chinese herbal medicine, physical therapy and nutraceutical's have been found to be clinically beneficial in the treatment and management of neurologic conditions including various causes of paralysis, paresis, seizures, coma, etc. (1,2,3)

Acupuncture has been used successfully for the treatment of various neurologic conditions in small animals. As with conventional medicine, correct diagnosis and lesion localization is essential for the best possible results. Comprehensive history, physical examination, neurologic evaluation, and any appropriate laboratory and radiographic should be conducted prior to acupuncture evaluation. The increase in the clinical use of CT scans and MRI's has increased the successful use of acupuncture for neurologic conditions as it has improved lesion localization and etiology.

Once an appropriate diagnosis is made, one can determine if acupuncture is an appropriate therapy by itself or in combination with conventional medical or surgical approaches. Acupuncture may be beneficial both pre-operatively as well as postoperatively. In general, animals with traumatic, vascular, degenerative and some inflammatory nervous system disorders may benefit from acupuncture therapy (1). Neoplastic and infectious diseases of the nervous system are not routinely managed with acupuncture (1). Algorithms for the management and localization of neurologic conditions are illustrated in the "Acupuncture for Neurologic Disorders" (1). This chapter offers a comprehensive review of acupuncture for neurologic disorders in animals.

The primary clinical indication for acupuncture is for pain management such as in the treatment of intervertebral disc disease (2).

Acupuncture may also be beneficial when either medications are not working or are having side effects and where surgery is not feasible or when it has not worked. Response to corticosteroids may be one possible indicator as to whether acupuncture may be beneficial. For instance, in cases of degenerative myelopathy that may also be present with signs of multiple Type II disc disease, the response to corticosteroid may assist the veterinarian in deciding if acupuncture may or may not be indicated.

Once a diagnosis and lesion localization has been completed, then one can decide if acupuncture may be an appropriate treatment either solely or as part of an integrative approach to the condition.

There are various techniques of acupuncture including dry needle technique, electroacupuncture with or without needles, aquapuncture, moxibustion, gold bead implants, acupressure and laser acupuncture. Treatment technique and duration may vary from treatment to treatment based on signs and response. Various techniques may be used to treat the same condition based on previous recommendations or the practitioner's clinical experience. For example, I have used all these techniques at one time or another for the treatment of idiopathic esophageal achalasia. I decide on the technique based upon the individual signs that the patient is presenting at that time and based on the response to previous treatments.

The length of time of treatments, treatment frequency interval and the number of treatments also varies based on the condition of the animal, presenting signs and response to previous treatments. Typically treatments will begin at once to twice a week and then taper down based on response. Normal treatments may take anywhere from five to thirty minutes depending on the desired effect, sedation or stimulation of the acupoints.

One of the most common indications of acupuncture for neurologic conditions is the treatment of nonsurgical intervertebral disc disease (2). Acupuncture may be used in the treatment of intervertebral disc disease either alone or postoperatively, depending on the severity of the presenting signs. It has been found to be beneficial in treatment of both cervical and thoracolumbar disc disease. If acupuncture is deemed appropriate for the particular animal, technique, point selection and duration are then selected. In general, the most common acupoint selection includes local acupuncture points along the Bladder meridian cranial and caudal to the lesion as well as specific distal acupoints. Distal acupoints include BL-40, BL-60, GB-34 and ST-36(2). Additional points along the Governing Vessel or Ting points as well as distal points based on treating any underlying Traditional Chinese Medicine imbalances may also be included.

Brain disorders that have been found to respond well to acupuncture include Idiopathic epilepsy, Cerebrovascular accidents, acute cerebral hemorrhage due to trauma, coma, as well as meningitis (1,). Treatment of idiopathic epilepsy may decrease the frequency and severity of seizure episodes as well as decrease the required medication doses.

Spinal cord disorders that have responded to acupuncture include fibrocartilagenous embolism (FCE), spinal cord trauma, lumbosacral disease (cauda equina syndrome) and other causes of lumbar disease (4). It may be used as an adjunct treatment in the treatment of discospondylitis. Degenerative myelopathy does not normally respond well to acupuncture. An integrative approach including acupuncture and nutritional supplements has been developed by Dr. Clemmons (5). Some cases of degenerative myelopathy that have appeared to respond to acupuncture also had concurrent multiple Type II disc disease. It has been suggested that the apparent response was due to the improvement in the disc disease component. One condition is not mutually exclusive from the other. In such cases acupuncture may be appropriate, but the prognosis is more guarded. Even though the degree of signs associated with the disc disease may improve, the progression of the degenerative myelopathy may surpass any other signs of progress.

Cervical spondylomyelopathy, commonly known as Wobbler Syndrome has had variable response to acupuncture based on the degree of spinal cord compression and whether it is both dorsal and ventral cord compression or just one or the other. Acupuncture technique will vary based on lesion localization and severity of cord compression.

Acupuncture treatment may be contraindicated for the treatment of spinal cord neoplasia. Based on clinical experience, it may possibly increase the microcirculation to the tumor site and accelerate its growth.

Peripheral neuropathies may also respond well to acupuncture. Cranial nerve VII neuropathy, Trigeminal neuritis (cranial nerve V neuropathy) and geriatric peripheral vestibular syndrome (CNVIII neuropathy) as well as Idiopathic peripheral vestibular syndrome and neurogenic deafness have all responded positively to acupuncture (6). The success of treatment for traumatic peripheral neuropathies depends on the extent of the trauma to the nerve (7). Several cases of diabetic neuropathy have responded well to acupuncture.
Treatment is based on both a TCM diagnosis as well as treatment of the specific nerve.

Neuromuscular disorders and immune mediated myopathies such as Masticatory muscle myositis (MMM) and Idiopathic esophageal achalasia have also responded well to acupuncture (8). Treatment is based on both a TCM diagnosis as well as local treatment of acupoints related to specific nerves and nerve roots.

In general, neurologic disorders causing pain respond more frequently and faster, usually within three treatments, whereas those impairing function may not respond for eight or more treatments (1).

Nutritional supplements and other complementary approaches to neurologic conditions will be discussed as well.

Photobiomodulation low level laser therapy is another integrative approach that has been found to be beneficial in the treatment of neurologic conditions and will be discussed.

In conclusion, acupuncture may be of great benefit as a primary treatment or as an adjunct as part of an integrative approach to the treatment of neurologic conditions. The prognosis depends on the diagnosis, lesion localization severity of the condition as well as other factors. It should definitely be considered as part of an integrative approach to neurologic conditions.

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WORKING EQUIDS IN DEVELOPING REGIONS OF THE WORLD: HOW CAN WE HELP THIS 80% OF THE WORLD›S HORSES, DONKEYS AND MULES?

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The importance of working draught animals in developing areas of the world is often overlooked. Based on world equid population statistics [2], of the approximately 55 million horses, nearly 84% are used for work in developing countries; of the 41 million donkeys, ~98% are used for this purpose; and of the 13 million mules and hinnies, ~96% are used for performing work in developing countries. According to some estimates, 98% of the world's equine veterinarians work on a mere 10% of the world's equine populations. It is understandable that most equine veterinarians would work in developed areas of the world; however, there is tremendous working equid suffering taking place that merits our attention. For people who have not yet worked with livestock in developing parts of the world, the inevitable question comes . . . why help the animals when the people are often suffering? It has been our experience that when working animal welfare is enhanced, it subsequently enhances the well-being of their respective families. Furthermore, there are environmentally friendly aspects to supporting the sustenance, possibly even the growth, of draught animal usage in developing countries where efficiency may be best captured through use of lower rather than higher forms of technology.

The author first became intrigued by working equids in 2000 during a conference in southern Brazil. Since then, her experiences with these amazing animals have taken her on 10 different "adventures" to five different countries to learn as much about working equid welfare as possible. Literally thousands of animals have been assessed in terms of welfare and behavior measures; detailed evaluations have been conducted on approximately 25% of these equids (e.g. body condition score, an equid's response to a person's approach, lesion scores, questions to the owner about care, etc.) Situations have varied from animals in urban dense areas where handlers have a hard time acquiring feed for their equids and animals rummage in trash piles for food, to extremely rural situations where a donkey may be the only way for a child to get to school; they've varied from mistreated mules working in brick kilns who are so aggressive it is hard for handlers to remove their harnesses [1] to beloved horses who appear to receive food before their human companions do.

Welfare challenges across these locations have been surprisingly similar. For example, common animal based measures of concern: low body condition scores, insufficient hydration, harness/saddle/tethering lesions, and lameness are all commonly seen in these locations. In southern Brazil [4], we observed that 74% of surveyed horses were "thin" or "very thin" (≤ 3 on the Henneke 1-9 scale); in Mali [3] 41% of surveyed donkeys were "thin" or "very thin". Work-related lesions (e.g. harness lesions, knee lesions from falling when overburdened) are frequently observed (ranging from 40% in Malian donkeys to 96% in Brazilian cart horses). A recent trip to rural villages in Mexico found open lesions on 50% of the equids: lips (due to bit fit or misuse), chin groove (due to metal, prong style curb straps), forerib area (due to harsh cinch materials, poor saddle fit) and withers (due to poorly fitted harness/saddle or overloading). Noticeable lameness is another problem (≥ Grade 3 on AAEP lameness scoring system; 30% in Brazilian cart horses, 17% in Malian donkeys). Resource based measures that are often noted: lack of nutrients, lack of water, insufficient parasite control, inadequate vaccination protocols and poorly designed carts/harnesses are all common issues (e.g. 0% of surveyed owners of Brazilian cart horses were providing salt, dewormer or vaccines).

In many cases, reactive care has been the common intervention strategy; i.e. NGOs working to help treat wounds, deworm, provide vaccines. Only recently have proactive intervention strategies started gaining a foothold; e.g. providing educational programs on proper feeding, behavior, humane training, and fostering local community harness makers and farriers. Implementation research is needed to assess the efficacy of various welfare enhancement protocols.

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TREAT FELINE CAUDAL STOMATITIS

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This is a very painful oral inflammatory disease in cats. It can be very frustrating to treat, with no one answer in every case. This lecture will cover the most common and effective forms of therapy as well as options for difficult cases.

The history will generally include anorexia, drooling, gagging, and pain during mastication. Physical exam will typically include a thin pet with unkempt fur. The oral exam will reveal severe stomatitis usually over all teeth. The inflammation will most commonly be worse on cheek teeth than canines and incisors. However, faucitis is the key clinical finding. Severe hyperplastic inflammation to the gingiva can result from periodontal disease, however caudal mucositis will not be present.
A pre-operative blood panel will generally show a marked elevation in globulins (Polyclonal gammopathy) and total protein.

Medical Therapy: Most medical therapies will work for a while, however in general resistance will start within a year or less. In addition, most therapies have side effects worse than the disease process in and of itself. In general, medical therapy is very frustrating to the practitioner and client.

Corticosteroids are the mainstay of most medical therapy today. It is generally very effective at first and is relatively inexpensive for the client. In my experience, injectable (depomedrol 10 mg IM) is much more effective than oral preparations in my experience. However, they will typically loose effectiveness after a year or so requiring higher and higher doses at shorter increments. This generally results in significant deleterious effects. About 10% of stomatitis cases we treat are already diabetic!!!

Antibiotics are safer than steroids but much less effective, especially in long term therapy. They are generally disappointing in their success. Metronidazole and clindamycin are the mainstays of therapy; however, Clavamox and amoxicillin can be used as well. Metronidazole may be the antibiotic of choice due to its anti-inflammatory effect.

Other immune suppressive such as Imuran, Cytoxan, Gold Salts, Cyclosporine have been used. However, they are all very expensive with numerous adverse side effects (mylosuppression). Cyclosporine is currently the most commonly prescribed immune modulatory drug (other than steroids) for this disease process. However, its chronic use is somewhat expensive and has been implicated in severe fungal and protozoal infections. Starting dose is 5-10 mg/kg. Look for a trough level of about 500 ng/ml on regular basis. In most dentist's opinion it is only really effective AFTER teeth are removed. However, it has shown promise in resistant cases.

Laser therapy is not proven at all, most clients and RDVM's are very unhappy with the long-term results. It is very expensive and short-term relief only.
Surgical Therapy: Extraction is currently the ONLY effective long-term treatment for this disease process in cats. In our experience, the sooner this is done, the better that cats do both post-operatively as well as long term.

For extractions to be successful, the teeth must be COMPLETELY removed. Therefore, post-operative radiographic confirmation of complete extraction of the tooth roots is recommended. Following the insurance of complete removal of the teeth, perform aveloplasty to remove the periodontal ligament and smooth rough bony edges. This is typically performed do this with a rough diamond bur.

Studies report a 60% success rate when all teeth caudal to the canines are extracted, however our experience has not been as good. However, whole mouth extractions have a success rate of approximately 90-95% for clinical remission. Slight faucitis may remain, but pets are comfortable. In addition, the rare cases that don't completely respond are generally much more responsive to medical therapy.

If there is NO inflammation to the canines or incisors (which is rare), then the owner is given the option of leaving the canines. However, if these are inflamed, all teeth should be extracted.

Resistant Cases

In the rare cases where the teeth have been fully extracted but inflammation and pain continue, other therapies are needed. The current treatment of choice in the USA is cyclosporine. Another option, which appears to work better in Europe is feline interferon. Finally, UC Davis has had some success with Stem Cell Therapy.

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THE RIGHTS AND WRONGS OF HOMEMADE DIETS

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The most significant pet food recall in the history of the North American pet food industry (e.g., melamine contamination, 2007) resulted in several changes that are still prominent more than a decade later. The first involves many (if not most) pet food manufacturers paying closer attention to ingredient sourcing, manufacturing procedures, quality control and the traceability of their finished products. The second change involves an increasing number of dog and cat owners across North America opting to feed 'alternative' diets (including homemade diets) rather than exclusively feeding commercial kibble or canned pet food. There are several reasons hypothesized or suspected for the increasing trend toward homemade or alternative diets, including pet owners who seek a greater sense of control in selecting ingredients, perhaps in part because they have lost trust in the safety of commercial pet foods.

A review of the 2018 FDA recall archives revealed 386 product recalls, market withdrawals or safety alerts for products ranging from pet food and treats to homeopathic medicines, nasal products, baby oral gels, tampons, shaving cream, sterile injectable drug products and vacutainer tubes.(1) Last year, the human food products that were recalled ranged from sea salt caramels, cage free eggs, pumpkin seeds, raw coconut and organic almond butter to non-fat yogurt, cheese, cake mixes, white beans, curry powder, protein shakes, bread, pistachios, Asian fusion cookies, tortilla chips, loose leaf tea, crackers, frozen broccoli, farm-raised frozen tilapia, canned leaf spinach, and hot dog chili sauce.(1)

Of the 386 product recalls in a single year, just over 11% (43/386) were associated with 35 different brands of pet food. Approximately 65% (28/43) were associated with fresh or frozen raw products suspected to be contaminated with one or more of three organisms: Salmonella, E. coli, or Listeria monocytogenes. While most of us could agree there should be better regulations for testing commercial pet foods in North America, there are at least some protocols and guidelines in place. The same statement cannot be said for 'alternative' or homemade diets.
A handful of studies—published between 2001 and 2014—have examined the nutritional adequacy and use of home-prepared diets for both healthy pets and those with diseases such as cancer or chronic kidney disease. Results of these reports suggest three major reasons why we should be concerned: nutrient profiles of the vast majority of recipes are in excess or deficient in one or more nutrients; many pet owners do not follow recipe instructions; and/or many pet owners deviate over time from the original recipe.(2-8)

While there is no objective evidence in the scientific literature to support the idea that feeding homemade diets can produce significant health outcomes for dogs or cats, there have been several case reports demonstrating unbalanced or improperly fed homemade diets can directly lead to serious health conditions such as osteopenia, hypervitaminosis A, vitamin D deficiency, and nutritional secondary hyperparathyroidism.(9-14) The committed owner must understand the time involved as well as the financial investment for one or more balanced recipes, the daily purchase of ingredients and supplies (e.g., gram scale), and an appropriate vitamin-mineral supplement. While there are many vitamin-mineral products available online and through pet stores or veterinary clinics, not all supplements are adequate to achieve a balanced formulation. Below is a list of vitamin-mineral supplements formulated or designed specifically by board certified veterinary nutritionists.

Vitamin-mineral supplements formulated by board certified veterinary nutritionists:
BalanceIt--designed by Dr. Sean Delaney--available for over 10 years at www.balanceit.com. Costs of canine and feline products range between $60 and $70 per container. Depending on the pet's size, one container can last from 3 to 6 weeks. Products are available for both dogs & cats; and products are available for healthy animals as well as those with certain medical conditions.
Chef Canine Complete--designed by Dr. Rebecca Remillard for MyPetGrocer and can be purchased at: www.mypetgrocer.com. Canine adult product on the market for 6 years; puppy product introduced in late 2018. Products cost about $30 for 1-lb package, and one package can last from 3 to 6 weeks, depending on size of the dog.
Cuisine-a-Croc--products are designed by Dr. Geraldine Blanchard--canine and feline products are available in France at https://cuisine-a-crocs.com/en/. Costs may be prohibitive to ship to North or South America.
Integrative Veterinary Innovations--products designed by Dr. Justin Shmalberg and available online at www.ivinutrition.com. Company is less than 2 years old; canine and feline products (iviblend) are available to pet owners via their authorized veterinarian; specific pricing available by writing directly to the company.
Wagtritious--designed by Dr. Edward Moser--canine products are available on line at www.wagtritious.com. Company is less than 2 years old. Specific pricing is available by writing to the company.

Resources for balanced recipes:
www.balanceit.com
www.petdiets.com
www.acvn.org (American College of Veterinary Nutrition)

Monitoring Dogs and Cats on 'Alternative' Diets:
Healthy dogs and cats fed alternative (homemade) diets should be evaluated every 6 months, while those with medical conditions should be assessed once every 3 or 4 months. Documentation should include your findings from a thorough physical examination, body weight check, body condition score, muscle condition and baseline bloodwork and urinalysis. A complete review of what is being fed each day, amounts and frequency of feedings will also be important. Clients should be asked to keep a 3- or 5-day food diary prior to each recheck appointment; someone from your health care team should carefully examine the food diary to identify ingredient substitutions and tally up calories fed and consumed each day. In addition to overall energy and appetite, the animal's stool quality and skin and hair coat should be assessed. Trends in body weight, body condition and muscle condition should be noted and discussed with the owner. It is also recommended to perform an ophthalmic exam and blood work to monitor albumin level, red blood cell numbers, hemoglobin concentration, protein status and trace mineral status.(15)

An in-depth presentation of how to evaluate alternative diet requests was first outlined 5 years ago (16); these instructions and recommendations remain equally relevant at the present time with the ongoing popularity of feeding dogs and cats homemade diets. Veterinary health care teams can and should improve their nutrition counseling services offered by committing to regular and consistent communication and stronger support of pet owners who wish to feed an alternative diet.

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GROWTH MINDSET - HOW TO ACHIEVE MORE

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Growth Mindset was a concept that was initially researched and documented by Dr. Carol Dweck. She had initially commenced her research with the intention of examining how people coped with failure. She gave children a series of increasingly difficult puzzles to solve. Several of the children responded by being excited by their failure rather than frustrated. They looked upon failure as an opportunity. She had an epiphany about this and turned her attention to studying this phenomenon instead.

According to Dr. Dweck, two mindsets exist at all times in all people: Fixed mindset and Growth mindset. It's important to understand that one does not have only one mindset, but a tendency towards one or the other. The Fixed or Growth mindset will often dominate in different situations for the same person. Despite the terms, the other thing that we should remember is that there should be no negative connotation to either mindset.
Read the following statements:
Your intelligence is something very basic about you that you can't change very much
No matter how much intelligence you have, you can always change it quite a bit
You can do things differently, but the important parts of who you are can't really be changed
You can always change things about the basic person you are.

Chances are that you identify with points one and three OR two and four for most parts of your life. The odd numbers are consistent with a fixed mindset. Interestingly enough, many highly successful people display fixed mindset. Fixed mindset means that you want to succeed always – even if it means taking a safe route. Fixed mindset is risk adverse, because it means you might not succeed. Compare this to Growth mindset, where one accepts and embraces the fact that the risk of attempting something where you might not succeed is not a failure at all.
So this is all well and good, but what does it have to do with veterinary medicine? Let's start off by first considering the population that applies, and gets admitted, to veterinary school. This is a population of perfectionists, who are used to achieving high grades, and who are not used to being wrong.

Interestingly enough, many of us have achieved what we have by adhering closely to Fixed Mindset, and in fact, we are rewarded for it. Sound familiar? How many of us like to make mistakes? How many of us are willing to admit to making errors? And how many of us can actually say that we look upon errors as opportunities for improvement? How do we rationalize stretching ourselves at the risk of a patient's health?

So perhaps the best way to look at the advantage of Growth mindset is to consider how we respond to adversity. It's interesting that when hiring astronauts, NASA looks for people who have suffered and recovered from adversity. Puzzles that we don't understand, problems we don't have solutions to can all be used as a means to grow and improve. We just have to be willing to consider that they are a positive impact on our lives rather than setbacks.

We all feel the pressures of making errors. Rather than feeling badly about them, perhaps we are best to ask "what did we learn, and how can we improve next time?" Would you have ever persisted in learning how to ride a bike if you gave up the first time you fell? Hopefully your parent (or the person responsible for teaching you) dusted you off and encouraged you to try again. Remember the feeling of intense satisfaction when you finally succeeded? Children have an inherent desire to take risks and learn. Somewhere along the way, for many of us, that desire is overtaken by a need to prevent mistakes and play it safe. As a result, we become fearful in the face of failure.

The suicide rate in veterinary medicine is disproportionately high compared to the general population and many other professions. We cite concepts like compassion fatigue, poor public perception of our profession, and an ever-changing and demanding clientele. A fixed mindset can contribute to an individual becoming desperate enough to consider self-harm because it can mean that we protect ourselves from failure at all costs. Growth mindset alone doesn't do it, but it is another tool in our toolbox. We need to give ourselves as many tools as possible to continue to not only survive but to thrive.

So change your vocabulary. Instead of being proud of getting the right answer, be proud of the journey you took to get there. Reward the effort of trying rather than the final result. Let's embrace challenging situations and use them as a springboard to learn and grow.

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THE SECRETS OF DENTAL PAIN: CURRENT KNOWLEDGE

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The pain experience is a combination of sensory and emotional components. Pain causes fear, stress and anxiety, negatively impacting quality of life. It also delays recovery and induces behavioral changes that affect the owner-companion animal bond.(1) Dental and oral diseases are by far the most common conditions seen in small animal practice. They can produce significant pain, as well as localized and potentially systemic infection. (2) Indeed, severe pain and inflammation might further impact nutrition and feeding behavior. Treatment of periodontal disease often involves general anesthesia and dental extractions.(3)
Recently, extensive guidelines on the management of dental disease in dogs and cats have been reported.(2,3) These documents highlight the importance of adequate pain management and the mandatory use of general anesthesia for appropriate dental treatment.

The literature specific to dental pain is quite limited in veterinary medicine. Nevertheless, recent studies have shed some light into the subject. For example, in a study involving cats with minimal or severe periodontal disease, several parameters were evaluated including pain scores, analgesic requirements and food intake before and after dental treatment. Cats were evaluated under general anesthesia and treatment was performed according to what was clinically recommended; they were evaluated for up to 6 days. Pain scores were significantly increased in cats with severe disease when compared with baseline and with cats with minimal disease. Prevalence of rescue analgesia was significantly higher in severe (91.7%) than minimal disease (0%).
Pain scores and frequency of rescue analgesia were significantly correlated with the number of tooth extractions, gingival and calculus index. Finally, food intake was significantly lower in cats with severe dental disease.(4) Those authors highlighted the need for long-term analgesia after dental extractions in cats with severe oral disease. Furthermore, when the behaviors of cats with minimal and severe dental disease were compared using video-analysis before and after treatment, cats with severe disease showed particular behaviors when compared with those with minimal disease. They spent significantly less time sitting and paying attention to surroundings, and significantly more time laying down, at the back of the cage or curling the tail.(5) Pain scales such as the Glasgow feline composite measure pain scale can be used to help in the assessment of postoperative pain after dental treatment and extractions in cats. Detailed information of the use of these scales is available elsewhere.(6)

The prevalence of chronic pain in cats due to periodontal disease is unknown, but it is believed to be quite prevalent if one considers the frequency at which these are diagnosed in practice. It can involve periodontal disease, but also tumors affecting the oral cavity, for example.(7) In dogs, a few studies are also available. For example, a study designed to evaluate the analgesic efficacy of local anesthetic techniques in models of oral pain in dogs revealed that the addition of buprenorphine to bupivacaine may extend the duration of analgesia during regional anesthetic blocks.(8) In another study, the efficacy and safety of deracoxib administered for 3 days was compared with placebo for the control of postoperative pain and inflammation associated with dental surgery in dogs. Dogs were evaluated prior to and after surgery using a modified Glasgow Composite Pain Scale (mGCPS). Pain scores were lower in dogs treated with deracoxib than placebo. Four out of 27 deracoxib-treated dogs (14.8%) were rescued compared to 20 out of 30 placebo-treated dogs (66.7%).(9) This study highlights the importance of long-term analgesic requirements in dogs undergoing dental treatment. When it comes to chronic pain, a recent survey involving veterinarians from the UK revealed that dental pain is considered an important cause of chronic pain in dogs.(10) They can also be affected by malignant and non-malignant diseases of the oral cavity causing chronic pain.The treatment of dental pain is multimodal and involves pharmacological and non-pharmacological techniques. In the pharmacological treatment of acute pain, local anesthetic techniques, non-steroidal anti-inflammatory drugs and opioids should always be considered. In the pharmacological treatment of chronic pain, non-steroidal anti-inflammatory drugs as well as centrally acting analgesics such as gabapentin, amitriptyline and tramadol (cats only) might be considered.
This lecture will improve you knowledge on dental pain and will ultimately impact how you manage these patients in the clinic to provide them with with better hospital experiences and better outcomes.

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ANIMAL HOARDING ANIMAL WELFARE - EXPERIENCES FROM DIFFERENT COUNTRIES AND CULTURES 2

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Animal hoarding behavior is a mental disorder that crosses national boundaries. Cases of hoarding are seen throughout the world. Ways that they are handled in other nations vary, dependent on the cultural systems of the particular country. The author of this joint lecture will present experiences from various countries to demonstrate particular ways of handling cases.
The following methods have been utilized to assist with hoarding situations:

Hoarding task forces – The hoarding task force is a community based task force that includes stakeholder representatives of civic government and the public. Specific roles represented include code enforcement, police, fire, public health, mental health, adult/child protective services, and animal control. Task forces meet regularly to discuss specific cases. People with hoarding disorder may be included to serve on task forces to assist with other hoarding situations.

Community-based mental health services – In those communities where animals are not being removed from hoarding situations because of a lack of animal welfare organizations to keep them (meaning no animal shelters beyond vector control), mental health professionals are entering the community to work with people with hoarding disorder directly in their home settings. Animals are being “absorbed” into the community in these situations but to varying degrees, dependent on the number of animals and particular circumstances.

The “contract” – Mutually agreed upon goals are outlined in a contract with the person with hoarding disorder.
Developing a rating system – similar to object hoarding rating scales (Saving Inventory- Revised, UCLA Hoarding Severity Scale, Clutter Image Rating) the creation of a scale for animal hoarding scale may assist with determining severity of mental incapacity in particular situations and severity of conditions for the animals.

Full-response case – this occurs often as a last resort but large-scale cases are common and require coordination between many stakeholder agencies. Response will be discussed as one option in this lecture.

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ANIMAL HOARDING ANIMAL WELFARE - EXPERIENCES FROM DIFFERENT COUNTRIES AND CULTURES 2

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Canadian animal hoarding cases rarely appear in the peer-reviewed literature.1 In addition to 6 published Manitoba cases,1 an Internet search going back to 2011 found 11 cases in the popular media. Of the 17 cases, 7 were from Ontario, 6 Manitoba, 2 Quebec, and 1 each from 1 British Columbia and Alberta. Thirteen included only or predominantly cats, 2 dogs, 1 rabbits and 1 horses. Multiple species were reported in 3 cases.
The total number of animals was 1,192 (average 70; median 64; range 26 to 200). This is higher than the median of 39 reported in a landmark paper.2 This may be because only the most severe cases are reported. The Toronto Humane Society (THS) collected data on hoarded 371 cats surrendered from 2011-2014 (submitted for publication) for which the average group was 27, median 21, and range 10-77. These types of cases, which anecdotally are frequently seen by other shelters, are rarely reported.

The barriers to legal intervention in hoarding are high and this model is slow, expensive and frequently ineffective, with a high recidivism rate.3,4 The Canadian Criminal Code and provincial legislation do not specifically address animal hoarding,5 and neglect is viewed differently from active cruelty. There is, additionally, a need to balance the criminal actions of the hoarder with their attachment to the animals and their belief that they are helping them.

Harm reduction, which originates from the substance abuse field, aims to reduce the harmful consequences of behaviours without attempting to “cure” them.6 This approach has had impressive results in object hoarding7 and can also be applied to animal hoarding.4,8,9 The underlying themes in harm reduction are pragmatism, focus on harms, prioritization of goals, autonomy and evaluation.6 The Toronto City Council has developed a coordinated, harm reduction approach that now, thanks to the efforts of Toronto Animal Services and the THS, includes animal hoarding as well as object hoarding.10

Case Study 1: The Black and White Cats

A cat colony caregiver in Toronto noticed multiple cats coming in and out of an alleyway near where she was feeding. Over time she made contact with the home owner, a single mother in her 50s living with her adult son in subsidized housing and working a part-time professional job. Her cats had bred out of control over the years and she had approximately 40 cats and kittens. There was no active acquisition.

The intermediary offered food, cat litter and access to health-care, and was gradually able to gain the owner’s trust. Five cats were initially sterilized and returned and 9 additional cats were then brought to the THS for sterilization. When they were found not to be healthy enough for surgery, the owner agreed to allow them to remain at the shelter for treatment. She was convinced to surrender most of them after reassurances that they would not be euthanized. Within a few months, she surrendered all but 6 or 7 cats and reported being relieved to be free of the burden of constantly caring for so many. Two years later the cat numbers were reportedly stable.

The THS does not perform investigations and relies on partnerships to facilitate the relinquishment of hoarded animals to our care. The role of untrained community intermediaries, most of whom were involved with cat colonies or rescue groups, was notable in the THS study (above). Intermediaries discovered hoarding situations, built relationships with the hoarders and facilitated the surrender process in most cases. The THS experience demonstrates that a great deal can be achieved by using informal grassroots resources as a pathway to voluntary relinquishment.

Case Study 2: Madame X and her 640+ cats

In early 2017, the THS was asked to assist a Toronto rescue group wishing to transfer 90 cats from a peri-urban shelter in Quebec. The shelter was owned and operated by “Madame X”, who was also President of the Board. There were an estimated 640 cats and 15 dogs in the shelter as well as a suspected 60 cats and 14 dogs in the owner’s home on the premises.
The Quebec regulatory agency, MAPAQ, had responded to complaints about the shelter a dozen times since 2009, including 5 complaints in 2016, and had issued orders of non-compliance and instructions for improvements. Fearing animal seizures and euthanasias , the owner asked a local animal welfare agency for help. She had alienated most other local organizations and refused to work with the nearby shelters. However, she was willing to transfer cats to Ontario. The shelter’s finances were at crisis point after the mandated renovations. In late 2018, health problems further deepened the crisis.

Assistance provided was:

- Transferring cats, as well as some rabbits and dogs, to the THS;
- Subsidizing transport when needed;
- Several site visits during which we gathered information and suggested manageable improvements;
- Provision of cat food and feral cat dens;
- Subsidizing TNR for feral cats held in the shelter.

Difficulties encountered:
- The shelter was in a different province with a different language, culture and legal framework;
- It continued to take in animals;
- Diseases including retrovirus infection, dermatophytosis and chronic Streptococcus equi subspecies zooepidemicus rhinosinusitis and otitis media;
- Costs of treatment were high;
- The organizations that initially requested help from THS soon withdrew, leaving us with multiple decision points at which to determine whether to continue helping or terminate our involvement;
- It was extremely difficult to manage this complex situation at a distance of more than 600km;
- The harm reduction strategy was difficult to explain to staff, who expected resolution of the situation and were frustrated when this did not occur.

Successes in this project were:
- The ability to work effectively through a dedicated volunteer at the source shelter;
- Through 21 transfers (as of February 2019), reducing numbers of shelter cats from an estimated 640 to approximately 32 by the end of 2018;
- Persuading the owner not to add new retrovirus-positive cats to an existing group of long-stay retrovirus-positive cats;
- Through transfers, reducing the number of long-stay retrovirus-positive cats in the shelter to zero;
- Convincing the owner to spay/neuter and release feral cats onto the property;
- A high overall live release rate for the transferred cats.

Failures were:
- An inability, until early 2019, to help animals in the owner's home;
- An inability to find partners close to the shelter, which was necessary for provision of adequate veterinary care and infection control;
- An inability to navigate a pathway to appropriate mental health resources;
- The lack of a mechanism by which the shelter could be closed down, despite recent amendments to animal cruelty laws in Quebec.

This case illustrates many features of severe animal hoarding:
- The tremendous, long-term suffering it causes;
- The amplified harm of institutional hoarding, where the hoarder operates a shelter, sanctuary or rescue;
- The perpetuation of animal hoarding through societal inaction or enabling - multiple municipalities awarded animal control contracts to this shelter and the regulator renewed its operating permit;
- The failure of a regulatory agency to appropriately apply animal cruelty legislation;
- The tremendous difference one intermediary can make, by providing a conduit between an animal hoarder and an animal welfare organization such as the THS.

Despite the myriad difficulties, this case illustrates the benefits of a harm reduction approach in a seemingly unmanageable situation. There is a need to play the "long game" in severe animal hoarding cases and this case is a good example. Organizations that intervene should not expect quick or easy resolution and should regularly re-evaluate progress, goals and expectations.

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STATE-OF-THE-ART LECTURE: ADVANCED LUNG ULTRASOUND: SUBPLEURAL CONSOLIDATIONS AND BRONCHOGRAMS

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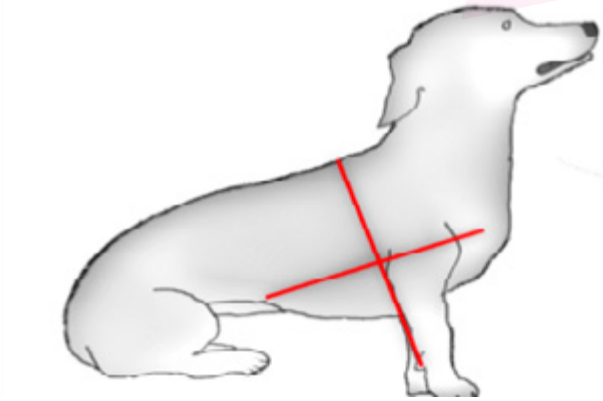
Introduction

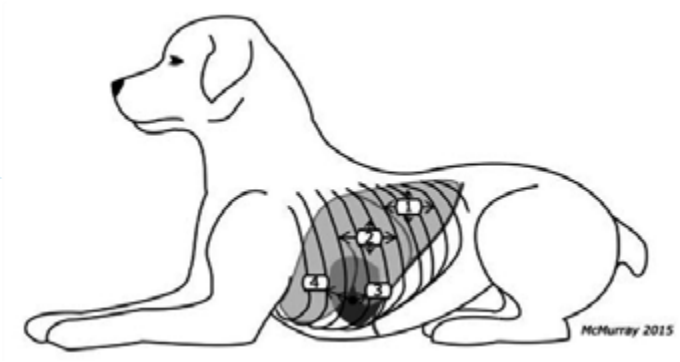
Thoracic veterinary point of are ultrasound (VPOCUS) has evolved greatly over the last several years. The initial thoracic FAST study by Lisciandro et al in 2008 described 4 sites on the thorax (bilateral chest tube site, bilateral pericardial site) and was designed to detect pathology in the pleural space (pneumothorax, pleural effusion) and the pericardial space (pericardial effusion). The study was not originally intended to assess lung pathology. With the development and validation of several human lung ultrasound protocols, a number of veterinary small animal lung ultrasound protocols have recently been published in dogs (see below). Only one study has published normal lung findings using lung ultrasound in cats.

Different lung ultrasound protocols published in dogs:

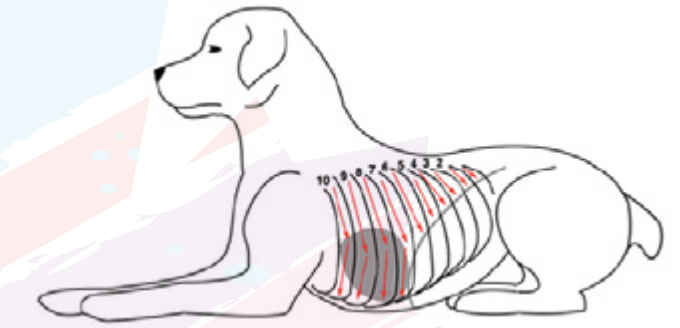
The Radamacher protocol (2014) divides each hemithorax into four quadrants: craniodorsal, cranioventral, caudodorsal, and caudoventral. The sixth intercostal space was determined as the limit between the cranial and caudal areas and the elbow as the limit between dorsal and ventral. Patients are scanned in sitting or standing.



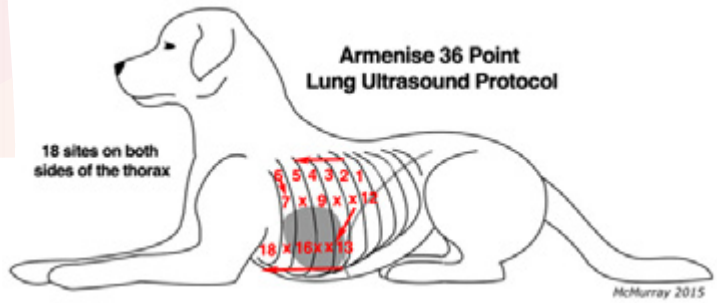
The Lisciandro Vet BLUE (2014) places the prove stationary and horizontally at the caudodorsal lung lobe region. The starting point for Vet BLUE is the same point referred to as the chest tube site in Thoracic FAST. Similarly, lung is observed at the perihilar, middle, and cranial lung lobe regions. Patients are scanned in sternal or standing.



In the Vezzosi protocol (2016) each hemithorax was examined by sliding the probe from dorsal to ventral, examining all intercostal spaces. Dogs are positioned in standing p and manually restrained.



The Armenisie protocol (2018) is a horizontal sliding technique. Starting from the upper caudal dorsal 9thintercostal space and moving cranially, examining each intercostal space up to the 4thintercostal space, followed by the middle third of the thorax moving caudally one intercostal space at a time from the 4thto the 9thintercostal spaces, and finally the ventral third of the thorax moving cranially one intercostal space at a time from the 9thto the 4thintercostal spaces.



Principles of lung ultrasound:

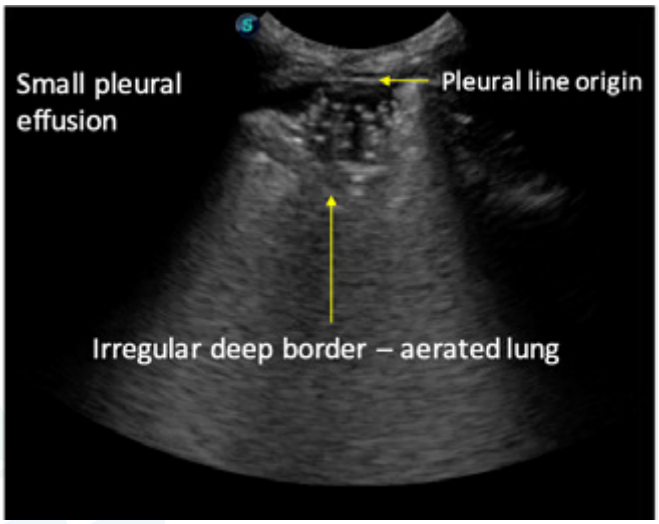
The interface between soft tissue structures (e.g. internal thoracic muscles and pleura) and air (air filled lung) results in 99.9% of the ultrasound beam being reflected, rendering aerated lung impenetrable to ultrasound. Therefore, any structures below the visceral pleura are not sonographically visible when the lung is filled with air.

However, it is possible to detect lung pathology through the identification of lung surface artifacts when the lung is aerated (B lines) and consolidated lung regions when air is no longer present within the lung (bronchograms, consolidation).

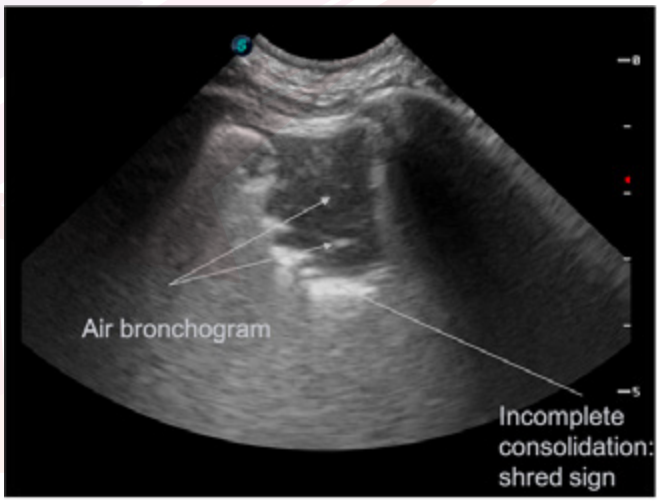
KEY point:
Lung ultrasound varies from the detection of true structure visualization in states where there is less than 5% air in the lung (e.g. consolidation) to the detection of artifacts in conditions where the lung is predominantly aerated (10-95% aerated lung). To be detected by lung ultrasound it is important to remember that these pathologies must reach the lung surface.
The lung appearance, from healthy aerated lung to consolidation with conditions such as bronchopneumonia fincludes progression from the glide sign and A lines (healthy lung), to the glide sign with occasional B lines (mild wet lung), to coalescing B lines with or without pleural irregularities (markedly wet lung), to a glide sign with a shred sign (partial lung consolidation) to a glide sign with hepatization or tissue sign (fully consolidated from one pleural surfact to the other). It is important to note that consolidation can occur as the result of simply atelectasis (with otherwise normal underlying lung tissue) to significant pathology such as consolidation associated with aspiration pneumonia.

Criteria to diagnose alveolar consolidation:
Alveolar consolidation
Consolidated lung can appear as a tissue sign, shred sign, subpleural nodules or even thromboemboli.
Tissue-like sign: When the lungs become highly fluid filled they can resemble the echogenic appearance of the liver. This is termed hepatization. When extensive the pleural line on the opposite side of the lung becomes visible. Consolidation is often accompanied by pleural effusion.

Shred sign: In cases of less extensive consolidation when there is still significant air in the lung echo poor areas are noted, which appear as though someone has “taken a chunk out of the lung surface”. These less extensive areas of consolidation are bordered by aerated lung with the presence of a glide sign and B lines.



Air bronchograms: Air bronchograms appear as white punctate (end on) or linear (longitudinal) structures contained within consolidated lung. They can be classified as static (no movement during respirations) and dynamic (move with respirations). Air bronchograms help distinguish between consolidated and atelectatic lung; dynamic bronchograms are more likely to be seen with pneumonia/infection while static bronchograms are more often seen with atelectasis. Fluid bronchograms can also be seen in severe lung pathology.



Pulmonary thromboembolism(PTE): Human studies have demonstrated that lung ultrasound is very sensitive but not specific for detecting pulmonary embolism. Sonographically, PTE is a type of consolidation, often between 0.5 and 3 cm in size, forming well-demarcated echo-poor triangular, rounded or polygonal consolidations in the absence of air inclusions/bronchograms. They tend not to have surrounding inflammatory changes (Inflammatory changes = b-lines) and are more likely to be PTE when located in more than 2 locations, particularly if pleural fluid also present.

They demonstrate an absence of blood flow when using doppler. They can easily be confused for nodules. Because they are not specific they must be interpreted in light of clinical signs!

Atelectasis:In human medicine pathologic lung consolidation is often difficult to differentiate from atelectasis using ultrasound. In the presence of large pleural effusions, then compression atelectasis should be considered (figure 12). If only small pleural effusion is present than consolidation is more likely. Draining pleural effusion should re-inflate atelectatic lung, and change its sonographic appearance, while consolidated lung will often remain consolidate following removal of pleural effusion. Dynamic bronchograms are more likely to be seen with pneumonia/infection while static bronchograms are more often seen with atelectasis.
Lung surface characteristics:There is emerging evidence in the human literature that the surface of the lung (smooth) vs. irregular may help differentiate cardiogenic (smooth surface) from non-cardiogenic (irregular lung surface with subpleural lesions) causes of AIS.

Criteria to diagnose consolidation
Abnormal pattern should be in thorax (should be differentiated from the liver or spleen)
Should arise from the pleural line
There should be a tissue like pattern (similar to liver echotexture)

Anatomic boundaries must be present:Superficial boundary of consolidation
At the pleural line in the absence of pleural effusion
At the deep boundary of a pleural effusion if effusion present

Deep boundary of the consolidation may be irregular (aerated lung boundary: figure 6) or regular (if whole lobe is consolidated: figure 7)

Where consolidation fails to reach the deep border of the lung and comes in contact with air an irregular consolidation/air interface is created referred to as a “shred sign”.

Where consolidation extends through the entirety of the lung, from one surface to the other, hepatization or a tissue sign is seen.

Summary:
In human medicine, studies demonstrate that lung ultrasound has a higher diagnostic accuracy than physical examination and chest radiography combined. In general, human lung ultrasound can be used to detect pneumothorax, pleural effusion, alveolar interstitial syndrome (AIS) irregular lung surfaces,small subpleural consolidations (< 0.5 cm), larger subpleural consolidated lung lesions (hepatic sign, shred sign > 3cm), air bronchograms, subpleural pulmonary nodules, and has been used to detect pulmonary thromboembolism that reaches the lung surface. In veterinary medicine, although a lot of clinicians are applying veterinary point of care lung ultrasound protocols to help diagnose the above conditions, only pneumothorax, pleural effusion and AIS have been published using point of care ultrasound techniques.The differential diagnosis for subpleural consolidation should be considered in light of the entire clinical picture, history and to some degree, the shape and distribution/severity of the consolidation.

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THE SCIENCE OF CANINE COGNITIVE DECLINE AND DYSFUNCTION: EVIDENCE BASED TREATMENT OPTIONS

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Strategies that might slow the progression and improve the signs of CDS, include drugs, functional foods and nutritional supplements focused on reducing the effects of oxidative stress, correcting metabolic changes associated with cognitive decline, and improving mitochondrial function, neuronal health and signaling. In addition, the combination of behavioral enrichment and nutrition has been demonstrated to slow the progression and improve the clinical signs of cognitive dysfunction.1 A reduction in reactive oxygen species (ROS) is reported in humans after exercise.

Environmental enrichment

When considering the type and level of enrichment for senior pets, provide for the pet's needs within the limitations of its physical and mental health. Shorter, slower, more limited or less frequent physical activities might need to be provided. Reward based training and shaping and other forms of mental stimulation (e.g. scent work, hide and seek, activity puzzles) can provide ongoing enrichment even if mobility and stamina are reduced.

Dietary Therapy and Nutritional Supplements in Dogs
Studies in both laboratory models and clinical trials have demonstrated a beneficial effect of nutrition on improving signs and slowing the progression of cognitive dysfunction in dogs. In fact, in one recent study dogs fed high quality commercial diets designed for age, size, or health, were 2.8X less likely to develop CDS than dogs fed low quality commercial food or table scraps.2 Although single ingredient supplements may be beneficial, the greatest effect was demonstrated with a combination of ingredients.1,3,4 This is supported by human studies in which diets containing fruits, vegetables, seeds, legumes, nuts and fish oils as in a Mediterranean diet, and a diet with both omega-3 fatty acids and B vitamins have been shown to reduce cognitive decline.

A diet supplemented with botanic oils containing medium chain triglycerides (MCT) to provide ketone bodies as an alternate source of energy for aging neurons improved memory in AD patients.5 Studies in dogs have demonstrated a significant reduction in cerebral glucose metabolism in 6 year old dogs compared to one year of age.6 In dogs fed a diet supplemented with 5.5% MCT over 8 months, there was significantly better performance over a placebo diet in a variety of neuropsychological tests. The group supplemented with MCT had significantly elevated levels of the ketone body, □-hydroxybutyrate (BHB).7 Most recently Nestle Purina assessed a diet supplemented with MCT combined with a brain protection blend (BPB) of nutrients in a clinical trial in dogs presenting with signs of DISHAA. The blend was selected to address risk factors for cognitive decline including arginine (to enhance nitrous oxide synthesis to reduce blood pressure, improve circulation and cognition); antioxidants including vitamins C, E and Selenium; B vitamins; and fish oil containing DHA and EPA for anti-inflammatory effects. In humans, a combination of high omega-3 and B vitamins reduced cognitive decline in human subjects with mild cognitive impairment. In a study in dogs aged 9 to 11.5 years, and a study in cats aged 5.5 to 8.7 years, a a BPB enhanced diet has been demonstrated to enhance cognitive function and slow aging-induced decline in learning tasks.4,13 In the clinical trial, dogs supplemented with 6.5% MCT and BPB (Purina® Pro Plan® Veterinary Diets NC Neurocare™) improved all 6 categories of DISHAA significantly after 90 days compared to the control diet for which 4 of the 6 categories improved (but not social interactions or disorientation). After 30 days, 5 categories improved in the MCT + BPB diet but only 3 categories in the control group.8

A senior diet (Hills® Prescription Diet® b/d® Canine) supplemented with fatty acids, antioxidants (vitamins C and E, beta carotene, selenium, flavonoids, carotenoids), and dl-alpha-lipoic acid and l-carnitine to enhance mitochondrial function has been shown to improve signs and slow the progress of cognitive decline in laboratory models and in clinical trials.1,9 The highest cognitive scores were seen in the dogs that received both the antioxidant diet and added enrichment.1,9 However, a reduction in beta amyloid pathology, reactive oxygen species and improved mitochondrial function was seen with dietary therapy but not with enrichment alone while enrichment protected against neuronal loss in the hippocampus.1,9

Another diet that might enhance senior pet cognitive function contains phosphatidylserine, tryptophan and a blend of antioxidants. (Royal Canin® Veterinary Canine Mature Consult)
Nutritional supplements that might be effective for CDS include a mix of phosphatidyserine, gingko biloba, resveratrol, vitamin E and B6 (Senilife®); a mix of phosphadylserine, omega-3 fatty acids, vitamins E and C, l-carnitine, alpha-lipoic acid, coenzyme Q and

selenium (Activait®); and S-adenosylmethionine (SAMe, Novifit®), a methyl donor that might improve membrane fluidity.

Pharmacological therapy

Selegiline is the only drug licensed for treatment of CDS in North America. It is a monoamine oxidase B inhibitor that may improve signs of CDS by increasing 2-phenylethylamine and other catecholamines in the cortex and hippocampus and by decreasing production and increasing clearance of free radicals. The dose is 0.5 to 1.0 mg /kg in the morning.10 In some European countries, both propentofylline, a xanthine derivative and nicergoline, an alpha-adrenergic antagonist have been licensed for treatment of age related behaviour changes, perhaps by improving cerebral blood flow. Although feline use is off label, beneficial effects have been reported in cats selegiline for signs of disorientation, vocalization, and decreased interest in affection. In addition, there are anecdotal reports of efficacy of propentofylline.

As the elderly are particularly susceptible to the effects of anticholinergic drugs, it is prudent to avoid drugs with anticholinergic effects. In fact, anticholinergic drugs might potentially contribute to further cognitive impairment. Therefore, drugs that enhance cholinergic transmission such as donepezil and phenserine might theoretically improve signs.

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TREAT FELINE LOWER URINARY TRACT DISEASE

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Introduction

Feline LUTD includes cystic calculi, infectious and sterile cystitis, neoplasia, anatomic defects, behavioural problems, and feline idiopathic/interstitial cystitis (FIC). Urolithiasis comprises 15-23% of cases, urethral plugs 10-21%, anatomic defects up to 11%, bacterial infections 1-8% and neoplasia up to 2%1. In cats over 10 years old bacterial infections account for 20-50 % of LUTD cases; urine culture should be performed rather than assuming the urine is sterile1,2. Signs of LUTD in cats under 10 years old without urethral obstruction is caused by FIC in 55-73% of cases1.

Clinical signs

Dysuria, stranguria and pollakiuria localise the disease to the LUT, and along with haematuria, are the common signs associated with LUTD. Urinating outside the litter box (periuria) can be a manifestation of cystitis. LUTDs may not affect the patient's general health, and do not cause polyuria, polydipsia or azotaemia.
Obesity, stress and LUTD

In humans, stress is associated with obesity, though it can be difficult to differentiate cause and effect. About half of adult cats are overweight or obese and they have a higher prevalence of LUTD, including FIC and urolithiasis, compared to normal weight cats3.

Pathogenesis of FIC, a highly complex disorder
Cats with FIC have a variable disease course with signs usually resolving in 5 to 7 days, then recurring. This waxing and waning is likely associated with events activating the central stress response system4. Many affected cats show signs from other organ systems, e.g. the gastrointestinal tract, skin, lung, cardiovascular, central nervous, endocrine, and immune systems. The disease aetiology likely has a neuropathic aspect as well as a local bladder wall disorder.

The bladder smooth and striated muscles and the neurovascular supporting tissues engage in complex neuroendocrine communications between the body and brain to coordinate urination. Bladder neural connections include sensory afferent, central, and somatic, sympathetic, and parasympathetic efferent neurons interacting between the urothelium and the cerebral cortex4.

Cats with FIC show a denuded uroepithelium with increased permeability and a decreased total glycosaminoglycans layer in the bladder4. Urine protein concentration was four times and urine protein to creatinine ratio five times higher in cats with FIC than in normal cats5. Increased serum concentrations of pro-inflammatory cytokines and chemokines are also present in FIC cats6.

In addition to uroepithelial bladder abnormalities, urinary changes, and altered serum cytokines in FIC, there are alterations in components of acetylcholine synthesis and release. Changes in the nonneuronal cholinergic system may contribute to alterations in cell-to-cell contacts and communication with underlying cells that contributes to changes in sensory function and visceral (bladder) hyperalgesia. Differences in sensory neuron anatomy and physiology are present in FIC cats, suggesting a more widespread abnormality of sensory neuron function. The acoustic startle response, a brainstem reflex motor response to a perceived threat from unexpected auditory stimuli, is increased in FIC cats. Differences in sympathetic nervous system function identified in FIC cats include changes in the brain stem region associated with an important source of noradrenaline. This area is involved in brain functions such as vigilance, arousal, and analgesia and mediates the visceral response to stress. Changes in brainstem help explain the waxing and waning of sign and the aggravation of signs by environment stressors4.

Some cats with FIC have abnormalities in the hypothalamic-pituitary-adrenal axis, with decreased serum cortisol secretion and smaller adrenal glands compared with healthy cats. Thus, some of these cats have an excessive sympathetic response to stress with decreased cortisol response, in addition to pathology within the bladder4.

Risk factors for FIC

Risk factors for FIC include being an indoor cat, young middle age (4-7 years), neutered, and overweight. Other factors may include low activity, using a litter tray, eating a high proportion of dry food, and living with more than one other cat, especially with conflict between the cats. Compared to normal cats, cats with FIC have been described as being more fearful, nervous, having less hunting behaviours, hiding when unknown visitors are in the house and drinking less water7. Episodes are often triggered by stress, e.g. moving house, new cats in the house or neighbourhood, new people in the house, or car rides to the clinic. A case-control study on indoor cats in South Korea showed increased FIC odds ratios for males cv females (odds ratio 2.34), cats not having vantage points to see out (odds ratio 4.64), cats living in an apartment (cv in a house) (odds ratio 2.53),

and cohabiting with other cats compared to living alone (odds ratio 3.16)8. Cats using non-clumping litter had 2.62 times the odds compared with those using clumping litter.

Treatment for FIC

FIC generally cannot be cured, though it is often possible to decrease the frequency and severity of episodes. The initial treatment should include analgesics (e.g. buprenorphine) as these episodes are painful. Addressing stress management and diet are among the most important treatments.

Environmental enrichment

A thorough history about feeding and management should be obtained. Resources can be found on line (http://indoorpet.ocu.edu/veterinarians/research/ondex.cfm). Multimodal environmental modification (MEMO) should be adopted to reduce stress, although only one or two changes should be made at a time. Each cat should have his own food bowl, separate from the water bowl, and both should be away from the litter box. It is recommended that the number of litter boxes equal the number of cats plus one, although this can be challenging to place around a house. As non-clumping litter is identified as a risk factor, using a non-scented clumping litter and/or meticulous cleaning of the litter box may help.

The cat should be able to access all resources without competing with other cats. When cats are not compatible, microchip-operated cat flaps in internal doors can offer a means for separate and private access to feeding and litter boxes9. Environmental enrichment should also include resting and hiding places, provision of normal cat behaviours (e.g. scratching, hunting or play-hunting) and a set routine with familiar people. Pheromone use can be helpful.

Moisture/Water

If possible, a wet diet should be fed and water intake increased. Water intake may be encouraged by daily fresh water and multiple full bowls placed away from food and litter boxes. Some cats prefer running water, e.g. a water fountain. Many FIC cats present with a urine specific gravity (SG) of around 1.050; decreasing the urine SG to <1.035 decreases frequency of the episodes10.

Diet and supplements

Weight loss

Weight loss is important for the overweight or obese cat for many health concerns. While overweight body condition is more common in FIC cats than in normal cats, no studies have been done which show that weight loss results in fewer episodes of FIC. Obesity is associated with a chronic state of inflammation which could exacerbate the urinary signs.

Glycosaminoglycans and Glucosamine

The urinary bladder glycosaminoglycans (GAGs) layer of cats with FIC is thought to be reduced or damaged, and oral provision of glucosamine, the precursor of GAGs, may have some benefit. Studies have not confirmed this in cats, although the studies may have been underpowered10.

Anti-oxidants

A struvite prevention diet with lower calcium, phosphorus and added antioxidants (vitamin E and-carotene) and omega-3 fatty acids resulted in fewer recurrent episodes of clinical FIC signs compared to cats fed a control diet11.

Stress and anxiety modification with nutrients and dietary ingredients

The two currently used anti-anxiety ingredients for FIC are L-tryptophan and milk protein hydrolysate (MPH). L-tryptophan is an essential amino acid and the precursor of brain serotonin. Increased serotonin is associated with increased sedation, and decreased aggression, fearfulness, insomnia and pain sensitivity. In a double-blinded controlled cat study, added L-tryptophan decreased anxiety, stress-related behaviours and house soiling12. Milk protein hydrolysates, e.g. alpha-casozepin, have a similar structure to gamma aminobutyric acid (GABA), an inhibitory neurotransmitter which decreases anxiety and stress related disorders. Oral MPH given to cats decreases fearful behaviours and increases contact with people13. A study showed beneficial effects of an alpha-casozepine and L-tryptophan supplemented diet on fear and anxiety in cats placed in an unfamiliar location although fear in the presence of an unfamiliar person was not decreased14. A urinary food supplemented with milk protein hydrolysate and L-tryptophan fed for eight weeks to eighteen FIC cats improved FLUTD signs, and emotional and quality of life scores15.

Summary for Treatment of FIC

In summary, feeding a wet food and a food or ingredient to decrease stress have good evidence for decreasing the signs of FIC. Anti-oxidant therapy also appears to help and glucosamine may have some benefit. Overweight cats are more at risk and although weight loss has not been studied as a therapy it is recommended due to the risk of co-morbidities of obesity

References available upon request.

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URINE, URINE EVERYWHERE AND EVEN MORE TO SPARE: MARKING CATS

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Introduction

Houseoiling represents approximately 40% of cases seen at behavior referral practices.1,2 Most soiling cases involve urine only although some cats soil with urine and stools and fewer with stools only.1 In one study 63% of soiling was litter box aversion (toileting) and 15.5% urine marking.1 Persian, Siamese and Burmese type were reported to have highest soiling with urine, Siamese and Burmese greater spraying and Persians highest urine and stool soiling.2,3

DIFFERENTIAL DIAGNOSIS

Marking is a form of social communication. Marking may be sexual or reactional and may be stimulated by arousal or a change in the cats environment. Targets include plants, furniture, boundaries and exits. Less commonly cats that soil on horizontal surfaces may also be marking. In most cases, the cat backs up to a vertical surface and directs a small stream of urine toward an object or surface. Typical posturing includes standing, treading with back legs, with tail elevated and quivering. Cats that spray generally still use their litter for elimination. Although sexually intact males are most likely to mark the problem is more common in neutered males than spayed females

Most horizontal housesoiling is due to avoidance of the box, litter, or location, or a preference for substrates or locations other than the box. Cats usually assume a squatting posture and may dig or scratch after elimination. For cats that intermittently use the litter box, the history can provide insight as to what might be leading to avoidance (e.g. cleaning, aversive events, social conflict, surface preferences). Households with urine spraying compared to households with toileting cats had higher fecal glucorticoid levels in both treatment cats and controls, but no differences between cats in the same houshold. 3.

DIAGNOSTIC WORKUP

Medical conditions can cause or contribute to both toileting and marking. In a recent case controlled study medical problems including renal insufficiency, cystitis, and lithiasis had similar frequency in toileting and spraying cats (39%). Cats living in the household with the soiling cat but not the spraying cat were more likely to also have medical problems.4

Increased frequency or volume of urine, loss of control, pollakiuria, or discomfort during elimination (e.g. vocalization, running from the box) might indicate a medical cause. Systemic diseases, neurological disorders including cognitive dysfunction and pain may contribute to soiling by altering hormonal states, increasing anxiety, or altering mobility. In spraying cats with evidence of masculinization such as penile barbs or tomcat odor, rule out hormonal disorders arising from a retained testicle, extratesticular tissue or a Sertoli cell tumor . Through history or video if available determine if the cat is marking or toileting. In some households both problems co-exist. Cats that mark near external walls, windows, and doorways may be responding to outdoor stimuli. Cats that mark household objects, owner possessions, visitors clothing, or those of the family dog may be stressed or anxious in their social relationships or with their home environment.

TREATMENT

In one study, environmental management alone (i.e. enzymatic cleansers, increasing the number of litter boxes to the number of cats plus one; cleaning the box daily; changing the box weekly and ceasing punishment) led to improvement in a number of cats that were vertically marking.5 For toilering focus on litter box management including increasing size, cleaning more frequently, adding additional boxes, and identifying the preferred substrate, box type and location. Where there are sources of underlying anxiey or conflict, that contribute to litter avoidance, interestial cystitis or marking medication might be indicated.
For a comprehensive review see www.catvets.com/guidelines/practice-guidelines/house-soiling

Urine Marking

a) Environmental management
Insure that all of the cats behavioral needs are adequately met and that there are sufficient resources and opportunities for comfort and security (bedding, perches) to prevent and avoid social conflict. (catvets.com, indoorpet.osu.edu). Manage the environment to prevent access to triggers or to prevent access to the areas being marked. For cats that mark in specific locations an indoor marking site might be considered.
b) Behavior modification
For marking related to social anxiety with people, stressors should be identified, unpleasant interactions avoided (including any punishment) and relationships improved with reward based training and desensitization and counterconditioning. For social conflict between cats, identify and avoid triggers, increase availability of resources, place a bell on the aggressor, separate at times and in situations where problems might arise and improve relationships with desensitization and counterconditioning.

c) Medication is often necessary to reduce the cat's level of arousal or anxiety. As no psychotropic drugs are currently licensed for cats except clomipramine for urine marking in Australia, drugs should be dispensed with informed owner consent and with ongoing veterinary monitoring and oversight.

Selective serotonin reuptake inhibitors (SSRI) and Tricyclic antidresssants (TCA)
Fluoxetine and clomipramine are simialarly effective in reducing or controlling urine marking.7 Other SSRI's such as paroxetine and TCA's such as amitriptyline are also an option; however their efficacy has not been evaluated. While improvement may be seen within the first week, 8 weeks or longer might be needed to achieve maximal control.8 Once there has been a cessation for 2 months, the dose might be gradually decreased. However, long term therapy is often necessary and recurrence is likely unless sufficient modifications have been made to manage the environment and modify behavior.
ii) Benzodiazepines may be effective as an alternative option particularly for the "victim cat" with intraspecific social conflict. Benzodiazepines might also be considered for as needed use for situational anxiety. Since diazepam has been associated with rare reports of fatal hepatopathies, lorazepam and oxazepam may be safer options as they have no active intermediate metabolites.
iii) Buspirone has been shown to reduce urine spraying with a lower relapse rate than diazepam on withdrawal.
iv) Gabapentin might be a consideration for situational use as well as for ongoing use particularly when neuropathic pain might be contributing.
v) Progestins have been shown to improve marking in 50% of neutered males; however, due to high risk of adverse effects including diabetes, immune suppression, and breast tumors their use should be avoided or limited to refractory cases.
vi) For both the stress and pain associated with interstitial cystitis, the use of a serotonin norepinephrine reuptake inhibitor, venlaflaxine might be considered in refractory cases.
vi) Natural options might also be used as an alternative to, or in conjunction with drug therapy including feline F3 facial pheromone (Feliway®), Feliway Multi-Cat® for marking related to intercat social conflict, l-theanine, alpha-casozepine, a combination of Magnolia, phellodendron, l-theanine, and whey protein (Solliquin®, Nutramax) or diets supplemented with alpha-casozepine and tryptophan.
In a meta-analysis of 10 studies that evaluated drug and pheromone use for urine marking, there was a significant ($P<0.001$) association between the use of any intervention and the number of cats that ceased or were reduced by at least 90%. The greatest effect was achieved with fluoxetine and clomipramine.7

When there are compliance issues with oral dosing, compounding and transdermal dosing might be considered. However, with compounding there are concerns about homogeneity, bio-availability, and stability while transdermal use has not demonstrated sufficient absorption or bioavailablity, particularly with TCA's and SSRI's. However, in one study comapring buspirone at 1 mg/kg orally to 4 mg/kg transdermally for 5 weeks, a significant improvement was seen in both groups.8

Drug	Oral Dose
Lorazepam	0.125-0.25 mg/cat prn to bid
Aprazolam	0.125-0.25 mg/cat prn to tid
Oxazepam	0.2-0.5 mg/kg prn to bid
Gabapentin	5-30 mg/kg prn to tid
Amitriptyline	2.5-10 mg/cat q24h
Clomipramine	0.25-1 mg/kg q24h
Fluoxetine	0.25-1.5 mg/kg q24h
Paroxetine	0.25-1.5 mg/kg q24h
Buspirone	0.5 to 1 mg/kg sid-bid
Venlafaxine	0.5-2.0 mg/kg daily

Table 1 – Drug doses for marking in cats

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CREATING A 21ST CENTURY INTEGRATIVE VETERINARY MEDICINE PRACTICE TO IMPROVE THE WELL BEING OF YOUR STAFF, PATIENTS, CLIENTS, YOU AND YOUR FAMILY

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Introduction

The Integration of mind body wellness medicine allows us to create a healthier, happier, practice environment for all. My approach is based on incorporating the latest research in neuroscience and quantum physics with the human animal bond and veterinary practice management. Practical approaches that you can immediately integrate into your practice and life will be discussed.

The current state of veterinary medicine has created such high levels of stress, pressure and anxiety among veterinarians and their staff that veterinarians have reached the dubious notoriety of having the highest suicide rate of medical health care professionals, surpassing dentists who previously held that record. This is the current state of affairs in our profession. An innovative, trans-disciplinary approach can help us evolve and create a more expansive view of what it means to be a veterinarian and where we can go in co-creating healing practices for the 21st century. This approach is based on integrating neuroscience and quantum physics with the human animal bond and veterinary medicine (1).

For four decades my practice philosophy was that no one form of medicine has all the answers and we should explore all diagnostic and therapeutic options to assist animals under our care to be able to heal as much as possible.

As I studied other approaches, I began to recognize the importance of mind-body medicine and took advanced training at Harvard Medical School in their Department of Mind Body Medicine (MBM). I began to incorporate that into everything I did in my practice and my life. I continued to take further advanced trainings in MBM and integrated these approaches into the way I was with clients, patients, staff, colleagues and family. Some of the most beneficial and practical approaches are described in this paper.

MIND/BODY MEDICINE APPROACH (MBM)

Mind/Body Medicine (MBM) is a rapidly expanding field in human medicine and its applications for veterinarians are just beginning to be explored. In its simplest definition, Mind/Body medicine is the use of our mental activity, thoughts and feelings to help prevent and treat various “dis-eases”. Studies in MBM document the effects of thoughts on the release of various neurotransmitters and neurohormones and the impact that has on our physical, mental and emotional health (12). I have found that integrating various practices of MBM into a comprehensive integrative approach is beneficial for veterinarians as well as their staff, family, clients and patients. Extended workshops in MBM training are offered through my Center for Integrative Animal Health. MBM can be of benefit by creating an atmosphere of calmness, compassion and mindfulness when working with animals and their human caretakers. It can help prevent compassion fatigue and burn out for veterinarians and their staff.

Research from the Mind/Body Institute at Harvard University compared the most ancient and the most recent approaches to meditation and found two simple steps that they all incorporate. Dr. Benson at Harvard calls this scientific approach “The Relaxation Response”. This technique will be practiced as part of the lecture. MRI studies on freshman college students evaluated by Dr. Davidson at the University of Wisconsin Neuroscience laboratory have shown that simply taking ten minutes a day to focus on quieting the mind and then on compassion for all beings actually stimulates areas in the prefrontal cortex for joy. Practicing this approach for only two weeks actually stimulated positive changes in the brain. Approaches on integrating this into your practice and life will be discussed.

Research at the HeartMath Institute has documented the electromagnetic field emanating from the human heart and how that field impacts on others. In my last book “The Compassionate Equestrian” (2) I discussed the potential impact that these various studies can have on human-animal interactions in animal hospitals, shelters, horse barns and anywhere animals and humans interact. I proposed two new theories integrating the latest neuroscience research, quantum physics and electromagnetic fields with a new possibility of human animal interactions. This theory is called “The Trans-species Field Theory” (TSFT). Essentially, I propose that the multitude of human/animal interactions at animal hospitals or shelters creates an overall energetic field that manifests everyday. The second theory I propose is called “The Compassionate Field Theory”. This theory states that by incorporating a conscious intention into the field, one can have a beneficial effect on the entire field. The neuroscience research at the University of

Wisconsin neuroscience lab offers us an approach to create a happier mental state by integrating quiet focused intention on compassion for all beings one can create a more conscious energetic field in your veterinary practice and your life. By integrating these practices into your veterinary practice and your life, you can improve relationships with your staff, colleagues, clients, patients and your family. This is one of the foundation approaches to creating a happier, healthier 21st century integrative practice.

Another approach to mind body medicine focuses on sound healing and the latest research on the effects of sound on brain function (3,4). Different binaural sound frequencies have been found to quiet the brain, stimulate alpha, beta and theta waves, decrease stress and increase sense of well being. These sound healing techniques can be very beneficial in decreasing stress at the end of the day.

Various sound frequencies and music have also been found to be of benefit to dogs. Veterinary neurologist, Dr. Susan Wagner, authored a book, "Through a Dog's Ear" (5), on how sound can improve the health and behavior of dogs and created a cd of classical music that has been clinically demonstrated to soothe a dog's nervous system (6). This CD seems to be quite beneficial for animal shelters, animal hospitals and for patients with separation anxiety.

Recent research on the need for quiet, contemplative time in a busy schedule and life and the implications are updated in the Book "Quiet, The Power of Introverts in a World That Cannot Stop Talking" (7). I sense that many veterinarians tend to be introverts. I know that personally, I related to many of the stories in the book.
In addition, an eastern tradition offers the prescription of "The Three Precious Pills", which will be discussed here as well.

We as veterinarians are in a unique position as caretakers of animal companions, which inherently assist in opening the hearts of our clients. I propose that veterinary medicine may be a much broader field than we ever imagined. Perhaps veterinary medicine can be even more expansive and that each animal care location can be a place for expanding compassion in each and every community and thereby be a vehicle for making the world a happier and healthier place. We have the ability to be of so much more benefit to the world by being and expressing loving kindness and compassion in every thought and action we take. This is one example of how the integration MBM into our veterinary practices and lives can be of immense benefit to the entire world.

The future of veterinary practice continues to evolve. Stress appears to continue to increase in our practices as well as throughout the world. A new world view of how veterinary medical practice can be of benefit to all beings in our community and society based on the integration of mind body medicine is open to all of us to co-create. A new concept of how veterinary practices can become centers of compassion in society and be of practical benefit to all living beings can be shared and co-created between all of us.

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AESTHETIC MODIFICATIONS (SUCH AS TAIL ISSUES) AND TRAINING MODIFICATIONS (SUCH AS ROLLKUR) THAT IMPACT THE WELFARE OF COMPETITION HORSES

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"Equitation science promotes an objective, evidence-based understanding of the welfare of horses during training and competition by applying valid, quantitative scientific methods that can identify what training techniques are ineffective or may result in equine suffering" (http://www.equitation- science.com/) [3]. The relatively young field of equitation science has yielded many important findings in terms of equine welfare in a competitive setting; for example, König von Borstel and others [4] performed a meta-analysis of 55 studies related to hyperflexing horses' necks (e.g., Rollkur). In 88% of the studies, the hyperflexed neck posture negatively impacted welfare. During our discussion we will discuss differences/perceived differences between Rollkur and Low, Deep and Round. We will also discuss how similar tactics are used in other disciplines, besides dressage and show jumping, but are less often scrutinized.

Within the competition side of the horse industry, there are a number of aesthetic modifications undertaken to enhance the (perceived) beauty of our equine competition partners. Many of these have not traditionally fallen under the umbrella of equine research. Modifications to the horse's tail provide an interesting set of examples [2] to discuss why each practice was started, what is the rationale by industry insiders to continue the practices, how do the associations and their rulebooks respond, and what are potential welfare implications. The four tail issues we will specifically discuss are tail docking in draft horses, gingering for high held tails In certain breeds, nicking and setting the tail in certain breeds, and blocking the tail in certain disciplines. There has been very limited research in this area [5] and some of the practices continue to be performed 'under the radar.' We can, in all likelihood, extrapolate to extensive work that has been done in other mammalian species, e.g. lambs [1].

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SCREENING FOR PRIMARY GLUCOCORTICOID DEFICIENCY

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Basal or Resting Cortisol Concentration

- Convenient and inexpensive way to rule out hypoadrenocorticism. Recommend in dogs that have nonspecific signs (inappetence, weight loss, vomiting, diarrhea) that could be due to glucocorticoid deficiency without electrolyte abnormalities.

- > 2 mg/dL (55 nmol/L)- rules out hypoadrenocorticism
- 1-2 mg/dL (28-55 nmol/L)- hypoadrenocorticism is less likely, but an ACTH stimulation test is needed to confirm/rule out the diagnosis
- < 1 mg/dL (28 nmol/L)- an ACTH stimulation test is needed to confirm/rule out the diagnosis
- Many laboratories have decreased the detection limit of the cortisol assay from 1 mg/dL (28 nmol/L) to 0.2 mg/dL (5.5 nmol/L). Although this has improved the ability of the basal cortisol concentration to differentiate dogs with and without hypoadrenocorticism (i.e., a cortisol concentration < 0.2 mg/dL in a dog that has not received corticosteroids is highly suspicious for hypoadrenocorticism), an ACTH stimulation test or cortisol to ACTH ratio is still recommended to confirm/rule out the diagnosis in dogs with a low basal cortisol concentration.

ACTH Stimulation Test

- Still considered the gold standard for diagnosing hypoadrenocorticism
- Recommend in dogs that have clinical signs consistent with hypoadrenocorticism and hyponatremia and/or hyperkalemia.
- Can use a 1 µg/kg dose of synthetic ACTH (cosyntropin or tetracosactrin) for screening. Repeat with a 5 µg/kg dose to confirm the diagnosis if results are borderline/equivocal with the 1 µg/kg dose.

Cortisol to ACTH Ratio (CAR)

- Single blood sample can be used to confirm/rule out primary hypoadrenocorticism
- Eliminates the need for synthetic ACTH and to perform an ACTH stimulation test
- Samples must be collected before the administration of corticosteroids
- Sample handling important for endogenous ACTH measurement (review laboratory recommendations)- immediately centrifuge, separate plasma from cells, and freeze until shipping. Ship overnight on ice. This will minimize the degradation of ACTH, which is a concern with inappropriate sample handling.
- Unlike the basal cortisol and endogenous ACTH concentrations, there is no overlap of the CAR between healthy dogs, dogs with non-adrenal illness, and dogs with hypoadrenocorticism

- Not useful for cases of secondary hypoadrenocorticism (low ACTH). An ACTH stimulation test is recommended to rule out/confirm hypoadrenocorticism in dogs with low basal cortisol and ACTH concentrations.

- Interpretation:
- Calculate the ratio of basal cortisol to ACTH
- CAR = cortisol (mg/dL) ¸ ACTH (pg/mL)
- Median CAR from Lathan et al. J Vet Intern Med 2014
- Healthy = 2.27
- Non-adrenal illness = 2.84
- Hypoadrenocorticism = 0.000714
- CAR range from Lathan et al. J Vet Intern Med 2014
- Glucocorticoid deficient hypoadrenocorticism: 0.0004-0.01
- Mineralocorticoid and glucocorticoid deficient hypoadrenocorticism: 0.0004-0.0310

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PLANT-BASED DIETS FOR DOGS AND CATS

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Human diets minimizing, or completely eschewing, animal products have been increasing in prevalence in developed countries. Many meat-avoiding pet owners have a moral dilemma as they live with animals that rely on animal products for their nutritional sustenance. This conflict can result in feelings of guilt and internal conflict. For some, this may stress the human-animal bond to the point where they do not feel comfortable sharing their home with a carnivorous pet, and abstain from this, despite their desire to do so. Considering a prevalence of vegan pet owners in Canada of around 10%, a large number of owners and pets may be affected.

The main concerns that vegan pet owners have regarding the use of animals for production of pet food are challenging to alleviate. They consistently reported concern with the animals' rights to not be farmed and processed. While claims of improved animal welfare, health effects, and/or sustainability are becoming very popular on pet food labels, these will not help to sway the decisions of this particular group. In Canada, 25% of vegan pet owners reported feeding their dog a plant-based diet, while of the 75% who did not do so, 75% indicated an interest in doing so.

Plant-based diets have been introduced to the pet food market. This practice is certainly a solution for meat-avoiding pet owners. However, considering the novelty of these diets, and the unique challenges posed when attempting to formulate and design a plant-based diet for opportunistic carnivorous dogs and obligate carnivorous cats, there is concern regarding the nutritional adequacy these diets. Lack of evidence of adequacy is the number one reason for hesitance among pet owners who do not feed a plant-based diet, but are interested in doing so. Nutritional analyses have yielded conflicting results. In North America, there is poor labeling compliance, and concerns have been expressed regarding the amino acid content. Though diets may be formulated to meet industry recommendations, manufactures rarely perform nutritional analyses and feeding trials. Moreover, very few commercial plant-based diets exist, which may leave some owners choosing to feed a homemade plant-based diet instead, with increased risk of nutritional imbalances and potential predisposition for nutritionally-associated diseases.

Nutritional insufficiencies and imbalances may occur with any nutrients, however those of greatest concern are the essential nutrients which are found mostly or exclusively in animal tissues. These include: the amino acids methionine, cysteine and taurine; the omega-3 (n-3) fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA); the omega-6 (n-6) fatty acid arachidonic acid; calcium, phosphorus, and vitamins A, B12 and D.

PROTEIN AND AMINO ACIDS

Protein is readily found in many plant ingredients. Though both the total quantity of dietary protein and the biological value, a function of digestibility and constituent amino acid content, must be considered. When compared to animal proteins, plant proteins may have lower digestibility and may require more processing to mitigate anti-nutritional factors. Moreover, the amino acid profile of plant proteins may be incomplete, particularly with methionine and lysine being limiting amino acids. For dogs, methionine is the only strictly essential sulfur amino acid, as cysteine and taurine can be synthesized if enough methionine is provided. Cats have even higher dietary requirements for sulfur amino acids; furthermore, they cannot synthesize taurine. Also the bioavailability of sulfur amino acids can vary depending on ingredient source, and high levels of dietary fibre appear to increase biliary taurine losses and/or support bacterial degradation of dietary taurine. Taurine deficiency causes ocular changes, dilated cardiomyopathy and heart failure, while signs of sulfur amino acid deficiency also include weight loss, lethargy, and skin lesion. Recently, grain-free diets, especially diets high in legumes, including plant-based diets, were suggested as a risk factor for development of taurine-deficiency dilated cardiomyopathy in dogs. Protein content differs among plant sources, although some, for example soy meal, sunflower meal, and Brewer's yeast, contain total protein and sulfur amino acids comparable to animal protein ingredients commonly used in pet food. Still, the inclusion of synthetic DL-methionine is recommended, and synthetic taurine also especially if methionine concentrations are insufficient or close to minimum.

FATTY ACIDS

N-3 and n-6 fatty acids are required for cellular structure and physiological functions. For adult, non-reproductive cats and dogs, □-linolenic is the only essential n-3 fatty acid. During growth, puppies and kittens require provision of dietary EPA and DHA, as these essential fatty acids selectively accumulate within the developing nervous tissues. For dogs, linoleic acid is the only essential n-6 fatty acid, and while it is also essential for cats, they additionally require arachidonic acid, which is found mostly in animal fats. Marine sources are the only

ingredients which contain EPA and DHA, and in pet food, fish oil has been the traditional source. Species of algae are known to contain EPA, DHA and arachidonic acid, though their use for pet food is still rare.

MINERALS

Some minerals such as calcium, phosphorus, potassium, and zinc, are found in low concentrations in most plant-based ingredients and can be deficient in diets that are not formulated or supplemented appropriately. Calcium and phosphorus in pet diets are typically provided by animal-derived dietary ingredients, such meat and bone meal, or bone meal, as well as in mineral supplements. Phosphorus is also abundant in non-animal ingredients, though both calcium and phosphorus in plant-derived ingredients may be poorly available due to complexing as phytate. Calcium and phosphorus are critical for healthy skeletal development, and imbalances in these minerals can result in severe skeletal abnormalities, particularly in growing animals. Not only provision of adequate amounts of each macro-mineral is a concern, also the appropriate ratio of calcium to phosphorus should be maintained. Due to the relative ubiquity of phosphorus in non-animal ingredients, risk of an inverse calcium to phosphorus ratio is great if appropriate supplementation of calcium is not included.

VITAMINS

Most diets, when appropriately formulated, are supplemented with vitamins. Although non-animal sources exist, vitamins A, B12 and D are traditionally obtained from animal sources. Vitamin A is essential only for cats. Dogs can synthesize sufficient vitamin A from dietary precursors. Vitamin A is essential for embryological development, immune function and vision. Vegetables rich in □-carotene can be included in pet foods in order to provide adequate precursors for vitamin A metabolism. Synthetic vitamin A analogs, retinyl esters, can also be added. Of the B vitamins, B12, or cobalamin, is the least prevalent in plant-based diets. In nature, cobalamin is produced by microorganisms within the gastrointestinal tract of herbivorous animals and is found within their tissues. Dogs and cats do not possess the microorganisms, and thus require a dietary source. Yeasts and yeast extracts are a source of cobalamin, and also synthetic cobalamin is available and frequently used within the pet food industry. Neither dogs nor cats can synthesize adequate vitamin D in their skin, making it an essential vitamin. Vitamin D exists in two forms in nature: as D3, or cholecalciferol, found in animal tissues, or D2, or ergocalciferol, found in fungi. While it is thus relatively simple to include vitamin D as ergocalciferol, its biological effectiveness in cats and dogs is not well known. Indeed, it would appear that cats do not utilise D2 with near the same efficacy as D3. Still, the amounts required are currently unknown.

SUMMARY

Dogs and cats have dietary requirements for energy and essential nutrients, but they do not have requirements for specific ingredients, no matter if these ingredients are animal-derived, plant-derived or synthetic. However, special care must be taken when formulating plant-based diets to ensure that all nutrient requirements are met, accounting for nutrient interactions, and palatability and digestibility should be verified with feeding trials. Dogs and cats fed homemade plant-based diets are at similar, or even greater, risk of nutrient imbalances and deficiencies as pets fed other homemade diets due to the unique challenges of nutrient provision when sourcing nutrients exclusively from animal-free ingredients. It is recommended that pet owners use recipes formulated by a qualified veterinary nutritionist and that these pets are routinely examined by a veterinarian as they are considered high-risk animals.

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YOUR INVISIBLE CLIENTS-YOUR TEAM - TEAM CULTURE, MAKING YOUR TEAM IMPORTANT

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"The customer is always right". Most of us have heard that phrase in relation to customer service, and I have to believe that the intent was to encourage good communication and a genuine desire to assist each and every client. The pendulum has swung somewhat, and what often happens instead is we prioritize the needs of the client, sometimes to the detriment of the relationship we have with our teammates.

Why should this matter anyhow? We all know how difficult it is to find, train and most importantly, RETAIN, good team members. We know how dependent we are on team members to get through our day. We know how important it is for our team to be supportive of our practice goals so our practice is successful. In return, we need consider the messaging we send to those team members.

The highest category of business expense for most hospitals is salaries of support teams. Well managed practices keep this cost around 22%, but they can be much higher. Conservatively, that's a fifth of your total expense for running a veterinary hospital. There probably isn't any other expense category of that magnitude that you would leave to its own devices, so why do we do so with our teams?

This is not just about praising our teams and thanking them. Let's try this thought experiment. What if we were to treat our teams with the exact same courtesy, respect and patience that we ask them to give to our paying clients? You might find it easier to categorize your team and clients into two categories: Internal and External clients. Now give some thought to your interactions with your team.

If you offer coffee or other refreshments to your external clients, do you ensure that your team has time to eat lunch and go to the bathroom?
Do you strive to be on time for every appointment with an external client? If so, are you on time for team meetings when they are scheduled?
If your internal client has their own pet booked for an appointment, do you bump their appointment in favour of an external client? Would you ever ask an External Client to move their non-urgent appointment in favour of an emergent problem for an Internal Client's pet?

Do you tolerate gossiping in your hospital amongst your Internal Clients? If so, you might be inadvertently condoning External Client bashing. If you don't tolerate gossip about your External Clients, why would you tolerate it amongst your Internal Clients?
Would you permit an Internal Client to be abusive to an External Client? If not, why would we condone the opposite?

Do you thank your External Clients for coming in to see you? Do you thank your Internal Clients for making a positive difference in the lives of the pets who are seen at your hospital?

There are many other comparisons that we can make between Internal and External Clients, and by renaming them, it may help to make the behavioural expectations for both ourselves and our team clearer.
If you have had an epiphany after reading these notes, fear not. This is an entirely correctable problem, and it starts at the top. Leaders have to be consistent in their treatment of Internal Clients, and unfortunately, a change in behaviour needs to be consistent for 6-12 months before team members will believe that it is a permanent change. Very commonly, a consistent change in behaviour won't even be noticed for 3-4 months! (so hang in there!)

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ADJUNCTIVE DRUGS FOR PAIN MANAGEMENT -IS THERE ANY EVIDENCE?

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The pain experience is a combination of sensory and emotional components. Pain causes fear, stress and anxiety, negatively impacting quality of life. It also delays recovery and induces behavioral changes that affect the owner-companion animal bond.(1) Treatment of pain relies on a multimodal approach involving pharmacological and non-pharmacological techniques. Particularly for pharmacological treatment of acute pain, the use of local anesthetic techniques, non-steroidal anti-inflammatory drugs (NSAIDs) and opioids are always recommended.(1) Nevertheless, NSAIDs might be contraindicated in some circumstances,(2) and the recent opioid crises have highlighted the importance of alternatives to opioids. In this scenario, adjuvant analgesics come into play.

Adjuvant analgesics are drugs indicated for primary non-pain conditions but that were found to be efficacious in analgesia either when used alone or in combination with other analgesics.(3) The use of adjuvant analgesics such as ketamine, gabapentin, □-2 agonists, and lidocaine (when administered systemically) is performed both in human and veterinary medicine for the management of postoperative pain.

Although there are few studies in small animals, some recent publications have shown interesting results. For example, in one study, cats undergoing ovariohysterectomy and being administered buprenorphine as part of the premedication were evaluated. One group received the oral administration of gabapentin approximately 12 and 2h prior to surgery showed (test group); another received placebo at these same time points (negative control); and third group received the same placebo and meloxicam (positive control). Although the prevalence of rescue analgesia using a multidimensional composite pain scale was not different, it would be if it were based on the Glasgow pain scale (rCMPS-F).(4) Those authors discussed the lack of power due to small sample size and emphasized the promising results of gabapentin as an ani-hyperalgesic in the management of acute pain. In fact, systematic reviews and meta-analyses from studies in people reveal that perioperative administration of gabapentin reduces acute postoperative pain after surgery.(5) Other authors have also reported the use of adjuvant analgesics such as gabapentin, ketamine and tramadol in cats after trauma or undergoing major surgical procedures.(6)

In a prospective randomized and blinded clinical study involving dogs undergoing forelimb amputation, those that received a low-dose ketamine infusion for up to 18 hours after surgery had significantly lower pain scores and were significantly more active on post-operative day 3 than dogs in the control group receiving saline infusions.(7) Constant rate infusions of lidocaine, ketamine, dexmedetomidine alone or in combination have been studied in dogs undergoing ovariohysterectomy. The combination lidocaine-ketamine-dexmedetomidine provided superior postoperative analgesia when compared with saline or each drug administered alone.(8)

Controversies on the use of adjuvant analgesics also exist. For example, maropitant is a neurokinin-1 receptor antagonist that blocks the effects of excitatory neurotransmitter substance P. Although the drug is labelled for treatment of acute vomiting in cats and dogs, it has been anecdotally used for the management of postoperative pain. Some studies have shown decreases in minimum alveolar concentrations of sevoflurane during ovarian ligament stimulation in cats and dogs.(9,10) Maropitant might aid with patient comfort as anti-emetic, but at this point, it remains unknow whether it provides any analgesic effect.

Appropriate management of acute pain is essential for providing state-of-the-art patient care. However, it has to rely on solid evidence-based medicine. Understanding these drugs and how to use them can have a great impact on animal health and welfare. This lecture will present and discuss the current evidence-based knowledge on the use of adjuvant analgesics for the management of acute pain.

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STATE-OF-THE-ART LECTURE: BEYOND THE BUGS: WHAT MAKES THE GUT (AND HOST) HEALTHY

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There has been a lot of focus on the interaction between mammalian hosts and their intestinal bacteria in recent years. It has been elucidated that the relationship between host and bacteria is a complex one- and that bacteria are essential for maintaining host health. However, focusing on just this interaction, this neglects the other components of the microbiome and the fecal components themselves.
Because the GI tract is a primary site of exposure of host organism to microbes, there is development of extensive crosstalk between the host and the luminal environment of the intestine. The other components of the intestinal microbiome (viruses, archaea, fungi) and the intestinal milieu (e.g. bile acids), also interact with the immune system. There is evidence that they can act in a beneficial manner to the host (by counteracting intestinal inflammation), maintain normal homeostasis or at times be deleterious.

Viruses

Viruses outnumber bacteria 10:1 in most environments, but viral DNA usually only represents 2-5% of the total DNA in a microbial community. Until recently, it has been difficult to determine the full viral fingerprint in a community as most viruses are unable to be cultured, and they lack a consistent genetic fingerprint like the 16S ribosome that is common between bacteria. Advances in viral enrichment protocols, sequencing techniques and bioinformatic pathways mean that recently the GI virome is beginning to be documented in many communities and species, including the intestinal tract of cats and dogs.
The intestinal virome consists of eukaryotic viruses that can infect host cells, endogenous retroviruses and prokaryotic viruses (phages) that infect bacteria, archae and fungi. Most viral sequence data isolated from human faeces is unmatched in databases, with most unreadable sequences being phages. The predicted hosts of the phage populations coincided with the bacterial groups detected by 16S ribosomal RNA gene analysis in the same samples.

The viral genome appears to be unique to individuals, with little to no similarity between individuals, minimal clustering in households and with long-term stability. In a study of twins, the viral gut population remained stable and specific to the individual, with no clustering observed between twins or their mother, which contrasts with bacterial populations that tend to cluster within families. This is potentially one explanation for why there is variable disease expression of Crohn's disease in monozygotic twins despite identical genetic and environmental factors being present.

Eukaryotic viruses have been identified in the feces of healthy dogs and cats, as well as cats in shelters. None of these eukaryotic viruses were associated with clinical disease. A further study of dogs with chronic enteropathy (inflammatory bowel disease) also identified eukaryotic viruses in affected dogs (kobuvirus, astrovirus) but a wider prevalence study didn't show any association with disease. The same set of studies also showed a higher number of bacteriophages in dogs with chronic enteropathy than healthy dogs, or dogs in shelters with acute diarrhea.

A landmark study showed that a eukaryotic virus, norovirus, may exert beneficial effects on the intestine. Germ-free mice were infected with norovirus, and vertical transmission was then allowed to occur. The presence of norovirus was associated with a reduction in intestinal inflammation that normally spontaneously occurs in germ-free mice, as well as following induction of colitis by dextran sodium sulphate or antibiotic administration. Although there were quantitative differences on the inflammation between strains, the overall effect was similar.

Phages are a very interesting area of future study, as they are the most abundant viral organisms in the gut, with very little known about their physiological function. There has recently been proposed a theory that the presence of phage within the mucus may also confer a protective effect. One in vitro study showed that phage abundance is dependent on mucus, and increased phage numbers protected the underlying epithelium from bacterial infection, independent of other factors. The enrichment of phage in mucus is via interaction between mucus glycoproteins and Ig-like protein domains that are exposed on phage capsids. Phages may have a beneficial effect on the development of strains of bacteria and be protective against pathogenic strains of bacteria. As a result, there may be the potential for phage therapy in the future of inflammatory bowel disease (IBD). The absence of phage in probiotics, as well as genetic variation, may be a possible reason for different responses in different studies to probiotics in CD. Similarly, the success of fecal transplantation for treatment of chronic Clostridium difficile infection) may be in part due to the presence of phage.

Archaea and fungi

Compared to bacteria and even viruses, the role of archaea and fungi in the normal intestinal homeostasis is poorly understood.

Of the two groups, fungi have probably been the most studied and are thought to contribute 0.1% of the GI microbiome. The most common fungi in the human gut is the Candida genus, and the mycobiome is greatly influenced by the environment and diet. Rodent models have shown that fungal dysbiosis can influence local and systemic inflammation and immune modulation. There is a small amount of evidence that fungi play a role in the development of chronic intestinal inflammation directly, although a competitive relationship with the resident bacteria is likely. More interestingly, it has been shown that when fungal overgrowth occurs in the gut secondary to antibiotic administration, airway sensitivity to mold spores occurs. Thus, the mycobiome may prime distant mucosal sites to disease. Archaea are unicellular organisms that unique ribosomal sub-units to be classified as a separate life domain. Methanogens are probably the best-known example of this domain, and are strict anaerobes found in many environmental samples as well as the intestine. Generally, archaea are resistant to most antibiotics, but their ubiquitous nature in the gut is only recently being explored, again due to the development of non-culture techniques such as fluorescent in-situ hybridization (FISH) or metagenomic studies. Despite little being known about this group, they account for 10% of the anaerobic bacteria in the human gut and are vital to facilitate digestion, particularly of carbohydrates. There is also evidence that diversity of this group decreases with age, but it is unclear whether this is associated with a functional change. An emerging field of investigation is their use as probiotics to improve cardiovascular health in people; this is via reducing plasma triethylamine-N-oxide levels. However, there is also some evidence that methanogens are associated with constipation and inflammatory bowel disease in people. Whether these changes are opportunistic, or causative is unknown at this stage.

Bile acids and other fecal metabolites

To add to the overall study of the normal gut, the term ‘sterolbiome’ has been coined to describe the production of bile acids (BA) in the gut by the microbiome. Bile acids and the microbiome have bidirectional impact on each other. Primary bile acids are produced by the liver, and then modified by bacterial enzymes (bile salt hydrolases [BSH]) within the gut. Metagenomic studies have shown that BSH are produced in people predominantly by Firmicutes, Bacteroides and Actinobacteria, as well as methanogenic archaea. Secondary BA (namely deoxycholic and lithocholic acid) are produced in the gut by some specific clostridial species. The role of bile acids is increasingly being studied. In people with chronic Clostridia difficile associated diarrhea, secondary BA are down-regulated, whilst primary BA are up-regulated. Bench-top studies have shown that primary BA promote germination of C difficile spores, whilst secondary BA suppress production of spores. The reduction in secondary BA with antimicrobial treatment, and lack of secondary BA in probiotic treatments is another compelling explanation for the success of fecal microbial transplantation in the treatment of C difficile associated diarrhea. However, not all actions of secondary BA are as positive. A Western diet is associated with an increase in both deoxycholic acid (DCA) and lithocholic acid (LCA), and higher serum concentrations of DCA and LCA have been identified in people with colon cancer. The mechanism by which this may occur is uncertain, but it appears that pro-inflammatory pathways (particularly COX-2) are stimulated.

Bile acids can directly modulate the gut microbiota directly or indirectly. Therefore, it appears that host metabolism can be affected by microbiome manipulation of bile acids, particularly through modulation of FXR and TGR5 receptors. However, studies to date have shown massive differences between species, meaning that it will be difficult to directly extrapolate other studies. One study of dogs with chronic enteropathy identified low secondary BA in dogs with active CE, and an increase following treatment. Whether this is a direct result of disease or associated with diet is uncertain- as diet has been shown to affect fecal BA concentrations.

Other fecal metabolites that may have an impact on gut (and host) health and disease include catecholamines, short-chain fatty acids, amino acids and steroid hormones.

Conclusion

The synergy and complex interaction between the complex fecal environment and the host is a rich area of potential research for intestinal and systemic immune disease. The gut is now considered to be an endocrine and nervous system organ- one that has the potential to influence host health and immunity.

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TREAT FELINE HYPERTROPHIC CARDIOMYOPATHY

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Diagnosis

Suspicion of cardiomyopathy occurs in one of three contexts: 1) a physical finding, such as a heart murmur or a cardiac arrhythmia, or a radiographic finding, like cardiomegaly, is identified in the course of an examination that was not primarily directed at the heart («incidental finding»); 2) the patient shows overt physical signs consistent with congestive heart failure, arterial embolism, or syncope; or 3) sudden death, often without premonitory signs. In a university-based referral center setting, the presenting concern in cats that are subsequently found to have hypertrophic cardiomyopathy (HCM) is 33%, 46%, 17%, and 4% in cats with an incidentally-detected heart murmur, signs of congestive heart failure, signs of aortic thromboembolism, and syncope, respectively. Most cats with restrictive cardiomyopathy (RCM) are brought to veterinary attention due to dyspnea (83% in one study). Anecdotally, many cats with RCM are presented due to aortic thromboembolism, as might be expected with hypercoagulability from blood stasis resulting from marked left atrial enlargement. It is uncommon for RCM to be identified incidentally in a cat with no overt clinical signs; for example, only 3% of cats with RCM had no clinical signs at the time of diagnosis in one study.
In a typical hospital caseload, an incidentally-detected heart murmur is the most common initial finding that first raises the possibility of cardiovascular disease. Heart murmurs occur in 40% of all cats in a shelter/rehoming setting, with 70% of those murmurs being physiologic, based on an echocardiogram showing normal cardiac structure. Therefore, the newfound presence of a murmur must be treated as a clue, but not necessarily indicative of a cardiac disorder.

Clinically, cardiomyopathy is confirmed or excluded with echocardiography. If an echocardiogram is not immediately available, measurement of plasma NT-proBNP concentration can be considered as a screening test. A high quantitative (central lab submission) NT-proBNP result does not differentiate between cardiomyopathy types (a differentiation that is of unproven therapeutic importance in cats anyway), but a low or normal value is strongly suggestive of the absence of cardiomyopathy.

Similarly, cardiomegaly on radiographs is consistent with structural heart disease if it is very substantial: a vertebral heart score >9.3 is strongly suggestive of heart disease in dyspneic cats, whereas a vertebral heart score <8.0 makes it very unlikely that a cat's dyspnea is caused by congestive heart failure. Finally, several electrocardiographic abnormalities have been assessed as possible markers for feline hypertrophic cardiomyopathy: ST segment changes, increased QRS width, and increased QT interval prolongation have all been associated with cardiomyopathy in small case series of cats. Echocardiography provides the morphologic diagnosis. Since physiologic murmurs occur commonly in cats, the echocardiogram first serves to identify whether any structural abnormalities of the heart are present at all. If abnormalities are noted, they are typically categorized as one of the following, according to changes observed in the ventricles:
- Left ventricular hypertrophy (LVH): thickening of the interventricular septum, left ventricular free wall, or both, and occurring either diffusely or regionally. In the absence of systemic causes or artifactual impostors (see separate topic), the diagnosis of exclusion is HCM.
- RCM: presence of moderate or marked atrial enlargement, a restrictive ventricular filling pattern on Doppler echo assessment, or both, possibly coexisting with shelf of myocardium and fibrous connective tissue coursing obliquely along the endocardial surface of the ventricle.
- Dilated cardiomyopathy: enlargement of the left ventricular lumen, with thin walls showing reduced motion. The least common of the cardiomyopathies, and only seldom associated with touring deficiency nowadays.

- Unclassified cardiomyopathy (UCM): a term given to a heart with an appearance that captures elements of more than one of the three cardiomyopathies listed above. The existence of this category highlights the fact that the categorization template is an imperfect approach to feline cardiomyopathies, because some ventricles show features that represent a hybrid of categories, or features (such as marked atrial enlargement with left ventricular thickening that is present but very minor) that deviate from the typical morphology of one of these categories.In addition to assessing the ventricles to establish a morphologic diagnosis, stratification of severity is an important part of echocardiography. This hinges on the appearance of secondary effects. Examples include visible systolic dysfunction of ventricular walls, presence of turbulence on Doppler evaluation, and perhaps most important, degree of atrial enlargement. Left atrial size has been associated with all of the major complications of cardiomyopathies in cats: left atrial enlargement increases the risk of congestive heart failure, of aortic thromboembolism, and of a shortened lifespan.

Treatment

Treatment of preclinical ("asymptomatic") HCM has not been shown to be successful. For example, based on retrospective analysis, no significant difference in survival has been identified when cats with hypertrophic cardiomyopathy and extended treatment with atenolol are compared to similar cats who are not treated. Therefore, the cornerstone of treatment of feline cardiomyopathies is the management of its consequences. In this brief presentation, the discussion will be centered on treatment of congestive heart failure (CHF) in the cardiomyopathic cat.

Medication selection

Furosemide. Furosemide is a potent, rapidly acting, high-ceiling, loop diuretic. It is the drug of choice for treating cardiogenic pulmonary edema. In patients that are severely dyspneic, it should be administered intravenously with judicious physical restraint of the animal. Moderately to markedly dyspneic cats should receive 3-4 mg/kg IV; with tolerant patients, skilled technical personnel, or both, a blood sample for baseline kidney and electrolytes values and urine sample for urinalysis should be obtained in addition to lateral and dorsoventral thoracic radiographs prior to the administration of furosemide. The expected onset of action is 5 to 10 minutes in healthy cats, and within the first 30 minutes in cats with severe CHF based on experience; objective information to support or refute this is not known to exist in publication currently. Absence of improvement in respiratory rate and character, which should be monitored closely, justifies re-administration of a similar dose of furosemide within 30 to 45 minutes if necessary, as well as reassessment of the diagnosis of CHF if any uncertainty exists. A patient that responds well has the dosage tapered rapidly; typically one or two doses are needed intravenously for initial mobilization of pulmonary edema, and subsequent doses of 1-3 mg/kg can be given intravenously every 6 to 8 hours for 24 to 36 hours afterward. This regimen is modified based on improvement in respiratory clinical parameters. The decision to administer furosemide orally after 24 to 36 hours of IV use is based on the ease of medication administration, the resolution of dyspnea, and the cat's willingness to eat in the hospital. Occasionally, it is necessary to discharge an inappetent cat with oral furosemide to be administered at home, even though the cat has only been receiving intravenous furosemide up until that point. This leap of faith assumes that the cat's willingness to eat and to receive medication will be improved in the home environment, and no more than 24 hours of inappetence or anorexia should be allowed to lapse before the cat is returned to the hospital if this approach was unsuccessful. Atypical dosage of furosemide given orally is 2 mg/kg every 12 hours, and this is modified based on several parameters, including sodium content of the diet, and ease of resolution of respiratory clinical signs with intravenous furosemide administration.

Some cats with apparent diuretic resistance, as evidenced by intermittent recurrence of signs of CHF (and especially a cat with urine specific gravity >1.020 while receiving diuretics), may benefit from supplementation of oral furosemide with furosemide 1-2 mg/kg SC as needed (e.g., once weekly) at home; this presumes that part of the reason for diuretic resistance is malabsorption of the oral formulation of the drug.

Angiotensin-converting enzyme (ACE) inhibitors. ACE inhibitors (enalapril, benazepril, ramipril, etc.; typically 0.25 mg/kg PO q 12-24 h) are adjunctive treatments given concurrently with furosemide once the patient's hemodynamic and respiratory parameters have stabilized. There is no known benefit or clear roll for their being instituted during acute CHF. Although their use has been suggested in preclinical HCM, such an application has been unsuccessful.

Spironolactone (typical dosage: 1-2 mg/kg PO q 12h). This potassium-sparing diuretic is routinely used in conjunction with furosemide in dogs with CHF. The concept of sequential nephron blockade, together with potassium retention, and additional anti-aldosterone affects, are important assets, although its efficacy as a diuretic in monotherapy appears very weak. In cats, by extrapolation, it can be considered as part of a treatment protocol for CHF, especially when there is concurrent hypokalemia. Possible anti-fibrotic effects that could slow the process of HCM progression have been evaluated, and were not found to be present. A substantial concern regarding acute, severe adverse dermatologic effects of spironolactone in cats appears to be infrequent, and possibly limited to the Maine Coon cat breed.

Pimobendan (typical dosage: 1.25 mg/cat PO q 12 h). This inodilator drug, which is used widely in dogs, has markedly different pharmacokinetic properties in cats, and has not been investigated with any prospective trials. Nevertheless, it is the only drug for cats with HCM and CHF that has been shown in a controlled (retrospective) study to be associated with significantly longer survival. Given both this limitation and this apparent benefit, pimobendan is recommended off-label for cats with HCM and CHF if such a diagnosis is confirmed unambiguously with clinical, radiographic, and echocardiographic evidence, especially if there is evidence of decreased left ventricular systolic function.

Additional Management Strategies: Acute CHF

Oxygen supplementation. In the acute setting, oxygen supplementation can be beneficial provided its delivery is not detrimental to the cat. Specifically, an oxygen cage can be excessively hot, distressing to a cat (loud blasts of noise from oxygen flow valves), or can limit personnel's ability to work with and monitor the patient properly.

Intranasal delivery is not typically practical in cats, but in Elizabethan collar covered by a transparent plastic membrane may be an effective alternative to oxygen cages. The oxygen flow setting should achieve an inspired or ambient oxygen concentration of 40%.
Stress reduction. Excessive restraint can be catastrophically detrimental to a cat with CHF. One important source of this stress to be avoided is physical restraint when thoracic radiographs are being taken. A solution to minimize this problem is to take only a dorsoventral radiograph, with the patient in sternal recumbency. This position mimics the cat's natural posture when dyspneic; it appears less distressing to a cat compared to lateral recumbency, and certainly is much less likely to trigger a respiratory crisis than is dorsal recumbency. Another important opportunity for avoiding stress is to provide a hiding place for cat in its cage. A cardboard box or soft, washable, dome-covered bed are excellent options.

Thoracocentesis. Physical withdrawal of free fluid from the pleural space can be accomplished safely and promptly. The ideal volume to be withdrawn is not known; it should be sufficient to relieve clinical signs, but excessive removal, especially if a chylous effusion and secondary fibrosing pleuritis are present. This consequence can cause trapped lung, and has been associated with bronchopleural fistula and intractable pneumothorax in a small but clinically significant number of cases. Thoracocentesis can be repeated chronically as needed, and no precise limit has been defined regarding a maximum number of times this procedure can be performed on a particular patient.
Additional Management Strategies: Chronic CHF
Dietary sodium restriction. The function of diuretics is to reduce circulating blood volume. Doing so favors movement of fluid from the extravascular space back into the vascular space, which is the fundamental principle behind elimination of edema. All the diuretics used clinically for this purpose in cardiology accomplish this effect by inhibiting renal sodium resorption. Therefore, it is logical that a reduction in sodium intake can lead to resolution of edema, and maintenance of an edema-free state, with less diuretic. A nutritionally-balanced diet fed in calorically-appropriate amounts must above all continue to be eaten willingly by the cat. Diets that are sodium-restricted but not palatable are detrimental if the patient refuses to eat well. Ideally, a patient that develops acute CHF continues to be fed its regular diet until CHF signs are well-controlled. Then, if the patient is tolerant to it, a balanced low-sodium diet can be introduced gradually (over a week or so), with the proportion of the regular diet decreasing day by day as the proportion of low-sodium diet is increased.

Acute ingestions of sodium (e.g., canned tuna, commercial cat treat, etc.) must then be avoided since a salt-avid state exists and such excesses can quickly trigger recurrent pulmonary edema or pleural effusion. Ultimately, a low-sodium diet that is eaten willingly by the patient means a lower dosage of diuretic can be administered while the patient remains free of edema and effusions. The degree to which such a dosage reduction is possible depends on many factors, some of which can be assessed (e.g., severity of underlying heart disease, sodium content of food) and others not (e.g., efficacy of pulmonary lymphatic drainage).

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DIAGNOSTIC CYTOLOGY: OPTIMIZING SAMPLE QUALITY FOR BETTER RESULTS

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Advantages of performing fine-needle biopsy for cytology include quickly obtained samples, often without sedation or general anesthesia, the procedure is minimally invasive, relatively inexpensive, and preparation, staining and interpretation are often rapid. The limitations of cytology include the lack of architecture compared to histology, it is not always possible to distinguish between reactive, dysplastic and neoplastic changes or to determine the type of neoplasm, the expertise of the examiner (experience helps avoid pitfalls) and the relatively increased frequency of non-diagnostic samples. This latter reason is often a source of frustration for clinicians causing them to avoid using cytology as a diagnostic assest.
Reasons for non-diagnostic samples

1. Hypocellular sample

- Anatomic miss – needle may have passed directly through or is adjacent to the area of interest.
- Insufficient vacuum pressure in aspiration techniques.
- Cells encased in a fibrous matrix in mesenchymal-based lesions. A non-aspiration technique may be more useful in these cases.
- Cells wash off slides during processing – especially with adipose cells from lipomas.
- Slides are not dry prior to staining – material washes off during staining.

2. Ruptured cells

- Needle bore too small – creates excessive frictional force when aspirating.
- Excessive vacuum pressure – creates excessive friction.
- Sample dried prior to smearing – cells adhere to the slide. Placing another slide on top and dragging it away for smear preparation is like moving an anchored ship – something has to give!
- Excessive smearing pressure – when using a slide-over-slide smearing technique, no downward pressure should be placed on the smearing slide.
- Some cells are fragile. Neoplastic lymphocytes can be quite fragile, particularly with previous corticosteroid therapy. Sample collection should be performed prior to drug administration whenever possible.

Site preparation prior to sampling

Often little is required other than prepping with alcohol. However, give thought to the anticipated lesion and whether you wish to perform culture and sensitivity testing. Is the lesion a possible abscess? If yes, it is ideal to clip and surgically prepare the overlying skin to help avoid possible normal skin flora contamination. When performing ultrasound guided samples, be cognizant of how much ultrasound gel is present. It stains dark purple with standard stains and can completely obscure sample details.

Equipment

- 22 – 25 gauge needles are ideal. Larger bore needles essentially result in a core biopsy collection. This decreases numbers of individual cells and increases cell cluster density, often making interpretation impossible. Larger bore needles also increase blood contamination potential, decreasing diagnostic potential.
- Syringes – ~3 – 20 ml.
- Extension sets and butterfly catheters – often used with ultrasound guided samples allowing for precise needle control. If negative pressure is required, an assistant can perform this without disturbing the needle and/or the ultrasound probe.
- Slides – ideally with a frosted end for labelling and bevelled edges for making blood smear-type smears.
- Tubes – plain and EDTA tubes for most fluid samples.
- Pencil or solvent-resistant marker for labelling slides.
- Clean flat surface and space allowing for well-orchestrated smear preparation.
- Hair dryer – air drying slides is often sufficient. In some instances low heat from a hair dryer may improve diagnostic quality, particularly with lipomas and bone marrow aspirates.

Technique – aspiration versus non-aspiration

- An aspiration technique does not always obtain cells from very firm masses. Aspiration usually is better suited for fluid-based lesions and lesions anticipated to exfoliate easily.
- The goal of a non-aspiration technique is to create a cell slurry by rapidly and repetitively advancing and withdrawing the needle along a single path within a lesion. Redirect without entirely removing the needle and repeat. Cells travel up through the needle with each forward thrust. Some cytologists prefer performing only one needle advancement before redirecting. The technique can be performed with or without an attached syringe. When using a syringe, fill it with air prior to introducing the needle into the lesion.

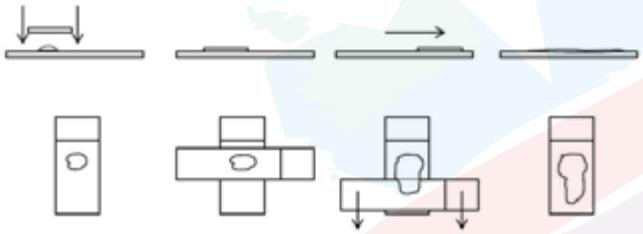
Impression smears prepared from histological biopsy samples

• Cut a fresh surface of the biopsy specimen for imprinting. Only a small (~0.5-1.0 cm2) representative piece is required.
• Blotting the piece on gauze or tissue paper prior to making impression smears to remove excess blood is a key step.
• Lightly touch the freshly cut surface to the slide and then lift directly vertical, avoiding horizontal smearing.

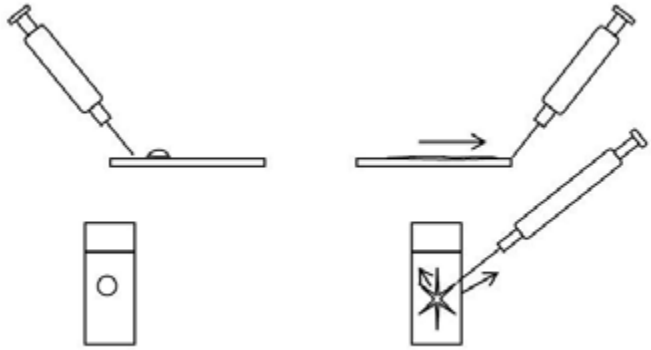
Repeat several times forming 1-3 rows of individual **impressions along the slide.**

Slide preparations

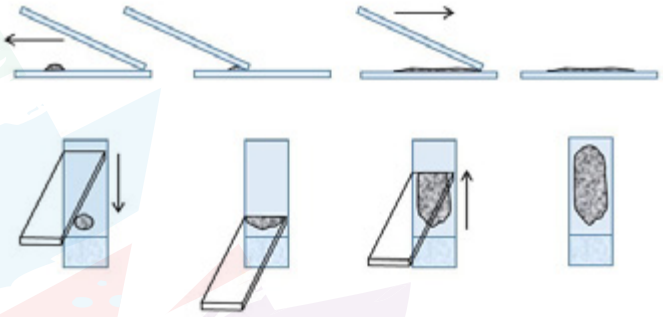
1. Squash, slide-over-slide or smear technique
• Generally, the best method for most lesions.
• Goal is to prepare a thin film with cells spread in a single layer without rupturing cells.
• Squash is a misnomer as no or minimal downward pressure should be applied to the top spreader slide during smearing.



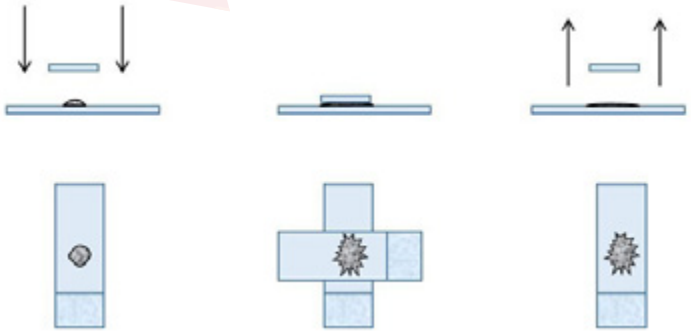
2. Starfish or needle technique
• Involves dragging the ejected material on the slide peripherally in several directions using a needle.
• Relatively gentle on cells but often leaves thicker areas along the centre of the starfish arms, which may be too thick for review.
• Needs a certain amount of fluid to allow spreading and should be performed quickly prior cells drying and adhering to the slide.



3. Blood smear technique
• Most appropriate method for fluid samples.
• Requires enough fluid for proper smearing.
• Cell rupture is minimal except at the feathered edge.
• Chamfered cornered bevelled edged slides are ideal.
• Spreader slide is tilted between a 30-45 degree angle and pulled back into the ejected material. The spreader slide is then smoothly and rapidly glided forward. The smear should end at least 1 cm from the opposite end of the slide as some automated stainers do not stain the entire slide.



4. The touch and go technique
• Similar to the squash preparation but without the smearing component.
• Performed by placing a slide on top of the sample then gently lifting it off. Typically only the surface tension is used; slides are not squeezed together.
• Provides a rough combination of the squash and starfish methods.
• Generally, this produces a mixture of areas where cells lay out well and thicker areas that may be difficult to evaluate.



Random pearls and suggestions

• Prepare and submit multiple slides – sample volume and quality varies between slides.
• Avoid blood contamination as much as possible, understanding that some lesions are vascular or blood-filled. Iatrogenic blood sources are often due to larger bore needle selection and/or prolonged aspiration. Extremely bloody fluid samples can be placed into EDTA and plain tubes, then several smears can be prepared controlling the drop size using hematocrit tubes.
• Avoid slow, shallow needle passes when using a non-aspiration technique.
• Firm masses (mesenchymal tissue) often require more vacuum pressure facilitated by a larger syringe.
• Be well organized – pre-label slides and make smears promptly. If cells prematurely dry, they rupture once smearing is attempted.
• Avoid ejecting material well above the slide such that numerous droplets splatter onto the slide. Place the needle bevel downward to contact the slide and eject material with a smooth rapid plunger depression.
• Fluid sample submissions should include samples in EDTA and plain tubes and 1-2 air-dried unstained blood smear style smears.
• For cerebrospinal fluid, if a delay of >24 hours is likely prior to reaching the laboratory, the sample should be separated into two aliquots. These consist of one unaltered aliquot for total protein and cell counts, and one containing 20% fetal calf serum or 10% serum from the patient for the differential cell count1.
• With cystic skin masses, attempting to sample the cyst wall is encouraged. Also, draining as much fluid as possible and re-sampling any solid areas may improve obtaining cells. Many epithelial and follicular lesions will not yield diagnostic material from the central cyst; the wall is typically more rewarding.
• For clear colorless fluid samples, prepare a line smear (rather than blood smear style) to help concentrate cells along a thin line.
• Provide an appropriate history and description of the lesion(s) being submitted. For skin masses, noting if they are cutaneous or subcutaneous is important.
• Avoid tape or sticky slide labels – often difficult to remove and remaining glue fragments absorb stain, inhibiting proper staining.
• Avoid refrigerating prepared slides – condensation destroys cells.
• Avoid contact between slides and formalin or formalin fumes which will partially fix cells and markedly interfere with staining. Formalin fumes will penetrate most containers, even screw-top jars sealed in plastic bags. Use only approved leak-proof containers and package appropriately.
• Use solid slide holders. Stiff cardboard holders bend under pressure and slides may break. Additionally, thicker slide preparations often make contact with the closed lid of cardboard mailers, allowing a portion or the entire sample to wick into the cardboard.
• Mast cell granules stain poorly with Diff-Quik type rapid stains, potentially leading to erroneous diagnoses in inexperienced hands.
• Laboratories can over-stain previously quick stained slides received but it is optimal for unstained slides to also be received. Reviewing your own slides prior to submission and comparing findings from a board-certified clinical pathologist is excellent free continuing education.

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READING LANGUAGE TO UNDERSTAND EMOTIONAL STATES AND INTENT OF DOGS AND CATS

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Understanding how to read and interpret the body language of the patient is the first step in recognizing and reducing stress, as well as keeping handlers safe. Animals communicate with each other, as well as towards humans, through changes in body posture, eye contact, movement, and vocalization. This is vastly different from inter-human communication and understanding the difference requires experience and skill. Human caretakers must recognize the intent of the animal and react appropriately in order to effectively handle them, minimize their fear and anxiety, and remain safe.

Canine body language

"Green" – This patient feels safe, is relaxed in the environment, and is safe to proceed with handling

Posture
Weight carried evenly between all four limbs
Muscles are soft and relaxed throughout the body
May see a play bow or a loose body "wag" or "wiggle"
Tail
Held in a relaxed, neutral position
May see a loose wag of the tail*
Eyes
Steady, relaxed gaze without intense focus
Pupils are normal size for the light level of the room
Eyebrows and eye lids are soft and neutral, may be partially closed
Ears
Soft and neutral without being pressed or flattened back
May be facing different directions without alerting to anything specific
Mouth
Long, loose lips
Mouth may be open with a loose tongue relaxed and lolling
Mouth may be closed with lips relaxed over the teeth
Vocalization

Typically none

"Yellow" – This patient perceives danger, is alert, on the defensive, and would prefer to retreat rather than progress to a fight. This patient may proceed to aggression if provoked further. Note that the displacement behaviors may occur prior to other postural changes and are good early indicators of stress. Make a handling plan to mitigate the threat this animal perceives.

Posture
Muscles tense, weight shifted towards the back limbs
May crouch low to ground, holding one paw up
May roll over slightly to expose belly with or without urination
Postural displacement behaviors – "shaking off" and interaction (aka "wet dog shake"), holding one paw up, hind-end checking
Tail
Stiff, held lower to the ground or tucked up against the body
May have a low wag* which can be fast or slow
Eyes
Fully open, alert and scanning or darting
Pupils are dilated; may see whites of eyes (aka "whale eye")
Eyebrows furrowed and shifting, may be averting gaze to avoid eye contact
Ears
Pressed back and flattened against the head
Floppy ears may be pinched and tense
Mouth
Lips pulled back to expose teeth or tensely held over teeth
Oral displacement behaviors - excessive or harsh panting, lip licking, chewing, yawning, grooming
Vocalization
Excessive whining or whimpering
Low growl

"Red" – Patient perceives a life-threatening danger and is ready and willing to use an offensive aggression to protect itself with little additional provocation. This is not a safe animal to proceed with handling. Consider chemical restraint if procedure is essential, or send the animal home and create a handling plan for the next visit if it is non-essential.

Posture
Muscles are hard and with stiff movements
Weight shifted to the front feet
May "freeze" or shut down entirely
Frantic attempts to escape, such as climbing walls, rolling and flipping when handled (aka "gator rolling").
Sudden release of urine, feces and anal gland secretions
Tail
Raised high above the back
May be wagging* in a slow and stiff manner
Eyes
Hard, direct stare with eyelids wide open or squinted
Pupils fully dilated
Ears
Held erect and forward
Little movement
Mouth
Top lip retracted showing front teeth only
Vocalization
Growling, snarling, barking

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AN INTRODUCTION TO EVIDENCE BASED BEHAVIOR

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Abstract Body: TITLE: An Introduction to Evidence Based Behaviour
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Overview of the Issue. The process by which horses learn (equine learning theory) is not routinely taught in equine veterinary schools. As such veterinarians graduate with a limited knowledge of equine learning theory and handle horses using traditional methods of restraint. They also tend to explain the behaviour of the horse according to that used by the general horse owning community. Ultimately there is a high prevalence of injuries sustained by veterinarians working with horses, but this may be reduced through a deeper understanding of equine learning theory.

Objectives of the Presentation. This presentation aims to present to the delegate an understanding of the mental capacities of horses and learning theory. This knowledge can be applied to horses under their care to reduce any unwanted behaviours, such as kicking out, exhibited by the horse, and to make working with the more difficult equine patient more time efficient.

The Mental Capacities of Horses
We are often guilty of overestimating the intelligence of the horses we work with. Often equine veterinarians will comment that the horse 'knows' what he is doing and is making a purposeful decision to misbehave, however the behaviour can often be explained using equine learning theory – see below. Behaviours should never be attributed to higher processes of learning or understanding when they can be easily be explained by more simple processes. Key points to remember include:
- Horses have a relatively poor short term memory. They may not associate punishment with the unwanted behaviour after even a few seconds.
- Horses have an excellent long term memory. Memories in horses are triggered and so a horse may have a fear response triggered by a specific veterinarian or procedure they previously found fearful, even if they were not exposed to the veterinarian/procedure for many years in between.
- Horses learn behaviours in the context which they experience them in. For example a horse may associate certain areas, such as veterinary examination boxes, with certain behaviours, such as pulling away, when it would not normally offer these behaviours elsewhere.
- Horses are not capable of problem solving but instead learn even apparently complex behaviours through trial and error.
- Horses cannot learn new behaviours through observational learning. For example they cannot develop cribbing by copying another horse.

Classical Conditioning - Making associations between two previously unrelated cues; increases the Predictability of the environment for the horse.

Most of us will remember the story of Pavlov's dogs whereby he rang a bell before feeding his dogs meat. He then discovered if he rang the bell when no meat was present the dogs would still salivate in anticipation of being fed. This is the phenomenon of classical conditioning, when the horse learns that one cue predicts what will happen next. How quickly the association is made depends on how frequently the two events occur, how consistently one predicts another and how close together they occur.
Examples
- An older horse approaches a young horse with teeth bared and ears back. The youngster stands still and gets bitten. Next time the older horse approaches with teeth bared and ears back the youngster can predict what will happen next (a bite) and can move out the way to prevent being bitten.
- In well trained horses the rider will give a postural cue before using their hand/leg. The horse will quickly associate the two events and react to the postural aid. The rider does not then need to use the leg/hand and the aids appear 'invisible'
- How many horses do you know that whinny when they hear the latch slide open on the feed room door, or that become anxious when you raise the jugular vein prior to venipuncture?
- Clicker training relies on the fact that the 'click' predicts a reward will follow

Operant Conditioning - Making associations between a stimulus and a response; increases controllability for the horse.
Operant conditioning allows the horse to learn how its behaviour can alter the environment. It is divided into Reinforcement training – Increasing the likelihood a behaviour will be repeated in the future and Punishment – decreasing the likelihood a behaviour will be repeated in the future.

Positive Reinforcement

The addition of something pleasant after the desired behaviour.
This makes the horse more likely to repeat the behaviour in the future. Common examples would be food or a scratch on the withers.
The timing of positive reinforcement is vital – it needs to be as close as possible to the desired behaviour. For this reason secondary positive reinforcement is frequently used. For example in clicker training the 'click' predicts the food reward and so the click can be timed to coincide with the desired behaviour.
Examples
- Giving a horse a small food reward every time they are caught makes them very easy to catch
- Giving a horse a quick scratch on the wither when they stand still in an examination room, makes this behaviour more likely to be repeated

Negative Reinforcement

The removal of an aversive stimulus after a desired behaviour.
Lots of people get negative reinforcement confused with punishment. Try and think of it from the mathematical sense of the word, negative means removal or subtraction of something and reinforcement means to increase the likelihood the horse will repeat the behaviour. A better way to remember this is often removal reinforcement. Pressure is applied to the horse which motivates it to remove the pressure, provided the pressure is released as soon as the desired response is offered the horse will offer that response next time the pressure is applied. An important thing to remember is that the pressure should never cause pain or induce fear as these are both detrimental to learning.

Examples

- If a horse is too hot they seek shade, if they are thirsty they drink, if a fly irritates them they swish their tail. Each time the horse alters their behaviour to remove the aversive stimulus
- If you put pressure on the horses halter (pressure) they should walk forwards and the pressure be released
- If the horse feels pressure from the halter when tied up and pulls back, breaking the rope, this releases the pressure and the horse is more likely to repeat this behaviour in the future.

Positive Punishment

The application of an aversive stimulus after an unwanted behaviour has occurred.
This makes the behaviour less likely to be repeated in the future. Again try to understand this in the mathematical sense: positive means the application or addition of something and punishment tells us the behaviour is unlikely to be repeated again in the future. A good example of punishment would be an electric fence.
The act of the horse pushing on the fence results in an aversive stimulus (electric shock), this results in the horse being less likely to push on the fence (the unwanted behaviour).

Negative Punishment

The removal of a pleasant stimulus after an unwanted behaviour has occurred
Again this makes the behaviour less likely to be repeated in the future and again think of the words in the mathematical sense: negative means the subtraction of something and punishment tells us it is to make a behaviour less likely to occur again in the future. An example would be not giving the horse its feed if it was badly behaved in a ridden session before – we can obviously see this is a very ineffective technique (as the horse will not associate its behaviour with the consequence) but amazingly it is still widely used by horse owners.

The Problems with Punishment

- It lowers the motivation of the horse to trial new responses in training. Punishment tells the horse what not to do but does not tell it what it should be doing instead. Therefore when punishment is used frequently in training the horse becomes reluctant to offer new responses, in case they are wrong and are reprimanded for them.
- The horse can become desensitized to the punishing stimulus. If the punishing stimulus is not enough to suppress the behaviour the horse will gradually become habituated to increasingly powerful and painful punishing stimuli with obvious welfare consequences.
- Timing - To suppress a behaviour the punishment needs to occur at the same time as the behaviour occurs. If it occurs afterwards there is a good chance the horse will associate the punishment with the immediate body reaction/ posture of the person, not with the unwanted behaviour. Therefore the behaviour is not likely to be suppressed and the horse will be more confused and anxious in training
- The horse may have an extreme reaction to the stimulus. This is negatively reinforced if the reaction stops/ delays the punishment meaning the horse is more likely to offer extreme reactions in the future.
- It creates powerful fear associations with the person/ whip. Fear is learned from a single response and never completely forgotten. We always want to avoid fear in training.

Summary including 5 KEY "TAKE HOME" POINTS

1. Horses have limited ways in which they can learn new behaviours that are based on operant conditioning
2. Horses are excellent at making associations between two events
3. Reinforcement of a behaviour means it is more likely to repeated
4. Punishment of a behaviour means that it is less likely to be repeated
5. When we talk about positive or negative from a behaviour perspective we are indicating weather something is being added to or subtracted from the scenario

Summary

Horses have limited ways in which they can learn and we should not assume an unwanted behaviour is being exhibited because the horse is naughty or has a desire to upset us in some way. By understanding the processes by which horses learn we can not only understand why unwanted behaviours are offered but also understand how to prevent them being repeated in the future.

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CREATING A CULTURE OF WELLBEING

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What is Wellbeing?

One wellbeing definition is "when individuals have the psychological, social, and physical resources they need to meet a particular psychological, social and/or physical challenge."1
Wellbeing includes "the presence of positive emotions… the absence of negative emotions…satisfaction with life, and fulfillment and positive functioning.2

A Wellbeing Framework

Veterinarians, like all health professionals, are subject to multiple demands and stressors that at times in their careers can compromise satisfaction, engagement, and wellbeing. These stressors include high debt load, long hours, heavy workloads, client demands, navigating social media, and isolation. Our health as professionals can be conceptualized on a continuum, with optimal wellbeing at one end and burnout on the other. Veterinarians and the organizations they work within may move at times toward the wellbeing end of continuum, while others may move more towards burnout.
Wellbeing stems from an interactive relationship between various dimensions, with no single perfect plan but rather a continuum of useful strategies. Our needs, and the needs of our organization may change from day to day. An ideal plan is one that can adapt to changing circumstances over time.
The essential skills of being a whole, healthy veterinary professional include intentional integration of the following dimensions:3

Career Wellbeing

The professionally well veterinarian engages in work to gain personal satisfaction and enrichment consistent with his or her values, goals, and lifestyle.

Creative Wellbeing

The creatively well veterinarian values and participates in diverse arts and cultural experiences to appreciate and understand the creative world.

Emotional Wellbeing

The emotionally well veterinarian can identify, express, and manage the entire range of feelings and seeks assistance about areas of concern and to promote optimal functioning.

Environmental Wellbeing

The environmentally well veterinarian recognizes his or her responsibility to preserve, protect, and improve the environment and appreciates how he or she is interconnected with nature.

Financial Wellbeing

A financially well veterinarian is fully aware of his or her personal financial status and budget, saves regularly, and manages his or her finances to achieve realistic goals.

Intellectual Wellbeing

The intellectually well veterinarian values lifelong learning and seeks to foster critical thinking, develop moral reasoning, expand worldviews, and engage in education for the pursuit of knowledge.

Physical Wellbeing

The physically well veterinarian gets enough sleep (i.e. 7 to 9 hours for both young adults ages 18 to 25 and adults ages 26 to 644); eats a balanced nutritious diet; engages in 150 minutes of moderate aerobic activity or 75 minutes of vigorous aerobic activity and at least 2 strength training sessions per week5; gets regular medical check-ups; limits intoxication substance use; and practices safe, healthy sexual relations.

Social Wellbeing

The socially well veterinarian has a support network based on interdependence, mutual trust, and respect and has developed sensitivity and awareness of others' feelings.

Spiritual Wellbeing

The spiritually well veterinarian seeks harmony and balance by openly exploring the depth of human purpose and its meaning and finding connection through dialogue and self-reflection.

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TREAT CANINE PARVOVIRUS INFECTION

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Agent. Canine parvoviruses are non-enveloped DNA viruses which require rapidly divided cells to reproduce. Currently, most worldwide cases with clinical diseases are infected with CPV-2b or CPV-2c. The small animal parvoviruses are quite resistant to environmental destruction but are susceptible to bleach. Infections in dogs came from feline panleukopenia virus and emerged in the late 1970s. The primary means of transmission is horizontal transmission via oronasal – fecal transmission. Vertical transmission via in utero infection can occur and can leads to myocarditits. CPV-2b and CPV2c can also infect cats.

CPV-2 first enters the oronasal cavity and infects lymphoid tissue followed by viremia for at least 1-5 days. Rapidly dividing cells of the gastrointestinal tract, myocardium, CNS, skin, kidney and other organs are targeted. Most notably, CPV-2 infects the crypt epithelial cells causing villus blunting. Decreased absorption (manifested as diarrhea), necrosis (sloughing of blood) and inflammation result. Lack of gastrointestinal integrity allows normal GI flora to penetrate into the blood stream and can lead to bacteremia with or without sepsis. Canine parvoviruses are shed primarily in feces for 3 to 14 days post infection, often starting before clinical signs appear. Clinical signs usually develop starting 5 to 12 days after exposure. Dogs with maternal or vaccinal antibodies can usually limit viremia and fully immunized dogs have sterilizing immunity.

Clinical findings. Any dog can be infected, but disease is thought to be more severe in some breeds like the American Pit Bull Terrier and Rottweilers. Severity of disease depends on virulence of the strain, size of inoculum, age, breed, and host's defenses. Clinical signs of CPV infection are most severe in pups less than 12 weeks that do not have prior immunity. Most dogs have enteritis characterized by foul smelling bloody diarrhea and vomiting. Leukopenia and fever are also common. Dogs may also have signs of sepsis like red mucous membranes and some dogs will develop disseminated intravascular coagulation. CPV-2 can infect the primary CNS with resultant hemorrhage into brain or spinal cord. In utero infection or infection in pups less than 8 weeks can lead to myocarditis and result in sudden death or congestive heart failure. Depending on the presence of prior immunity, some dogs may have subclinical infections.

Diagnostic evaluation. Dogs under two years of age with acute bloody diarrhea should be considered at high risk for CPV-2, particularly if the vaccine history is incomplete. Another differential diagnosis in dogs with appropriate clinical signs is salmonellosis; this should be considered in dogs that look clinically like parvovirus, but are well vaccinated. The clinical diagnosis is usually supported by documenting parvovirus antigen in feces by ELISA or PCR assays which are commonly part of diagnostic PCR panels in the United States. However, the PCR assays are so sensitive, CPV-2 DNA can be amplified from feces of dogs vaccinated with modified live strains of the virus. At least one of the ELISA antigen tests (SNAP®Parvo; IDEXX Laboratories) has a cut point for a positive test result that excludes most vaccinated dogs. Thus, the ELISA may be superior to PCR for screening dogs and can also be performed in the veterinary clinic. Some dogs will have completed the shedding period by the time the test is run, leading to false negative results. Electron microscopy, virus isolation and seroconversion can also be used to document active or recent infection.

Treatments. Greater than 90% of dogs with CPV-2 enteritis will survive if administered supportive care shortly after clinical signs develop. Fluid replacement, electrolyte balance (particularly potassium), control of hypoglycemia, control of oncotic pressure (hypoalbuminemia can develop), treatment of bacteremia and sepsis (antibiotics), control of nausea and vomiting, and "feeding the gut" as early as possible are paramount to success.

Fluid therapy should be designed to correct losses, hyponatremia and hypokalemia. Oncotic pressure should be maintained with plasma transfusions, hetastarch, or related compounds. Broad spectrum antibiotics with like a first generation cephalosporins are often used in routine cases with therapy escalated to include drugs with a better gram negative spectrum in dogs showing signs of sepsis. Injectable enrofloxacin or amikacin can be added to the protocol to enhance the gram negative spectrum. Many clinics use second generation cephalosporins like cefoxitin as their primary antibiotic as this drug has an enhanced gram negative spectrum compared to first generation cephalosporin. Recently it has been shown that maropitant can be used successfully as an antiemetic agent, but also lessens abdominal pain. It is important to "feed the gut" early in cases with enteritis and so at Colorado State University, nasoesophageal or nasogastric tubes are often used to start to deliver elemental diets as soon as possible. Highly digestible diets with or without probiotics are often used in the recovery phase.

A new gastrointestinal recuperation diet, Rebound Recuperation (Virbac) was found to be palatable, as determined by acceptance and preference testing, in healthy dogs during the preoperative and postoperative phases of routine sterilization (Forbes et al, 2015). In a followup study, Rebound Recuperation was used successfully in the management of canine parvovirus infections in a clinical trial performed at Colorado State University (Tenne et al, 2016).

Many different adjunctive therapies like passive immune therapy (hyperimmune serum infections), colony stimulating factors, oseltamivir (Tamiflu) are used to attempt to improve survival but not all have been shown to be effective in controlled studies. Interferon omega has been beneficial in some puppies and is labeled for this purpose in some countries. Prognosis is variable. Intussusception may occur as a sequel to severe enteritis and so all parvovirus puppies should be palpated daily.

Not all clients can afford hospitalization and intensive care. Thus, researchers at Colorado State University evaluated an out-patient protocol that had equivalent success rates to hospitalization (Venn et al, 2017)

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BOUTIQUE/EXOTIC AND GRAIN FREE DIETS - ARE THEY A PROBLEM?

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INTRODUCTION

Diet-induced dilated cardiomyopathy (DCM) is not new to veterinary medicine. The first article confirming the essentiality of taurine for cats was published in 19781 and the first report of taurine supplementation at correcting diet-induced DCM in a cats was published in 1987.2 By the early to mid-1990's researchers recognized that diet composition (in addition to absolute dietary taurine intake) and intestinal microflora could influence taurine status in cats.2-4 Conversely, taurine is considered a non-essential, or dispensable, amino acid for dogs and as long as adequate levels of the sulfur amino acid precursors, methionine and cysteine, are present in the diet they are able to make adequate levels of taurine for normal heart health.5 Despite this, taurine-deficient DCM was seen in a number of large breed dogs in the late 1990s and early 2000s even when these animals were being fed commercial diets formulated to be complete and balanced.6,7 It was subsequently discovered that certain breeds of dog are less efficient at converting cysteine to taurine; that diets low in total protein or that included protein sources limiting in methionine and cysteine (such as lamb, rabbit, and vegetarian or vegan diets) may increase the risk of taurine depletion; and that diets high in fiber can increase loss of taurine through feces.8,9 Companies working with knowledgeable formulators and nutrition advisors knew about this potential problem and have adjusted their formulas and recipe accordingly for decades. That is to say that pet food companies that worked with or continue to work with Veterinary Nutritionists (either PhD or DACVN) and have followed their recommendations on formulation, manufacturing, and post-production testing appear less likely to be involved with the most recent DCM outbreak, whether their diet are grain-free or contain exotic ingredients, or both.

RECENT DIET-INDUCED DCM OVERVIEW

As of November 2018 the United States Food and Drug Administration Center for Veterinary Medicine (FDA-CVM) has identified 294 cases of diet-induced DCM.10 Those that have been evaluated by the FDA-CVM appear to fall into one of three categories.

1. Breeds that are genetically predisposed to DCM irrespective of diet, such as Golden Retrievers, Doberman Pinschers, Newfoundland, Portuguese Waterdogs, Irish Wolfhounds, and Cocker Spaniels. These breeds have an even higher risk of DCM if fed "high risk" diets as described above.11

2. Taurine-deficient DCM in atypical breeds. A number of dog breeds that are not considered at-risk for DCM have been diagnosed with low plasma and whole blood taurine levels while eating grain free or smaller label/boutique pet foods. It is not clear if diets that are marketed as "grain free" have other characteristics that are decreasing the bioavailability of taurine precursors; if they are changing gut bacterial populations to ones that deconjugate taurocholic acid and cause an increased loss of taurine; if there are anti-nutritive factors in the diet or individual ingredients that irreversibly binding taurine/taurocholic acid and prevent absorption/reabsorption; or these individual dogs may simply have significantly lower than "average" energy requirements and when fed at a level to prevent weight gain the animal may be under-consuming methionine and cysteine. What we have seen is that companies with high inclusions of plant-based proteins, especially protein coming from legumes such as peas, lentils, and chickpeas, appear to be more involved with this problem; of the 294 cases reported through November 2018, 191 had complete diet histories reported and 180 of those diet included peas as a primary ingredient.12

3. Diet-induced DCM not associated with taurine deficiency. Most cases of diet-induced DCM fell within either expected breed predispositions or had low plasma and whole blood taurine levels, but a small percentage of cases were among dogs that did not fit breed predispositions and had normal blood work results. These dogs were eating grain free or smaller label/boutique brands, had clinical signs and echocardiographic changes consistent with DCM, and had resolution or improvement of their disease when the diet was changed. The development of diet-induced DCM in this population of dogs could be related to correcting of a relative deficiency in other sulfur amino acid metabolites (such as carnitine) with the diet change, or could indicate the presence of a cardiotoxic compound either naturally occurring in the foods or created as a secondary compound during manufacturing but it is still too early to draw conclusions.13

SUMMARY

Complete and balanced commercial diets are designed to be fed as a sole source of nutrition to dogs and cats. European Pet Food Industry Federation (FEDIF) and Association of American Feed Control Officials (AAFCO) have established model guidelines for the countries and states regarding pet food labels, ingredient definitions, what can and cannot go into pet foods, and levels of specific essential nutrients required for a given life-stage.14,15 Any pet food with an FEDIAF or AAFCO label of adequacy must have met these guidelines, though it is up to individual manufacturers to ensure that their diets meet these requirements, and the individual nations or states to regulate and enforce these recommendations. Commercial diets labeled as having been "formulated" to meet nutritional profiles mean that the typical analysis of the diet in question meets recommended levels when compared within the formulation software, though bioavailability and digestibility can vary with ingredient quality, the specific combination of ingredients, and preparation or cooking method. Meeting nutritional levels by formulation alone does not guarantee nutritional adequacy. Pet foods labeled as having gone through "feeding trials" indicate that the diet in question has not only been formulated to meet requirements, but has also been fed to a group or groups of health dogs to demonstrated nutritional adequacy. While non-grain carbohydrates such as potatoes and legumes (especially soy and peas) have been used successfully in commercial pet foods for decades, the inclusion levels were historically much lower than what can be found in today's grain free diets. The re-emergence of diet-induced DCM in dogs demonstrates the importance of pet food companies using knowledgeable formulators, the importance of digestibility and feeding trials especially when dramatic changes in diet formulations or ingredient ratios have been made, and the importance of not allowing food fads and marketing to supersede animal health and wellness.

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WHEN «IT›S NOT A PROBLEM» IS THE PROBLEM! - PERCEPTION OF PROBLEMS

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There is an incredible amount of frustration that comes from feeling like you are the only person noticing a problem! Why can't the others see it? Why is everybody ignoring it? Why am I being told "it's not a problem" when it clearly is?!
According to the Oxford Dictionary, a problem is defined as "A matter or situation regarded as unwelcome or harmful and needing to be dealt with and overcome."
With that said, there are two questions when a perceived "problem" arises…
1) Is it truly unwelcome or harmful?
2) Will dealing with it, or overcoming it, make our situation better, easier and/or less "harmful?"
When a problem is identified, it is all about the eyes of the beholder, so your first step has to be about the people. Within a team, it isn't always about everybody believing there is a problem, it's about the "right" people believing it. In some cases, the "right" people are the entire team, in other cases it could be a manager, owner or other key decision maker. Nevertheless, without the "right people" buying into the greater issue, we cannot move forward.

Step 1 – Identify the key people necessary to buy into your problem and need for change. Normally, these people are the ones who are actively part of/connected to your problem, or necessary to participate in/sign off on, the financial or strategic steps necessary for the solution.

A favourite saying of mine is that "People don't change because you tell them to, they change because they feel something." With that in mind, your job is to help these key people feel something. Easier said than done? Maybe. But think about it this way: by definition, problems are an unwelcome or harmful matter, so what you have to do is work backwards and make a case for how it is harmful or unwelcome from somebody else's perspective.
We are surrounded by problems in the world. We hear it on the news. We see the protests. We sign the petitions. Problems are depressing and can actually feel quite overwhelming. Deciding which problems to tackle can sometimes feel like a problem in itself, and this leads to people settling for "good enough" or "comfortable" situations where the proverbial "devil you know" is still better than the new and unknown situation.
seriously are usually the things that affect us most personally. They have actual consequences that directly impact us, or people we care about… in some cases, animals we care about. How do you tie your perceived problem to something people genuinely already care about and are already committed to? How do you make it feel personal to them?

Step 2 – What motivates the key people we have identified? For example: Is it financial gain (or minimizing financial waste)? Is it reputation of the team or practice? Is it better patient care/ medicine outcomes? Is it efficiency, time management or productivity? Is it a happier, less stressful work environment?

Whatever the case may be, and regardless of your own personal motivation, you must highlight the things that are most important to your key people. If your key people are already bought into a Mission or Vision statement, Core Values or Brand, then you can utilize these to your advantage. In some way, any perceived problem would be in direct contradiction of these elements, preventing us from being our best self as a team, practice or business. If your key people are not already on board with one of these elements, or if your practice doesn't already have something specifically articulated, then it is important to drill down to basics and identify something they are personally committed to. Find something people care about and tie the problem to that thing. Again, this isn't about why YOU think it's important… this isn't your Why, it's about theirs!

Step 3 – Secure buy-in. Tie the problem to the things that drive your key people. Connect the dots carefully and studiously. Ensure each point you make has a targeted purpose behind it. Position everything from their perspective – make them feel something about the problem. Make it personal. Use examples where possible to make it real. Emphasize the consequences of what might happen if we don't address this problem now.

Nothing resonates more closely to us than when there is a relatable story. A true example of how the problem is affecting us as individuals, a team, a hospital, a business. Stories engage people. It makes them care. Ensure your story is powerful enough, and/or that you have multiple examples. We all know that the survey-of-one will be a quick way for somebody to negate your problem so choose carefully. This doesn't mean that a single example isn't good enough. In some cases, one bad outcome is all you need, the worst case is it was already one too many. Just ensure the example is significant. Talking in terms of how things may go in theory is never going to be as compelling of an argument as something that has already happened, or something that might have happened with a serious outcome in conflict with what your key people care about.

Give them an example of how the problem is "harmful" and pose the simple question of "so now what?" We often don't like to think about what might be, and when faced with the need to answer it we must ask ourselves, is it easier/better to address the problem before something goes wrong, or are we comfortable with waiting for it to go wrong and then having to take action. Of course, not every problem is about something being wrong. In the case of finances, it could be that we are being wasteful or inefficient. Technically nothing is "wrong," but it could be that we are spending money that would be much better utilized somewhere else. This is significant. Money, time and energy (physical or emotional) are high value goods and problems associated with these three are more apt to be taken seriously.

Step 4 – Be solution oriented. Look for greater engagement. Seek feedback and involve others. Flush out ideas, listen to understand, remain focused on positive outcomes and get agreement on a potential solution.

Once your key people acknowledge an issue, it is time to discuss solutions. At this stage it may be helpful to involve other team members as everybody has a different perspective and somebody from the outside looking in often has more clarity on exactly what is needed. No matter who you involve in the resolution, ensure that people are involved. You may already have a solution in mind, but in the same way that it is not about Your Why, it is not about Your Solution. Soliciting feedback from a larger group ensures that all possibilities are flushed out with any other issues and challenges raised openly. If people perceive other problems within the solution, it is of benefit to know this from the outset. There is always a "What's in it for me?" concern with a larger team and, especially if the suggested tactic requires a change (even if just in mind-set), we must address the concerns head on and clear a path for our new initiatives. The buy-in of others when it comes to the solution often comes from their ability to be involved in the creation of the solution. People don't like being told what to do, they will however do things they believe are necessary.

The devil's advocate requires me to add a note here that acknowledges, some people just don't like change. They will be indecisive on any solution, even when they agree there is a problem. They will complain about having to change habits or say that the problem isn't big enough to change what we do now. At some point, we have to draw a line in the sand and declare a change is necessary. That is why we need our key people on board first. If you have a particularly "squeaky wheel" with respect to a real, relevant problem, then it begs the question of whether or not that person is a good fit for your team and the culture of your practice.

Of course, not every solution works well on the first try. Many people resist change because they have seen other changes implemented in vain, leaving the team with a new process or behaviour, and the same problem as before! A promise to monitor the proposed tactic to ensure it actually resolves the problem is a way to ensure more consistent follow-through from the team. They must trust that their time and efforts will result in success, and if they don't, that a new solution will be identified.

Step 5 – "If at first you don't succeed, try, try again." Measure and monitor your solution and if your problem is not addressed, change it and push forward!

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OVER-USE OF OPIOIDS PERIOPERATIVELY: WHAT›S THE PROBLEM?

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Introduction

Opioids have long been the backbone of acute peri-operative pain. Ironically, it is probably due to their efficacy that the recognition and treatment of acute pain has progressed so rapidly in the last several decades. With that progression in understanding the ugly under-belly of the opioids has gradually been revealed: with addiction, regulatory challenges, and a facilitatory role in the progression of chronic pain.

Although a cast of characters, both in physiology and in human form, make up the problem; if we are to label a single system that underlies it all, it would be the immunologic effect of opioids through toll-like receptor (TLR) expressing cells in the central nervous system, such as glial populations. From this stronghold the addiction and tolerance breed, the immunologic effects multiply, and the seemingly paradoxical hyperalgesia emerge. (S, 2017)

A direct consequence of opioid drug interactions with central immune signaling is addiction to opioid medications, which has reached epidemic proportions in the USA in the last decade. In an attempt to stem the tide of addiction, regulatory agencies are intensifying control on opioid medications, limiting the prescribing duration, reducing the overall availability of these medications on the markets, improving addiction treatment, and improving funding for evidence-based treatments that are non-pharmacologic. An excellent example of this work can be found at https://www.end-opioid-epidemic.org/wp-content/uploads/2019/01/AMA-Paper-Spotlight-on-Colorado-January-2019_FOR-WEB.pdf. While this regulation is slower to affect Veterinary medicine, it does influence availability of opioid medications, and many practitioners have been forced to adopt alternate approaches to acute pain protocols due to these changes. These challenges are going to magnify over time, so developing a skill-set to manage acute pain with less and different opioid medications is a critical task for our profession. A further complication to opioid drug use in dogs and cats includes generally poor absorption of oral opioids due to the robust hepato-enteric recirculation that developed in species that may eat questionable food sources.

Fortunately, these considerations are peaking at time when long-acting local anesthetics have become available, as well as a burgeoning database for the non-pharmacologic pain modalities including acupuncture, physical rehabilitation, laser therapy, and a series of mono-clonal antibody therapies directed at treating pain. (HeatherTick, 2018)

The aspects of opioid medications that we will address today include the previously recognized aspects of sedation, dysphoria and gastro-intestinal effects, as well as the more recently realized aspects of immune modulation and glial stimulation that are critical to understand in the practice of both acute and chronic management of pain in veterinary species.

Undesirable effects of opioids

Sedation: This is a common side effect of opioids in dogs that is used to advantage when opioids are administered for premedication, however post-operatively it can result in a reluctance to eat, drink and mobilise. The degree of sedation in dogs depends on the opioid used, with butorphanol providing greater sedation than methadone (when combined with dexmedetomidine) [1]. Clinically methadone alone post-operatively appears to provide greater sedation than buprenorphine.

Dysphoria: In cats, sedation is less common, with dysphoria or mild excitation being more frequently associated with opioid overdose in this species. This may be due to differences in opioid receptor distribution in the brain of cats and dogs. Similarly to excessive sedation, cats that are dysphoric are less likely to eat and drink voluntarily which may hinder their recovery from surgery. Dysphoria can also occur in dogs and has been reported following fentanyl administration during orthopaedic surgery [2]. Signs of dysphoria can be difficult to distinguish from signs of pain, which is challenging in the peri-operative period because if dysphoria is wrongly mis-diagnosed as pain then the further administration of opioids will worsen clinical signs. Dysphoria is usually best managed by the judicious use of sedation such as a low dose of ACP (10 µg/kg IV) or dexmedetomidine (1-2 µg/kg IV) depending on the cardiovascular status of the patient.

Nausea and vomiting: Nausea and vomiting are well-known opioid-induced effects that may possess peripheral and central components. The mechanisms involved in nausea are extremely complex. Low doses of opioids activate mu opioid receptors in the chemoreceptor trigger zone (CTZ), thereby stimulating vomiting. Alternatively, higher doses of opioid may suppress vomiting by acting at receptor sites deeper in the medulla. The CTZ is in the floor of the fourth ventricle,

a location which is considered in the periphery due to its incomplete blood brain barrier. Opioids can directly stimulate the vestibular apparatus, although the mechanism of action is still unknown. It has been postulated that morphine and synthetic opioids increase vestibular sensitivity, perhaps by opioids activating morphine opioid receptors on the vestibular epithelium. Maropitant administered prior to morphine and acepromazine administration has been shown to reduce the incidence of vomiting in dogs [3]. Methadone is clinically less likely than morphine to cause overt vomiting in dogs and cats although nausea, manifest as lip licking and salivation is still common.

Other gut effects of opioids: As well as being strongly associated with nausea and vomiting, opioids have other potent effects on gut health generally termed Opioid Induced Bowel Dysfunction (OBD). In the GI tract opioid receptors are mainly expressed on neurons within the myenteric and submucosal plexus and the activation of the μ receptor in neurons within the myenteric ganglia or on nerve terminals innervating smooth muscle cells reduces GI motility resulting in constipation. Increased gut transit time due to constipation can also increase the risk of bacterial translocation, compounded by evidence that morphine can disrupt intestinal barrier function and damages tight junction protein organization. It has also been demonstrated that opioids induce gut microbial dysbiosis.

Immune effects of opioids: The effects of opioids on the immune system are complex and depend on the opioid drug, the duration of administration and the dose. Morphine is the best studied opioid and there are convincing data in animals to show that it has immunogenic effects. It suppresses activity in both the innate and adaptive immune system; for example morphine will decrease phagocystosis and cytokine production by macrophages, decrease cytokine and chemokine production by neutrophils, and decrease antigen presentation by dendritic cells. Effects on the adaptive immune system include decreased antibody production and MHC-II expression. There is one study in dogs documenting an effect of opioids on immune function [4]. Despite the wealth of evidence in laboratory animals there is a lack of randomized controlled studies in man and companion animals to determine whether the immunosuppressive effects of opioids are clinically relevant.

Opioid induced hyperalgesia (OIH): This is defined as opioid mediated sensitization of pain signaling pathways and is generally induced by the administration of high doses of opioids. There is reasonable evidence in laboratory animals and man to support the presence of this phenomenon although it has not been reported yet in companion animals.

It is diagnosed in man by an increased opioid requirement to manage pain accompanied by a worsening in pain experience as opioid doses are increased and an increase in pain sensitivity over time. Mechanisms of opioid induced hyperalgesia are complex and multifactorial. The NMDA receptor is linked to OIH, with studies in both animals and humans showing that NMDA receptor antagonists such as methadone and ketamine reduce OIH. Other mechanisms that have been postulated include descending facilitation, microglial activation, and a role for μ opioid receptors on nociceptors. Recommended prevention strategies to avoid OIH in human patients are poorly evidence based but include avoiding the use of remifentanil, switching to opioids with a longer half life such as fentanyl; limiting opioid dose by the concurrent administration of non-opioid analgesics and the use of regional anaesthesia techniques.

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MANAGING PATIENTS WITH CONCURRENT CARDIAC AND RENAL DISEASE

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Introduction

It is common for cardiac disorders and renal disorders to coexist in small animal patients. Several practical questions with important implications arise from this duality, including:
- Should a patient with a heart murmur receive a smaller volume of parenteral fluids?
- Should a cardiac patient who is azotemic be given fluid therapy as a form of renal protection?
- What is the best form of fluid therapy for a chronic renal failure patient who also has heart disease?
- Are there early warning signs that can be identified prior to respiratory problems if one is especially concerned about IV fluid intolerance in a cardiac-renal patient?
The cardiorenal syndrome has been defined as "worsening renal function limiting diuresis despite obvious clinical volume overload"1. This syndrome presents difficulties in treatment, since certain treatments aimed at resolving one disorder may cause decompensation of the other.2 The problem of suboptimal renal function in small animal patients with heart disease is a widely prevalent one, likely with adverse consequences similar to those seen in human medicine.1-6 The cardiorenal syndrome, then, presents at least two aspects of care that are of interest to use as small animal clinicians: approaches that can help avoid or delay its onset, and methods for managing patients who have developed it despite precautions and optimal care.

Natural history and pathophysiology

In dogs with myxomatous mitral valve disease, a significant increase in number of azotemic dogs is noted as disease severity worsens from compensated stages to advanced CHF.7 Blood urea nitrogen (BUN) and serum creatinine levels are elevated minimally if at all during the compensated, "murmur-only" stage of the disease.7-9 These patients' renal values rise significantly at the onset of CHF, at which time the confounding influence of diuretics may also contribute to azotemia.8 BUN (but not necessarily creatinine) is elevated thereafter.7,9 Later, recurrent CHF prompts increases in diuretic dosage and other treatments; together with worsening renal perfusion due to forward failure and adaptive mechanisms, serum creatinine levels rise and BUN levels continue to increase.

Eventually, the dichotomy between preserving adequate renal perfusion and avoiding fluid congestion/CHF marks the onset of the cardiorenal syndrome. A similar pattern of evolution is apparent in cats with heart disease, although supportive data are lacking.

Chronic kidney disease is an umbrella term that encompasses progressive loss of nephron function often due to unidentified processes, but which ultimately lead to chronic tubulointerstitial nephritis or other nonspecific, irreversible lesions. With ongoing nephron loss, azotemia becomes detectable when glomerular filtration rate falls below 25% of normal. Anemia of chronic disease, compounded by erythropoietin-deficient anemia of chronic kidney disease and possibly gastrointestinal (GI) blood loss from uremic GI effects, decreases circulating red blood cell mass. Systemic hypertension occurs in a variable proportion of cases, as a result of mechanisms that also may contribute further to loss of nephron function. These mechanisms include increased activity of the renin-angiotensin-aldosterone system (RAAS), causing vasoconstriction, sympathetic activation, sodium retention, and potentiation of oxidative stress; endothelial dysfunction; and defective nitric oxide metabolism.

In concert, coexisting heart disease and kidney disease can produce cumulatively detrimental effects
- decreased renal perfusion due to renal afferent arteriolar constriction in heart disease
- renal effects triggered by low-pressure cardiopulmonary baroreceptors3
- vasopressin/antidiuretic hormone release in advanced heart disease
- decreased renal perfusion with heart disease (decreased arterial blood pressure; hypovolemia due to diuretics; others) leading to sodium retention
- systemic hypertension from chronic renal disease augmenting afterload
- tense ascites causing abdominal compartment syndrome, reducing renal perfusion
- sympathetic and renin-angiotensin-aldosterone system activation as compensatory cardiac mechanisms worsening renal disease

THE CARDIORENAL SYNDROME IN SMALL ANIMAL PRACTICE

How do we first suspect individuals at risk?
Usually, a patient is presented for evaluation, and from the history, physical exam and diagnostic tests, the clinician establishes that abnormalities involving dysfunction of both the heart and the kidneys are present. The degree of compromise of each system is variable.

One generally predominates- i.e., usually there is a greater concern regarding one system, and dysfunction of the other mainly stands as an obstacle impeding vigorous treatment of the primary problem.

What is the concern of having concurrent kidney and heart disease?
Treatments for heart disease and for kidney disease may be mutually antagonistic in at least one respect: extracellular volume. Increasing extracellular volume with intravenous fluid therapy to improve renal perfusion and promote fluid diuresis can help kidney function but precipitate congestive heart failure iatrogenically; conversely, decreasing extracellular volume with diuretics can help with congestive heart failure but decrease renal perfusion, precipitating a uremic crisis. Optimal treatment is essential –but often difficult- since withholding therapy can be as detrimental as overzealous treatment. Undertreatment can allow deterioration of the patient's state due to progression of the dominant disorder, whereas overtreatment may cause the lesser problem to emerge suddenly as the worse of the two because of iatrogenic decompensation of the previously latent condition.

What are some practical management approaches?
Proposed partial checklists for management of patients with azotemia and congestive heart failure
Acute decompensation of one system (CHF or uremia) in a patient with disorders involving both systems:
- Identify and address reversible causes (CHF: e.g., recent sodium-rich dietary indiscretion; uremia: e.g., pyelonephritis; aortic thromboembolism causing renal infarction).

- Assess patient for onset of gallop sound during fluid therapy, suggesting iatrogenic CHF.
- Use fluid type that matches needs (e.g., no replacement fluids like lactated Ringer's solution/0.9% NaCl when patient is euvolemic/well-hydrated).
- Manage coexistent electrolyte abnormalities, especially hypokalemia which can lead to ventricular tachyarrhythmias while also causing refractoriness to antiarrhythmics like lidocaine.

- Consider diuretic constant rate infusion instead of intermittent injections for superior natriuresis.
- Change medications to injectable form (e.g., diuretic) while managing crisis in-hospital, and suspend administration of oral medications with benefits that are long-term only, not short-term (e.g., ACE inhibitors).
- Confirm suspicions. Is dyspnea from pulmonary edema? Thoracic radiographs are indicated regardless of pulmonary crackles, intensity of murmur, etc- films may be normal (e.g., pulmonary thromboembolism in patient with nephrotic syndrome), may show pleural effusion instead (which can be centesed, reducing or avoiding acute doses of diuretics), etc.

- Have radiographs interpreted by radiologist/cardiologist if uncertain (both false-positive and false-negative results are common for pulmonary edema, cardiomegaly, and other relevant cardiovascular interpretations).

- Look to remainder of physical exam to offer clues regarding whether heart or kidney problem is worse at that moment.

- E.g., the presence of respiratory sinus arrhythmia generally signifies that cardiogenic pulmonary edema is not present.

- However, avoid overinterpretation of lung sounds. Crackles do not equate to pulmonary edema (e.g., pulmonary interstitial fibrosis)

- Removal of large-volume body cavity effusions in acute states: centesis is generally superior to diuretics for both efficacy and lesser degree of adverse effect.

- Positive inotropes – dobutamine unconvincing, pimobendan promising, dopamine if hypotensive.
Chronic management of coexisting cardiac and renal disorders:
- Verify client compliance with drug administration (both client diligence and patient co-operation).

- Identify diuretic resistance.

- measure urine specific gravity.

- have owner measure water intake, confirm > 20 cc/lb/day (45 cc/kg/day).

- Identify systemic hypertension and treat if present and if attributed only to renal disease.

- With good client comprehension, taper diuretic to lowest effective dosage.

- Consider dual-diuretic therapy (e.g., furosemide + spironolactone, except in Maine Coon cats due to breed-associated adverse effects associated with spironolactone [facial dermatitis]).

- Manage coexistent electrolyte abnormalities, especially hypokalemia (which could lead to ventricular tachyarrhythmias while also causing refractoriness to antiarrhythmics like lidocaine).

- Differentiate between advanced chronic renal disease and acute-on-chronic process: anemia, hyperphosphatemia, and small kidneys (exceptions: polycystic kidney disease, lymphoma) suggest chronic kidney disease; their absence offers the possibility of an acute, potentially reversible superimposition on chronic kidney disease (e.g., occult urinary tract infection: up to 72% prevalence in cats with chronic kidney disease).
- Manage anemia (with chronic kidney disease, anemia can arise due to chronic illness, erythropoietin deficiency, uremic gastrointestinal blood loss, or a combination of these factors).

- Have radiographs interpreted by radiologist/cardiologist if uncertain (both false-positive and false-negative results are common for pulmonary edema, cardiomegaly, and other relevant cardiovascular interpretations).

- Look to remainder of physical exam to offer clues regarding whether heart or kidney problem is worse at that moment. E.g., respiratory sinus arrhythmia generally does not coexist with cardiogenic pulmonary edema.

- Removal of large-volume, recurrent body cavity effusions in chronic states: periodic centesis/drainage may be superior to higher-dose diuretics for both efficacy and lesser degree of adverse effect.

- Positive inotropes: role still to be defined. Like many veterinarians, the author has treated severely ill, “end-stage” cardiorenal patients with pimobendan, resulting in improved azotemia and uremia and prolonged survival due to delay in the owner’s decision to euthanize. This response is variable and unpredictable, with some dogs improving dramatically and others deteriorating despite similar therapy. However, all dogs that demonstrated a visible positive response to pimobendan did so within the first several days of treatment, an observation that offers the opportunity for a therapeutic trial.

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OCULAR DISEASES IN OLD DOGS AND CATS

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1- Physiologic changes due to aging
1-2 Eyelids
Senile ectropion
- Signs: eyelid margins very lax, exposure of the globes and the conjunctiva
- Treatment: None or artificial tears or surgery (V to Y technique) if too pronounced and exposure keratitis

1-2 Lacrymal film
Quantitative or qualitative deficit
- Decrease in tear production with age (- 0.4mm/year)
- Signs: discharge, +/- conjunctivitis/kératitis
- Diagnosis: Rose bengal, Schirmer tear test, TBUT)
- Treatment: artificial tears,
cyclosporine, …according to signs

1-3 Iris
Iris atrophy
- Signs: rough edge of the pupil, thin iris (even with holes) +/- photophobia
- Différential: iris hypoplasia, coloboma, glaucoma, retina or neurologic conditions
- Treatment: none or Doggles if photophobia

1-4 Lens
Nuclear sclerosis
- Signs: normal change of the lens, in dogs and cats older than 6 years,
no/slight effect on vision (presbytia in humans)
Nuclear sclerosis
- Differential: cataract (disorganisation of the lens fibres = opacity) with +/- effect on the vision to be differenciated by indirect ophthalmoscopy and presence of fundus reflex
- Treatment: none

1-5 Vitreous
Vitreal Degeneration
- Asteroïd hyalosis, liquefaction
- Signs: ponctiform multifocal opacities in the vitreous, liquified vitreous, “floatting bands ”
- Differential: inflammation (vitritis)
- Treatment: none or prophylactic retinopexy in breeds predisposed to retinal detachment

2- Physiologic changes due to aging
2-1 Exophthalmia
- Causes:
. cellulitis /abscess
. myositis (eosinophilic m./extra-ocular m.)
. Neoplasm
(primary/secondary)
. traumatism of the orbit (hematoma/fracture)
Clinical signs:
Exophthalmia, strabism, discharge, NM protrusion, conjunctival chemosis +/- hyperhemia, +/- corneal lesion
Diagnosis approach:
Physical and eye exam (fluorescein test),
Retropulsion
Exam of the oral cavity
Imaging: radiography, ultra-sound
Therapeutic approach
Temporary treatment until the cause is known:
- pain control
- globe protection (lubrification, tarsorraphy) +/- treatment of the corneal lesions
If obvious cause -> start an eatiologic treatment :
- Abcess: systemic AB +/- drainage, syst. NSAI
- Neoplasia:....
2-2 Eyelids
Eyelid tumors (Meibomius gland)
- Signs: mass(es) at the eyelid margin +/-keratitis/conjunctivitis, benign
- Treatment: none or artificial tears or excision surgery if mass too big/ulcerated or if keratitis/conjunctivitis
- Surgical excision:
Principle
* «a minima » Incision
* Start suturing at the edge of the eyelid’s margin
- figure 8 stitch
* One suture layer, 3-0 or 4-0, nylon or silk
(simple or cross pattern)
2-3 Cornea
2-3-1 Calcic degeneration
- Signs: white deposits on/in the cornea, rough aspect of the cornea +/- Oedema, ulcer, inflammation
Treatment:
- Artificial tears +/- AB
- Corneal contact lens
- (lamellar superficial keratectomy)
2-3-2 Endothelial decompensation
- Endothelium +/- epithelium = water pumps
- Endothelial cell density:
2500 c/mm2 in dogs
- Decrease of density with age:
1900-2100 in 9 yo dogs and decompensation at 500-800
- Predisposed breeds: Daschund, Boston Terrier, Chihuahua
- Signs: Corneal oedema +/- severe
Treatment:
- Non if focal and light si monitoring)
- Hyperosmotic ointment
(Muro 128, NaCl 5%, BID to TID)
- Thermokeratoplasty if severe
2-3-3 Indolent ulcer (Boxer ulcer)
- Prediposed breeds: Boxer, Pekingse, Corgi, Lhasa Apso and others...

- Middle and old age, female
- Hemidesmosomes deficit, basale membrane defect, presence of an hyaline membrane...
- Signs: epithelial loss of substance with « lips » avec des “lèvres”, local corneal oedema, conjunctivitis, blepharospasm, discharge, photophobia, usually unilateral
- Improvement then relapse
- Diagnosis: from history but mainly by exclusion of other causes of non healing ...
- Confirmation: fluorescein stain (that will pass underneath the epithelial lips)

Initial treatment:
- Antibiotics : drops (tobramycin 0.3%..) TID-QID
- Cycloplegic: Atropine 1% (not too frequent SID)
- Hyperosmotic ointment
(Muro 128, NaCl 5%, BID)
- Serum (frequent)

- E-collar 24h/24 7d/7
If no progress, following treatment:
- Contact corneal lens, collagen auto-dissolving lens (72hrs)
- Debridment with Q-tip
- Same medication
- Nictitating flap (tarsorhaphy): NO
- Partial eyelid suture (blépharorhaphy) possible
If no progress , then:
-Topical anesthesia
- +/- sedation
- Debridment with Q-tip: scrapping of the non-attached epithelium
If no progress , then:
- Superficial linear scarification (superificial linear keratotomy)
2-3-4 “indolent” ulcer in cats
- Do not exist in cats
- Often associated with Feline Herpes Virus type 1
- Avoid debridments
- Keratotomy not indicated

Important risk of corneal sequestrum
- Treat as a superficial ulcer
2-4 Glaucoma
- Main disease causing blindness in humans in the world
- Frequent condition in dogs (as in humans) Prevalence of 1.7 to 2%
- Disease often diagnosed too late in our pets
- Age = important risk factor
- At any age but onset around 6-7 years old
- clinical suspicion: Decrease in vision
- Pain
- Mydriasis
- Scleral redness
- Increase of globe’s size
- Opacity of the cornea
Differential diagnosis:
- Red eye syndrome: conjunctivitis, keratitis, uveitis, épisclérite
- Exophthalmia
- Oedema of cornea: keratitis with or without ulcer uveitis, endothelial dystrophy
- Mydriasis: retinal atrophy, iris sphincter atrophy, optic nerve disease
-Tonometry: - Confirmation of the clinical diagnosis
- Follow-up of treatment installed
- “Screening” for predisposed breeds
- This test should be part of a geriatric exam
Treatment objectives
As of today, no curative treatment for glaucoma
Objectives of the therapy:
1 # Maintain the vision and control the pain by reduicng the IOP :
- Increase of the drainage of the AH
Decrease the production of the AH
2 # Prevent and delay the onset
of glaucoma in the contro-lateral eye
2-5 Lens
Cataract
- Disorganisation of the lens fibers = opacity
- With +/- effect on vision
- At any age (congenital, juvenile...) by increase in frequency with age
C50 at 9.4 +/- 3.3 years old
C100 at 13.5 years old
Differential: nuclear sclerosis, vitreous degeneration differenciated by indirect ophthalmoscopy and positif fundus reflex
Refer as soon as possible
In order to:
- Follow the progression of the cataract
- Avoid complications from cataract
- Choose the right time to perform
2-6 Retina
Hereditary diseases of the retina
- Various types: progressive atrophy, rod/cones dysplasia
- Many breeds affected
- Often early signs but not diagnosed
- Diagnosis made in terminal phase , when animal is older
Hereditary diseases of the retina
- Fundic exam +/- electroretinogram for earlier diagnosis
- Treatment: ...
Anti-oxydants ...Ocu-glo
Degenerative diseases of the retina
Sudden acquired retinal degeneration syndrome (SARDs)
- Female, 6 yo and older, Cushing
- Fundic exam: normal
- Electroretinogram: flat
- Treatment: none

Hypertensive retinopathy of cats
Aged cats
Ocular signs:
Sudden blindness
Dilated pupils bearly or no reactive to light
Tortuous retinal vessels
Serous retinal detachement
Vitreal and retinal hemorraghes
Systemic signs
Systolic arterial blood pressure >160 mm Hg
Cardiomegaly
Chronic renal failure
Hyperthyroïdism
Hyperglycemia
Treatment
Treat underlying cause
Calcium channel blocker agents: Amlodipine 0.625 mg/ animal/day

CONCLUSIONS

Ocular diseases frequent in aged dogs and cats
Importance of a complet eye exam to detect as soon as possible a ocular disease in order to put a prophylactic or a therapeutic treatment
Importance to take into consideration age , breed and health status of the animal in order to propose the adequat treatment for the diagnosed eye disease

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BASIC CYTOLOGY

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Introduction

Cytology is a minimally invasive, relatively inexpensive, powerful clinical tool allowing for rapid and sometimes critical information. This information may be definitive or may only provide partial information, but often will narrow differential lists or provide justification for additional diagnostic procedures. Regardless, experience is necessary to make sound conclusions and to avoid over- or under-interpretation.

Indications for cytology samples vary. If a tissue or fluid is suspected to be abnormal and a cytologic sample can be safely collected, cytology is encouraged as an initial diagnostic test. Cytology is commonly used to evaluate skin lesions, enlarged lymph nodes and a variety of fluid samples such as airway washes, cavity effusions, joint and cerebrospinal fluids. With the aid of imaging modalities, particularly ultrasound guidance, cytology is also routinely used to assess internal organs. Collection methods, sample preparation and general suggestions are discussed further under DIAGNOSTIC CYTOLOGY: Optimizing Sample Quality for Improved Results.
Cytological evaluation begins with a well-maintained and properly set up microscope, including Köhler illumination. Köhler illumination generates even lighting and sharp resolution of sample features. Websites of most microscope manufacturing companies and on-line videos demonstrating Köhler illumination procedures are available.

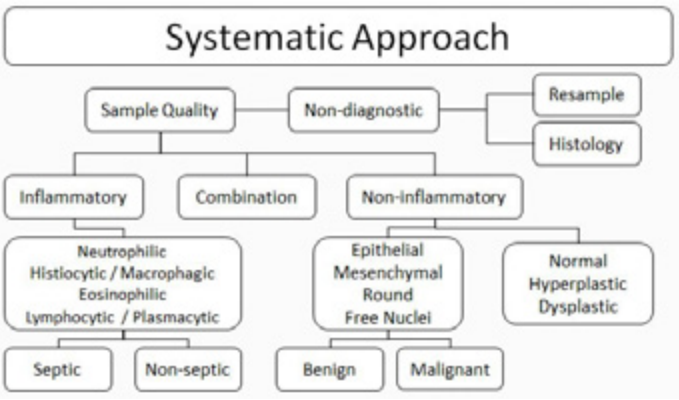
Gross examination of slides for excessive blood, large cellular clumps, defects and greasiness can help assess sample quality and where to focus attention once viewed microscopically. A systemic approach should be employed to avoid corner-cutting and limit errors.
Step 1) Review the entire slide at low magnification to assess sample quality. Ask yourself:

- Are sufficient cell numbers present?
- Are the cells well-preserved? Poorly preserved? Are they intact?
- Has there been adequate spreading of cells? Adequate staining of cells?
- Are normal cells anticipated, such as columnar ciliated epithelial cells in transtracheal washes?
- What areas are worthy of further evaluation at higher magnification?

Step 2) Assuming sample quality is adequate, assess cellular arrangement at lower magnifications. Are cells found only as individual cells? Are tight cohesive clusters of cells present? These findings will aid in determining cell populations and cell origins at higher magnifications. At higher magnification, classify cells into big categories. Are the cells inflammatory, non-inflammatory or a combination?

Step 3a) If cells are inflammatory, determine the type(s) – neutrophils, histiocytes/macrophages, lymphocytes, plasma cells, eosinophils, basophils or mast cells. If mast cells predominate, the lesion is almost certainly a mast cell tumour, not an inflammatory lesion.
Step 3b) If cells are non-inflammatory, determine the type(s) – focus on the broad categories of epithelial, mesenchymal, round cell and neuroendocrine. These categories do not necessarily reflect cell origin or function. Rather, they are based on cytomorphological characteristics, including their general association with each other. Also evaluate for normal cells (are any seen and/or anticipated?) and for cells thought to be hyperplastic or dysplastic.

Step 4a) If inflammation is diagnosed, a search for possible infectious organisms is warranted. The presence of degenerate neutrophils often provides a diagnostic clue and helps warrant continued search to identify intracellular bacteria. The type of inflammation will guide possible infectious considerations.
Step 4b) If neoplasia is diagnosed, the next logical information a clinician will want is whether the neoplasm is benign or malignant. This is determined by evaluating cellular criteria of malignancy. Generally, nuclear criteria are more reliable than cytoplasmic criteria for estimating malignancy potential. Recognition of 3 or more malignant criteria in a high percentage of tumour cells is often cited to diagnose malignancy. However, exceptions certainly exist. It is not always possible to determine whether a cell population is benign or malignant on cytology alone as not all neoplastic behaviour correlates well with cellular atypia or lack thereof.



Inflammatory conditions are classified based on the predominating cell type present.
Neutrophilic inflammation: This is diagnosed when neutrophils comprise >70-85% of cellularity. Neutrophilic inflammation can be acute or chronic and be due to various infectious and non-infectious conditions. Evaluating for neutrophil degeneration can often help narrow considerations. Non-degenerate neutrophils are present in relatively non-toxic environments such immune-mediated disorders, sterile foreign body lesions and neoplastic conditions. Degenerate neutrophils have swollen, pale staining nuclei, supporting rapid death in a toxic environment. Neutrophil degeneration occurs most commonly due to bacterial toxins, but other causes are possible. Neutrophils chronically present in fluid environments such as urine or body cavity effusions may imbibe fluid and have features mimicking degeneration. Conversely, even if neutrophils are non-degenerate, a bacterial infection should still be considered as bacteria may be present in low numbers or they may only produce small amounts of toxin.

Mixed inflammation: If neutrophils comprise ~50-70% of cellularity and remaining cells are mononuclear (macrophages, lymphocytes, plasma cells), mixed (neutrophilic and mononuclear cell) inflammation is diagnosed. This is also called pyogranulomatous or chronic-active inflammation. We look for degeneration of neutrophils, infectious agents and foreign material. This type of inflammation is associated with foreign body reactions, fungal and mycobacterial infections, panniculitis, lick and sterile granulomas and various chronic tissue injuries.

Histiocytic/macrophagic inflammation: This type of inflammation is diagnosed when macrophages comprise >50% of cellularity. It is typical of low-grade irritation and is often associated with systemic mycoses and sterile foreign bodies. It may also represent resolving inflammation of a previously more active lesion. Presence of inflammatory giant cells and epithelioid macrophages support granulomatous inflammation. When observed, these cells strongly support a persistent cause such as a systemic mycotic infection or a sterile foreign body reaction.

Eosinophilic inflammation: This is typically diagnosed when eosinophils comprise >10% of cellularity. Eosinophils may be the predominant cell type in select lesions (e.g. eosinophilic granulomas) but are often found in association with other inflammatory cells. Eosinophilic inflammation is typically associated with allergic hypersensitivity reactions, fungal infections, parasitic migrations, mast cell tumours and other select neoplasms.

Non-inflammatory cells may be normal, hyperplasic, dysplastic or neoplastic, and effort should be made to place them into one or more of the following classic cytomorphological categories.

Epithelial cells: These tend to exfoliate in tight cohesive clusters or sheets, although individual epithelial cells can certainly be seen. When in clusters or sheets, cells bind by distinct tight junctions (desmosomes), often providing distinct alignment and abutting of cells to each other. This helps give epithelial cells distinct cellular margins. Palisading, acinar, lobular and trabecular arrangement of cells are all typical findings. Although size can vary, epithelial cells are often large, round to polygonal cells with well-defined cell borders. Nuclei are usually round to plump ovoid in shape.

Mesenchymal cells: Compared to epithelial cells, mesenchymal cells are poorly exfoliative, often resulting in poorly cellular samples. When present, cells tend to exfoliate as individual cells or in variably sized clumps or clusters. Unlike tightly arranged epithelial cell clusters, aggregates of mesenchymal cells are loosely cohesive and often have storiform arrangement. Bright pink (with Wright-Giemsa staining), extracellular, granular to amorphous material representative of extracellular matrix may be seen closely associated with cells. Mesenchymal cells are classically stellate to spindloid but may be ovoid. They tend to lack distinct cell margins and have wispy cytoplasm that often trails to fine points or blends with the background. Nuclei are classically elliptical or elongate but may be ovoid or round.

Round cells: Round cell lesions are often rewarding as they readily exfoliate providing highly cellular samples. Cells exfoliate individually but may be present in clumps. Single cells have distinct cellular margins and are round in shape. They tend to be smaller than epithelial cells with round, ovoid to reniform or indented nuclei. Application of malignant criteria to round cell tumours may not be as helpful as for epithelial and mesenchymal cell tumour. This is because biological behaviour appears more specific to the round cell tumour type than degree of morphological atypia.

Neuroendocrine (Free nuclei) cells: Cells from these tissues often exfoliate easily and in loosely cohesive sheets with many free nuclei present. Occasional clusters may have distinct cell outlines. When intact, cells are generally round to mildly polygonal. Nuclei are typically round to indented. Cells from neoplastic lesions often have no to minimal anisokaryosis yet these tumours often have aggressive behaviour.

Concurrence of inflammatory and non-inflammatory cells warrants special attention as dysplastic or reactive changes to epithelial and mesenchymal cells caused by inflammation often mimic malignant criteria. Urothelial, squamous and respiratory epithelia, and mesothelium are prone to appear malignant due to dysplastic or reactive features, requiring experience to differentiate. Similarly, reactive fibroblasts associated with significant inflammation can easily have marked cytologic atypia and potentially be misdiagnosed as a sarcoma with secondary inflammation to the untrained eye.

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MODIFYING YOUR ENVIRONMENT AND HANDLING SKILLS TO REDUCE STRESS AND IMPROVE PATIENT WELFARE

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Assessing the Environment and making it comfortable for the patient
When assessing the environment, one must consider how the animal perceives and interprets the associated stimuli. What an animal sees, smells, feels, tastes and hears can have dramatic effects on its well-being and emotional state. Animals with previous frightening or painful veterinary visits may be classically conditioned to associate any or all of the surrounding stimuli with a negative emotional response (fear).

Maximizing environmental comfort
Visual stimuli
Bright and/or constant light can be stressful for animals. The presence of a tapetum lucidum allows certain species to perceive light in higher abundance than humans, making what people consider soft lighting seem brighter and aversive. Consider 60 watt bulbs in exam rooms and treatment areas to provide softer lighting.
Keep quick and sudden movements to a minimum, as animals may startle or suddenly feel threatened. If animals are not tolerating subtle movement, it may help to restrict their visual intake through the use of towels or other visual blocking aids, such as a ThunderCap (ThunderWorks, Durham, NC). Towels can be used to cover a cat's head during all parts of the exam and procedures that do not involve the head.

Cover cat carriers in the clinic with a towel until you are ready to work with the cat. If housing cats in a cage, provide a hiding option, such as a box or a partially covered cage front so that they can remove themselves from visual stimuli and have the perception of being concealed5. The sight of dogs or other cats in the lobby or treatment area is highly likely to be stressful.

Admit fearful or fractious dogs and cats through a side or back entrance to reduce visual contact with other animals and strangers.

Take off your white coat. Animals may make visual associations with stimuli in the veterinary clinic, including the attire of the veterinary clinicians and staff, with a frightening experience (i.e. the "white coat effect"). These animals may respond better without exposure to this fear-eliciting stimulus.

Auditory stimuli
Speak softly and sparingly around animals to help them stay calm. As animals begin to exhibit symptoms correlated with elevated stress when ambient sounds approach 85dB6, keeping noise levels at or below 60dB is preferable.
Avoid reprimands or using harsh or punitive tones of voice, regardless of the animal's behavior, as this is likely to increase stress and may exacerbate aggression.
Classical music has been shown to increase behaviors associated with relaxation in animals.

Utilize sources of noise cancellation, such as white noise, to mask extraneous and potentially stressful sounds, such as barking dogs and people talking or moving in the adjacent hallway or rooms.

Olfactory stimulation
Allow time for the chemical smell of cleaning agent to dissipate after disinfecting an exam room between patients. This is also important for cage cleaning as placing an animal in a cage that has not fully dried after cleaning will expose them to harsh chemical scents.
Use alcohol sparingly during procedures as the strong scent is potentially aversive to animals.

Wipe down exposed surfaces, such as the floors, walls and cabinets, after stressed animals as they have likely deposited scents and pheromones associated with fear and alarm which may indicate the environment is dangerous.

Minimize exposing cats to canine odors by having designated cat exam rooms and/or wiping down and airing out rooms between canine and feline patient as the smell of a potential predator may induce a stress response.

Utilize calming pheromones [Feliway; Adaptil (Ceva Animal Health, Lenexa, KS)] in exam rooms and treatment wards, on towels, tables, and your own clothing to provide a signal of safety for the animal and to reduce stress.
Utilize calming scents, such as lavender and chamomile when handling animals. Essential oils can be dabbed on bedding and handlers can use mildly scented lotions on their hands prior to handling.

Tactile stimulation
Avoid placing animals on cold, slippery surfaces. Cover metal exam tables with towels no-slip mats or soft foam covering. Use a padded mat when placing animals into recumbency on the floor.
Place soft bedding inside the cage or kennel to promote rest, to provide warmth, and to prevent cats from resting in their litter box.

Avoid over-stimulating touch with animals. While some pets enjoy petting, others may find it frightening or uncomfortable.

Owner presence

Many animals are less anxious and tolerate veterinary handling better with a familiar person present, likely because animals feel safer in proximity to familiar members of their social group. It is also import to be sensitive to owner requests about not being present. A fearful, agitated, or punishing owner may escalate the animal's fear and aggression.

Making a Handling Plan

Once an assessment of the environment, patient and handler comfort levels is complete, a careful handling plan can be designed and implemented.
Guidelines for organizing a patient handling plan:
Critically consider what needs/must be done
Critically consider what needs to be performed - must the procedure be done today, or at all?
Determine if and what the patient can eat so that a plan for counter-conditioning that is appropriate and safe for the animal can be made.

Select the appropriate level of restraint for the individual patient and the procedure.

Select any handling tools that will increase safety and decrease your patients fear and arousal.

Place the required procedures in order of most important to least important in the event the patient is unable to tolerate some of the procedures.

Place those procedures in order of least offensive to most offensive so that early difficult procedures do not inhibit your ability to complete later ones.

Consider the level of pain, invasiveness, number of procedures, and how the patient is coping with minimal handling and consider chemical restraint when it is unlikely the patient will be able to tolerate all the procedures.

If there is a possibility that chemical restraint will be necessary, have it ready and waiting so that it can be implemented before the animal becomes too aroused.
Utilizing Counter-Conditioning
To combat the development of this fear or to alter an already established fear of the veterinary clinic settling, animal handlers can rely on counter-conditioning. To create this positive emotional response, we pair veterinary experiences with something that naturally elicits a positive emotional response in the animal - food.

Palatable food is the easiest and most powerful means of establishing this association as it is a natural and automatic elicitor of a positive emotional response. This natural emotional wiring is what motivates animals to eat and to survive. Keep in mind the palatability of the food needs to be high to maximize the animal's interest in eating and increase the power of the positive emotional response.

Procedures where counter-conditioning should be utilized:

injections
toenail trims
otoscopic exams
restraint by a stranger
rectal temperature/palpation
microchip placement
placement onto a cold table
Examples of palatable foods for dogs:
Chicken or turkey baby food
Peanut butter
Squeeze cheese
Kong Paste (The Kong Company, Golden, CO)
Braunschweiger (liverwurst)
Canned dog food
Pill Pockets (Greenies, Franklin, TN)
Examples of palatable food for cats:
Chicken or turkey baby food
Canned tuna or chicken
Squeeze cheese
Canned cat food
Pill pockets (Greenies, Franklin, TN)
Soft cat treats
Whipped cream

Safe and Effective Restraint

Once the itinerary of procedures has been organized, a restraint plan should be coordinated for each procedure. Less invasive procedures tend to require less restraint, whereas more invasive and aversive procedures may require heavier restraint for safety purposes and so that the animal feels secure.

Guidelines for restraint

Use the least restraint that is necessary to safely perform the procedure. Venipuncture from a lateral saphenous vein in a standing dog is typically better tolerated than is placing a dog into lateral recumbency. Furthermore, many cats will tolerate gently being turned into lateral recumbency for a medial saphenous venipuncture without being scruffed. When greater restraint is needed, support the animal well by providing firm, balanced restraint with global support around the patient. Prevent flailing by keeping control of head and rear end at all times.

If the pet struggles in response to restraint for longer than 3 seconds, stop, reposition, and try again. Wait until the pet has relaxed and, preferably starts eating, before beginning the procedure. If after 2-3 attempts the patient does not relax and/or starts to getting fractious, stop altogether and consider whether or not the procedure is essential. If it is essential, make a plan for chemical restraint. If it is non-essential, send the animal home and create a plan for a more successful visit the following day.

Chemical Restraint

Chemical restraint allows for safe and effective handling without causing the patient emotional distress. Avoid waiting for the animal to become fractious and highly agitated before considering the use of chemical restraint.

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PRACTICAL APPLICATION OF LEARNING THEORY TO EVERYDAY CASES

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Overview of the Issue. Equine veterinarians have a high prevalence of occupational injury and the behaviour of the horse is frequently cited as a cause for these injuries. Equine veterinarians also report frequently having to deal with horses demonstrating unwanted behaviours. These range from behaviours that may be frustrating and prolong the time taken to complete a given task, for example horses that will not stand still or will not load into the trailer to go home, However many behaviours that are can also be dangerous to people working with these horses, for example rearing, striking and kicking out.

Objectives of the Presentation. This presentation will look at how we can incorporate behaviour modification techniques into our everyday practice to deal with difficult horses. It will include multiple video examples of cases to demonstrate these techniques are not only safer and less stressful for everyone involved but also frequently more time efficient.

Shaping

The horse is unlikely to offer the correct behaviour on the first attempt – for example with horse that is already aversive to accepting oral medication they are unlikely to stand still and calmly accept the oral medication so we can reward this behaviour. Instead we need to start with something the horse can easily achieve – using the same example placing the syringe on the cheek instead, so we can reward this behaviour initially and slowly build up to the desired behaviour over several repetitions.

Behaviour Modification Techniques that will be presented
Positive Reinforcement – The addition of something pleasant after the desired behaviour.
This makes the horse more likely to repeat the behaviour in the future. Common examples would be food or a scratch on the withers. Giving a horse a quick scratch on the wither when they stand still in an examination room, makes this behaviour more likely to be repeated
The timing of positive reinforcement is vital – it needs to be as close as possible to the desired behaviour. For this reason secondary positive reinforcement is frequently used. For example in clicker training the 'click' predicts the food reward and so the click can be times to coincide with the desired behaviour.

Clicker training (often combined with negative reinforcement) can be utilizsed to rapidly train horses to accept ocular or oral medication among many other things.

Negative Reinforcement – The removal of an aversive stimulus after a desired behaviour.
Lots of people get negative reinforcement confused with punishment. Try and think of it from the mathematical sense of the word, negative means removal or subtraction of something and reinforcement means to increase the likelihood the horse will repeat the behaviour. A better way to remember this is often removal reinforcement. Pressure is applied to the horse which motivates it to remove the pressure, provided the pressure is released as soon as the desired response is offered the horse will offer that response next time the pressure is applied.

Examples

- If a horse is too hot they seek shade, if they are thirsty they drink, if a fly irritates them they swish their tail. Each time the horse alters their behaviour to remove the aversive stimulus
- If you put pressure on the horses head collar (pressure) they should walk forwards and the pressure be released
- If you raise the horse's vein and they jerk their head back the release of contact will be inherently rewarding. However if you keep your hand in contact with the neck and then remove it as soon as the horse stands still you are instead rewarding the behaviour of standing still. After only a few repetitions the horse will then often stand still and relaxed for venipuncture.

Leading the Horses into Stocks or a Trailer
Make sure you have control of the horse, this may mean leading them in a bridle. or chiffeny . Teach the horse to step backwards and forwards lightly using negative reinforcement training (pressure release)

• Backwards – Stroke the horse with the whip on their forelegs to make sure they are not scared of it. Tap the horse on the cannon bone of the leading foreleg until they step backwards with that leg (start off very lightly then get faster and stronger until they move the limb). Do not stop tapping until they step backwards and immediately stop tapping as soon as the limb goes backwards. Once the horse understands backing up from whip taps ask them to step backwards from a light pressure on the lead rope followed by tapping the legs if they don't step back. The horse will quickly associate the lead rope signal with tapping and start to step back off a light signal

• Forwards – Stroke the horse with the whip on their sides to make sure they are not scared of it. Then tap the horse in the girth region until they offer a step forwards, as soon as the horse steps forwards immediately stop tapping.

If the horse walks backwards, rears etc keep quietly tapping until they offer the correct response of stepping forwards. The horse will quickly learn the only way to stop the tapping is to walk forwards. Once the horse is obedient to step forwards from light tapping give a light cue from the lead rope before you tap. The horse will quickly make the association between the lead rope signal and tapping and begin to lead forwards off a light lead rope signal.

Once the horse is light to will step backwards and forwards lightly and obediently repeat the process getting closer and closer to the ramp. Once at the ramp ask the horse to step forwards on to it. If they pull backwards keep tapping until they take a single step forwards then stop tapping. If they go to swing the hindquarters away reach forward and tap the hindquarters until they start to move back in the same direction again. Once the horse does step on the ramp stop and give them a rub on the neck or head. Back them off the ramp and then ask for them to step up again. You will find the horse comes further in each time but remember to step them back out fairly frequently to gain their confidence. Once the horse will step all the way in have someone stand inside with a feed bucket. The horse is then walked in each time, is allowed a few mouthfuls of food before being backed out again and the process repeated. Lots ofMany repetitions consolidates the response and increases the horse's confidence.

Counter Conditioning

This utilizses classical conditioning to replace the horses fear response to a stimulus with one that predicts a positive outcome. A good example would be administration of intramuscular injections into the hindquarters. Initially each time the person thumps the gluteals for the third time a second person holding the horse should give a small food reward at the same time. After a few repetitions the horse will expect feed on the third 'thump'. Then the needle can be placed on the third thump without an adverse reaction from the horse.

Approach Conditioning

As flight animals, horses tend to be scared of things that chase them, however conversely they rapidly habituate to things they can 'chase'. So if you have a horse that is scared of umbrellas you can lead/ride the horse towards one and then as they get closer get a friend to walk away with the umbrella so the horse ends up 'chasing' it. In the veterinary context this technique is more limited but can be utilised for items such as radiography plates, enabling the horse to tolerate them close to their limbs or body.

Stimulus Blending

You can habituate a horse to a scary stimulus by slowly introducing it alongside a stimulus they are confident with. A good example would be for a horse that is scared of fly spray but confident to be hosed off. By hosing the horse and slowly spraying the horse gets used to the sound and as the hose pipe is slowly turned down and eventually off they habituate to the feel of the spray.

Overshadowing

Horses are like men – they can't multitask!! By getting the horse to concentrate on one1 task they are unable to be scared of something else and so will become habituated to it. This can be used very successfully to habituate horses to clippers, plastic bags, needles and many more things.

Injecting or Blood Sampling Nervous Horses

The handler should be confident to step the horse backwards or forwards lightly. Approach the horse and give them a scratch at the wither region first. Rub the horse's neck and work towards the jugular groove. , iIf the horse becomes anxious (he may lift or toss his head, tense his neck, show the whites of his eye) get the handler to step the horse backwards and forwards whilst while (AMERICAN) the vet keeps rubbing the same spot until he relaxes and wants to stand still. At this point step away from the horse and after a few seconds repeat, starting from just before the point at which the horse became anxious. This process is broken down into the following steps

For I.V. injections: -

- Rub/Scratch the horse's neck near the wither
- Rub the horse up and down the jugular groove (this helps desensitisedesensitize the skin)
- Raise the jugular vein with 1 hand
- Press the needle lightly against the jugular vein with the cap on
- Build up to pressing the needle firmly against the jugular groove with the cap on
- Inject the horse gently – think of pressing the needle against the skin and gently sliding it into the vein.

For I.M. injections: -

- Rub/scratch the horse's neck near the wither
- Rub the horse's neck in the region intended for injection (this helps desensitisedesensitize the skin)
- Lightly grasp a very small amount of skin
- Increase the amount of skin twitch and pressure used to hold it each time until you have a handful of skin
- Wiggle the skin twitch whilst lightly pressing the needle with the cap on against the skin
- Increase the pressure of the needle with cap on each time until you are pressing it firmly into the neck.
- Gently inject – think of gently wiggling the skin held in the other hand on to the needle

At each step ensure you step away from the horse each time they become calm and stand still, never step away or remove your hand from the horse if they get anxious – get the handler to step them back and forwards instead. If the horse is getting anxious each time, you are doing too much too soon, step back to a threshold the horse can cope with and remember to step away each time the horse offers relaxation. This will make the horse faster to relax next time.

Summary including 5 KEY "TAKE HOME" POINTS
1. Working as an equine veterinarian caries a high risk of occupational injury and the behaviour of the horse is a frequent cause of these injuries
2. Behaviour modification techniques can be utilizsed to prevent adverse reactions from the horse and are usually faster than traditional restraint methods.
3. Horse learn primarily through release of pressure. If the contact from the person's hand is removed (even only momentarily) by jerking their head back or kicking out the horse will repeat this behaviour.
4. However if we can work at a lower threshold for the horse, for example placing the hand on the neck but further away from the jugular, we can then remove the hand when the horse stands still and relaxed, thus rewarding this behaviour instead.
5. We need to shape behaviours. This means starting off with something that is easily achievable and slowly asking for a bit more with each repetition.

Summary
Working as an equine veterinarian is a potentially dangerous occupation. Equine veterinarians frequently encounter horses exhibiting unwanted and potentially dangerous behaviours. Utilizsing behaviour modification techniques is safer, less stressful for personnel and the horse, and is generally faster thenthan traditional restraint methods.

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AVA MENTORING SYSTEME

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The Australian story of support for the mental health of graduate veterinarians began in 1996. In response to the tragic suicide of a new graduate veterinarian, the AVA (WA) Graduate Support Scheme was born, with significant contributions from AVA (WA) Committee members. The scheme was set up to provide additional support for new graduate veterinarians as they headed out in to the wide wondrous world of practice as a qualified vet.

Family and friends can be a great source of support for new graduates but they are likely to have an inadequate understanding of the complexities of practice and workmates may not want to get involved in issues that could affect their own positions. Situations can arise where new graduates feel isolated, or simply unwilling to discuss the issues with those closest them. This is where a mentor can help.

In short, the Graduate Support Scheme worked by assigning each graduate from Murdoch University Veterinary School to an experienced volunteering member of the profession to act as a mentor during their first year in the profession. During this early development Dr Paul Davey coordinated and enhanced the scheme, became its champion and had a major role in making the program what it is today. Later, we developed earlier assignment of mentors to graduates (In September at the AVA Trade Fair), efficient email communication systems, and more opportunities for graduates and mentors to socialise prior to leaving the university system.

Some basic support resources were supplied to the mentors, and the successful acquisition of the WA Government's Suicide Awareness Strategy funding through the OneLife program in 2011-13 dramatically enhanced our ability to provide further training and support to mentors. Dr Brian McErlean, another Western Australian veterinarian passionate about mental health, managed this project. Much cooperation and collaboration occurred between the Veterinary Surgeons Board (WA), Murdoch University, and the AVA to ensure the AVA (WA) Graduate Mentor Scheme intermeshed appropriately with other strategies and resources designed to improve career resilience and new graduate satisfaction in their career choice. A quote from the Taverner report, commissioned by the AVA to examine new graduate issues, emphasises the importance of this vertical integration:

"Transitioning to the workforce from university is a very challenging time for, most, if not all new graduates. The nurturing of the veterinarians of tomorrow needs to start earlier in their career – while they are still being educated.

Most new graduates, once they find a job, feel thrown in at the deep end and while they recognise that support is available, sometimes it is too late".

How does mentoring work?
Mentoring is the pairing of two people – a mentor and a mentee - to facilitate the sharing of professional and personal skills and experiences, as well as enhancing career development. It provides a structured and trusting relationship by bringing less experienced veterinarians together with more experienced members of the profession, normally working in a similar field, who can offer guidance, support and encouragement. Mentoring is a powerful personal development and confidence building tool. It's an effective way of helping people progress in their careers.

The Australian Veterinary Association's mentoring program is a 12 month commitment between an established professional and someone who is new to the veterinary industry. Mentees also have the opportunity to request a mentor known to them.

Key Features of the AVA Program
The AVA Graduate Mentoring Program engages experienced veterinary professionals to support new graduates in a smooth transition into the profession, to assist them to reach their full potential and to be happy in their jobs. The program aims to develop and sustain a satisfying professional career for veterinarians. Mentees join in their final year of veterinary study, before they commence work. In addition, the program now welcomes any AVA graduate members in their 2nd, 3rd or 4th year in the profession to apply as mentees. Mentors must have at least three years' experience in the profession, and be an AVA member. Any non-member wishing to participate is reviewed on an individual basis.
Mentors and mentees are matched according to application details and are required to attend three events - Program Launch, Mid-Program Review and Program Close, some of which are face-to-face meetings while others are delivered via webinars. During the program, mentors and mentees are expected to be in contact at least monthly. Mentees and first-time mentors are expected to complete the Art of Mentoring online training to prepare them for their mentoring relationship. The training takes approximately one hour to complete. Acceptance into the program is conditional upon a commitment to completion of the training.

Confidentiality
During discussions between mentor and mentee it's inevitable that matters of client confidentiality will be an issue when clinical material is presented. Both mentor and mentees must be aware of the likely confidential nature of their interactions. Breaches in confidentiality are only supported if the other party is at risk of harm; physical or mental wellbeing, and in the case of something unethical or illegal.

What if the relationship isn't working?
As with all human relationships, some mentoring interaction will work well, some will be okay and others will not work at all to the satisfaction of both parties. When the mentoring relationship is not working for whatever reason, it's important that the issues are addressed promptly and a mutually agreeable solution found as soon as possible

When should a mentor refer their mentee on to another professional?
Mentors may be challenged by some questions or issues that they are unable to completely resolve for their mentee. One of the key skills of mentors in this program is to recognise the limitations of their skills and not to try to accomplish things that they are not qualified to do.

The role of the Mentor
A mentor can assist the mentee to develop trust in their own abilities and boosting confidence and self-esteem. A mentor asks questions and challenges their mentee, while providing guidance and encouragement. A mentor is a guide who can help the mentee refine the direction they might like to take in their career and who can help them to develop solutions to career issues.

A mentor may:
support transition and help assimilation into veterinary life
act as a source of information and insight
suggest relevant options regarding career development or strategies for achieving professional goals
recognise when a mentee may need professional help to address mental health or other personal or professional issues
be able to recommend appropriate professional help to address these issues
recommend resources to improve specific skills
help the mentee problem solve professional challenges in their working life
discuss issues of professional ethics
discuss workplace related problems and options for how these may be addressed, for example pay and conditions, and interpersonal relationships
provide advice on options for dealing with difficult client relationships.

Some of the skills required to be a mentor include:
an understanding of different mentoring styles
a genuine desire to assist mentees transition smoothly into professional life

an ability to negotiate time commitments and accessibility
being able to identify the mentee's needs and goals and how to facilitate, support and encourage them to achieve those goals
being able to actively listen
honesty and openness in providing non-judgemental feedback and advice
knowledge of a range problem solving approaches
ability to recognise when to refer a mentee to a health professional

Do mentor programs work?
An interesting outcome from analysis of our national program is the high retention and satisfaction of mentors; perhaps this demonstrates that a mentoring program does work on a leadership development level.
Twenty-two years after the trauma and sadness of Dr Gavin Baraugh's suicide, we have certainly learnt a lot more about what influences veterinarian's mental health and we have moved from a focus on suicide prevention to more targeted support for mental health and personal development.

The Future
When the Western Australia AVA was running its mentoring program prior to it going national, the numbers and resources available made assessments of the effectiveness of the program difficult. With the national program which has been running for three and a half years with significant sponsorship from Guild, Hills, Petsure, Royal Canin, Provet and Virbac, there will be better opportunities to assess the success of the program.

National program numbers

Year	Uni	Graduates	Mentors
Cohort 1: Oct2015-Oct2016	ALL	249	247
Cohort 2: Oct2016-Oct2017	ALL	196	247
Cohort 3: Oct2017-Oct2018	ALL	216	261
Cohort 4: Oct2018-Oct2019	ALL	190	287
Total graduates Oct 2015 – Oct 2019		851	

The AVA national graduate mentoring program is part of the AVA's Graduate and Student Program which is currently managed by Monika Cole who is a wonderful ambassador for the program.

References

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TREAT GI DYSMOTILITY IN THE ICU

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Gastro-intestinal motility disorders are extremely common in the clinic. An excellent clinical practice review was published to discuss this disorder in JVECCs. (Whitehead K, 2016). Most commonly affected are: esophageal dysmotility, delayed gastric emptying, small intestinal ileus (functional obstruction) and disorders of colonic motility. These are seen with a variety of critical illness, and many conditions that are primarily gastro-intestinal in nature (laparotomy, foreign bodies, pancreatitis, etc.). Symptoms include a lack of auscultated intestinal motility paired with regurgitation or vomiting, abdominal pain, and/or constipation. Increased morbidity and mortality are associated with these conditions, which tend to be incompletely responsive to the available pharmaceuticals. However, judicious use of pharmaceuticals is required, with appropriate awareness of the motility-reducing effects of most-anti-emetics

Additional considerations include maintaining appropriate metabolic and fluid balance, early mobilization (exercise/motion), appropriate pain control, and early enteral nutrition. In addition to these recommendations, there is a significant body of work showing the efficacy of acupuncture at various levels of the gastro-intestinal tract. These data are primary pre-clinical (rodents), but provide valuable information for the growing use of acupuncture for GI motility disorders in humans. (Zhang AL, 2014 Jun;32(3))

In addition to specific regional effects on GI motility (esophageal, stomach, small intestine and colon, changes in visceral sensitivity, GI barrier function, and brain-gut axis have been investigated and reviewed (Hui Li, 2015 July 21)

There is significant overlap between the physiologic biochemistry driving gastro-intestinal barrier function and the neurochemical mediators that are altered during acupuncture. Acupuncture at ST¬36 provided protective effects against gut injury and mucosal barrier dysfunction in hemorrhaged rats by activating the cholinergic anti-inflammatory-dependent pathway and enteric glial cells. (Hui Li, 2015 July 21).

Finally, acupuncture has solid evidence for reducing nausea (comparable to anti-emetics), and it can thus also serve as an adjunct for promoting early enteral nutrition. (Anna Lee, 2015) For all these reasons, acupuncture has a key role in promoting GI function in the ER.

An important additional physical medicine modalities to consider for GI dysmotility has already been mentioned: motion/exercise. Exercise is analgesic. Constipation is strongly associated with immobility, and exercise as well as routine schedule is likely to encourage elimination. Additional consideration here includes walks in a location that would encourage potty-trained patients to eliminate (such as the outdoors), and perhaps an enclosure to allow leash-free elimination for the shy.

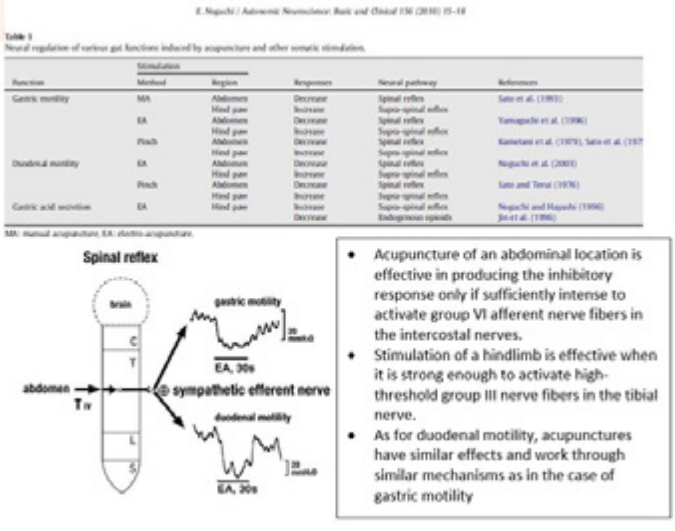
Abstracts from some of the evidence-based for acupuncture on GI motility, anti-nausea and gastric mucosal protection are included below:

Xinyan Gao,1 Yongfa Qiao,2 Baohui Jia. NMDA Receptor-Dependent Synaptic Activity in Dorsal Motor Nucleus of Vagus Mediates the Enhancement of GastricMotility by Stimulating ST36. Evidence-Based Complementary and Alternative Medicine
Volume 2012, Article ID 438460, 11 pages
doi:10.1155/2012/438460

- Molecular mechanisms behind efficacy of ST36 for GI motility disorders

2-3mA pulse of 0.5ms duration at a frequency of 4Hz for 20 min by a pair of needle electrodes inserted 3mm depth into the skin.

- Control CV12 The abdomen point was also inserted to a depth of 3mm and stimulated with the same protocol.
- Enhanced NMDAR-mediated synaptic transmission in gastric-projecting neurons of the dorsal motor nucleus of the vagus (DMV)
- Intra gastric pressure dramatically increased by ST-36 and decreased by CV12
- suppression of presynaptic μ-opioid receptors may contribute



2) Gastric Mucosal Integrity and Healing
Han YJ, Dai WW, Peng L,Effect of acupuncture on contents of beta-endorphin in the plasma and hypothalamus in rats with stress-induced gastric mucosal injury. Zhen Ci Yan Jiu. 2011 Oct;36(5):341-6.
- Four groups: no treatment, injury only, treatment after injury, treatment before
- Acupuncture was applied to «Zusanli»(ST 36), «Zhongwan» (CV 12) and «Neiguan» (PC 6) for 20 min, once daily for 5 days
- Gastric mucosal ulcer index, plasma and hypothalamic beta-endorphinin
- Gastrointestinal propulsion rate was increased remarkably in the prevention group ($P < 0.05$), and the gastric mucosal ulcer indexes and the contents of plasma beta-EP level were decreased obviously in both treatment and prevention groups ($P < 0.05$, $P < 0.01$). The contents of hypothalamic beta-EP were increased
- Acupuncture of ST 36, CV 12 and PC 6 can promote the repair of gastric mucosal injury and improve gastrointestinal function, which may be related to its effects in reducing plasma beta-EP and upregulating hypothalamic beta-EP level. Acupuncture also has an effect in preventing gastric mucosal injury.

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Anna Lee, S. K. (2015). Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting. Cochrane Database Syst Rev; 11, 1-137.
Hui Li, T. H. (2015 July 21). Acupuncture and regulation of gastrointestinal function. World Journal of Gastroenterology 21(27), 8304-831.
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Zhang AL, P. S. (2014 Jun;32(3)). Acupuncture and standard emergency department care for pain and/or nausea and its impact on emergency care delivery: a feasibility study. Acupunct Med, 250-6.

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FUEL THE BRAIN: DIET CONSIDERATIONS FOR THE DOG WITH A SEIZURE DISORDER

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Energy for the Brain

Brain tissue consumes a large amount of energy in proportion to volume, largely to sustaining the electric charge of neurons. The brain derives most of its energy from oxygen-dependent glucose metabolism, which provides a substrate for ATP. During exercise, blood lactate is increased and can be metabolized by the brain to provide energy; however, its contribution to brain energy requirements is small.

Ketones, e.g. □-hydroxybutyrate and acetoacetate, provide an important alternative brain energy source, especially in starvation where they provide up to 60% of the requirement. Long chain fatty acids (LCFA) are oxidised by □-oxidation to form acetyl-CoA, which is normally further oxidized by the citric acid (TCA) cycle. If the TCA cycle is challenged, e.g. due to low amounts of intermediates such as oxaloacetate, acetyl-CoA is used instead to synthesize ketones. The brain has limited ability to utilise LCFA, likely due to low enzymatic capacity of neuronal mitochondria for □-oxidation, although an inability of LCFA to cross the blood brain barrier may play a role1

Fats

Triglycerides are comprised of three fatty acid (FA) carbon (C) chains and a “backbone” of glycerol. The attributes of fats are due to the carbon chain length and the degree of hydrogen saturation. Less hydrogens means more double C:C bonds, resulting in mono (one double bond) or polyunsaturated fats (PUFAs). Triglycerides with long chain fatty acids (LCFA) usually have 16 to 22 carbons, medium chain triglycerides (MCTs) have 6 to 12 carbons, and short chain fatty acids have less than 6 carbons. The most useful medium chain fatty acids (MCFA) appear to be octanoic acid (8C; caprylic acid) and decanoic acid (C10; capric acid). Unlike LCFA, MCFAs are oxidized in brain astrocytes and provide a glucose sparing effect. MCFAs were thought to be absorbed passively across the intestinal mucosa into the portal blood, although it has been suggested that they are absorbed by the intestinal lymphatics like LCFAs in dogs2. MCFA are transported into hepatocytes through a carnitine-independent system.

MCTs

MCT oils are typically a mixture of saturated triglycerides C8:0 (65-75%) and C10:0 (23-35%) with 1-4% of C6:0 and C12:0. Coconut and palm kernel oil are used for the commercial extraction of MCT. Coconut oil contains about 65% MCFA. MCT oils contain few essential fatty acids and should not be the sole dietary fat. Food with 15% MCT was not palatable for beagles, although no signs of toxicity were noted3. Ketosis produced by diet differs from pathological ketosis (e.g. in diabetes mellitus); the amount of blood ketones is much lower and acidosis is not recognized.

Ketones and Ketogenic Diets (KD)

MCTs are metabolized by the liver into ketone bodies, even without starvation. MCTs provide more ketones/calorie than LCFA triglycerides. Ketones readily cross the blood brain barrier. As glucose metabolism is disrupted with epilepsy, ketones are potentially a good energy source and diets supplemented with MCT show an increase in blood B-hydroxybutyrate in dogs.
LCFA ketogenic diets (fat as 75-80% of the calories) have been used in the treatment of human epilepsy, especially children with refractory seizures; however, peripheral utilization of ketones is more efficient in dogs. They are more resistant to nutritional ketosis4 and a ketogenic diet trial failed to show a decrease in canine seizure frequency, and it had to be stopped due to some dogs developing pancreatitis5. Some evidence suggests that omega-3 fatty acids reduce human seizures6 but supplementation did not reduce seizure frequency or severity in 15 dogs with idiopathic epilepsy (IE)7.

MCT Diets

A more promising diet based on MCTs improved seizure control in the majority of cases in two placebo controlled studies8. MCTs have a higher ketogenic yield, which can improve brain metabolism. Furthermore, valproic acid, an anti-epileptic drug (AED), is an MCT; its metabolites and other MCTs might have a similar antiepileptic effect. There is now robust evidence that decanoic acid has anti-seizure effects, with a ground-breaking study revealing its mechanism of action. Decanoic acid was found to be a non-competitive AMPA receptor antagonist at therapeutically relevant concentrations, in a voltage-and subunit-dependent manner, that results in direct inhibition of excitatory neurotransmission, and thus has an anticonvulsant effect9 This is especially interesting, as most AEDs used in veterinary medicine work on increasing the function of the inhibitory brain pathways, which also explain the side effects frequently seen, e.g. sedation and ataxia10,11. Decanoic acid readily passes the blood brain barrier, with 60-80% of its serum concentration arriving in the brain12.

Interestingly, in experimental seizure models in which the direct seizure reducing effect of decanoic acid has been effective, high concentrations of acetone or beta-hydroxybutyrate had no effect9.

Thus, the effect on the AMPA receptor may be the main mechanism of action for an MCT diet. Another interesting potential mechanism is decanoic acid regulating mitochondrial proliferation 13and therefore protecting against mitochondrial dysfunction, which can be seen with intensive seizure activity. The effect on improved mitochondrial function was also recently shown by a study highlighting de-novo fatty acid generation of C17, potentially being responsible for some anti-seizure effects14.

An MCT enriched diet was tested in a 6-month prospective, randomized, double-blinded, placebo-controlled crossover study in chronically AED treated dogs with IE8. The dogs were randomised to either the MCT or placebo diet and switched to the other diet after 3 months. Seizure frequency, severity, physical and neurological examination findings, drug serum concentrations and clinical pathology data were analysed for dogs completing the study. The overall seizure frequency was significantly reduced by 13% on the MCT diet in comparison to placebo diet; 71% of dogs showed a reduction in seizure frequency, 48% of dogs showed a 50% or greater reduction in seizure frequency and14% of dogs achieved cessation of seizures. As many dogs experienced cluster seizures, the number of seizure days was assessed, which also significantly decreased on MCT diet. The MCT diet resulted in significant elevation of blood beta-hydroxybutyrate concentrations in comparison to the placebo diet, but no significant differences were found for AEDs serum concentrations, visual analogue scores for sedation, ataxia, QoL, weight and most laboratory values (there was a mild decrease in creatinine and mean cell Hb concentration on MCT diet). These results were reproduced in a similar study, strengthening the evidence that MCTs have a positive impact on canine epilepsy for some patients.

In addition to the demonstrated benefits of MCTs on seizure frequency, there are potentially beneficial effects on the behavioural comorbidities seen in canine epilepsy. A pilot study in children with autism showed an improvement in some of the social interaction, behavioural, and cognitive insufficiencies seen in these patients15. In dogs, diets reportedly modify certain types of behaviours16, e.g., certain types of aggression may improve on a low protein diet 17,18. Interestingly, a similar MCT diet as used in the aforementioned epilepsy trial8 has been previously been shown to support cognitive health of ageing dogs19. The authors hypothesized that the improvement in cognitive function is explained by the diet providing the aged brain with a more effective energy source.

Interestingly, cognitive impairment and cognitive health might also need more consideration when managing epilepsy patients. Emerging research has highlighted signs of cognitive impairment in dogs with epilepsy such as reduced trainability20, increased signs associated with canine dementia and deficits in spatial memory. Dogs with epilepsy were less trainable than control dogs21. Dogs with epilepsy found it harder to obey a sit or stay command, were slower to learn new tricks, more easily distracted by interesting sights, sounds or smells, and less likely to listen to their owner or pay attention to them. Within the group of dogs with epilepsy, AEDs worsened behaviour, particularly potassium bromide and zonisamide, along with the use of multiple drugs simultaneously. In the second study, dogs with epilepsy showed more signs of cognitive dysfunction (‘canine dementia’) than control dogs20. Dogs with epilepsy more commonly failed to recognise familiar people, had difficulty finding food dropped on the floor, and paced or wandered without direction or purpose. These signs were seen in young epileptic dogs under 4 years of age, and are thus unlikely to represent classic canine dementia seen in geriatric patients, usually seen in dogs over 8 years old. Within the group of dogs with epilepsy, those with a history of cluster seizures or a high seizure frequency were most likely to show these signs, which may reflect progressive brain damage from recurrent seizures. In a recent study22 using a task developed to measure signs of cognitive dysfunction in a clinical setting, dogs with epilepsy were found to show reduced performance in a spatial memory task than matched controls. While most control dogs were able to immediately find a food reward after a short period of ‘forgetting time’, dogs with epilepsy spent longer searching for the reward. In conclusion, epilepsy is far more complex brain disease than formerly thought. As research emerges about its comorbidities our management considerations have to improve. It is ultimately about improving QoL of the patient and the owner, which may be achieved with a more holistic approach considering all factors involved.

References available upon request.

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POTATO, POTAHTO, DON›T CALL THE WHOLE THING OFF - COMMUNICATION FOR MULTI-GENERATIONAL TEAMS

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There is much discussion about the need to be aware of varying attributes of different generations when having discussions in the workplace. Sifting through all of the information that is currently is available is daunting to say the least. A great many theories exist regarding generations and what approach is required for communication. You may feel that you don't relate well to people of other generations in your hospital, which makes communication difficult to impossible.

Generational theory was first proposed by Karl Mannheim in his essay "The Problem of Generations" in 1928. More recently, Neil Howe and William Strauss have been credited with coining the term "Millennial". Can communication be successfully handled without knowing the differences between generations? Yes, it can, but a bit of insight is sometimes helpful.
Let's start by defining some of the generations (or perhaps more appropriately, "cohorts") within your hospital. I would never recommend that you generalize anything, so it is important to realize that these are just guidelines and should not be held as absolutes.

Baby Boomers
Born between 1946 – 1964
In general, this generation is very loyal to brands and to their chosen career. Many stay in the same job for their entire professional lives and "live to work". They tend to be workaholics and expect everyone to have the same work ethic that they do. They get annoyed when that isn't the case. They are committed, respectful of authority and employers.

Gen X
Born between 1965 – 1984 (alternatively 1966 – 1976)
"Balance Work with Family Time"

This was the first "day care" generation, with both parents working outside the home (also known as the "Latchkey Generation"). Because of their workaholic parents, they are more likely to be seeking balance in their lives. This generation seems to prefer the use of email for workplace communication.

Millennials (aka Gen Y)
Born between 1982 -2004 (alternatively 1977 -1994)
"Never Confuse your Work with your Life"

Protected by their parents, this cohort has been more sheltered than the proceeding ones. They are looking for balance between work, life, self-improvement and community. They have high expectations of management to mentor and assist them to achieve their professional goals, and they want a challenging, rather than boring, job. They are ethical leaders and mentors. They prefer feedback often and in a timely fashion. (As an aside – these are not kids! The oldest members of this cohort are in their late 30's and highly productive members of society in a great many cases!)

Gen Z
Born between 1995 -2012
The "Always on" cohort
Highly educated, technologically adept and socially conscious, they are early adopters, brand influencers and social media drivers. Start thinking about these folks! They will be entering your workplaces soon (if they haven't already!)

So now we are faced with the fact that we have a very challenging task to communicate with all of the different cohorts within our practices (and also have them relate to, and communicate with, each other).

Does communication truly depend on knowing the other person's cohort well, or can we distil it down to a system that works for everyone? The latter is easier (and I'm all about simplicity in my current time-strapped state!). It also means we don't have to learn about the new in's and out's of Gen Z (or in fact, Gen AA or whoever is coming after them) in order to communicate effectively. So given that we need great communication when we are providing feedback or coaching, let's use that as the basis for forming a system which can be generalized across cohorts.

Step One:
Communication needs to be safe. Think about how you communicate with your team. You can easily trigger a negative response (even if you didn't mean to!)
Avoid questions that start with "Why".
"Why did you think that was a good idea?" vs. "What was the outcome you were hoping for?"
Avoid following praise with the word "but".
"I really thought you did a great job with Mrs. Jones' complaint, but I need you to understand that you could have handled it better." vs. "I really thought you did a great job with Mrs. Jones' complaint and I'd like to discuss how we can make it even better next time."
Think about your tone and body language – do you roll your eyes, get impatient or interrupt?

Step Two:
Know what kind of feedback your team member likes. This should be known for each member of your team (preferably at the time of their job interview)!
"How do you know that you've been successful at treating a pet?"

Possible Answers:
"I just know" – this is someone who is internal, and doesn't need external feedback to know they've done well. Doesn't mean to say you shouldn't acknowledge their efforts from time to time. Some may be uncomfortable with praise from an external source.

"I get thanks from my client or my boss" – here's the person who needs praise and feedback from an external source. You need to provide it often, and in timely fashion!

"The pet gets better" - this person is data driven and will base success on numbers. Provide feedback with facts and numbers! Often in conjunction with either a or b.

Notice that this works for any member of any cohort (with the added bonus that you are listening to them and not imposing your perceptions on them).

Step Three:
Effective communication
This starts with being a good listener and NOT just giving advice. Be interested, not interesting. Show curiosity.

I love the coaching system laid out in the book "The Coaching Habit", by Michael Bungay Stanier. Well worth a read and I tend to carry a copy with me most of the time. It's a very simple method of asking questions and listening.

What's on your mind?
And what else?
What's the real challenge here for you?
What do you want?
How can I help?
If you're saying "Yes" to this, what are you saying "No" to?

What was most useful for you?
This is a highly adaptable system that also works via email if you have someone who prefers that method of communication.

In closing, don't put yourself into a corner with respect to communication. You have the tools to be able to have meaningful conversations with any member of your team if you remember that they are not a category!

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CONTROVERSIES IN LOCAL ANESTHETIC PRACTICAL APPLICATION

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Local anesthetics do represent a unique opportunity in perioperative analgesia as they have the potential to not only reduce painful sensations, but to abolish them completely. The effective block of nociceptor activity and of nerve conduction not only is reducing or preventing pain sensation, it will also help prevent the build-up of later possible chronic pain development. Particularly when needing to provide perioperative analgesia without the use of opioids using local anesthetics becomes useful. However, employing local anesthetic blocks in the perioperative period allows for a strong reduction of analgesic requirements anyways and will produce less painful patients while circumventing side effects that may represent a concern with systemically applied analgesics at higher doses.

The use of local anesthetics is severely underrepresented in small animal clinical practice. Traditionally, small animal veterinarians provided perioperative analgesia using systemic analgesics, such as opioids, alpha-2-agonists and NSAIDs- probably because we could -at least in many countries. Systemic application is easy to perform and much information about dosing schedules is available allowing for some acceptable clinical safety. In North America the use of opioids has become challenging as they are much under discussion. In many other countries of the world they have never been broadly available. This development and pain pathophysiology issues (hypersensitivity with long-term administration, dependence) call for a broader use of local anesthetics in chronic pain situations, but particularly in the acute pain situation of a perioperative period.

One of the main issues in preventing their broad use is the need for some special technology (Ultrasound-guided and electrostimulator-guided nerve blocks) and, maybe more important the mastering of the application techniques. This is a training issue and a question of mindset.

Local anesthetics can be applied in a multitude of routes:
- the peripheral infiltration and drip-on techniques(splash-blocks), designed to desensitize peripheral nociceptors. There are
- mucosal, corneal and transcutaneous delivery options to block sensations to superficial nociception.

- intravenous application of lidocaine is of particular importance for dogs and horses to provide systemic analgesia of short duration, or visceral analgesia and pro-peristaltic and anti-endotoxemic effects during and after visceral operations, but is not recommended for cats.

- peripheral nerve block techniques. There are such blocks that can be easily learned and do not necessarily require special apparatus, such as the dental nerve blocks. Most limb nerve blocks are best performed using an electrical nerve stimulator. Some peripheral blocks (such as the transversus abdominis block, TAP) and some blocks that desensitize a whole plexus (such as the brachial plexus) are probably best performed using the guidance of an ultrasound imaging.

- neuraxial anesthesia (epidural or subdural) are not so difficult techniques that can be used to block sensations particularly in the hind limbs and the caudal half of the body (abdomen, perineum)

- intra- and periarticular application offer perioperative solutions to abolish pain sensation. This very common application technique has been -subject to reviving discussions of the last years.

- wound instillation techniques commonly employ (surgical) placement of so-called wound perfusion catheters, specifically designed perfusion devices that allow instillation of a local anesthetic over time (up to 3-5 days), this is particularly useful for larger wound areas (mastectomies) or areas to which systemically applied analgesics are hard to get to (total ear canal ablation)

- perineural catheter applications: specifically designed catheters allow for an instillation of local anesthetic over time around a particular large nerve. This is a method of choice to provide analgesia after limb amputations

- intravenous regional anesthesia replace blood in a distal part of a limb with lidocaine and in this way not only desensitizes the limb part, but also makes for a bleeding-free operation site

- intratesticular and intra-ovarian application
No other group of analgesics, or drugs in general, presents with that many options for applications, providing analgesia to the whole body or parts thereof.

Misconceptions and controversies
There are quite some points that are discussed

- As any drug, a local anesthetic may produce unwanted side effects. Most of these side effects are related to the dose given. Side effects that are commonly listed may include central nervous system depression, cardiac arrhythmias and seizures. At clinically used doses, particularly after neuraxial application, the most common side effects, however, may be hypotension and hypothermia. As general line of thought such side effects do occur at lower doses in cats when compared to dogs. It is a misconception, however, to deduce from this that cats shall not receive local anesthetics. Maximum recommended doses for the single local anesthetics in dogs and cats have been published in the Guidelines of Recognition, Assessment and Treatment of Pain by the global pain council

- Local anesthetics exhibit chondrotoxicity when administered intraarticularly. This has been particularly shown for lidocaine and bupivacaine-less so for ropivacaine and is a more important side effect when pumps (continuous administration) are used. The use of intra-articular local anesthetic application has never reached the clinical importance it clearly had in human anesthesia. However, currently it seems that ropivacaine demonstrates less of such chondrotoxicity and single administration is associated with less profound and shorter duration of metabolic disruption to chondrocytes.

- Side effects due to local anesthetic overdose can be treated using symptomatic crystalloid infusion therapy. However, this may depend on the side effect to counteract. Hypotension to a degree may be treated using crystalloid infusions, but CNS depression or seizures may require lipid emulsion infusions.

- Adjuvants to local anesthetics. It is a not infrequent thought to include other drugs into a local anesthetic solution to be administered. These may include epinephrine (adrenaline), hyaluronidase and bicarbonates with different ideas, effects and side effects. Their addition to the administered solution requires careful thought for each single application technique and a number of application techniques preclude from their use.

- Combining a long acting and a fast acting local anesthetic provides fast and long-duration analgesia. This is mostly discussed for the combination of lidocaine and bupivacaine. While a faster onset of a peripheral nerve block is highly likely with such combination, it is as likely to present with a reduced duration of effect. Furthermore, regarding side effects, it may be important to notice that toxicity of local anesthetics is additive. However, a faster onset than with the slow onset drug alone and a longer duration than with the fast-acting drug alone are highly likely.

- All local anesthetics act the same on all nerve fibers is a common misconception. Local anesthetics may present (for example mepivacaine, ropivacaine) with a certain preference for sensitive over motor nerve fibers. Such differential block may affect the choice of local anesthetic.

During the presentation these and more of such questions are addressed, revealing some as misconceptions, some as rather correct assumptions and some as not yet clearly answered in a scientific way.

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ANESTHESIA IN THE SMALL ANIMAL CARDIAC PATIENT – RISKS, PRECAUTIONS AND OUTCOMES

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General anesthesia can alter the cardiovascular system in negative ways, by causing myocardial depression, sinus tachycardia, systemic hypertension, and other potentially harmful physiologic changes (Pypendop, 2011). In dogs, the overall risk of anesthetic and sedation-related death is 0.17% based on a survey of 98,036 dogs anesthetized at 117 general veterinary practices (Brodbelt 2008a). In cats, the overall risk of anesthetic and sedation-related death is 0.24% based on a multicenter survey of cats presented to general veterinary practices (Brodbelt 2007). As might be expected, dogs and cats have a greater anesthetic risk when they are in poor health, (Brodbelt 2007). However, the specific impact of heart disease in dogs undergoing elective general anesthesia recently has been shown to be minimal when anesthesia occurs under optimal conditions (Carter 2017).

Initial approach

The suspicion of heart disease in dogs and cats depends on clinical presentation. The most common situation is the dog with a heart murmur and no external signs of decompensation – the so-called “asymptomatic murmur” case. In such patients, a preanesthetic cardiac evaluation that includes physical examination, thoracic radiographs, and an echocardiogram (with simultaneous electrocardiographic display) is a recommended minimum database in all cases. The information gathered from such testing identifies the cause of the murmur and the expected hemodynamic impact: the severity of the underlying disease, expected possible complications (and likelihood of such complications based on the degree of the primary problem and secondary changes) and the steps that can be followed to minimize the risk of such problems. When such a database cannot be obtained due to limitations that are logistical, financial, or perceptive (the client, the attending veterinarian, or both parties do not understand the value of the information), then the attending veterinarian can use his/her physical exam findings to narrow the differential diagnosis to the greatest degree possible (Carter 2017). An approach for doing this is described in practical terms in an open-source article (Côté 2015): https://avmajournals.avma.org/doi/pdf/10.2460/javma.246.10.1076.

Cats

A cat with an incidentally-detected heart murmur or incidentally-detected cardiomegaly on thoracic radiographs can have heart disease that ranges in severity from trivial to very advanced. In either situation, an echocardiogram is recommended in order to identify heart disease, if any; the extent of primary lesions; and the degree of secondary changes. Thoracic radiographs plus circulating biomarker measurement (typically NT-proBNP, possibly cardiac troponin-I) are an alternative if echocardiography is not feasible. Physical exam findings and the medical history, together with echocardiographic results, are the core sources of information for planning and performing general anesthesia in a cat with an incidentally-detected abnormality and no externally apparent clinical signs.

Key principles for general anesthesia in cats with subclinical HCM:
- Avoidance of tachycardia: Premedication with vagolytic drugs probably should be avoided in cats with HCM. Rather, atropine (0.02 mg/kg IV, or approximately 0.2 mL mL/CAT if using standard 0.54 mg/mL concentration; can repeat twice more within 10 minutes if needed) or glycopyrrolate (0.005 mg/kg IV, or approximately 0.1 mL/CAT if using standard 0.2 mg/mL concentration; can repeat twice more within 10 minutes if needed) can be given if the heart rate is less than approximately 130 beats/minute in a normotensive or hypotensive anesthetized cat.
- Avoidance of tachycardia: Avoid (or minimize, if no alternatives exist) high-dose (IM) ketamine, tiletamine, and other premedications or induction agents that directly trigger sinus tachycardia. Suitable options in cats with HCM include propofol (4-8 mg/kg slow IV to effect) or alfaxalone (3-7 mg/kg slow IV to effect).
- Avoidance of reflex sinus tachycardia due to systemic hypotension: premedication selection is important.

Drugs with minimal cardiovascular effects that are used routinely for premedication in cats with HCM include butorphanol (0.1 mg/kg IV once or 0.2 mg/kg IM once) or buprenorphine 0.005-0.01 mg/kg IV once or 0.01-0.02 mg/kg IM once). Acepromazine generally is avoided, although low dosages (e.g., 0.005 mg/kg once) given IM have historically been part of many cardiologists’ armamentaria and subjectively are associated with few to no adverse effects and a smoother, longer-lasting sedation when given with on of the other drugs just named above. Dexmedetomidine (3-5 microg/kg IV or IM once) is used routinely by cardiologists in feline cardiomyopathic patients, whereas certain anesthesiologists recommend against using it in feline heart disease due to the possibility of coronary vasoconstriction. Much higher dosages are recommended by the drug’s labeled indications but are essentially never used.

Dexmedetomidine's alpha-2 agonist properties cause vasoconstriction, which elicits a reflex sinus bradycardia while maintaining normo- or slight hypertension. This is desirable, to increase diastolic filling time and decrease the cardiac work that is otherwise associated with tachycardia.

Maintenance of general anesthesia is almost always by inhalation (isoflurane or sevoflurane), although total intravenous anesthesia may be considered together with intubation for oxygen administration.

An important consequence of diastolic dysfunction is intolerance to intravascular volume expansion. For this reason, intravenous or subcutaneous fluids can be given at reduced dosages in cats with HCM. A typical rate is 2 mL/kg/hour, with higher rates chosen under certain circumstances (e.g., absence of atrial enlargement echocardiographically, concurrent kidney disease) and lower rates chosen in other circumstances (e.g., advanced disease as evidenced by moderate or marked atrial enlargement). An isotonic, low-sodium fluid type such as 0.45% NaCl with 2.5% dextrose is preferred in euvolemic/normally-hydrated cats, although the drawbacks of dextrose administration to cats and their future predisposition to diabetes mellitus must also be considered (Zini, 2009).

Dogs

In degenerative/myxomatous mitral valve disease, mitral regurgitation imposes a volume overload on the left ventricle, increasing cardiac work with each heartbeat. The degree to which this occurs depends on the volume of regurgitation, which is not reliably linked to murmur in intensity; for example, 56% of DMVD dogs with moderate-intensity (grade III/VI) heart murmurs have no significant secondary changes echocardiographically (Ljungvall 2008). However, even in dogs with secondary changes (e.g., left atrial enlargement), no difference in complication rates was found in one clinical general anesthesia study comparing 100 dogs with advanced, subclinical heart disease and 100 matched control dogs with no heart disease (Carter 2017). The study was conducted under referral conditions, which implies an optimal degree of monitoring and responding to changes when they occurred.

Key principles for general anesthesia in dogs with subclinical DMVD:

- Tachycardia can be more harmful in individuals with eccentric ventricular hypertrophy than in normal individuals. This is because greater myocardial mass is not matched by increased myocardial perfusion, and the result can be ischemia during periods of increased cardiac work. Furthermore, sympathetic stimulation that causes sinus tachycardia also increases ventricular systolic function, which increases the force applied to a diseased mitral valve apparatus. As a general rule, dogs with heart disease who undergo general anesthesia should have a heart rate that is never greater than 200 beats/minute and ideally is always less than 170 beats/minute.

- Similarly, bradycardia can lead more quickly to a decrease in cardiac output in dogs with heart disease than in healthy dogs. As a general rule, dogs with heart disease who undergo general anesthesia should have a heart rate that remains high enough for them to maintain an adequate perfusing blood pressure, which can be defined loosely as a mean arterial pressure greater than 70 mmHg, or a systolic arterial blood pressure greater than 90 mmHg. In the absence of blood pressure monitoring, the patient's heart rate should generally be maintained above 80 beats/minute.

- Dogs with heart disease have an altered tolerance to intravascular volume changes. On principle, they are at greater risk of iatrogenic pulmonary edema due to intravascular fluid overload, and might also be at greater risk of the opposite, i.e., of renal ischemic injury due to vascular underloading. This narrower margin of IV fluid tolerance typically is addressed by administering maintenance-type fluids (e.g., 0.45% NaCl in 2.5% dextrose), which are isotonic but contain less sodium, rather than replacement-type fluids (e.g., LRS, 0.9% NaCl). The rate of IV fluid administration for patients with heart disease, e.g., 1-2 mL/kg/hour, usually is lower than intraoperative maintenance rates. This approach, while logical, remains to be proven by objective evidence. Adjustments in fluid administration rate can be made in response to changes during monitoring. For example, hypotension may prompt administration of a small fluid bolus. However, other means should always be attempted first. For example, decreasing inhalant anesthetic concentration is always preferred over fluid administration in a hypotensive cardiac patient.

Drug selection

General practical applications for premedication and induction of dogs with compensated ("asymptomatic") heart disease include the following:

- Avoidance of tachycardia: Premedication with vagolytic drugs probably should be avoided in dogs with heart disease. Rather, atropine (0.02 mg/kg IV; can repeat twice more within 10 minutes if needed) or glycopyrrolate (0.005 mg/kg IV; can repeat twice more within 10 minutes if needed) can be given as needed during anesthesia, such as if the heart rate is less than approximately 80 beats/minute in a normotensive or hypotensive anesthetized dog.

- Avoidance of tachycardia: Avoid (or minimize, if no alternatives exist) ketamine, xylazine, and other premedications or induction agents that directly trigger sinus tachycardia. Suitable premedication options include those listed in the next item, below, as well as benzodiazepines (e.g., midazolam 0.2-0.3 mg/kg IM once). Suitable options for anesthetic induction in dogs with heart disease include propofol (4-8 mg/kg slow IV to effect), alfaxalone (3-7 mg/kg slow IV to effect), or etomidate (1.5-3.5 mg/kg slow IV to effect).

- Avoidance of reflex sinus tachycardia due to systemic hypotension: premedication selection is important. Drugs with minimal cardiovascular effects that are used routinely for premedication in dogs with heart disease include butorphanol (0.1 mg/kg IV once or 0.2 mg/kg IM once) or buprenorphine 0.005-0.01 mg/kg IV once or 0.01-0.02 mg/kg IM once). Hydromorphone has important analgesic properties but its stimulation of panting and the increased susceptibility to noise (which can coexist with or be mistaken for dysphoria) are important drawbacks that may make it less favorable in patients undergoing elective procedures, especially if such procedures are minimally or not painful. Acepromazine generally is avoided, although low dosages (e.g., 0.005 mg/kg once) given IM have historically been part of many cardiologists' armamentaria and subjectively are associated with few to no adverse effects and a smoother, longer-lasting sedation when given with on of the other drugs just named above. Dexmedetomidine and other alpha-agonists are inappropriate for most canine heart disorders, including DMVD and dilated cardiomyopathy, because the arterioconstriction they cause can increase preload to a degree that causes congestive heart failure iatrogenically. Other forms of heart disease where alpha-agonists can be considered are disorders that involve outflow tract obstruction (e.g., subaortic stenosis) and disorders of diastolic dysfunction (e.g., cardiac tamponade).

Maintenance of general anesthesia is almost always by inhalation (isoflurane or sevoflurane), although total intravenous anesthesia may be considered together with intubation for oxygen administration.

Monitoring

Standard monitoring of dogs with any type and degree of heart disease undergoing general anesthesia should always include:
- Continuous electrocardiographic (ECG) monitoring during anesthesia, assessing for sinus rhythm that decreases below 80 beats/minute (which justifies treatment with atropine or glycopyrrolate if associated with normo- or hypotension, as described above) or that rises above 160 beats/minute (which justifies assessment for the cause of the tachycardia –typically too light an anesthetic plane, or a different tachycardia such as ventricular tachycardia warranting confirmation/immediate consultation and possibly antiarrhythmic treatment), and for pathologic arrhythmias;
- Blood pressure (BP) monitoring, either through sphygmomanometry for continuous monitoring (observing trends) or periodic Doppler assessment; and
- Pulse oximetry

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OCULAR EMERGENCIES

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INTRODUCTION

When do we have to face an ocular emergency ? Ocular pain, Abnormality of globe position, Sudden blindness, Change of eye appearance

OUTLINE

Abnormal position of the globe(s), Eyelid laceration, Corneal injuries, Glaucoma , Uveitis, Sudden blindness
Abnormal position of the globe(s)
Three types:
-Exophthalmia: cellulitis /abscess, myositis (eosinophilic m. / extra-ocular m.), neoplasia (primary/secondary), trauma of the orbit (hematoma/fracture)
-Enophthalmia : ocular pain (ulcer/uveitis…), Horner's syndrome
-Proptosis : trauma, predisposed breeds (brachycephalic)
Clinical signs: Exophthalmia, NM protrusion, swelling (chemosis), strabismus
Work-up: PE, ocular examination, Retropulsion, Exploration of the mouth, Imaging: U/S, X-ray
Therapeutic Approach: Temporary until determination of the cause: pain management, globe protection (lubrication, tarsorraphy)
Proptosis
Clinical signs: Proptosis = eyelid behind the equator of the globe, Swelling (chemosis) , Strabismus , Corneal lesions, intra-ocular lesions
Assessment and prognostic: PLR (fixed dilated / miosis), globe integrity, corneal integrity, extra-ocular muscles, intra-ocular lesions
Therapeutic Approach: Main goal : save the eyeball, pain management, keep cornea moistened/lubricated, General anesthesia, lateral canthotomy (+/-), prep the eye (diluted betadine 1:50), globe replacement, tarsorraphy (4/0- 5/0 , stents), E-collar, Medical treatment: systemic AID, topical AB

Eyelid laceration

Clinical signs: Easy….
Basics: Check orbital bones/head integrity and globe integrity, Restore eyelid integrity and function..., Surgical repair ASAP (ideally <4hours), Minimal trimming of the wound margins, Apposition of the eyelid margin first (fig 8 suture), SI suture (silk 4/0-5/0), E-collar
Medical treatment: sys AID, sys AB, topical AB
Corneal injuries
Corneal ulcers

Comments: Making the diagnosis of a corneal ulcer is critical for the welfare of the patient, It is the difference between sight and blindness, or a small scar and a large scar, Assume ulcers will get worse!, Treat aggressively
Normal healing: Corneal epithelium is a barrier against bacteria and fungus , In simple traumatic corneal injuries in which a small amount of epithelium is removed, healing is rapid (5-7 days), about 0.5-1mm/day
In case of noninfected, midstromal ulcers, healing is about 0.6 mm/day with a pronounced fibrovascular healing response

If the ulcer becomes infected or the epithelium is unable to attach to the stroma, healing is delayed, and progression to a deep stromal ulcer may occur, Proteinases, mainly matrix metalloproteinases (MMP) are produced by keratocytes, tear film PMNs and microbes, In infected ulcers, proteinases may digest stromal collagen to cause a descemetocele, and iris prolapse (within 24 hrs) Corneal degeneration due to proteases is referred to as «melting" Ulcers in which proteases are active have a grayish-gelatinous appearance which must be distinguished from corneal edema . The action of proteases are potentiated by topical
Abnormal healing: Uncomplicated corneal ulcer will heal within 5 to 7 days unless: The cause is still presentIt is infected, It has a basement membrane defect (indolent), Topical corticosteroids are used (retard epithelialization, activate collagenase, and decrease stromal wound strength)

Classification of corneal ulcers:
Depth: superficial, deep, descemotocele , perforation
Causes: Keratoconjunctivitis Sicca (KCS), Lid abnormalities, Ciliary disorders, Physical irritants, Infectious agent: Herpes virus, Bacteria, Fungus, Neurotrophic (lack of sensation of ophthalmic branch of CN5) Neuroparalytic (CN7 paralysis), Foreign bodies behind 3rd eyelid, Trauma

Speed of progression: melting , indolent
Clinical signs: Blepharospasm, photophobia, Epiphora, Eyelid swelling, Conjunctival swelling, Sign of anterior uveitis associated: Myosis, fibrin, hypopyon, Corneal edema, Rough depressed area, Missing outer layer of cornea Work up : Evaluation at distance (discharge, symmetry), Menace, Dazzle, blinking , Pupil size, PLRs , Slit lamp examination, Schirmer Tear Test , Corneal culture Fluorescein stain (Detects a corneal epithelial, stromal ulcer (stain stroma not epithelium), Seidel test, All red, inflamed or painful eyes should be routinely stained with fluorescein, Rose Bengal (poor stability of the PTF and inadequate protection of the corneal epithelium), very small superficial ulcers and erosions , Corneal scraping for cytology, Look for an underlying cause (KCS, distichia, trichiasis, entropion)

Treatment :
Questions to ask yourself: Infected? Depth? Melting? Uveitis associated ?

Medical treatment:
Determine and eliminate etiology (eg KCS, entropion, infection), Prevent or treat infection (Broad-spectrum topical antibiotics; culture and sensitivity tests), Prevent progression (melting), Treat Uveitis, (Topical atropine cycloplegia/mydriasis, Topical NSAIDs (careful)… No steroids), Prevent self-trauma: E-COLLAR , Ulcers can degenerate even if sterile!

Antibiotics: Basics topical application q2h to q8h, broad spectrum antibiotic (neomycin-polymyxin-gramicidin) if not melting and before culture results. if melting ulcer:… suspect Pseudomonas (gentamycin, tobramycin, ciprofloxacin, amikacin) …suspect □ hemolytic Streptococcus (chloramphenicol, cefazolin, bacitracin)
Collagenolysis (melting) prevention: serum (□2 macroglobulin and □1 proteinase inhibitor) (q1h) , 5-10% N-acetylcysteine (NAC) , 0.05 - 0.2% EDTA, Galardin (MMP inhibitor), Doxycycline (topical 0.1% or sys)

Uveitis treatment : Atropine:BID or SID initially (depends if degree of uveitis) Mydriatic, cycloplegic, and decrease vessel leakage, Careful with KCS induced by atropine
Systemic anti-inflammatory: NSAIDs: rimadyl or meloxicam (depends on the degree of uveitis) Topical anti-inflammatory: flurbiprofen, diclofenac (BID to TID)Careful. May get keratomalacia Corticosteroids are contra-indicated in case of corneal ulcers

Surgical treatment
Debridement, keratectomy, keratotomy:to remove necrotic tissue and bacterial debris, remove hyaline membrane , superficial punctate or grid keratotomy with a 20G needle Indications: necrosis, melting, indolent ulcers

Conjunctival graft: Pedicle Conjunctival graft
Biomaterials: submucosa or porcine intestine or porcine bladder (BIOSISTs, ACELL)Amniotic membrane
Indications: large and/or deep ulcers, desmetocoeles, perforated ulcers
PK :Deep corneal ulcers Descemetoceles Endothelial dystrophy

GUIDE for the treatment of corneal ulcers :
-Superficial ulcer: Broad spectrum AB, +/- atropine, E-collar
-Superficial ulcer in cats: Broad spectrum AB (tetracycline), +/- atropine, Anti-viral, L-Lysine PO,

E-collar
-Non-healing ulcer: Broad spectrum AB, +/- atropine, E-collar Serum, Muro 128
If does not heal: debridement, scrapping, grid keratotomy

-Stromal ulcer: Broad spectrum AB, atropine, sys NSAIDs, anti-collagenases, E-collar
If <50% stromal depth, medical management is appropriate for initial management
If ≥50% stromal depth or progressive depth or area despite medical management, consider surgery (Keratectomy + conjunctival pedicle flap, corneal graft)

-Melting corneal ulcer : Ulcers infected or treated with steroids , Very aggressive medical and/or surgical therapy, AB initially q1-2h, Antifungal q2-4h if + for hyphae, Atropine q12h till dilated, Serum and EDTA q1h, sys doxy(5 mg/kg PO BID or 10 mg/kg PO SID) Sys NSAIDs (Keratectomy and conjunctival flap)

-Monitoring: Eyes with ulcers should show reduced fluorescein uptake and the eye be less painful in 24-48 hours. If not, consider that a resistant bacterial strain or a fungus could be present, or other complicating factors. Melting ulcers should show an increase in stromal rigidity in the first 24 hours. If not, surgery is indicated as corneal rupture is possible

-Desmetocoele: Ulcer through entire stroma leaving only Descemet's membrane and endothelium * Prior to referral
Broad spectrum AB, atropine, sys NSAIDs, sys AB,+/-anti-collagenases, E-collar* Surgical intervention - referral

. If very small: glue, primary sutures . If larger: surgery (conjunctival pedicle flap, corneal graft)
-Perforated corneal ulcer: Prior to referral, Topical AB drops (not ointments), Systemic AB and NSAIDs, E-collar for trip, Surgical intervention – referral, Reduce iris prolapse if present, Synthetic or frozen corneal graft w/ conjunctival graft, Primary suturing if <1mm in diameter +/- conj graft

3-2 Corneal foreign bodies
Remove with irrigation, needle, forceps, Treat with antibiotics and atropine, Always examine entire eye

Glaucoma
Aqueous humor dynamics and intraocular pressure :Balance between production and drainage keeps intraocular pressure (IOP) within normal range (15-25 mm Hg), IOP varies with time of the day, age, position, blepharospasm, drugs (i.e. anesthetics, caffeine, steroids) Glaucoma = Increased IOP with associated visual defects

(over 25 mmHg in dogs and 31 mmHg in cats) IOP increase most commonly due to increased resistance to outflow
Glaucomas types Over 42 breeds of dogs affected Up to 5.5% of the dog population affected Two main types: Primary glaucomas (30%) and Secondary glaucomas (70%)
-Primary glaucomas: 2 types: Angle open (10%) and narrow/closed (90%) Bilateral glaucomas in predisposed breeds
Goniodysgenesis (pectinate ligament dysplasia) Breed: Bouvier des Flandres, Great Dane, Siberian husky
-Secondary glaucomas :Have a detectable cause, Most frequent types include: Cataract formation and lens-induced uveitis , Lens displacement , Intraocular tumors Intraocular inflammations

Clinical signs

Acute changes : Vary with level of IOP (signs when IOP above 40 mmHg), Mydriasis , Corneal edema, Congested episcleral vessels, Blepharospasm (ocular pain), Vision loss or blindness,+/- Aqueous flare
Chronic changes : Buphthalmia, Visual deficits , Corneal striae (Haab's straie) and other keratopathies, Lens subluxation/luxation, Excavation/cupping optic nerve head, Optic nerve "cupping" is due to ON axonal loss, and rotation, compression and posterior bowing of the lamina cribrosa.Cupping is unique to glaucoma.Retinal degeneration
Diagnosis : tool = tonometer . Normal canine and feline IOP: 15 to 25 mm Hg COMPARE BOTH EYES Generally, difference in IOP between fellow eyes < 5-8 mmHg Digital tonometry: crude IOP evaluation, BUT unsatisfactory for monitoring. Schiotz's indentation tonometer,Tonopen Applanation tonometer, Tonovet Rebound tonometer
Treatment objectives: Presently no cure for glaucoma
Objectives of therapy:
1# Maintain vision and eliminate pain by lowering the IOP by: increasing aqueous outflow, decreasing aqueous production 2 # Prevent or delay glaucoma in other eye
Treatment of acute glaucoma
Need to rapidly decrease IOP. Topical prostaglandin- latanoprost or others (NOT if lens luxation) increases uveoscleral outflow Hyperosmotics – dehydrates vitreous, reduces ultrafiltration 20% mannitol or 50% glycerol
Anterior chamber paracentesis remove aqueous through peripheral cornea
Maintenance of medical therapy : @ Drugs to decrease aqueous production :Systemic Carbonic-anhydrase inhibitors (CAIs)Side effects: metabolic acidosis, anorexia, depressionEspecially cats! Topical CAIs – same effect as systemic, safer Beta-adrenergic antagonists (topical) Reduce formation aqueous humor, no effect on outflowSide effects: bradycardia especially in small dogs @ Drugs to increase outflow : Prostaglandin analogs (Topical) Parasympathomimetics (topical) @ Additional drugs Calcium Channel Blockers, Glutamate Inhibitors Systemic corticosteroids In selected cases
Prophylactic treatment :Essentially all primary glaucomas are bilateral! Need to treat fellow normotensive eye with: # Topical beta-blocker (0.5% timolol maleate: BID # Topical CAI (2% trusopt: BID/TID)
Medical versus surgical treatment : The iridocorneal angle gradually closes in most types of glaucoma and the initially effective treatment becomes inadequate . Surgery is the option available when vision continues to diminish and IOP continues to increase in spite of maximum medical therapy
Surgical therapy
Visual eyes Cyclodestructive procedures (decrease aqueous production): lasers (cyclophotoablation) or cryocycloablation (cyclocryoablation) Fistulization procedures (increase outflow): gonio shunts
Blind eyes : Ciliary Body Ablation, Intraocular Prosthesis, Enucleation - removes source of pain
Feline Glaucoma POAG in Siamese and Burmese, Secondary glaucomas from uveitis and tumors are most common, Clinical signs can be very discreet (often only amiscoria/mydriasis, buphthalmia) Latanoprost (Xalatan) not effective in cats
UVEITIS
Causes : Idiopathic, Infection (TBD, FIV,FIV, FeLV, Herpes ,toxo, crypto), Immune-mediated (VKH, LIU), Neoplasia, Trauma , Secondary to another ocular condition (ulcer, cataract, lens capsule rupture)
Clinical signs: Photophobia, epiphora ,Prolapsed nictitans ,Conjunctivitis Scleral injection ,Corneal edema, KP ,Aqueous flare , Hyphema and/or hypopyon ,Miosis ,Hypotony. Glaucoma may result.
Treatment: Etiologic Mydriatic/Cycloplegic: atropine Topical +/- systemic AID
SUDDEN BLINDNESS
Work-up: Visual assessment, PE
Ocular examination: * blindness due to ocular condition (RD, Optic neuritis, SARDs) * central blindness
SARD's : Sudden Acquired Retinal Degeneration, Non-inflammatory degeneration & loss of photoreceptors , Female, obese, 8-10 yo, cushinoid …
Treatment if blindness due to ocular condition: Important to know if it is degenerative (SARDs) or inflammatory (RD, Neuritis)
Treatment if blindness due to systemic disease: infectious, inflammatory, systemic hypertension, immune-mediated…
CONCLUSIONS
Take care of the eye !! Can reveal the presence of a systemic condition Need to understand WHERE, HOW and WHY
Few important aspect of the treatment: Pain management, Try to maintain visual function, Aesthetic aspect for pets

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TREAT POSTOPERATIVE ABDOMINAL PAIN USING INTRAPERITONEAL AND INCISIONAL ANESTHESIA

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The opioid crisis has left us wondering what to do without them. Alternatives to opioid usage include the practice of multimodal analgesia which should always included local anesthetic techniques whenever possible. Intraperitoneal and incisional anesthesia are technically easy to perform, low cost and effective. Veterinarians can easily incorporate the use of these techniques into their routine practice.
The processing of nociceptive information occurs via four main steps: transduction, transmission, modulation and perception. Transduction is the first step in processing pain. It starts with the activation of nociceptors that are present in the target tissue such as skin, muscles, joints and viscera, and that respond to noxious stimuli. Transmission occurs when the nociceptive impulse travels from the primary afferent fiber (first order neuron) to the dorsal horn of the spinal cord.(1) Local anesthetics inhibit nerve conduction and nociceptive input by blocking primarily Na+; hence they act early in the pain pathway blocking peripheral inputs. For these reasons, they produce excellent analgesic efficacy when used for the management of acute pain. Local anesthetics have several advantages. They are inexpensive, uncontrolled and generally available worldwide.(2)

In people undergoing abdominal surgeries, the use of intraperitoneal and incisional anesthesia has been shown to reduce early postoperative analgesic requirements, reduce time to first-intervention analgesia and reduce pain scores. For these reasons, these techniques are recommended for laparotomy and laparoscopic surgery in people, as an adjuvant analgesic technique.
In veterinary medicine, studies in dogs and cats are showing similar evidence of efficacy with good safety profile when local anesthetics are administered at recommended dosages. For example, in dogs, both techniques have been studied separately or in combination using either bupivacaine, lidocaine or ropivacaine. Plasma concentrations of lidocaine after intraperitoneal and incisional anesthesia in dogs undergoing ovariohysterectomy were below toxic levels (Wilson et al, 2004). Although some studies were inconclusive, pain scores and need of rescue analgesia were generally reduced after intraperitoneal and/or incisional anesthesia when compared with controls.(3–5) In cats, only the intraperitoneal technique using bupivacaine has been studied. Plasma concentration of intraperitoneal anesthesia using bupivacaine alone or in combination with epinephrine or dexmedetomidine were below toxic levels.(6–8) The technique was shown to reduce pain scores and need of rescue analgesia when compared with controls.(7) The association of dexmedetomidine or epinephrine to bupivacaine provided similar analgesia.(8)

Based on the current literature, intraperitoneal and incisional anesthesia should be considered for the management of postoperative pain in any type of abdominal surgery. They are also excellent choices during spay-neuter programs. Their administration must be performed under aseptic conditions and general anesthesia. Intraperitoneal and incisional anesthesia should be used as part of a multimodal analgesic protocol including other pharmacological and non-pharmacological therapies.

Both techniques are described and demonstrated in the following link: https://www.youtube.com/watch?v=76dwKuirqt0.
This lecture will present the current evidence on the use of intraperitoneal and incisional anesthesia in small animal practice as well as offer recommendations on how to safely and effectively use these techniques.

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EVALUATION OF EFFUSIONS

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A variety of disorders cause pericardial, pleural and peritoneal effusions. However, just five underlying pathological mechanisms alone or in combination create effusions. Understanding these mechanisms helps elucidate how fluid analysis can contribute to diagnosis and case management.

Small amounts of clear serous fluid are normally present in the pericardial, pleural and peritoneal spaces. These spaces are enclosed by visceral and parietal surfaces lined by mesothelial cells. This fluid acts as a lubricant and transport medium for electrolytes and solutes. Both the protein concentration and cellularity of the fluid are low. Expected nucleated cells include mesothelial cells, macrophages, lymphocytes and neutrophils.

In health, fluid forms from processes involving anatomic features and Starling's forces. Anatomic features include capillary permeability, the surface area for fluid movement and lymphatic openings within the mesothelium responsible for fluid drainage. According to Starling›s law, net capillary to interstitium fluid movement is directly related to the difference between hydraulic and oncotic pressure gradients across the capillary wall, capillary permeability and the surface area for fluid movement. Plasma filtrate leaves capillaries, enters the interstitial space, diffuses into body cavities, is removed by lymphatics and returned to plasma. Thus, vascular permeability, mesothelium permeability, lymphatic drainage, and Starling's forces all play key roles in effusion formation.

Pathologic mechanisms of effusion formation1
1. Transudation: Transudates occur because of excess diffusion of plasma water from vessels due to increased hydraulic pressure with or without decreased oncotic pressure. Transudates may also form when lymphatic drainage is impaired. Transudate formation solely due to hypoalbuminemia is rare as compensatory processes occur in this state. These include decreased intravascular hydraulic pressure, reduced interstitial oncotic pressure, globulin synthesis and increased lymphatic drainage. A marked hypoproteinemia occurring acutely may result in transudation because insufficient time has occurred for effective compensation. Transudates are typically low in cellularity and protein-poor (<25 g/L), but protein-rich (>25 g/L) transudates may also form.

a. Protein-poor transudates: Protein-losing nephropathies and hepatic disease resulting in pre-hepatic (mesenteric lymphatics), presinusoidal (portal) or early sinusoidal hypertension are the most common reasons. Occasionally, protein-losing enteropathies may create protein-poor transudates. If an enteropathy causes marked hypoproteinemia, part of the transudate formation may be due to decreased oncotic pressure. Additionally, some protein-losing enteropathies such as lymphangiectasia may impair drainage of intestinal lymph.
b. Protein-rich transudates: Common causes are sinusoidal or post-sinusoidal hypertensive hepatic disease, neoplasia and congestive cardiac disease. Portal hypertension caused by congestive cardiac disease is post-sinusoidal and post-hepatic. Increased hydraulic pressure occurs in the hepatic sinusoids leading to a protein-rich effusion.

2. Exudation: Exudates form due to increased vascular permeability secondary to inflammatory mediators released from inflamed tissue, allowing plasma and proteins to leak from vessels. Chemotactic substances cause leukocytes to migrate from vessels, contributing to the increased cellularity of exudates. However, other factors may contribute to exudates: A) Inflammatory mediators may cause vasodilation such that increased blood volume enters inflamed tissues. Therefore, increased capillary hydraulic pressure may contribute to the fluid accumulation. B) If blood vessels are directly inflamed, loss of plasma, proteins and leukocytes into the fluid readily occurs. C) Loss of plasma proteins to the interstitium lowers the osmotic pressure gradient between plasma and interstitium, decreasing the ability of plasma to retain water. D) Mesothelial inflammation creates damage so protein-rich interstitial fluid more easily moves into cavities.

3. Hemorrhage: Vascular trauma enables blood to escape creating a hemorrhagic effusion. Minor hemorrhage often occurs during sampling and minor hemorrhage may be present in exudates due to vascular damage associated with inflammation. Acutely formed or collected pathological hemorrhagic effusions have similar features to blood. However, effusion volume and composition will change with time as lymphatic vessels work to resorb effusion water, solutes and erythrocytes.

4. Lymphorrhage: This term means leakage of lymph from lymphatic vessels. Lymphorrhage may occur with trauma, lymphatic hypertension, lymph stasis, increased permeability of lymphatic vessels and dilated lymphatic vessels resulting in defective lymphatic valve function. Occlusion of lymphatic vessels due to compression by a mass or luminal obstruction by metastatic cells within lymphatic vessels may also contribute to lymphorrhage.

5. Hollow organ/tissue rupture: Damage to the urinary, biliary or gastrointestinal tract can allow leakage of urine, bile or gastrointestinal contents, respectively, into the peritoneal cavity. A septic or non-septic inflammatory reaction is commonly associated with these effusions. Fluid findings will vary with time.

Initial Fluid Evaluation
Fluid evaluation begins at collection, noting the colour, clarity and ease of sampling. If initially clear fluid turns bloody during collection, or vice versa, blood contamination likely occurred. Collection of frank blood supports a hemorrhagic effusion or incidental sampling of a highly vascular organ such as the spleen. A cloudy white fluid is typical of chylous effusions. Dark green fluid is typical of direct gall bladder sampling. Depending on the degree of leakage and time, fluid from bilious effusions may vary from dark green to light green-yellow. Colourless clear fluids are typically protein-poor and hypocellular, suggesting a transudate. Yellow opaque fluids are typically protein-rich and highly cellular, supporting an exudate. These are generalizations and can be useful, although in one study fluid color did not have strong associations with any particular disease process2. The total nucleated cell count (TNCC) and protein concentration are rarely known prior to smear preparation. However, recognizing fluid transparency at initial collection can help guide smear preparation3. When in doubt, submission of both direct and sediment smears is ideal.

Preparing fluid samples for submission
Direct smears: This preparation is identical to that used for blood smears. At very minimum, at least one direct smear should be submitted. Fluids with low TNCCs yield hypocellular direct smears. Thus, clear, colourless fluids warrant preparation of smears using techniques that aid in cell concentration.

Line smears: These are created similarly to a blood smear technique but the spreading slide is stopped and lifted vertically off of the underlying slide such that cells concentrate along a line. Line preparations are ideal for protein-poor low cellular fluids. High-protein fluids may result in an area too thick for microscopic evaluation.

Sediment smears: These are prepared similarly to urine sediment preparations and are ideal for protein-poor low cellular fluids. Fluid is gently centrifuged for 5 minutes, most of the supernatant removed, the sediment re-suspended and a small amount transferred to a slide for creating a direct smear or slide-over-slide preparation.

Cytocentrifuge preparations: These preparations require special commercial cytocentrifuges typically limited to larger laboratories. They are highly valuable for low cellularity samples.

Assessing fluids at diagnostic laboratories
Laboratories routinely provide gross fluid characteristics, TNCCs, red blood cell (RBC) counts, total protein concentration and cytological analysis for effusion samples. Additional diagnostic tests can be performed as desired to aid diagnosis with select effusions.
Cell counts: These can be performed manually using hemocytometers or automatically using electronic analyzers. Electronic analyzers vary in sensitivity and potential exists for cells and debris to obstruct these machines. Additionally, non-nucleated cells or fragments, debris and organisms can falsely contribute to automated TNCCs. Hence, assessing cellularity is one reason cytological evaluation is required. When effusions are pink to red, the erythrocyte count or hematocrit should be assessed. The fluid RBC count may be similar to the patient's blood RBC count in early hemorrhagic effusions but declines as erythrocytes are absorbed by the lymphatics and altered oncotic gradients cause fluid to shift into the body cavity.

Total protein concentrations: Estimates can be determined using refractometers. This should ideally be performed on post-centrifugation fluid supernatant, especially with turbid fluid samples, to reduce artifactual increases. Additive in some EDTA tubes can refract light causing falsely increased values, particularly with low sample volumes4. More accurate protein concentrations are obtained using chemistry analyzers.

Cytological analysis: Often the most important part of fluid analysis as relying only on cell counts and protein concentrations may produce incorrect diagnoses. Smears are evaluated for relative nucleated cell proportions, neutrophil degeneration, cytophagia, infectious organisms, neoplastic cells, foreign material, frank or previous hemorrhage and any other features. Several excellent textbooks are suggested for further details5-8.

Additional tests: Not routinely performed but desired in select cases. These may include measurement of concentrations of urea, creatinine, triglycerides, bilirubin, lipase, lactate, glucose and pH. Suspected bilious effusion samples should be protected from ultraviolet light because it degrades bilirubin. Lactate, glucose and pH assessment should be performed immediately because storage yields erroneous values. Fresh samples from neoplastic effusions may be further evaluated using advanced modalities such as clonality testing or immunophenotyping using flow cytometry.

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EVALUATION OF EFFUSIONS: SPECIFIC EFFUSIONS & EFFUSION SPECIFICS

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Routine evaluation of cavitary effusion fluid includes its gross appearance, total nucleated cell count (TNCC), protein concentration and microscopic findings. Because a specific pathogenesis may be found, microscopic findings are of most importance. Cellular components in effusions typically include inflammatory cells, mesothelial cells and neoplastic cells. The numbers, proportions and types of cells helps classify and determine the reason for the effusion. A specific cause may be determined, such as finding bacteria, fungi, parasites, lipid droplets, urine crystals, sperm, bile, plant material and barium crystals. Additional tests such as measurement of fluid triglyceride, cholesterol, creatinine, bilirubin, glucose and lactate concentrations may further characterize the fluid.

Transudates are often clear to medium yellow and transparent to mildly turbid. They have low TNCCs, with counts <5.0 x 109 cells/L and typically <1.5 x 109 cells/L, and are either protein-poor (<25 g/L) or protein-rich (>25 g/L). Variable proportions of macrophages and non-degenerate neutrophils are typically, with fewer lymphocytes and mesothelial cells. Mesothelial cells may be found individually or in single layer sheets with bland uniform features. However, they frequently have dark blue cytoplasm and variable degrees of anisocytosis, anisokaryosis, multinucleation and other features found in malignant cells. Differentiating reactive mesothelial cells from exfoliated mesothelioma cells is extremely difficult to impossible; a diagnosis of mesothelioma should not be based solely on cytology. Erythrocytes from contamination, diapedesis associated with increased hydraulic pressure, or hemorrhage may be seen.

Exudates are typically cream to yellow and lightly to markedly turbid or flocculent, with TNCCs >5.0 x 109 cells/L and protein concentrations >25 g/L. Exudates are typically predominated by neutrophils (>70-85%), especially when effusions are caused by bacterial infection. Variable proportions of neutrophils, macrophages and other inflammatory cells may also be seen. This is defined as mixed inflammation; it is typical of chronic inflammation caused by situations such as fungal infections, foreign material reactions and neoplasia. A septic source, especially a bacterial one, is anticipated when neutrophils have degenerative changes.

These are characterized by cytoplasmic vacuolation and swollen nuclei, with loss of segmentation and pale staining chromatin. However, neutrophils may be degenerate with non-septic inflammation, particularly with bile peritonitis and uroperitonitis. Exudative fluid warrants culture whether or not degenerative neutrophils or infectious organisms are observed microscopically. Effusions containing >10% eosinophils are characterized as eosinophilic effusions and are uncommon. When high numbers of eosinophils are present these fluids may be grossly tinted green. Eosinophilic effusions are associated with neoplasia, particularly mast cell tumors and lymphoma, hypersensitivity conditions, dirofilariasis, sarcocytosis, aelurostrongylosis and select neoplasms1-3.

A difference of serum to effusion glucose >1.11 mmol/L has been shown to support bacterial peritonitis4. Lower effusion glucose concentrations may be due to utilization by bacteria and/or cells. Increased effusion concentrations of lactate, a product of anaerobic glycolysis, have been described with bacterial exudates4,5. The increased lactate may be from bacteria, leukocytes and erythrocytes. Increased effusion concentrations of lactate have also been observed in dogs with bowel strangulation6 and abdominal neoplasia7. As cellular metabolism continues post-sampling, glucose and lactate require prompt analysis. A portion of these fluids should be submitted in special tubes containing sodium fluoride to inhibit glycolysis.

Feline infectious peritonitis warrants special mention as effusion formation is exudative, yet fluids tend to have low cellularity (<5.0 x 109 cells/L) and markedly increased protein concentrations (often >45 g/L). This is because the inflammation is a vasculitis. Leukocyte chemotaxis to body cavities is not prominent, yet damaged vessels leak large amounts of protein. Fluids are grossly light to moderately yellow, transparent to mildly turbid and may or may not contain fibrin strands or clots. Microscopically, fluids contain a mixture of non-degenerate neutrophils (~60-80%) and macrophages (~20-40%) with few lymphocytes/plasma cells and mesothelial cells. Given the high protein concentrations, the stained smear background is typically lavender to purple, stippled with precipitated protein. Protein crescents are often seen.

Hemorrhagic effusions are grossly bloody during collection and do not clot in non-anticoagulant tubes. The TNCC, erythrocyte count and total protein concentration may be similar to but are usually lower than that of blood. Concurrent inflammation will increase the TNCC. Nucleated cells consist of leukocytes, low numbers of macrophages and mesothelial cells.

Erythrocytes predominate and platelets are absent. Erythrocytophagia, macrophages containing hemosiderin and/or hematoidin crystals found intracellularly or extracellularly support previous hemorrhage and are key diagnostic features. When present, platelets support either very recent pathological hemorrhage or iatrogenic hemorrhage. Trauma, hemostatic disorders and neoplasia are classic sources of hemorrhagic effusions. Various infectious agents also can result in hemothorax8,9. Idiopathic pericardial effusion in dogs is well-recognised and may warrant further evaluation for vector-borne disease10.

Chylous effusions are grossly white, creamy to pale pink-red and opaque. An upper creamy lipid layer may present if the fluid is refrigerated or left standing. The TNCC is highly variable but usually >2 x 109 cells/L and < 15 x 109 cells/L in the author's experience. Protein concentration is often >25 g/L but may be falsely increased by lipemic artifact. Small lymphocytes typically predominate with fewer non-degenerate neutrophils and macrophages. Macrophages usually contain numerous round uniform clear lipid vacuoles. With chronicity and irritation by chyle, neutrophils may out number lymphocytes. Fluid triglyceride concentrations >1.1 mmol/L confirms chylous effusion11. However, anorexic patients may have lower triglyceride concentrations and the fluid may not be grossly chylous. Historically, trauma has been a commonly listed source for chylothorax. However, external trauma is a less common source than lymphorrhage associated with altered lymphatic drainage. Causes include increased systemic venous pressure such as seen with right-sided heart failure, heartworm disease and pericardial effusion, or with lymphatic compression by neoplasia, granulomas or lung lobe torsion. When an underlying source cannot be isolated, the chylous effusion is characterized as idiopathic. Chylous peritoneal effusions are rare and typically associated with lymphangectasia or lymphatic obstruction.

Uroperitoneal fluid may be clear to medium yellow and transparent to mildly turbid. Acutely, findings mimic that of a protein-poor transudate. However, with time and mesothelial irritation from urine, peritonitis develops. While clues such as urinary crystals and spermatozoa may aid diagnosis in select cases, uroperitoneal fluid usually lacks specific findings. Clinical suspicion of uroperitoneum and creatinine evaluation are required. Fluid creatinine concentrations >2 times that of concurrent serum samples support uroperitoneum12. However, as time and pre-existing azotemia will impact fluid creatinine concentration, lower values do not completely exclude uroperitoneum.

Bilious effusions are classically green to green-brown and moderately turbid to opaque. Depending on chronicity and leakage volume, effusions may resemble transudates. However, an exudate with mixed inflammation predominated by neutrophils and variable numbers of macrophages is typical. Presence of intra- or extracellular amorphous to granular, yellow to green-brown bile pigment provides an excellent diagnostic clue. The fluid bilirubin concentration can also be assessed and is usually >2 times that of serum bilirubin concentration13. Ultraviolet light degrades bilirubin so samples should be protected from light. Bilirubin concentrations may be low in patients with ruptured gall bladder mucoceles. In such patients, the mucinous component of bile (referred to as white bile) may be observed in the effusion. It appears as amorphous to fibrillar, sky to deeper blue, extracellular material on Wright-Giemsa stained smears, blue with Alcian blue-PAS stain and deep red with mucicarmine stain14.
Bilious effusions are typically due to trauma, mucoceles, cholelithiasis, neoplasia and necrotizing inflammation. Gut leakage or rupture generates effusions that are grossly tan to brown and variably turbid. Fluid may be flocculent with food or particulate matter. The TNCC and protein concentration vary and volume may be low in acute cases. Automated TNCCs should not be trusted as organisms and debris may be falsely counted as cells. Ultimately, a septic peritonitis develops. Concurrent hemorrhage may be seen. Finding phagocytized bacteria is a key differentiating factor from partial enterocentesis. Incidental enterocentesis should contain only intestinal contents, lacking inflammatory cells. Severe inflammation, trauma, obstruction, torsion and strangulation are some sources.

Although not part of the mechanistic classification of effusions, neoplastic effusions deserve recognition. They often allow an immediate, specific diagnosis, and are created by one or more of the five effusion mechanisms. Neoplastic effusions are highly variable in gross appearance, TNCC and protein concentration due to variation in duration, tumor type and presence of secondary inflammation and/or hemorrhage. Round and epithelial cell neoplasms readily exfoliate cells. Sarcomas rarely cause effusions and their cells rarely exfoliate cells. Common neoplasms include lymphoma, carcinomas and adenocarcinomas, with mast cell neoplasia and mesothelioma less commonly observed. Lymphoma of granulated lymphocytes may be difficult to differentiate from mast cell neoplasia on cytology alone. Morphology may strongly overlap between some lymphomas, carcinomas and mesotheliomas, requiring advanced modalities such as flow cytometry and clonality testing for diagnosis.

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UTILIZING ANIMAL HANDLING TOOLS THAT REDUCE STRESS AND INCREASE EFFICIENCY AND SAFETY FOR ALL

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Introduction

Animal handling tools are designed to expedite veterinary procedures and increase safety, which will, in turn, reduces patient stress, reduces staff stress, and increases owner satisfaction. The key to successfully integrating handling tools into the veterinary practice is using them correctly, using them often, and using them early. Handling tools are most helpful if integrated early in the handling plan. Owners should be encouraged to expose their pet to these tools at home, away from the presence of noxious stimuli so that the tools do not become predictors of stressful events.
Canine Handling Tools

Muzzles

The “sleeve” style of muzzle fits tightly over the nose and mouth, holding the mouth closed. The pros of this type are that the muzzle can be placed quickly if it is the stiffer, leather type and the animal can lick food from the open front of the muzzle. Cons are that the muzzle prevents the dog from panting and should only be worn for brief procedures as the patient may overheat if wearing of the muzzle is prolonged. Furthermore, the dog can still bite with the exposed incisors. The “basket” style of muzzle is an open plastic or metal cage or basket which encloses the entire nose and mouth. The pros of this type are that the muzzle allows for some level of panting, making it safer to be worn for longer procedures and when a dog is kenneled and that food can easily be smeared along the inside of the muzzle which may encourage the dog to place its nose into the muzzle without a struggle.
Dog appeasing pheromones - DAP (Adaptil; Comfort Zone)

This pheromone product is available in a spray, body heat-activated collars, and plug-in diffusers. It is an analog of the appeasing pheromone produced by the bitch from the sebaceous glands in the inter-mammary sulcus, which serves as a signal of food, comfort and safety for the puppies. The spray can be applied to a bandana that can then be placed on the dog, or applied to a towel and placed on the exam table. Never spray directly on a dog and be sure to allow a brief time for an application to “air out” prior to placing the bandana on a dog. Diffusers can be plugged into outlets in exam rooms, treatment areas, and kennel areas where dogs are housed.
Thunder (aka “Calming”) Cap (ThunderWorks, Durham, NC)

This is a sort of “blindfold” made of soft, semi-opaque fabric that covers the dog’s eyes in order to limit the intake of visual stimuli. This cap helps reduce the stress associated with the anticipation of procedures. When dogs do not witness the events prior to the procedure, the chances are much greater they will remain calm. It is helpful for dogs with aggression issues associated with the sight of unfamiliar dogs or people when moving them from the car to the lobby, through the treatment area, or one part of the hospital to another. Hospitalized dogs with dog aggression issues can wear this cap when confined to prevent agitation from the sight of other passing or hospitalized dogs.

Thundershirt (ThunderWorks, Durham, NC)

This tool is a body wrap that swaddles the dog, providing firm, balanced pressure around the chest and torso. Design is based on evidence that evenly applied pressure on the body may reduce anxiety and fear.

Squeeze cage

For dogs that are not safe to muzzle, the squeeze cage can be used to administer an injection for chemical restraint. The dog can be placed into the cage by the veterinary staff or by the owner, depending upon which option is safer and easier for the dog. Once the dog is contained, the back wall is gently pulled forward, pushing the dog up against the front of the cage. After the injection is administered, the back wall is released and the dog can remain in the cage until responding to the sedation. Alternatives to the squeeze cage may include a chain-link panel that swings out from the wall. The injection for chemical restraint can then be administered through the panel.

Towel restraint

For dogs who cannot be muzzled due to brachycephalic conformation or intense fear of the muzzle, towels can be used to provide control of the head. Apply just enough pressure to restrict movement and not restrict breathing.

Elizabethan collar restraint

For dogs who cannot be muzzled due to brachycephalic conformation or intense fear of the muzzle, Elizabethan collars can be used to provide control of the head. If safe for the owner to place the collar, it may be best to have them place it at home, prior to entering the clinic. The head can be controlled, using two hands behind the collar to grasp the neck and head firmly, but gently.
Feline Handling Tools

Muzzles
In cats, muzzles are typically used to cover both the mouth and the eyes. This provides safety to the handler as well as minimizes visual stimuli that may be stressful for the cat. Stiff leather or plastic muzzles are preferable for fractious cats as they are unable to bite through the tougher material.

Towels
Head control and reduction of visual stimuli are the primary purposes of towels when handling cats. For fleeing or fearful cats, often it is enough to place the towel over the head, then push the towel under to include the head and feet. Any movement forward will be inhibited by the pressure of the towel and many cats will then calm down. The clinician then has access to the rear end and of the cat for auscultation, abdominal palpation, and medial saphenous venipuncture. Be sure that the wrap is fit snuggly to provide firm, balanced lateral support. This will prevent flailing and help the cat remain calm, while preventing scratching with the front or rear claws.

Feline facial pheromones (Feliway; Comfort Zone)
Feliway is available in a spray and plug-in diffuser. It is an analogue of the facial pheromone released from the perioral gland of cats when cheek rubbing (bunting) on prominent objects, people and other animals. Placing synthetic facial pheromones in the hospital environment may help cats eat fasterand be more tractable with handling. These Pheromones should not be directly sprayed onto the cat. Instead, spray the exam table towel, cage padding, and/or the inside of a cage cover.

Clipnosis (KVP International, Irwindale, CA)
“Clipnosis” is performed using the proprietary Clipnosis Gentle Calming or other tools, such as binder clips, which provide firm, steady pressure when placed on the scruff of a cat’s neck. The pressure provided is greater, more evenly distributed, and more consistent when compared to hand “scruffing”. Scruffing a cat typically does not provide equivalent behavioral calming. Once the pressure is applied, there is a resulting pinch-induced behavioral inhibition. Cats reach a “trance-like” state, becoming calm, semi-immobile, and relaxed, without activation of a stress response. Note that all cats are not responsive to the clips. Cats that are averse to pressure on the scruff or are fractious with handling are not candidates for Clipnosis. Some veterinarians have reservations regarding the clipping procedure and its effects on behavioral inhibition through freezing vs. calming.

The carrier
The cat’s own carrier can be a valuable handling tool, especially for fearful cats. A towel can be slid under the top and over the cat as the top half of the carrier is slowly lifted and removed. This method allows for the cat to remain in a familiar area and tends to prevent fleeing as the sides of the carrier provide some sense of concealment. Soft sided carriers are useful for cats in need of intramuscular injections for chemical restraint. Keeping the familiar carrier within the cage has been shown to help hospitalized cats go back to eating sooner during recovery. The carrier is a most effective tool for cats that have been conditioned to feel comfortable entering on their own and remaining calm in it during car travel.

EZ Nabber (Campbell Pet Company, Brush Prairie, WA)
Mesh netting is tightly secured to a metal enclosure which opens and closes manually to allow for capture and restraint of cats. It is especially helpful for feral or fractious cats who are fleeing or housed in a wall unit cage as it puts a 2 foot distance between the handler’s hands and the cat. It is used to administer chemical restraint intramuscularly as injections can easily be given through the mesh netting.

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WHY DO ACCIDENTS HAPPEN?

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Prevalence of unwanted behaviours and injuries.
A study conducted by the British Equine Veterinary Association concluded that working as an equine veterinarian was the most dangerous profession in terms of occupational injury. It found equine veterinarians sustained more severe injuries than those working in the construction industry, prison service or fire service. A study of veterinarians conducted by the presenter found that equine veterinarians frequently have to work with challenging horses. In this study, 95% of 132 veterinarians reported interacting with horses they perceived as difficult on at least a monthly basis. The most common unwanted behaviours they had to deal with were horses that were pushy, would not stand still, were needle shy or head shy. Other commonly encountered unwanted behaviours included horses that were clipper shy, kicked out with a hind foot, pulled away from the handler, refusing to load into a trailer or striking out with a front foot. In this survey, 81% of the equine veterinarians had sustained an injury in the previous 5 years as a result of the behaviour of the horse they were working with. When asked how they control or restrain horses that were difficult they tended to favor traditional methods that were based on physical restraint.

Arousal

Arousal refers to the level of alertness of the horse, with increased arousal being associated with elevated heart rates and blood pressure. The opposite of course would be relaxation. High levels of arousal are associated with hyper reactive behaviours such as bolting, kicking out and rearing. Horses that are in a highly aroused state are more likely to over react to what would normally be innocuous stimuli, for example placing the stethoscope on the chest wall. Arousal levels can be associated with a positive emotional state such as a stallion teasing a mare. However, in the veterinary context it is usually associated with a negative emotional state i.e. fear. By being able to monitor the arousal levels of horses we can predict when they are liable to react adversely.

Level of Arousal		
	High	Low
Muzzle	Lips pursed and tense	Lips relaxed, lower lip may even droop
Nostrils	Flared, tight lines around them due to prominent muscles of fa-cial expression	Relaxed and comma shaped
Eye	Rapidly moving or more com-monly fixed and frequently look-ing slightly backwards which re-veals some of the sclera	Soft and quietly moving accord-ing to the environment
Eye lids	Triangulation of upper eyelid due to prominent muscles of facial expression	Upper eyelid is a smooth curve where it merges with the head
Ears	Rapidly flicking around or more frequently fixed either out to the side or slightly backwards	Quietly moving back and forth or softly out to side
Head height	Above the height of the wither, generally the higher the head the higher the level of arousal	Approximately level with or slight-ly above the height of the with-ers, may be much lower in very relaxed horses
Neck musculature	The muscles on the underside of the neck are prominent	The muscles on the topline are prominent
Skin over neck	Tight making it difficult to grasp in a neck twitch	Loose making it very easy to grasp a full fistful for a neck twitch
Jugular vein	Is flat and difficult to raise	Easily distends when raised
Body	Musculature is prominent and hard to palpate	Musculature is soft and relaxed
Vasculature	Prominent across body	Not prominent
Forelimbs	Stiff with prominent musculature	Musculature appears soft, no tension evident
Hind limbs	Musculature prominent, may be slightly flexed/ hind quarter low-ered in a crouched position	Musculature soft, one hind limb resting
Tail	Clamped down to body, or oc-casionally raised	Resting loosely against body and easily raised.

Summary including 5 KEY “TAKE HOME” POINTS
1. Working as an equine veterinarian caries a high risk of occupational injury and the behaviour of the horse is a frequent cause of these injuries
2. Horses are frequently described as being unpredictable however they are actually fairly easy to predict with some training
3. Horses with high levels of arousal are likely to be hyper reactive and are more dangerous to work with
4. The arousal level of the horse should always be monitored when working with them, as described in the table above
5. When the horse is in a state of high arousal behaviour modification techniques can be used to relax the horse rapidly and these will be discussed in the accompanying lectures

Summary

Working as an equine veterinarian is a potentially dangerous occupation. Equine veterinarians frequently encounter horses exhibiting unwanted and potentially dangerous behaviours. While horses are frequently described as being unpredictable animals this is not true. With a limited amount of training equine veterinarians can learn how to predict a horse’s behaviour more accurately and also learn how to take steps that make the scenario safer and less stressful for all involved.

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HOW TO SURVIVE (AND THRIVE) IN VETERINARY PRACTICE

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Veterinary care providers commonly struggle with strategies to «stay sane» and maintain work-life balance. Given the difficulties faced by veterinary professionals on a regular basis, practical strategies for setting boundaries, saying no, and daily debriefing are needed to foster wellness and resilience. These function to expand awareness of a person's needs, as well as conserve their limited physical and emotional resources. They also foster life balance including separating work from play and rest.

Building Better Boundaries

Unhealthy boundaries occur when we do not set limits on ourselves or others. Some examples include going against our personal values or rights to please others, letting others direct our life, letting others describe our reality, looking to others to define us, or expecting others to think, feel, and behave the same way we do.
Healthy boundaries are essential to healthy relationships and leading a healthy life; however, boundary-building can be a challenging concept for many people. Having healthy boundaries basically means knowing and understanding what your limits are and not allowing them to be compromised.

Name your limits. To set boundaries, you must first identify your physical, emotional, mental, and spiritual limits. In veterinary medicine, this also means identifying your moral stressors. Know what you can tolerate and accept versus what makes you feel uncomfortable or anxious. Identify where you need more space, self-respect, energy, or personal power.

Tune in to your feelings. Feelings of discomfort or resentment are "red flags" or cues that a boundary has been crossed. Pay close attention to when you lose energy, feel a knot in your stomach, or want to cry. If you notice these feelings coming up for you in certain situations or interactions, ask what it is about the situation, interaction, or expectation that is bothering you. Resentment usually stems from a feeling of being taken advantage of or not feeling appreciated and can be an indication that you are pushing yourself beyond your limits.

Be direct. If people have similar communication styles, views, or personalities, they tend to approach each other similarly and maintaining healthy boundaries does not require a direct dialogue.

However, when dealing with people who have a different personality or background, you will need to be more direct about your boundaries.
Give yourself permission. Fear, guilt, and self-doubt can inhibit our ability to set boundaries even when we feel drained or taken advantage of. Boundaries are a sign of self-respect, so give yourself the permission to set boundaries and work to preserve them.

Practice self-awareness. Boundaries are all about tuning into your feelings and honoring them. If you notice yourself slipping and not sustaining your boundaries, consider what has changed, what you have control over, and what you can do about it.

Consider your past and present. If you have a history of ignoring your own needs and focusing on others, you have probably previously let yourself become drained emotionally and physically. Consider this when setting boundaries, especially in relationships, and ensure that they are reciprocal.

Make self-care a priority. Give yourself permission to put yourself first, such that your motivation to set boundaries becomes stronger. This also means recognizing and honoring your feelings, which serve as important cues about your wellbeing and what makes you happy. Remember that putting yourself first also gives you the energy to have a more positive outlook and be a better co-worker, friend, partner, etc.

Seek support. If you're having a difficult time setting boundaries, consider seeking support, whether it's from a support group, counsellor, therapist, life coach, friend, or mentor. Also consider sharing your boundary-setting goals with friends or family so that you can be held accountable.

Be assertive. It is not enough to create boundaries; we must abide by them as well. Do not expect others to read your mind and know when they cross a boundary. You must assertively communicate with that person to let them know. There is no need to defend, debate, or over-explain your feelings. Be firm, gracious, and direct, and when faced with resistance, repeat your statement or request. Remember that if you give in, you invite people to ignore your needs.

Start small. As with any new skill, assertive communication of boundaries takes practice. It is best to start with a small boundary that is not threatening or overwhelming you and then slowly increase to more challenging boundaries. Setting boundaries takes courage and practice but is a skill that anyone can master.

When to Say No…
It can be difficult to determine which activities in our lives deserve our time and attention and what we must say no to. To evaluate opportunities and obligations that come your way, consider the following:

Focus on what matters most; examine your obligations and priorities before making any new commitments. Ask yourself if the new commitment is important to you. If it's something you feel strongly about then do it, if not, pass.

Weigh the yes-to-stress ratio; is what you are considering a short- or long-term commitment? Do not say yes if it will mean months of added stress. Instead, look for other ways to contribute.

Take guilt out of the equation; do not agree to a request that you would rather decline out of guilt or obligation. Doing so will inevitably lead to additional stress and resentment.

Sleep on it; before you respond, take a day to think about the request and how it fits into your current commitments. If you cannot sleep on it, at least take the time to think the request through before responding.

Imagine saying yes and then tune into your feelings; visualize what life will be like if you commit to the request and then become aware of your thoughts and feelings as they arise. If you feel anxious, resentful, or stressed, then consider saying no.

How to Say No…
Saying no is often not as simple as we would like it to be. Here are some simple strategies to help.

Say no. The word «no» is a complete sentence and has power. Do not be afraid to use it. Be careful about using wimpy substitute phrases, such as «I›m not sure» or «I don›t think I can.» These can be interpreted to mean that you might say yes later.

Be brief. State your reason for refusing the request, but do not go on about it. Avoid elaborate justifications or explanations.

Be honest. Do not fabricate reasons to get out of an obligation. The truth is always the best way to turn down a friend, family member, supervisor, or co-worker.

Be respectful. Good opportunities will arise and it can be tough to turn them down. Complementing the person›s effort while saying that you cannot commit shows that you respect what they are trying to accomplish.

Be ready to repeat. You might need to refuse a request several times before the other person accepts your response. When that happens, just hit the replay button. Calmly repeat your no, with or without your original rationale, as needed.

Other Things to Consider When Saying No at Work…
More than ever, people are expected to do more work in less time. People say yes to requests because they want to be a team player, look eager, or simply be nice. But saying yes all the time can lead to burnout.

Take time to consider the request; determine how much time you will need to perform the task well and how the request fits into your existing demands. Before you say yes, you want to think clearly about the advantages and disadvantages.

Offer an alternative; while saying no, try to help the other person who approached you with the request. Ask if you can do something else to help or offer to comply with the request later.

Say no in person; email or text messages can be misinterpreted and the willingness that you express through your tone of voice might be missed. To avoid insulting the other person, call them on the phone or schedule a meeting, if possible.

Avoid details; keep your explanation short and simple. By describing your entire calendar or other commitments, you run the risk of seeming defensive about your choices and the person might question the importance of your other obligations.

Consider the consequences; weigh the risks and benefits of each refusal, both personally and professionally. If you are a new employee, you might have less leverage when it comes to declining a request. However, saying yes to an opportunity might get in the way of other professional goals. If you have concerns about that, voice them.

Do not respond with self-deprecation; the person making the request might respond with flattery and insist that you oblige the request. Instead, lay out your current assignments or lack of availability as an explanation.

Ask for help; if needed, explain that you have a real conflict and are trying to resolve it. For example, if a colleague asks you to take on an extra call shift say "I'd love to cover your shift, but I made a commitment to my family to have one day off each weekend. Can you cover my Sunday shift in lieu of me covering your Saturday shift?" Keep your explanation as simple as possible.

Debriefing

Personal debriefing is a means of recognizing how an experience was for an individual and aims to help integrate the experience into their life, perceive the experience more meaningfully, and bring a sense of closure. It requires personal reflection and can help with disengaging from work at the end of a shift. Essentially, it gives closure to work and work relationships, while acknowledging the good work that was done. Personal debriefing should be performed on daily basis when completing a shift or other work done that day.

Steps of Daily Debriefing

Check that tasks are finished and that documentation is completed, then deal with any outstanding issues. If items are essential, then complete them. Otherwise delegate or write them down to complete the next day.

Acknowledge the day and recall what went well and what did not. Try to focus more on the positives and less on the negatives. Recognize that the best work was done with the time and resources available.

Handover responsibility for the care of patients. Be conscious during case transfers that total responsibility is being passed along to colleagues.

Close computer or paper files with intention.

Say goodbye. This is closure for the day on relationships with patients, clients, and colleagues.

Debrief and de-role by taking through any distressing events. If time does not allow this, then arrange for a debrief later if needed. Take off ID badges/name tags, scrub tops, work shoes, etc. or use other personal rituals to signify that work is done. Use any reminders to signify that work is complete and it is time to shift from work to home life.

Make the journey home a final separation between work life and home life.

If on-call or work from home is required, create a specific space at home for professional work and try to keep to this space only when working. Then develop a ritual that signifies when work is completed (e.g., closing the door to the office).

If thoughts of work come up at home, write them down and keep them in the work space or work bag. If they are still present the next day, consider talking them through with someone or scheduling a debrief with a colleague if needed.

Ensure that no matter the circumstance at work, that others can be contacted for support if needed. Isolation, loneliness, or lack of belonging can lead to psychological distress during difficult time. Have the names and contact information of trusted co-workers or colleagues that can be called to talk through difficult situations should the need arise.

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TREAT CATS THAT CHEW THEIR HOME AND HAIR

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Chewing, both environmental and self-directed may be normal behavior, a displacement behavior arising out of conflict, frustration and stress, or an abnormal repetitive behavior which may a result of an underlying medical condition or a compulsive disorder. Stress may also contribute to both gastrointestinal and dermatologic disorders. The diagnosis is further complicated as the medical problem could be the cause or an effect of the behavior. For example, self-trauma can lead to pain, inflammation, and infection while pica can lead to gastrointestinal signs and foreign body obstructions.
Compulsive behaviors arise from normal behaviors that become exaggerated, repetitive, out of context, and fixated on a goal. They may be sufficiently intense or sustained that they cannot be easily interrupted or directed into alternate outlets. In addition, there may be a lack of control in terminating or initiating the behaviour. They behaviors may initially be seen in response to situations of conflict (competing motivations or uncertainty), frustration (motivation to a achieve a goal that is behaviorally or physically prevented) and in environments that do not adequately meet the pet's behavioral needs. With repeated stress, the behavior may become compulsive with altered neurochemical responses, especially in individuals that are genetically predisposed. Abnormal serotonin transmission has been identified as a primary mechanism by which compulsive disorders are induced and drugs that inhibit serotonin reuptake can be effective e.g. clomipramine, fluoxetine1,2. However, multiple neurotransmitters might be implicated including alterations in dopaminergic and glutamatergic pathways or opioid receptors.3

ENVIRONMENTAL CHEWING

Environmental licking, chewing and picas may begin as normal behaviors arising from play and exploration, or because of taste, texture or odor appeal. However, the behaviors become compulsive when they are repetitive, excessive and fixated on a goal including wool or fabric sucking, chewing or pica. In one focused on Siamese and Burmese cats, wool was most commonly chewed, followed by cotton, synthetic fabrics, rubber, and plastic.2 In Siamese, Burmese and Birman cats, there appears to be a genetic predisposition, which may be triggered by social or physical stressors in the environment.2,4-6.

In another study of 91 cats with pica, most of which were domestic shorthair, the most common targets were shoelaces, thread, plastic and fabric.7 No association was found between pica and a suboptimal environment or early weaning.7 Significantly more cats in the pica group were likely to self suck, indicating that there may be common contributing factors.7

Compulsive disorders are diagnosed by first ruling out medical conditions that might cause or contribute to the signs including anemia, FIP, hyperthyroidism, diabetes mellitus, cancers, and gastrointestinal disease.7,8 In a recent case series of cats with fabric sucking and ingestion, 7 of 8 had mild to moderate gastro-enteritis. However, only 3 improved with gastrointestinal treatment.8 Compared to a control group, cats with pica vomited more frequently and cats in the control group were more likely to be fed ad-lib.

SELF-TRAUMA

In cats, self grooming and scratching increases in response to conflict and with repeated stress which might progress to self traumatic disorders.3,9 In addition, stress might contribute to increased inflammation and pruritus.

Medical differentials include adverse food reactions, atopy, parasitic hypersensitivity, parasites, fungal infections, pain or discomfort at the site of licking and the dermatologic manifestations of systemic diseases e,g. hyperthyroidism, hepatocutaneous syndrome. Drug reactions including treatment with methimazole can also cause pruritus. In a clinical trial of 21 cats referred for psychogenic alopecia, each cat was examined, anal sacs expressed and a trichogram, CBC, biochemical profile, T4, FeLV and FIV testing, urinalysis, fungal culture, skin scraping and biopsy performed. If there were no abnormal findings, a parasiticide (Revolution®) and an 8-week trial of hydrolyzed protein diet (Hills prescription diet Z/D) were dispensed. If the cat improved significantly, it was challenged with its own food. If there was no improvement, the cat was treated with 2 injections of methylprednisolone acetate 3 weeks apart to rule out pruritus. Using this protocol, 16 cats were diagnosed with a medical etiology, 2 were psychogenic, and 3 had both. A combination of atopy and adverse food reaction was most common (12 cats). Out of 20 cats biopsied, 14 had inflammatory skin lesions. All cats with histological evidence of inflammation had an underlying medical condition. However, of 6 cats with no histological abnormalities, 4 had atopy, an adverse food reaction or both.10

TREATMENT

As stress is an underlying factor in initiating and maintaining the behavior and may be a contributing factor to gastrointestinal and dermatologic disorders, stress assessment and management (both social and environmental) is an integral part of both diagnosis and treatment. However, a combination of both behavioral management and drug therapy will generally be required for successful improvement of most compulsive disorders.

First insure that all of the cat's behavioral needs are sufficiently and appropriately being met for bedding, perching, climbing, hiding, scratching, elimination, food and water, and object and social play as well as sufficient resources to avoid conflicts with cats, dogs, and family members. Desirable behaviors should be rewarded and sources of stress identified and prevented or resolved. Evaluate for owner responses that inadvertently reinforce the behavior or further add to the pet's anxiety including. Unpleasant interactions and fear evoking stimuli must be identified and avoided e.g. handling, visitors, children, other cats. Train with rewards to reinforce what is desirable, including one or more cues to train alternate behaviors (mat, come/touch). Punishment must be avoided, since even if it suppresses the undesirable behavior, it will cause fear, conflict, and avoidance and negatively impact the human animal bond.

Provide constructive activities to maximize enrichment including working for food (food filled toys), multiple small meals, outlets to explore, chew and chase, positive social interactions including play and reward training, and resting places and bedding that are elevated and secure. An e-collar might prevent self-trauma and provide temporary relief, while separation or cat proofing will prevent access to objects that might be chewed or ingested; however, unless positively conditioned to wearing collars or to confinement this will add to further anxiety.

If observed in the act, cue, lure or reorient the pet into a desirable behavior or ignore the pet until it settles. A leash might be left attached (to a body harness) to prevent undesirable and prompt the pet into an acceptable outcome. For stimuli or situations that lead to fear and anxiety, avoid exposure or desensitize and countercondition to change the response.

Together with behavior management and modifications, drugs or supplements may be indicated to reduce fear, anxiety, stress, impulsivity and reactivity. These might include natural products such as pheromones, l-theanine, alpha-casozepine or combinations of ingredients; bennzodiazepines, buspirone, gabapentin, clomipramine or selective serotonin reuptake inhibitors. For situational or as needed use, gabapentin, trazodone, and benzodiazepines such as alprazolam, lorazepam or clonazepam might be considered.

For compulsive disorders, treatment with a selective serotonin reuptake inhibitor (fluoxetine or paroxetine) or with clomipramine should provide some measurable improvement within 4 to 6 weeks. If there is insufficient response, a higher dose, drug combination or change in medication will be required.

Drug	Dose
Alprazolam	.125 mg - .25 mg per cat prn up to tid
Lorazepam	.05-.25 mg/kg (0.125-0.25 mg/cat) prn up to bid
Clonazepam	0.02 – 0.25 mg/kg prn or up to bid
Fluoxetine, paroxetine	0.25-1.5 mg/kg q 24h
Clomipramine	0.25-1.0 mg/kg q 24 h
Trazodone	50-100 mg / cat prn
Gabapentin	10-30 mg/kg (50-100 mg/cat) prn up to tid
Buspirone	.5 to 1 mg/kg bid

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WHAT'S NEW IN DIETARY THERAPY FOR RENAL DISEASE

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Chronic kidney disease (CKD) is a common disease in both dogs and cats, especially of advanced age. Clinical trials support the use of specific diets that improve both survival and quality of life1,2. Dietary management is the main treatment of this disease in both species. 3 Nutritional modifications include phosphorus restriction, protein and sodium moderation, B vitamins supplementation and alkalinization. Potassium content is variable, but tends to be higher in feline CKD diets vs maintenance. Some CKD diets also include long chain omega 3 fatty acids EPA and DHA.

Feeding plan

Nutritional evaluation
A complete nutritional evaluation (http://www.wsava.org/guidelines/global-nutrition-guidelines) should be carried out before making recommendations. The evaluation includes diet and medical history and a complete physical exam, including body condition score (BCS) and muscle condition score (MCS).
When to start feeding a CKD diet
Clinical studies have seen benefits of CKD diets in stages II to IV, it is unknown if using such a diet would be beneficial in stage I (unless there is proteinuria). That said, the better the patient feels, the easier to switch diets. Several manufacturers have early stage CKD diets, with the same modifications but in a less aggressive manner.

Diet choice

Diets for CKD have the following modifications:
Phosphorus restriction addresses renal secondary hyperparathyroidism. The IRIS society (www.iris-kidney.com) recommends the use of low phosphorus diets early in the disease. In later stages, phosphate binders will be required at later stages, where dietary restriction is not enough

We do not know the effect of dietary sodium on renal or systemic hypertension, so CKD diets are not really restricted, but provide moderate sodium, below typical maintenance diets. A very low sodium diet is not desirable since it stimulate the renin angiotensin aldosterone axis and result in hypertension4.

Potassium varies amongst renal diets. Some patients (especially canine) can show hyperkalemia, associated for example to treatment with ACE inhibitors, and they respond well to dietary moderation of potassium.5
Protein is never restricted in CKD patients, because it is required for body functions. However, the goal is to avoid excess to minimize nitrogen waste products. For this reason, CKD diets should provide moderate protein amounts of a high biological value and digestibility, to avoid creating essential amino acid deficiencies. Protein moderation seems to help more with quality of life than survival3 with the possible exception of proteinuria, where is helps reduce protein losses. The NRC6 minimum protein requirement for dogs is 8% protein calories and for cats 16% protein calories, while AAFCO recommendations for adults are, respectively, 16 and 22%. All CKD diets provide above NRC requirements in dogs and, in cats, they all provide protein above AAFCO requirements for healthy pets. However, protein deficiency can occur in patients with poor appetite that do not eat enough. An inadequate energy intake will result in muscle mobilization.
Diets for CKD should have high B vitamins concentrations to compensate for increased losses due to polyuria

Diets for CKD promote alkalinization to help manage the acidosis that is caused by the disease

EPA and DHA have shown positive effects on experimental canine CKD7, and one retrospective study in cats suggested that diets rich in these fatty acids could result in longer survival8 but we need more prospective research in both species with spontaneous disease.

Per the above, it is indicated to choose a commercial CKD diet from a reputable brand. Diets differ in the degree of nutritional modifications but also on energy density, palatability, texture, etc. Choice will be affected by price, availability, palatability, and how well the nutrient characteristics of the diet match the nutritional evaluation of the patient. Treats can be given, as long as they provide less than 10% of the total daily calories and follow the same strategies as the main diet.

If a homecooked diet is desired, consult a specialist (www.acvn.org, www.esvcn.eu) to get a customized recipe.

Amount to feed

The amount of food should be enough to maintain a stable body weight and ideal BCS. Label instructions are a good start (or formulas, such as http://www.wsava.org/sites/default/files/Calorie%20requirements%20simple%20cat.pdf)

but they will need twice a month adjustments, since formula error is common. Patients with low BCS should be fed 20% more of label instructions/formulas. Weight loss can be attempted in overweight patients if it affects negatively quality of life. In that case, we aim for a weight loss rate of <0.5% body weight per week.

Feeding method

Thin animals with picky appetite will benefit from either ad libitum feeding or multiple meals per day. Normal weight patients can be fed ad libitum as well, unless they are obese prone. If they are obese prone or already overweight, portion control is indicated.

Follow up

In addition to standard CKD monitoring (via physical exam, bloodwork, urinalysis, medical history), regular nutritional evaluations (including weight, BCS, muscle mass, food intake, etc) are important to adjust the plan.

What to do if they do not eat the diet:

Hypo and anorexia should always be worked up. There might be issues that can be managed, such as dehydration, anemia or nausea. Moreover, the use of appetite stimulants can be considered.

Renal diets are high in energy density to promote energy intake even with an inconsistent or poor appetite. In these cases, dry foods are helpful, since they are more energy dense than canned.

Patients that are losing weight due to a poor appetite might need assisted feeding via feeding tubes that can also be used for hydration and to medicate the patient.

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RALLYING THE TROOPS: STRATEGIES FOR SUCCESS - STRATEGIES/COLLABORATION

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Let's start with an important note. The team includes everybody. It amazes me when people comment about the team as a separate entity to the veterinarians or owners. You are all in it together – each person committed to a common goal in their own way. This is why one of the most critical elements on a team – for any team member – is knowing what is expected of you. The other would be, what is expected of Us.

The team serves a Big Picture purpose. Each team member also serves a purpose and, that purpose, is directly related to the team's purpose. How can you all be working towards common goals if you don't know what they are, and what your role is within them?
If people are to work collaboratively, they must be unified in the reason they exist as a team. Whether a Mission Statement, Vision Statement, Core Values or other element that identifies a way of "being," we must remember that these are tools to be utilized, not static pieces. Do not get distracted by language. One person's mission might be interpreted as a part of another's values and at the end of the day, what matters, is that your team has language and a structure that resonates with them. Include them in the creation of these philosophical elements when possible, and involve them regularly in conversations that put these elements to the test for team comprehension, alignment and adherence (especially in light of new team members and an ever-changing environment). No matter what, a structure that sets the tone of who we are, how we want to be and what our goals are as a group, is an important foundation for team.

Team Meetings

Scheduled team meetings are a necessary component of successful practices. The concept that, with minimal distraction, the team can come together and discuss ideas, operations, medicine and service are key. Meetings can also help to develop and reinforce culture, best practices and team dynamic. Meetings should be a safe space, a place where people come together to contribute honestly for the good of the team and practice. There should be the understanding that we all want to be our best, constructive feedback about things that are not working should be welcomed. Attitude is everything. Create an agenda:

Structure and an eye on timing are important. Allow for "new business" but don't lose track of things being worked on from previous meetings. Involve the team in agenda topics.

Rotate the Chair: Meetings do not always have to be led by the same person throughout. Give others a voice, assign topics to different people, share the stage.

Keep minutes: It is important to document discussions, outcomes, ideas and things to follow up on. Minutes also allow missing team members the opportunity to stay informed. (consider having minutes initialed by those who have missed a meeting, to acknowledge their review)

Educate: Utilize representatives from companies to keep your team educated, but do not only hold meetings for guests. Encourage in-house training and mentorship.

Have Fun: Create games for sharing examples of good service and bad service, maintaining "house pride," achieving goals (financial, compliance or otherwise) etc.

Share: The team shares in situations that only they will be able to relate to. Acknowledge patients who have passed away, debrief tough cases/customer service interactions, find silver linings and learnings.

Dog Park: Don't lose sight of things that come up along the way. Just because the thought doesn't fit with the current topic of discussion, have a "dog park" (traditionally referred to as a "parking lot") for topics to come back to. This allows for focus without losing a valuable thought/idea.

Reflect or Contradict

Two words with a great deal of power when you are trying to hold yourselves accountable to outcomes. Are we reflecting or contradicting things that we have deemed important? You can use this as an exercise to assess personal behaviours, tools currently used or being created in the practice, marketing materials and customer service (to name a few). By utilizing these two words we can open a conversation around whether something is working or not, and what we need to do to rectify it. The word "contradict" generally brings about an emotional response with the team as it acknowledges that we are somehow creating an outcome that is opposite to the thing we have agreed to be committed to. If the team identifies a contradiction it immediately creates buy-in that a change is required.

Team Acknowledgement

Create opportunities for hard work and above-and-beyond moments to be highlighted, rewarding when appropriate. Have a "shout out" board for team members to publicly acknowledge or thank each other. Post thank you notes and testimonials from clients so that they can celebrate their successes.

Team Engagement

Allow team members the knowledge necessary to affect a positive change. While financial information doesn't necessarily need to be shared, setting targets or key performance indicators so that the team can collaborate with the intent to help as many animals or people as possible can be very helpful for overall business performance. Tracking metrics that are relevant to team members (ie. Number of wellness tests, fecals, new clients etc.) engages them and allows them to be aware of how we are doing with compliance of things that truly matter to animal health. Incentivize in a way that makes sense for your team and practice. Incentives don't have to be costly; food (ie. lunch/dinner of their choice, fun snacks, sundae bar), gift cards (ie. restaurant/coffee, local mall, movies, gas, grocery), outings (meals, movies, escape room, axe throwing etc.) and money on employee accounts are all examples of ways to give back and reward responsibly.

Addressing Resistance

Resistance to change may arise for several reasons. There is a handy model (SCARF – first published by David Rock) that allows you to keep track of areas through which discomfort may arise when changes are occurring:

Status – is my personal status going to be affected by this change? Will my importance be diminished?
Certainty – what is the future going to look like? Will I feel comfortable with my new reality?
Autonomy – am I going to lose my level of control? Will I still have the freedom to work my way?
Relatedness – are my relationships with the rest of the team going to be affected?
Fairness – is this going to be fair to me? Will people be treated equally or differently to me?
Being aware of these areas for concern (and therefore resistance) will allow you to address them in advance. While we cannot anticipate every scenario, conversations around upcoming changes can be built to acknowledge the things that may be at the forefront of peoples' minds.

Implementing Changes

There is often an insecurity that arises from trying new things. Some team members worry that a new behaviour will negatively affect existing processes, while others worry that the goal of the change will not be met and yet the change will remain in place indefinitely.

Utilizing a system to manage changes can give the team peace-of-mind that if positive outcomes are not achieved, it will be noticed and addressed accordingly.

1) Start with your Goal. What is the thing you are trying to achieve?
2) Decide on the strategy and tactic you believe will achieve this goal. This is the change you want to implement.
3) Agree on who is going to be responsible/accountable for the implementation of the change. This leaves the other members of the team in a support role – everybody should be aware of the change, even if they are not ultimately responsible for carrying it out.
4) Assign a time frame for implementation. Measure the results immediately but keep in mind that there is usually a short period of confusion where people are trying to remember to implement the change, alter a habit and/or begin the new behaviour consistently. Track the change; is it working, how often, is it going the way we expected, what issues have we identified? Measure and monitor the outcomes of the change.
5) Utilize a meeting or rounds to discuss feedback on the change. What does our measuring/monitoring indicate?

Are we achieving our initial goal? If yes, is there any negative fall out? If no, then great! However, if we are not achieving our goal, or if there have been negative consequences as a result of our change, then what tweaks can be made of our existing tactic in order to achieve the goal without undesirable side-effects? Does our tactic need to be replaced altogether? Is our goal realistic?

By tracking our change through this system, we can avoid some of the pitfalls that usually come with changes; inconsistent implementation, ineffective changes, adverse effects. This gives the team a sense of security that changes will benefit them and achieve goals, not just waste time or have negative impact.

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ACUPUNCTURE FOR ACUTE PAIN

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Introduction

With the multi-faceted regulatory issues surrounding opioids (opioid epidemic, mercurial availability issues and increased regulation incentivizing abusers to pursue veterinary sources), as well as the ugly underbelly of opioid agonists being increasingly revealed (opioid induced hyperalgesia, very poor absorption and utility of oral opioids in dogs, opioid induced immune suppression and the neuro-inflammatory effects of opioids, to name a few); non-opioid options for treating pain become increasingly desirable. This opens the door to physical medicine techniques: defined as techniques that utilize and modify the endogenous chemistry of an organism to treat pain. At the forefront of these modalities, especially where pain is concerned, is acupuncture. A modality with deep roots and deep potential but plagued with equally deep misconceptions and consequent controversy.

Acupuncture describes the stimulation of distinct

anatomic points, often with fine needles. Other methods of stimulation of these points (such as injections, laser, deep pressure massage, trigger point needling) exist, and are encompassed in the overall field of acupuncture-related modalities. The key differentiation between acupuncture with needles, and other treatments, is the source of force applied to the region of the acupuncture point- mechanical deformation (needle), thermal, electrical, chemical, photons, etc.

Acupuncture is applied anatomy

Acupuncture points have distinct anatomic underpinnings that can be understood based upon the integral homeostasis of living organisms. These points were found by trial and error, as well as being in the vicinity of neurovascular structures (bleeding from these areas was important traditionally). They have since been linked into “lines” or “meridians” that partially relate to anatomic similarities, such as major nerve pathways, dermatomes, sclerotomes, or sensations related to axon anatomy, but partially are NOT explained by these.
As an over-arching heading for the effects of acupuncture, it is most accurate to describe acupuncture as a tool that can help modify the endogenous homeostasis of the various body systems of an organism. The major homeostatic systems modified by acupuncture include: nerves: sensory, motor and autonomic; neurotransmitters and biochemicals; blood vessels; fascial sheets and lymphatic beds. It is a combination of these systems that provide organism homeostasis, and a combination of these effects that arise from an acupuncture treatment.

Cutaneous structures

Microscopic analysis repeatedly demonstrates that acupuncture points contain somatic anatomic structures such as: free nerve endings, encapsulated cutaneous receptors and musculo-tendinous sensory receptors (muscle spindles and golgi tendon organs). It has long been recognized that acupuncture points are found in cutaneous regions that show high levels of diverse innervation. (Zhao 2008) This occurs where groups of nerves emerge through bone, muscle and fascia from their origins; where they branch or join and where they attenuate distally. These nerve fibers are made up of Ab, Ad myelinated) and c (non-myelinated) fibers, as well as autonomic fibers, and acupoints generally have greater neural density compared to non-acupoint regions. (Zhang 2012)

These peripheral components help to explain why neuromodulation is the primary pathway for acupuncture mechanisms and these components occur in the skin as well as along peripheral nerve bundles. Acupuncture stimulates afferent nerve fibers. This has been shown with both manual acupuncture, as well as electroacupuncture. Both manual stimulation and electrical stimulation have been found to stimulate all four types of nerves; Aa Ab, Ad and C-fibers, although these occur with unique discharge frequencies.

With insertion and rotation of an acupuncture needle, collage fibrils pull on the associated fibroblast, causing remodeling of the cellular structure within 10 minutes, as well as release of purines from both the fibroblasts, and the mast cells that are caught up in this wave of mechanical stretching. This is followed within 90 minutes by increased mechano-transduction and up-regulation of genes related to muscle and sensory homeostasis. Unlike other forms of collagen deformation, such as massage and stretching, the acupuncture needle creates a microscopic “whorl” of collage within the connective tissue, which may result in a biochemical modification and changes in connective tissue tension regulation that can last for hours to days, as compared to other forms of stretch. (Gray 2014)

Corridor Structures:

Fascia: Changes in the “loose” connective tissue of the body has a dramatic influence of fluid movement through the tissues, as the appendicular connective tissue is the home of the lymphatic system.

The lymphatic system is the home of immune homeostasis, as is demonstrated by the coalescing of lymphocytes and other immune cells into the lymph nodes along these lymphatic chains. Thus, the fibroblasts; and by extension, acupuncture, are integral into immune homeostasis as well as neurological processing homeostasis. (Yin, 2018)

When an acupuncture needle is placed, a dynamic and self-sustaining change occurs in the fascia, and this can be identified microscopically, but also by measuring chemical mediators and transcription. This change likely ripples along the fascial network of an organism, creating far-reaching change. Of note, this impact also self-sustains, as fibroblasts will pull on their neighbors, changing the community neurochemistry, and creating a new army of activated fibroblasts to subsequently pull on their neighbors- spreading the signal over both space and time. (Gray 2014) Thus, fascia provides a critical component of the efficacy of acupuncture treatment. In the periphery this is primarily tied into the microcirculation and microscopic nerve and vasodilatory influences. Along the body this is tied more into a macroscopic structure tying together nerve and motor communication, body awareness, and providing for the delivery and removal of life-sustaining fluids to the extra-vascular body compartments.

Trigger points: Even for acute pain conditions, trigger points in muscles are a common and important component of treatment. In addition to named points that are treated proximate to the pain, proximal and distal to the pain along the nervous system, and points that are primarily homeostatic, as well as paired points on the opposite limbs. Needling these regions will dis-inhibit muscles that are restricted by poor bloodflow, algogenic substances, and reduced function. This is accomplished through inserting needles into the damaged, contracted region to bring in nutritive blood-flow, reduce pain, and restore function and collaboration with neighboring muscle groupings. (Tang 2018)

Reflex loops: In addition to release of trigger points from muscle groups, acupuncture can modify the sensory and reflex-loop portion of the motor unit. The sensory portion of muscles are the muscle spindles, and these are located diffusely throughout motor units. These sensory structures are more replete in muscles that have a larger proprioceptive role. Acupuncture over muscles can interact with the muscle spindle units, modifying both the sensations experienced by the muscles, but also interacting with the reflex loops that increase or decrease muscle contraction in the presence of stretch or fibrosis.

Golgi tendon organs are deep structures, and like the muscle spindle points, they have use in managing musculo-skeletal conditions where pain, damage or musculo-tendinous shortening has taken place. Needle placement in points with strong tendon input will feed into the reflex relaxation of the associated myotendinous structures, and an immediate reduction in local pain.

Any one acupuncture point may generate input from both cutaneous sources and deeper sources, such as trigger points, muscle spindles and golgi tendon organs. In general, data exists that deeper needling generates a greater biological response, so a summation of input from a combination of both cutaneous and deeper structures is likely ideal. At the same time, any needled point carries the cutaneous sensory and fascial input.

This input is part of why acupuncture performs poorly in placebo-controlled studies, as some biological response will be seen whether a true acupuncture point is used, versus any other point on the body. The responses to sham versus verum acupuncture have been shown to differ in magnitude, as acupuncture points are universally located in regions with potent neurochemical underpinnings, but differences in magnitude are difficult to detect in clinical studies.
Spinal Structures:

The dorsal horn of the spinal cord is the receiving zone for afferent impulses ascending from the periphery. Significant diversity of receptors, pain fibers and neurochemical compounds contributed to the magnitude and type of signal being seen at the dorsal horn. At the level of the dorsal horn this signal can be transduced to nerve tracts that ascend to the central nervous system, but there is vast opportunity to modify this signal here as well.

At the dorsal horn, a variety of biochemicals can modify the likelihood that the signal will cross the synapse, and create an action potential in the second order nerve. Moment-to-moment modulation occurs through changes in GABA, serotonin, norepinephrine, CGRP, sP, endorphins, cannabinoids. Acupuncture effects emanating from the periphery have been shown to exert at least some modification on each these compounds in various laboratory studies. (Zhao 2008) Acupuncture has been shown to influence the activity of glia, potentially reversing some of the negative effects of glial stimulators (like the opioids) and decreasing the long-term central neuro-inflammation resulting from pain and opioid treatments alike.

In addition to the modifications possible at the first synapse, the topography of the spinal cord provides for interneurons that can inhibit or amplify the incoming afferent signal. Concepts such as diffuse noxious inhibitory control (DNIC) are being utilized to assess amplified pain states, as well as detect therapies, such as acupuncture, that work to decrease central pain amplification. These can be modified by the local neurochemical milieu, but also by descending input from the midbrain. Acupuncture input has also been shown aide in the modification of descending inhibitory mechanisms, and this method of testing the nervous system may significantly improve the

The somotopic layout of the spinal cord is integral to the function of acupuncture to modify deep tissues and organs. Deeper tissues can be modified by interacting with somatic sites that share the same spinal innervation network. Examples of this used by modern medicine include “sea bands” for nausea (over PC-6 acupuncture point) and electrical stimulation over the tibial nerve (KI-3 acupuncture point) to aide in urinary retention.

Modification of autonomic outflow is most likely near accessible portions of the sympathetic chain and parasympathetic ganglia. Examples of sympathetic proximity include the cervico-thoracic junction (start of the sympathetic chain) and the lumbosacral junction (Sacral sympathetic outflow). Examples of parasympathetic ganglia are in the thoraco-lumbar region (stellate) and at the thoracic inlet (cranial cervical ganglion). In addition to modification of autonomic function through the vagal nerve, acupuncture can influence sympathetic outflow and certain points, and parasympathetic outflow at others. Spinal reflex loops in addition to the modification of sympathetic/parasympathetic balance more globally have been shown to contribute to some of the organ effects seen with acupuncture, such as regulation of cardiac activity.

Brain Structures: Studying acupuncture’s central effects has traditionally been limited to laboratory animals, due to the invasiveness of such studies. Decades of data show influences on neurotransmitters (the same we previously discussed regarding the spinal cord), especially endogenous opioids. This hasn’t answered the lingering questions about why acupuncture appears so effective for mood and behavior. However, neuroimaging studies have come of age, and have provided vast amounts of data, although there remains controversy as to how to value and interpret this data. In general, imaging studies have shown complex activation and deactivation of many areas of the brain. In general, verum acupuncture needles have shown a larger effect than sham, and having a deep needling treatment, with adequate tissue grab (deqi) appears important.

The periaqueductal grey and ventrolateral medulla show consistent responses to acupuncture for pain. This is one of the important effects when using acupuncture in acute and peri-operative pain

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STATE-OF-THE-ART LECTURE: CASE STUDIES IN CANINE CARDIOLOGY

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Case 1: Worsening mitral valve disease or not?

Signalment: 11 y.o. Mc Dachshund
Chief Concern: Acute-onset dyspnea in last 24 hours
History: Heart murmur known to be present for >3 years. Echocardiogram 2 years ago identified myxomatous mitral valve disease with normal left atrial size (ACVIM stage B1). Routine recheck echocardiogram 8 months ago: unchanged.

New-onset dyspnea (severe/catastrophic at admission). Thoracic radiographs suggestive of pulmonary edema but heart size well within normal limits. Hospitalization and treatment (furosemide IV, O2 supplementation) with resolution of signs. Further evaluation to investigate discrepancy between congestive heart failure (CHF) and normal heart size.

Physical Exam (36 hours after admission): Bright, alert, responsive dog breathing comfortably. Regular heart rhythm, 140 beats/minute. Grade IV/VI systolic left apical murmur. Pulse strong and synchronous.
Diagnostic Test Results: An echocardiogram confirmed changes indicating degenerative mitral valve disease but with limited secondary changes: no left ventricular enlargement, and mild left atrial enlargement (LA:Ao = 1.7:1). Review of thoracic radiographs: interpretation unchanged.

Analysis and Conclusion: Discrepancy between heart failure and mild/moderate heart disease can be explained by transient intravascular volume overload, sudden worsening of heart disease (e.g., chordal rupture), or theoretically, insufficient pulmonary lymphatic drainage. In this case, despite careful history-taking, it was only later (after 24h of hospitalization) that the owner's spouse indicated having given the dog potato chips as a snack the day before the onset of dyspnea.
No salty snack foods have been given since then, and there has been no recurrence of clinical signs.

Learning Point: Excessive sodium ingestion can be associated with congestive heart failure in dogs with moderate or marked disease. Identifying it is important: the prognosis is better that with deterioration of the primary disorder and treatment can be increased temporarily rather than permanently.

Case 2. Cough + murmur: to treat or not to treat?

Signalment: 11 y.o. Fs Cocker Spaniel
Chief Concerns: Chronic cough; exercise intolerance; dyspnea; inappetence
History: Cough X 5 months, worse last few weeks; exercise intolerance X 1 year; increase in respiratory effort (weeks); waxing-waning appetite X 6 weeks
Physical Exam: Quiet, alert, responsive, inquisitive dog. Body weight = 26.4 kg; body condition score = 9/9. Mildly increased respiratory effort at rest and with exercise; no respiratory distress, no upper respiratory noise. Recurrent, moist cough. Left apical systolic grade IV/VI heart murmur. Respiratory sinus arrhythmia @ 90 beats/minute with fair, synchronous pulse. Unremarkable abdominal palpation.

Diagnostic Test Results: Thoracic radiographs (2 views): difficult to interpret due to superimposed body fat; cardiac silhouette appears WNL; pulmonary pattern appears WNL but cannot rule out pulmonary edema (vs. superimposed fat). Echocardiogram: degenerative mitral valve disease causing moderate mitral regurgitation, with mild/moderate left atrial enlargement (LA:Ao = 1.9:1). Doppler arterial blood pressure: 150 mm Hg systolic. Complete blood count, serum biochemistry profile, urinalysis, abdominal ultrasound examination: no significant abnormalities of note.

Analysis and Conclusion: The principal diagnostic question is whether or not this animal has pulmonary edema; knowing this will directly influence treatment (diuretic if yes, no diuretic if no) and prognosis. The thoracic radiographs are ambiguous because of the opacifying effect of superimposed body fat. The echocardiogram is of limited help because with moderate left atrial enlargement, pulmonary edema is possible (stage C) but so is the compensated, preclinical state (stage B2). The dog's increased respiratory effort, along with exercise intolerance, and weak pulse (from interposed SQ fat) can be attributed to obesity. Similarly, the decreased appetite may be a manifestation of selective taste rather than of longstanding illness given the dog's body condition score and lack of any evidence of anorexia-inducing illnesses on the tests performed to date. Therefore, the remaining information must be considered: the respiratory sinus arrhythmia, absence of sinus tachycardia, absence of respiratory distress, and inquisitive demeanor of the dog make CHF very unlikely. Treatment of suspected (+/- further testing for) primary airway disease are most appropriate. Learning Point: The dilemma of whether respiratory signs are due to primary respiratory disease or to CHF is a common conundrum in coughing dogs with mitral valve disease. Thoracic radiographs and the echocardiogram are most useful for resolving this dilemma. Additionally, specific physical exam findings and historical elements can be very helpful, as in this case.

Case 3: Is it Boxer cardiomyopathy/arrhythmogenic cardiomyopathy? If so, do I treat?
Signalment: 8 y.o. Mc Boxer dog
Chief Concerns: Arrhythmia noted as incidental finding
History: Active dog, no current health concerns, no medication. Arrhythmia noted on annual physical exam.
Physical Exam: Bright, alert, responsive, comfortable dog. Heart rate = 170 beats/minute when calm and corresponding pulse rate = 120/minute; heart rhythm = irregular, with single premature beats and occasional (1-2/minute) bursts of 3-5 premature beats with weak or absent corresponding pulse. Comfortable respirations. Normal heart sounds. Unremarkable abdominal palpation, cutaneous examination, and rest of physical exam.

Diagnostic Test Results: Electrocardiogram: normal sinus rhythm with single, paired and triplet monomorphic premature ventricular ventricular complexes (PVCs). Echocardiogram, thoracic radiographs, complete blood count, serum biochemistry profile, abdominal ultrasound exam: unremarkable.

Analysis and Conclusion: The diagnosis of arrhythmogenic cardiomyopathy (also called arrhythmogenic right ventricular cardiomyopathy, Boxer cardiomyopathy, and familial ventricular arrhythmias of Boxers) is one of exclusion: the presence of ventricular arrhythmias with no detectable primary cardiac or systemic cause is diagnostic. Holter monitoring can be undertaken when a dog is experiencing syncope, in order to document whether an arrhythmia is occurring during the episodes; or to establish a baseline number of PVCs prior to starting treatment (but realizing that normal day-to-day fluctuations of >80% in number of PVCs is expected irrespective of treatment). In this case, the dilemma is whether to begin antiarrhythmic treatment, typically with sotalol 1-3 mg/kg PO q 12h, in the absence of clinical signs. Empirically, the occurrence of pairs and triplets of PVCs has been interpreted to mean a higher grade of ventricular arrhythmia (and to justify starting sotalol) but supportive proof is lacking.

Learning Point: Either treating or not treating is acceptable in subclinical arrhythmogenic cardiomyopathy and a discussion with the owner can draw on the owner's wishes and abilities regarding twice-daily medication administration, and the owner's beliefs and philosophy regarding pre-emptive but uncertain treatment of an irreversible condition. The known reduction in PVCs associated with omega-3 fatty acid treatment in this disease (though no proof of reduction in future syncope nor of prolongation in lifespan) can prompt treatment with DHA 497 mg/DOG + EPA 780 mg/DOG PO q 24h.

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OCULAR DISEASES OF THE CAT

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Few ocular diseases specific to cats: corneal sequestrum, eosinophilic keratitis, malignant glaucoma
ORBIT
1-1 Retrobulbar neoplasia, Abscess/Inflammation, Trauma (fracture)
Clinical signs
Exophthalmos, Deviation globe, Protrusion third eyelid, Conjunctival hyperhemia/chemosis +/- corneal lesions
Orbital Neoplasia
90% malignant, Squamous Cell Carcinoma most common, Lymphosarcoma second most common
Diagnostic approach:
Physical and ocular exam (fluorescein test), Retropulsion of the globes, Exploration of the buccal cavity, Imaging: radiographs, ultra-sound
Therapeutic approach
Temporary treatment until the determination of the cause:
- pain management
- protection of the globe (lubrification, tarsorraphy) +/- treatment of the corneal lesions
If obvious cause -> start etiologic treatment:
- Abscess: sys AB +/- drainage, sys NSAIDs
- fracture: sys NSAIDs +/- sys AB
1-2 Globe proptosis
Severe trauma
Clinical signs:
Proptosis = palpebral edge behind the equator of the globe , Conjunctival oedema (chemosis) and hyperemia, Lateral strabismus, Corneal and +/- intra-ocular lesions
Diagnostic approach and prognosis:
Pupils and PMR (fixed mydriasis: bad pro / myosis: better pro)
Skull bones integrity
Globe integrity (rupture: bad pro)
Cornea integrity (rupture: bad pro)
Extra-ocular muscles (rupture of 3 of the extra-oc m.: bad pro)
Intra-ocular lesions (hyphema:bad pro, risk of glaucoma)
Therapeutic approach:
Main goal: to preserve the globe
pain management, keep the cornea moistened/lubricated, general anesthesia (verify the status of the animal), lateral canthotomy (+/-), clean the eye (diluted betadine 1:50), replace the globe or enucleate (si rupture of the globe, the optic nerve or 3 extra-ocular m.), tarsorraphy (4/0-5/0, U sutures, “stents”), E-collar, Medical treatment: sys SAIDs or NSAIDs, topical AB
Sequellae:
Lateral strabismus (100%), Blindness (80%), KCS, Phtisis bulbi, Glaucoma, Corneal scar
EYELID
2-1 Eyelid agenesis
Portion of the temporal upper eyelid fails to develop
Concurrent congenital defects: PPMs, optic disk colobomas, lenticonus , microphthalmos , choroidal hypoplasia
Clinical signs: absence of palpebral edge, conjunctival hyperemia, corneal fibrosis and neovascularisation caused by: corneal exposure and trichiasis
Treatment : Repair the defect (rotational eyelid pedicle flap, H-pasty) and Cryotherapy or electrolysis for the trichiasis
2-2 Eyelids’ tumors of the cat
2% of the cat diseases are tumors and 2% of the cat tumors affect the eye and its adnexa
More agressive and malignant than those in dogs
Types of eyelids’ tumors in cats: squamous cell carcinoma, fibrosarcoma, lymphosarcoma, adenoma/adenocarcinoma, mastocytoma, round cell tumor
Squamous cell carcinoma
Most common eyelid neoplasm Increased incidence in white, aged cats Slowly progressive, ulcerative lesions
Late metastasis
Diagnosis: based on age, clinical signs, cytologic or histologic examination
Treatment: Surgical excision with wide margins combined with radiation therapy or cryotherapy or hyperthermia or CO2 laser
– CONJUNCTIVA, NICTITATING MEMBRANE , CORNEA
3-1 Conjunctivitis
Common, Often primary infections Herpes virus, Chlamydophila (Chlamydia), Mycoplasma
3-1-1 Feline Herpesvirus type 1 (FHV-1)
Primary infection, Acute, conjunctival-respiratory infection ± corneal ulcer, Neonatal, adolescent cats , Bilateral serous □ mucoid/mucopurulent ocular discharge, Bilateral hyperemic conjunctiva (chemosis usually not prominent), Primary infection usually resolves in 10-14 days (~80% latently infected)
Conjunctivitis/Herpesvirus
Young adult cats : Usually no respiratory infection, Bilateral, Intermittent blepharospasm, Hyperemic conjunctiva ± corneal lesions (epithelial ulcer), Ocular discharge mild, serous Chronic and/or recurrent, Factors inducing inflammatory episodes: stress, usage of corticosteroids
Herpesvirus - diagnosis
Clinical signs Best to test during active disease Lots of viral shedding, ImmunoFluorescentAntibody testing of conjunctival scrapings, Fluorescein stain after collecting samples to avoid false positives Lacks sensitivity

PCR very sensitive. May cause problem with interpretation
Herpes Virus - treatment
Topical antibiotics (tetracyclin, chloramphenicol, erythromycin)- Control secondary bacterial infections Antivirals (mainly for keratitis) Steroids

CONTRAINDICATED

Prophylactic or maintenance treatment:
Oral L-lysine : decrease frequency and severity of the inflammatory episodes (500 mg BID PO adult; 250 mg BID kitten) Interferon : prophylactic effects not proven
3-1-2 Chlamydia psittaci (Chlamydophila felis)
Unilateral bilateral, Conjunctival hyperemia, Chemosis ++, Serous ocular discharge
No corneal involvement
Cytology: Inclusion bodies cytoplasm
Treatment: Tetracycline topically
3-1-3- Mycoplasma felis
Pathogenic role unclear, Unilateral bilateral conjunctivitis, Conjunctival follicles, pseudomembranes
No corneal involvement
Cytology: Inclusion bodies cytoplasm
Treatment: Susceptible to most antibiotics (tetracycline, erythromycine, chloramphenicol)

CORNEAL ULCERS

Corneal ulcers from bacteria – uncommon in cats, Herpetic keratitis (FHV-1) +/- ulcerative, Traumatic lacerations – common, Corneal foreign bodies – common
General comments
Making the diagnosis of a corneal ulcer is critical for the welfare of the patient, It is the difference between sight and blindness, or a small scar and a large scar, Assume ulcers will get worse! Treat aggressively
Melting ulcers
Corneal degeneration due to proteases is referred to as «melting“
Ulcers in which proteases are active have a grayish-gelatinous appearance which must be distinguished from corneal edema
The action of proteases are potentiated by topical corticosteroids
Herpetic keratitis
Herpes – only known viral cause of keratitis in cats
Young animals – keratitis = extension of primary conjunctival infection, adults – keratitis = reactivation of latent virus
Acute keratitis Dendritic ulcers Mild-moderate conjunctivitis Serous-mucopurulent discharge
Chronic keratitis : may have stromal edema Fibrosis Superficial vascularization
Diagnosis
Blepharospasm, photophobia, Epiphora, Eyelid swelling, Conjunctival swelling, Sign of anterior uveitis associated: Myosis, fibrin, hypopyon…Corneal edema, Rough depressed area, Missing outer layer of cornea
Evaluation at distance (discharge, symmetry) : Menace, Dazzle, blinking , Pupil size, PLRs , Slit lamp examination, Schirmer Tear Test , Corneal culture , Fluorescein stain, Rose Bengal, Corneal scraping for cytology Fluorescein test (Detects a corneal epithelial, stromal ulcer (stain stroma not epithelium)) Seidel test
All red, inflamed or painful eyes should be routinely stained with fluorescein
Look for an underlying cause (KCS, distichia, trichiasis, entropion)
Treatment.
Medical and/or surgical...according to the answers to the following questions:Infected? Deep? Melting? Inflammed? (associated uveitis)
Medical treatment
Determine and eliminate etiology (eg KCS, entropion, infection) Prevent or treat infection (Broad-spectrum topical antibiotics; culture and sensitivity tests) Prevent progression (melting) Treat Uveitis (Topical atropine cycloplegia/mydriasis, Topical NSAIDs (careful)… No steroids Prevent self-trauma: E-COLLAR
Herpetic keratitis =/- ulcerative Antimicrobial treatment
Antibiotics Antiviral agents: good response in acute cases, poor response in chronic cases idoxuridine 1%, acyclovir, trifluridine 1%, ganciclovir, famciclovir
Treatment of a superficial herpetic ulcer: similar to a superficial corneal ulcer (AB + Anti-viral) it can look like an indolent ulcer, it can be debrided keratotomy

CONTRA-INDICATED

Treatment Anti-inflammatories: Corticosteroïds : contra-indicated as they can activate the viral replication
NSAIDs : can be used with caution, either topically (diclofénac) or systemically (meloxicam) Cyclosporine A
Surgical treatment
Conjunctival graft (or biomateral graft)
Corneal sequestrum
Degeneration of collagen, Accumulation of brown pigment, Varying intensity, Unknown etiology, Ocular irritation (chronic herpetic keratitis, entropion, traumatic ulcers)
Himalayan, Persian, and Burmese cats are predisposed
Treatment Keratectomy: removal of the sequestrum, Keratectomy alone: risk of recurrence, Keratectomy and conjunctival graft --> rare recurrences Keratectomy and corneo-conjunctival transposition --> rare recurrences
Eosinophilic keratitis
Proliferative corneal mass, White to pink, Irregularly surfaced, Vascularized , Most commonly originates from the temporal or nasal limbus, may involve adjacent conjunctiva and nictitans
Diagnosis : Cytology of corneal scrapings, Eosinophils, mast cells, lymphocytes, plasma cells
Therapy: Topical corticosteroids, Topical 1% Cyclosporine A, Systemic megestrol acetate (side effects: diabetes)

Recurrences are common

4 - UVEA
4-1 Uveitis
Anterior uveitis ± chorioretinitis common in cats
Causes : Trauma, Infectious (common) (Viral: FeLV, FIV, FIP, Toxoplasmosis, Fungal : Cryptococcus, Blastomycosis, Histoplasmosis, Coccidioides, Candida, Aspergillus), Neoplastic (Diffuse iridal melanoma, Primary ocular sarcoma, Primary ciliary body adenomas / adenocarcinomas, Metastatic uveal neoplasms) Lens (Cataract-induced, Lens luxation), Immune mediated, Idiopathic (70%)
Clinical signs: Blepharospasm, Epiphora, Photophobia, Conjunctival hyperemia, Corneal edema, Flare/hyphema/hypopyon/fibrin, Hypotony, Myosis, Hyperemia of the iris, Iris color change, Keratic precipitates, Synechiae
Feline Infectious Peritonitis : Coronavirus infection-often in younger cats, Uveitis is more common with the non-effusive form of FIP, Ocular lesions may be the only sign of infection or preceed systemic signs
Diagnosis (Anterior > posterior uveitis, Aqueous flare, keratic precipitates, Fibrin and/or hypopyon in AC, Chorioretinitis, retinal detachment, Retinal vasculitis, optic neuritis, Elevated total plasma protein, Polyclonal gammopathy)
Toxoplasmosis: Ocular lesions + generalized disease, Hematologic spread of sporozoites, Multiplication of tachyzoites in ocular tissues, Rel. mild anterior uveitis, Multifocal retinitis or retinochoroiditis, Diagnosis: IgG / IgM titers

FeLV : Anterior uveitis, Chorioretinitis, Lymphoma-related uveitis, Anterior lymphoma, Chorioretinal masses, Retinal detachment, Secondary glaucoma
Uveitis treatment : Mydriatics (1% Atropine ointment), Anti-inflammatories: Topical SAIDs: acetate forms of prednisolone or dexamethasone, Systemic SAIDs (with caution) Topical and systemic NSAIDs, Antibiotics (Toxoplasmosis – clindamycin 12.5 mg/kg, BID, 28 days), Antifungals

4-2 Uveal tumors
Diffuse iridal melanoma (Slowly progressive pigmentation of iris, Can obstruct iridocorneal angle causing glaucoma, Late metastasis (liver, lungs))
enucleation if: uveitis/glaucoma, large pigmented area, pigmented area not flat, irido-corneal angle affected, change in pupil's shape, change in pupil's mobility
5 - GLAUCOMA
Causes: Primary glaucomas (Open/normal angle, ± collapsed cleft (Siamese), Narrow/closed angle (chronic)
Secondary glaucomas (most common in cats): Uveitic (chronic anterior uveitis), Lens luxations (trauma/age), Phacolytic/phacoclastic uveitis (lens perforation), Hyphema (rare), Intraocular neoplasia (primary/secondary neoplasms)
Clinical signs: often very discreet (sometimes, only elevated IOP and anisocoria/mydriasis, buphthalmia)
Treatment : Correct underlying cause when possible, Mannitol in acute cases, IOP >50 mmHg , Carbonic anhydrase inhibitors: dorzolamide 2% TID, Beta blockers: timolol 0.5% BID, Analogs of prostaglandins: not effective in cats, (Laser cyclophotocoagulation)
6 - LENS
Lens cataract: Primary: rare in cats Secondary to: Uveitis, Trauma, Glaucoma, Lens luxation, Diabetes (rare)
Congenital: rare
Cataract surgery: By phacoemulsification, Intra-ocular lens: 53 D, Outcomes even better than in dogs
7 - POSTERIOR SEGMENT
Tapetal fundus- larger and brighter than the dog,Non-tapetal fundus- related to hair coat color, Retinal vasculature- 3 large pairs of arteries and veins, Optic nerve head: small and round
Nutritional retinal degeneration
Taurine deficiency : Identical to Feline Central Retinal Degeneration, Cats fed dog food or "homemade" diets, Initial lesion = hyperreflectivity of area centralis, Chronic deficiency - severe retinal degeneration & irreversible blindness
Baytril toxicity:
Safe dose 2.5 mg/kg BID PO;Original dose: 11mg/kg PO q24h
Rod-Cone degeneration in Abyssinian
Begins 1.5-2 years of age, Complete degeneration in 2-4 years
Inflammation (chorioretinitis)
FIP, FeLV, Toxoplasmosis, Fungi, Neoplasia (primary or secondary)
Hypertensive retinopathy
Old cats , Ocular signs: Sudden blindness, Dilated or poorly to unresponsive pupils, Tortuous retinal vessels, Serous retinal detachment, Retinal and vitreal hemorrhages. Systemic signs: Systolic blood pressure >160 mm Hg, Cardiomegaly, Renal disease, Hyperthyroidism, Hyperglycemia
Treatment: Treat underlying disease, Calcium channel blocker, amlodipine 0.625 mg/cat/day
Retinal folds and detachments
Separation sensory / epithelial retina, Congenital, Secondary to other diseases
Causes: Hypertension, Hyperviscosity, Trauma, Infections, Neoplasms

CONCLUSIONS

Take care of the eyes !! They can reveal the presence of a systemic disease, Important to understand WHERE?, HOW?, and WHY?
Important aspect of the treatment: Pain management, Preservation of the vision, Esthetic appearence of the animal

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MEDICATE FEAR OF TRAVEL AND VETERINARY VISIT

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MEDICATING FEAR OF TRAVEL AND VETERINARY VISITS

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While proactive measures are essential to prevent and alleviate fear, anxiety and stress (FAS) and make for a fear free veterinary experience, many pets arrive from travel fearful or anxious, or become fearful, anxious, or painful during the visit. In fact, 77.8% of both dogs and cats are reported to be fearful even before entering the clinic and over half of the cats are stressed before leaving home.1,2 In dogs 74% were fearful when the veterinarian approached and 11% were aggressive. In cats 85% were fearful on the exam table and 9% were aggressive.

Using an FAS scale, pets should be continually monitored and assessed from travel to hospital to home, and if signs of FAS arise or begin to escalate, RECOGNIZE, STOP and REVISE to a) be able to proceed calmly and positively b) avoid some or all of the procedures that are not immediately necessary or can wait for a future visit with a modified approach or c) use medication immediately, prior to a future visit or both. Medication addresses the pet's emotional and physical welfare, helps to insure safety and successful completion of the procedures, prevents further conditioning of fear of handling and veterinary visits, and can provide for more accurate screening and diagnostic findings..

PRE-VISIT MEDICATION

For medications to be effective, they must be administered before the fearful event and at a dose and frequency to achieve optimal effect. As there is extensive individual variability, drugs should be assessed in advance of the fear evoking situation, to determine effect, side effects, dose, onset to peak effect, duration, frequency and combination use. Depending on the duration of effect, it might be advisable to combine drugs, give an additional dose 8-12 hours in advance or to begin one or more of the medications 2 to 3 days in advance.

Natural products might be used alone or combined with drugs. Dog appeasing pheromone and feline F3 cheek gland pheromone can help to reduce FAS during travel, veterinary exams and hospitalization. A reduction in anxiety might also be achieved with alpha-casozepine, l-theanine, an l-theanine supplement containing magnolia officinalis, phellodendron amurense and whey protein, therapeutic diets supplemented with alpha-casozepine and tryptophan, aromatherapy, melatonin and a Souroubea spp (betulinic acid) and Plantanus sp supplement.

For mild to moderate fear and anxiety in dogs, trazodone, clonidine, benzodiazepines (e,g, alprazolam, diazepam, lorazepam), gabapentin, imepitoin or dexmedetomidine oromucosal gel might be effective for car ride anxiety, veterinary visits and procedures.3 In cats, gabapentin, trazodone and benzodiazepines (e.g. lorazepam, alprazolam) can be effective.4,5 Buspirone might also be considered in dogs and cats although best started a week or more in advance.

If single products are not sufficiently effective combinations should be considered. For additional sedation, phenobarbital or acepromazine might be added. Where indicated, also prescribe medications for pain, nausea and as gastrointestinal protectants.
For increased sedation in healthy, fractious pets, transmucosal acepromazine, dexmedetomidine, detomidine gel in dogs, or buprenorphine in cats might be effective given 30-60 minutes in advance.6 For more intense fear, a transmucosal combination of dexmedetomidine plus narcotic might be considered (e.g. buprenorphine in cats or butorphanol in dogs), mixed with honey, molasses or maple syrup to increase viscosity, enhance contact with mucosa and slow absorption.

Before the pet leaves the hospital, also consider medication to address the pet's mental (FAS) and physical state (pain, discomfort, gastrointestinal upset, nausea) for travel home and reintroduction to the household

PAIN AND ANXIETY

Pain management is essential for addressing welfare. Pain increases stress which further exacerbates pain and can condition fear of handling, stimuli and environments such as the veterinary hospital. In fact, pre-operative fear and anxiety may contribute to increased post-operative pain and slower recovery. Therefore, to prevent or alleviate FAS, pain management must be addressed, while to effectively manage pain, FAS must be addressed.

INJECTABLE SEDATION

Medicating before the pet is stressed is safest, most effective and requires the lowest dose. Sedation before stress, addresses the physical and emotional health and welfare of the pet, helps to insure safety and allows for the procedure to be successfully completed. An alpha 2 agonist such as dexmedetomidine can sedate, reduce anxiety and provide pain management. Dexmedetomidine should be avoided in pets with cardiovascular compromise due to the potential for vasoconstriction and hypertension. As levels of sedation with dexmedetomidine alone are variable, optimal sedation can best be achieved with low dose intramuscular dexmedetomidine combined with a narcotic such as butorphanol.7 Midazolam might be added as an anxiolytic, muscle relaxant, and potential amnesic (but might lead to paradoxical excitation). In place of butorphanol, buprenorphine might provide more analgesia but less sedation while mu agonists such as hydromorphone and morphine offer greater pain control and sedation and are reversible. Dexmedetomidine can be reversed with atipamezole for faster recovery. However, if the patient is not reversed, recovery may be smoother and less stressful. As an alternative to dexmedetomidine, acepromazine might be substituted; however acepromazine has a shorter duration of action, less profound sedation, no analgesic or anxiotyic effect and is not reversable. In more fractious patients or for greater chemical restraint, ketamine or alfaxalone for cats and small dogs might be added.7

In a recent study when manual restraint was compared to dexmedetomidine and butorphanol or to dexmedetomidine alone, manual restraint required more personnel, and longer contact time, while the combination of dexmedetomidine and butorphanol required less (or no) restraint, less time and had the best behavioral and cooperative scores. Response to dexmedetomidine alone was intermediate.9 This is consistent with human studies in which patient tractability, costs, and hospital stays are shortened in patients sedated with dexmedetomidine.

Doses for oral pre-medication

Drug	Dogs	Cats
Trazodone	3-10 mg/kg	50-100 mg / cat (for travel)
Clonidine	0.01-.05 mg/kg	
Gabapentin	10-40 mg/kg	10-30 mg/kg (50-100 mg/cat)
Alprazolam	.02-0.1 mg/kg	.125 mg - .25 mg per cat
Diazepam	0.5-2.2 mg/kg	
Lorazepam	.02-0.1 mg/kg	.05-.25 mg/kg (0.25-0.5 mg/cat)
Dexmedetomidine oromucosal gel	125 micrograms / m2	
Add on sedation:		
Acepromazine	0.5-2.0 mg/kg	0.5-2.0 mg/kg
Phenobarbital	5.0-10 mg/kg	5.0-10 mg/kg

Doses for transmucosal administration

Drug	Dogs	Cats
Dexmedetomidine	0.01-0.04 mg/kg	0.02-.04 mg/kg
Acepromazine	0.025 – 0.05 mg/kg	0.02-0.1 mg/kg
Buprenorphine		0.02-0.05 mg/kg
Dexmedetomidine + Butorphanol	.01-.04 mg/kg + 0.2 mg/kg	
Dexmedetomidine + Buprenorphine		0.02-0.04 mg/kg + 0.02 – 0.05 mg/kg
Detomdine gel	0.5-5.0 mg / m2	
Ketamine (additional if needed)		10 mg/kg

Doses for intramuscular sedation

Drug	Dogs	Cats
Butorphanola (sedation but minimal pain)	0.2 -0.4 mg/kg	0.2 -0.4 mg/kg
Dexmedetomidineb,c	0.003-.01 mg/kg	0.005-.015 mg/kg61
Midazolamd	.05-0.2 mg/kg	.05-0.2 mg/kg
Additional add-on sedation (if needed)	1-3 mg/kg	1-5 mg/kg
Ketamine	0.5-1.0 mg/kg (small dogs)	0.5-1.0 mg/kg
Aflaxalone	1.0 – 2.0 mg/kg	1.0-2.0 mg/kg
Tiletamine – zolazepam		

aFor moderate pain can substitute buprenorphine at 0.01-0.03 mg/kg. For moderate to severe pain can substitute morphine at 0.3-2 mg/kg (dog) or .05-0.3 mg/kg (cat), or hydromorphone at .05-.2 mg/kg (dog) or .05-0.1 mg/kg (cat) or for greater pain management methadone 0.3-0.5 mg/kg (dog) or 0.3 mg/kg (cat)
bIncrease to .04 mg/kg in dogs and cats if greater sedation required
c) Can substitute acepromazine at 0.01 - 0.03 mg/kg dogs and 0.03 - 0.5 mg/kg cats (up to maximum 0.2 mg/kg dogs or cats) or alfaxalone at 2-5 mg/kg in cats
d) May provide anxiolytic, muscle relaxation and amnesic effect but may cause paradoxical excitation
For geriatric or ill dogs and cats: Butorphanol 0.2 -0.4 mg/kg + midazolam 0.2 mg/kg

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CYTOLOGY OF LYMPH NODES

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Indications for performing lymph node fine-needle biopsy

1. Lymphadenomegaly: Enlargement of a single or multiple lymph nodes.
2. Evaluation of lymphoma: Definitive classification ultimately requires immunophenotyping. However, cytology may help guide initial therapy while further diagnostic results are pending. Some molecular techniques such as PCR for Receptor Antigen Rearrangement (PARR) can be performed on submitted slides. Cytological evaluation of lymph nodes and other tissues can aid in lymphoma staging.
3. Evaluation of metastatic disease: Lymph node fine-needle biopsy is commonly utilized to evaluate for metastatic disease. When sampling for this reason, one must consider normal lymphatic drainage patterns.

Pearls regarding sampling and submission

• When sampling very large lymph nodes, avoid sampling the centre. The central sinus areas may contain myriads of neoplastic lymphocytes, yet may also be spared containing few. Additionally, with tumor expansion, the possibility of central necrotic areas or hemorrhagic tissue exists, potentially leading to non-diagnostic samples.
• With generalized peripheral lymphadenomegaly, the prescapular and popliteal lymph nodes are preferred sampling sites. The mandibular lymph node is constantly exposed to oral cavity antigens and ideally should never be the solely sampled lymph node when generalized lymphadenomegaly is present. Close proximity to salivary glands also creates the potential for incidental salivary gland collection and non-diagnostic samples.
• Use a non-aspiratory technique. Lymphocytes tend to be fragile and aspiration sampling techniques creates enough negative pressure to readily rupture them. A non-aspiratory technique using multiple, quick, stabbing needle motions helps prevent cell rupture as well as excess blood contamination.
• Use gentle smear spreading techniques. Neoplastic lymphoid cells are easily ruptured even when employing gentle smearing methods. Only use the surface tension that is created between two glass slides to prepare smears. Rupturing is enhanced with corticosteroid administration (even a single dose); collect samples prior to administering therapeutics whenever possible.
• Avoid formalin fumes. Formalin exposure, including its fumes, to cytology smears will prematurely fix cells resulting in poor staining and non-diagnostic results. Cytologic and histologic samples should be stored and shipped separately to avoid formalin artifact.

Use a systematic approach to cytologic review
Before enthusiastically applying oil to view cells using an oil immersion lens, take a few moments to scan the entire slide at lower magnifications (40x, 100x). Review a systematic checklist to assess whether slides warrant further evaluation – see BASIC CYTOLOGY notes. Assuming cellularity, cell preservation, cellular detail and staining are adequate, continue with a systematic approach now focused on meaningful details.

1. Scan the entire slide at low magnification (40x, 100x) taking note of:
a. Cellular arrangement – are cells found solely as individual cells, present in tight cohesive clusters, loose clumps or other arrangements? Lymphoid cells are typically found singly or in clumps of variable size and density. Finding cohesive clusters may serve as a clue for potential metastatic epithelial cells.
b. Metastatic cells – although low magnification scanning does not allow cellular details to be seen, it is often easier to identify metastatic cells in a sea of lymphoid cells than at 1000x. Never be hasty and move to the oil immersion lens too quickly!
c. Best areas for higher magnification – much of our time as cytologists is spent looking for areas on slides worthy to invest more time on at higher magnification. Distinguishing these areas saves time as we move from low to high magnification.

2. Is the lymphoid population uniform or heterogeneous? Similar to metastatic cells, assessing the overall lymphoid population for uniformity (suggestive of lymphoma) or heterogeny (suggestive of benign hyperplasia/reactivity) is often easier at lower magnification. I tend to utilize 200x magnification for this purpose.

3. Categorize lymphoid and, if present, non-lymphoid populations. At higher magnification, perform lymphoid cell counts, recording the proportions of small, medium and large lymphocytes, lymphoblasts and plasma cells. If present, evaluation of inflammatory cells, metastatic cells or any infectious organisms is also performed.

Cytological evaluation of lymph nodes requires experience. Fortunately, lymph node cytologic interpretations are generally limited to five major categories:
1. Normal
• A normal lymph node is not grossly enlarged and is predominated by small lymphocytes (>90% of total cellularity) with fewer medium and large lymphocytes (collectively ~8-10%). Occasional immature lymphocytes (lymphoblasts) and/or plasma cells may be present (~<2-3% collectively). Macrophages and rare mast cells are occasionally present.

Leukocyte numbers are proportional to the amount of blood present.
• The size of lymphocytes is conventionally determined by comparing the nucleus diameter to an erythrocyte (RBC).
• Small = 1-1.5x an RBC. Small lymphocytes have scant volumes of cytoplasm and dark clumped chromatin in the nuclei.
• Medium = 2-2.5x an RBC. Low cytoplasmic volumes and finely stippled to clumped chromatin.
• Large = >2.5x an RBC. Similar cytoplasm/chromatin as medium lymphocytes.

2. Hyperplastic or Reactive
• Lymphocyte proportions in a hyperplastic lymph node are often left shifted (increased numbers of immature lymphocytes present). However, proportions may be similar to that of a normal lymph node, yet the lymph node is grossly enlarged. Finding normal lymphoid proportions in an enlarged lymph node should raise suspicion for a hyperplastic lymph node or possibly a small cell lymphoma.
• Proportions of medium and large lymphocytes increase but are typically and collectively less than 50%. Increased mitotic figures may or may not be seen.
• Plasma cell numbers may or may not be increased. When increased, this supports reactivity. Mott cells, which contain multiple spherical to linear, pale blue structures representing immunoglobulin secretions (Russell bodies) may be seen.
• Macrophages, neutrophils, eosinophils and mast cells may also mildly increase in response to antigen stimulation, but numbers are lower than expected in lymphadenitis.
• Look for a source of antigenic stimulation such as metastatic cells or organisms. The lymph node(s) may instead be responding to systemic antigenic stimulation or are draining an area of local stimulation such as a nearby abscess.

3. Lymphadenitis
• Proportions of inflammatory cells are greater than expected with any concurrent blood contamination in the sample. Proportions vary depending on blood cell counts, but guidelines for diagnosing neutrophilic and eosinophilic lymphadenitis exist:
• Neutrophilic: Neutrophils comprise >5% of total cellularity
• Eosinophilic: Eosinophils comprise >3% of total cellularity
• Neutrophilic lymphadenitis is due to various infectious and non-infectious causes, including bacterial infections as well as neoplastic and immune-mediated conditions.
• Eosinophilic lymphadenitis is commonly associated with flea bite hypersensitivity, feline eosinophilic skin disease, hypereosinophilic syndrome and as a paraneoplastic syndrome with mast cell tumors, certain lymphomas and infrequently with carcinomas and sarcomas.
• Histiocytic/Macrophagic lymphadenitis is often associated with systemic fungal disease and other infectious diseases, including mycobacteriosis, leishmaniasis, protothecosis, pythiosis and salmon fluke poisoning disease.
• Combinations of inflammatory cells may be present.

4. Lymphoma
• Diagnosis of lymphoma is straightforward when a uniform population of lymphoblasts or medium to large lymphocytes predominates (>50%, often >90% of total cellularity).
• Diagnosis of small cell lymphomas can be challenging. Small lymphocytes comprising these types of lymphomas often have less clumped chromatin compared to normal lymphocytes. They also tend to have mildly increased volumes of cytoplasm localized to a rounded point, giving cells a hand-held mirror or tadpole appearance. The pointing direction these cytoplasmic tails is random, making a smearing effect unlikely. This morphology has been reported with T-cell lymphomas, but is by no means confirmatory for neoplasia as it also occurs with normal and hyperplastic lymph nodes.
• Importantly, there is a strong uniformity to overall cell morphology, regardless of cell size. This is sometimes better appreciated at 200x or 500x than at 1000x magnification.
• Increased numbers of mitotic figures may or may not be seen.
• Concurrent hyperplasia/reactivity may be present, complicating interpretation.

5. Metastatic disease
• Finding metastatic cells depends on how much of the lymph node is affected by the tumor and if the needle happened to enter an affected area during sampling. Otherwise, cytology is as accurate as histology in identifying metastatic disease. Collecting multiple samples helps increase odds of identifying metastatic cells.
• Entire slides need to be examined. A lack of metastatic cells does not completely rule out metastasis.
• Metastatic cells are easily identified when large or present in cohesive clusters, sheets, acini or other arrangements atypical of lymphocytes.
• Hyperplasia/reactivity and/or lymphadenitis may be concurrently present.
• Histiocytes and epithelioid macrophages can easily be misinterpreted as neoplastic cells. Foamy vacuolated macrophages with evidence of cytophagia and presence of other inflammatory cells favours inflammation rather than metastasis.

• Occasional melanophages and melanocytes may be present in normal or hyperplastic/reactive lymph nodes draining areas of dermatitis, especially in dark pigmented patients. While potentially suspicious for metastatic melanoma, occasional widely dispersed pigmented-laden cells are insufficient to confirm it. Hemosiderin must be differentiated from melanin using special stains. High numbers of pigmented cells, especially when found in groups or clusters, and/or with sufficient malignant criteria, are required for a confident cytologic diagnosis of metastatic melanoma.

• Low numbers of mast cells are present in normal and hyperplastic/reactive lymph nodes, especially if draining an area affected by hypersensitivity or parasitic disease. This is also the case for gastrointestinal lymph nodes, which often have more inflammatory cells, including plasma cells and mast cells. Similar to diagnosing metastatic melanoma, confidence of metastatic mast cell neoplasia is much greater when mast cells are numerous, present in clusters and display numerous criteria of malignancy.

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REDUCING PATIENT STRESS THROUGH CHEMISTRY

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When is full chemical restraint indicated?

Marked fear at any point or moderate fear in response to minimal handling

MARKED FEAR: Alligator rolling, flinching and vocalizing with minimal touch, releasing anal glands, urinating, flailing, panicked attempts to flee during exam, in addition to moderate fear signs. These patients should be given CR for any and all procedures until (if/when) patient can be desensitized/counter-conditioned to be more accepting of handling.

MODERATE FEAR: Cowering, crouching, urinating, tail tucked, head turned away, avoiding eye contact, ears pinned back, displaying several oral displacement behaviors (harsh panting, lip licking, yawning, lip smacking). May be able to "talk these patients off the ledge" using food for counter-conditioning, minimal restraint, environmental modification and handling tools; if not then opt for chemical restraint.
Severely fractious behavior at any point or moderately fractious behavior in response to minimal handling

SEVERELY FRACTIOUS: Barking/lunging upon clinician's entrance or when within immediate radius, attempts to bite, hackles up, snarling, air snapping, tail up, ears forward. These patients should be given CR for any and all procedures until (if/when) patient can be desensitized/counter-conditioned to be more accepting of handling.

MODERATELY FRACTIOUS: Growls, snarls, freezes with "whale eye" at any touch, may show more defensive postures while growling and showing teeth (ears back, tail tucked, cowering). May be able to "talk these patients off the ledge" using food for counter-conditioning, minimal restraint, environmental modification and handling tools; if not then opt for chemical restraint

Known history of displaying moderate-marked fear or fractious behavior during a specific procedure. For example a patient who shows this behavior during a previous toenail trim, rectal exam, ear cleaning, bandage change, urinary catheterization, blood draws, etc., should have CR before such procedures.

Prior to painful or socially invasive procedure, or combination of procedures, which may adversely affect the future behavior of a patient in the clinic setting. For example, CR should be given prior to pelvic radiographs, wound repair/debridement, and abdominal FNAs.

When should CR be administered?

Ideally injection should be given PRIOR to the patient's becoming highly aroused, agitation or fractious. If the procedure is not essential, you can plan for CR on a subsequent visit.

Oral premedications

Oral anxiolytics/sedatives can be used as sole method of anxiety reduction for mildly fearful patients. They can also be used prior to administration of injectable chemical restraint to reduce stress during and increase safety of giving the injection. Oral medications should be administered AT LEAST 90 minutes prior to patient's getting into car/carrier to come to the vet clinic. Any new medication should be tested by owner at home a few days before scheduled visit to assess for adverse effects and ensure adequate dosing.

Trazodone	
Dose	DOGS: 4-18mg/kg PO; not exceeding 300mg per dose; CATS: 50-100mg/cat
Class	Serotonin 2A Antagonist/Reuptake inhibitor (SARI)
MOA	Some selective inhibition of 5HT reuptake, antagonizes 5HT2A receptors, releasing 5HT1A
Onset of action	60-120 minutes
Duration of action	About 8 hours
Contraindications	Use caution in patients with severe systemic disease
Drug interactions	Do not combine with MAOIs, slight caution with other SRIs
Side effects	Likely: Sedation; Possible: GI upset/bleed, agitation, urinary incontinence, changes in appetite
Shortcut dosing:	
Dogs < 40 lbs. start at a calculated dose between 4-6mg/kg	
Dogs: >40 lbs. start at 100mg titrated as needed up to 300 mg/dog	

Clonidine	
Dose	DOGS: 0.01-0.05mg/kg PO; CATS: 5-10µg/kg PO
Class	Alpha-2 agonist
MOA	Slows release of NE in CNS, decreasing anxiety, HR, BP, pupil dilation
Onset of action	30-90 minutes
Duration of action	6-8 hours
Contraindications	Cardiovascular disease, severe renal disease, hypotensive patients
Drug interactions	Beta-blockers may enhance bradycardia, other antihypertensive drugs (Ace?)
Side effects	Likely: Sedation, mild hypotension; Possible: Agitation, GI upset, collapse, bradycardia

Gabapentin	
Dose	DOGS: 10-50*mg/kg PO; CATS: 50-200mg/cat PO
Class	GABA analogue; anticonvulsant
MOA	Not well understood; blocks release of excitatory NTs (substance p, gluta-mate, NE)
Onset of action	60-90 minutes
Duration of action	6-8 hours
Contraindications	Caution in patients with severe renal insufficiency
Drug interactions	Antacids block absorption
Side effects	Likely: sedation,
Caution: Human Neurontin® oral solution contains xylitol	

Lorazepam	
Dose	DOGS: 0.05-0.5mg/kg PO; CATS: 0.05-0.25mg/kg PO
Class	Benzodiazepine
MOA	Potentiates GABA activity;
Onset of action	30-60 minutes
Duration of action	6-8 hours
Contraindications	Severe respiratory insufficiency, aggressive patients
Drug interactions	Caution with other CNS depressants
Side effects	Likely: Increased appetite, sedation; Possible: ataxia, aggression, paradoxical excitation
Caution diazepam (benzodiazepine) has been associated with acute hepatic necrosis after PO administration in cats. No active liver metabolites in lorazepam – risk should be lower.	

Acepromazine	
Dose	DOGS: 0.55-2.2mg/kg PO; CATS: 1.1-2.2mg/kg PO
Class	Phenothiazine tranquilizer; antipsychotic
MOA	Block post-synaptic dopamine receptors in CNS, depressing RAS (alert-ness)
Onset of action	30-90 minutes
Duration of action	8-12 hours
Contraindications	Seizures?, severe cardiovascular disease, hypotensive patients, aggressive patients?
Drug interactions	Antacids block absorption, caution with other CNS depressants
Side effects	Likely: sedation, hypotension; Possible: Collapse, seizures, bradycardia, agi-tation, noise sensitivity

Best used in combination with an anxiolytic drug – does not provide anxiolysis
Common oral premed cocktails for dogs
Trazodone + clonidine
Trazodone + gabapentin
Trazodone + acepromazine
Trazodone + clonidine + gabapentin
Trazodone + acepromazine + gabapentin
*Lorazepam can be added to any of the above combinations in non-fractious patients. All are safe premeds for injectable sedation in healthy dogs
Oral premed cocktails for cats
Lorazepam + acepromazine
Acepromazine + gabapentin
Lorazepam + gabapentin
Chemical Restraint – Injectables

Dexdomitor® (dexmedetomidine)	
Dose	Dogs: 4-20µg/kg IM, 40µg/kg OTM; Cats: 10-40µg/kg IM or OTM
Class	Alpha-2 agonist
MOA	Very specific for alpha-2 receptors in CNS, causing major CNS depression
Onset of action	5-15 minutes (IM); 30-60 minutes (OTM)
Duration of action	45-60 minutes
Contraindications	Cardiovascular disease, severe renal disease
Drug interactions	Caution with high doses of acepromazine and CNS depressants
Side effects	Bradycardia, vasoconstriction, hypothermia, pale MM, respiratory depres-sion

Reverse dexmeditomidine with half volume of atipamezole to volume of dexmedetomidine administered IM

Torbugesic® (Butorphanol)	
Dose	Dogs: 0.1-0.5mg/kg IM, IV, or SC – dogs AND cats
Class	Opiate partial agonist
MOA	Partially agonizes/antagonizes μ and opioid receptors, subcortical and spinal analgesia
Onset of action	3 minutes (IV) – 15 minutes (IM, SC)
Duration of action	1-4 hours
Contraindications	Severe renal insufficiency, severely debilitated patients
Drug interactions	May enhance CNS depressant effects of other CNS depressants; will partially reverse full opioid agonists
Side effects	Sedation, mild bradycardia, mild respiratory depression, mild ataxia

Ketamine	
Dose	1-5mg/kg IM - dogs AND cats
Class	Dissociative general anesthetic
MOA	NMDA receptor antagonist
Onset of action	5-10 minutes
Duration of action	1 hour
Contraindications	Hypertensive patients, CHF; caution in epileptic patients
Drug interactions	Caution with other CNS depressants
Side effects	Anesthesia, respiratory depression, seizures, dysphoria, myoclonic jerking

Acepromazine	
Dose	1-5mg/kg IM - dogs AND cats
Class	Dissociative general anesthetic
MOA	NMDA receptor antagonist
Onset of action	5-10 minutes
Duration of action	1 hour
Contraindications	Hypertensive patients, CHF; caution in epileptic patients
Drug interactions	Caution with other CNS depressants
Side effects	Anesthesia, respiratory depression, seizures, dysphoria, myoclonic jerking

Midazolam	
Dose	0.2-0.4 mg/kg IM or IV – dogs AND cats
Class	Benzodiazepine
MOA	Potentiates GABA activity;
Onset of action	3-5 minutes
Duration of action	1-2 hours
Contraindications	Severe respiratory insufficiency, aggressive patients
Drug interactions	Caution with other CNS depressants
Side effects	Likely: Increased appetite, sedation, muscle relaxation; Possible: ataxia, ag-gression, paradoxical excitation

Telazol® (teletamine/ zolazepam)	
Dose	5-10 mg/kg IM – dogs* AND cats
Class	Dissociative general anesthetic/ benzodiazepine
MOA	NMDA receptor antagonist/ potentiates GABA activity;
Onset of action	3-5 min
Duration of action	30-60 min
Contraindications	Pancreatic disease, severe cardiac or respiratory disease
Drug interactions	Caution with other CNS depressants
Side effects	Anesthesia, respiratory depression, jerky recovery possible, but less likely than w/ ketamine

How do we get the injection into the dog?
Drive-by sedation (aka “Ninja Stab”)
Squeeze cage option
Can also use a door and adjacent wall – less for smaller patients

Injection administration for cats
Ideally can keep cat corralled in own carrier
Can give IM injection through soft, mesh carrier
Can lift top off of hard carrier and use towel to restrain for quick IM injection (a bit riskier)

Can use EZ Nabber to restrain and give IM injection through the mesh
Achieving and maintaining adequate sedation
Visual blocking: Avoid lobby time if at all possible; use Calming Cap or carrier cover to reduce visual input before/during/after injection; keep room DARK after injection

Auditory blocking: Play classical music and white noise; minimize talking; use room away from lobby and treatment areas; place cotton balls in ears after injection
Tactile: No touching after injection; avoid moving patient until fully sedate

Olfactory:
Have pheromones applied to room ahead of time

Keeping track
Write down drugs, doses and time each medication given (including oral meds given at home)
Quick reference guides
Herron, M., Shreyer, T. 2015 Blackwell's Five-Minute Veterinary Consult: Canine and Feline - 6th Edition "Fear and Aggression in Veterinary Visits" pp. 484-487
Herron, M., Shreyer, T. In Press. Blackwell's Five-Minute Veterinary Consult Clinical Companion: Canine and Feline Behavior - 2nd

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PAIN, BEHAVIOURAL OR BOTH?

G. Pearson

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Overview

Horses often present are presented to the veterinarian due to unwanted behaviours. These are vary in severity from poor performance to dangerous behaviours including rearing and bucking when ridden. Owners also may request investigation if they perceive everyday scenarios such as girthing to elicit pain because of the horse's behavioural response.

Objectives of the Presentation. This presentation will look at why various unwanted behaviours may occur and how they are reinforced. It will discuss how we can decipher if an unwanted behaviour is caused by pain, is primarily of behavioural origin or a combination of the two. Multiple video case studies will be used to demonstrate these points in the presentation.

How Behaviours are Reinforced

Behaviours can either be reinforced by the addition of something pleasant (positive reinforcement) or the removal of something aversive (negative reinforcement) immediately after the behaviour occurred. Ideally when the rider applies leg pressure the horse will move forwards (the desired behaviour) and the leg pressure is removed, thus rewarding the behaviour. However if leg pressure is applied and the horse offers an unwanted behaviour, for example bucking, and the rider's leg moves as they lose balance, then then this removal of pressure will reward the unwanted behaviour (bucking). Horses will repeat behaviours that resulted in a release of pressure from the rider's leg, rein contact or seat, even if the pressure is released for a fraction of a second. In this regard, horses will offer unwanted behaviours including bucking, rearing, napping/ baulking and shying more and more frequently. It is important to recognize that the unwanted behaviour is not due to the horse being purposefully naughty but simply because it is being inadvertently reinforced.

Pain Resulting in Unwanted Behaviour

Obviously, pain or discomfort will motivate the horse to remove the source and can lead to the development of unwanted behaviours. A subtle, bilateral hind limb lameness may not be evident to the rider and trainer, but the discomfort may result in the horse being reluctant to push with its hind limbs and so instead poor performance is noted. Alternatively the pain may be more marked when the horse strikes off in canter, and quickly the horse will associate pain with the transition.

Now when the rider asks for a canter, the horse will try and to avoid the transition, perhaps by ignoring increasing leg pressure or by offering an alternative behaviour such as bucking.

There are of course many causes of pain in horses, and in the presenter's experience the majority of cases presenting with behavioural problems when ridden have some underlying physical reason. A thorough evaluation should include but is not restricted to:

- Orthopedic assessment, both in a straight line and lunged on deep/hard surfaces by an experienced orthopedic clinician
- Assessment of the horse's back by both an experienced veterinarian and chartered physiotherapist, ideally togethecharted physiotherapist (UK) or sports medicine clinicianr. It should be remembered that generalized back pain is frequently a consequence of hind limb lameness
- Full dental evaluation by an equine vet with extensive experience in dentistry
- Gastroscopy (assessing both squamous and glandular portions)
- Assessment of Serum Amyloid A can help to indicate if there is any inflammation ongoing, for example an abdominal abscess, that would indicate further investigation such as abdominal ultrasonography

If no obvious source of pain is identified, it may be worth considering an analgesic trial. When undertaking an analgesic trial, especially in chronic cases, high doses may be required to see a significant difference. It is also important to remember that pain is a perception, whilst and while a positive response indicates pain as an underlying cause, a negative response to an analgesic trial does not rule out pain.

Any source of pain discovered should be taken seriously. , oOften veterinarians are aware of a low grade lameness but do not think it is severe enough to justify the behaviour. As we have already mentioned, pain is a perception and an individual feeling; whilst while one horse may be happy to continue doing its job with a marked lameness, others will not even tolerate a very subtle lameness without altering their behaviour.

Primary Behavioural Ccases

Often when we perceive there are no underlying sources of pain, the underlying cause of the horse's unwanted behavior actions is then assumed to be the horse's behaviour, as if they are making a conscious decision to misbehave. Instead we should shift our focus to deficits in the horse's training. We know what reinforces unwanted behaviours; i.e. that they are inadvertently reinforced through release of pressure when exhibited. So now we need to consider what might motivate a horse to trial unwanted behaviours in the first place. and it usuallyMost often it is a result of the rider/trainer not

adhering to training principles that take into account the horse's mental capacityies and learning capabilities. Unwanted behaviours (rearing, bucking, shying, bolting, napping, etc) are often called conflict behaviours and are trialed due to pain, fear or confusion in the horse's training.

Training errors include:

• Using contradicting aids simultaneously. This is probably the number one reason for horses to offer conflict behaviour. Consider that generally we train rein aids to elicit deceleration responses and leg aids to elicit acceleration responses. The problem occurs when the rider then attempts to influence the horses head and neck position by giving leg aids whilst holding onto a strong contact through the reins. It is understandable that the application of conflicting cues is very confusing for horses. They often initially trial opening the mouth to alleviate the increased rein pressure, hence an increase in the use of restrictive nosebands, and over time many become habituated to leg aids as the mouth is more sensitive. Ultimately many of these horses may then trial conflict behaviours to remove the conflicting pressures and of course any momentary release of rein or leg pressure if the rider momentarily loses balance will reward this behaviour.

• Training more than one response per signal. Good training relies on distinctive cues for different responses. However, again some training methods use the cue of backwards pressure on the reins for deceleration but also use the same cue for flexion of the head and neck. For the horse it is difficult to understand when to offer which response and the resulting confusion may result in conflict behaviours being trialed.

• Not training persistence of responses (self-carriage). If the horse is not trained to maintain its own speed, direction and line it will be constantly 'practicing' small unwanted behaviours. For example if a horse constantly drifts to the left they are practicing pushing sideways from their right foot without being asked. These horses are much more likely to spook sideways when startled (or even just randomly) as a bigger version of the smaller behaviour that has become habitual.

• Not releasing the pressure. As we have discussed, horses learn through release of pressure. Whilst While horses habituate to the light pressures involved with contact, they are motivated to remove heavier pressures. As well as trying responses such as acceleration and deceleration, they may trial conflict behaviours through frustration of 'not finding the right answer'.

• Using too much pressure. Horses can be trained to respond to very light pressures. Consider a fly landing on a horse's side, it swishes it tail because this removes the fly. Using excessive pressure from the rein or leg indicates that the pressure has not being removed at the right time in previous training. Horses find excessive pressure very aversive and are liable to trial conflict behaviours to remove it.

Equine veterinarians are of course not trainers, however observing a horse that presents with unwanted behaviours being ridden can often give clues that poor training is contributing to the problem. The International Society for Equitation Science have has published a poster and short document on the principles of training, the link is included in the reading list below.

Both pain and behaviour?

Often unwanted behaviours develop in response to pain. However as the behaviour is repeatedly practiced a habit may form. In this scenario the behaviour may persist even when the pain has resolved. This is where retraining may be required alongside treatment of the physical condition and help from a qualified behaviourist is indicated.

Another interesting scenario is where no source of pain can be found and behavioural therapy is initiated. In the presenter's experience, several of these cases have then gone on to demonstrate an obvious lameness in the following weeks or months. Although further research is required it is possible that these cases are in a state of increased sympathetic stimulation due to a combination of pain and confusion associated with poor training. Once the training level improves, the horses become more relaxed generally in life and then demonstrate lameness.

Summary including 5 KEY "TAKE HOME" POINTS

1. Deciphering if an unwanted behaviour is a result of pain, is a primary behavioural response or a combination of the two is very challenging
2. Work up of these cases requires lots of time and a team of people with expertise in different areas
3. Pain is almost always underlying in most cases presenting with unwanted behaviours when ridden.
4. An analgesic trial indicates pain if a response is seen to treatment, but does not rule out pain if no response is seen
5. Unwanted behaviours can develop as a consequence of poor training methodology and observation of the horse being ridden can be useful to detect this.

Summary

References/Suggested Reading

Pearson, G. (2015) Practical application of equine learning theory, part 1
In Practice 2015;37:5 251-254 doi:10.1136/inp.h2046
Pearson, G (2015) Practical application of equine learning theory, part 2
In Practice 2015;37:6 286-292 doi:10.1136/inp.h2483
Text books
McGreevy, P and McLean, A. (2010) Equitation Science. Published by Wiley-Blackwell, West Sussex, U.K. IBSN 978-1-4051-8905-7
Link to The First Principles of Horse Training document, created by the International Society for Equitation Science
http://www.equitationscience.com/learning-theory-in-equitation

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NEWLY APPROACH VENTRAL FEMORAL HEAD AND NECK OSTECTOMY (FHO)

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Newer Ventral Approach for Femoral Head and neck Ostectomy (FHO)
Femoral head and neck ostectomy (FHO) is a good choice in cases that are refractory to medical therapy, as a less expensive alternative to total hip replacement surgery. The overall function (range of motion and strength) will not be as good in bigger, heavier dogs, however they are usually far more comfortable through range of motion than prior to surgery.

Case Selection and Surgical Timing
Previously FHO was thought to be a last moment salvage procedure. It is much preferable to have the patient still well ambulatory and in relatively good body condition at the time of surgery versus being so over-weight and muscle atrophied that the rehabilitation process is much harder.

Although the ideal timing for each patient is individual, this author typically recommends FHO when the patient is becoming refractory to good medical management. For example, the patient should be in healthy body condition with a regular moderate exercise regime. The dog should also be on joint supplements and may have gone from needing NSAID administration once every 3-7 days during more strenuous activity, to needing daily to twice daily NSAIDs as well as other analgesics such as Gabapentin, Tramadol or Amantadine.

If the patient is very obese with significant muscle atrophy, enrolment into a professional physical therapy program ("pre-hab") is strongly recommended prior to surgery to optimize the patient's recovery.

Where possible, FHO should also be avoided in skeletally immature patients, particularly where other concurrent pelvic fractures may exist. These patients may be more prone to healing of the femoral bone cut to the pelvis or muscle contractures that carry a poor long-term prognosis for return to function.

FHO Ventral Approach
The main benefit of this approach over the more traditional craniolateral approach includes preservation of the cranial-dorsal musculature and soft tissue support structures that need to take over function of the hip post FHO.

Additionally, the only muscle transection that is needed is the pectineus muscle. Pectineal myotomy has been described previously as a treatment option for hip dysplasia, so is also an inherent advantage of this approach. Subjectively, return to comfortable function in the limb is faster with this approach versus the craniolateral approach. This is the preferred FHO approach for the author in the majority of cases apart from those that have craniodorsal hip luxation or patients that have excessive inguinal fat that may hinder clear identification of surgical landmarks.

This approach is performed as outlined in Piermattei and Johnson's "Atlas of Surgical Approaches to the Bones and Joints of the Dog and Cat".

The femoral arterial pulse and adjacent pectineus muscle (which lies just caudal) are palpated, and a skin incision is made centered over the origin of the pectineus muscle. Careful blunt dissection with right-angled forceps is then carried out to isolate the origin of the pectineus m. During this process care is taken to identify and protect the femoral artery, vein and saphenous nerve which lie on the cranial aspect of this muscle. Once isolated, sharp transection of the pectineus muscle close to its musculotendinous origin on the pre-pubic tendon and iliopubic eminence is carried out.

With the pectineus muscle reflected distally, the medial circumflex femoral artery and vein that run caudally and medially to the acetabular portion of the pelvis can usually be seen. It may be necessary to free these vessels from the surrounding fascia and to retract them proximally. Small branches from these vessels may be disrupted during retraction and can be cauterized if electrocautery is available.

A separation between the iliopsoas and the adductor longus muscle is developed by blunt dissection. Retraction of the iliopsoas m. cranially and the adductor m. caudally exposes the rim of the acetabulum. Gelpi self retaining retractors are useful for this step, although care should be taken to avoid trauma to the femoral neurovascular bundle with the sharp instrument tips.

The joint capsule can then be sharply incised to reveal the femoral head. The author prefers not the luxate the hip out of the acetabulum at this point, but leaves it in-situ to help with stabilization during the osteotomy. Time and care should be taken to ensure sufficient joint capsule has been removed from the femoral neck to allow accurate removal of both the femoral head and neck. Best exposure of the neck of the femur can be developed by placing Hohmann retractors cranial and caudal to the femoral neck.

The author recommends having a bone model of a pelvis and femur in the operating theater to help guide correct orientation of the FHO cut. As the pelvic limb is typically abducted in a frog-legged position, orientation of the cut is typically ~ 30-45 degrees off vertical pointed towards the pelvis. Iliopsoas m. insertion on the lesser trochanter can readily be palpated, however the greater trochanter will not be visualized due to the limited exposure of this approach and its dorsal-lateral location. If the orientation of the FHO cut is too perpendicular to the femur, it may risk inadvertent damage to the greater trochanter.
When performing the osteotomy, this author likes to mark the start of the osteotomy just proximal to the lesser trochanter (which is easier to palpate via this approach) with an osteotome. The angle of the osteotomy cut is approximately 25-45 degrees from parallel with the femur. When performing the osteotomy it is essential to have an assistant scrubbed into the surgery to help hold the retractors and limb to allow for accurate orientation of the cut.

Note: it is very important not to be too perpendicular to the bone with the FHO osteotomy as inadvertent fracture of the greater trochanter may occur.

The osteotomy site should be carefully palpated post osteotomy to confirm configuration of the FHO osteotomy (lifting the leg can help palpation of the dorsal aspect of the cut).

Post-operative radiographs
Before the patient is recovered from anesthesia, a post-operative hip extended VD pelvic radiographs should be taken to confirm the configuration of the cut.

Post-operative rehabilitation
In the author's experience, the main complications are related to insufficient rehabilitation eg. Patient was cage rested without sufficient range of motion and ended up with severe muscle contracture limiting extension of the hip. Leaving too much of the femoral neck can also be a technical pitfall of limb and saw positioning intra-op, which hopefully can be corrected when found on palpation or on the post-operative radiograph when the patient is still under general anesthesia.

Following surgery, the rehabilitation plan is focused on providing adequate analgesia to the patient to ensure that daily physical therapy can be carried out. The main focus of physical therapy is to encourage normal range of motion in the hip joint (particularly hip extension). To facilitate early normal weight bearing in the operated limb, and to slowly rebuild muscle strength in the upper limb musculature.

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CANADA ROCKS! A LOOK AT THE CHANGING MANAGEMENT OF CANINE AND FELINE UROLITHIASIS

D. Houston

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Introduction: The two most common urolith types identified in dogs and cats in North America, and many other parts of the world, are calcium oxalate (monohydrate and dihydrate) and struvite (magnesium ammonium phosphate hexahydrate) with the relative proportions of these two types varying over time.

Animal-related and dietary factors contribute in various ways to the development and management of these uroliths and will be the focus of this talk. Other urolith types including cysteine and urate, occur much less frequently. The ACVIM Small Animal Consensus Recommendations on the Treatment and Prevention of Uroliths in Dogs and Cats, available on line, addresses their management (1).

Canine Calcium Oxalate (CaOx): Approximately 75% occur in older, small breed dogs (2). Many of these at risk dogs are overweight, a factor we must remember when calculating caloric intake from food including treats (3). Although a genetic basis has not been proven, there are distinct differences from non-stone forming dogs, in the gastrointestinal absorption of calcium, mineral metabolism and urine composition in certain breeds of dogs including the Miniature Schnauzer and Bichon Frise (4-9). Hypercalciuria rather than hyperoxaluria appears to be a significant predisposing factor of CaOx urolith formation in both dogs and cats (7, 8). The enteric microbial flora of calcium oxalate stone forming dogs is altered and distinct from non-stone forming dogs and Oxalobacter formingens, an anaerobic organism that metabolizes intestinal sources of oxalate, is absent in some stone forming dogs (10, 11).

Feline Calcium Oxalate occurs with increased risk in older, male cats and in particular, Tonkinese, Burmese, Devon Rex, Himalayan, Persian and Ragdoll cats (12). Many cats with urolithiasis are overweight. Hypercalcemia and concomitant hyercalciuria may need to be addressed. Management of calcium oxalate urolithiasis in dogs and cats: Medical dissolution of calcium oxalate urolithiasis is not yet possible. Minimally invasive procedures (MIP) such as lithotripsy are recommended over surgery for urolith removal (1). As risk of calcium oxalate urolith recurrence is high, especially in some breeds of dogs, a change to a therapeutic diet designed not to be overly restricted in calcium, magnesium or phosphorus is recommended (1, 5, 13-15). There are a number of diets, with variable nutrient profiles and some with either relative supersaturation testing (RSS) or activity product ratio (APR) testing, available to help in prevention of calcium oxalate urolithiasis. Multiple small meals throughout the day may help stimulate water intake and urine output. Treats are generally not recommended unless they follow the exact profile of the therapeutic diet. Unfortunately, more than 50% of owners give human food as treats to their dogs and this behaviour is unlikely to change (3). Consequently, it is important a diet history including treats and supplements is filled out-a short diet history form is available at wsava.org. Any human foods offered must be safe and appropriate, that is to say, low in calories, low in oxalate, moderate in calcium, low in collagen/ hydroxyproline, and provide no more than 10% of the pet's maintenance energy requirements (MER). Oxalate levels are highly variable in human foods depending on the source sited (16). For the purpose of this talk, a discussion on oxalate and caloric content of human food utilizes the Harvard web site (https://regepi.bwh.harvard.edu/health/Oxalate/files) and the USDA site (http://www.nal.usda.gov/fnic/foodcomp/search/) respectively. The reader is reminded that only a small portion of oxalate comes from the diet with a greater amount endogenously produced from hydroxyproline in the liver (17). Studies in dogs and cats are limited on this topic but it is clear the amount of hydroxyproline in the diet or in treats should be limited (18-21). In a recent study, rawhide bones were reported to have the highest hydroxyproline content of examined chews (21). Rawhide chews and other animal body parts (e.g. pigs' ears) are potential sources of contamination from bacterial organisms and they often exceed the 10% of daily caloric intake suggested for treat ingestion.

In addition to diet, additional therapy may be needed: Potassium citrate (50-75mg/kg q12-24hr) is commonly recommended for dogs and cats although citrate deficiencies have not been identified. One study did document an increase in urinary citrate levels and in 3 Miniature Schnauzers, a significantly lower urinary relative calcium oxalate supersaturation when fed a diet supplemented with potassium citrate, compared with control diet (22).

Vitamin B6 (pyridoxine) increases the transamination of glycosylate, an important precursor of oxalic acid, to glycine and while naturally occurring deficiencies have not been reported in dogs and cats, supplementation is often recommended at a dosage of 2 mg/kg PO q 12 hours. Hydrochlorothiazide diuretics may be used in dogs and cats (with caution).

Probiotics: Given the absence of Oxalobacter degrading bacteria in some dogs (probably cats) with oxalate uroliths, probiotics containing Oxalobacter degrading bacteria such as Lactobacillus spp., Bifidobacterium spp., Enterococcus among others may be of value (23-25).

Monitoring: Follow up is critical. Urinalysis (pH and USG in particular) is recommended every 3-6 months; imaging for stone recurrence is recommended at least every 6 months.

Struvite in dogs: Struvite in dogs is almost always in female dogs and due to urinary tract infection (UTI) with ascending urea-splitting bacteria, most commonly Staphylococcus pseudintermedius, or less commonly Proteus mirabilis (uncommonly Ureaplasma, Corynebacterium). These bacteria result in hydrolysis of urea to form ammonia and carbon dioxide which increases the urine pH and availability of ammonium and phosphate ions for struvite formation; it is not usual for a struvite urolith to contain smaller amounts of calcium phosphate and urate. Houston et al determined that medium and larger breeds, and in particular, the Saint Bernard, Labrador retriever, and Golden retriever are more likely to have a struvite urolith than any other type of stone (2).

Management: Medical dissolution of struvite uroliths is possible providing the diet maintains an average urine pH <6.5, ideally under saturates the urine in minerals contributing to stone formation, and appropriate antibiotics, based on culture and sensitivity results (from a cystocentesis collected urine sample) are given to treat the UTI (26). Previous protocols for antibiotic therapy recommended treatment throughout the dissolution period and up to one month beyond due to the concern for bacteria trapped within the matrix of a urolith being slowly released from the inner portions of dissolving uroliths re-establishing an active infection leading to formation of more stones (26). Given concerns for antimicrobial resistance, costs/adverse effects associated with longer term antibiotic use, and limited scientific data available regarding the need for antibiotics in asymptomatic individuals for this duration, new ISCAID guidelines suggest treatment for only 7 days at the time of initial clinical presentation (26).
Monitoring: Following dissolution or mechanical removal of uroliths, monitoring for UTIs and management of any predisposing factors to development of UTIs is critical. Struvite stones can form quickly in the presence of a UTI. No diet can prevent an infection although diets marketed for struvite urolithiasis but may delay or minimize urolith burden in the presence of an unrecognized UTI (12).

Struvite in cats: Houston et al reported an association between domestic long haired cats and struvite urolithiasis with females over presented (12). Unlike the dog, infection is not generally a risk factor for struvite formation in healthy 1-10 year old cats. Most affected cats are young to mid-age and often overweight, a risk factor for all forms of lower urinary tract disorders. High urine pH coupled with a high urine specific gravity predisposes. In a retrospective case-control study, diets high in magnesium, phosphorus, calcium, chloride and fiber, moderate in protein and low in fat content were associated with increased risk (27).
Management: Feline struvite uroliths are readily amenable to medical dissolution. There are 4 published studies confirming the efficacy of feline struvite dissolution diets (28-31). On average, sterile struvite uroliths dissolve within a month. The current recommendation is to feed the calculolytic diet alone for 2-4 weeks beyond radiographic resolution to ensure complete dissolution of calculi < 3 mm, which are not radiographically visible. Where a UTI is confirmed by culture, antibiotics are indicated.
For prevention, a diet promoting aciduria (pH <6.5 but above 6.1), restricted in magnesium and phosphorus, under saturating the urine for struvite, and promoting less concentrated urine, is recommended. A weight loss diet may be needed. Multiple small meals throughout the day will help mitigate the degree of the post prandial alkaline tide and should help stimulate water intake and urine output.
Water consumption is to be encouraged to help in prevention of all urolith types (excluding infection induced struvite uroliths), with the goal to maintaining a urine specific gravity <1020 in dogs and <1030 in cats (1).

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BUILDING YOUR TOOLKIT: REAL LIFE CHALLENGES. TOOLKIT WORKSHOP

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Creating your own toolkit requires some self-reflection and honest interpretation of what is happening around you. It also requires prioritization of challenges, and a realistic perspective of what is achievable within a given time frame. Consider your situation carefully and try to focus on big picture without getting stuck on the details of a single problem. Usually, these smaller issues are signs of larger concerns.

All of that said, the best place to start is with yourself. Consider your personal culture. Consider the personal culture of your Management Team and Leadership Team – all people involved in shaping the culture of your practice.

For your own situation, make a list of strengths and opportunities with respect to personal culture.

From there, consider the way communication occurs within your team. Again, start with self. Is there respect within the team in how we communicate with each other. Are we holding ourselves back by not communicating effectively on the team? Does your team's communication flow benefit or hinder clients with respect to their understanding, learning and compliance?

Where are the greatest communication issues within your own situation? What is your role in them? (be honest with yourself) How can you affect a positive change?

Consider your own mindset and your learnings around fixed and growth mindset. How will sharing this learning with your team open the door for success? What are you're A-HA moments with respect to this concept and how will it benefit your team?

Speaking of the team… do they have the voice they require, in order to be the best version of themselves? Do they have reason to sing the praises of the hospital? Do they have reason to sing the praises of the team?

In your own situation, what would help to reinforce the importance of your team and how could this translate into improvement for patients, clients, team and business?

Knowing that everybody on the team is different, we will still have various perspectives on things. What is happening within your situation that divides the team?

Are there problems that not everybody perceives the same way? What common thread could be introduced to try and unite and engage team members into being solution oriented about things that matter?

Are the generation differences between team members holding you back as a team? Is this something that has ever been addressed or is it only ever brought up with an eyeroll and laughter? Are generation differences being used as an excuse for poor communication instead of being seen as a benefit to the team?

What can be done in your situation to highlight the importance of generational differences on the team? How can you utilize the differences on your team as a strength?

Finally… with communication in check, and differences acknowledged as a positive… how do we work as a team and remain united and engaged? Within your situation, where is there resistance to change? Are meetings being held and, if so, are they effective? Do people know what is expected of them? Is the practice fulfilling it's goals? Do the team know what those goals are? At the end of the day, do people feel valued and do they value the work that is accomplished every day?
Creating a plan can be a very helpful way to really identify what is important. Making a list of your challenges/needs and then sorting them by their level of urgency and importance can help to formalize priorities and a plan. Remember to focus on big picture before drilling down to details as a way of not missing any issues and highlight why things are happening so that you are not just addressing the problem itself.

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OPIOD-FREE PERI-OPERATIVE ANALGESIA

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Managing anesthesia without opioids provides a challenge, as opioids have long been the cornerstone of acute pain management. When use of opioids is not limited by supply issues, legal issues, or individual intolerance, they should still be considered for treating acute pain. Narcotics are highly effective at treating acute pain, have a high margin of safety, and they cause minimal cardiovascular changes. Despite being very effective at treating acute pain, narcotics also stimulate glial activation, and contribute to neuro-inflammation, tolerance and dependence. They amplify pain in the long-run, while suppressing pain in the short term. Thus, even when used clinically, they should be used with other tools to decrease the neuro-amplification and immune modulation they cause (such as NSAIDs, local anesthetics, and other classes of pain medications).
Once accustomed to using multi-modal approaches to treat pain, including both pharmacologic and non-pharmacologic approaches, opioids become an option rather than a requirement in the peri-operative period.
A description of a typical pattern of case management, either WITHOUT the use of opioid, or with limited use of opioids (including partial agonists or mixed agonist/antagonist drugs) follows.

Opioid-reducing pre-anesthetic handling and premedication: keep the patient as calm as possible
Opioids provide a reliable adjunct to sedating patients pre-operatively, and without them some of the pre-anesthetic period requires increased consideration of hospital environment, such as separating cats and dogs, leaving pets with their sources of comfort until ready for procedures, use of calming sounds, smells, lighting and use of items such as thunder-shirts.
Oral sedation options for use prior to coming to the clinic in fearful patients:

Gabapentin- 10-20 mg/kg (or 100 mg/cat) can be very sedating until a patient becomes tolerant of this dose. Generally a very safe drug even at high doses, where PK is limited by absorption.
Melatonin- usually combined with Gabapentin or a different oral medication. Dose is extrapolated to be ~1 mg for creatures <10#, 3 mg from 10-40#, and 5 mg above 40#. Also a very safe supplement, even at high doses. There is a sustained release version available for dogs that are up at night with dementia.
Trazodone - usually about 10 mg/kg. This drug is a partial antagonist of serotonin in the brain, and also has some SSNRI effects. High doses, or combinations with other SSRIs or tramadol create the risk of serotonin syndrome, which can be severe.

Benzodiazepines- as listed above- oral versions include alprazolam and diazepam. This is not an option for cats, as repeated dosing of benzodiazepines in cats has been associated with hepatic injury. Unreliable behavioral effects also limit the usefulness of this class, although when paired with other drugs they may be efficacious.

Transmucosal drug options: Stand-alone or in combination with oral medications:
Acepromazine, Dex-medetomidine, Ketamine and Buprenorphine have shown some fair absorption characteristics in dogs.
Dex-medetomidine, ketamine, buprenorphine, methadone, and to a lesser degree, hydromorphone: have shown some reasonable absorption characteristics in cats

Parenteral drug options: Without opioids in the mix, the usual medications remain: acepromazine, alpha-two agonists, benzodiazepines, and low-doses of most of the induction drugs. Premedicate between 15 minutes and two hours prior to anticipated surgery time (short for dexmedetomidine, long for acepromazine/trazadone).
*Gentlest (and also least effective)- midazolam (0.1-0.4 mg/kg)

*Moderate (both non-reversible)– acepromazine (injection 0.01-0.05 mg/kg) or trazadone (2-6 mg/kg oral)
*Most Sedating (also analgesic and reversible)- dexmedetomidine

Reserve anticholinergics for as-needed use except as noted under special conditions
Note: VERY anxious animals should be given oral sedation before coming to the clinic. This can be drugs such as: Gabapentin, Trazadone, or Acepromazine, and supplement Melatonin

Catheters can be placed in non-premedicated dogs, but if you choose this route, you should use topical lidocaine to desensitize the skin, and reduce the likelihood of patients becoming fearful on this and future visits. Practice low-stress restraint techniques!!!!!

Adjust drug dosages as necessary for your patient- so much of this is experiential… wisdom of practice experience!!

All drugs should be dosed to the patient's ideal body weight (with a nod to body surface area- larger animals require relatively less drug per body weight than smaller animals)

Likewise, older animals require relatively less drug than younger animals.

Disease and concurrent drug therapy may reduce drug requirements (or increase them!)
A Smooth anesthetic period involves: Lack of awareness, analgesia, smooth induction, rapid recovery, maintenance of balanced autonomic reflexes, lack of movement. A smooth anesthetic period helps to beget a smooth recovery.

Without the use of opioids, an appropriate non-steroidal anti-inflammatory should be used early in the procedure, once a trend of adequate blood pressure has been established. Addition of local anesthetic should be used throughout the procedure. Wherever possible, a long-acting local anesthetic block should be performed before recovery. A diverse knowledge of local blocks and constant rate infusion techniques is important:

Local anesthetic educations videos are available at the WSAVA-GPC website:
https://www.wsava.org/WSAVA/media/PDF_old/Local-anesthetic-educational-videos_0.pdf

Infusions and Local Blocks to master:
All dental blocks
Testicular blocks (and line blocks) for neuters
Line blocks/pedicle blocks for spays
Coccygeal blocks for urethral obstruction/anal sacs
Epidurals or femoral/sciatic blocks for orthopedics (knees)
Declaw blocks
Ear canal blocks for TICA
CRIs or PIVA

Recovery: As mentioned pre-induction, a quiet, controlled recovery situation improves recoveries when less parenteral medications are on board to modify this period.

Pain should be well controlled with NSAIDs, locoregionally techniques and application of analgesic micro-doses as needed (such as dex-medetomidine, ketamine).
All surgical wounds for which it is not contra-indicated (skin flaps) should have ice placed for 15 minutes during the recovery period.

Other non-pharmacologic techniques for providing analgesia in the post-operative period include laser therapy (done before ice, or at least 2 hours after), acupuncture, pulsed electrical fields (PEMF loops, beds, jackets), and compression wraps where appropriate. A knowledge of these techniques becomes more important when peri-operative opioid medications are limited or unavailable.

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CASE STUDIES IN FELINE CARDIOLOGY

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Case 1: Syncope versus seizures

Signalment: 14 y.o. Mc Domestic Shorthaired cat
Chief concern: Recurrent seizurelike episodes X 8 months, now occurring several times daily.
History: Episodes are characterized by ataxia, disorientation, opisthotonos, and seizure activity. They are brief (10-30 seconds) and self-terminating. On initial evaluation 8 months earlier, the referring veterinarian heard premature beats and speculated that sotalol should be prescribed; the cat had been receiving sotalol 20 mg PO q 12 h for the 8 months prior to presentation.
Physical Exam: Bright, alert, responsive cat. Normal mentation. Normal heart sounds and regular heart rhythm @ 220 beats/minute.

Diagnostic Test Results: An electrocardiogram revealed normal sinus rhythm/sinus tachycardia. An echocardiogram was unremarkable. Hospitalization with electrocardiographic monitoring (Holter) demonstrated no arrhythmia over a 24-hour period. The patient was discharged after discontinuation of sotalol. 6 weeks later, episodes recurred and were more severe. ECGs obtained immediately after episodes showed sinus tachycardia. An event monitor was placed and triggered during an episode identified third-degree AV block with ventricular standstill lasting up to 25 seconds.
Analysis and Conclusion: A permanent epicardial pacemaker was implanted on an emergency basis and episodes resolved.

Learning point: Neurologic disease and severe cardiac arrhythmias, especially severe bradycardias, can produce similar or even indistiguishable signs. The arrhythmia should always be evaluated first, using echocardiography to assess cardiac structure, then electrocardiography until an arrhythmia is convincingly identified or ruled out during an episode. Failure to do so risks anesthetizing a patient for a neurologic work-up, with an arrhythmic crisis under anesthesia.

Case 2: Thromboprophylaxis: when to treat to prevent blood clot formation

Signalment: 1 y.o. Mc Burmese
Chief concern: Incidentally-detected heart murmur
History: Routine physical exam revealed new heart murmur. No overt clinical signs. No treatment.

Physical Exam: Bright, alert, responsive cat in good body condition. Normal respirations, exam room RR = 24/minute. Grade II/VI systolic murmur, with point of maximal intensity over left parasternum. Regular rhythm @ 220/minute.

Diagnostic Test Results: Echocardiography revealed moderate, asymmetrical left ventricular thickening (maximal interventricular septal thickness in diastole = 6.7 mm) and moderate to marked left atrial enlargement (2D LA:Ao = 2.2:1, absolute LA diameter = 23 mm; subjectively disproportionate degree of left auricular enlargement; no clot or spontaneous contrast). Mild systolic anterior motion of the mitral valve, and mitral regurgitation, were apparent at higher heart rates.
Analysis and Conclusion: Given these findings, an increased risk of thromboembolism could be suspected.

Whether or not to begin treatment with clopidogrel was discussed both from a medical standpoint (absence of supportive evidence; risk associated with atrial enlargement; lower risk associated with hypertrophic obstructive cardiomyopathy, as in this cat, compared to hypertrophic or restrictive cardiomyopathies) and a logistical standpoint (owner ability to administer medication daily; tolerance of the medication [palatability]; lack of quantifiable benefit). This cat's owners opted to begin treatment with clopidogrel 18.75 mg/cat PO q 24 h.

Learning point: Left atrial enlargement is considered a risk factor for cardiogenic thromboembolism in cats, but efficacy of preventive treatment (thromboprophylaxis) is unknown in cats that have not experienced an episode of thromboembolic disease. Presence of spontaneous contrast (minority of such incidentally-detected cases) or of discrete intra-atrial clots (even less common) are logical indications for initiating treatment.

Case 3: Subclinical HCM: what to do?
Signalment: 12 y.o. Mc Domestic Shorthaired cat
Chief concern: Incidentally-detected heart murmur
History: Unremarkable past medical history. Routine annual exam revealed newly detected heart murmur.
Physical Exam: Bright, alert, responsive cat in good body condition. No evidence of dehydration. Normal respiratory rate and character. Grade III/VI systolic heart murmur with point of maximal intensity over sternum. Regular heart rhythm @ 200/minute. Strong, synchronous pulse.

Diagnostic Test Results: Echocardiography reveals moderate, diffuse left ventricular hypertrophy, septum thicker than free wall (7 mm and 6 mm, respectively, in diastole). Left atrial diameter within normal limits.

Analysis and Conclusion: The incidental finding of a thick left ventricle in a cat raises several important questions. 1) Is it pseudohypertrophy? The effects of dehydration and of tachycardia must be considered or ruled out. 2) Is it hypertrophy due to an extracardiac disorder? Hyperthyroidism, systemic hypertension, and acromegaly must be consiered and ruled out if clinically relevant. 3) Is there a structural cardiac reason to explain hypertrophy? Aortic stenosis must be ruled out. 4) Should it be treated? The absence of overt clinical signs makes treatment nonessential because efficacy of treatment has not yet been demonstrated.

Beta-blockade, while logical in patients with persistent left ventricular outflow tract obstruction, has not been shown to alter the course of spontaneous hypertrophic cardiomyopathy in cats. Angiotensin-converting enzyme inhibition (e.g., via ramipril) likewise appears ineffective.

Newer treatment options, be they chronotropic (e.g., ivabradine) or myocardial (e.g., inhibitor of sarcomere contractility) are under investigation. An argument can be made for thromboprophylaxis when the left atrium is enlarged (see above), but not when it is of normal size, as in the present case.

Learning point: Before establishing a diagnosis of hypertrophic cardiomyopathy in a cat with no overt clinical signs, the clinician must consider other explanations for increased left ventricular wall measurements. When such confounders are excluded, treatment generally is considered only when additional factors support it, such as the presence of tachyarrhythmia (for beta-blockade).

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OPHTHALMOLOGY QUIZ: INTERACTIVE PRESENTATION OF COMMON AND UNUSUAL OPHTHALMOLOGIC CASES

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Case 1

4 YO female boxer. Comfortable. Visual OU
3 weeks after a procedure was done on one eye.
Which procedure has been performed?
Repositioning of the gland of the nictitating membrane OS
superficial keratectomy OD
superficial linear keratotomy OD
Nictitating membrane excision OS

Case 2

1 yo poodle male presented for redness in OD for 4-5 days.
Which complementary diagnostic test(s) would you recommand?
ocular ultra-sound
hematology and biochemistry
Intra-ocular pression and fluorescein
electroretinogram
What is your diagnosis?
glaucoma
posterior stromal ulcer
Anterior uveitis and mature cataract
Indolent ulcer
Which treatment would you recommand?
Local AB local and systemic AB
Local SAI, local Atropine and systemic AI
Anti-glaucomatous meds
Local NSAI
Which treatment would you recommand?
None
Local SAI
NSAI +/- lens luxation surgery
Local NSAI +/- cataract surgery

Case 3

3 yo boxer presented for a lesion on OD appeared the same day...
Menace response hard to assess, Dazzle , direct and indirect PLR are positive…
What is your diagnosis?
Melting corneal ulcer
Epibulbar melanocytoma
Corneal perforation
Corneal dermoid
What would be the recommanded treatment?
medical treatment alone
enucleation
conjunctivo-corneal transposition
corneal sutures

Case 4

Seven month cat chat presented a bilateral lesion that appeared 5-6 weeks.
What is your diagnosis?
Squamous cell carcinoma of the NM
follicular conjunctivitis
NM cartilage eversion
Luxation of the gland of the NM
Name 3 cats'breeds predisposed to "cherry eye"

Case 5

11 yo Boston Terrier female, Visual OU. Comfortable OU
7 days after a procedure was performed in OD
Which procedure has been done in the right eye?
Ponctiform Keratotomy
lamellar superficial Keratectomy
thermokeratoplasty
Iodine cauterisation

Case 6

4 yo DSH female cat presented with a lesion that appeared the morning of the visit to the clinic…
What is your diagnosis?
Melting ulcer
macrocornea
Acute bullous keratopathy
Corneal endothelial degeneration

Case 7

14 DSH cat female. Comfortable. Visual OU
What is your diagnosis?
Anterior synechiae after a corneal perforation OU, iris melanoma OS
Persistance of pupillary membrane persistance OU, iris melanoma OS
Persistance of pupillary membrane persistance OU, iris cysts OS
Anterior synechiae after a corneal perforation OU, iris cyst OS

Case 8

2 yo Persan cat. Comfortable. Visual OU
4 months after a procedure has been performed in OD
Which procedure has been done in the right eye?
lamellar superficial keratectomy and conjunctivo-corneal transposition
lamellar superficial keratectomy and conjunctival graft
lamellar superficial keratectomy and equine amniotic membrane graft
lamellar superficial keratectomy alone

Case 9

What is your diagnosis?
nodular granulomatous episcleritis
Corneal squamous cell carcinoma
Corneal perforation with iris prolapse
Corneal dermoïd

Case 10
8 yo Tibetan terrier presented for an intermittent cloudy right eye. Comfortable.
Menace: OU +
PLR: OU +
What is your diagnosis?
Incipient cataract OU; primary glaucoma OD
Nuclear sclerosis OU; primary glaucoma OD
Nuclear sclerosis OU; lens sub-luxation OD
incipient cataract OU; posterior lens luxation OD
Which treatment would you recommand?
none
Local AI OD , local anti-glaucomatous OD
Laser surgery for glaucoma
Lens luxation surgery
Same dog was presented 3 months later for an acute pain in OD.
Menace: OU +
PLR: Direct OD -, OS +; Indirect OD -, OS +
Which treatment would you recommand?
none
Local AI OD , local anti-glaucomatous OD
Laser surgery for glaucoma
Lens luxation surgery

Case 12
7 months Poodle/bichon female presented for severe redness in both eyes that did not improve despite 15 days treatment with triple antibiotic ointment. . Comfortable, Menace +
What is your diagnosis?
1 glaucoma
2 pannus (chronic superficial keratitis)
3 Squamous cell carcinoma
4 Nodular granulomatous episcleritis

Case 13
8 yo male cat, going out, presented with a lesion on the right eye that is not healing despite 2 weeks of treatment...
Which treatment would you recommand to be combined with the medical treatment?
1 debridment, E-collar +/- corneal lens
2 debridment, keratotomy superficial, E-collar
3 Nictitating membrane bandage, E-collar
4 superficial keratectomy, E-collar.

Case 14
6 yo DSH female cat presented for a lesion in the right eye that is not improving despite AB treatment. Comfortable and visual OD.
What is your diagnosis?
1 Nodular granulomatous episcleritis
2 Fungal ulcer
3 Eosinophilic keratitis
4 Squamous cell carcinoma
Which test would you perform?
1 fluorescein stain
2 Corneal scraping and cytologic exam
3 Corneal sampling and microbiologic culture
4 Seidel test

Case 15
What is your diagnosis?
1 No ocular condition
2 Glaucoma left eye
3 Equine recurrent uveitis left eye
4 Glaucoma right eye

Case 16
Right eye slit lamp examination on a horse that is visual and confortable OU
What is your diagnosis?
1 multifocal posterior cortical ponctiform cataract
2 nuclear sclerosis, vitreal degeneration
3 nuclear sclerosis, vitritis
4 multifocal anterior cortical ponctiform cataract

Case 17
4 months old female BullMastiff was presented to evaluate the white appearence of both eyes. Visual OU. Comfortable OU.
Which diagnostic test would you recommand?
1 intra-ocular pressure
2 electroretinogram
3 MRI
4 Ocular ultrasound
What is your diagnosis?
1 Anterior uveitis with hyphema, cortical anterior cataract
2 Posterior uveitis (vitritis) , vitreal degeneration (asteroïde hyalosis)
3 Posterior uveitis (vitritis) , retinal detachment
4 cortical posterior cataract / persistance of primary vitreous hyaloïd artery

Case 18
4 YO male Siberian husky presented for evaluation of the left eye red since 2 weeks , despite topical steroid treatment.
Right eye, comfortable, visual
What is your diagnosis?
1 Meibomian gland tumour, iris atrophy, nuclear sclerosis
2 Meibomian gland tumour, iris hypoplasia, nuclear sclerosis
3 Meibomian gland tumour, iris atrophy, mature cataract
4 Squamous cell carcinoma, iris atrophy, nuclear sclerosis

Left eye, incomfortable, non visual
What is your diagnosis?
1 Posterior lens luxation, glaucoma, secondary retina and ONH degeneration
2 Anterior lens luxation, glaucoma, secondary retina and ONH degeneration
3 lens subluxation, glaucoma, normal fundus
4 lens subluxation, glaucoma, secondary retina and ONH degeneration
What would be the treatment according to you?
1 Right eye: none Left eye : none
2 Right eye: palpebral mass excision Left eye: enucleation
3 Right eye: palpebral mass excision Left eye: chemical ablation of the ciliary bodies
4 Right eye: palpebral mass excision Left eye: intracapsular lens extraction

Case 19

6 yo Merle Australian sheepdog went for the first visit to his veterinarian after adoption.
Menace : OD = + ; OS = -
PLR: OU +
What is your diagnosis?
1 OD: nuclear sclerosis OS: incipient nuclear cataract
2 OD: immature cataract OS: hypermature cataract
3 OD: nuclear sclerosis OS: asteroïd hyalosis
4 OD: mature cataract OS: asteroïd hyalosis
Which test(s) would you recommand?
1 Fluorescein and Rose Bengal Rose staining
2 Arterial pressure measurement, ocular ultrasound
3 Hematology , biochemistry including glycemia
4 Intra-ocular pressure, Electroretinogram, O. ultrasound
Which treatment(s) would you recommand?
1 OD: local SAI OS: enucleation
2 OD: Anti-glaucomatous OG: local SAI
3 BOTHE EYES : local SAI and cataract surgery
4 OD: local SAI and cataract surgery OS: local SAI

Case 20

Indirect ophthalmoscopic exam
What is your diagnosis?
1 Chorioretinitis in a cat
2 Complete retinal detachment in a dog
3 Normal fundus, albinotic in a dog
4 Normal fundus, albinotic in a cat

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APPROACH MAST CELL TUMORS

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Mast cell tumors (MCTs) are the most common maligant skin tumors in dogs, making up 16-21% of cutaneous tumors. This disease is sometimes called the “great pretender” because the gross appearance of this tumor is variable, in part due to the variable biological behavior of this disease. For this reason, it is extremely important to do a fine needle aspirate and cytology on all skin masses in dogs to determine the diagnosis. This disease can affect any dog breed and any location, but middle-aged to older dogs are predisposed and common breeds include Boxers, bulldogs, Boston terriers Labrador retrievers and Sharpeis. The location of MCTs are as follows: ~50% on the trunk, 40% on the limbs and 10% on the head and neck. Most are dermal, but 5-10% are subcutaneous. MCTs have a wide range of biological behaviors. Approximately 80% of MCTs are low to intermediate grade and therefore will have a relatively benign behavior.

After diagnosis of a MCT, it is important to consider the staging that will be necessary for each patient. In all cases, the draining lymph nodes should be palpated, when external and a FNA and cytology should be performed. If the draining lymph nodes are internal, an abdominal ultrasound may be necessary to examine the regional nodes. The decision whether or not to do an abdominal ultrasound for staging of MCT is clinician and case-dependent. In cases with large masses, recurrent disease or lymph node involvement, an abdominal ultrasound should be performed. Small dermal MCT that are amenable to wide resection can be removed with a wide margin and then staging decisions can be made once the histological grade is available. If an abdominal ultrasound is performed, further controversy exists about whether or not to perform a FNA of the spleen and liver if they are ultrasonographically normal. There is literature that suggests that because metastasis of MCT tends to be infiltrative, rather than nodular, the spleen and liver should be aspirated in all cases. There is also literature that supports the view that only spleen and liver that are abnormal on ultrasound should be aspirated because when the spleen/liver are normal on ultrasound, the diagnosis of metastasis is rare. Although there are only a small number of studies evaluating the utility of thoracic radiographs for staging of MCT, the rate of detecting radiographic lung metastasis is low.

Thoracic radiography may be warranted, however, as a method of ensuring that there is not concurrent disease in these patients or evaluating hilar lymph nodes. The evaluation of the buffy coat for mast cells is now considered historical only. Further, bone marrow aspiration is also not routinely done because dogs with bone marrow involvement will have widespread and severe disease before the bone marrow is affected.

Although a lot of prognostic factors have been reported in MCT in dogs, significant factors include histological grade, stage of disease, the presence of a c-kit mutation, location and mitotic index. The Patnaik grading scheme grades dermal MCTs based on the degree of differentiation, invasiveness and the mitotic index. MCTs are classified as grade I, II and III. Grade I and II MCTs have a low risk of metastasis, but still require adequate local control. Grade III MCTs have a higher rate of metastasis and a shorter survival time. Local therapy alone is not adequate and chemotherapy is indicated in these cases. There is significant variability in grading of MCTs, and interpretations of this grading system can vary between pathologists. It has also led to a large number of grade II MCTS and this makes it difficult to predict the behavior of the majority of MCTs. There is a new system that has been proposed that divides MCTs into high and low grade, it is highly repeatable between pathologists and appears to be predictive of survival. This system may replace the Patnaik grading scheme in the next few years. MCTs are staged to indicate the degree of involvement of distant sites. Multiple mast cell tumors are assigned to stage III. However, this is a misnomer because the recent literature suggests that multiple mast cell tumors are likely de novo tumors, rather than metastatic sites and, when treated appropriately at each site, multiple mast cell tumors will not affect overall survival.

Symptomatic treatment of mast cell tumors includes addressing histamine release by treating with diphenhydramine and famotidine. Determining the recommended local treatment will depend on the stage of disease and the owner’s goal. Curative intent may involve a wide or radical excision or a marginal excision followed by radiation therapy. For patients with widespread metastasis, or tumors that are no amenable to surgical excision, palliative therapy may include cytoreductive surgery, palliative radiation and/or systemic therapy.

In general, a wide resection is recommended for mast cell tumors. The exact margin required is not definitively known. A recent paper has suggested that 2cm margins laterally are all that is required for tumors that are grade I or II.

However, a subsequent study indicated that when 2cm margins are used for grade II MCTs, 10% of the cases had dirty margins. Because of this, I recommend 3cm lateral margins when possible and one fascial plane deep to the tumor. It has also been suggested that neoadjuvant treatment with corticosteroids may facilitate resection. Corticosteriods will decrease inflammation of the tumor and this may make resection easier, however, the corticosteroids will not have an affect on the tumor cells that are peripheral to the tumor. It is possible that corticosteroid treatment may create a false sense of security and the ability to achieve clean margins. It is the author's opinion that corticosteroid use preoperatively should be reserved for cases where cytoreductive surgery and a marginal resection is the goal of surgical therapy.

MCTs respond well to radiation therapy. In general, radiation is used to treat dirty scars after marginal excision or wide excision with incomplete histological margins. Chemotherapy is indicated for high grade tumors and has been shown to prolong survival time. The standard protocol for MCTs is prednisone and vinblastine. Recently, it was discovered that some MCTs have a specific mutation in the tyrosine kinase cell surface receptor for hematopoietic growth (c-Kit). C-Kit is expressed in normal and malignant mast cells and is important for cell survival, proliferation and differentiation. A c-kit mutation means that the receptor becomes independent of normal growth factors and is upregulated beyond normal cell controls. 30-50% of canine MCTs have c-Kit activating mutations. This correlates with a poorer prognosis. It also is a "druggable" target for tyrosine kinase inhibitors such as toceranib.

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5 ESSENTIAL TIPS TO IMPROVE ANESTHESIA IN YOUR PRACTICE

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1) Intraperitoneal and incisional anesthesia

Incisional anesthesia is accomplished by infiltrating the skin in the surroundings of the surgical field with local anesthetics. For laparotomy, local anesthetics are injected into the subcutaneous tissues along the linea alba before celiotomy.

Intraperitoneal anesthesia with bupivacaine produces postoperative analgesia in cats undergoing an ovariohysterectomy;1 plasma concentrations of bupivacaine were below toxic levels.2 For ovariohysterectomy, the solution of bupivacaine 0.5% (2 mg/kg) is diluted with an equal volume of saline 0.9% resulting in a final concentration of 0.25%. Otherwise, commercial formulations of bupivacaine 0.25% are available. The final solution is equally divided in three parts and instilled into the peritoneal space over the ovarian pedicles and caudal uterus using a 3 ml syringe. The solution is prepared sterilely. Videos will be presented to describe these techniques.

2) Supraglottic airway devices

Supraglottic airway devices are good options for airway management in cats. The device comprises a tube with a distal elliptical component that has an inflatable bladder on the dorsal aspect that is used when needed to create a better seal. Intubation is easy and well performed by individuals with little experience in feline airway management. A lower incidence of upper airway discomfort after extubation when compared with an endotracheal tube. They can be inserted at a more superficial depth of anesthesia than an endotracheal tube and used for mechanical ventilation.3However, the author does not use in dental procedures due to the risk of accidental extubation. A capnograph is recommended to avoid complications. These devices are much more expensive than endotracheal tubes. This lecture will present a quick guide and evidence behind the use of these devices.

3) Pulse oximetry and capnography

Pulse oximeters are insensitive monitors that give rapid and continuous assessment of the pulse rate. SpO2 (i.e. measurement of hemoglobin saturation) values correlate with PaO2 (i.e. partial pressure of oxygen). Values that are lower than 90% indicate hypoxemia which will have deleterious effects in the body with potential cardiovascular collapse.

Capnographs are devices used to measure the end-tidal volume of carbon dioxide during anesthesia and it is an indirect representation of partial pressure of carbon dioxide (PaCO2) and represents the ventilatory status of the patient. The use of these two monitors in anesthesia decrease the risk of anesthetic-induced death dramatically.4 This lecture presents some practical considerations on the use of these two monitors.

4) Dexmedetomidine

Dexmedetomidine is an agonist of alpha-2 adrenergic receptors that produce sedation, muscle relaxation and chemical restraint. Lower doses are used for premedication especially in combination with opioid analgesics. Higher doses are used for sedation and chemical restraint especially in fractious animals or when immobility is required for radiographs and lancing of abscesses. The drug has also been administered in the early postoperative period to control dysphoria. It smooths anesthetic recovery in healthy patients when administered at 0.5-1 mcg/kg IV. In cats, dexmedetomidine can be given by the buccal route of administration (oral transmucosal) for hands-off, off-label sedation.

5) Gabapentin

Gabapentin is a lipophilic structural analogue of the inhibitory neurotransmitter GABA. The mechanism of action of gabapentin remains to be elucidated but the drug acts on voltage-gated calcium channels. This lecture will introduce some new insights in the administration of gabapentin for the treatment of acute pain and for transportation to veterinary visits in cats.5

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WSV - 096

BARRIERS TO ACCESSIBLE VETERINARY CARE

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The issue of accessible veterinary care has been growing in the veterinary professional discourse. Currently, there is considerable interest in addressing the barriers to accessible veterinary care. Broad categories of barriers to accessible veterinary care include socioeconomic, geographic, and knowledge-based barriers. These are not mutually exclusive of one another and contributes to the complexity of accessible veterinary care. The financial or socioeconomic barriers to care often create the most tension both in daily veterinary practice and within the broader profession, while geographic barriers pose both logistical and sociocultural challenges. Barriers to accessible care not only impact animal welfare, but also the experiences of those who care for them, animal owners and veterinarians alike. It should be noted that the veterinary profession, animal welfare agencies and animal health industries have been highly successful in reducing knowledge-based barriers to care through active public engagement, communications and education on issues such as preventive medicine, population control (spay/neuter) and care for cats. The purpose of this presentation is not to provide an exhaustive examination of this challenging issue, but rather to engage with veterinary professionals in an open dialogue on multi-level barriers to care in order to further our understanding.

Research on the issues of accessible veterinary care is being conducted by several groups including but not limited to, the Access to Veterinary Care Coalition (AVCC) out of The University of Tennessee Knoxville (1), Shelter and Community Medicine at Tufts University (2,3), the Access to Care Initiative of the American Veterinary Medical Association (4), and the Strategy and Research Department of the American Society for the Prevention of Cruelty to Animals (5). In terms of barriers to accessible care, the recent AVCC report identified challenges to providing care from perspectives of both animal owners and veterinarians. Among veterinarians, factors impacting the provision of accessible care include personal finances (e.g. student debt), concerns about standard of care, workplace policies, and devaluing professional services. This report also identified how veterinarian's attitudes on pet ownership may impact the provision of accessible care: "the majority of respondents do not think everyone is entitled to own a pet…However, veterinarians in urban areas were more likely to believe that everyone is entitled to a pet and that society bears some responsibility to help care for all pets" (1 p92).

Among pet owners, socioeconomic and financial factors are not surprisingly, significant barriers to accessing veterinary care along with transportation challenges, not having appropriate equipment (e.g. carrier), geographic barriers and not knowing where to get care (1).

As previously mentioned, the issue of accessible veterinary care is complex. Therefore, in order to examine this issue in a structured approach, I have chosen a One Health framework. Using a One Health model ensures that other sectors and stakeholders are considered, as well as the interactions between sectors. Additionally, it supports the examination complex issues from multiple levels, including individual, institutional and systemic, and structural levels. For the purposes of this presentation exploring the barriers to accessible care, the human sector of the One Health model will include both individual and institutional or systemic barriers, whereas structural barriers and influences will be considered within the broader environment sector. I have chosen to use a nested One Health model to do this (Image 1). Similar to social determinants of health frameworks (6), a nested model appropriately describes how larger structures influence both systems and individual experiences in the context of accessible care.

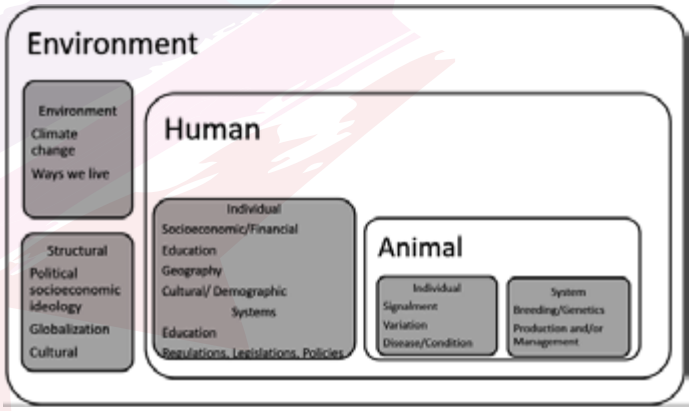

Image 1. Nested One Health Model to Explore Barriers to Accessible Veterinary Care

Naturally, the sector that has been most explored in terms of accessible care is the human sector. As mentioned previously, the individual care-providing stakeholders include both animal owners and veterinarians. Socioeconomic and/or financial factors are obvious barriers for animal owners to access veterinary care in terms of available disposable income and affordability. However, financial factors may also be barriers for veterinarians in providing care. For example, financial factors for veterinarians including operational costs and remuneration models based on production may influence provision of care.

Education level influences access to care for animal owners both directly through an awareness of the health needs of animals and indirectly through the effect on education level on employability, socioeconomic and financial status. Similarly, for veterinarians, education creates significant debt load that when remuneration is tied to production, financial barriers once again arise. Geographical factors for animal owners may be tied to socioeconomic status for those living in impoverished areas, but also for rural or remote areas which may be 'care deserts' where there are few to no veterinary services available. Such geographical issues impact care provision for veterinarians as well, creating logistical, operational and financial challenges in serving large geographical areas with smaller populations, as well as challenges in attracting veterinarians to rural and remote areas. The issue of serving rural and remote populations is not unique to veterinary medicine and is tied to several larger systems and structures.

The role of demographics and culture on barriers to care further add to the complexity of this issue. Among animal owners, cultural roles of animals, expectations of care, and individual experiences contribute to accessing veterinary care. For example, self-sufficiency, stoicism and trust are cultural issues that have been identified as barriers to accessing care among rural Canadian farmers (7). Among veterinarians, similar factors of role of animal, expectation of care and individual experience impact where, how, when and to whom care is provided. As mentioned above, attitudes and perceptions on the right to pet ownership, the value of veterinary care, as well as risk and liability, and appropriate standards of care contribute to the provision of care.

Systems within the human sector include human health systems, education, and regulations, legislations, and policies. The human health system is relevant to the discussion on accessible veterinary care, as there are still considerable barriers to accessible and equitable human health care even within a Canadian universal health care system. Therefore, it may be unreasonable to expect that equitable animal health care access is achieved before human health access. In the One Health model, human health is tied to animal health, and therefore by extension it could be argued that where there is inequitable access to human health care there will be inequitable access to animal health care. Education is also identified as a system within the human sector as veterinary education influences our approaches to the practice of medicine including standards of care. Veterinary regulations and legislations that influence standards of practice and therefore liability, as well as workplace rules and policies further impact the provision of care.

In this One Health model the animal sector is nested within the human sector as humans are overall responsible for their care and management. With respect to accessible care, animal-based factors influence the amount and kind of care including species, breed, age, and reproductive status. Individual variation within any given population further impacts care, as well as the condition of the animal and/or disease process. Systems within the animal sector include the human manipulation of genetics through breeding, as the impacts of the systematic selection (and public demand) for unhealthy traits in animals on accessible veterinary care cannot be ignored (8). Further, human-derived intensive animal (food) management and production systems influence all three One Health sectors (9).

Lastly, we will discuss the larger and broader environmental and structural factors that influence accessibility of veterinary care. Throughout the previous discussions, one can see the web of interconnections between both factors and sectors, however, large structural factors are often ignored. Much like the social determinants of human health, broad socioeconomic, cultural and environmental conditions in which we live and work, have a powerful influence on both human and animal health (10). Environmental conditions including climate change, urbanization, and globalization impact the daily lives and experiences of individuals, families, communities, and the animals that we live with and work with. If we look at climate change as an example, the effects of climate change disproportionately affect the poor and vulnerable, humans and animals alike. Environmental inequalities and injustices include speciesism via wildlife extinction and endangerment but is also experienced in urban populations. One well-known example is Hurricane Katrina, in which environmental injustice and human (and animal) neglect were shown to be tied to race, education and class (11) and further prompted the 2006 U.S. Pet Evacuation and Transport Standards (PETS) Act (12). This environmental disaster highlighted the impacts of structural inequalities on both people and animals.

It is in this way that political socioeconomic factors are important to consider when discussing the issues of accessible veterinary care, as these large factors are also tied to deeper issues of race, class, and gender inequalities. As veterinary care is fee-for-service, to exclude discussion of these issues would be to ignore the reality of people's lived experiences in current political socioeconomic times. As previously stated, the issue of accessible care is complex, and while exploring these barriers through lenses of One Health and structural influences may uncomfortably increase its' complexity, our social discourse and actions must include ways to acknowledge and address these multi-level barriers to accessible care.

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WSV - 060

RESEARCHING AND MANAGING COMMON CANINE COMPLEXLY INHERITED DISORDERS - A CALL FOR COLLABORATIVE EFFORTS

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Preventive measures are an increasing part of our case load as small animal practitioners. As such measures involvement in screening procedures and testing for inherited diseases is an evolving area of our professional duties.

But how to manage and handle breeding advices regarding cases not yet possible to screen or test for?
Screening programs
In many disciplines screening for an early detection to predict clinical outcome and prevention from breeding of affected animals have been in place for more than half a century e.g.

Screening for radiographic signs of Hip- and elbow dysplasia is now a routine in many countries and have proven its value in populations with a larger proportion of breeding stock is screened and unaffected. Likewise palpatory screening for patellar luxation is well validated for its purpose.

Screening for Hereditary Eye conditions have also been in place for more than half a century and also screening for signs of mitral valve disease and cardiomyopathy are available for some breeds in some countries as well as screening for Syringomyelia
More recently examination for Brachycephalic Airway Obstructive Syndrome have been offered in many countries

DNA testing

Since the Canine Genome was revealed in 2005 also testing for “genetic diseases” has become increasingly popular within many disciplines.
Since long time mutations for many disorders with a simple recessive inheritance have been identified. Especially Hereditary Eye conditions as several variants of PRA have been revealed over the last decades and also Lens luxation. Out of common neurological diseases the mutations for several more or less breed specific epilepsies have been found as well as more rare conditions with a mitochondrial transmission like SAN in golden retriever

The controversy on risk gene tests

Besides these altogether fairly rare conditions with a simple inheritance there are very few genetic tests (risk gen tests) for more complex diseases that have fully proven their value as indicators of the risqué to be clinically affected.

Top causes of deaths

By availability of epidemiological data from Insurance data bases (Bonnet et al 1997, 2005), breed club surveys (Adams et al 2010) or general practices (Lewis et al 2018) we now know the top causes of deaths (mortality) as well as reasons for veterinary care (morbidity)
In Table 1 is listed a number of common more or less specified causes of deaths as well as veterinary care. Some of them rather causes of euthanasia than “deadly diseases”

Many of those indicated is not just one disease
At a closer look at these diagnoses it can be seen that they are commonly not just one but rather several variants of a cruder diagnose.
Lymphoma, cardiomyopathy, epilepsy is not just one disease but rather Lymphomas, cardiomyopathies and epilepsies. Likewise diabetes, elbow dysplasia and PRA are of various forms. To refine these diagnoses is of outmost importance for clinical managing of the cases as well handling the selection of breeding stock.
Most more Complex diseases and not yet fully revealed Complex diseases (that is those with many genes involved and often more or less known environmental factors) still makes up for the great majority of cases handled by general practitioners and specialist in almost every sub discipline.

Most common causes of death as well as other severe diseases are not possible to either screen for at an early age or to predict by molecular genetic screening.
Table Common causes of canine death by discipline
With an indication on available screening programs and DNA tests
ONKOLOGY
Lymphoma Mammary tumor
no screening no DNA tests no screening, no DNA tests
CARDIOLOGY
Cardiomyopathy Mitral Valve degeneration
screening screening
NEUROLOGY
Epilepsy Syringomyelia
some DNA tests some screening
ORTOPHEDICS
Hip Dysplasia Elbow dyspl. Rupt. lig. cruciate Patella lux.
screening screening no screening screening
DERMATOLOGY
Atopy Demodicosis

no screening no screening
SOFT TISSUE
BOAS Bloat
some screening no screening
ENDOCRINOLOGY
Diabetes Lymphocytic Thyroid. Cushing Addison
no screening some screening no screening
OPHTALMOLOGY
PRA Entropion Ectropion
screening screening some DNA tests

The need for specific diagnoses
Based on research the colleges and other specialist organisations are best suited to propose diagnostic criteria based on research for each of these diseases.

General practitioners and registration bodies like OFA and several kennel clubs are key elements for the use of more specific information in its use for breeding advice.

Death registries

As a complement to epidemiological data currently available it is proposed that death registries - either for all diagnoses as specific as possible or for specified diagnoses with diagnostic criteria - is established by national Kennel Clubs or breed clubs as a valuable complement to current registrations of phenotypic screening and results from DNA –testing.

Researchers and specialist organisations have been and are still involved in the establishments of phenotypic as well as genotypic screening programs.

They are now urged also to reveal - within their disciplines - the more refined aetiology and diagnostic criteria to be used for proper registration of the most common causes of deaths.

It is then of outmost importance also that such refined diagnostic criteria are used in general practices and when possible also registered together with the ancestral background of a potential breeding animal.

By collaborative efforts by researchers, specialist organisations, general practitioners and registration bodies a novel tool to handle also diseases not yet possible to screen for.

With information in death registries on age and causes of death, a powerful complement to current screening programs would enhance selection of breeding stock for a long and sustainable life.

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WSV - 303

FIELD GUIDE TO IMPROVING RADIOGRAPHS

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Introduction:

Lameness is a frequent medical problem in horses. Aside from localizing techniques such as palpation and subsequent diagnostic blocking, radiographic investigation of the limbs, neck and back is often the first choice in diagnostic testing. Digital radiography is widespread and arguably considered the standard of practice. The advantages of digital systems include the ability to manipulate images, apply post processing, centrally store and quickly obtain and review images immediately after acquisition. Despite these advances in technology, the basics of radiographic exposure and patient positioning haven't changed. When producing radiographic images using digital technologies, the veterinarian or technician must still correctly position and choose a technique appropriate for the body part being imaged. Faulty imaging due to poor positioning or inappropriate exposure can lead to under or over diagnosis of pathologic changes. The goal of diagnostic imaging is to reach an accurate diagnosis to target treatment specifically. Well positioned radiographic images acquired with the appropriate technique are a key component to reaching the correct diagnosis.

Principles of X-rays

When a radiographic image is obtained, about 90% of the x-ray photons are absorbed by the tissue and 10% of the photons pass through the patient and reach the detector. Many of the absorbed photons generate scattered radiation (Compton scatter). These scattered photons travel in all directions creating noise and degrading image quality. The effect of scattered radiation can be minimized by collimating the x-ray beam to reduce the number scattered photons.

The farther away you are from the patient the less intense the photons are that strike plate. This is especially important for obtaining radiographic images in large body parts with portable generators. The typical film focal distance (distance from the plate to the generator) is 60 cm. When imaging larger body parts such as the caudocranial stifle, neck or back it is important to maintain a 60 cm distance (or closer). We can also stand closer to the image detector and patient to improve image quality when imaging larger body parts when limited by our generators.

By standing closer when obtaining radiographs of larger body parts, the increased quantity and intensity of photons reaching the plate will help to reduce the commonly obtained gray, grainy images (also known as quantum mottle)

Patient and x-ray positioning

The ideal conditions for obtaining most radiographs of equine joints is with the horse standing square; except for non-weight bearing views. Unfortunately, not all of our equine patients are willing to stand square and the equine practitioner must accommodate the patient to make quality radiographs. Radiographic examination of the stifle, especially the caudocranial image is a good example of this principle. For example, the optimal angle for the caudocranial image is 10 degrees from caudal proximal to cranial distal with the horse standing square (the tuber calcaneus is in line with the tuber ischii); However, if the limb is slightly behind the vertical (camped out), or under the horse (camped under), the angle must be adjusted to accommodate the stance of the horse. If the horse is standing with the limb behind it, the angle (caudoproximal to craniodistal) will increase (be steeper) and vice versa for the horse that is stood under itself. When evaluating the caudocranial stifle image for adequate positioning, the tibial plateau should superimpose itself from cranial to caudal and the tibial tuberosity should be distal (10 to 15 mm) to the tibial plateau. If the tibial tuberosity is proximal to the tibial plateau, the angle is typically too steep. The x-ray generator should be centered about 8- 10 cm proximal to the indentation created by the distal aspect of the thigh musculature as it transitions to the proximal crus area. Joint narrowing in the stifle may be masked or falsely created by inadequate positioning. The most common areas of pathologic change in the stifle are associated with the medial femoral condyle and the lateral trochlear ridge2,3, the caudo45 lateral – craniomedial oblique highlights these areas well. A well-positioned Cd45L-CrM oblique should project the medial femoral condyle caudal to the tibial eminence and show the joint clearly. The superimposition of the medial femoral condyle with the tibial eminence can mask subtle concave defects. Just as with the caudocranial projection of the stifle, the angle of the x-ray generator should be 5-10 degrees proximal to distal in a square standing horse. The most common mistakes are to is be at too steep of an angle or being too lateral. Limb positioning also affects acquisition of the lateral radiographic projection. If the horse is standing base wide the x-ray generator will have to be angled distally; if base narrow, the generator angle will be slightly proximal. Judging placement of the x-ray generator in a cranial to caudal fashion is best done by lining up with the heel bulbs and tarsus. The most common mistake is being too far cranial.

Radiographic examination of the neck has seen a dramatic increase in frequency in recent years. Unlike the distal extremities, the radiographer cannot see the x-ray detector on the opposite side of the neck. This creates positioning problems and often results in images with one vertebral body or facet joint that is not centered on the x-ray detector. Furthermore, the articular facets on the lateral radiographs may not be perfectly superimposed, which can lead to interpretation errors. However, if a moment is taken to palpate the transverse processes and apply white tape to these sites, this can serve as a guide to detector placement and x-ray generator focus . Centering just proximal to the transverse process will render well positioned radiographs, when the horse's poll is in line with the withers. Symmetrical anatomy of the neck can make lesions difficult to lateralize. Oblique radiographs obtained in a left/right 45-55 degree ventral to right/left dorsal fashion can help localize lesions5. The xray generator is typically centered at the jugular furrow and the x-ray detector is placed with the transverse process centered at the bottom 1/3 of the x-ray detector. Radiographic images are named from where the x-generator is located and subsequently where the x-rays enter to where the x-rays exit the neck, and where the x-ray detector is located. In the example of a L55V-RD oblique the left articular facets will be projected dorsally and the right transverse processes will be projected ventrally. Properly labeled, opposite oblique radiographs should be obtained to accurately localize the lesion. Well positioned oblique radiographs should project one side of the articular facets dorsal and show the intervertebral foramen well. The other articular facet joint will be superimposed over the vertebral body highlighting the joint width. Oblique radiographs obtained with portable units centered at the articular facets at C6-7 are challenging due the shoulder superimposition. This may be overcome by offsetting the forelimbs, with the leg near the x-ray generator pulled caudally.

Radiographic projections are used to highlight specific areas and document pathologic change. The fetlock is an area with a multitude of pathologic change in which appropriately positioned radiographs make the pathologic change easy to identify. For example, palmar/plantar process osteochondral fragmentation is a common abnormality in the fetlock and depending on the location may be a source of lameness. The oblique views (dorso 20 proximo 45 lateral-palmaromedial oblique and dorso 20 proximo 45 medial –palmarolateral oblique) should show these lesions best. However, if the proximal sesamoid bones superimpose this area, the fragmentation could be easily missed. Ideal oblique and DP radiographs of the fetlock project the proximal sesamoid bones proximal to the joint margin.

Conclusions:

Patient preparation and positioning, adequate technique and knowing how to correct malpositioned radiographs are skills in achieving diagnostic radiographic images. Taking a moment to assess unintentional obliquity, patient conformation and stance can reduce retakes and reduce radiation exposure.

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Radiography is an integral part of veterinary medicine and we often rely on x-rays in aide in diagnosing our patients. X-rays is a big part of our job and with the ease and speed of digital radiography, the number of radiographs taken per study has increased from the days of film.

We already know that radiation exposure carries a health risk. Occupational exposure to x-rays (ionizing radiation) can result in deleterious effects, such as cancer, that may manifest themselves not only in exposed individuals but in their descendants as well. Aside from measuring our exposure levels by wearing a Dosimeter, it is our responsibility (and requirement), to follow ALARA (As Low As Reasonably Achievable) when it comes to radiation safety in our workplace = Time, Distance, Shield.

Hands-Free Radiography = DISTANCE
Hands-Free techniques allow for increased distance from the source of radiation.
The inverse square law - small increase of distance = big reduction in exposure!
Shield - PPE (Personal Protective Equipment) is ALWAYS required when staying in the room during exposure, even if not holding.
Hands-Free Techniques Considerations

Patient Comfort

For awake patients it is imperative that the patient is comfortable, or they will not be compliant to positioning. A comfortable patient is key to being successful with hands-free radiographs.
If the patient is not comfortable, he or she will not stay in position for the radiograph. Big part of patient comfort relies on proper positioning devices. Why are we taking x-rays? Painful? Arthritic? Be mindful of your patient.

Positioning Aide

KEY at achieving hand-free x-rays. Without proper equipment you will not be able to keep the patient comfortable and in place for the image.
Recommended for hands-free techniques:
Foam V-Troughs: These are great for keeping patients comfortably in position for VD views.
Sandbags - Sock Style HALF FILLED SANDBAGS – half filled sandbags allow for low pressure points on the patient (especially important for small breeds and cats) while keeping the patient in position. The outer layer of the sandbag is best when it grips to the table does not slide around the x-ray table (useful for extremity positioning).
Soft Elastic Extremity Straps (loop) – Soft elastic straps will allow the patient some movement (more comfortable) and can attach (and detach) very quickly to the (hook) table lining.
Table Lining (hook) – Lining the table with an adhesive type hook lining will allow for the use of the extremity straps (see image).
Positioning Wedge – Useful at preventing rotation of the patient and keeping the patient comfortable .
Simple Towel – Great for wrapping cats for lateral views
Cat Scruffers

Diagnostic Quality Radiographs

Remember: As a technician (or anyone non DVM performing radiographs) we have 3 questions to ask in regard to quality of the radiograph:
1) Is the exposure appropriate?
2) Do I have all anatomy included?
3) Do I have the right views, and is it straight/rotated?
Considering Hands-Free Techniques
Hands-Free = out of the room? Not always. Wear PPE, Dosimeter, one person, stand in the furthest point in room and be ready to return to your patient at any point.
Preparation – Plan ahead, communicate with your DVM (what views are required, why are we taking x-rays, painful patient? Etc.), be efficient.
Proper Technique – proper use of equipment, settings, straight and diagnostic images.
Always consider your safety – ALARA – PPE/Distance/one person vs. two
Sedation (oral/injectable)

WSV - 003

ROCK & ROLL, TURN AND DANCE IN CIRCLES - WORK-UP AND MANAGE VESTIBULAR DISEASES SUCCESSFULLY

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The vestibular system main function is to maintain an animal's equilibrium during movement and orientation against gravity. It is divided into two main sections, the peripheral and the central. The peripheral one is composed of cranial nerve VIII (CNVIII; vestibulocochlear nerve) and sensory receptors contained within the petrosal bone. The central one is that part of the vestibular system held within the cranial vault, i.e., the vestibular nuclei of CNVIII. The peripheral system detects linear acceleration and rotation movement of the head. It is responsible to maintain the position of the eyes, neck, trunk and limbs in reference to the position of the head.

The sensory receptors of the vestibular system are located in the inner ear. The sacculus and the utriculus are located in the vestibule and detect linear acceleration and head positioning against gravity. The semicircular ducts with their ampullae detect rotational acceleration. There are three semicircular ducts, which are orientated in each dimensional direction.
The vestibular nerve fibres travel in CNVIII, terminate mainly in one of the four vestibular nuclei, but also in the cerebellum. A pathway (medial longitudinal fasciculus) connects the medial vestibular nucleus with the nuclei of III (N. occulomotorius), IV (N. trochlearis) and VI (N. abducens) to control eye movements. Other pathways connect the vestibular nuclei with the cerebellum, cerebrum, other brainstem centre (e.g. vomiting centre) and the spinal cord. The vestibular system is mainly unilateral. The lateral vestibular nucleus give rise to a pathway to the spinal cord ventral grey matter and is facilitatory to the extensor muscle (inhibiting the contralateral extensor tone and the ipsilateral flexor muscle).

Keeping this in mind, it is logically that a head tilt and a reduced extensor tone of the limbs are on the side of the lesion. "It looks like the animal is running around a curve". The jerk nystagmus develops from the dysfunction of the pathways connecting the vestibular nuclei with the cranial nerve nuclei responsible for the eye movement. When the head moves, no / uncoordinated eye movements can be seen. The slow phase of the jerk nystagmus goes into the direction of the lesion; the fast phase is the compensatory one. Vision and proprioception can help to compensate the vestibular dysfunction. This can be often observed in clinics as vestibular disease can progressively improve.

Clinical signs of dysfunction of the vestibular system are: loss of balance, head tilt, leaning, rolling, circling, nystagmus, strabismus, and depending on the type of vestibular disease, other cranial nerve deficits, Horner›s Syndrome, cerebellar signs, mental depression and hemiparesis with postural reaction deficits. By defining the clinical signs present the clinician will be able to determine central vs. peripheral vestibular disease. Because the list of differentials depends on the location of the lesion, this determination is most important (see below).

Nystagmus -There is the «normal» physiological nystagmus that we can elicit performing the occulovestibular test or by spinning the animal (together with the clinician) around its on axis. Another type of «normal» nystagmus would be the pendulous nystagmus of particular cat breeds (Siamese, Birman and Himalayan), which is caused by a larger numbre of fibres crossing at the optic chiasm. The pendulous nystagmus is characterised by equal speed of eye movement to both sides. There is also a searching type nystagmus described in animals, which have been born blind.
Abnormal types of nystagmus would be the jerk nystagmus with a slow and a fast phase with varied directions; horizontal, rotatory or vertical. These may be conjugate or disconjugate, they may also be positional. Positional nystagmus will vary with the patient depending on its head position. The direction of the nystagmus is always defined by the fast phase, even if the slow phase is to the side of the lesion.
Strabismus -Certain cat breeds (Siamese) may have congenital divergent strabismus. A divergent strabismus may also be seen in severe cases of hydrocephalus. The strabismus seen with vestibular disease is ventrolateral (unilateral) and is not responsive to the occulovestibular test. It is seen in the eye ipsilateral to the lesion. This does not differentiate central from peripheral vestibular disease.

Leaning, falling, circling - The patient tends to lean or fall toward the affected side because the vestibular system facilitates the extensors of the ipsilateral side (see also above). The patient also tends to circle toward the affected side as with lesions of the forebrain. However, the circles of vestibular disease tend to be closer and tighter rather than the large roaming circles of forebrain disease. The patient with central vestibular disease is more likely to be non-ambulatory.
The head tiltis on the side ipsilateral to the lesion, unless, the lesion is in the flocculonodular lobe of the cerebellum or the cerebellomedullary pontine angle; then the patient may have aparadoxical head tilt. In this case, the head tilts to the contralateral side.

Because the lesion involves the cerebellar projections to the vestibular nuclei, and because the cerebellum is predominantly inhibitory in effect, the side of the lesion becomes overactive, giving excessive tone to the extensors of that side and causing the patient to lean and tilt away from the lesion. However, the side of the lesion can be determined by testing the proprioception, especially paw positioning which are reduced to absent on the side of the lesion.

Horner's syndromeis characterised by the loss of sympathetic innervation to the eye. In dogs and cats fibres of the postganglionic sympathetic fibres travel through the middle ear before following the ophthalmic nerve of the trigeminal nerve. A damage at this site can cause a Horner's syndrome. The postganglionic sympathetic fibres innervate the smooth muscle of the periorbit and eyelids (also third eyelid in the cat).

Furthermore, they innervate the dilator pupillaris and iris muscle. Therefore, the cardinal signs decribed by Dr. Horner were: 1. Enophthalmos; 2. Third eyelid protrusion; 3. Ptosis; 4. Miosis. As the sympathetic system also controls the smooth muscles in blood vessel, a failure of the system results in congested vessels. This can be best appreciated on the sclera and the ear.

Sometimes the patient may present with bilateral vestibular disease. One typically sees wide excursions of the head, symmetrical ataxia, no head tilt and the patient may not demonstrate a «normal» physiological nystagmus. Examples would be aminoglycoside toxicity, bilateral otitis media/interna in cats, and congenital bilateral vestibular disease in young Doberman Pinchers.

Differentials to consider for peripheral vestibular disorders

Category	Acute nonprogressive	Acute progressive	Chronic progressive
Degenerative			Congenital
Metabolic			vestibular
Neoplastic			syndrome
Inflammatory / infectious		(Diabetes mellitus; indirect)	Hypothyroidism
Idiopathic	Idiopathic (vascular?) Fracture	Metastatic	Soft tissue tumours
Traumatic			Nerve sheath tumour
Toxic	Infarction Septic emboli	Otitis media/ interna (bacterial)	Otitis media/ interna (bacterial)
Vascular	Hemmorrhage	Protozoal	Protozoal

The diagnostic work-up may vary greatly between central versus peripheral disease but all patients should have a complete blood count, biochemistries, thyroid screening and blood pressure evaluation. Even if it is only a geriatric with idiopathic vestibular syndrome, there may be an underlying renal deficiency and the nausea/vertigo may be enough to keep the patient from drinking adequately, precipitating renal failure.

Given a peripheral vestibular location, radiography of the skull with oblique views and open mouth can be considered, but the main investigation will be an otoscopic examination of the external ear canal and the tympanic membrane. If the potential for otitis media exists then myringotomy is simple and quick. It does necessitate some form of short acting sedation. Cultures and cytology may be obtained from within the bullae. Take note that the bullae of the canine are different from the cat. The feline has two compartments in the bulla. Myringotomy is done in the ventrocaudal aspect of the tympanic membrane. The resultant puncture in the membrane is quick to heal.

Central vestibular disease will almost always require advanced imaging. This is the most important reason to localise as it will change the way how you work up the case. It is generally believed that it has to do with determining the prognosis. But the prognosis is determined by the diagnosed disease process and not by the location of the lesion. We have diagnosed many animals with soft tissue sarcomas invading the middle ear (poor prognosis) and vice versa have diagnosed dogs with cerebellar infarcts (usually good prognosis).
Differentials to consider for central vestibular disorders

Differentials to consider for central vestibular disorders

Category	Acute nonprogressive	Acute progressive	Chronic progressive
Degenerative			Congenital
Metabolic			vestibular
Neoplastic		Hypoglycaemia	syndrome
Inflammatory / infectious		Metastatic	Hypothyroidism
Idiopathic		Metastatic	Soft tissue tumours
Traumatic	Fracture/bleed Infarction		Nerve sheath tumour
Toxic	Infarction Septic emboli	Otitis media/ interna (bacterial)	Otitis media/ interna (bacterial)
Vascular	Hemmorrhage	Protozoal	Protozoal

WSV - 136

FORENSIC BEHAVIOURAL ANALYSIS: USING THE FIVE DOMAINS MODEL TO ASSESS SUFFERING IN ANIMALS (PART 1)

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Introduction

Federal and Provincial animal welfare legislation refer to various terms, including suffering, distress, hardship, fear and pain.

For example, under the Criminal Code of Canada 445.1 (1), "Every one commits an offence who (a) willfully causes or, being the owner, willfully permits to be caused unnecessary pain, suffering or injury to an animal or a bird."

Using the British Columbia's Prevention of Cruelty to Animals Act as an example of Provincial legislation (PCA Act, RSBC 1996, Chapter 372, Part 1.1.2.b), an animal is defined as being in critical distress, "if it is injured, sick, in pain or suffering."

Historically, expert reports and subsequent animal cruelty charges have focused on whether an animal is physically sick or has been physically harmed as a result of (a) being injured or diseased, (b) being provided with inadequate nutritional (lack of food, water etc), or (c) kept in substandard environmental conditions (e.g. a lack of shelter etc). Case law has generally omitted references to animal suffering or negative affect that does not involve physical harm. This is reflective of how up until 20-30 years ago, animal welfare scientists focused their assessment of animal wellbeing on the animal's "biological functioning".

However, over the last 20 years, animal welfare science has evolved. Our understanding of animal suffering has become more comprehensive, with most consideration now being placed on the internal mental experiences of animals, or their feelings. Suffering or distress specifically describe the negative mental or affective experiences of animals. Various frameworks that allow for the assessment of animal welfare have also since been developed and validated.

Despite advancements in animal welfare science, the intangible nature of suffering and distress - concepts that are based on inference as opposed to clinically measurable parameters – has deterred animal experts (most of whom have been veterinarians) from providing opinions on how an animal may have suffered as a result of cruel acts inflicted on them. Terms such as 'feelings' and 'suffering' have often been regarded as being anthropomorphic, and non-scientific conjecture.

Furthermore, the lack of training for veterinarians (professionals whose primary focus is physical wellbeing) in these updated animal welfare concepts and current affective neuroscience, has led to affective states not being given due consideration in cases of animal cruelty. A review of 42 animal cruelty cases expert reports by veterinarians, published by Baumgaertner et al (2016), highlights this. The researchers reported that, while physical and / or clinical observations were clearly reported in all cases, the severity of suffering was omitted in 38% of reports; duration was omitted in 31% of reports; the nature of the suffering was omitted in 33% of reports; the necessity of the suffering was omitted in 36% reports; and external scientific references supporting the expert's opinion were provided in only 31% of reports. Furthermore, where suffering and distress were commented on, experts frequently disagreed on their definitions.

The failure of an expert to opine on animal suffering will limit the type of cases that are investigated, the cases for which charges are recommended and approved, and ultimately, the sentencing imposed by Courts.
This series of presentations aims to provide animal experts with (a) a current, evidence-based understanding of suffering and distress in animals, (b) frameworks for demonstrating to Courts if, how and to what extent an animal has suffered, and (c) examples of legal cases where these frameworks have been successfully applied.

How do animals suffer?
It is well established in peer-reviewed scientific literature that suffering is a collective term that infers an unpleasant state of mind. An animal is regarded as suffering when it experiences unpleasant feelings or negative affective states (Gregory 2004; Panksepp 2004; Mellor 2015; Ledger & Mellor 2018).

Negative feelings are unpleasant, and thus motivate the animal to avoid potentially life-limiting conditions, such as asphyxiation (which causes the negative affects of breathlessness and panic), injury and disease (which cause the negative affects of pain, nausea, dizziness, debility, lethargy and weakness), malnourishment (which causes the negative affects of hunger and weakness), dehydration (which causes the negative affect of thirst), and threats (which cause the negative affects of anxiety, fear and also panic), (Mellor 2015; Hemsworth et al 2015).

The ability to suffer from these various negative affects is an essential part of all terrestrial animals' capacity to survive. Animals are genetically preprogrammed to experience negative feelings or affects, and without them they could not survive (Mellor 2017).

The scientific field of affective neuroscience has clearly established the neural processes that underlie positive and negative affective experiences in all mammals (Adamec 1991; Panksepp 2004). These processes include the neural pathways that pick up the disturbances in the body (such as dehydration or injury), and that are transmitted up the spinal cord and into and throughout brain systems (Panksepp 2004), where they are perceived as being pleasant or unpleasant. Suffering refers to these unpleasant or negative sensations and emotions, or affects.

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WSV - 353

HOW TO SURGICALLY MANAGE CRYPTORCHID DOGS - A PRACTICAL LIMITED PARAMEDIAN APPROACH IN MALE DOGS

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Introduction

Objectives of the Presentation
Present an alternate approach for limited access to the caudal abdomen in male dogs.

General Key Points:

Technique Advantages
Easy, quick method to access the caudal abdomen in male dogs.

Allows continuation of exploration outside abdominal cavity along inguinal region to scrotum, if needed.

Technique Limitations

Only allows limited access to caudal abdomen.
May cause more hemorrhage in abdominal wall compared to midline approach.

Key point: Surgeon must be certain that further exploration of abdomen will not be required before attempting this approach. Further access to abdominal cavity from the paramedian approach will cause unnecessary tissue dissection and bleeding.

Key Anatomy Points:

Between the umbilicus and the pubis, the external rectus sheath is comprised of fused fascia of the external and internal abdominal oblique muscles, and the transverses abdominis muscle. On the lateral half of the external rectus fascia there are 2 separate fascial sheets (the fused fascial sheets of the abdominal oblique muscles, and the fascial sheet of the transversus abdominis muscle. In this area, there is no internal rectus fascia deep to the rectus abdominus muscle but there is a thin layer of peritoneum present. The caudal superficial epigastric vessel runs medial to the nipples as it runs forward to supply the prepuce, superficial inguinal lymph node, and mammary skin. The deep epigastric vessel runs about 1-2 cm lateral to the linea alba just deep to the rectus abdominus muscle. Smaller branches of this vessel course both lateral and more superficial in the muscle.

Technique

Step 1
With the dog positioned in dorsal recumbency, place a towel clamp on the prepuce (if a urethral catheter is not expected to be used in the procedure) and clamp it to the skin on one side of the body (the side opposite the side of your intended abdominal approach).

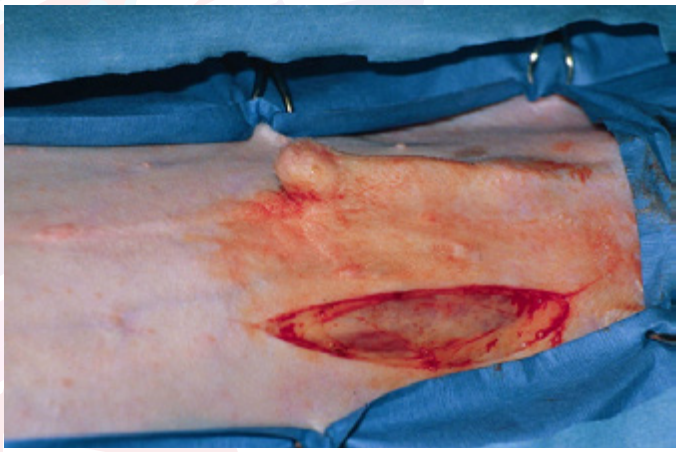
If you expect that you will need access to the urethra, for example, to flush urinary calculi from the urethra, thoroughly irrigate the prepuce with antiseptic solution and position the prepuce within your sterile field.

Step 2

Create a skin incision about 1 cm parallel and lateral to the nipples from the level of the cranial aspect of the prepuce to about 3-4 cm cranial to the pubic bone (palpate this landmark under the skin). Avoid the caudal superficial epigastric vessels, which run longitudinal and parallel to nipples.

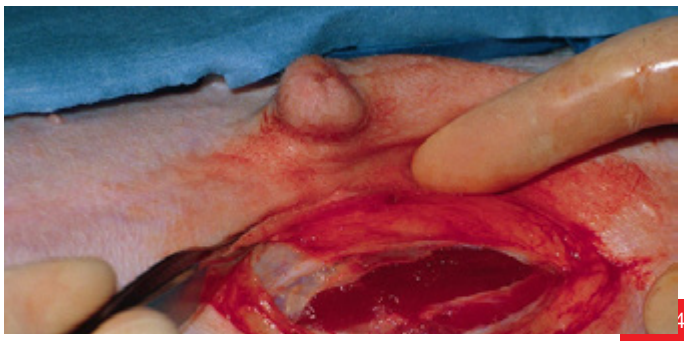
Step 3

Incise through the subcutaneous tissue and ligate or electrocoagulate small lateral branches of the epigastric vessels. Once the rectus fascia is visible, locate the lateral edge of the rectus muscle (this is seen as a line between the whitish fascia of the rectus muscle and the more reddish-appearing external abdominal oblique muscle.



Step 4

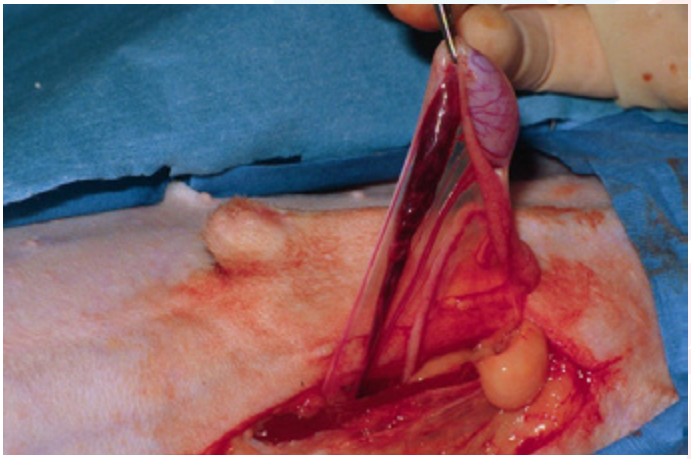
About 2/3 the width of the rectus muscle from the linea, make a stab incision parallel to the linea in the external rectus fascia. Undermine the rectus fascia parallel to the linea and make an incision in the fascia (you will cut through two separate layers of fascia) with Mayo scissors the length of the original incison (do not incise underlying muscle yet).



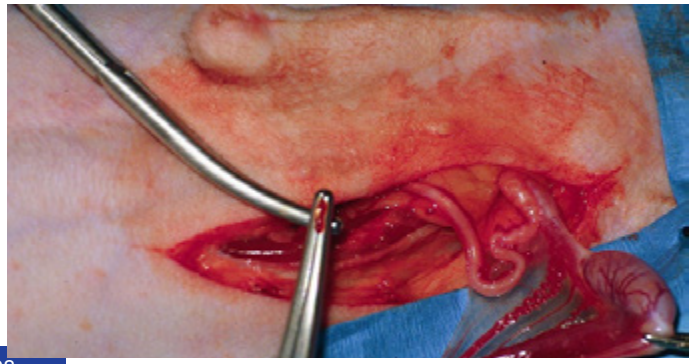
Step 5
At the same level as the rectus fascia incision, bluntly create an opening into the peritoneal cavity with mosquito forceps. Grasp two mosquito forceps, one in each hand, place the tips of the forceps in the wound, and spread the forceps in the direction of the muscle fibers. This will bluntly open the abdominal cavity without cutting muscle tissue, which will reduce tissue trauma and bleeding. If the deep epigastric vessels are accidentally discupted, ligate the bleeding vessels with chromic catgut sutures.

Step 6
Bluntly break down any peritoneal attachments with your fingers. The abdominal exposure is complete. Place laparotomy sponges along the rectus edges, and insert abdominal retractors (Balfour retractors work fine here) to help isolate the problem area.

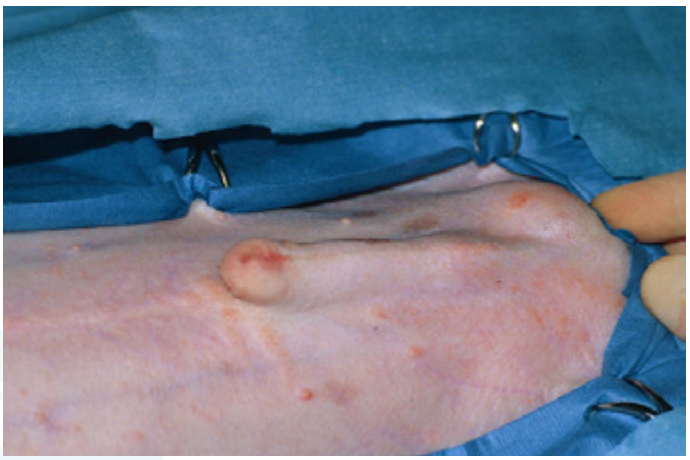
Step 1
If the surgery aim is to remove an abdominal ectopic testis, find the ductus deferens and follow this structure to the testis.



Alternately, the testicular artery can be used to locate the testis. Remove the testis by separately ligating the testicular vessels and ductus with absorbable suture material or vascular occluding clips.



Perform routine castration for testicle in normal scrotal location



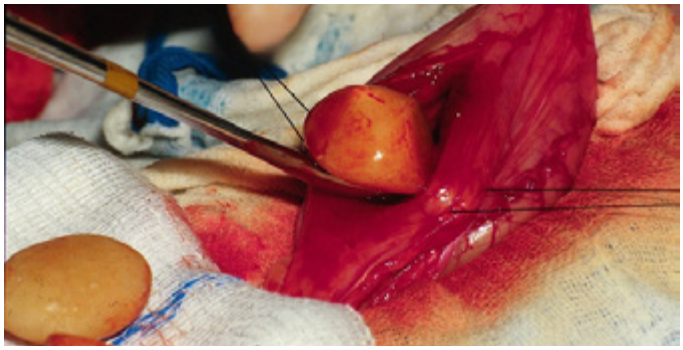
Step 2
If the ductus is followed to the inguinal ring (this means you did not detect that the testicle is outside the abdominal cavity), first gently pull on the ductus to determine if the testis is in the ring- if it is not, bluntly dissect external to the inguinal rings to find the spermatic cord. Dissect along the cord until the testis is found. The original skin incision is easily enlarged caudally to help expose the area between the inguinal canal and scrotum if the testicle is located in the subcutaneous tissue caudal to the original incision area. Routinely ligate and remove the ectopic testis.

Step 3
If the opposite testicle is intra-abdominal, this can be reached through the same approach (follow step 1 again)

Urinary calculi removal through paramedian approach

Step 1
Isolate the bladder with moist laparotomy sponges. Place your stay sutures at the ends of the proposed bladder incision site.

Step 2
Create the cystotomy.

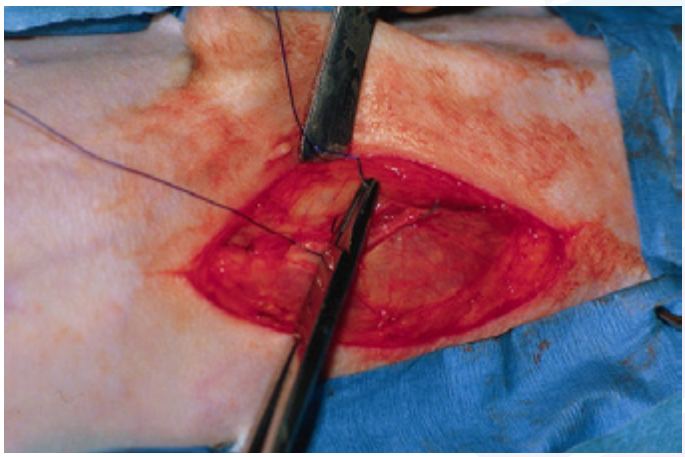


Step 3
Run an appropriately-sized soft red rubber urinary catheter normograde and retrograde up the urethral orifice and cytotomy incision to remove residual calculi.

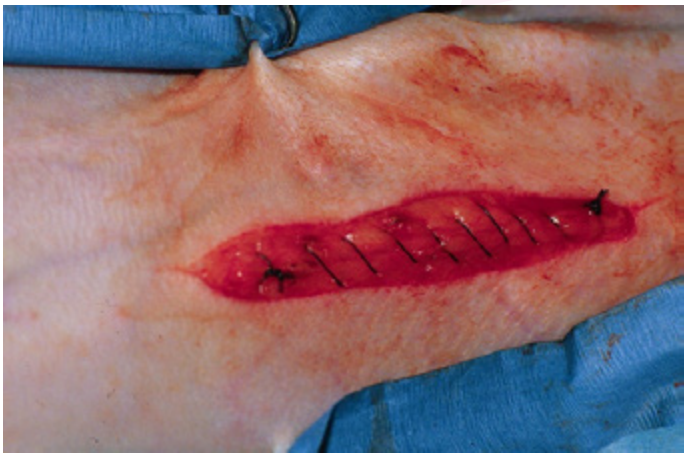
Step 4
Close the cystotomy routinely.
Closure of the Approach

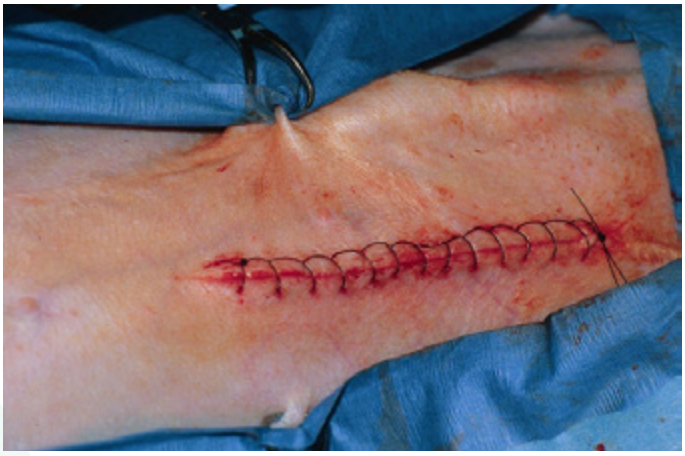
Step 1
Perform a sponge count and remove all pads and instruments from the abdomen. There is no need to close the peritoneal layer or muscle.

Step 2
Close the external rectus fascia (both fascial sheets) in one layer with either a simple interrupted or simple continuous pattern. Prolonged absorbable sutures are recommended for closure.



Step 3
The subcutaneous tissue and skin are closed routinely.





Aftercare
Strict confinement after surgery is recommended for 2 weeks.

Monitoring
Monitor the wound for any evidence of infection, fluid accumulation, or breakdown.
Fit an Elizabethan collar on the patient if extra wound protection is necessary.

Complications
Just like for the standard midline approach to the abdomen in dogs, bruising or seroma formation occasionally occurs due to ineffective subcutaneous dead space closure or poor hemostasis.

WSV - 068

THE EFFICIENT ORTHOPEDIC EXAM

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Introduction:

The Efficient Canine Orthopedic Examination
The objectiveof this session is to provide the veterinarian with some practical tips on how to perform an efficient but thorough orthopedic exam.
We recommend you practice this examination on as many normalcandidates as you can get your hands on, so that when you then get your hands on an abnormal patient you will appreciate the difference!
Try to develop a consistent approach to this exam every time you perform it to help ensure you are not missing steps.

Look for a consistently repeatableresponsefrom your patient that fits with the signalment and history, then use this information to guide further investigation.
Gait Observation/Ambulatory Exam
The purpose of this portion of the evaluation is to help;
Decide if the dog's gait issound(normal),lame(orthopedic), or ataxic(neurologic).

Localize the lameness to a particular limb or limbs.
Grade the lameness severity as a reference to others, and to assess the success of treatments.
CSU Small Animal Orthopedic lameness grading scale;

Grade	Description
0	No detectable lameness at any gait
1	Barely perceptible lameness
2	Mild or inconsistently apparent, weight-bearing lameness
3	Moderate, obviously apparent, weight-bearing lameness
4	Severe, predominately weight-bearing lameness
5	Severe, predominately non-weight-bearing lameness

Tips for success;
Use an assistant to lead the patient whilst you observe.
A quiet area (with few distractions), and good footing is ideal.

Video the patient and replay in slow motion (Use of a smart phone on a selfie stick can be particularly handy!)
What you are looking for when you compare the right and left sides of the patient;

Head or Hip "bobbing" -rise and fall
Pets lift their head/hip as the paw of the painful limb strikes the ground - in order to "un-weight" the limb.
Some people prefer to watch for dropping of the head/hip when the normal limb strikes the ground - "Down on sound".

It is best to look for fore limb lameness as the dog walks towards you and hind limb lameness as the dog walks away.

Stride lengthmay be shortened in the affected limb
Straight vs. circularadvancement of the limb.
Abduction or adduction of the affected limb may also be noted.

If you do not note a lameness at a walk, observe the dog walking at afaster paceor ascending and descending stairs;
More weight is carried by the hind limbs when ascending and the fore limbs when descending.
Watch which limb the dog may preferentially lead with, or whether it "bunny hops" both limbs together.

Sit Test

Observe the patient as they are asked to sit on command.
Forcing the patient to sit by pushing on their hind end may result in false +ve or –ve.
A positive sit test is when the patient sits with the leg held out to the side, underneath the body or behind the body.
In order to sit normally (negative sit test), dogs need to comfortably fully flex the stifle and tarsal joints.
A positive sit test may indicate lameness related to the stifle or the tarsal joint. Eg. Cranial cruciate ligament disease.

Standing Exam

The goalof this portion of the exam is to further localizethe lameness to a specific joint/bone/muscle or tendon.
Useboth hands simultaneouslyto note asymmetryin: muscle mass, joint effusion, tissue warmth, bony landmarks, etc.
Allow pet to familiarize with examiner!
Stand animal symmetrically
Most dogs shift their sore limb(s) away from the center of their body weight
Be systematic – working from rostral to caudal, and from proximal to distal on the patient.
"Eyes in your finger tips"

Pelvic limb: Can usually evaluate entire limb while standing behind patient.
Thoracic limb: Stand in frontor besidepatient to examine limb (use muzzle and avoid eye contact if patient feels threatened).
Effusion readily detected in: elbow, stifle, carpus and tarsus
Correlate findings with previous clinical findings from Signalment, history and gait observation.

Joint manipulation

The goalof this portion of the exam is to further confirm your localization of the lameness to a specific joint/bone/muscle or tendon.
Whether you localize more with the standing or recumbent portion of your physical exam may be dictated by temperament of patient. Some animals are better evaluated with secure restraint in lateral recumbency, whilst other patients will "tense up" making interpretation of pain and/or instability difficult.
-Comfort the pet to aid in relaxation
-Usually begin with "normal" limb first.
-Usually start at toes and move proximally on the limb.
What to look for when manipulating the joints (CREPI);
Crepitus
Range of motion
Effusion
Pain

Instability

Don't forget to palpate the bones in-between the joints and the axillary and inguinal regions!
Look for a consistent, repeatable responsefrom the patient that fits with the restof the previous exam findings!
Specific manipulationsfor specific joints;

Elbow

-supination/pronation(with carpus and elbow held at 90 degrees)
-direct palpation of medial compartmentof the elbow (just distal to prominent medial epicondyle)

Shoulder

-Biceps traction test(biceps tenosynovitis- flex shoulder, extend distal limb, palpate bicipital groove)
-Abduction angles(shoulder in extension not flexion)

Stifle

-Cranial drawer(landmarks- patella, lateral fabella, tibial tuberosity and fibular head)
-Tibial thrust(index finger over patella and patella tendon onto tibial tuberosity, flex tarsus and compress tibia. Ensure the tibia is not already cranially translated by pinching between your proximal hand's index finger and thumb.)
-Patella luxation(If present, it is usually easiest to luxate and reduce the patella with the stifle in extension- patella will be proximal in the groove).

Hip

-Landmarks (hip luxation- triangle, thumb-pinch)
-Ortolani(Support pelvis, push dorsally with leg in neutral position to subluxate, then abduct the limb to feel for "clunk" of reduction= Ortolani Sign)

Other

-Lumbosacral disease(Direct palpation, extension of the hind limbs)
-Iliopsoas muscle strain (traction with extension of hip and internal rotation of femur)

WSV - 078

RADIOGRAPHIC APPROACH TO A DIAGNOSIS FOR VOMITING IN SMALL ANIMALS

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Introduction:

Most clinics adhere to a standard protocol for completing radiographic studies depending on the anatomical region of interest. On some occasions, important diagnostic information can be obtained with an additional view. Typical views of the abdomen include a ventrodorsal (VD) and right or left lateral view. Often times, the right lateral recumbent view is routinely chosen because the spleen is better identified and the kidneys are better separated from each other in this view (1). Simple additional techniques include positional radiography (left lateral abdominal projection, horizontal beam radiography, humanoid thoracic view), compression radiography, and simple negative contrast radiography (pneumocolon and pneumogastrogram) used in combination with the above.

POSITIONAL RADIOGRAPHY

Personal preference largely determines which standard views to obtain for the abdomen. Gravity, mobility of organs, and the changes in distribution of gas and fluid with recumbency can be used to the clinician's advantage to optimize diagnostic capability of radiographic studies in many common clinical scenarios.

Left Lateral Abdominal View

Luminal contents within stomach and small intestine often contain some degree of fluid and gas. Because patients are positioned in recumbency (rather than standing) and views are obtained with a vertical beam (rather than horizontal beam), the classic appearance of a combination of contents in the gastrointestinal tract is a summation of opacities created by both gas and fluid. When a combination of soft tissue and gas material is present within the stomach or small intestines, the difference in opacity between these two can sometimes be used as a "natural" radiographic contrast to highlight margins where gas acts as a negative contrast agent. Fluid and mobile soft tissue material will be present in the gravity dependent part of the stomach or small intestines while gas rises to the non-gravity dependent part. By altering recumbency, the redistribution of gas within the gastrointestinal tract (without administration of additional contrast agents) has been used to diagnose pyloric outflow obstructions, locate obstructions within small intestines, highlight intussusceptions, distinguish colon from dilated small intestine, rule out gastric malpositioning, and definitively locate the pylorus, among other applications (2-5).

Specifically, in the left lateral recumbent view, gas rises to the right-sided pylorus and antrum, while fluid and soft tissue that are mobile fall to the region of the fundus on the left side. This is useful in cases of suspected pyloric outflow obstruction, where material that is non-mobile at the level of the antrum can be highlighted by gas limiting the effect of border effacement of soft tissue foreign objects or masses by fluid contained within the stomach.

Horizontal Beam Radiography

The usefulness of horizontal beam radiography is also based on the principle of gravity dependency of fluid versus gas. In the abdomen, the main purpose for obtaining a horizontal beam view is to reliably diagnose free peritoneal gas. Small volumes of free gas can be missed on survey radiographs, most commonly because gas bubbles are assumed to be associated with the gastrointestinal tract. Larger gas accumulations can also be overlooked, as the only finding may be a cranial or generalized decrease in abdominal opacity, which can be missed or mistaken for gas within the fundus of the stomach.

Horizontal beam views of the abdomen can be obtained in one of two ways. The basis of these techniques is to force gas to accumulate in a predictable location (i.e. non-gravity dependent) and radiograph this location. One method is to position the animal in left sided recumbency. The tube head and detector are positioned horizontally such that a VD view of the abdomen centered at the cranial abdomen is obtained. In this view, free peritoneal gas will accumulate caudal to the diaphragm on the right side. Left sided recumbency is preferred over right-sided recumbency due to positioning of gas within the stomach. Gas that is free or contained in the stomach will both rise to similar, non-gravity dependent locations. In left recumbency, the gastric gas will rise to the pyloric antrum, which is more desirable because it is smaller than the fundus and gas contained within the stomach is less likely to be confused for free gas (5). A second method is to position the animal in dorsal recumbency with the cranial half of the animal slightly elevated. The tube head and detector are positioned horizontally such that a lateral view of the animal centered at the cranial abdomen is obtained. Free peritoneal gas will accumulate caudal to the diaphragm ventrally in the non-gravity dependent part of the peritoneal space.

COMPRESSION RADIOGRAPHY

The purpose of compression radiography is to isolate a specific region of interest or remove superimposition by use of a radiolucent compression device (6). The most typically used device is a radiolucent wooden spoon or spatula; however, any rigid radiolucent device with a handle can be used. The indications for this study include isolation of specific organs of interest that are otherwise obscured by superimposition or to better delineate margins of a normal or abnormal structure seen on survey radiographs. This technique has been used to better delineate palpable or radiographically visible abdominal masses, isolate the urinary bladder to prove presence of absence of calculi, remove superimposition of the gastrointestinal tract on kidneys, separate small intestines from each other, and confirm presence of uterine enlargement, among other potential applications.

NEGATIVE CONTRAST RADIOGRAPHY

The inherent contrast between soft tissue/fluid and gas, as already discussed, is the basis for negative contrast radiography. Pneumogastrography and pneumocolonography are the two main procedures discussed that use room air as the contrast agent. These procedures are often used in combination with positional or compression radiography. For example, in a dog with clinical signs suspicious of mechanical pyloric outflow obstruction, the stomach may contain very little gas to contrast with material in the pylorus in performing a left lateral abdominal view. In such a case, the gas needed to create contrast may be added by simply administering room air into the stomach. Additionally, in some circumstances, it is beneficial to determine the precise location of the colon so that small intestinal foreign material or dilation can be confirmed or ruled out. Negative contrast is beneficial in that it is free of cost and will not obscure luminal material or the mucosal surface, unlike positive contrast agents (7).

Pneumogastrography

A pneumogastrogram can be used to determine size, shape, and position of the stomach. It can also be used on some occasions to highlight foreign objects, especially those located in the pylorus(8) and makes the left lateral recumbent view more effective. It is more commonly used in animal suspected of pyloric outflow obstruction or in cases of a cranial abdominal mass where the stomach is not well identified. Mechanical obstructions originating in the proximal duodenum often show absence of radiographically visible small intestinal dilation (especially where vomiting is effective at removing luminal contents) and can be highlighted by a pneumogastrogram performed in left lateral recumbency.

Pneumocolonography

A pneumocolonogram can be used to determine location of the colon and to highlight mural, luminal (foreign material), or extramural narrowing of the colon. It is commonly used to differentiate small from large intestine in cases suspect for mechanical obstruction or when the origin of dilated intestinal loops cannot be positively determined (7). Pneumocolonograms are useful in determining the origin of inhomogeneous or foreign material as being in small or large intestine, as material in the colon is typically nonsurgical, unless it is linear in nature and plication is seen. Once the location of the colon is determined, the remaining loops can be assumed to be small intestine.

CONCLUSION

Rather than adhering to a standardized protocol for obtaining an abdominal or thoracic set of radiographic views, consider the use of an additional view in another recumbency, using compression, or administering a contrast agent as available as room air to provide useful clinical information.

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WSV - 084

VIDEO-BASED LEARNING OF ACUTE PAIN MANAGEMENT IN CATS

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Introduction:
Appropriate pain assessment is required for proper treatment of pain. Pain evaluation should be part of the initial physical examination of all patients (TPR: temperature, pulse, respiration). Physiological changes such as heart and respiratory rates, pupil size, and neuroendocrine essays are not correlated with acute pain in cats. Anxiety, stress and fear will affect these variables particularly in the hospital setting. Appetite and blood pressure are the only physiological "markers" that have been correlated with increased pain, but blood pressure monitoring is not practical in a busy clinical practice and the cat may not eat simply because it is not hungry. Therefore, pain evaluation is mostly performed using subjective behavioral changes.

PAIN BEHAVIOURS/POSTURES

Key behavioral indicators of abdominal pain in cats have been identified and include abnormal postures such as hunched-up guarding or splinting of abdomen.1 An expert consensus using the Delphi-method has identified 23 items that are considered as certainly or often sufficient to establish the occurrence of pain.2 Some of these behaviors are commonly observed in acute pain and include, for example, reaction to palpation, withdraw/hiding, decreased appetite, hunched-up posture, lower head posture, growling, groaning and eyes closed. Indeed, some of these signs/behaviors were already identified in the previous literature when using validated pain scoring systems.1,3 However, some of these changes may be only related to the cat's temperament and show how important the context/environment is when evaluating pain in cats. For example, the type and duration of surgery, severity of pain, hospitalization, individual variability, age and disease should all be considered in the assessment of pain.

FELINE PAIN SCORING INSTRUMENTS/TOOLS

A systematic review investigated different pain scales in regard to validity (construct, criterion and content), reliability (internal consistency, intra-rater and inter-rater and test-retest) and sensibility (identification of a cut-off point and responsiveness) in cats.4 The UNESP-Botucatu multidimensional composite pain scale (MCPS) was the only one evaluated for the three above components. The visual analog scale, the numerical rating scale and other descriptive rating scales did not present any kind of validation and should not be used for the evaluation of pain in cats. The MCPS refers to sensory and affective domains of pain; it was originally developed in Brazilian Portuguese and translated, and further validated, in English, Spanish, French and Italian languages.3,5,6 These articles are free for download. The MCPS is a valid, reliable and responsive instrument that involves different domains such as 'pain expression' and 'psychomotor change'. On the other hand, this scale has only been validated for evaluating cats after ovariohysterectomy and is time-consuming. It is not known whether this tool is suitable or would have the same "performance" in cats undergoing other types of surgical procedure, trauma, or with medical, neuropathic pain. Currently, a short-form of the scale is under investigation and may circumvent some of the above issues. The Glasgow rCMPS-Feline has been shown to be valid with some evidence of responsiveness; nevertheless, reliability testing has not been reported. Construct and content validity were reported.7 The instrument is easy to use and theoretically, it can be applied to any kind of acute pain (medical, surgical, etc.). An updated version (Glasgow CMPS-Feline) has been recently published and includes facial expressions with a cut-off for interventional analgesia of $\geq$ 5/20.8 This latter version should be preferred as it showed increased discriminatory ability when compared with the previous version.8

FELINE GRIMACE SCALE (FGS)

Facial expressions have been used to evaluate pain in different species. Recently, the development of the Feline Grimace Scale revealed differences between painful and non-painful cats.9 Five action units have been identified and include ear position, orbital tightening, muzzle tension, and whiskers and head position. The Feline Grimace Scale is an interesting addition to feline acute pain assessment. At the time of writing, the manuscript reporting the scale was under review and will report the full validation of the instrument using image assessment. A review on acute pain assessment has been recently published.10 This lecture presents a quick overview of the MCPS, CMPS-F and FGS. It presents a series of videos of cats before or after surgery where the audience has the chance to practice the use of these scales.

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WSV - 061

EXPLORING COMPLEX PHENOTYPES WITH GENOMICS: DALMATIAN DEAFNESS AND LABRADOR RETRIEVER ANXIETY

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Introduction

Our focus today will consider two complex traits that are undergoing investigation in our laboratory. Our goal is to discover critical genetic drivers of these traits that might be used to improve dog welfare either through better physical management or through tools to enhance breeding strategies. Our laboratory focuses on the use of within-breed gene mapping as a strategy to uncover genes that impact common phenotypes. This presentation will focus on inherited deafness and a common behaviour disorder. Both traits are expected to be impacted by multiple genes as well as environment and other non-genetic factors (such as random chance).

DALMATIAN DEAFNESS

One of the most common forms of peripheral hearing loss in dogs is congenital sensorineural deafness (CSD). Dalmatians are frequently represented in lists of breeds that exhibit CSD, and prevalence in the breed is reported to be 16-29.9%. CSD is known to be inherited; and heritabilities have been reported that suggest selection will effectively improve it. CSD in the Dalmatian breed is classified as non-syndromic and can occur in both unilateral and bilateral forms.

Dalmatian deafness has long been presumed to be related to the extreme white coat coloration in the breed. While Dalmatians are somewhat less “white” than other breeds with the extreme white coat colour (such as the Bull terrier), they exhibit a higher rate of deafness in pups. This suggests that the coat pigmentation alone is not responsible for the phenotype.

Methods: Deafness was assessed through the application of brainstem auditory evoked response (BAER) testing of pups between six and eight weeks of age. Several different BAER testing devices can be employed for this purpose and not are all equally reliable. For our study, a veterinary neurology specialist (Child) used a Synergy on Nicolet EDX System (Natus Medical Incorporated, Pleasanton, California, USA) with a repetitive click stimulus that was applied to the pup via inserted earphones. The device was used to ascertain normal hearing, unilateral deafness or bilateral deafness.

Either buccal swab or blood samples were collected from the pups with the permission of the owners and DNA was extracted. 172 Dalmatian DNA samples were available for analysis and were genotyped using Illumina Canine Genotyping arrays (Neogen Inc Nebraska USA). Genome-wide association mapping applied a quantitative model using the Plink software (Purcell et al 2007).

Results: Our results validated the findings from an earlier study in the Dalmatian breed that showed complex association including association with the white-markings locus including the gene Micropthalmia-associated Transcription Factor (MITF).

Conclusion: The precise mutations that are impacting the phenotype are yet to be identified but a risk marker haplotype has been established that concords with the earlier finding.

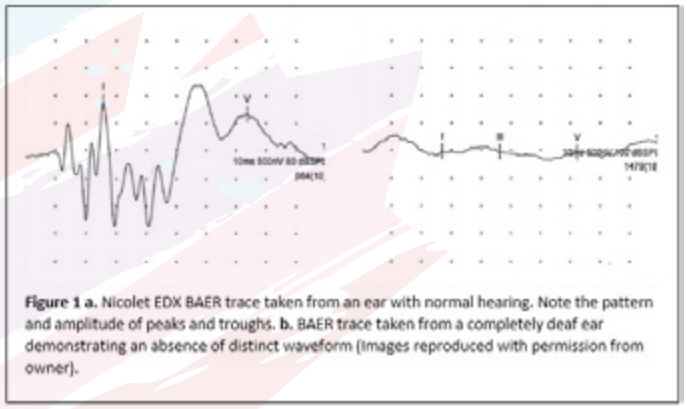

Figure 1 a. Nicolet EDX BAER trace taken from an ear with normal hearing. Note the pattern and amplitude of peaks and troughs. **b.** BAER trace taken from a completely deaf ear demonstrating an absence of distinct waveform (Images reproduced with permission from owner).

CANINE SEPARATION-RELATED DISTRESS

A common problem in companion dogs is separation related distress (also called separation anxiety). As affected dogs are often vocal or destructive when left alone, the disorder results in the euthanasia or relinquishment of many dogs world-wide.

To map genes underlying the disorder, we have concentrated on the inheritance of this condition in Labrador retrievers. The disorder manifests in dogs of many different breeds as well as cross-breeds – perhaps as a result of humans selecting for dogs that are very attached to us. We sought to use a within-breed mapping strategy, and this was facilitated by choosing a breed that is readily accessible as one of the ten most popular dog breeds in Australia (and indeed in many countries world-wide).

Methods: Separation-related distress was assessed by an owner-based questionnaire based on C-BARQ. Dogs had lived with their owners for at least 6 months. Owners reported on the frequency of 8 behaviours commonly seen in separation-related distress, and the 8 scores averaged to give an overall score for each dog. We validated the questionnaire by comparing owner responses to an analysis of video footage of dogs left alone.

Buccal swabs were collected from privately-owned dogs by ourselves or the owners. DNA was extracted and genotyped using Illumina Canine Genotyping arrays (Neogen Inc. Nebraska, USA). A quantitative model of genome-wide association analysis was conducted using Plink software (Purcell et al 2007). We had 90 Labrador retrievers with both questionnaire and genotyping data that were analysed.

Results: Of the top ten most significant markers, three were within an 80 kilobase region on chromosome 1 and four within a 2 megabase region on chromosome 12. Genes involved in the HPA-stress axis, schizophrenia and social behaviour are located within and adjoining these areas of interest. We have not yet identified candidate genes or mutations.

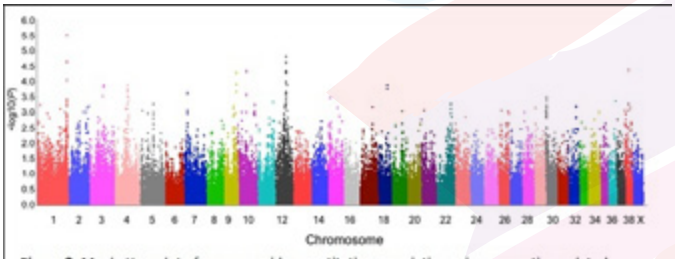

Figure 2. Manhattan plot of genome-wide quantitative association using separation-related behaviour scores of 90 Labrador retrievers

Conclusion: Identifying genes associated with behavioural disorders is challenging. While our work has produced some exciting results, further work is needed to validate our findings and identify the genes involved in the development of separation-related distress.

WSV - 362

KEYS TO SECURE LIGATIONS OF LARGE PEDICLES; LEARN THE RULES

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Introduction

Importance of Ligations

Ligation involves the use of encircling suture material and a knot, called a ligature, to tightly occlude blood vessels in surgery. Despite the introduction of newer electrosealing devices for use in open and minimally invasive surgery now available to veterinarians for large vessel hemostasis, ligatures are still considered the gold standard method to achieve hemostasis. Ligation of solitary vessels, or multiple vessels within a pedicle (mass ligation) is used virtually every day in practice during ovariohysterectomy, castration, amputation, splenectomy, and lobectomies; therefore, creating secure ligations is one of the most critical life-saving steps in most soft tissue surgeries.

Suggested Suture Material Choice and Size for Ligation

Although a number of sutures can be used successfully to ligate a pedicle or critical blood vessel, most surgeons choose strong absorbable monofilament material (such as polydioxanone -PDS, polyglyconate –Maxon, glycomer 631 –Biosyn, polyglecaprone 25 –Monocryl) of 0 to 3-0 size for most small animal applications. For larger arteries, some surgeons still recommend monofilament nonabsorbable suture material, such as polypropylene. Multifilament sutures such as silk, a suture noted for its excellent handling and ligation qualities, can be used successfully for ligation but these sutures have been shown to increase the risk of suture-related wound infections. In addition, generally speaking, multifilament suture materials tend to lockup prematurely during tying (the first throw of the knot may not tighten fully around the vessel or pedicle) since the suture develops more friction between strands compared to the monofilaments. Knot ears should be cut at least 3 mm for synthetic sutures. Generally speaking, it is good practice to choose the smallest suture material size providing sufficient strength for the intended ligation.

Testing the Security of Ligations

One of the most common but dangerous ways surgeon's attempt to "test" their ligations to be sure they are leakproof is to carefully and slowly release the clamps and any tension on the ligated pedicle, and watch to see if bleeding occurs from the cut end. Realize that simply crushing the vessel or pedicle with a hemostatic forceps can temporarily stop bleeding particularly when the patient is hypothermic and somewhat hypotensive.

In addition, any tension on the pedicle can also temporarily occlude flow through the vessel and this can give the surgeon the false impression that "all is well" at that site. Meticulous surgeons safely practice the principles of secure ligation, rather than solely relying on whether the pedicle is found to bleed or not soon after the ligation is completed.

Table 1
Rules for Consistently Secure Ligations

Double ligate critical blood vessels or pedicles
Transfix large vessels and pedicles especially when there is no "mushroomed" wad of tissue distal to the ligation(s).

Use a 3-forceps technique if you choose to clamp the pedicles before ligation. The transfixing ligature is always placed distal to the first ligature since this ligature requires needle penetration of the vessel, and the first circumferential ligature safely occludes the vessel first. Do not attempt to place a ligation on a vessel or pedicle close to a hemostatic clamp unless the clamp is "flashed" or loosened and the throw can be retightened. Ideally, if the clamp can be flashed, attempt to move the ligature so it falls in the crushed area of pedicle after the hemostat has been "flashed".

Tension on the pedicle during knot tying also tends to loosen the first throw of a ligation. This tension also tends to fan or spread out the pedicle which increases the risk of loosening of the first throw. If the first throw loosens just a small amount, this could result in fatal hemorrhage.

Choose strong suture material with good knot security. Place firm, slow and even tension on the knot throws during tightening so the throws are squarely fashioned.

Binding or Friction Knots

Binding knots are knots on a strand that either constrict a single object or hold multiple objects snugly together. Whippings, seizings and lashings serve a similar purpose to binding knots, but contain too many wraps to be properly called a knot. In binding knots, the ends of rope are either joined together or tucked under the turns of the knot. These so-called friction knots are held in place by the friction between the windings of line, or they are held in place by the two ends of the line being knotted together. Originally, these knots were designed to be performed by solo field workers to firmly close the end of burlap sacks. Binding knots were chosen because they would temporarily hold the neck of the sack tight without assistance until the knot was permanently secure with additional square throws.

Some of the more common friction knots used at that time were the Miller's knot, the Constrictor knot, Strangle knot, the Double Reverse Half Hitch (not covered in this presentation), and the Surgeon's knot.
During surgery, once a friction knot/throw is applied and tightened firmly it should be considered only temporarily stable, additional square throws are applied on top of it to make it permanently secure. In most cases, 3-4 snug, additional square throws will secure the ligature knot. Ideal qualities of the first throw friction knot include the ability to 1) cinch down tightly and completely without prematurely locking up. This characteristic allows the surgeon to "feel" when the knot does not cinch down any further during tensioning and thereby signaling when it is tightly applied, and 2) the friction knot should resist loosening once placed allowing time for additional throws to be performed for a permanent secure knot.
A surgeon's knot is a type of friction knot created by a double twist on the first throw (called the surgeon's throw) and it is completed with a second square, single-twist throw on top. Although the surgeon's throw can be used successfully for ligation in practice, it is generally not recommended for this use. This risky friction knot can "lock-up" prematurely, creating a dangerous situation in which the surgeon falsely thinks the knot has been tightly applied but it is not. When the strands are tensioned on a surgeon's throw, as the encircled tissue is tapered, the double twisted throw tends to bind up and resists further tightening. In addition, of the friction knots mentioned in this proceedings, it has been shown to be the least able to resist loosening when placed under expansile force when tested in my recent knot security research project.

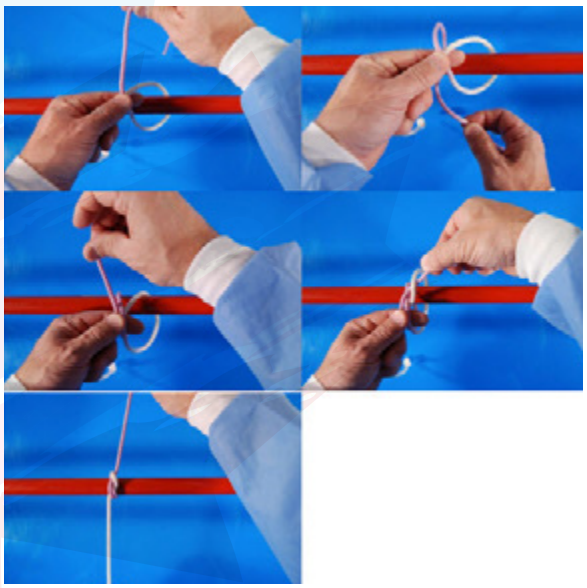
Recommended One or Two-Pass Friction Knots

Friction knots commonly employed in veterinary surgery can be classified by how many passes are placed around the pedicle. One-pass friction knots are the Surgeon's knot (not recommended for ligation) and the Double Reverse Half Hitch knot. The highly dependable 2-pass friction knots commonly chosen in practice include the traditional Miller's knot and the newly introduced Strangle knot.
Some surgeons choose a one-pass friction knot since it is easier to apply as it requires only one pass of the suture around the pedicle or vessel. The two pass friction knots, take a bit more effort to pass twice around the pedicle but they are highly effective as first throw knots to resist loosening.(TIP) For the two pass knots, complete a loose knot on the jaws of a hemostatic forceps first, and then push the loose knot down over the jaws into the appropriate position on the clamped pedicle after which fully tighten the knot. This enables construction of the knot in a site with ample room, before it is pushed down to crush the pedicle.

(TIP) For the two pass knots, complete a loose knot on the jaws of a hemostatic forceps first, and then push the loose knot down over the jaws into the appropriate position on the clamped pedicle after which fully tighten the knot. This enables construction of the knot in a site with ample room, before it is pushed down to crush the pedicle.

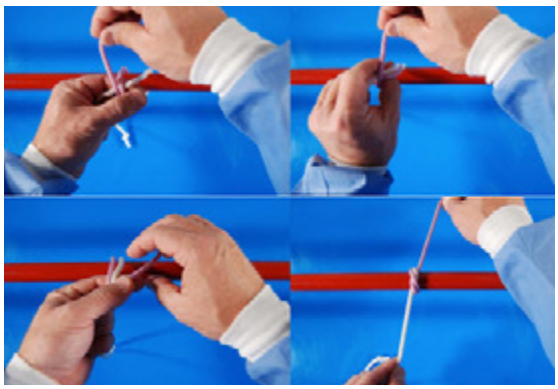
Miller's Knot (2-Pass Friction knot)

A Miller's knot is the most traditionally taught friction or so-called "binding knot" used to tie-off vessels or pedicles. This knot works well on large pedicles, such as ovarian pedicles or uterine body during ovariohysterectomy, since the strands of the knot have many surfaces in contact to increase friction, and a greater surface area of compression by the multiple suture passes encircling the pedicle. This knot does not "bind up" prematurely, and allows the operator to confidently know when the knot has been tensioned correctly to obstruct blood flow through the pedicle.



Strangle Knot Hand Tie Technique

The Strangle knot is another variation of a 2-pass binding knot and can be used in lieu of a Miller's knot. The author prefers this binding knot since it tends to stay tight even when the ends are manipulated like the Miller's knot, but it is easier to tie. The only difference between this knot and the modified Millers is that the strands are crossed on the first pass, and the second pass is to the left of the first formed loop.



WSV - 069

AVOIDING THE DOGOGRAM - ORTHOPEDIC RADIOGRAPHY 101

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Overview

We have all been tempted when faced with a lameness in a small patient, to simply radiograph the entire animal if it fits on the film and then try to make a diagnosis. This session focuses on practical ways to get the most diagnostic value out of our orthopedic radiographs. Critical evaluation of positioning and interpretation of the more common joints and conditions encountered will also be discussed with case examples. The main key take home points are highlighted below;

Localize the Lameness

Similar to other diagnostic tests, radiographs should be utilized to add additional information to help rule in or out differential diagnoses based on gait evaluation and our orthopedic exam. Even if a case presents with a previous proposed diagnosis and radiographs, I try not to read the medical record or view the radiographs until after my history and orthopedic exam, so I can then see if my findings were consistent with the historic ones. It is ideal to localize the lameness to 1-2 joints or bones of the affected leg, and grade the severity of the lameness to see if the clinical findings fit with the radiographic interpretation.

More is not Always Better

If the regions of interest are the pelvis and the stifles, even if both regions can fit on one radiographic film, it is best to take a separate set of radiographs for each region that is centered on the joint/bone of interest. This will allow optimal positioning and subsequent interpretation of each region.

Safety First!

When in a rush it is easy to forget to follow the radiation safety principles of ALARA (As Low As Reasonably Achievable). Use of Personal Protective Equipment, Collimation, and sedation of the patient as needed. Proper positioning of many orthopedic radiographs often requires at least light to moderately heavy sedation. A common protocol used at CSU in an otherwise healthy patient is a combination of Butorphanol (0.1-0.3mg/kg IV/IM/SQ), and Dexmedetomidine (2-5mcg/kg IV/IM/SQ) that is reversed with Atipamazole once the procedure is complete. The sedation can be helpful not only to allow for a less stressful and painful positioning of the patient, but also may allow for more thorough palpation and manipulation of the injured region.

Calibrate Radiographs

Anytime you take a radiograph of a bone or joint, place a radio-dense object of known sizeas closeto and at the same heightas the targeted bone or joint. Positioning of the object in this way allows it to be under the same influence of magnification as it is the same distance from the radiographic beam. This has become increasingly important with wider spread use of digital radiography. Calibration allows important measurements to be made for pre-operative implant and technique planning. Even if you are not the clinician that is going to be performing the definitive surgery, the surgeon and clientwill be very happy that repeat radiographs are not needed if there are well positioned and calibrated radiographs that arrive with the patient.

Don't Forget the Opposite Leg

When a bone is fractured or if an unusual bone lesion is seen, it is a great idea to take a set of calibrated radiographs of the ipsilateral "normal" limb. The normal side can be an invaluable reference for the true shape/size and unique "normal" anatomic variants for that patient.

Critically Evaluate your Positioning

The number one reason that orthopedic radiographic miss-diagnoses are made is poor positioning. Poorly centered and positioned radiographs are more difficult to interpret, can create "artificial lesions", and may hide true pathology. Before the patient has left the radiology table (and before it is re-positioned for the next view if you have digital radiography), critically evaluate if the projection is truly what you aimed to achieve, and learn how to adjust the positioning of the patient or the radiographic beam if it is not quite right.

Stifle Joint Radiographs

The lateral projection is most commonly used for interpretation. Useful positioning tools and tips and critical evaluation of positioning will be covered using clinical case examples. Dogs with cranial cruciate ligament disease will frequently have varying degrees of effusion and secondary osteoarthritis. Case examples will be used to illustrate how to be more objective about evaluation of these changes and how to differentiate these findings from more aggressive disease such as septic arthritis or neoplasia. This session will also overview how to measure the tibial plateau angle (TPA), and why this is an important step to take in our CrCL patients even if we are only performing extracapsular stabilization or conservative management.

Hip Joint Radiographs

The ventro-dorsal (VD) hip extended pelvic view (OFA-like positioning) is the most useful for interpretation of hip dysplasia. Useful positioning tools and tips and critical evaluation of positioning will be covered using clinical case examples. Dogs with hip dysplasia will have varying degrees of dysplasia secondary osteoarthritis depending on the phase of their disease. Case examples will be used to illustrate how to be more objective about evaluation of these changes.

Elbow Joint Radiographs

Three views are necessary to evaluate all regions of the elbow. Critical evaluation of positioning and interpretation will be covered using clinical case examples. The most common orthopedic condition affecting the elbow in dogs is elbow dysplasia due to medial coronoid disease. This condition is very difficult to evaluate using radiographs and the author's preference is instead to utilize CT to evaluate such cases.

Carpal and Tarsal Radiographs

It is not uncommon to have traumatic ligamentous injury to these lower joints. Knowledge of the degree of instability and joint level affected is critical in the treatment decision making process. This information can only be obtained by careful palpation of the joints under sedation and the use of stress-views.

WSV - 079

AN ALGORITHMIC APPROACH TO DIAGNOSING ICTERUS IN THE DOG USING ULTRASOUND

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Overview

Icterus is the dog has multiple potential underlying causes, many of which are diagnosed with imaging (ultrasound, radiography, and computed tomography). Specifically, the methods to complete an imaging diagnosis of icterus in the dog, with emphasis on ultrasound, will be discussed.

Causes of Icterus in the Dog

Table 1 Causes of icterus.

Pre-Hepatic	Hepatic
Hemolytic Anemias:	Hepatitis – chronic
Primary immune-mediated hemolytic anemia	Hereditary hepatitis (breed-specific)
Idiopathic	Drug-induced (phenobarbital)
SLE	Hepatitis – acute
Blood transfusion	Toxic (e.g. NSAID)
Paraneoplastic hemolytic anemia	Infectious (leptospirosis, canine infectious hepatitis, Yersinia, Salmonella)
Lymphoma	Neoplasia
Hemangiosarcoma	Lymphoma, mast cell tumor, hepatic
Infection-induced hemolytic anemia	
Piroplasmosis, dirofilariasis, bacterial endocarditis, leptospirosis, ehrlichiosis, sepsis	
Toxin-induced hemolytic anemia	
Onion, zinc, methylene blue, sulphonamides, copper, penicillins/cephalosporins	

Once pre-hepatic causes of anemia are ruled in or out, distinguishing the remaining causes of icterus as hepatic or post-hepatic is very imaging intensive with ultrasound being the primary modality used.

Table 2 Specific organs to isolate on ultrasound examination for causes of hepatic or post-hpeatic icterus.

Organ to Evaluate	Specific Diagnoses
Liver	Hepatitis, neoplasia
Gallbladder	Cholecystitis, mucocele, gallbladder rupture
Bile duct, hepatic ducts	Biliary obstruction, cholangitis
Pancreas	Pancreatitis causing obstruction
Pancreatic neoplasia causing obstruction	
Duodenal papilla	Nodule or mass causing obstruction

Hepatic Diseases Causing Icterus

Diffuse Abnormalities of Hepatic Echogenicity

Many of the diseases that may cause icterus are diffuse in nature. As a result, rather than finding focal masses or nodules, an overall alteration in hepatic size and/or echogenicity may indicate disease.

Table 3 Common differential diagnoses for diffuse changes in hepatic echogenicity.

Diffuse Hyperechogenicity	Diffuse Hypoechogenicity
Steroid hepatopathy	Passive congestion
Lipidosis	Acute hepatitis or cholangiohepatitis*
Other vacuolar hepatopathies	Lymphoma*
Chronic hepatitis□*	Leukemia
Fibrosis□*	Histiocytic neoplasms*
Cirrhosis□*	Amyloidosis
Lymphoma*	
Mast cell tumor*	

□Often have concurrent microhepatia (the remaining differential diagnoses can occur in normal or enlarged livers).

*Most apt to cause icterus.

Hepatitis

The ultrasonographic appearance of acute and chronic hepatitis differs, classically. Acute hepatitis, if abnormalities are visible, tends to create a mildly enlarged liver that is diffusely hypoechoic. Chronic hepatitis will create hepatic hyperechogenicity. The ultimate diagnosis of hepatitis and distinction between forms requires clinical history and tissue sampling.

Dogs with acute hepatitis typically have hepatomegaly (although a normal sized liver is possible) and inflammatory cells, hepatocellular apoptosis, necrosis, and regeneration would, in varying degrees, be reflected in tissue sampling. A hallmark of chronic hepatitis is the addition of fibrosis to the mononuclear or mixed inflammatory infiltrate, hepatocellular apoptosis, necrosis, or regeneration. Cirrhosis is the end-stage result of hepatic fibrosis with a small and irregular liver. Concurrent peritoneal effusion can be present due to the presence of portal hypertension and vascular derangement.

Hepatic Neoplasia

The most common neoplasms to cause icterus are infiltrative and metastatic neoplasms. Infiltrative neoplasms are usually round cell tumors that cause enlargement and a diffuse change in echogenicity. Lymphoma is the most commonly encountered infiltrative neoplasm of the liver and it typically causes a diffuse hypoechogenicity.

Metastatic neoplasms are about 2.5 times more likely to occur than primary hepatic neoplasms such as hepatocellular carcinoma (1). Often metastases originate from the spleen, gastrointestinal tract, and pancreas. Metastatic lesions within the liver are often nodular in appearance. Many benign lesions within the liver can also create a nodular appearance (nodular regeneration, e.g.). Targetoid nodules are more indicative of malignancy and can be found within the liver or spleen and may be due to metastatic or primary neoplasia, but are often found with metastatic disease (2). A targetoid nodule is a typically hypoechoic nodule having a hyperechoic center. Ultimately, tissue sampling of the nodules and surrounding tissue must be obtained to confirm malignancy.

Biliary System

The gallbladder, located between the quadrate and right middle liver lobes, should be anechoic or a layer of sludge can be visible in asymptomatic dogs (3). The gallbladder wall should be nearly invisible measuring no greater than 3 mm in thickness. Occasionally, a normal bile duct can be identified; the normal bile duct in a dog should not measure greater than 3 mm in diameter. The bile duct is ventral to the portal vein and may be slightly to its right. The intrahepatic biliary system, including hepatic ducts, should never be visible. The key landmark for locating the common bile duct is identification of the major duodenal papilla just aborad to the cranial duodenal flexure.

Biliary Diseases Causing Icterus

The most common diseases of the biliary tract causing icterus are due to primary gallbladder diseases (gallbladder mucocele or cholangiohepatitis), or obstruction or infection of the common bile duct (cholangitis). Of all dogs presenting for gallbladder disease requiring surgery or resulting in necropsy, about 47% were icteric (4). A significant relationship exists between gallbladder necrosis and gallbladder rupture. Dogs with gallbladder rupture tend to be icteric and rupture can occur secondary to a mucocele, infected bile (cholecystitis), or idiopathic wall necrosis and rupture without concurrent infected bile or mucocele (4).

Cholecystitis and Mucocele

Cholecystitis may not be sonographically visible. If evidence does exist, a thickened gallbladder wall may be seen (>3 mm). Sometimes luminal gas can be identified in the gallbladder. Cholecystitis leading to gallbladder wall rupture can be a sequela of infected bile. However, gallbladder wall necrosis without concurrent infection or mucocele can also occur for unknown reasons. About 50 - 75% of dogs presenting with a gallbladder mucocele will have concurrent rupture due to wall necrosis (4, 5); however, the presence of a mucocele can be an incidental finding. A gallbladder mucocele appears as an irregular anechoic rim at the inner margin of the gallbladder wall of variable thickness and, often times, a hyperechoic center of hyperechoic luminal sludge material.

Gallbladder Rupture

The primary indicator of rupture is regional changes within the liver or peritoneum (4, 5). A large volume of effusion is rarely present with gallbladder wall necrosis and rupture. Often times, only a small rent is present in the gallbladder, which is rarely visible on ultrasound unless a mucocele can be identified protruding from the wall (4). A variable echogenicity change within liver surrounding the gallbladder and hyperechoic mesentery in the region of the gallbladder are the most reliable indicators of gallbladder rupture. Often times mesentery in the right cranial abdomen is also hyperechoic.

Dilated Common Bile Duct

A dilated common bile duct is most often seen with extrahepatic biliary obstruction. This is most often caused by a concurrent pancreatitis, although luminal obstructive material (sludge or a choledocolith) or extramural mass associated with the duodenum or pancreas can also cause obstruction. A dilated common bile duct is expected within 48 hours of obstruction. Intrahepatic biliary duct dilation is evident 5 – 7 days after obstruction of the common bile duct (6, 7). Dilation of the intrahepatic biliary system appears as too many branching vessels within the liver.

Pancreatitis

If visible changes are identified, the classic appearance of acute pancreatitis is an enlarged, hypoechoic pancreas having irregular margins and surrounded by hyperechoic mesentery. Only about 25% of cases of pancreatitis are icteric having increased likelihood of extrahepatic biliary obstruction and these tend to be the more sonographically severe cases (8, 9). When pancreatitis is discovered, make special attempt to locate the duodenal papilla and bile duct to confirm suspicion of an extrahepatic biliary obstruction.

Conclusion

Follow the algorithm below for an approach to the icteric dog.

Figure 1 Approach to the icteric dog.

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SERVING HOMELESS POPULATIONS THROUGH A ONE HEALTH APPROACH

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The Canadian Observatory on Homelessness defines 'homeless' as "the situation of an individual, family or community without stable, safe, permanent, appropriate housing, or the immediate prospect, means and ability of acquiring it" (1). Homelessness includes people who are unsheltered (i.e. living in public spaces or spaces not intended for human living), are emergency sheltered, provisionally accommodated (e.g. short-term or interim housing, institutional care), and those at risk of homelessness (1). In Canada, almost a quarter of a million people experience homelessness in a year. Youth make up 20% of Canada's homeless population with 40,000 youth experiencing homelessness every year (2). Almost 30% of homeless youth identify as LBQT2S, 58% have been involved with child protection and 63% have experienced physical, sexual or other forms of abuse (3). Over 50,000 people experience hidden homelessness in any given year and almost 1 in 10 Canadians have experienced hidden homelessness at some point in their lives (4).

It is estimated that approximately 20% of those experiencing homelessness in Canada are pet owners (5). Pet ownership by this population has been shown to have both benefits and barriers. Pet ownership by those experiencing homelessness has been shown to positively influence the pet owners' sense of self (6), responsibility and pride and creates routine and structure that many did not have prior to becoming a pet owner (5). Pet ownership has also been associated with lower prevalence of depression among street-involved youth (7) as well as a strong motivator to decrease their use of alcohol and/or drugs and avoid arrest (5). These human-animal relationships are often described as "my best friend", "my only family", companion or child-like, and are often the only source of unconditional love without judgement (5).

Among the systemic barriers for homeless pet owners are inaccessibility to emergency sheltering, counselling, addictions treatment, and/or healthcare and other support services with their pet (5). Other barriers include increased difficulty in obtaining pet-friendly housing, and an inability to take advantage of employment and/or education opportunities as there is no safe place to leave their animal companion while at work or school (5).

Adding to pet-related barriers are negative social stigmas and social triaging experienced by those who are living rough, often with mental health issues and/or substance use challenges. These negative experiences contribute to a sense of distrust of healthcare providers among this population.

In serving homeless pet owning populations, it is therefore necessary to first understand the experiences of those we are serving and to be able to understand their lived experiences through the social determinants of health framework (8). What is critical is to see how systemic (e.g. employment, housing, employment, healthcare, social exclusion) and structural factors (e.g. social ideology, political and economic factors - globalization) impact the daily lives of individuals and families living homeless along with their animal companions and their access to care and support. As animals are sentinels of human health and welfare, we can see how the social determinants of animal health are closely tied to the social determinants of human health (9). In understanding these shared social determinants of health - the micro to macro social, political and economic influences on human and animal health, we are practicing One Health.

Another critical aspect of serving homeless pet owning populations is in a personal reflection of values and beliefs. Values shape our relationships with clients, community partners and ourselves. These values must be examined through an ongoing process of critical self-reflection. As veterinarians we hold privileged positions of having animal health knowledge and power (see Foucault for more). As human beings, we also hold personal biases and beliefs based on our social and physical environment and experiences. It is crucial to examine how our own biases and beliefs may impact the care we provide but also how we are impacted by decisions of others that we may not agree with. This is perhaps not uncommon in the daily experiences of veterinarians but can be amplified when serving pet owners who are living homeless, experiencing multiple challenges and are strongly and negatively impacted by structural inequalities.

Many of the values that Community Veterinary Outreach adopts are based on the Canadian Association of Social Workers Code of Ethics (10) and includes respecting the inherent value and worth of each person and animal; offering support, compassion, and affirmation, not judgment; valuing diversity and striving to create an environment that is inclusive of and accessible for all; believing that clients are experts in their own lives, with existing resiliencies and inherent strengths, and that clients have a right to self-determination,

autonomy and agency. Further in a One Health model, clients are considered health partners. In terms of health practices, values include practicing evidence-based medicine and believing that all people and animals are entitled to a high standard of care, regardless of socioeconomic status. Therefore, practicing from a One Health approach involves considering the values, goals, and perspectives of multiple stakeholders in the One Health model, including ourselves, those we serve, and our community partners.

Community One Health practices will be discussed next. However, it should be emphasized that the above core practices of ongoing critical self-reflection, goals and values determination, and understanding of the lived experiences of those we serve, the multiple barriers that contribute to those experiences (including the social determinants of health) are critical first steps to serving marginalized populations. Creating strong collaborative partnerships in community health is an obligatory One Health practice to remove interdisciplinary barriers in both delivering and accessing health services by homeless populations. By offering human health services and health education alongside preventative veterinary care, Community Veterinary Outreach provides innovative access to both veterinary and human health care for at-risk populations. Community Veterinary Outreach partners with health providers from public health agencies, mental health agencies, social service agencies, community health centres, and academic institutions. Health professionals include nurses and nurse practitioners, dental hygienists, social workers, psychologists and pharmacists as well as students from health care programs.

In working collaboratively in a One Health model of care, all team members regardless of professional background or training, are committed to supporting the health and welfare of both the people and their animals. Practically, this common goal means that veterinarians are as concerned with human health issues that may arise during interactions with pet owners, as they are with animal health issues. This kind of active listening for human health concerns is often a skill that is learned through consistent practice. In addition to active listening skills, we employ communication practices based on the spirit, principles and processes of motivational interviewing (11), as well as health messaging amplification. Finally, in a One Health model of care, veterinarians learn how to confidently and effectively communicate with clients about human activities that impact animal health including exercise, and tobacco and cannabis use. It is important to note that in doing so, veterinarians are not expected to extend advice beyond their scope of practice but rather to facilitate connections to appropriate human health providers. In this way veterinarians act as community connectors for clients.

The client-veterinary relationship is unique, in that through a mutual caring for an animal, a strong and trusting relationship develops. Additionally, through presentation of animal health concerns, veterinarians often learn of personal and environmental challenges that clients are dealing with such as a new move, loss of a loved one, illness, or work challenges. For homeless clients, these concerns also include structural inequalities and intersected experiences of abuse, victimization, trauma, extreme poverty, and discrimination. Practicing from a One Health perspective therefore also means that with any presenting animal health issue, we also gather knowledge from the human and environmental sectors as well as the animal sector. In so doing, veterinarians create a more holistic picture of both the client, animal and the context in which they are living with and experiencing the presenting issue. A One Health approach to veterinary practice seeks to adequately and accurately see clients as whole persons. To provide this kind of care is to go beyond an understanding of medical issues, to also understand how their experiences, relationships and environment impacts the lives of both humans and their animal companions.

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RADIOGRAPHY OF THE EQUINE FOOT

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The equine foot is arguably one of the most x-rayed regions and most scrutinized. Numerous studies describe pathologic changes in the foot and association with lameness Imaging the equine foot most often starts with radiographs. Indications to radiographic the foot include lameness that localized to the region, farriery, regions wounds/lacerations, draining tracts, guided needle placement or inter operative imaging.
Foot preparation is paramount to obtaining quality, diagnostic radiographic images of the equine foot. The shoe should be removed and the the foot should be cleaned, preferable with a wire brush. Debris in the hair should be also be removed. The sulci of the frog should be thoroughly cleaned. The sulci should be packed with a soft deformable substance such as play-doh . Only the sulcus should be packed to eliminate gas artifact, not the entire sole.

The conventional radiographic projections of the foot include a lateromedial (LM), dorsopalmar (DP), dorsoproximal -palmarodistal oblique (D60Pr-PaDiO), and palmaroproximal -palmarodistal oblique (Pa45-55Pr-PaDiO) or skyline view. The DP view can be horizontal or angled 30 degrees dorsoproximal-palmarodistal. Changing the angle will highlight different regions of the articular surfaces of the distal interphalangeal joint. If suspecting pathologic change in the wings of the distal phalanx or fossa of the collateral ligaments, additional oblique views can be used to highlight these regions. The lateral 45° proximal-mediodistal oblique. Oblique projections (including opposite projection) to highlight the palmar processes. Fractures of the palmar processes can be radiographically occult with standard views and may require oblique imaging and even time (14 days) to be seen. In some instances, these fractures are only seen on cross sectional imaging.

There are normal variations in the bone contour that can occur in the distal phalanx. Extensor process may have several different configurations, including a single point or double point and may rounded or pointed. The appearance of the distal phalanx as well as in the size of the crena marginalis. Care should be taken not miss a centrally located keratoma. Contralateral radiographs may be beneficial in these cases. Ossification of the ungual cartilages can occur without clinical significance. However, recent study with MRI have demonstrated soft tissue abnormalities that can accompany ossification of the ungual cartilages or fractures that may be difficult to see on radiographs.

It is important to understand and know the attachments of commonly injury soft tissue on the bone . Bone can give indications that there is is concurrent soft tissue injury.

The collateral ligaments of the distal interphalangeal joint on the middle and distal phalanges can be identified and should be closely evaluated. At the origin, there are smooth protuberances present on dorsomedial and dorsolateral P2. These also serves as the region of attachment for the chondrocoronal ligaments. The distal insertion of the collateral ligaments is an elongated oval lucency outlined at the 9 and 3 o'clock position on P3. Bone resorption/lysis in addition to regional sclerosis indicates enthesopathy of the collateral ligaments. Similar other enthesopathic injury, clinical significance needs to be correlated with physical exam and or advance imaging

As with many sites, radiographic abnormalities in the foot may not correlate with lameness. The navicular bone in particular is often scrutinized. The shape, corticotebecular bone definition, presence of enthesophytes, size and number distal border synovial invaginations, and distal border fragmentation are often described. The clinical relevance of each of these findings is variable. Sound horses can have a trapezoidal or slightly elongated along the flexor cortex looking similar to a chef's hat. Navicular bone distal margin fragmentation can be seen as an incidental finding. Synovial invaginations are often debated as degenerative changes in the navicular bone. Warmbloods have some normal variation of larger and more numerous synovial invaginations at the distal border compared to other breeds. When considered as a single entity, synovial invaginations may have minimal association with lameness. However, in the author's opinion, enlarged synovial invaginations thinning the cortex have the propensity to erode through and become a flexor cortex defect and should be considered a risk. Radiographic findings considered clinically relevant are defect in the flexor cortex, loss of corticotrabecular bone definition, medullary sclerosis and to a lesser extent proximomedial and lateral enthesophytes. Often when interpreting findings, it is several points of pathologic change in the foot/navicular region that mount and are assessed as a potential risk.

Ossified ungual cartilages were often thought of as a benign process with little clinical consequence, unless they fractured. There has a been more recent work to inspect this area further on purchase exams. The ungual cartilages can ossify in two patterns. The more common is from the base extending proximal and the second is with a separate ossification center proximal.

The junction between the separate center and the base can be irregular and sclerotic. When reviewing this area is important to evaluate the ossified ungual cartilage and palmar process for sclerosis. This can precede a fracture of the distal phalanx. Ossified ungual cartilages have also been associated with collateral ligament injury. Ossified ungual cartilages will not likely preclude the horse from doing it's intended purpose, but should be scrutinized as a potential (low) risk.

The distal phalanx is uncommonly subject to osseous cyst like lesions but typically are regarded at clinically relevant and a source of lameness. These lesions are more often than not unilateral and in the forelimb. Mild signs of osteoarthritis are often encountered in the distal interphalangeal joint, especially in horses that have a long campaign record. In these case it is the author's opinion that symmetry and history are important considerations to convey impressions of risk. Advanced demineralization and irregularity along the solar margins (anatomic diagnosis of pedal osteitis without an underlying cause) in thoroughbreds may be a consideration as these may be lame, where as warmbloods tend to be less affected by lameness with similar radiographic findings.

There are often small osteophytes at the dorsoproximal aspect of the (fore) middle phalanx that are incidental. Osseous cyst like lesions are common seen associated with the hind proximal interphalangeal joint (distal aspect of the proximal phalanx) and are important to include in the radiographic views of the hind fetlock joint. When these cysts are located along the weight bearing surface, the author considers these a risk.

In conclusion, patient preparation, knowledge of regional anatomy, normal variation and careful interpretation of bone margins can help identify clinically relevant changes and direct future imaging to help diagnose the source of lameness.

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TECHNIQUES FOR CHEST & ABDOMEN: AWAKE & SEDATE

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Thoracic and abdominal radiographs are the most common radiographs taken in small animal clinics. Many clinics will do upwards of 10+ radiographic studies per week. With the ease of digital radiography, the number of radiographs taken per study has increased from the days of film.

Most patient requiring thoracic or abdominal radiographs do not require sedation – however some patients may benefit from a sedative or analgesic. This will be discussed further in the sedation section. For awake patients, it is imperative that the patient is comfortable to allow for compliance with positioning. A comfortable patient is key to being successful with hands-free radiographs.

Remember: As technicians (or anyone non-DVM performing radiographs), we have 3 questions to ask ourselves in regard to quality of the radiograph:
1) EXPOSURE - Is the exposure appropriate?
2) INCLUSION - Do I have all anatomy included?
3) POSITIONING - Do I have the right views, and is it straight/rotated?

Chest (Thoracic) Views

Thoracic radiographs should be taken on inspiration to allow for complete expansion of the lungs.
Two views (lateral and dorsoventral) are recommended for patients with heart failure.
Three views (both laterals, and ventrodorsal) are recommended for patients requiring a metastasis check or assessment of aspiration pneumonia.
Techniques for diagnostic thoracic radiographs should include a low mas and high kvp.
Lateral Views (Right/Left):

Dogs

Positioning Tips
Collimation: Point of shoulder to 13th rib, center over the heart.

Radiographic Inclusion: Cranial to caudal tip of lungs.
Diagnostic Quality: Straight with no rotation, ribs should be overlapping. No area of the lung should be visible above spine (rotation). Adequate collimation and contrast/density (which may need to be altered depending on disease state).

Steps

Place patient in lateral recumbency with a sandbag over the pelvis and neck.
Extend front legs forward to the comfort of the patient using sandbag or elastic extremity straps.
Deep chested dogs may require wedge under sternum to prevent rotation.
Ensure entire thorax fits in the field and collimate.
Large dogs may require a cranial and caudal view.

Acquire radiograph on inspiration if possible.
Include R/L marker.

Cats

Positioning Tips
Collimation: Point of shoulder to just caudal of the 13th rib, center over the heart.
Radiographic Inclusion: Cranial to caudal tip of lungs.
Diagnostic Quality: Straight with no rotation, ribs should be overlapping. No area of the lung should be visible above spine (rotation).
Cats can be wrapped in a “kitty burrito” style using a simple towel for positioning if awake (see image).
Using a small piece of vetrap around the extremities (front for thoracic and back for abdomen) can be helpful with keeping the elastic extremity straps in place.
Cat scruffers can be useful with some cats, but should be left on for a maximum of 30 seconds.
*note: not all cats tolerate being scuffed and must be assessed prior to use.
Thorax Ventrodorsal (VD) View
Positioning Tips
Position: Point of shoulder to 13th rib, center at heart.
Radiographic Inclusion: Cranial to caudal tip of lungs. Entire lung field, including caudal tips of lungs on inspiration.
Diagnostic Quality Straight – sternum overlap vertebrae. Spinous process should appear as a “teardrop shape” in the center of each vertebrae.
Adequate collimation and contrast/density.

Steps

Place patient in dorsal recumbency (in a radiolucent foam trough) with sandbag over pelvis (+/- neck)
Extend front legs cranial with sandbags or elastic extremity straps.
Ensure head and neck are straight, as this prevents cranial rotation. Using the foam wedges can be helpful at keeping head straight and crossing the extremity straps can sometimes be helpful too.
Acquire radiograph on inspiration.
Include R/L marker.
Cats Tips: Same as with dogs. If using the scruffers – make sure they are pointing towards the head, out of the trough.
Thorax (DV) View

Positioning Tips

Position: Point of shoulder to 13th rib, center at heart.
Radiographic Inclusion: Cranial to caudal tip of lungs. Entire lung field, including caudal tips of lungs on inspiration.

Diagnostic Quality Straight – sternum overlap vertebrae. Spinous process should appear as a "teardrop shape" in the center of each vertebrae.
Adequate collimation and contrast/density.

Steps

Place animal sternal (in foam trough) with sandbag over pelvis (+/- neck).
Extend front legs cranial with sandbags or ties.
Ensure head/neck are straight.
Acquire radiograph on inspiration.
Include R/L marker.

Abdomen Views

ABDOMEN TIPS:
Foreign Bodies : LEFT LATERAL abdomen views are often indicated for potential obstructive pyloric foreign body, as air will be evident in pylorus, often allowing better visualization of foreign material.

Lateral Views

Positioning Tips

Position: Mid thorax (6th rib) to hips, center at 13th rib.

Radiographic Inclusion: Entire diaphragm to hips.

Diagnostic Quality Straight: Transverse processes should overlap so only one can be seen.

Adequate collimation and contrast/density.
Steps

Place animal R or L lateral recumbency with sandbag comfortably over neck and front legs (or straps).
Extend hind legs back and place sandbag over hind legs.

Left lateral more diagnostic for potential gastric foreign body, right lateral for GDV.

Cats can be wrapped in a "cat burrito" for positioning.
VD Views
Positioning Tips

Position: Mid thorax (6th rib) to hips, center at 13th rib.
Radiographic Inclusion: Entire diaphragm to hips.
Diagnostic Quality Straight: spinous processes in middle of vertebrae.
Adequate collimation and contrast/density.

Steps

Place animal in trough in dorsal recumbency with sandbags or straps securing front legs and/or thorax. Straps or sandbags to secure hind legs.
Similar to thoracic positioning.

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SHAKE, RATTLE & ROLL – IS IT A SEIZURE, MOVEMENT DISORDER OR WHAT IS IT?

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The most important step in the management of a 'collapsing' disorders is to establish the presenting complaint. A patient presented with a history of paroxysmal episodes or "fits" can provide any experienced clinician with an interesting challenge. First, the patient is usually normal at the time of presentation.

Second, the identification of the type of episode is dependent on a good description from the person who witnessed the episode. Third, most of these paroxysmal episodes appear unpredictable and uncontrollable for the owner and therefore their observation might be heavily biased by an emotionally loaded perception of reality. A detailed history is, however, vital before embarking on a diagnostic investigation. Many owners can video the events, which can help you characterise them.

Syncope, narcolepsy/cataplexy, pain, compulsive behaviour disorders, vestibular attacks, certain movement disorders, neuromuscular weakness and seizures are paroxysmal events, which share commonalities in their clinical presentation. The inter-episodic clinical examination can be normal for these presentations. Some of the animals might present with inter-episodic deficits and this will guide your clinical decision-making and help you determine the system involve (and localise the lesion within). The animals might even present with the 'strange' episode at your clinic, e.g. prolonged seizure activity (status epilepticus [>10min], cluster seizures [≥2 seizure/day]) or vestibular dysfunction.

Define the problem

Paroxysmal episodic disorders can have many presentations affecting posture, muscle tone, uncontrolled movements and alteration in behaviour. Apart from characterising the episode itself, it is important to establish any triggers or clinical signs the animal might show prior to or shortly after an episode. Common episodic events, which need to be differentiated are syncope, narcolepsy/cataplexy, behaviour changes, vestibular attacks, movement disorders, neuromuscular weakness and seizures.

Syncope

Episodes of syncope are usually characterized by a sudden, short, transient loss of consciousness and postural tone. The animals are flaccid during the episode, but can experience a brief myoclonic jerk just before collapsing. We have seen this especially in cats with 3rddegree atrioventricular block. This can be confused with brief focal seizures. However, most animals with syncopal episodes do not show any pre- or post-episodic signs. Syncopal episodes are commonly associated with exercise or movement rather than occurring at rest. Recovery is usually nearly instant.
There can be multiple episodes per day, which can occur shortly after each other and show no improvement on anti-epileptic drugs. In fact, antiepileptic drugs can impair cardiorespiratory function and therefore these episodes can get worse with anti-epileptic drug treatment.

Narcolepsy

Narcolepsy is a rather rare disorder of the sleep-wake-cycle. Cataplectic attacks are common in narcolepsy, which can resemble syncopal collapse and seizures. Cataplectic attacks are usually triggered by food, excitement, and stress or pharmacologically (e.g. physostigmine). Following the 'trigger' the affected animal will become flaccid and collapse. Narcoleptic animals experience chronic fatigue, although they do not necessarily sleep more. They can be restless at night and sleepy during the day because of a disturbed and irregular sleep pattern. A history of others affected in the litter or in the breeding line is not uncommon.

Paroxysmal behaviour changes

Pain can be experienced episodically and trigger a behavioural response which can resemble focal seizures, e.g. nerve root impingement or irritation caused by lateral disc protrusion/extrusion resulting in 'freezing', myoclonic jerks, muscle spasms and/or muscle fasciculations. Behaviour disorders, such as episodes of aggression or compulsive behaviour changes (stereotypic behaviours, e.g. continuous rhythmic pacing, licking and vocalisations) can also look similar to sensory seizures. Dogs and cats are usually normal in between episodes. Compulsive behaviour changes, however, are not associated with changes in muscle tone or in the level of consciousness and usually a behavioural trigger can be identified.

Vestibular attacks

Transient vestibular episodes are a rare phenomenon characterised by the same cardinal signs seen with non-intermittent vestibular disease such as head tilt, nystagmus and ataxia. Nystagmus and gait abnormalities can also be seen with seizures, but it is rare that a seizure causes a head tilt. These patients will typically have no altered consciousness during an episode and are fairly normal before and after an episode. These episodes will not respond to standard antiepileptic drug treatment.

Paroxysmal movement disorders
Our understanding and therefore ability to identify paroxysmal movement disorders has improved in the last decade. Most of the movement disorders are elicited or deteriorate when the animal is excited or gets stressed. They usually are associated with movements, rarely occur at rest or out of sleep,are episodic and involve an increase in muscle tone (dystonia) and do not affect the level of consciousness. Some of these paroxysmal movement disorders were formerly thought to be seizures but they lacked adequate response to standard antiepileptic drugs. In addition, they more closely resemble movement conditions described in humans and so they are now considered to be a movement disorder. Some of them have been genetically characterised.

Canine Epileptoide Cramping Syndrome
Canine Epileptoide Cramping Syndrome ("Spikes Disease") in Border Terriers is one of these examples. These episodes were formerly considered to be focal seizures, but they are now considered to be a subtype of paroxysmal dyskinesias reported in people (paroxysmal dystonic choreoathetosis). Paroxysmal dyskinesias have been classified based on phenomenology, duration of the events and precipitating factors. This last classification includes paroxysmal kinesigenic dyskinesia, if the attacks occur abruptly after a sudden voluntary movement; paroxysmal non-kinesigenic dyskinesia, if the attacks occur spontaneously; paroxysmal exertion-induced dyskinesia, if the attacks are precipitated by prolonged physical exertion, and paroxysmal hypnogenic dyskinesia, if the episodes of involuntary movements occur only during sleep. Differentiating epileptic seizures from paroxysmal dyskinesia is also challenging in people. Paroxysmal dyskinesias are distinguishable from focal seizures by the lack of secondary generalisation of motor activity as would be seen in a generalised motor seizure. However, the muscle tone is often increased on both sides of the body (e.g. extended and increased muscle tone in two or four limbs), but the consciousness is not impaired as it would be if this would be a seizure affecting both brain hemispheres. Border Terriers affected by the syndrome haveepisodic mild tremors, dystonia and difficulties walking.

Chinook paroxysmal dyskinesia
A similar condition has been described in the Chinook dog. 'Chinook paroxysmal dyskinesia' episodes are characterised by dystonia (e.g. involuntary sustained muscle contractions causing twisted postures or repetitive movements), chorea (e.g. rapid, involuntary, non-stereotypical, semi- or non-purposeful movements of an extremity or extremities) and ballismus (e.g. violent, involuntary, non-stereotypical, rapid movement of an extremity or extremities). However, athetotic movements (slow, involuntary, non-stereotypical, non-purposeful movements of an extremity or extremities) have not been reported in these dogs. Autonomic signs are absent such as urination, defaecation and hypersalivation. The duration of episodes can range from minutes to an hour. The episodes are not triggered by sudden movement and the animals are normal before and after an episode. However, after the episodes dogs can appear tired most likely because of the prolonged sustained increased muscle activity.

Episodic falling
Episodic falling in Cavalier King Charles Spaniel is an example of a paroxysmal exertion-induced dyskinesia, which is typically aggravated or induced by stress, excitement or exercise. It is characterised by episodes of increased muscle tone (muscular hypertonicity) of the limbs. These dogs appear not to be able to relax the affected muscles and can have a "deer-stalking" gait. The back can become arched and the head lowers to the ground before the dog falls over. These dogs appear normal following an episode and have a normal mentation during an episode. The episodes last from seconds to minutes. Concurrent autonomic signs have not been reported in this disorder.

Idiopathic head tremor
Movement disorders can affect specific body parts such as the head in idiopathic head tremors ("head bobbing"), which are described in dogs such as the Doberman Pinscher, Bulldog or Boxer. The head tremor has usually a frequency of 5/s, can be vertical and/or horizontal in direction, lasts seconds to hours, can occur multiple times per day, be triggered by certain positioning of the head and can be aggravated by stress or excitement. The tremors can be stopped or reduced when the animal is distracted e.g. food. No autonomic signs have been described and the animal has appropriate mentation during an episode.

Summary
As a rule of thumb, if you are presented with a purebred dog which has an paroxysmal episode that does not cause autonomic dysfunction, is normal post episode, does not look like a generalised tonic-clonic seizure, has appropriate mentation during an episode even if changes in muscle activity are bilateral and/or does not respond as well to antiepileptic drugs, you should consult the relevant internet databases for a breed specific movement disorder.

In brief, these paroxysmal movement disorders usually lack:
· an identifiable precipitating event like an aura (sensory seizure activity, such as behaviour change [attention seeking, sniffing, starring], lasting a couple of minutes just prior to the motor seizure activity)
· autonomic signs (e.g. hypersalivation, urination,

defaecation)
· generalisation of increased motor activity (e.g. generalised tonic or tonic-clonic seizure)
· an impairment of consciousness. Usually dogs with impaired consciousness will not be able to look in the owner's eyes during the event and this is a good question to ask the owner. Animals will also often not listen to the owner due to the impairment of consciousness, although this is often falsely under reported due to the owner's perception of the event.

Seizures

The brain is a 'complex' structure, but has only 'simple' (limited) ways of expressing dysfunction. A seizure is a clinical sign caused by forebrain dysfunction – it is not a diagnosis (one specific disease). A plethora of structural and functional causes can result in seizures (see below when we talk about defining the lesion). Seizures can have many forms depending on which part of the brain is affected by seizure generation and propagation, e.g. a seizure could just affect a specific part of the sensory cortex and the animal might only have a change in behaviour (starring, freezing, sniffing, …) or only one part of the motor cortex is affected and the animal only demonstrates oro-facial automatisms. The location of the 'symptomatogenic' zone (area of the brain causing the observed clinical signs) usually overlays or is close to the epileptogenic zone (area of the brain causing the seizure) and therefore indicates the origin of the seizure.

Seizure semiology, using clinical signs of cerebral dysfunctions caused by a seizure, not only helps to confirm that the event is a seizure, but also provides information about its origin. It is relatively simple and is clinically and cost effective. Depending on the brain areas or parts being affected by the seizure motor, sensory (including behaviour changes) and vegetative changes and automatisms can be differentiated and help to characterise the seizure event.

Is it a seizure?

In brief:
· Increased muscle tone is far more likely in seizures. The most common recognised seizure is a generalised tonic-clonic seizure. Most commonly, the animal first goes stiff (tonic phase), loses proprioception and collapses into lateral recumbency, then the tonic-clonic phase (rhythmic alternating muscle contractions) starts followed often by running movements (automatisms). Atonic seizures are very uncommon and a 'floppy' collapse should guide the clinician to 'think' syncope or cataplexy.
· Rhythmic alternating muscle contractions are common in both focal and generalised seizures.
· Seizures often first involve the head and facial muscles (eye or facial muscle twitching).
· Stereotypical - most animals will have only one (or two) type(s) of seizure (seizure onset generalized, focal seizure onset with or without secondary generalisation). Seizures in an animal typically originate from the same epileptic focus and spread following the same brain pathways.

· The ictus (seizure itself) normally lasts 1-2 minutes.
· Most seizures exhibit several stages:

o pre-ictal behaviour changes (prodrome [hours to days] and/or aura [minutes])
o ictus
o post-ictal behaviour or neurological deficits (hours to days).

Apart from the seizure itself, it is the post-ictal changes that are recognised by the owner.
· Common post-ictal dysfunctions are:
o behaviour changes such as fear, aggression and disorientation
o increased appetite
o compulsive pacing
o blindness, usually with normal pupillary light reflexes consistent with "central" blindness
o menace response deficits
o miosis contralateral to the lesion (if one lesion [secondary to disinhibition of the oculomotor nucleus])
o gait abnormalities especially ataxia and "conscious" proprioceptive (paw position) deficits

· Seizures often, but not always, occur at rest or while sleeping.
· Seizures usually impair the consciousness of the animal.
· Most of the seizure disorders will at least initially respond to antiepileptic treatment.

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FORENSIC BEHAVIOURAL ANALYSIS: USING THE FIVE DOMAINS MODEL TO ASSESS SUFFERING IN ANIMALS (PART 2)

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Overview

According to Gregory (2004), from a knowledge of the accepted causes of suffering, and the responses that usually accompany suffering, we can judge whether or not suffering is likely to be present for that situation. For example, if a dog is struck (the cause), and he yelps (the response), we can determine that the dog experienced the negative affect of pain (a cause of suffering).

The Five Domains Model is a peer-reviewed framework, which allows for a systematic assessment of an individual animal's welfare, by considering all of the various conditions under which suffering may occur (Domains 1-4: nutritional, health, environmental and behavioural constraints), and the nature of that suffering (Domain 5, the negative affective states, or feelings arising as a result of the constraints in Domains 1-4).
The Five Domains Model has been reported on and reviewed in a vast number of peer-reviewed publications, and is relevant across species living in a variety of conditions: farm animals (Mellor et al., 2009; Hemsworth et al., 2015), working animals (Littlewood and Mellor, 2016), sport animals (McGreevy et al., 2018), zoo animals (Mellor et al., 2009; 2015; Portas, 2013; Sherwen et al., 2018), research animals (Mellor, 2004, 2012), and other animals (Mellor et al., 2009), whales (Butterworth, 2017; Clegg and Delfour, 2018) and pest species (Sharp and Saunders, 2011, 2011; Beausoleil et al., 2012; Beausoleil and Mellor, 2012, 2015; Littin et al., 2014; Baker et al., 2016; Beausoleil et al., 2016).
Consequently, the Five Domains Model has been adopted internationally by various organizations as part of their regulatory and approval processes to aid with the assessment of animal welfare. These include:

• From 1997 in New Zealand, the mandatory use of the 5DM to assess the negative welfare impacts of research, teaching and testing procedures has been applied to a wide range of sentient animals (including horses, cattle, deer, goats, sheep, pigs, domestic poultry, game birds, other birds including endemic, native and introduced species, dogs, cats, guinea-pigs, mice, rats, rabbits, ferrets, stoats, weasels, wallabies, possums, cetaceans, reptiles, amphibians and fishes);

• World Association of Zoos and Aquariums (Mellor et al 2015);

• >50 legal cases in Canada (charges have considered or have been laid under the Criminal Code and Provincial legislation), where Courts have sought to understand the nature and severity of animal suffering (Ledger & Mellor 2018).

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THE FELINE ANESTHESIA ENIGMA: INTERACTIVE CASE DISCUSSIONS

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In this lecture, participants will be invited to interact with the speaker and discuss the anesthetic and analgesic management for a variety of patients and situations. There will be a "bit of everything" related to feline anesthesia and unique challenges in this species. The discussion will go from anesthesia in healthy cats undergoing routine procedure such as ovariohysterectomy and dentistry but also those in critical condition with urethral obstruction and lower urinary tract disease, and gastrointestinal foreign body. Some life-saving therapies and stabilization of the patient will be presented (e.g. treatment of hyperkalemia and acidemia; fluid resuscitation). The lecture will explore novel concepts and techniques in feline anesthesia and pain management with a practical and interactive approach including protocols with dosage regimens. Treatment of perioperative pain relief and considerations on the use of analgesics in cats with chronic pain will be discussed. Controversial topics will be broken down using current literature and evidence. The following cases should be discussed during the lecture –

1 – Anesthetic and analgesic management of cats undergoing ovariohysterectomy

2 – Anesthetic and analgesic management of cats undergoing dental procedures

In these two situations, the choice of anesthetics and special pharmacological considerations for these agents will be presented. Local anesthetic blocks for dentistry, the use of injectables protocols including videos will be demonstrated.

3 – Anesthetic and analgesic management of cats with urethral obstruction.

4 – Anesthetic and analgesic management of cats with gastrointestinal foreign body.

In these two situations, emphasis will be given to patient stabilization such as in hyperkalemia (Box 1) and undergoing celiotomy (Box 2).

5- The analgesic management of cats with osteoarthritis. We will explore the multifactorial cause of osteoarthritis, chronic pain assessment and treatment including therapy with NSAIDs.

BOX 1 – Patient stabilization in cats with hyperkalemia
A list of problems is presented. Cats with urethral obstruction have reduced glomerular filtration rate, hypothermia, hyperkalemia, acidemia and circulatory collapse with weak peripheral pulses.

An electrocardiogram (ECG) identifies bradycardia and signs of hyperkalemia; it includes an increased T wave amplitude, decreased R wave amplitude, ST segment depression, decreased P wave amplitude, prolonged PR, QRS and QT intervals and not uncommonly loss of P wave with possible ventricular arrhythmias.

Venous catheterization is mandatory for fluid and electrolyte administration such as 10% calcium gluconate, dextrose, sodium bicarbonate, among others. Acidemia is partially induced by potassium ions moving extracellularly in exchange for hydrogen ions which are buffered intracellularly. Metabolic disturbances will lead to hypovolemia and cardiovascular depression since the resting membrane potential is raised in hyperkalemia, and cardiac automaticity, conductivity and contractility are decreased.

Rapid fluid resuscitation is required especially if poor perfusion and severe dehydration are present in the absence of cardiac disease. A bolus of balanced isotonic crystalloid fluid such as saline 0.9% is administered at 45-60 mL/kg/h while relief of obstruction relief.
Cats with a serum potassium concentration greater than 6 mEq/L should not be anesthetized until hyperkalemia is treated. Warming techniques will prevent and treat hypothermia.

A sacro-coccygeal epidural block has been recently described to facilitate urethral catheterization in cats with urethral obstruction. The technique is performed under aseptic conditions and produces anesthesia of the perineal area, penis, urethra, colon and anus. Preservative-free lidocaine 2% (0.1-0.2 mL/kg) is injected for this block. Relaxation of tail and perineal region is normally observed.

BOX 2 – Special considerations for cats with urethral obstruction

Emergency abdominal exploratory surgery is commonly required due to intestinal obstructions (foreign body, intussusception, neoplasias, megacolon, etc.), GI ulceration, uroabdomen, GI biopsies, etc. Some complications include fluid losses, proliferation of intestinal bacteria and secondary intestinal inflammation, GI perforation, peritonitis, systemic inflammatory response, severe hypotension, hypovolemia and shock.
Clinical findings are variable but tachycardia is observed in hypovolemic patients.

The list of problems includes hyper- or hypothermia, electrolyte imbalances and acid-base abnormalities. Hypochloremia, hypokalemia, hypoglycemia and hyperlactatemia are not uncommon, but again fluid imbalance will vary with condition (vomiting versus diarrhea, dehydration, hypovolemia, septic versus non-septic). Dehydration with cardiovascular collapse including hypovolemia, hypotension, hypoproteinemia requires aggressive fluid therapy.

Severe abdominal pain is treated with opioid and ketamine infusions since NSAIDs are contra-indicated.
The intraperitoneal administration of bupivacaine is recommended at the end of the surgery and it provides postoperative analgesia for up to 8 hours.

Regurgitation followed by aspiration pneumonia can occur after induction of anesthesia. Positioning for induction should take this issue in consideration. Suction should be available and a stomach tube can be used to empty GI contents.

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USE IT OR LOSE IT: WHY THE VETERINARY PROFESSION NEEDS TO LEAD THE TELEMEDICINE MOVEMENT

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Telemedicine is currently viewed by many in the veterinary community as a potential threat to the traditional approach to general practice. Almost every industry today has evolved to quench the consumer's growing thirst for e-commerce, yet the veterinary space has specific complexity which requires careful consideration. Although the public may demand the convenience of a virtual veterinary experience, they should be made aware of the limitations of a virtual consultation and the potential risk if specific recommendations are provided in the absence of a physical exam. Regulation of this new branch of veterinary practice will be essential to ensure that telemedicine delivers the quality and professionalism required by other veterinary disciplines, yet not regulated in ways that unnecessarily restrict access to virtual services that are in obvious and growing demand. Like all other emerging fields of the veterinary profession, the patient and client impact of telemedicine will be best understood and most responsibly developed by veterinarians. When operating within the confines of good medical practice, veterinary telemedicine will increase access to quality care, improve communication with clients, and ensure that our profession remains relevant to an increasingly tech-savvy consumer.

The Center for Connected Health Policy defines telehealth as "encompassing a broad variety of technologies and tactics to deliver virtual medical, health, and education services. Telehealth is not a specific service, but a collection of means to enhance care and education delivery."1 Many of the current approaches to veterinary telemedicine are not significantly different from e-commerce strategies already employed by most consumer facing industries. If telehealth is viewed from the perspective of a communication method (such as texting or video conference), and the veterinarian must abide by the same regulations as traditional practice, then common sense would suggest no additional regulation is needed. The veterinarian would be responsible for limiting their recommendations based on the detail and type of information that could be acquired and would be held accountable for poor judgement if adverse patient or client impacts occurred. This however is not the case, as veterinary telemedicine has been under intense scrutiny and inconsistent regulation since the term first started to appear in the profession.

According to the College of Veterinarians of Ontario (CVO) a veterinary-client-patient-relationship (VCPR) is established when a veterinarian and client agree on a specific scope of services that will be provided by the veterinarian to an animal or a group of animals in accordance with the standards of practice of the profession2. The CVO also has specific guidance suggesting that a VCPR can be established through virtual means such as telemedicine3. This decision by the CVO seems both logical and appropriate when you consider the agreement formed between a veterinarian and client regarding advice offered during a telehealth consultation - the veterinarian agrees to listen to the concerns of a client and offer a perspective on which the client will make a more informed decision regarding their animal›s health. Establishing a VCPR alone does not grant a veterinarian with the ability to diagnose or prescribe, as a physical examination is required for each of these activities.

This logical approach to the regulation of telemedicine is unfortunately rare in the profession as many jurisdictions and associations strongly oppose creation of a VCPR in the absence of a physical exam. The American Veterinary Medical Association states that "veterinary telemedicine should only be conducted within an existing Veterinarian-Client-Patient Relationship (VCPR)"4, suggesting that the consulting veterinarian needs to have examined the patient prior to a virtual interaction. The AVMA also states that advice given outside of the existence of a VCPR should be limited to general information, and not be specific to a patient, unless given in an emergency situation to assist the client until the patient can be examined by a veterinarian4. The American Association of Veterinary State Boards (AAVSB) supports this perspective on emergency triage occurring in the absence of a VCPR5. Both associations also highlight the importance of geographic location of the animal and veterinarian in telehealth circumstances, suggesting that the practitioner needs to hold a valid licence in the same jurisdiction as the animal at the time of consultation. The need for this restriction can be easily supported when considering the human and animal risks associated with zoonotic diseases that are specific to various geographies. A veterinarian unaware of local infectious disease risks specific to a region in which they are not licenced could fail to consider health risks impacting both patient and client.

The current regulatory environment creates a significant amount of confusion and question surrounding telehealth in veterinary practice. Although it is generally accepted and logical that diagnosis and treatment cannot occur without a physical exam, what constitutes a general consultation and when it becomes the practice of veterinary medicine is still very murky at best. Numerous tele-triage services are already in operation and are giving patient specific advice to clients which, by definition, could be considered in violation of current policy and regulation. There is wide variation in the definition, restriction, and acceptance of the practice of veterinary telemedicine throughout North America, with many jurisdictions still holding onto broad reaching restriction of virtual veterinary-client-patient consultations. If there is one practical and obvious approach that should be adopted by all jurisdictions, it should be the requirement for a VCPR to be in existence or created within all consultations that involve specific discussion of an animal's current state of health and perceived risks. The VCPR clearly suggests that a service will be held to the same standards of traditional care, holding the veterinarian accountable to professional conduct and evidenced-based methods of practice. Almost every other industry has adapted to the rapidly changing consumer landscape that now views e-commerce as an essential means of customer interaction. Electronic based forms of communication and data collection will continue to integrate into the pet and agricultural markets, and veterinarians have the best array of tools and experience to ensure the integration of virtual interaction with clients is done in a responsible and appropriate fashion.

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LESSONS LEARNED FROM 12 YEARS OF GENETIC TESTING

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More than 700 inherited disorders and traits have been described in the domestic dog [1]. Approximately 300 of these are estimated to have a genetically simple (Mendelian) mode of inheritance with the causal mutations for over 240 Mendelian disorders and traits (such as coat colour) having been identified to date [1]. The precise number of globally available canine DNA tests that are based on specific disease-associated mutations is unknown but is likely to be well in excess of 150. The appropriate use of DNA tests has long been anecdotally described as an effective means to control the spread of recessive mutations within populations/breeds. This is because carriers of recessive disease-associated mutations are healthy with respect to the disease they carry, and can only be identified retrospectively, once they have produced clinically affected offspring and as such DNA testing for autosomal recessive disease mutations in many dog breeds is now relatively commonplace. There have, however, been few efforts made to determine changes in the frequency of disease causing mutations as a result of selection based on the results of DNA testing, in other words, to answer the question 'Does DNA testing lead to a reduction in the frequency of disease mutations within breeds?'. A recent study uniquely analysed genotype data from two sources i) dogs who had been DNA tested themselves and whose test results had been reported to the UK Kennel Club and ii) dogs with a known hereditary status, for whom a definitive genotype could be inferred and ascribed based on known parental genotypes, to address this question [3].

Eight disease-specific mutations that segregate in eight different breeds were selected for investigation. The breeds and disorders were chosen to reflect differences in numerical breed size and frequency of the disease-causing mutation at the time of publication; all eight mutations had been published, and thus formed the basis of a commercially available DNA test, at least five years prior to the study. For each disorder/breed mutation frequencies were calculated within pre- and post- test periods, for the population of dogs that had been DNA tested themselves (test results) and for the larger population of dogs with known genotypes(DNA tested dogs plus those with a known hereditary status).

The results, using known genotype data, indicated a general and sizeable decline in disease-mutation frequency across eight diseases in eight breeds (by between 12–86% in dogs born 2–4 years after publication of the mutation, and by nearly 90% or more in those born 8–10 years after). In contrast, data from test results only, while revealing an almost complete and immediate end to the production of affected individuals, show little general decline in either the derived mutation frequency or the proportion of heterozygote carriers. The data also showed that the numerical size of the breed is an important determinant on the rate of uptake of a DNA test (as judged by the proportion of a breed born four years after publication of the disease-causing mutation with a known genotype).

These findings, which will be presented and discussed in detail, show that dog breeders appear to be incorporating the results of DNA testing into their selection strategies to successfully decrease the frequency of mutations within breeds, which presumably is also leading to a reduced prevalence of the same diseases.

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WSV - 305

DIAGNOSING INJURY TO THE REGION OF THE TARSUS AND METATARSUS

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Overview

Hind limb lameness localizing to the distal tarsus and proximal metatarsus is common among all horses and disciplines. The complexity of diagnosis of distal tarsal pain and proximal metatarsal pain lies in the in reliability in localization of lameness via local and intra-articular analgesia in this region1,2. Additional challenges are met imaging the complex anatomy of the region.
Osteoarthritis, is the most common cause of lameness associated with the tarsus in horses; most commonly seen in the distal intertarsal and tarsometatarsal joints. Radiography is generally the first diagnostic imaging modality used to diagnosis this process tarsus. Radiographic findings for osteoarthritis include periarticular osteophytes, periarticular and subchondral lysis, joint narrowing, enthesophytes at the attachment of the ligaments surrounding the tarsometatarsal and distal intertarsal joints. These changes are typically at the dorsal, dorsomedial and dorsolateral aspects of the distal intertarsal and tarsometatarsal joints. A 4 view series is needed to to fully evaluate the tarsus3-5.

However, some lesions of the distal tarsus may be undetected or be underestimated by radiographic evaluation alone. There tends to be poor correlation of the degree of lameness and alteration in performance with radiographic changes of the tarsus and metatarsus6. It is likely that this poor correlation stems in part from the under-diagnosis of pathologic changes. There is evidence to suggest that location of the pathologic change may have some bearing on clinical significance. Those horses with osteoarthritis along the medial aspect of the tarsometatarsal joint tended to lame in that limb. Horses with Talocalcaneal joint osteoarthritis are typically lame because of the disease process7. Nuclear medicine has wide spread availability may help diagnose radiographically occult lesions. The use of MR and correlation back with nuclear medicine has helped the understanding of disease process and location8. Additionally locations thought to be uncommonly affect by osteoarthritis, such as the plantar aspect of the distal tarsal joints may be overlooked on radiographs alone. Lesions in the bone marrow are typically occult radiographically despite having a consistent moderate to severe lameness. Advanced imaging progresses this knowledge and helps target treatment.

Fractures involving the distal tarsus are not common. However, when horses present with an acute lameness suspicious of a fracture; diagnosis may be a challenge as the fractures may be radiographically occult with conventional views. The central tarsal bone tends to be more affected. Often the fracture configuration is biarticular extending in a dorsomedial to plantarolateral fashion. These may be most apparent on a Dorso 15-25 lateral-plantar lateral oblique image. Fragmentation is may be seen with traumatic injury collateral ligament injuries or be benign. Fragmentation in the proximal tubercle of the talus are typically benign9, but may be met with uncertainty due to the low frequency encountered. It is important in cases of fragmentation to have an comprehensive understanding of what soft tissue may be affected or causing the fragmentation to discern potentially significant from insignificant findings.
Suspensory ligament.

The suspensory ligament is a well documented source of hind limb lameness in the horse10-12. The bulk of the suspensory ligament originates on the plantaroproximal aspect of the 3rd metatarsal bone. At is proximal extent, the origin is bilobed and valentine or trapezoid in shape. However, there is a small bundle of fibers that continues proximally to the fourth tarsal bone and plantar aspect calcaneus12. Hindlimb suspensory ligament injury is a common problem in the sport horse. Despite the frequency of this injury, diagnosis can be challenging as horses can vary in their presenting signs and the often bilateral nature of the disease confounds the diagnosis. Response to hind limb flexion is generally moderate to marked, which may overlap with clinical signs associated with lameness originating primarily from the tarsus. Approached to ultrasound examination is critical for making accurate diagnoses. In the authors opinion, the more sensitive approach to diagnosing injury is a non-weight bearing approach (often in a farrier sling) with the bone margin parallell to the bottom of the ultrasound screen. Imaging/pathologic findings associated with the hind suspensory ligament vary. Pathologic changes may include one or more of finding including diffuse enlargement, dorsal or plantar margin tearing, diffuse fiber damage, fibrosis/scarring and osseous changes. Persistent hypoechoic areas regardless the angle of beam incidence are typically indicative of areas of fiber damage. Variations of anatomy do occur are important to realize. For example, there is a hypoechoic region on both on and off angle approximately just distal to the origin of the suspensory ligament. This site may be confused for a core lesion, which are less common in the hind suspensory ligament.

Focal or diffuse areas of increased echogenicity independent of angle of incidence are consistent with fibrosis/scar tissue. Dystrophic mineralization can also occur and if subtle can be difficult to distinguish from scarring. Measuring the cross sectional area (CSA) can be helpful for comparing the size to the opposite limb. Assessing mild enlargement can be difficult, particularly as there is no guarantee that the contralateral limb is normal. Measurements on cross sectional area of the hind suspensory ligament are not standardized for each bread. Normal CSA for a Warmblood may not be the same as a reining Quarter Horse. For the warmblood this may greater 2 cm2 and for the quarter horse it may be 1.8 cm2. It is more helpful to use imaging characteristics to diagnose injury rather than using cross sectional area as primary source of normal versus abnormal. These include loss of the normal space between the dorsal margin of the suspensory ligament and plantar bone margin, displacement of the medial plantar vessels, and extension of the ligament beyond the plantar confines of the splint bone. Pathologic changes in the suspensory ligament often do no result is marked enlargement, but focal marginal change (dorsal most frequent). It is important to realize the suspensory ligament is comprised of multiple tissue types and has different echogenicity as it is image with ultrasound.

Pathologic changes to the bone can occur in additional to ligamentous pathologic change or can be the primary abnormality. Abnormalities can include bone proliferation, resorption and avulsion fragmentation. MR imaging is very good for assessing changes to surface, cortical and medullary portions, ultrasound can actually be superior for identifying small avulsions and enthesopathies. This is part due to acoustic shadowing from fragmentation, good contrast between bone and ligament structures and thin tissue sampling. The axial margins of MT2 and MT4 should also be evaluated for proliferative changes that could impinge on the suspensory ligament.

In conclusion, a combination of history, lameness evaluation, response to diagnostic analgesia and multiple imaging modalities is needed to make a diagnosis. Imaging modalities should be viewed complementary modalities and be used as such. To get the most out of imaging findings, it is important to take into consideration clinical history, physical and moving examinations and diagnostic anesthesia findings.

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WSV - 103

TECHNIQUES FOR ORTHOPEDIC VIEWS

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Orthopedic radiographs are difficult to achieve even with a cooperative patient. The importance of diagnostic quality orthopedic radiography is emphasized while demonstrating how to achieve them using hands free techniques. Orthopedic studies are, for the most part, performed on systemically healthy yet painful patients. While we will discuss the benefits of sedation in another section, the use of analgesics and appropriate sedation is imperative to patient comfort and to achieve the best quality radiograph for accurate diagnosis.
In this section we will cover how-to demonstrations (video and description) on the most common orthopedic radiographs including:
Pelvis

Stifle (TPLO vs Routine, CdCr vs CrCd)
Elbows (CrCd view individual joint, flexed laterals)
Shoulder (where does the joint need to be?)
Fractures, longbones and other misc. orthopedic radiographs

Each study will be discussed in detail including anatomic landmarks for collimation, visuals to demonstrate what is straight/crooked and tips on how to achieve a properly positioned orthopedic radiograph using hands-free techniques the first time. As many of these demonstrations are video based, we welcome questions and can repeat any videos for clarification. During the videos we will discuss the importance of proper positioning:
Joint centered, collimated and close to the table
Anatomical landmarks
Orthagonal views
Exposure settings and algorithms
Cropping/Viewing orientation (digital)
Properly identified radiographs with lead marker (OFA)
Positioning Techniques

Pelvis

Pelvis (Lateral)
Position: Entire pelvis, center at acetabulum
Radiographic Inclusion: Entire pelvis, lower leg positioned cranial.
Diagnostic Quality: Straight – transverse processes overlap, wings of ilium overlap.
Adequate collimation and contrast/density.
Positioning Tips:
Place animal in lateral recumbency.
Separate legs with lower leg pulled forward in a natural walking position, raise as needed.
Use sandbags/straps to restrain front end, and wedge raise hind legs to create a square pelvis.

Pelvis (Extended V/D)
Position: Entire pelvis to stifle. Centre at acetabulum
Radiographic Inclusion: Wings of ilium to stifle joint (include entire joint)
Diagnostic Quality Straight : Ensure that the wings are of equal width, and obturator foramen are the same size/shape. Femurs should be the same size/length and parallel to each other. Patellas centered and condyles equal size. Ensure tail is out of the way. Adequate collimation and contrast/density.
Positioning Tips:
Often moderate to heavy sedation will be required.
Place animal in VD with or without trough.
It is ideal to have the pelvis close to the table (ie. Use trough only under thorax) Secure animal in VD position with sandbags/straps.
Use foam wedge under pelvis.
Extend hind legs with straps and place 1” tape around patellas to hold stifles inwards.
Edge Artifact: Edge of foam trough will be seen on x-ray, make sure area of interest is out of trough.
Elbow
Elbow (Lateral)
Position : Distal humerus to proximal radius. Centre on joint.
Radiographic Inclusion : Entire elbow joint, include distal humerus to proximal radius.
Diagnostic Quality Straight: Only one epicondyle should be visible. Adequate collimation and contrast/density
Positioning Tips
Place patient in lateral recumbency, with a natural bend in elbow.
Restrain top leg with strap or sandbag.
A wedge may be required under shoulder, especially with large patients to allow the elbow to lay flat against the table.
Sandbag hind legs and neck as required.
Elbow (Cranial/Caudal)
Position: Distal humerus to proximal radius. Centre on joint.
Radiographic Inclusion : Entire elbow joint, include distal humerus to proximal radius.
Diagnostic Quality Straight: Ulna should overlap middle of humerus. Only one elbow per radiograph to ensure proper collimation and centering.
Positioning Tips
Sedation often required. Place animal sternal (in or out of trough).
Extend front leg forward using strap or sandbag.
If patient is in a trough, often a foam wedge underneath the elbow will prevent the leg from slipping or twisting.

Elevate head using block or trough if the patient is sedated.

Rotate the elbow as needed to adjust straightness.
Stifle (Lateral)
Position: Distal femur to proximal tibia. Centre on joint.
Radiographic Inclusion: Entire stifle joint, include distal femur to proximal tibia. Include stifle joint to hock for preoperative TPLO radiographs.
Diagnostic Quality Straight: Condyles overlap so only one is visible. Adequate collimation and contrast/density.

Positioning Tips
Place patient in lateral recumbency.
Secure the front end with sandbag/straps.
Extend affected leg to create a 90 degree angle in stifle and hock, this can be achieved by using a strap just above the hock and pulling leg back.
Placing a sandbag over or behind the foot can help create a 90 degree angle at the hock.
A foam wedge under the down hip may be required to create a straight lateral.

WSV - 094

PAIN IN THE NECK – HOW TO DIFFERENTIATE SPINAL CONDITIONS OF THE CERVICAL SPINE

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Differentiating between causes of gait abnormalities in practice can be challenging(1). However, by initially defining the problem and the system involved, a list of further appropriate diagnostic tests can be performed. Despite the recent advances in diagnostic imaging, the neurological and orthopaedic examinations remain the foundation of localising the lesion and help identified severity. The majority of cats and dogs that present with a thoracic or pelvic limb lameness will have an underlying orthopaedic condition, but it is important to recognise that neurological disorders can present with similar clinical signs. Neurological disorders will more commonly present as decreased voluntary movement (paresis) or lack of voluntary movement (plegia), these clinical signs are not synonymous with neurological disorders. Once the location of the lesion has been defined, a list of differential diagnoses can be formulated based on onset, clinical course and clinical features such as pain and asymmetry of clinical signs (five finger rule) + signalment. Each individual case has its own challenges, and any purely rule-based system is likely to result in mistakes. I will discuss various cases and have a live on stage discussions which I hope will help you tackle these challenging cases better in the future.

The majority of patients who present with gait abnormalities will have abnormalities that primarily and structurally affect either the musculoskeletal or the nervous systems. As a result, lesion localisation will concentrate on lesions affecting the musculoskeletal and neurological systems. Unlike the cardiovascular, metabolic and respiratory body systems, there is no simple laboratory or diagnostic test that can be performed to differentiate between the nervous and musculoskeletal body systems. The differentiation between the two systems is based on the clinician's physical examination. Most animals with neurological disorders will present with paresis, while those with orthopaedic disorders will present with lameness.

For neurological diseases it is important to differentiate between diseases which cause only pain and no neurological deficits (painful non-myelopathic spinal diseases) and diseases which cause neurological deficits (myelopathic spinal diseases). Non-myelopathicspinal diseases- Animals that solely present with back pain and do not show neurological deficits need to have a thorough orthopaedic examination, as polyarthritis has to be considered.

Other differentials are inflammatory, infectious and neoplastic diseases. If the animal presents with a history of trauma, luxation and fractures need to be considered. As aforementioned, syringomyelia is an exception and can present as a painful condition without causing neurological deficits.

Myelopathic spinal diseases - The five-finger rule (onset, progression, pain, lateralisation and neuroanatomical localisation) can be used to effectively differentiate between myelopathies these myelopathies. A couple of examples are listed as follows(2):
Patients who present with peracute, non-progressive or improving, largely non-painful and lateralised neurological deficits have a 98% chance of having an ischaemic myelopathy such as fibrocartilaginous embolism (FCE) or acute nucleus pulposus extrusion (high velocity but low volume disc extrusion/traumatic disc).

Hansen type-I disc disease (intervertebral disc extrusion) is best characterised as an acute onset, deteriorating, painful and occasionally lateralised myelopathy. Ninety percent of patients presenting with these clinical signs will have Hansen type-I disease.
In contrast, Hansen type-II (intervertebral disc protrusion) has a more chronic onset, is often stable, but still painful. Meningo(encephalo)myelitis of unknown aetiology (MUA) can present with an acute onset, deteriorating painful myelopathy. MUA is four times more likely to present as a multifocal neuroanatomical localisation (multiple spinal cord segments and/or brain). Many of the animals will also have mentation changes and cranial nerve deficits.

These examples demonstrate that thinking pathophysiologically and using the five-finger rule can refine the differential list significantly. If you then also take demographics and signalment into account, you have a very high chance of identifying the most likely diagnosis before embarking on diagnostics. Many of the neurological conditions will require advanced imaging and/or CSF analysis, but funds are limited, and the aforementioned approach can provide you with the framework to narrow down diagnostics to the most essential or provide the owner with a presumptive diagnosis.

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FORENSIC BEHAVIOURAL ANALYSIS: APPLYING THE FEASAC FRAMEWORK IN LEGAL CASES OF ANIMAL CRUELTY AND NEGLECT

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FEASAC (Framework for the Evidence-based Assessment of Suffering in Animal Cruelty) was developed in 2014, and has been successfully applied in animal cruelty investigations across Canada. The framework describes a sequence of eight questions, that allows for the preparation of expert opinions regarding the nature, severity and necessity of animal suffering. The questions allow for the evidence, which is often circumstantial, to be presented in a way that allows the Courts to decide whether a person accused of animal cruelty is guilty of an offence.

1. Can the animal experience aversive events that could cause it to suffer?
If the animal is sentient and was/is conscious when ill-treated, the answer may be “Yes”. The ability of an animal to experience various negative affects will vary between individuals, according to species, age, previous experience, and personality.

2. Does current legislation recognize suffering or equivalent negative welfare states in animals? The precise wording of national or regional laws or regulations in relation to the up-to-date understanding of suffering and related matters should indicate what would be credible grounds for a prosecution in each location. Expert opinions need to be framed with this in mind. It should be noted that applying this framework is not contingent on animals being defined as ‘sentient’ within the legislation, as by definition, suffering already identifies that the animal is sentient.

3. Were conditions present that would cause the animal to suffer?
Systematic evaluation of circumstances related to the nutritional, environmental, health, and behavioural domains of the Five Domains will assist here. It is helpful to use a checklist for recording factual information about each domain.

4. Which affective state(s) would the animal likely experience?
Reference to the Five Domains Model helps when answering this question.

5. Is there physical and/or behavioural evidence that the animal did suffer or is suffering?
This may be evaluated by direct observation of the animal supported by careful interpretation of other specific elements of the evidence including the animal’s precise circumstances, during and/or following the abusive or neglectful act. Use of detailed checklists such as those mentioned above would be helpful.
It is important to carefully consider possible alternative explanations for the occurrence of the observed physical and behavioural responses of the animal in the circumstances under review. For example, in the case of an animal that shows physiological and/or behavioural signs of fear, causes other than the circumstances imposed by the accused should also be considered

6. How severe and protracted was or is the suffering?
This may be evaluated qualitatively by carefully interpreting the circumstances and the physical and/or behavioural evidence, guided by using the Five Domain’s Model’s 5-tier negative impact scale.

7. Could the suffering have been avoided? Was it necessary?
This refers to situations where there might have been reason to believe that the negative impacts were justified. Subsidiary questions that help to clarify these points are the following: Was a more humane option available? Could the overall benefit to the animal justify the negative impact of what was done?

8. Was the suffering inflicted willfully or recklessly?
This question helps to distinguish purposeful cruelty from indifferent disregard, ignorance, and naïveté, e.g., situations where the alleged perpetrator might not have anticipated the negative welfare impacts, or the possibility that they could occur.

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STATE-OF-THE-ART LECTURE: INTRODUCTION TO THORACIC SURGERY AND COMMON SURGICAL DISEASES OF THE THORAX

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Introduction

Diseases of the thorax are frequently encountered in small animal practice and many require surgical intervention for definitive diagnosis and treatment. Two approaches to the thoracic cavity are the 1) intercostal thoracotomy and 2) median sternotomy, with each approach having advantages and disadvantages. Minimally invasive approaches to the thoracic cavity have also been described in small animal and will be covered briefly in lecture. In order to perform thoracic surgery the practitioner should have a strong familiarity with thoracic anatomy and the availability of instrumentation/equipment. In addition, the practice must have the ability to provide 24 hr patient monitoring and the ability to provide multi-modal analgesia as approaches to the thorax are painful as a result of intramuscular and/or sternotomy incisions.

Indications

There are many indications for the performing surgery of the thorax. The practitioner should select their cases carefully to optimize outcome. Indications include lung lobectomy for neoplasia, torsion, abscess, trauma, spontaneous pneumothorax (bulla/bleb), thoracic trauma, pericardial disease, pleural space disease (chylothorax, pyothorax, hemothorax), and congenital heart disease (persistent right aortic arch, patent ductus arteriosus).

Approaches

Intercostal thoracotomy – The intercostal space (ICS) for surgery will depend upon target structure/site. A table providing optimal ICS dependent on target site is provided below. An incision is created through the skin, subcutaneous tissues and cutaneous trunci. An incision just caudal to the level of the caudal scapula will be approximately at the 4th ICS. Digital palpation of ribs can be performed prior to incision to provide a good approximation of location of initial skin incision. The incision is made parallel to the ribs extending from ventral to the costovertebral junction to proximal to the sternum. The latissimus dorsi muscle is encountered and incised along the same direction as the original incision. The author performs partial incision of the most ventral aspect of this muscle and then places a stay suture to provide retraction in an attempt to limit morbidity associated with myotomy of the latissimus dorsi.

Ventral to the latissimus dorsi is the pectoralis muscle and this may need to be incised as well. The Serratus ventralis muscle will then be visible with its finger-like muscle bellies just dorsal to the strap shaped Scalenus muscle which is identified by its insertion on the 5th rib. The Scalenus muscle is incised through its tendon and the Serratus ventralis muscle bellies separated to expose the external intercostal muscles that are between ribs. The external and then internal intercostal muscles are carefully incised midway between the ribs to prevent trauma to the neurovascular bundle located on the caudal aspect of the ribs to expose the parietal pleura which is bluntly penetrated allowing pneumothorax which will allow the organs to fall away from the thoracotomy incision. The pleural incision should be extended ventrally to the level of the internal thoracic artery that can be palpated digitally. The remainder of the pleura is incised and rib retractors placed to provide exposure to the thoracic cavity.

Prior to closure, a thoracic drainage catheter or thoracostomy tube is inserted and sutured in place. Closure of an intercostal thoracotomy is performed by first placing circumcostal sutures around the rib cranial and caudal to the thoracotomy incision using a long acting, monofilament suture. These are placed as stay sutures initially to allow for visual guidance during placement preventing iatrogenic trauma to the thoracic organs. Once they have all been placed the ribs are approximated and the preplaced sutures tied. The Serratus ventralis and Scalenus muscles are closed followed by the Latissimus dorsi muscle in layers. The subcutaneous tissues and Cutaneous trunci muscles are then closed routinely followed by the skin.

Target site	Left	Right
Cranial lung lobe	5	5
Middle lung lobe		5
Caudal lung lobe	5	5
Accessory lung lobe		6
Pericardium	5	5
PDA / PRAA	4	
Cranial esophagus	4	4,5
Caudal esophagus	7,8,9	7,8,9
Thoracic duct, canine		9,10,11
Thoracic duct, feline	9,10,11	

Modified from, Textbook of Small Animal Surgery, S. Johnston and K. Tobias.

Median sternotomy – Is the approach to the thorax used when the entire thoracic cavity needs to be explored. Common indications for performing sternotomy include pyothorax, mediastinal masses, spontaneous pneumothorax and thoracic trauma. Many surgeons believe this approach is associated with a high complication rate, however, with appropriate technique and perioperative multi-modal analgesia, sternotomy can be associated with very good outcomes. This approach does not provide good access to dorsally based structures such as the pulmonary hilus and thoracic duct, and total lung lobectomy is more easily performed from an intercostal thoracotomy approach.

With the animal in dorsal recumbency the entire ventro-lateral aspect of the thorax is prepared for surgery. The skin and subcutaneous tissues overlying the sternum are incised. The pectoralis muscle is encountered next and is elevated from the sternebrae using a combination of electrocautery and sharp dissection. An oscillating bone saw is used to perform a sternotomy. Generally this author tries to leave the manubrium and the xiphiod process intact to maintain stability of the sternum postoperatively. A rib spreader is placed in the sternotomy to improve thoracic exposure. The author has combined the sternotomy with a ventral midline laparotomy in cases where a bicavitary approach is required. Prior to closure, a thoracic drainage catheter or thoracostomy tube is inserted into the thoracic cavity and sutured in place.

For sternotomy closure, orthopedic wire is placed in a figure-of-eight pattern around each sternebrae incorporating a costosternal junction for maximum stability. The pectoralis muscle, subcutaneous tissues and skin are closed routinely.

Perioperative analgesia

Thoracotomy, regardless of approach, is a painful procedure and multimodal analgesia in the perioperative period is essential. Prior to intercostal thoracotomy surgery local anesthetics (bupivacaine/lidocaine) can be instilled over the intercostal nerves cranial and caudal to the site. High epidural analgesia can be provided with morphine and bupivacaine. Opioid analgesia is administered using constant rate infusions. Nonsteroidal anti-inflammatory therapy is administered if contraindications are not present. Intracavitary bupivacaine can also be administered post-operatively, however, at this authors institution this procedure is not commonly used and instead a wound soaker catheter placed in the surgical site (intercostal thoracotomy / median sternotomy) is used to administer local anesthetic in the postoperative period.

Conclusion

Thoracotomy is commonly performed for a variety of thoracic surgical diseases in companion animals. With appropriate knowledge of thoracic anatomy, equipment and multi-modal analgesia, thoracotomy can result in good outcomes for the treatment of thoracic diseases.

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FEMORAL HEAD OSTECTOMY– TIPS FOR SUCCESS AND NOVEL APPROACHES

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Introduction

Femoral Head and Neck Ostectomy (FHO)- Tips for Success and Novel Approaches
Femoral head and neck ostectomy (FHO) is a good choice in cases that are refractory to medical therapy, as a less expensive alternative to total hip replacement surgery. The overall function (range of motion and strength) will not be as good in bigger, heavier dogs, however they are usually far more comfortable through range of motion than prior to surgery.

Case Selection and Surgical Timing
Previously FHO was thought to be a last moment salvage procedure. It is much preferable to have the patient still well ambulatory and in relatively good body condition at the time of surgery versus being so over-weight and muscle atrophied that the rehabilitation process is much harder.

Although the ideal timing for each patient is individual, this author typically recommends FHO when the patient is becoming refractory to good medical management. For example, the patient should be in healthy body condition with a regular moderate exercise regime. The dog should also be on joint supplements and may have gone from needing NSAID administration once every 3-7 days during more strenuous activity, to needing daily to twice daily NSAIDs as well as other analgesics such as Gabapentin, Tramadol or Amantadine.

If the patient is very obese with significant muscle atrophy, enrolment into a professional physical therapy program ("pre-hab") is strongly recommended prior to surgery to optimize the patient's recovery.
Where possible, FHO should also be avoided in skeletally immature patients, particularly where other concurrent pelvic fractures may exist. These patients may be more prone to healing of the femoral bone cut to the pelvis or muscle contractures that carry a poor long-term prognosis for return to function.

FHO via a Cranial Lateral Approach to the Hip Joint
This is the most common approach used by most surgeons when performing an FHO. A solid knowledge of the regional anatomy is essential to avoid inadvertent neurovascular damage, and to avoid un-necessary muscle transection or trauma. During this approach, most dissection is focused in fascia planes between versus through muscles.

A partial tenotomy of the deep gluteal muscle may be required for exposure of the femoral head and neck. In some dogs, especially in traumatic cranial dorsal hip luxation cases, this tenotomy may not be required, which is preferable to optimize gluteal mm function in the recovery period.

Once the hip joint has been exposed, tips for luxation of the femoral head out of the acetabulum include; external rotation and adduction of the femur, and use of a Hatt Spoon (authors preference) or Round ligament cutter to transect any remaining round ligament and provide leverage.

Clearance of sufficient joint capsule and soft tissue from the neck of the femur is recommended prior to making the osteotomy. The ideal FHO removes the entire femoral head and neck such that the osteotomy extends to the proximal aspect of the lesser trochanter. Palpation of these landmarks and marking the planned osteotomy with electrocautery or etching the bone with an osteotome are recommended. During the osteotomy with an oscillating saw or osteotome, the femur should be held externally rotated with the stifle pointing at the ceiling, and the femur parallel with the surgical table. The angle of cut will then be vertically orientated along the planned mark.

Once the femoral head and neck have been removed, careful palpation of the cut should be carried out to ensure that sufficient neck has been removed, ie. The cut surface of the bone should extend just proximal to the lesser trochanter. If there is too much neck left behind, a second osteotomy can be performed or a bone rasp can be used for smaller bone segments. Once the surgeon is satisfied with the femoral side, they should also put a finger into the acetabulum and bring the hip through normal range of motion to confirm that no bony impingement can be appreciated.

Closure begins with re-apposition of the joint capsule. Repair of the deep gluteal tenotomy is essential and can be facilitated by abduction of the femur to take tension off the closure. The fascia is then closed in one or two layers, prior to routine subcutaneous and skin closures.

FHO via a Ventral Approach to the Hip Joint
This is the author's preferred approach for FHO where possible. The main benefit of this approach over the more traditional craniolateral approach includes preservation of the cranial-dorsal musculature and soft tissue support structures that need to take over function of the hip post FHO. Additionally, the only muscle transection that is needed is the pectineus muscle.

Pectineal myotomy has been described previously as a treatment option for hip dysplasia, so is also an inherent advantage of this approach. Subjectively, return to comfortable function in the limb is faster with this approach versus the craniolateral approach.

This approach is performed as outlined in Piermattei and Johnson's "Atlas of Surgical Approaches to the Bones and Joints of the Dog and Cat".
When performing the osteotomy, this author likes to mark the start of the osteotomy just proximal to the lesser trochanter (which is easier to palpate via this approach) with electrocautery or an osteotome. The angle of the osteotomy cut is approximately 25 degrees from parallel with the femur. It is very important not to be too perpendicular to the bone with this osteotomy as inadvertent removal of the greater trochanter may occur. Similar to the craniolateral approach, the osteotomy site should be carefully palpated post osteotomy to confirm configuration of the FHO osteotomy (lifting the leg can help palpation of the dorsal aspect of the cut).

Post-operative radiographs
With either approach, before the patient is recovered from anesthesia, a post-operative hip extended VD pelvic radiographs should be taken to confirm the configuration of the cut.

Post-operative rehabilitation
In the author's experience, the main complications are related to insufficient rehabilitation eg. Patient was cage rested without sufficient range of motion and ended up with severe muscle contracture limiting extension of the hip. Leaving too much of the femoral neck can also be a technical pitfall of limb and saw positioning intra-op, which hopefully can be corrected when found on palpation or on the post-operative radiograph when the patient is still under general anesthesia.

Following surgery, the rehabilitation plan is focused on providing adequate analgesia to the patient to ensure that daily physical therapy can be carried out. The main focus of physical therapy is to encourage normal range of motion in the hip joint (particularly hip extension). To facilitate early normal weight bearing in the operated limb, and to slowly rebuild muscle strength in the upper limb musculature.

WSV - 080

AN IMAGING APPROACH TO THE COUGHING DOG

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A cough is considered a defense mechanism to clear the (predominantly upper) airways. A cough clears the larynx, trachea, and large bronchi of secretions, infectious organisms, and foreign particles. The process of coughing is quite complex as are the pathways involved in the initiation of a cough. A cough occurs in 3 phases: an inspiratory phase, a forced expiration occurring against a closed glottis, and the opening of the glottis with rapid expiration which creates the audible sound of a cough (1). The afferent pathway of coughing is initiated by activation of "cough receptors" which are a somewhat controversial entity that exist in primarily the larynx, trachea, and large bronchi (1-4). It is generally considered that more "cough receptors" are present in higher airways like the trachea and larynx.
Along the efferent path of cough receptors, an afferent receptor becomes stimulated travelling through various fibers to the vagus nerve to cough centers in the medulla and cerebral cortex which then stimulate various efferent motor nerves to effect the cough. A mechanosensory receptor that responds to mechanical presence of aspiration (particulates or the physical presence of gastric content), post-nasal drip, or a pharyngeal bolus is reliably experimentally induced and is likely associated with rapidly adapting receptors (RARs) and travel through myelinated Ad fibers. A chemoreceptor that responds to infectious or non-infectious inflammatory or irritant-induced lung injury can be induced by inhalation of capsaicin, an irritant. This receptor is likely associated with unmyelinated C-fibers (2, 3, 5).
A chronic cough (existing for > 8 weeks) is considered to have a lower threshold for afferent activation of a cough. Therefore, the stimulus for a cough is less than that in a non-chronically affected animal (1, 2). This hyperresponsiveness and sensitization of the upper airway and bronchi that is a hallmark of a chronic cough is often due to asthma, rhinitis, and/or gastroesophageal reflux in people (5-7). Very few studies have investigated the causes of dogs presenting with a clinical history of coughing (8).

The upper airway has an overabundance of afferent cough receptors. Coughing, though important for protecting and clearing airways, can become excessive with deleterious effects that perpetuate inflammation (4). Also, given that the cough reflex can initiate from multiple anatomical sites, a variety of underlying causes could instigate a chronic cough. Because of this, chronic coughing is often considered a syndrome rather than a diagnosis (9) with a multifactorial approach needed to determine underlying cause.

Imaging Steps for Approaching the Coughing Dog

The foundation for the approach to a coughing dog should be based on the anatomical sites for receptors involved in the afferent pathway of cough initiation. Clinical history such as frequency of cough, environmental exposures, and activity during coughing episodes may assist with differentiation of potential causes of a cough. In people, using an "anatomic diagnostic protocol" results in diagnosis of cough in >90% of cases; some steps in the protocol involve imaging, while history, clinical signs, and other testing are important to incorporate into the work-up (10).
Differential Diagnoses for the Coughing Dog
Differential diagnoses for cough are numerous, many of which are thoracic diseases; however, upper respiratory disease is also a possibility. The most common causes for 115 dogs presenting for cough were large airway disease (chronic bronchitis, 77%; and tracheobronchomalacia, 51%; many dogs fell into both categories) (8). Other pleural, pulmonary, mediastinal, and cardiovascular diseases can cause a chronic cough, as well, so evaluation must be aimed at ruling out causes as much as definitively diagnosing disease. Given that coughing is most commonly associated with airway related disease, this will be the focus of imaging descriptions discussed below.

Primary Bronchial Disease

The primary radiographic finding identified with chronic bronchitis is thickening and irregularity of bronchial walls and increased visibility of bronchial markings, especially in the lung periphery where airways are typically not identifiable. Irregular and thickened bronchial walls create the so-called tram tracks and rings within the lungs. The finding of a bronchial pattern implies airway related disease that is either noninfectious inflammatory (allergy or irritant environmental exposure) or infectious (secondary to viral infection or bacterial). Rarely neoplasia, such as bronchoalveolar carcinoma, and cardiogenic edema can cause a bronchial pattern.
When the margins of the bronchial walls are indistinct and hazy, a more active disease or disease that extends or originates in peribronchial interstitium can be assumed. With chronicity, the bronchial walls tend to be better defined, while being irregularly marginated. Most often, when a true bronchial pattern exists, it is present in all lung lobes.

With chronic disease, bronchi can fail to taper, due to bronchiectasis. Bronchiectasis is important to recognize as an irreversible sequela of chronic airway related disease and as a predisposing factor for future airway related symptoms and bronchopneumonia (11).

Airway Collapse

Tracheal collapse is a common cause of cough in small breed, often obese dogs and is caused by weakened cartilaginous rings that have undergone chondromalacia and collapse in the dorsoventral dimension (12, 13). It may result in diffuse or segmental narrowing of the tracheal lumen, depending on severity. Severity is graded using percentage of tracheal lumen reduction where 0-25% collapse is likely normal, 50% is considered moderate, greater than 75% reduction in tracheal luminal diameter is severe (12, 14). Views obtained on expiration and inspiration may assist with diagnosis of this dynamic collapse. On inspiration, the cervical trachea is expected to collapse and, on expiration, the intrathoracic trachea is expected to collapse.

Bronchomalacia is the weakness and collapse of the principle bronchi or other small airways, which are supported by cartilage; this condition may be accompanied by tracheal collapse and results in excessive narrowing of the airways (13, 15, 16). In 83% of dogs with tracheal collapse, concurrent bronchial collapse was observed via bronchoscopy (15). Bronchomalacia as a single entity is less commonly reported in the veterinary literature when compared to combined tracheobronchial collapse or tracheal collapse as a single entity with a relatively unknown prevalence (17).

The Normal Thoracic Radiograph

"Thoracic radiography is the principal imaging method for investigating chronic cough in dogs because it is a versatile method for detecting various pulmonary, pleural, mediastinal and cardiac lesions, not because it usually enables a specific diagnosis." (18)

This should highlight the point that diagnostic tests and treatments should be geared towards the patient, not the radiographs, so the choice of performing an airway wash on a coughing dog with normal thoracic radiographs is certainly the correct one. Even more so when no other cause of coughing was detected on the radiographs.

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WSV - 086

ANESTHETIC CHALLENGES IN GERIATRIC PATIENTS

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Key Points
- Geriatric patients present changes in physiology and pharmacology that can impact anesthetic management;
- These animals can also present co-morbidities that can increase anesthetic risk;
- ASA status and increased aging are associated with increased odds of anesthetic-related death in dogs and cats

Geriatric patients present a challenge to the veterinarian based on their unique physiological and pharmacological features. Aging does not necessarily equal disease, however many of these patients may have co-morbidities that increase their anesthetic risk. For example, some geriatric cats may have advanced kidney disease or hyperthyroidism whereas most of large breed geriatric dogs have osteoarthritis. Old dogs were nearly twice as likely to develop serious peri-anesthetic complications, even when considering their ASA status than middle-aged and young dogs.1,2. Similar findings were observed in other studies with cats and dogs and increasing age was one of the factors associated with increased odds of anesthetic-related death.2-4 It can be hard to define what a senior/geriatric dog is but it is generally accepted that these patients have lived over 75% of their life expectancy. This is particularly true for dogs where different breeds tend to live longer than others. Geriatric patients are those at their life expectancy according to the American Animal Hospital Association guidelines.5 In cats, this is better defined, and senior and geriatric cats have usually between 11-14 and 15 years of age, respectively.6 Specific senior care guidelines have been published and can be of interest.7 More importantly than the age as an "absolute number" it is the healthy status of the patient.

Geriatric patients have limited physiological reserves especially in the presence of coexisting diseases. This can lead to poor nervous, cardiac, renal, respiratory, hepatic and endocrine function. Geriatric patients are notorious for compromised cognitive function due to changes in brain size, loss of neurons and depletion of neurotransmitters. The mature, senior and geriatric patients can present weakening of the respiratory muscles with loss of elastic tissues. Pulmonary fibrosis can be observed which impacts anesthesia by decreasing compliance and elastic recoil of the lungs.

Functional residual capacity is reduced as well as vital capacity. Susceptibility to respiratory infection is increased. In clinical practice, these animals should be preoxygenated using facemask for three minutes to prevent hypoxemia during anesthetic induction and early after extubation in the recovery period.

Monitoring of respiratory function include capnography, pulse oximetry and blood gas analysis. Regarding the cardiovascular function, there is usually reduced baroreceptor activity, blood volume and cardiac output resulting in overall reduced cardiac reserve. Therefore, geriatric patients have limited means for dealing with hypotension and hemorrhage. This is particularly aggravated by cardiac valve disease or disturbances in the conduction system leading to arrhythmias. Asymptomatic canine degenerative valve disease can be observed in up to 25% of geriatric patients and patients should be screened cautiously.8 A thorough physical examination is recommended. Further diagnostics and extensive cardiac examination including radiographs, ECG and echocardiography are recommended if necessary. Hypertrophic cardiomyopathy is relatively common in cats and anesthetic management can be challenging. Monitoring of the cardiac function is of utmost importance particularly in the geriatric patient. Reduced cardiac output leads to decreased hepatic blood flow. Drug metabolism can be further compromised by diminished microsomal enzyme activity which may result in prolonged anesthetic recoveries especially with injectable anesthetics. If liver function is abnormal, hypoproteinemia and coagulopathies can be present.

Renal function can be also compromised and staging of chronic kidney disease (IRIS staging of CKD) facilitates appropriate treatment and monitoring of the patient in these cases. Staging is based on creatinine levels assessed on at least twice. Sub-staging is based on proteinuria and systemic blood pressure, and appropriate therapy is recommended.9 In these patients, glomerular filtration rate is reduced, acid-base balance and electrolyte concentrations can be affected, and anemia observed. These effects can be exacerbated by general anesthesia and fluid therapy. It is also important to highlight that urea and creatinine levels are increased only when 70% of nephrons have been compromised. Geriatric patients can be affected by several endocrine diseases such as diabetes and anesthetic management will be tailored to the individual patient in all cases.

This lecture discusses a practical approach to anesthetic management of the small animal geriatric patient taking in consideration their specific physiological and pharmacological features.

WSV - 118

VIRTUAL VETERINARY CARE

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Telemedicine is currently viewed by many in the veterinary community as a potential threat to the traditional approach to general practice. Almost every industry today has evolved to quench the consumer's growing thirst for e-commerce, yet the veterinary space has specific complexity which requires careful consideration. Regulation of this new branch of veterinary practice will be essential to ensure that telemedicine delivers the quality and professionalism required by other veterinary disciplines, yet not regulated in ways that unnecessarily restrict access to virtual services that are in obvious and growing demand. When operating within the confines of good medical practice, veterinary telemedicine will increase access to quality care, improve communication with clients, and ensure that our profession remains relevant to an increasingly tech-savvy consumer.

The most common type of veterinary telemedicine is telehealth or triage, assisting clients in determining the urgency and severity of an animal health concern. Successful triage ensures that animals in immediate need of medical attention are not ignored by clients hoping the clinical signs will spontaneously resolve, and directs non-urgent cases to seek care from their regular veterinarian during normal clinic hours. In a profession that is demanding improvements in wellness and work-life balance, preventing non-urgent caseload from arriving at emergency centres, or the waiting room of fully booked clinics, is key to adapting our profession to the needs of future practitioners. In addition, considering that many pet parents have limited financial resources to dedicate towards veterinary expenses, helping these clients to avoid unnecessary emergency fees could potentially save resources better allocated toward diagnostics and procedures during regular business hours. Any veterinary facility licensed for companion animal practice has the resources to offer telehealth or triage services to their clients, and some use existing staff to offer out-of-hours advice. Alternatively, using an external veterinary telehealth service holds the obvious benefit of reducing staff out-of-hours responsibilities and ensures that calls are handled by personnel that are familiar with the telehealth environment, and the associated risks and nuances specific to veterinary telehealth and triage.

Many of the emerging approaches to telemedicine in veterinary practice cater to companion animals and are very similar in scope and purpose to e-commerce approaches already being used by most consumer facing industries. The public expects the convenience and accessibility of instant communication through smart phones and online, and the veterinary profession will need to adapt to these ever-evolving consumer desires. Fortunately, some veterinary regulatory bodies recognize this trend and are adapting specific policy and guidelines surrounding telemedicine in veterinary practice1,2. As a physical examination cannot be performed remotely, traditional veterinary practices should not view telemedicine as holding any significant threat of competition with their current business. In fact, offering a veterinary telehealth service to a veterinary client base can direct simple inquiries, triage, and discussion-only type interactions away from hospital-based veterinarians that should focus on traditional patient care. The interaction between traditional veterinary practice and veterinary telehealth can therefore be argued as one of symbiosis versus one of competition.

Virtual client interaction strategies are equally valuable following a traditional veterinary appointment or procedure. Accessibility to audio, video, and text-based communication applications online and through smartphones makes virtual communication with clients extremely easy and efficient. The use of telemedicine to augment traditional care can be seen in post-surgical evaluation, evaluation of disease progression or therapeutic success, and palliative care. When appropriate, which is highly case dependent, providing the option for a virtual interaction versus a traditional clinic visit holds numerous benefits. Virtual visits do not require a sanitized examination room, they occupy no space in the appointment book or waiting room, and timing can often be quite flexible. Sick and elderly patients can avoid travel to and from a hospital environment, and busy clients have more times available for consultation. In theory, the application of telemedicine approaches to traditional veterinary care is only limited by the creativity and investment of the veterinary practice.

Telemedicine is not immune to the potential for error, risk, and the associated liabilities. There are three fundamental areas of risk for consideration during any telehealth consultation; the risk of inferring a diagnosis, the risk of suggesting a treatment, and the risk of client involvement in physical assessment. It is common for a client to ask a telehealth provider whether a traditional veterinary approach is needed and if a general diagnosis and treatment option can be suggested or attempted prior to a full examination.

Diagnosing and making therapeutic recommendations without a physical exam are not only irresponsible, they are prohibited in almost all regulatory jurisdictions.

Veterinarians should discuss risk factors, potential outcomes, and level of urgency so that the client can decide when they will seek veterinary attention. During such consultations the veterinarian may be tempted to involve the client in diagnostic evaluation, such as palpating a sore leg, or looking into an itchy ear. The telehealth provider is viewed as a person of knowledge and authority, so it seems reasonable that a client would follow their recommendation without considering the potential risks at hand, and if bitten or scratched, it would seem equally reasonable to hold the provider accountable for any injury or damages that occur. Privacy and data security regulations vary widely between jurisdictions and veterinarians should always seek to understand the requirements associated with conducting virtual client interactions.

Telemedicine is not unlike other aspects of veterinary practice and offers significant benefits to clients and to the practice of veterinary medicine, but not without risk when done carelessly or without evidence-based process. Consumer demand for convenience, coupled with the rapid rise in pet technology and e-commerce, will be a strong driver for the development of telemedicine in the veterinary space. All stakeholders in our profession need to be advocates for the adoption of more technologically savvy approaches to client interaction, with equivalent emphasis on the need for an evidence-based approach prior to widespread adoption. Ensuring our profession keeps pace with emerging trends in e-commerce and customer interaction will be essential to remain relevant to the client, however, this must be done in ways that preserve the quality of veterinary practice and ensure both client and patient safety.

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WSV - 063

UNDERSTANDING HOW THE GENETICS OF PURE-BREDS AND MIXED-BREEDS AFFECT GENETIC COUNSELING IN PRACTICE

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INTRODUCTION

Genetic counseling for the individual patient is similar regardless of their purebred or mixed-breed ancestry. Common genetic disorders are caused by ancient disease liability mutations that preceded breed formation. They present at similar frequencies in purebred and mixed-breed cats and dogs. These disorders include; allergies, diabetes, heart disease, feline bladder disease, hereditary cancer, musculoskeletal disease, cataracts, and cruciate ligament disease.

Hereditary disease tends to present as chronic or recurrent episodic disease. Counseling to mitigate the clinical effects of hereditary disease is performed daily by veterinarians in practice. This includes diet modification in many diseases (diabetes, food allergy, urolithiasis, FLUTD, PSS, etc.), avoidance and prevention of allergic reactivity, behavioral counseling, modification of weight & activity, and other medical & surgical management.

Breeding management to prevent the production of offspring with hereditary disease varies based on the purebred or random-bred background of the parents. Understanding the genetic architecture of purebred versus mixed-breed dogs and cats allows a better appreciation of appropriate genetic counseling recommendations.

PUREBREDS

All dog and cat breeds originate from a small population of either related individuals or individuals who share a common conformational, behavioral, or working phenotype. Through selection, a breed standard is developed. Individual cats and dogs that do not adhere to the standard or who demonstrate deleterious traits or disorders are purged from breeding. Those individuals who demonstrate and propagate desirable characteristics will have an increasing influence on the gene pool through multiple generations of descendants. Once breed characteristics are fixed in the population, it can go through an expansion stage where the population grows.

Fig. 1: Pedigree of a typical purebred dog or cat (individual at the left). Breed founders appear at the right. Each breed goes through a purging stage, and then expansion stage.

All breeds will have several influential ancestors that appear far back in pedigrees, but pass on a high percentage of their genes to every individual in the breed. For example, all Burmese cats share on average 22.9% of genes with founder Wong Mau (close to the contribution of a grandparent), and 77.9% of his genes have been retained in the breed population. He does not appear on average until the 19th generation, but appears over 1.5 billion times in every Burmese pedigree. Bailie of Bothkennar was born in the 1940s, and contributes 32.6% of his genes to every modern Bearded Collie.

This process of breed evolution causes a loss of genetic diversity through the purging of undesirable individuals and the concentration and homozygosity of genes of high quality influential ancestors. This is an expected consequence of breed evolution and is not detrimental to the breed.

Deleterious genes can originate from a random mutation and be propagated through breed ancestors. Conversely, genes causing genetic disorders can be linked to a selected trait on a shared chromosome (ex., hyperuricosuria and Dalmatian spotting), or genetic disorders can be caused by direct selection for disease-causing phenotypic traits (ex., feline & canine brachycephalic syndrome).

The specific genes causing many common breed-specific genetic disorders have already been dispersed in breed gene pools. Therefore the chance of breeding two carriers together is based on the frequency of the deleterious gene(s) in the population, and not necessarily the type (outbreeding or linebreeding) of mating.

In order to have selective pressure for positive traits and against negative traits or disorders, there must be variation and genetic differences between individuals in the gene pool. This requires distinct family lines.

Pure breeds evolved in a different era when dedicated breeders judiciously selected against individuals that were unhealthy, could not thrive, could not excel at

working tasks (for working dog breeds), or did not conform to a healthy breed "standard". These early breeders purged unhealthy animals and their genes from the breed gene pools. Somewhere along the way, the responsibility to select for health and produce healthy offspring disappeared from dog and cat breeding. People just breed and expect healthy offspring.
People decide which cats and dogs get bred, and which get bred to each other. This is the difference between natural selection and artificial selection. If artificial selection does not select for health, then there can be no expectation of genetic health. If artificial selection selects for breed characteristics that impair health, then breed-related disease is the natural outcome. Breeding is all about selection.

MIXED-BREEDS

Mixed-breed dogs and cats usually mate randomly and whelp without human intervention. Therefore there is some natural selection involved if an individual fails to thrive. With the advent of mixed-breed DNA testing we are able to understand that some individuals go back to recent purebreds. However in many instances mixed-breed individuals have chromosomal DNA segments identifying ancestral relationships to many different breeds – or to predecessors of breed founders.
The occurrence of common genetic diseases in mixed-breed individuals occurs randomly due to dispersed ancient liability genes. Uncommon and breed-specific recessive or complexly inherited disease is far less likely in mixed-breed individuals. If an individual inherits a disease liability gene for such complexly inherited diseases, it is less likely that the individual will inherit the other breed-specific liability genes necessary for clinical disease.

BREEDING SCHEMES

Conservation geneticists versed in rare and endangered species have designed species survival plans (SSPs) that call for outbreeding; mating together animals that are least related to each other. The purpose of SSPs is to increase heterozygosity and randomize genes in the population to prevent the homozygous expression of deleterious recessive genes. However, natural species and artificially selected breeds have completely different, and in many instances completely opposite selection pressures and desired outcomes. SSPs call for using all available individuals in breeding and only outbreeding. Cat and dog breeding call for selection, which requires differences between prospective mates and therefore genetic diversity between individuals. Outbreeding homogenizes the population by removing the genetic difference between individuals in the breed and making everyone "alike". If two unrelated parents are bred together, the offspring make the two lines related. If an offspring is then outbred to a further unrelated line, their offspring make all of the lines related. Outbreeding is a self-limiting process as there will eventually be no unrelated individuals.

Thus, the basic conceptual point is, "What constitutes genetic diversity? Is it the diversity within each individual (heterozygosity through outbreeding)? Or is it the diversity between each individual (maintaining diverse family lines)? These two concepts are diametrically opposed to each other and are the basic difference between random and purebred breeding. The only way to select against specific genetic disorders is to specifically select against the causative or liability genes through direct genetic testing or phenotypic genetic screening.

COUNSELING FOR HEALTH CONSCIOUS BREEDING

In the planning of any proposed canine or feline mating, the selection of healthy parents is paramount to the health of the offspring. A pre-breeding health examination includes phenotypic examination of the major organ systems for; musculoskeletal, cardiac, ophthalmologic, gastrointestinal, pulmonary, dermatologic and behavioral abnormalities. Medical history should be examined for episodic inherited disease that cannot be identified on examination; I.e., allergies, seizures, bloat, inflammatory cystitis, urolithiasis, etc. Individuals demonstrating hereditary disease should be selected against for breeding.

Pure breeds can also have breed-specific genetic disease due to more recent mutations. For many of these there are genetic tests that can identify causative or disease liability genes. Many breed, kennel, and cat clubs list breed-specific, pre-breeding genetic screening and testing requirements or recommendations.

The advent of multiplex genetic panel testing (Canine & Feline Wisdom Health, Embark, etc.) provides genetic test results for over 180 canine and 60 feline traits and disorders. Unfortunately, most of the disease liability genes tested for in these panels are breed specific. Unless the gene(s) have been validated to cause clinical disease in other breeds or mixed breeds, the test result may not have any significance in your patient. In addition, the panel tests utilize SNPs (single nucleotide changes) instead of testing for a mutation; so false positives and negatives can occur. Breeding decisions regarding breed-validated liability genes should be based on direct mutation testing.
Typical genetic counseling recommendations utilize the breeding of carriers to non-carrier individuals and replacing the carrier parent with a quality non-carrier offspring. In this way breeding lines (and breed genetic diversity) are not abandoned and testable disease liability genes can be lost in one generation. A more in depth discussion of genetic counseling can be found in the 2017 WSAVA Congress proceedings, "Genetic Counseling by Practicing Veterinarians".

The public embrace of "adopt, don't shop" and cat and dog rescue has created a demand for mixed-breed and random-bred dogs and cats that exceeds their availability. This has created the "bred-for-rescue" industry that utilizes the same breeding and transportation networks that previously supplied pet stores. The bottom line is that if any pure-bred or mixed-breed mating is being planned, health conscious breeding through pre-breeding health examination, genetic screening and genetic testing should be performed. This is the only way to improve the genetic health of all cats and dogs. All dogs and cats deserve to live healthy lives.

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APPROACHES TO DIAGNOSING DISEASES OF THE EQUINE STIFLE

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Approaches to Diagnosing Diseases of the Equine Stifle
The equine stifle is a complex joint made of articulation of the femur, tibia and patella. The articulation creating three joint spaces: the medial femorotibial joint, the lateral femorotibial joint and the femoropetellar joint. Congruency in the femorotibial joint is created by the meniscus. The joint is stabilized by the collateral ligaments, and multiple extensor and flexor muscles and their attachments. It is important to have a robust understanding of this anatomy to accurately diagnose problems associated with the stifle.

Many of the injuries or lesions in the stifle occur in the medial femorotibial joint; the lateral femorotibial joint is affected less frequently. The lesions of the equine stifle, such as osteochondrosis, subchondral cyst like lesions, osteoarthrosis, fractures, synovial membrane changes/ synovial effusion, meniscal injury, meniscotibial ligament injury, cartilage damage and collateral and patellar, desmopathies may be a cause of hind limb lameness.
Imaging the equine stifle often starts with the radiographic examination, whether it be in search for pathologic changing in the lame horse for survey radiography in sale or prepurchase examination
By far and way the equine stifle are most commonly radiographed using portable equipment for radiography. The standard and complete study of the equine stifle include the lateromedial (LM), caudocranial (CC) and Caudo 45°lateral-craniomedial oblique (CdLCrMO) projections. An additional oblique image to consider is the Latero 5°cranio 10°distal-mediocaudoproximal oblique (flexed lateral oblique).

The caudal-cranial (CC) radiographic projections is obtained with the horse standing square. A downward angle of 5 to 10° with x-ray generator is needed to be tangential with the joint space. A wellpositioned radiograph should superimpose the cranial and caudal aspects of the tibial condyle, which facilitating visualization of the joint space. An improperly positioned CC view can artifactually create the appearance of a narrowed joint. If the joint space appears narrow on the radiograph, particularly in the absence of other indicators of advanced joint disease, it is recommended that a repeat radiograph be obtained to determine whether this is a real finding or a positional artifact.

The CC view is particularly useful for evaluating for periarticular osteophytes (commonly medial femoral condyle and tibial condyles), examining the articular surfaces of the medial and lateral femoral and tibial condyles and femoral intercondylar fossa. The attachment sites of the collateral ligaments, cranial meniscal ligaments and cruciate ligaments should also be examined.

The lateral view is obtained with the plate positioned on the medial aspect of the stifle joint. In a well-positioned lateral view, the medial and lateral femoral condyles are superimposed. The entire patella and supra-patellar area should be included. In larger horses or using a smaller x-ray detector, two lateral views, one made more distally and caudally to include the complete proximal tibia and one made more cranially and proximally to include the entire patella may be required. The lateral view is particularly useful for evaluating the femoral trochlear ridges, patella, proximal tibia at insertion sites of the key ligaments, and caudal aspect of the joint.
The CdLCrMO view is commonly utilized for evaluating lesions of the medial femoral condyle and lateral trochlear ridge of the femur. The view is obtained by positioning the plate on the craniomedial aspect of the joint, and aligning the x-ray beam at a 45 degree angle on the caudolateral aspect of the joint. Including a slight downward projection (approximately 10 degrees) may be needed in some cases to minimize superimposition of the lateral tibial condyle. In addition to its usefulness for evaluation of the MFC, the CdLCrMO is also excellent for evaluating the lateral trochlear ridge. Radiography may give you some clue that there are soft tissue injuries. Ultrasound lets you visualize and diagnose suspected injuries. Ultrasound is often employed to diagnose both soft tissue and osseous injuries of the stifle in horses that respond to intra-articular anesthesia. 5,8,9. A systematic approach to ultrasonographic examination facilitates visualization of common sites of the pathologic change. It is important to evaluate and document the key structures in the equine stifle that may become injured.

A linear ultrasound probe with a variable megahertz (8-13) is used for the majority of the imaging. The caudal aspect of the stifle requires a convex probe with a variable megahertz of 4-8 depending on the size of the horse. The ultrasound frequency should be set to the highest megahertz available and still be able to visualize the intended structure in its entirety. An appropriate scanning depth should be used. This is often 3-6 cm in depth for the medial, cranial and lateral and 6-8 caudally. The intended anatomic structure should fill the screen and the focal zones be set at the depth of the intended piece of anatomy. The stifle region should be properly prepared by clipping the hair, washing the skin with a mild detergent and water, and applying acoustic gel.

A starting point at the medial aspect of the joint, moving cranial and then lateral is often employed. This is followed by evaluation in a flexed position to visualize the cranial attachments of the menisci and femoral condyles. Finally the caudally aspect of the joint is evaluated. Each structure should be imaged in cross section and longitudinally. Creating a mental checklist of structures is paramount to reduce the chance of injury oversite in the examination.

The medial femorotibial joint should contain a small amount of compressible anechoic fluid. In conditions of chronic effusion, there may be synovial hypertrophy and joint capsule thickening.

The medial meniscus is triangular shaped with variably numbered hypoechoic parallel horizontal lines. The abaxial margin of the meniscus should remain with the boundaries of the tibial and femoral bone margins. The medial meniscus is much more frequently injured when compared to the lateral. Intra-substance tears may be oblique or horizontal in orientation and often are seen on the tibial margin of the meniscus but can occur in a variety of locations. These may be more apparent when the limb is in a non-weight bearing stance. Meniscal protrusion may accompany tears or present alone. The cranial attachment of the medial meniscus visualized in a flexed position is common site for tears and enthesopathy and can contribute to meniscal laxity. Placing the ultrasound transducer in the longitudinal plane in the “V” created by the medial and intermediate patellar ligament will serve as a guide to find the meniscotibal ligament in the transverse plane. This is the most sensitive plane to find injury. A common pitfall is diagnosing the normal hypoechoic striations and loose bundles as intrasubstance tears.

The medial bone margins of the tibia and femur are common sites of osteophytes. Osteophytes may occur along with meniscal injury or alone. Moderate and large femoral osteophytes will deform the femoral border of the medial meniscus.

The lateral collateral ligament is larger than the medial collateral ligament. The fiber pattern of the collateral ligaments twists from the proximal to the distal insertion. This allows the ligament to be taut in both flexed and extended positions but can result in sometimes confusing hypoechoic regions within the ligament on transverse images. The collateral ligaments of the stifle are rarely injured; injury occurs most often at the origin of the medial collateral ligament.

Three main patellar ligaments are present in the horse. These include the medial, intermediate (middle) and lateral patellar ligaments. These ligaments have distinct shapes in cross section, with the medial being more triangular, the lateral being flat and broad in the intermediate ovoid. The intermediate patellar ligament contains linear hypoechogenic striations at its insertion. The intermediate patellar ligament is more commonly injured (Figure 4).

The trochlear ridges are easily identified on ultrasound. The overlying cartilage is hypoechogenic with lateral being twice as thick as the medial. Ultrasound is sensitive at finding osteochondral fragments and intertrochlear groove osteochondrosis lesions.
Along the distal aspect of the lateral femoral trochlea is the extensor fossa. This is the common origin for the fibularis (peroneus) tertius and long digital extensor tendon. From here fanning the probe slightly caudally, the lateral meniscus is visualized. The lateral meniscus is triangular in nature and lies deep to the collateral ligament and tendon of the popliteus.

In a flexed position, the articular surfaces of the femoral condyles can be examined. The cranial aspect of the medial femoral condyle is a common anatomic area for articular and subchondral bone pathologic change. Shallow articular defects as well as the cloaca of the subchondral bone cysts are seen on ultrasound.
Using standard, well positioned radiographs, including the LM, CC and CdLCrM o views and knowing soft tissue attachments can aid in finding significant pathologic change in the equine stifle.

In conclusion, diagnosis of stifle injury may represent a significant challenge to the equine clinician. However, a stepwise approach to the equine stifle aids in the visualization of areas where pathologic change commonly occurs and may be seen with ultrasound and radiographs. Appropriate knowledge of anatomy and common areas of pathologic change are needed to get the most out of your diagnostic imaging.

WSV - 095

REVAMPING OUR UNDERSTANDING OF EPILEPSY

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Most texts will describe epilepsy as a pure seizure disorder. However, epilepsy is far more. Epilepsy is a brain disease(1)with seizures being the clinically most prominent sign. Most will recognise a generalised tonic-clonic convulsion, but relatively few will be able to spot focal motor or sensory seizures (ictal behaviour changes). However, apart from the seizures other clinical signs of epilepsy, which are increasingly recognised affecting the interictal period, are changes in cognition and behaviour(2-4). It is thought that there are shared pathophysiological pathways explaining the bidirectional relationship between neurobehavioural disorders and epilepsy(5); for example in human medicine, a patient with depression is more likely to develop epilepsy and a patient with epilepsy depression(6, 7). It is yet unknown if this bidirectional relationship exists in our veterinary patients.

Neurobehavioural comorbidities are been taken more and more serious in human patient, as they can have a bigger impact on health related QoL (HRQoL) than seizures. This is the case especially for inter-ictal anxiety and depression(8). Only few studies have studied interictal behaviour changes in dogs with epilepsy. In the first study, around two-thirds of dogs developed a behaviour change during the course of their idiopathic epilepsy(9). Drug-resistant dogs were found to have greater amount of unfavourable behavioural changes than drug responders in the same study(9), a finding also been seen in rodent models of epilepsy, where drug-resistant rats had greater behaviour changes(10). Not surprisingly, anxiety is the main behaviour change reported in dogs with IE (9, 11), and in two more recent studies changes in impulsivity and other clinical signs comparable with attention deficits hyperactivity disorder in people have been noted (12, 13). An increasing level of evidence also exists that dogs with idiopathic epilepsy might have changes in trainability, spatial memory and accelerated memory loss(3, 14, 15). As such, epilepsy management should in the future not only focus on reducing seizures, but also consider on reducing the effects of potential behavioural comorbidities(16).

In human medicine, certain antiseizure drugs have recognised anxiogenic and anxiolytic effects(16). As in veterinary medicine, most drug studies in human medicine have focused to study seizure supressing effects rather than also looking at the effects of the medication on cognition and behaviour. A recent systematic review and meta-analysis of antiseizure drug's tolerability and safety in dogs with epilepsy showed that every 10thcanine patient treated with primidone had anxiety documented as side effect, but there were no reports of increased anxiety in dogs being managed with phenobarbital, potassium bromide, levetiracetam, zonisamide or felbamate(17). Interestingly, our veterinary antiepileptic drug blockbuster phenobarbital and potassium bromide have become less used in human medicine due to their behavioural side-effects(16). One of the more promising anxiolytic drugs used in people are gabapentin/pregabalin(16), but these drugs have limited evidence in regards of seizure suppressing activity in dogs with idiopathic epilepsy(18). The trials available have only studied these drugs as add-on but not as the sole agent.

The new kid on the block for seizure control imepitoin showed promising anti-seizure and anti-anxiety effects in rodent models(19)and in a seizure Beagle model(20). Charalambous and colleagues(17)systematic review found that in one of ten studies where imepitoin was used reported reversible and dose-dependent anxiety. In a questionnaire based study no anxiogenic or anxioloytic effects of imepitoin was reported in dogs treated for idiopathic epilepsy (21). However, in "non-epileptic" patient imepitoin was used successfully in the management of sound related fears (22).

In 2011, the International League Against Epilepsy (ILAE) provided guidance notes for the management of neurobehavioural comorbidities(23). The ILAE recommendation is to use selective serotonin reuptake inhibitors (SSRIs) as first-line drug for the management of anxiety in people with epilepsy. SSRIs appear to be well tolerated and have no to minimal impact on the seizure threshold. Other drugs which are safe to use in these patients are benzodiazepines, azapirones, antihistamines and pregabalin (ADCE) (24). There is only anecdotal evidence for the use of the SSRI fluoxetine in dogs with epilepsy. Fluoxetine could impact the metabolism of phenobarbital so that close drug monitoring is indicated. Sertraline has been suggested as a safer substitute, which has been described for the usage of dogs with anxiety(16). SSRIs are thought to take around four weeks to show an effect. Tricyclic antidepressant and monoamine oxidase inhibitor are usually not recommended as there could be an effect on seizure threshold or stimulating certain behaviours (16).

An interesting alternative to medication is the use of diet to modify behaviour. A significant reduction in chasing behaviour (a potential indicator of canine ADHD-like behaviour) was documented with a medium-chain fatty acid enriched diet (25). Furthermore, a reduction in stranger-directed fear was noted in the same trial, which may indicate anxiolytic properties of the MCT.

In conclusion, epilepsy is a complex disease which might need more complex management solutions. Management needs to better tailored to the individual patient and the focus should be not only on getting better seizure control.

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WSV - 364

STATE-OF-THE-ART LECTURE: COBALAMIN: BLOOD, GUTS AND MORE

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Cobalamin (vitamin B12), a water-soluble vitamin required by all mammalian, is a vital cofactor in two enzymatic processes necessary for protein synthesis and cell metabolism1.It is involved in haematopoiesis, neuronal function, DNA and fatty acid synthesis, and energy production.

The important active forms, (deoxy)adenosylcobalamin and methylcobalamin) are cofactors for two enzymatic processes2. Adenosylcobalamin is a cofactor for methylmalonyl-CoA mutase, located in the mitochondrion, which catalyzes the reaction of methylmalonyl-CoA isomerization to succinyl-CoA, which then enters the TCA cycle.Methylcobalamin predominates in the cytoplasm and is a cofactor for methionine synthase, which converts homocysteine to methionine, important for protein synthesis.

Cobalamin deficiency testing

Serum cobalamin concentration (usually assessed with serum folate) should be measured with avalidated assay in all pets with signs of chronic gastrointestinal (GI) disease or other unexplained signs consistent with deficiency (e.g. immunodeficiencies, anaemias, neuropathies)3. Methylmalonic acid (MMA) is produced during amino acid metabolism. Cobalamin catalyses the conversion of methylmalonyl CoA to succinyl CoA. If cobalamin is insufficient, methylmalonyl CoA concentrations increase and is converted to MMA. Serum or urine MMA concentrations are indicators of cellular cobalamin status. Some dogs with low-normal serum cobalamin have increased serum MMA concentrations as decreased serum cobalamin concentration is not always sensitive for the diagnosis of cellular deficiency. While serum MMA concentration may be a better diagnostic test for cobalamin deficiency, it is difficult and expensive to run so not routinely used. If deficiency is likely to be present, supplementation should be considered as it is very safe and toxicity has not been reported4.

Sources and absorption

While cobalamin is produced by some gut bacteria, animal protein is the main source, especially liver. Cobalamin is ingested bound to protein and released from food in the stomach by pepsinogen and gastric acid. It is then complexed with Intrinsic Factor (IF), mainly produced by the exocrine pancreas in dogs and exclusively in the pancreas in cats.

Absorption involves a cubam receptor-mediated mechanism in the ileum; so cobalamin deficiency can be a marker for ileal disease. Cubam receptors are comprised of the proteins cubilin and amnionless5. Receptor recognition results in cobalamin absorption via ileal endocytosis followed by transportation in the circulation bound to transcobalamin I (haptocorrin) and transcobalamin II.

Cobalamin supplementation

Cyanocobalamin is the most common form for supplementation, although hydroxocobalamin can be used. Oral as well as parenteral cyanocobalamin is effective in dogs and cats, even those with GI disease (250-1000 ug/day)6,7,8. Six weeks of weekly subcutaneous doses (250-1500 ug) followed by a dose at one month and a 2 month recheck has been recommended3. Parenteral doses of 1 mg hydroxycobalamin monthly or bimonthly appeared adequate in Beagles with hereditary hypocobalaminaemia9.

Cobalamin deficiency

Familial cobalamin deficiency

A familial cobalamin deficiency similar to human Imerslund-Grasbeck syndrome (IGS) has been reported in giant schnauzers, Australian shepherd, beagles, Komondors, and Border collies. Clinical signs may begin in early adulthood and include anorexia, lethargy, cachexia, failure to thrive, poor body condition, dysphagia, vomiting, diarrhoea, glossitis, bradycardia, and oral ulcerations/erosions. Haematological abnormalities such as anaemia may be noted. Degenerative liver disease has been also reported in young beagle dogs with IGS10.

Australian shepherds and giant schnauzers have a genetic defect of chromosome 8, containing the amnionless gene11, 12,13. In beagles, mutations of the cubilin genes have been found, similar to the mutation in Border collies10, 11, 14,15; although the mutation location differs between the breeds.

Familial cobalamin deficiency in Sharpeis appears to be a different type of malabsorption, with a genetic defect on chromosome 1316,17. They have higher concentrations of serum MMA and homocysteine (HCY) than cobalamin-deficient dogs of other breeds. In humans, MMA levels are higher with genetic disorders that affect intracellular cobalamin processing compared those with disorders affecting gastrointestinal (GI) processing and extracellular transport. These defects result in deficient function of methylmalonyl-CoA mutase or methionine synthase, causing methylmalonic aciduria or homocysteinuria18.

Acquired cobalamin deficiency

Cobalamin deficiency can be caused by any disorder affecting IF production or intestinal absorption, e.g. chronic enteropathies (CE), exocrine pancreatic insufficiency (EPI) and intestinal lymphoma19.

In cats it is also reported to be associated with cholangitis/cholangiohepatitis and hyperthyroidism20. Cats with chronic kidney disease may have impaired function of cobalamin-dependent cellular metabolism21.

Cobalamin in GI Diseases

Low serum cobalamin deficiency occurs 6 to 73% of dogs with CE22,23,24,25 and occurs more in cats with CE or lymphoma compared with other gastrointestinal cancers26.

In one study, only 25% of hypocobalaminemic dogs had increased serum MMA concentrations; so hypocobalaminemia was not always associated with a cellular cobalamin deficiency25. A suggested mechanism for cobalamin deficiency in CE is decreased expression of the cubam receptor causing impaired absorption27. In lymphoma, ileal infiltration may damage the receptors19. Another suggested mechanism is GI dysbiosis28 as some anaerobic bacteria (e.g. some Clostridia spp and Bacteroides spp) utilize cobalamin decreasing the amount available for absorption29.

The prevalence of cobalamin deficiency in canine and feline EPI is 74 to 83%30,31,32 . Decreased production and secretion of IF occurs in EPI, reducing amounts of cobalamin-IF complexes available for absorption33,34,35 . Hypocobalaminemia at the time of EPI diagnosis is a significant risk factor for decreased survival, while hyperfolatemia is associated with improved prognosis36.

Hepatic disease

Hypercobalaninaemia can be present with liver disease, solid tumours, haematological malignancies, and kidney disease. A functional cellular cobalamin deficiency can occur with high serum cobalamin. In liver disease, a functional deficiency may be caused by alterations in binding of cobalamin to haptocorrin proteins, causing altered delivery to cells and increased HCY and/or MMA levels37 . In dogs with liver disorders 37.5% had hypercobalaminaemia and 26.7% had elevated serum MMA concentrations38. In cats with liver disease the odds ratio of increased serum cobalamin was 9.91 (95% CI 3.54 - 27.58)39. Hypercobalaminaemia, elevated MMA and HCY are biomarkers for functional deficits in cobalamin and can indicate an underlying disease.

Relationship between cobalamin (and folate) and anaemia- In humans, megaloblastic anaemia can occur with cobalamin (and folate) deficiency from defective DNA synthesis, ineffective haematopoiesis, and erythrocyte maturation arrest. Decreased white blood cell and platelet synthesis can occur due to bone marrow hypercellularity from impaired development and release of erythrocytes. Dogs with congenital hypocobalaminamia may show a nonregenerative anaemia, erythrocyte anisocytosis, megaloblastic bone marrow, and decreased white cells and platelets, although a study of anaemic dogs did not show a correlation between cobalamin and folate deficiency and macrocytic nonregenerative anaemia40. In some cats, low serum cobalamin has been linked to increased mean corpuscular volume and decreased serum phosphorus41,42 .

Hypocobalaminaemia in a cat has been reported to cause bone marrow failure and pancytopenia43.

Neurological disorders

Both folate and cobalamin deficiency may cause similar human neurological and psychiatric disturbances including depression, dementia, myelopathy and peripheral neuropathy44. In humans and rodents, subacute combined degeneration (SCD) is an adult onset neuropathy due to cobalamin deficiency45. This is related to interference with the methylation reactions in the CNS. These reactions are processed by S-adenosylmethionine (SAM), which is controlled by its product, S-adenosylhomocysteine (SAH). The relationship of these two compounds is the methylation ratio. If the ratio falls, it results in central nervous system (CNS) hypomethylation causing decreased function. Inhibition of the cobalamin-dependent methionine synthase causes a rapid fall in the ratio in the CNS as it does not have an alternative method of re-methylating homocysteine to maintain synthesis of SAM46,47.

There are also non-coenzyme CNS functions of cobalamin. A rat CNS neuropathy due to cobalamin deficiency is associated with increases in CNS tissue and/or cerebrospinal fluid levels of some neurotoxic molecules (e.g. nerve growth factor, TNF-alpha), and decreases in levels of some neurotrophic molecules (epidermal growth factor, interleukin-6). Low cobalamin levels have also been observed Alzheimer's patients, although the role is unclear. Cobalamin does delay the onset of signs of human dementia and improves cognitive functions in the elderly, if administered before the first symptoms48.

In a rat sciatic nerve injury model high doses of methylcobalamin improved nerve regeneration and function49. Anecdotally, cobalamin has been used for treatment of feline diabetic neuropathy. Methylcobalamin has been suggested to be the form needed for neurological tissue health; however, in a meta-analysis of human diabetic neuropathy, vitamin B complex (including cyanocobalamin) and methylcobalamin both had beneficial effects on symptoms such as pain and paresthesia51

Hypocobalaminaemia resulting in an encephalopathy and MRI lesions has been reported in a cat. The hypocobalaminaemia appeared to result in a urea cycle abnormality causing hyperammonaemia. Daily cobalamin injections resulted in a clinical improvement with resolution of MRI lesions at neurological signs after eight weeks52.

Summary

Cobalamin supplementation is essential for many GI and pancreatic disorders and for individuals with congenital hypocobalaminaenia. Hypercobalaminaeamia may be a biomarker for hepatic and other disorders. Cobalammin supplementation could be considered for adjunct treatment of neuropathies and cognitive disorders, although research in dogs and cats is needed.

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WSV - 071

THE MENISCUS – WHY OR HOW TO EVALUATE?

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The Meniscus- Why or How to Evaluate

Canine meniscal injury is typically associated with complete cranial cruciate ligament (CrCL) injury, with incidence reported from 50-90% of CrCL cases. Isolated meniscal injury in dogs (unlike humans) is rare, with most damage occurring from repetitive injury to the caudal pole of the medial meniscus with cranial tibial subluxation of the CrCL deficient stifle.

The most common configurations of meniscal injury are vertical longitudinal tears. The classic is referred to as a 'bucket handle' tear, with the damaged portion sometimes displaced cranially. Other less common configurations include multiple longitudinal or 'church pew' tears, short or incomplete vertical tears, oblique or flap tears, radial tears, or horizontal cleavage tears.
Concurrent meniscal injury significantly contributes to morbidity and progressive osteoarthritis in the stifle joint. Hence, thorough evaluation of the meniscus and treatment of any pathology is considered standard of care, as part of any CrCL surgery.

Pre-operative evaluation

When performing an orthopedic exam, there are some additional findings that may be suggestive of concurrent meniscal injury. These include; per-acute onset of more severe lameness localized to the stifle joint, increased discomfort associated with stifle range of motion, palpable/audible 'click' crepitation in the joint through range of motion, and significant medial buttress.
Radiographs can help support the diagnosis of CrCL rupture +/- meniscal injury with the findings of characteristic joint effusion and osteoarthritis.
Other imaging modalities such as ultrasound, CT or MRI +/- contrast arthrography have also been reported in the pre-operative setting to support a diagnosis of meniscal injury, but are not commonly utilized in the clinical setting.

Surgical meniscal evaluation

One of the main goals of stifle arthrotomy or arthroscopy during CrCL surgery is to evaluate the meniscus. When performing an arthrotomy, this author prefers a medial parapatellar approach vs lateral approach, as this facilitates improved visualization and manipulation of the caudal pole of the medial meniscus.
Arthroscopic evaluation of the menisci can provide a more minimally invasive, and detailed evaluation of the meniscus.

Regardless of the approach for evaluation, use of a Hohmann retractor or other stifle distractor device to bring the tibial into cranial subluxation, greatly improves the surgeon's ability to see and manipulate the meniscus. Probing the meniscus (both the femoral and tibial aspects) during this evaluation has also been proven to significantly increase the diagnostic accuracy of detecting a meniscal tear versus visualization alone.

Meniscal treatment

There is little debate that failure to treat meniscal injuries in dogs results in persistent lameness, and more rapid progression of osteoarthritis in the stifle.

Partial meniscectomy

A partial meniscectomy involves the removal of only the damaged section of the meniscus for those tears that do not extend to the peripheral rim. The cranial and caudal meniscotibial ligaments and peripheral rim are preserved. This is thought to maintain some of the load distribution and stabilizing functions of the meniscus. Maintaining tension on the torn portion of the meniscus during sharp transection at the junction between normal and abnormal tissue can facilitate a clean partial meniscectomy.

Hemi-meniscectomy

Many injuries of the medial meniscus involve the entire caudal pole, so removal of the entire caudal pole in the form of a hemi-meniscectomy may be required. The procedure is similar to a partial meniscectomy, only sharp transections are performed at the mid-body (level of medial collateral ligament) and meniscotibial ligament.

Total-meniscectomy

This is removal of the entire medial meniscus, and is not commonly performed, as it is rare for a meniscus to be so extensively damaged to warrant this more radical procedure.

Meniscal Release Controversies

This technique was described as a way to decrease late meniscal injury after TPLO or other CrCL stabilization procedures. It involves transecting the medial meniscotibial ligament or a mid-body transection of the medial meniscus just caudal to the medial collateral ligament. Although this has been shown to decrease the incidence of delayed meniscal injury, it does not totally eliminate this risk. Incomplete release, healing of the release site, or an inappropriate release may result in subsequent morbidity due to progressive meniscal and joint pathology. Experimental studies have also shown that performing a meniscal release on a normal joint causes altered joint load distribution and results in progressive osteoarthritis in the stifle. So even though meniscal release remains a commonly performed procedure, and was described as part of the original TPLO technique, this author's preference is not to perform a meniscal release if the meniscus is normal at the time of CrCL surgery.

WSV - 081

RADIOGRAPHIC INTERPRETATION OF THE DYSPNEIC CAT: AN EMPHASIS ON URGENCY

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Introduction

When cats present for dyspnea, the manner is often acute and the threat of exacerbation with even gentle, basic handling is of high concern. The goal of diagnosis is, ultimately, to be as rapid as possible without further reducing the stability of the cat in the process. In many cases, in addition to a tempered physical exam that limits unnecessary handling, radiography is a component of evaluating dyspneic cats. Additionally, the likelihood of obtaining a more complete assessment and the ability to share images through telemedicine is inherently more rewarding with radiography.

Top Causes of Dyspnea

The common causes of dyspnea in cats fall into one of four categories: cardiac, respiratory, neoplastic, or traumatic/other.

Table 1. Summary of Diagnoses in Cats Enrolled for Dyspnea

	Herndon, 2008 (JAVMA)(1)	Swift, 2009 (JSAP)(2)	Dickson, 2018 (JSAP)(3)
	43 cats	90 cats	92 cats
Cardiac	72%	38%	65%
Respiratory	10% (asthma)	32%	16% (asthma, 4%)
Neoplastic	12%	20%	11%
Traumatic, etc.	6%	10%	8%

Given the most likely diagnoses in cats presenting for dyspnea, the ultimate goal of diagnostic testing is to determine a cardiac versus non-cardiac cause of dyspnea. According to each of three studies where cats were enrolled due to presentation of dyspnea, cardiac disease and failure is the most statistically likely cause of the dyspneic presentation (1-3).

Determining the Cause of Dyspnea

Determining a cardiac cause of dyspnea is also confounded by the inability to detect a murmur in a significant portion of cats presenting with cardiac failure (2). Also, even in the presence of an audible murmur, the definitive diagnosis of cardiac disease cannot be assumed (4). Ultimately, the decision tree of treatment for dyspnea leads to the choice of whether to treat with diuretics or with airway therapeutics.

Cardiac

The most common acquired cardiac disease in cats falls under the category of cardiomyopathy, where hypertrophic cardiomyopathy (HCM) is the most common diagnosis. Pulmonary edema due to left sided congestive heart failure has no clear, reliable pattern of distribution and can mimic some non-cardiac lesion distributions. Also, in cats, left sided failure can also cause pleural effusion. Both cardiogenic edema and pleural effusion can reduce visibility of cardiac margins. The classic radiographic appearance of the most common cardiomyopathies in cats is associated with a shape change with or without measurable enlargement. On the lateral view, a concavity can be identified on the caudal cardiac margin that makes the heart appear kidney-shaped. On the ventrodorsal view, the cardiac silhouette will be largest in width near the heart base, rather than mid silhouette.

Respiratory

The most common respiratory diseases in cats are two specific types of lower airway disease: chronic bronchitis and asthma. These airway diseases are separate entities that can have some overlap in clinical presentation and radiographic appearance (6, 7). The most common radiographic pattern detected in cats with lower airway disease is a bronchial pattern (about 75% of diagnosed cases) (8). Twenty-three percent of cats with lower airway disease have normal thoracic radiographs (8). The distinction between chronic bronchitis and asthma relies on detection of any indicator of expiratory failure. Cats with asthma have intermittent expiratory respiratory distress due to bronchoconstriction which would not be a feature of chronic bronchitis (7). The only radiographically distinguishable feature that can indicate bronchial constriction (or, more likely, bronchiolar constriction) associated with asthma is the presence of hyperinflation associated with air trapping. A barrel-shaped chest, flattened diaphragm with or without apparent increased lung lucency might be identified. As air trapping occurs due to smooth muscle hypertrophy and edema, and constriction of small airways (bronchiolar level) that are radiographically too small to detect, the incidence of a bronchial pattern in cats with air trapping may not be present unless larger airways are also affected (9).

Other respiratory causes of dyspnea include pneumonia, congenital diseases, neoplasia, and trauma. Alveolar and interstitial pulmonary patterns that are ventral in position are most typically identified in cases of infectious pneumonia in cats. Additionally a “para-pneumonic” spread of infection to the pleural space is considered the most common cause of pyothorax in cats (11). Non-cardiac and non-neoplastic pleural effusions (e.g., pyothorax and FIP-associated pleural effusion) can be considered in the respiratory category of diseases causing dyspnea in cats (2, 3). Chylothorax is most often idiopathic, but cardiac disease must be considered and ruled out (12).

Neoplasia

The most common neoplastic causes of dyspnea are due to primary pulmonary neoplasia, pleural effusion due to pulmonary or cranial mediastinal masses, or mass effect originating within the cranial mediastinum with little to no pleural effusion. The most common primary pulmonary neoplasm is pulmonary adenocarcinoma, which can have pulmonary metastases in about 50% of cases (13). About 30% of cats having primary pulmonary neoplasia have concurrent pleural effusion, reducing ability to assess lungs and the heart (13).
Traumatic, etc.

Trauma may or may not have a matching clinical history. Rib or other skeletal fractures are sometimes present as clues. Rib fractures must be interpreted with caution because serial or singular rib fractures can occur secondary to chronic airway disease, as well (14). Pulmonary contusions or pleural effusion could be responsible for a dyspneic presentation.

Making the Most of the Radiograph

Cats presenting for dyspnea of cardiac or noncardiac/pulmonary causes are at risk of having a complicated lung pattern or pleural fluid that reduces visibility of the heart, mediastinum, and other soft tissue structures. Regardless of pulmonary or pleural status, the tracheal position is typically easy to assess. An indication of cardiomegaly can be made based on positional elevation of the trachea, even when entire cardiac silhouette is not visible. If enough of the cardiac silhouette is visible, an objective measurement of cardiac size could be obtained via a vertebral heart score (VHS) to determine likelihood of the heart as being the cause of dyspnea. In one study of 67 cats presenting for acute respiratory distress, a VHS cutoff of 9.3 or greater was “highly specific” for heart disease as being the cause of the respiratory distress (4). Seven cats (10%) in this study had pleural effusion to the point where a VHS could not be performed. Additionally, a VHS of 8 or less is specific for heart disease not being the cause of dyspnea. In determining whether dyspnea is cardiac or not, an assessment of cardiac size has to be made – where some have advocated, due to the prevalence of congestive heart failure as a cause of acute dyspnea in cats, treatment with diuretics in cases where complex pulmonary patterns are found, keeping in mind that pulmonary disease remains a possibility (4).

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WSV - 087

CANINE BLOOD TRANSFUSION IN MY PRACTICE: IS IT REALISTIC?

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Introduction

In the last decade, the demand for veterinary blood products has grown tremendously. The goal of transfusion medicine is ultimately to avoid transfusion reactions by having a high quality blood product.
The purpose of this presentation is to, using a case-based approach, demystify blood transfusions by emphasizing the selection of the appropriate blood product and its proper administration.

1. Careful selection of healthy blood donors

The ideal canine blood donor is a healthy large breed dog (> 25 kg) to allow the collection of a standard blood volume (450-500 ml depending on collection bag).
Ideally, the donor should have a docile temperament to permit blood collection without sedation. Contrary to what is often reported in the veterinary literature, pregnancy does not sensitize bitches to erythrocyte antigens. (1)Depending on the geographical location, blood donors must be tested for different infectious agents transmitted via a blood transfusion (ex: Babesia, Ehrlichia, Anaplasma). To this end, an updated ACVIM Consensus has been recently published, which proposes optimal and minimal standards.(2)

2. Proper techniques for collecting and storing blood products

Blood is collected via the jugular vein using either gravity or a suction system. using a 16G needle connected to closed collection system. The site should be shaved and prepared aseptically. Citrate-phosphate-dextrose-adenine (CPDA), with or without additive solution, is commonly used as an anticoagulant. In an emergency situation, heparin or sodium citrate may also be used for immediate transfusion purpose (not for storage).
Given the financial and time investment required to identify, test and collect blood donors, the purchase of high-quality blood products through a commercial blood bank is likely advantageous for most clinics.
Blood can be separated into different compounds (packed RBC (pRBC), fresh frozen plasma, etc.). Although centrifugation accelerates the process of separation of red blood cells and plasma, gravity can certainly allow adequate sedimentation.

Whole blood and RBC concentrate are stored at 4°C in a dedicated refrigerator and should be gently rocked daily. When used alone, CPDA-1 allows storage of RBC for up to 20 days. Preservatives (e.g. Adsol or Nutrisol) added to canine pRBC increase storage time to 35-37 days. Plasma products should be kept at -20oC (or colder) and has a shelf life of about one year.

The advantages of blood components therapy are:
- Limits the risk of transfusion reaction by limiting the transfusion of non-essential blood elements
- Limits the risk of vascular overload
- One unit of blood can be used for more than one patient
- Coagulation factors are maintained active in FFP (decrease in factor V, VIII and vWF at 8 hours post-storage; does not appear to be as dramatic as initially believed).

3. Appropriate administration of blood products

There are numerous indications to administer blood products, some more clinically appropriate then others (Table 1).

Table 1. Clinical indications for specific blood products

Indications	Blood products
Oxygen transport capacity	- Whole blood (fresh or stored) - RBC concentrate
Oncotic pressure and hypoalbuminemia*	- Whole blood (fresh or stored) - Fresh frozen plasma (FFP)* - Frozen plasma* - Cryo-poor plasma* - Human Albumin
(limited efficacy)	- Fresh Whole Blood - Platelet rich plasma - Platelet concentrate
Platelets*	- Fresh Whole Blood - FFP - Cryoprecipitate (ideal)
von Willebrand Factor	- Fresh Whole Blood - FFP
Coagulation factors (including factors VIII et vWF)	- Whole Blood (fresh or stored_ - FFP - Frozen plasma - Cryo-poor plasma*
Coagulations factors vitamin-K dependant	- FFP - Stored plasma
Immunoglobulins (unproven efficacy)	

* To be considered in small animals only
** See limitations in fresh frozen plasma

PACKEC RBC (pRBC)

Increasing the oxygen transport capacity of an anemic patient is obviously the main reason to use pRBC. It is particularly ideal in normovolemic dogs, e.g. in immune-mediated hemolytic anemia (IMHA).
- Total recommended volume: 6 to 10 ml / kg
The following formula can be used once the PCV on the unit is verify (usually around 60-70%), which will also allow to check for hemolysis secondary to storage/transportation.

- Volume administered (ml) = Weight (kg) X 90 (dog)) X (Desired PCV - PCV of recipient)
PCV of blood unit

FRESH FROZEN PLASMA (FFP)

FFP contains all coagulation factors and are indicated in numerous cases of coagulopathy (hepatic insufficiency, rodenticide poisoning, von Willebrand disease, hemophilia, DIC, etc.). Since plasma contains globulins, its use has been suggested in puppies which did not have access to maternal colostrum or with parvovirus, but its benefit remains unproven. Plasma is not ideal as the sole treatment of hypoproteinemia, since approximately 45 ml/kg of plasma is required to increase serum albumin by 10 g/L (unrealistic volume for large dogs). Finally, since FFP also contains □-macroglobulins, its use is often advocated during pancreatitis, but its efficacy remains unproven.(3)Before administration, FFP should gradually be warmed to 20-37 °C; overly aggressive warming can lead to inactivation of clotting factors and denaturation of plasma proteins, in addition to promoting bacterial growth.
- Total recommended volume: 10-15 ml / kg (repeated as needed)

The decision to administer a blood product should be based on the patient clinical signs. Indications for RBC transfusion in an anemic patient includes: weakness, exercise intolerance, tachycardia, tachypnea, weak pulse. Signs of coagulopathy may include petechiae, ecchymosis, hematomas, bleeding at venipuncture sites. Prolongation of clotting times may justify the use of blood products if a procedure that may lead to significant bleeding is planned (ex.: surgery, liver biopsy) or in actively bleeding patients.
Blood products must be examined prior to administration (expiration date, brownish discoloration (suggestive of bacterial contamination), microhematocrit to verify if hemolysis is present). Transfusion of RBC requires a catheter > 22 G, as smaller catheters may cause hemolysis. The use of volume-appropriate filters is essential. Only approved pumps for transfusion purpose should be used. In fact, administration by gravity seems ideal; indeed, a recent study in dogs has shown that even approved pumps can lead to significant hemolysis.(4)

A slower transfusion rate (0.25 ml/kg/hr) is initially recommended. It is essential to closely monitor the patient regardless of the transfused blood product. The animal›s mental state, temperature, heart rate, respiratory rate, mucosal color and capillary refill time should be noted before starting the transfusion, and then 15 minutes after it starts. If vital parameters are stable, the transfusion rate can be increased to 5-10 ml/kg/hr. Monitoring of vital parameters should be done at 20-30 minutes throughout the transfusion. The animal should also be monitored for signs of vomiting, diarrhea, angioedema, urticaria and hemoglobinuria.

In general, transfusions are better tolerated at slower rate, while respecting a 4-hour window (maximum time a unit should be kept at room temperature to limit risk of bacterial growth). In case of severe acute hemorrhage, the administration can be done much faster. In opposition, cardiac patients may receive their transfusion over two successive 4 hour-periods, while the rest of the unit is in the refrigerator. A hematocrit measurement should be taken 1 to 2 hours after the end of the transfusion.

4. Principles of blood compatibility: blood typing and crossmatch

It is strongly advised to determine the DEA 1 status of our donors and patients, since it is recognized has the most immunogenic and therefore most clinically significant blood group. Simple, fast and inexpensive blood typing methods are commercially available for DEA 1 blood typing, which are either based on agglutination reaction (RapidVet-H®) or immunochromatography technology (Alvedia®). Note that more extensive blood typing (other DEA, Dal antigen) can only be performed by certain specialized laboratories (eg Animal Blood Resources International, Inc., University of Montreal).

A crossmatch, which identifies circulating antibodies in the plasma, should be performed in dogs that have already received a blood transfusion (> 4 days previously). Although laborious, the crossmatch can be done in clinic with very little equipment. A major crossmatch, which is of up-most importance, consists in incubating a solution of washed RBC (blood donor) with the plasma (or serum) of the recipient. Commercial crossmatch kits based on a gel reaction (RapidVetH-Crossmatch) or immunochromatography (Alvedia Canine Crossmatch test) are now available and may facilitate interpretation.

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WSV - 107

THE PATHOPHYSIOLOGY OF PERIODONTAL DISEASE

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Periodontal disease is the most common infectious disease in both humans and pets. It is by far the most commonly seen oral problem, suggesting that our current preventive measures are either not widely practiced, or are not widely successful. Periodontal disease can be briefly described as inflammation leading to recession of the periodontium (tissues surrounding the teeth). However, the process that causes this disease is complex.

The Pathology of Periodontal Disease

After a meal, naturally-occurring microorganisms in the mouth mix with salivary glycoproteins (the pellicle), polysaccharides from ingested food, and other oral contents such as sloughed epithelial cells and white blood cells. This mixture forms plaque, a soft, sticky substance (or biofilm) that adheres to the tooth's surface. This soft plaque is initially confined to the tooth's crown, and contains predominantly Gram-positive, non-motile, aerobic cocci. When these Gram-positive, non-motile, aerobic cocci contact the gingiva, they stimulate an inflammatory response. Neutrophils engulf the bacteria, and when they become full, they burst, releasing toxins and enzymes that begin irritating the patient's periodontal tissues, causing inflammation of the gingival margin. This inflammation causes the attached gingiva to loosen from the tooth, creating a space between the tooth and the gingiva known as a periodontal pocket. The bacteria also secrete substances that improve the biofilm's adhesion to the tooth and protect the bacteria from antimicrobial agents – making the bacteria within this biofilm up to 1500 times more resistant to antiseptics and antibiotics than the same bacteria would be by itself. Oxygen is no longer able to reach the deepest layers of this thick matrix, so now the bacterial population begins to shift, with Gram-negative, anaerobic, mobile rods and filamentous organisms taking over. These anaerobes are more virulent than the surface-dwelling aerobes, producing endotoxins, which, along with the patient's own defense mechanisms, lead initially to soft tissue loss (or sometimes, gingival hyperplasia), progressing to bone loss, and eventually, tooth loss. This is known as attachment loss.

If plaque is not brushed off, within as little as 2-3 days calcium from food and saliva begin to mineralize it into a hard substance called calculusor tartar. Calculus itself doesn't cause periodontal disease, but it does have a very rough, porous surface that makes a great home for disease-causing bacteria.

Stages of Periodontal Disease

Periodontal Disease Index is scored by the amount of attachment loss. It is primarily determined by periodontal pocket depths and radiographic assessment of bone loss. There may be (and usually are) teeth with different periodontal indices within the same mouth.

PD0: Normal
-attachment loss is 0%
-no inflammation of the gingiva, it is pink, smooth, and lies flat against the teeth
-No treatment is required, but homecare should be initiated to maintain oral health
PD1: Gingivitis
-attachment loss is 0%
-gingivitis only
-there may be a slight increase in sulcus depth because of gingival swelling (pseudopocket) though no actual attachment loss has yet occurred
-bacteria at this stage are Gram-positive, aerobic, non-motile cocci
-this is the only stage of periodontal disease that is reversible!
-Treatment: dental prophylaxis to remove all biofilm and reverse inflammation, homecare
PD2: Early Periodontitis
-attachment loss is < 25%
-bacteria in subgingival regions are Gram-negative, anaerobic, motile rods
-pocket depth increases due to attachment loss
-crestal bonestarts to deteriorate
-Treatment: dental prophylaxis and closedroot planing. Perioceuticalscan be placed within the periodontal pockets to kill bacteria and help relieve inflammation. Homecare.
PD3: Moderate Periodontitis
-attachment loss is 25-50%
-bacterial population is almost entirely anaerobic
-alveolar bone start to deteriorate, leading to vertical bone lossand horizontal bone loss
-tooth roots may be exposed, and furcation exposure may be evident
-alveolitisor osteomyelitismay be present
-Treatment: frequent dental prophylaxis and periodontal therapy including open root planing.Homecare
PD4: Severe Periodontitis
-attachment loss is > 50%
-bacterial population is similar to PD3
-Tooth roots and root furcations are exposed
-Teeth may be mobile, some only held in position by calculus or granulation tissue
-Teeth with more than 50% attachment loss may not be able to be salvaged
-Treatment: assess whether each tooth can or should be saved.

Without intervention, periodontal disease will progress until the teeth exfoliate.At this point, since there is no longer any tooth surface for bacteria to cling to, the periodontal tissues can heal. Until such time, however, the patient suffers with chronic infection and oral pain. Bacterial infection in the mouth has also been shown to cause disease elsewhere in the body, such as endocarditis. Every time an animal with periodontal disease chews, tiny abrasions occur in the fragile, infected periodontal tissues. Capillaries in these abrasions rupture, allowing bacteria to enter the bloodstream and settle in the valves of the heart, the kidneys, or the liver. This is especially dangerous in patients whose health is already comprised, such as diabetics, the immunosuppressed, or those in poor body condition.

Contributors to Periodontal Disease

There are several factors which can predispose a pet to periodontal disease, or worsen existing disease.

1)Crowded teeth: most often seen in small or short-faced breeds such as Yorkshire Terriers, Pugs, Shih Tzu's, Chihuahua's, and cats such as Persians and Himalayans. These pets have been selectively bred by humans for their small size or flat faces, but unfortunately the size of their teeth has not decreased sufficiently to fit well within these smaller mouths. Because the jaws are too short to contain all of their teeth, the teeth are often rotated and crowded together. Crowded teeth tend to develop more tartar, and severely crowded teeth often do not have enough room between them for gingival tissue, allowing food particles and bacteria a path straight to the bone.

2)Retained (Persistent) Deciduous Teeth: most often seen in canine teeth. This is a variation of crowded teeth, since the adult canine tooth and its deciduous counterpart erupt extremely close together. We have all seen the tartar (and often hair or other debris) that gathers between a permanent canine tooth and its retained deciduous. As in the case of severely crowded teeth, no protective gingiva exists between these teeth, and infection can quickly spread to the bone around the root of the adult tooth.

3)Malocclusions: Teeth that are not in their proper position in the mouth can develop more tartar, as the forces of chewing and saliva flow help keep the teeth cleaner in a mouth which has a normal "pinking shears" occlusion.

4)Supernumerary Teeth: extra teeth in the mouth, which is a common genetic abnormality in some dogs such as Boxers, can cause crowding and all of the problems that go along with it.

5)Enamel Hypocalcification(also referred to as enamel hypoplasia): a condition of poorly mineralized tooth enamel, usually due to the young animal developing a high fever or illness during enamel formation. This hypocalcified enamel is often soft, discolored yellow or brown, and prone to flaking or pitting. Teeth with enamel hypocalcification tend to accumulate plaque and tartar faster than teeth with normal enamel because of their rough surfaces. Note: animals with enamel hypocalcification may also have highly sensitive teeth because of exposed dentin, and often do not tolerate tooth brushing.

6)Diet: animals fed soft food only may have a higher incidence of periodontal disease than animals fed a dry or mixed diet (in the absence of dental home care)
7)Malnutrition, Physical or Psychological Stress: these factors have been implicated in impairing the body's ability to mount an immune response.
8)Genetics: some pets appear to have a natural resistance to periodontal disease, while others have extreme susceptibility. This may be due to the immune system's ability to cope with oral bacteria.
9)Other Factors: include chewing habits, architecture of the mouth, saliva flow, and general health status.
Clinical Signs of Periodontal Disease
-halitosis(this is by far the most common reason pet owners present their animals for oral examination)
-red, inflamed gingiva (common, less often noted by owners)
-increased drooling, or blood in the saliva (not common)
-pawing at mouth (rare)
-difficulty eating (very rare, though many animals will prefer soft food if available)

Most pets hide their pain (a survival trait that pet owners often mistake for a lack of pain – don't make this assumption!) and will continue to eat even while their teeth are rotting out of their mouths. Their drive to eat will only lessen when they are in unbearable pain or are becoming acutely ill. Many owners believe that halitosis and tartar accumulation are natural for their pets, and have no idea that this indicates a disease process is occurring. It's our job to educate them.

WSV - 064

WHEN LOOKS GO BEFORE HEALTH - THE WELFARE IMPACT ON DOGS WHEN BREEDING FOR EXTREME CONFORMATION

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The breeding of dogs with excessive traits and the impact on their health and welfare has increasingly come into the spotlight over recent years. There has been an explosion in the popularity of certain breeds with exaggerated traits, especially of those with extreme brachycephalic conformation. While often popular with the public, such a conformation can lead to severe health and welfare issues. Although many good breeders and breed clubs work closely together with veterinarians and other stakeholders to improve the current situation, unfortunately this increased demand has also lead to an escalation of numbers of dogs produced by unscrupulous breeders or puppy farms, with little concern about the health and welfare of the dogs.
The purpose of breeding dogs is to produce offspring with specific characteristics. The Fédération Cynologique Internationale (FCI) currently recognises 344 breeds, the American Kennel Club recognises 193 breeds and the Kennel Club in the UK 210 breeds. However, not only purebred dogs are bred selectively: crossbreds can be created to aim for a certain look and/or behaviour, sometimes referred to as 'designer breeds'. Originally, selective breeding was directed towards the abilities of the dog, for hunting, guarding and herding. Since the mid-19th century, dogs have been increasingly kept as companion animals. This meant selection has become more and more focused on the appearance and on the 'popularity' of certain breeds, with little or no emphasis on performance, health or longevity.

Selective breeding has many advantages. It maintains a diversity of breeds creating a wide variety in appearance, temperament, function and utility; factors that all play a role in human–animal interactions. It allows potential dog owners predict to some degree what kind of animal they buy. The natures of randomly bred dogs are less predictable, which may have implications for the relation between the animal and its owner. Careful selection can also eliminate or reduce the prevalence of certain diseases.

However, selective breeding can also have a negative impact on the health and welfare of the dogs, for example when selecting for certain traits, such as short muzzles, excess skin, dome-shaped heads, 'droopy' eyes and sloped back. It can lead to severe health and welfare issues for the dogs involved.

Worldwide many veterinarians, and also breeders, are concerned with the declining health of dogs that are selected for extreme traits. However, as many of them still breed or are involved in breeding for extreme traits, it seems there is a lack of awareness.
Do we, vets, bury our head in the sand? Do we unwittingly highlight the positive aspects of certain breeds and ignore the negative ones because they are such great dogs? Do we normalise breed-related health and welfare problems and consider or see it as being 'typical for the breed'? Or do many of us try, but are we often demotivated because it is so difficult to get such an unpopular message across?

To raise awareness amongst veterinarian and to encourage vets to speak up, this lecture gives an overview of the welfare impact of some of the most common 'groups of breeds' or breeds that are bred for their looks. The lecture will not go into different diseases, nor does it suggest being a complete overview.

Brachycephalic dogs

Probably the first ' group' of dogs that comes to your mind when talking about breeding for looks are the brachycephalic dogs. The popularity of these breeds has exploded in recent years. There are lots of breeds in this 'group', but the most popular ones in large parts of the world are the French bulldog, the pug, and the English bulldog. Brachycephalic dogs have a short skull shape, it looks like part of the skull is amputated, but most soft tissue structures of a non-brachycephalic dog are still present in a brachycephalic dog. Needless to say, it does not fit anymore and causes major obstructive problems also known as Brachycephalic Obstructive Airway Syndrome (BOAS). Unfortunately, owners often do not recognise the clinical signs of BOAS leading to major welfare problems for the dogs involved.
Other non-respiratory problems we often see in brachycephalic dogs are for example eye disease, inability to mate or to give birth, skin infections and dental problems.

The German shepherd

German Shepherds are among the most popular dogs in the world. For the last hundred years, broadly speaking the breed has developed in two directions: a working line German shepherd and a show line German shepherd. In case of the show line dogs, looks clearly went for health. In these dogs, we see a steeply sloping back and very angulated hindquarters often leading to orthopaedic complications. The opposite occurred in the working line; these dogs were not selected for their looks and have a straight back and less angulated hindquarters.

Toy breeds

'They come in enough shapes and coat types to satisfy any preference, but all toy dogs are small enough to fit comfortably in the lap of their adored humans.› This is stated on the American Kennel Club site. It is evident, although selected for numerous reasons, looks comes first. One of the problems is the size of the dogs. It has become popular to produce increasingly unnaturally small and fragile dogs to fit the owners' lifestyle (and/ or handbag). Some of these dogs, like the famous Chihuahua and the Yorkshire terrier, have amongst other problems a higher than average incidence of hydrocephalus. An even more extreme example is the Cavalier King Charles Spaniel. Their brain size has remained that of a bigger dog, and their skull has become smaller and domed. In many Cavalier King Charles Spaniels, it leads to Chiari-like malformation and Syringomyelia that are complex conditions that affect the brain and spinal cord. In mild cases, the only visible symptom can be the scratching of the back of their necks, while in severe cases dogs scream in pain.

Giants

Breeding for extremes is indeed the cases in giant dogs like the Great Dane, the Newfoundland dog, the St Bernard, the Leonberger, the Mastiff, the Bernese Mountain dog and the Irish wolfhound. Size comes with health issues, and therefore the average life span of a giant breed lies far below that of smaller breeds. Giant breeds die young. You may say, we have accepted it; many do not consider it young, but normal to the breed…

Low and long backs

'It is important to bear in mind that this is a working hound and must be fit for purpose therefore should be strong, active and capable of great endurance in the field' is stated in the Basset hound FCI standard 2011. However, their short legs combined with a long back are not really an example of good engineering. It puts the spine under much stress, which predisposes these dogs to invertebral disc extrusion. Dogs like the Basset hound and dogs like the Dachshund are deliberately bred to have a genetic deformity, chondrodysplasia. In time their legs became even shorter, and a more extreme deformity became the standard.

Dogs with to much skin

Dogs with droopy faces, like the fearless Neapolitan mastiff and the powerful Dogue de Bordeaux are some of the worst affected dogs with skin and eye problems, but are considered to be good-looking. A Chinese Sharpei, with loose folds of wrinkled skin and deformed eyelids, is considered to be very cute. And what about the always popular and playful boxer? Due to the conformation of the head with long loose lips, it is not uncommon for them to drool. In fact, most people consider it to be normal to the breed.

The issue of extreme conformation does not just affect brachycephalic breeds. Apparently, a lot of people still find excessive traits attractive. But, we should realise that these great dogs are totally dependent on humans. If we choose to breed selectively, we also have to take our responsibilities. We should not accept that their appearance is more important than their welfare, nor should we deny that some traits that are considered to be normal to the breed are in fact defects.
No one could disagree that health should always go before looks!

WSV - 307

FAST LOCALISED SONOGRAM OF THE HORSE: HOW TO USE THE ULTRASOUND IN YOUR COLIC DECISION-MAKING

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Learning objectives: be able to quickly collect accurate information with your ultrasound, and how to use this information to make treatment decisions for colic cases.
Technical considerations: Similar to the complete abdominal ultrasound evaluation, a large curvilinear (2-6 MHz) transducer is required. Horses with a sport clip frequently don't require additional clipping. In horses with thick hair, consider finding the pre-defined windows by soaking the hair in alcohol and deciding whether clipping specific areas is needed.

The Fast Localized Sonogram of the Horse (FLASH) is a sonographic protocol developed to identify key locations to obtain important information rapidly in cases of colic(1).

The FLASH is relatively straightforward and easy to learn and as such readily applicable in equine practice. It does require image recognition of the classic abnormalities, and this session provides an opportunity to review these classic and less classic abnormal images.
Duodenal window:

Where? Right dorsal 17th-16thintercostal spaces
What? Duodenum ventral to the right kidney
Normal: duodenum present, filled with content, normal motility (can be affected by sedation)
Abnormal: fluid-filled non-motile duodenum
-> Suggestive of anterior enteritis but a proximal obstructive lesion is possible

Right mid window:
Where? Right mid 14th-12thintercostal spaces
What? Tip of the liver, right dorsal colon and right ventral colon
Normal: Tip of the liver, right dorsal colon and right ventral colon
Abnormal: presence of a dilated blood vessel (> 1 cm)
-> Right dorsal displacement

Ventral window:
Where? Cranial ventral abdomen
What? Ventral colon
Normal: wall thickness < 3 mm, small amount of anechoic fluid
Abnormal: wall thickness > 9 mm, medium to large amount of anechoic fluid, any amount of echoic fluid

-> Colon torsion
It's important to note that other diseases can cause large colon thickening such as inflammatory bowel disease or lymphoma, however these cases typically don't present with acute colic and as such patient selection is important when applying this rule. Typically, the thickened colon wall of a colonic torsion has an edematous corrugated appearance, whereas inflammatory bowel disease and lymphoma cause cellular infiltration of the submucosa. This difference is however not always appreciable.
Look for small intestine in the inguinal area
Normal: motile filled with content, wall thickness < 3 mm
Abnormal: amotile, distended (> 6 cm), thick walled (> 3 mm)

-> Small intestinal lesion
It's not possible to distinguish anterior enteritis from surgical small intestinal lesion in 100% of the cases. Data from the original FLASH paper found distended small intestine to have good sensitivity and specificity for the need for surgery. Dilated loops of small intestine were seen in 8 horses with a strangulating lesion but also 1 horse with proximal enteritis(1). Findings in favor of proximal enteritis include distended loops with decreased but some motility. Findings in favor of a surgical lesion include a population of distended small intestine with a normal wall thickness and another population of small intestinal loops with a thickened wall, representing the strangulating portion(2). However, horses with proximal enteritis can have thickened small intestinal wall and the enteritis can be segmental. As such, the sonographic findings should be used in conjunction with clinical and clinicopathologic data to make the choice for surgical versus medical management in small intestinal lesions.

Gastric window:
Where? Left mid 10th-15thintercostal spaces
What? Stomach and spleen
Normal: stomach covering 5-6 intercostal spaces, containing food and gas
Abnormal: large fluid-filled stomach
-> Gastric intubation needed. If large content-filled stomach: consider gastric impaction.
Nephrosplenic window:
Where? Left paralumbar fossa and 17th-16thintercostal spaces
What? Left kidney and spleen
Normal: kidney adjacent to the spleen, normal rounded dorsal border of the spleen
Abnormal: kidney obscured by gas shadow from gas within the colon, horizontal dorsal border of the spleen created by gas shadow of gas within the colon.

-> Nephrosplenic entrapment

The inability to image the left kidney is suggestive of nephrosplenic entrapment but can also be seen with other displacements. In addition, false positive results have also been reported(1,3).

In conclusion, the FLASH provides critical information that assist decision-making in colic cases. However, the findings should be interpreted in conjunction with findings of the clinical exam, transrectal palpation, blood work and results of the abdominocentesis to form a complete picture.

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WSV - 121

INTERVENTIONAL RADIOLOGY & ENDOSCOPY: DIAGNOSTICS TURNED THERAPEUTICS!

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Interventional radiology (IR) and interventional endoscopy (IE) use various imaging modalities to allow guided therapeutics. Traditionally, imaging and endoscopy have been used for diagnostic purposes. This specialty uses images to guide interventions and are therefore at once diagnostic and therapeutic. IR & IE offer minimally invasive treatments for a variety disorders. Small to no incisions, decreased pain, shorter anesthesia times, faster recovery and few post-operative limitations are some of the advantages. In some cases, IR & IE can be used when no good standard of care options are available (for example transjugular coil embolization of an intrahepatic shunt that cannot be reached in surgery, chemoembolization of nonresectable tumors). IR & IE also offer lots of interesting options for exotic, zoo and farm animal patients.

The main disadvantages of IR & IE are the advanced materials and technical expertise required to perform many of the procedures. An initial large investment is necessary to start offering IR and a steep learning curve exists. Therefore, limited availability for some of these procedures has been problematic in veterinary medicine. As the demand grows, training of professionals and availability will likely increase. A dedicated textbook and society (Veterinary Interventional Radiology and Interventional Endoscopy Society www.viries.org) exists1. The Society's mission is to promote training and research in IR & IE.

Veterinary IR & IE has primarily focused on the development of procedures for the urinary tract, respiratory tract, and the vascular system.
Urinary Tract/Endourology
Endourology refers to the specialty of urology in which endoscopes, fluoroscopy and other instruments are used to access, under direct visualization, structures inside the urinary tract. The entire urogenital system can be accessed from the vulva, through the urethra, into the bladder, up the ureter and into the renal pelvis. As opposed to traditional surgery, access is most commonly achieved through natural orifices and the procedures are done internally either without or with minimal external incisions. The following algorithm can be used to aid in the decision making process.

Figure 1. Decision making algorithm in the evaluation of a patient with urinary tract disease.

Some upper urinary tract interventions that will be presented: percutaneous nephrolithotomy, ureteral stenting, subcutaneous ureteral bypass, extracorporeal shock wave lithotripsy.
Some lower urinary tract interventions that will be presented: intracorporeal lithotripsy, urethral stenting, laser ablation of ectopic ureters, laser ablation of bladder/urethral masses, percutaneous cystolithotomy, hydraulic occlude, cystoscopic urethral bulking agents2,3.

Respiratory Interventions

The respiratory system can be readily accessed by endoscopy in most dogs and cats. Laser turbinectomy, nasopharyngeal stenting, tracheal and bronchial stenting will all be discussed1.
Vascular Interventions
The central venous and arterial systems are readily accessible through access to the femoral artery/vein, jugular vein or carotid artery. The portal vein can be accessed in the presence of portocaval shunting. The treatment of vascular occlusions (thrombectomy, angioplasty, stenting) will be discussed4,5.
Other species
IR & IE procedures can often be done in farm animals under sedation and an epidural, thus avoiding general anesthesia. Zoo animals can greatly benefit from the short recovery times and lack of post-operative care. Reptiles can be treated through their natural orifices thus avoiding prolonged incision site recovery and avoiding cutting the plastron in turtles and tortoises. Ureteroscopy and lithotripsy in pigs, goats, horses, guinea pigs and ferrets will be presented along with tracheal and ureteral stenting in ferrets and rabbits6,7.

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WSV - 298

REMARKETING, CTR, META TITLE, DISPLAY NETWORK: UNDERSTANDING THE MARKETING KEYWORDS TO COMMUNICATE BETTER WITH MARKETING EXPERTS

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Technology and Web marketing are growing at an almost inconceivable rate. Even if you want to avoid it or it carries no interest to you, veterinary practice does not escape its influence. You will surely encounter some terms during your interaction with a Web service provider or your information technology (IT) technician. Here is a small glossary of terms that will become more and more frequent, with concrete examples in our field.

TECHNOLOGIES
API (Application Programming Interface): An API is a programming interface that allows you to “plug” into an application to exchange data between two software or systems.

Let’s say you want to use your customer emails to send messages by MailChimp. There is probably an API that allows you to connect the cloud management software of patient records to MailChimp and to transfer data. Programmers are fond of APIs; it saves from transferring data manually which carries lots of risks. An API is not necessarily compatible with all software. But when it works, it saves a lot of time.

Chatbot: With artificial intelligence being more accessible, there are now many software programs that allow to automate an exchange between a system and a human. It’s a conversational agent that can sustain an intelligent conversation according to words it recognizes. Amazon’s Alexa or Siri are examples.

They have the advantage of being always available and they can automate some services. In veterinary medicine, it is mainly in Messenger that these bots are appearing. They will have the beneficial effect of reducing the waiting time of people who call to the clinic. In times of skilled labour shortages, it would be wise to exploit this avenue.

Cloud Computing: This refers to a way of storing information or transforming it by an entire infrastructure that is not on the premises of practice, but rather remote, example: transport by Internet, servers which are hosted in highly secure buildings and in controlled conditions, and different access points (computer, cell phones, tablets).

Why? Oh, how simpler life is in a cloud! This technology is so popular that Amazon Web Services (AWS) is aiming an income of $42 billion US annually for 2020.

Benefits:
Updates are done automatically with minimum downtime.

You can adjust the capacity of storage of the server with a few clicks, for a much more affordable cost than installing a server.

Servers such as AWS or Google Cloud are much more secure than what you have in the clinic.
In case of fire, theft or water damage, your data is safe.
Your data is accessible remotely, and not necessarily with a VPN.

SaaS (Software as a Service): Rather than buying a software and installing it on your computer or server (e.g.: Antidote or Vetware), you use the services remotely and usually pay as a monthly or annual package (e.g.: VetUp).

Open Source: These are software that have been developed by a community and whose code is public and accessible to all (e.g.: WordPress, the most popular website platform, or Moodle, the online training platform), as opposed to software that are proprietary or closed source.

For programmers, this concept of Open Source is very interesting, because they, like Lego®, can take a code and improve it, change it, adjust it to their needs. They don’t start from scratch; this process saves them time.
WeTransfer (wetransfer.com): It is a Web platform that allows sending easily and for free files that are too large for an electronic messaging system. Do you have pictures of your team or business to share with the agency that is building your website? This is an essential tool!

MARKETING
Ad Copy: This is the ad text, quite simply. It refers to the words and not the graphics or the URL. If you do Google Ads advertisements, it is the visible text when your ad appears in a search.
Always review the text you are offered for quality of language and also accuracy. We regularly see ads with mention of grooming or obedience class services, despite the business not offering them.

Audience: You might be asked in a paid advertising context on Facebook/Instagram: to which audience do you wish to broadcast your ad or sponsored posts? Facebook ads Manager allows you to establish audiences (characteristics for a group of individuals) and save them for later use. You can choose according to location, gender, age, interests and job title.

You will have the burden of explaining to the person who will schedule your campaigns what your audience should be; at the very least, define your territory, gender, age. If your criteria are too broad, you are wasting your resources.

B2B (Business-to-Business) or B2C (Business-to-Consumer): This defines who your customers are to you: are they consumers or other businesses? Here are some examples:

B2B: Zoetis towards veterinary schools;
B2C: a veterinary clinic towards pet owners.
Brand book or branding: These are the graphic sets of rules (logo, colours, font) that defines your company. You should have all these elements in an easily accessible file. If you have employees that make graphics on a free and friendly site like canva.com, they should be aware of your branding. Your image is your signature.

CPC (Cost-per-Click - CPC) and PPC (Pay-per-click): CPC is the amount paid by an advertiser to a search engine or a site editor for a click that brings a visitor from the link of an advertisement (text, image, video...) to the site of the advertiser.

PPC is a general term that includes methods for paying for ads according to the number of clicks compared to advertisements paid when an amount of viewed time for a video is reached (example: YouTube) or by the number of impressions from a graphic.

CTR (Click-thru-rate): This is one of the most important indicators to determine if an online advertising campaign is working. Representatives of Yellow Pages can tell you about the number of impressions (number of times your ad appeared), but if users don't click on it, that ad isn't useful. The average varies according to the type of ad. For Google Ads in the Search Network ads, it comes to a 2.02% average for all industries combined.

Display Network: Google Ads program offers different ways of advertising. The most used by veterinarians is the Search Network, where ads in the form of search results appear at the top of a list. The display network is another category of ads available where graphics appear throughout browsing websites. They are in the form of banners at the top or on the sides.

Landing page: This is the specific page on which the user arrives when he clicks on an advertisement. It must be connected to your ad. If you're talking about ticks, your landing page must talk about that too.

Long-tail Keyword: This trendy concept may sound intimidating, but it is actually a very simple one: these are key expressions rather than single words.
Faced with immensity of the Web and also the emergence of voice search, it is more natural to search with an expression (e.g.: "veterinarian Toronto inexpensive" rather than simply "veterinarian"). It is often a combination of the words: "veterinarian + locality + desired service.

Retargeting (remarketing): it is an advertising process by which you target users who have already visited your site through the use of cookies (small codes that identify the device to the user). It is very common on Google and Facebook. Ex.: You want to buy a new KitchenAid food processor on Amazon and realize that it «follows you» everywhere on the Web and on Facebook. Amazon hopes to «wear you down» in a moment of decision-making fatigue and that you will succumb to the temptation.

WEBSITE

Meta Title: this is the title of the Web page. Meta title tags are a major factor in helping search engines understand what your page is about, and they are the first impression many people have of your page. They are used on the search engine results pages (SERPs).
Google Analytics (GA): This is a software developed by Google that allows you to see traffic and behaviour statistics of users on your website. This is different from Google My Business. To plot this data, the GA account number must be added to your website. To find it, hover your mouse on your website page and right click on «view source code." Press Ctl + F: find UA. Your account number will look like UA-12345678-1.
CMS (Content Management System): This is the interface that allows you to change the content of your website. Ideally, it should be simple to use. It allows you to make changes yourself (opening hours, employee picture, new services) without asking a programmer.

Facebook Pixel: Here's how Facebook explains it: when a person visits your website and performs an action (for example, by buying something), the Facebook pixel fires and reports this action. This way, you will be able to track the actions a customer takes after seeing your Facebook ad. You can also reach this client again by using a custom audience. In concrete terms, it is a small piece of code that you will find in your Facebook Ads Manager and you will install on your website.

WSV - 365

ASKING THE RIGHT QUESTIONS THE RIGHT WAY - HISTORY TAKING FOR FELINE BEHAVIOR PROBLEMS

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Objective Statement:

The goal of this presentation is to improve history taking skills which are necessary for examination and creating a behavior problem list. Communication skills as well as knowledge about how and what to ask during an appointment are discussed. Specific questions vary depending on what type of problem will be addressed; however, the general framework provided in this presentation will allow a clinician to create a complete behavior problem list.

History Taking:

Taking a history from a client is a necessary skill for any practicing veterinarian, no matter the discipline. But especially in behavioral medicine, compiling a complete history and detailing the results of behavioral observations are the main aspects for reaching a diagnosis. Hence, a large portion of any behavior appointment is dedicated to getting the complete history. A good history will allow the practitioner to identify all the problems, continue on the path to create a list of differentials, which will eventually lead to the road that takes the clinician to the destination – the diagnosis, hopefully. History taking skills require communication skills as well as knowledge about what to ask, when to ask and how to ask it. Asking the right question or asking the question in the right way will help tremendously in reaching conclusions, because not many diagnostic tests are available to the veterinary behaviorist. Most veterinary behaviorists require the clients to fill out a lengthy history form (example: https://www.sfspca.org/behavior-training/behavior-consultations) and will review them prior to meeting with the client and the patient to save on appointment time. This process also helps greatly for asking specific questions in order to arrive at a diagnosis efficiently in the time allotted for the appointment. The goal of this presentation is to lead the practitioner to the path of a behavior diagnosis with the treatment as an outcome goal.

A: Opening:

Introduce yourself. Chances are the client knows who they are coming to see; however, it is good “bed-side manners” to introduce yourself first and explain to the client how the appointment will be structured. You are setting the expectations from the start.
Signalment: Identify your patient: age, breed, and weight are important data and can affect your differentials, diagnosis and/or your prognosis.

B: Exploration

Presenting complaint (PC): This is what the client tells you is wrong with the patient.

History of presenting complaint (HPC): Gain as much information you can about the specific complaint(s). Determine trigger(s) that elicit the behavior(s): try to be as specific as possible, (e.g. a large male wearing a hat and carrying a garbage bag coming from the front) Determine the threshold: at what level does the behavior NOT occur? This is just as important as at what level the behavior does occur. Clients will often tell you the behavior happens “all the time” or “unpredictably”; it is your job to ask the questions to determine the situations or circumstances as to when the behavior does or does not occur. Open ended questions are preferred in the beginning stages of an interview as not to “lead” the client.

Body language ABC: the description of the body language before, during, and after the behavior problem occurs is very important. This information can be provided by verbal description from the client, observation of a video and/or pictures as well as by direct observation. However, aggressive incidents do not need to be “reenacted”. In most cases it would be unsafe and irresponsible to do so and it is not needed in order to develop a problem list or a list of differentials.
Past medical history (PMH): Gather information about the patients other medical problems (if any), prevention and vaccine history. Past or concurrent medical problems can directly affect your problem list, differentials and diagnosis.

Drug history (DH): Find out what medications the patient had been taking in the past or is currently taking, including dosage and how often they are taking them e.g. once-a-day, twice-a-day, etc. including any OTC, herbal, homeopathic or other products which have or have not worked for the patient. Past or concurrent medications can directly affect your differentials and your treatment plan.

Find out if the patient has any food restrictions or other allergies.
Family history (FH): Gather some information about the patients and the family’s daily routine such as feeding schedule, sleeping location, exercise.
Training history (TH): This is the opportunity to find out a bit more about the patient’s training background. What commands and tricks can the patient do and what training methods were used to train. The use of confrontational techniques used in the past can directly affect your differentials and diagnosis.

C. Summary of history

Review: Complete your history by reviewing what the client has told you. Repeat back the important points which lead you to creating your problem list, so that the client can correct you if there are any misunderstandings or item missing. This does not mean that you will be addressing each and every problem in your initial appointment but it does allow you to discuss priorities of the problems. Often the priorities of the client and the priorities of the severity of the problems are not the same and the client needs to be educated. By summarizing the important points you will be able to find any discrepancies and will avoid non-compliance, or even frustration.

Goals and expectations: Review the client's goals and expectations for the consultation. It is often a good idea to ask what the precipitating event for this consultation is. Many problems have been ongoing for years and a change in environment, routine or social events might elicit the consult with specific needs for the client. A good acronym for this is ICE - Ideas, Concerns and Expectations.

Patient questions/feedback: During or after taking the history, encourage the client to ask any questions they may have.

D. Closing

When you are satisfied that you have all of the information you require in order to complete your problem list and reach a diagnosis, you will summarize your assessment and explain your diagnosis. You will discuss the steps of the treatment plan. You must consider the safety issues and recognize the client's limitations (emotional, environmental, financial, time restrictions, other family member's views). Client's compliance, or lack thereof, should be acknowledged and understood, otherwise might lead to frustration of everybody involved. A client that fully understands all aspects of the treatment plan has increased chances for compliance. You need to set expectations and a schedule for any required recheck visits. Thank the client for their time and encourage them to follow up with you with any questions or concerns.

Landing page: This is the specific page on which the user arrives when he clicks on an advertisement. It must be connected to your ad. If you're talking about ticks, your landing page must talk about that too.

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WSV - 072

FRACTURE DECISION MAKING

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A fracture is a failure of a rigid structure called bone. Fracture is the result of a force that exceeds the resistance of bone. If we examine the force/deformation curve, the curve is characterized by a zone of elastic deformation, a zone of plastic deformation and finally, structural failure.

The slope of the area characterized by elastic deformation is called Young's modulus of elasticity. Cortical bone, just like glass, can withstand a great amount of force with minimal displacement. Eventually, it shatters!

There are 5 types of forces that can apply to bone and that with act on a fracture once it is reduced:
Traction, compression, angulation, rotation, shear
***The goal of fracture fixation is to make the inventory of the forces responsible for the loss of reduction of fractures and then, neutralizing them!

Compression Traction Angulation Rotation Shear
To neutralize the different forces that act of a fracture, several implants can be used. Here is a non-exhaustive list of implants/devices and the forces they can neutralize:

	COMPRESSION	TRACTION	ANGULATION	ROTATION	SHEAR
CAST	-	-	+	+/-	-
PINS	-	-	+	-	+/-
MULTIPLE PINS	-	-	+	+/-	+/-
PIN/PLATE CONSTRUCT	+	+	+	+	+
CERCLAGE	-	-	-	+	+
TENSION BAND WIRE	-	+	-	-	-
DIVERGING K-WIRES (3)	-	+	-	+/-	-
EXTERNAL FIXATOR	+	+	+	+	+
BONE PLATE	+	+	+	+	+
LOCKING PLATES/ DEVICES	+	+	+	+	+
LC-DCP, ALPS, PAX,FIXIN, SOP	+	+	+	+	+
INTERLOCKING NAIL	+	+	+	+	+
LC-DCP, ALPS, PAX, FIXIN, SOP	+	+	+	+	+

PRACTICAL APPLICATION OF THESE PRINCIPLES

CASE 1)
Closed transverse diaphyseal fracture of the tibia
Forces to neutralizeImplants/devices
Implants devices
Multiple IM pins
IM pin and external fixator
Interlocking nail

CASE 2)
Closed long oblique/spiral diaphyseal fracture of the femur
Forces to neutralizeImplants/devices
Shear +++cerclage wires
Implants devicesCombination of
Cerclages and IM pin
Cerclages and plate/screws
Cerclages and external fixator

CASE 3)
Closed comminuted diaphyseal femoral fracture
Forces to neutralizeImplants/devices
Shear +++Plate, locking devices, interlocking nail, external fixator
Pin/plate construct
Implants devicesCombination of
Cerclages and IM pin
Cerclages and plate/screws
Cerclages and external fixator

CASE 4)
Closed long oblique distal diaphyseal fracture of the humerus
Forces to neutralizeImplants/device
Shear +++

CASE 5)
Closed short oblique proximal diaphyseal fracture of the tibia
Forces to neutralizeImplants/device
Shear +++no cerclages…

CASE 6)
Salter Harris type II of the distal femur
Forces to neutralizeImplants/device
Shear -

CASE 7)
Femoral trochanteric osteotomy
Forces to neutralizeImplants/device
Shear +

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THORACIC ULTRASOUND IN ADULTS AND FOALS

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Learning objectives: being able to recognize and interpret the abnormal images found on thoracic ultrasound evaluation of the horse.

Technical considerations:
A probe with a frequency between 6-14 MHz should be selected. In most adults and foals the pleural surface can be adequately imaged with a linear probe. The large curvilinear probe (2-6 MHz) is sometimes needed to penetrate deeper if extensive lung pathology is present. For the cranial mediastinum, the large curvilinear probe is needed. Horses with a sport clip frequently don't require additional clipping, but horses with thick hair will need clipping. The hair and skin are saturated with alcohol and then ultrasound gel is applied.

Normal findings
Evaluation of the normal lung is limited to the pleural surface, since the ultrasound beam is unable to penetrate the air within the lung. It's important to realize that minimal peripheral air is required to obscure underlying pathology. As such a "normal lung ultrasound" really means "normal pleural surface" and doesn't exclude deeper pathology. the cranial mediastinum can be imaged from the right side in the horse, ether angling the probe cranial under the triceps muscle from the 3rdintercostal space (this requires the horse to be cooperative and stand with the right leg forward), or through the triceps muscle over the level of the 3rdintercostal space. In the normal mediastinum, an echoic mediastinal septum can be seen and in some case heteroechoic pericardial fat can also be present(1).

Abnormal findings
Pleural space: scan for free pleural fluid (>3.5 cm of fluid is considered abnormal) note the depth and high on the chest for monitoring, and check for a lack of normal gliding motion between the parietal and visceral pleura. Although pneumothorax is uncommon in adult horses, ensure the air is contained within the lung and not the pleural space. Pleural irregularities will cast an acoustic shadow ("comet tail"), and this is a very non-specific finding which can be associated with a pleural scarring, viral or bacterial infection,

Pulmonary pathology: scan for anything that is not air, this includes hypoechoic lung tissue, anecoic fluid with or without echoic gas bubbles characteristic of pulmonary abscesses.

Foals
In addition to the abnormalities described above, foals are more prone to rib fractures and pneumothorax.
Rib fractures: ultrasound evaluation is more sensitive then radiographs at detecting rib fractures(2). For this, a high frequency linear probe is used to evaluate the surface of each rib, scanning for a lack of continuity in the surface.
Pneumothorax (often as a result of a rib fracture), can be imaged in the dorsal aspect of the thorax, although if the foal is lying down this may be altered. The air contained within the normal pleura moves rhythmically with respiration, so scanning carefully from dorsal to ventral, a transition can be seen between dorsal still air and ventral moving air within the lung. In addition, if pleural irregularities are present, these will cast small acoustic shadows, which are useful to identify air that is within the pleura.

Pulmonary abscessationis an important component of Rhodococcus equi pneumonia. Ultrasonography has been used as a screening tool for early detection of infection and treatment with antimicrobials has been instituted in foals with pulmonary abscesses. However, not all foals with pulmonary abscesses require antibiotics. A first study showed that foals for which the sum of the diameter of the abscesses was 10 cm or less, recovered without treatment(3). A second study showed that foals that developed clinical signs an required treatment had diameter sums of 20 cm or more(4).
In conclusion, thoracic ultrasound evaluation provides valuable information that affects the patient's treatment plan. However, it's important to interpret these findings with solid knowledge of the limitations of thoracic ultrasonography.

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LASER SURGERY OF THE URINARY TRACT: THE FUTURE IS NOW!

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The introduction of laser surgery to veterinary medicine about 15-20 years ago has allowed the minimally invasive treatment of a number of a conditions that would otherwise not have been possible. Applications of laser surgery to the lower urinary tract will be covered in this talk.

There are 2 types of lasers commonly used for the urinary tract: 1. Diode laser: excellent cutting and coagulating capacities for soft tissue 2. Holmium Yag : good cutting and coagulating capacities and has the ability to fragment uroliths (lithotripsy).
Cystoscopy and intracorporeal lithotripsy
Indications : Urolith removal in female dogs and cats and some male dogs.

Male cats, small male dogs or patients with large stone burdens should undergo PCCL.
Intervention : Under general anesthesia, a retrograde urethrocystoscopy is performed. Smaller uroliths are removed using a stone basket. Larger uroliths are fragmented by a holmium: Yag laser. Direct contact of the tip of the laser fiber is required. Once fragments are small enough, they can be removed using the stone retrieval basket. Smaller fragments and debris can also be voided by urohydropulsion1,2.

Complications : Performing this procedure in a patient with a urinary tract infection is not recommended due to increased risk of urosepsis. Antibiotic therapy based on culture/sensitivity is recommended for 5-7 days prior to performing this procedure.

Potential complications include urethral tears, strictures and bleeding. Bladder wall damage and perforation are possible complications but can be limited by avoiding contact of the laser/lithotripter with the urethral or bladder mucosa. Risk of incomplete stone fragment removal is higher in males (20-30%) than in females due to the difficulty in removing stone fragments by voiding urohydropulsion in male dogs.

Cystoscopic-guided laser ablation of intramural ectopic ureters
Ectopic ureters are characterized by one or both ureters inserting at a site outside of the bladder. Intramural EUs enter the bladder wall normally but tunnel distally in the submucosa through the trigone before inserting caudal to the urethral sphincter. Extramural EUs bypass the bladder before ending caudal to the urethral sphincter.

The recorded locations of ectopia in females are the vesico-urethral junction, proximal portion of the urethra, mid-urethra, distal portion of the urethra and vestibule, with a majority (45.8%) identified in the distal urethra. In males, the vesico-urethral junction, preprostatic and prostatic urethra have been recorded with a majority (36%) identified in the preprostatic urethra.

Indications: As >95% of EUs are intramural in female dogs, cystoscopic-guided transurethral laser ablation of intramural EU has emerged as a minimally invasive alternative to surgical correction and become the standard of care. Male dogs may have a higher incidence of extramural ectopia and therefore a retrograde cystourethrogram is essential to confirm the intramural course of the ureter prior to laser ablation.

Intervention : Cystoscopy, vaginoscopy and fluoroscopy-guided retrograde cysto-urethro-ureterography are performed under anesthesia to identify the site of the ectopia, identify concurrent anomalies and confirm the intramural course of the ectopic ureter. A laser fiber, Holmium:YAG or diode, is inserted through the operating channel of the cystoscope. The medial wall of the ectopic ureter is transected until the ureteral orifice inserts cranial to the urethral sphincter well within the trigone. Correction of ectopic ureter in male dogs can be technically challenging and often requires a percutaneous perineal approach3,4,5.

Diagnosis of ectopic ureters is made/confirmed by cystoscopy and fluoroscopic-guided retrograde ureterogram. Advanced imaging, such as CT, is rarely required unless other anomalies are suspected (vascular). Dogs with EU frequently have various other anomalies of the genitourinary tract (e.g. vestibulovaginal remnants (93%), urethral sphincter mechanism incompetence (USMI), hypoplastic bladder, pelvic bladder). Incontinence may persist after the procedure because of these concurrent urinary tract anomalies.

Outcome : Cystoscopic laser ablation results in continence rates of 47% in female dogs 6 months following the procedure. Continence rates increase to 77% with the addition of medical, cystoscopic or surgical therapy for urethral sphincter mechanism incompetence. Success rates are higher in male dogs (83-100%). The procedure is well tolerated and can be done on an outpatient basis. Cystoscopic laser ablation has similar treatment outcomes as compared to open surgical management and recurrence of the ectopia and stricture at the site of the new ureterovesicular orifice, the main complication with surgical management, has been rarely reported.

Laser ablation of bladder/urethral masses
Indications : Laser ablation can be performed for debulking/removal of both neoplastic and benign bladder and urethral masses. Ablation may reestablish a urine stream in cases of complete malignant obstruction.
Intervention : Under general anesthesia and ultrasound guidance, the cystoscope is advanced to within 2 to 5 mm of the tumor to allow precise viewing and control of the laser fiber. Ultrasonographic monitoring to allow tumor ablation without penetration of the bladder or urethral wall (masses in the distal 2/3 of the urethra are not visible on ultrasound). The resulting denatured, avascular tissue will slough within several days. Either a diode or holmium:YAG laser can be used for ablation.
Complications : Perforation of the bladder or urethral wall can lead to tumor seeding of the abdomen and require hospitalization with a urinary catheter.

Prognosis:
Long term success with laser ablation of bladder and urethral polyps have been reported. Ablation of transitional cell carcinomas has been described and is referred to as UGELAB6. This procedure is considered palliative and chemotherapy should be maintained to improve outcome (mean survival time of 380 days). Despite relief of urethral obstruction, many dogs remain persistently dysuric and pollakiuric, which can improve over time. Bacterial cystitis (reported in 50% of cases postoperatively) or tumor regrowth/spread should be considered if lower urinary tract signs recur. Patients may undergo multiple laser treatments and follow-up ultrasound can aid in early identification of tumor recurrence.

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CLINICAL APPROACH TO CANINE IMMUNE-MEDIATED ANEMIA, INCLUDING BENEFITS AND RISKS OF TRANSFUSIONS

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Immune-mediated hemolytic anemia (IMHA) is one of the most common causes of anemia in dogs. IMHA may present as an idiopathic event (primary) or secondary to a variety of infectious diseases, neoplasia, drugs, vaccins or inflammatory process (Table 1). There is no single pathognomonic finding for primary IMHA. Therefore, a diagnosis algorithm was proposed including the following criteria(1):

- Anemia: PCV usually less than 25-30%
- Evidence of immune-mediated destruction (> or = 2 signs): spherocytes; positive saline test without washing; positive Coombs› test (or flow cytometry)
- Evidence of hemolysis (> or = 1 sign): hyperbilirubinemia, significant biliruburia or icterus without functional hepatic disease, post-hepatic cholestasis or sepsis; hemoglobinemia; hemoglobinemia; hemoglobinuria; erythrocyte ghost
- Elimination of underlying diseases that may cause anemia

TABLE 1 – CAUSES OF SECONDARY IMHA IN DOGS

INFECTIOUS DISEASE	**Ehrlichiosis/Anaplasmosis** **Babesiosis** **Mycoplasma hemocanis** **Leptospirosis** **Dirofilariosis** **Histoplasmosis**
NEOPLASIA	**Lymphoma** **Hemangiosarcoma** **Lymphocytic leukemia** **Gastric and pulmonary carcinoma** **Diffuse sarcoma**
DRUGS	**Trimethoprim-sulfa or other sulfanamides** **Penicillin** **Cephalosporins** **Levamisole** **Phenylbutazone** **Dipyrone** **Chlorpromazine** **Vaccins**

DIFFERENTIAL DIAGNOSTICS

Identifying and eliminating diseases that cause IMHA may attenuate or stop immune-mediated erythrocyte destruction, which will allow to avoid adverse consequences of long-term immunosuppressive treatment. For similar reasons, non-immune causes of hemolytic anemias need to be considered, for instance rare hereditary disorders (ex: PK or PFK deficiency), toxins (ex: zinc, acetaminophen, onion/garlic), severe hypophosphatemia (ex: DKA) and microangiopathic hemolytic anemias (ex.: heartworms, vasculitis, vascular and GI tumors).

HISTORY AND CLINICAL PRESENTATION

Predisposed breeds include English Spaniels, Poodles, Irish Setters and Collies, with American Cocker Spaniel representing nearly a third of idiopathic IMHA cases. Most studies show a higher prevalence in females. The average age is 6 years, but IMHA has been reported in dogs of all ages. Seasonality (spring and summer) has been suggested in some studies.

Clinical signs parallel the severity and progression of the anemia. Clinical presentation often includes collapse, weakness, exercise intolerance, lethargy, anorexia, tachypnea or dyspnea, vomiting, diarrhea and sometimes polyuria/polydipsia. Physical examination typically reveals pale mucous membranes, tachypnea, splenomegaly, hepatomegaly, icterus, pigmenturia (hemoglobinuria or bilirubinuria), fever and lymphadenopathy. A grade II-III/VI systolic murmur is frequently noted in dogs with a PCV < 20%. Petechiae, ecchymosis and melena may be present if the concomitant thrombocytopenia is severe.

DIAGNOSTIC

Complete blood count (CBC)

To evaluate the degree of anemia, a spun PCV is suggested because calculated hematocrit may be unreliable when agglutination is present.(1) Typically, patients with IMHA have a moderate to severe, highly regenerative, anemia. Blood smear evaluation allows the identification of signs of regeneration, including reticulocytes, polychromasia, anisocytosis and nucleated RBC. However, nearly 1/3 of dogs with IMHA are presented with a poorly regenerative anemia.

Spherocytosis is identified in 89-95% of cases. Because they are rounded, spherocytes appear smaller and darker than normal RBC with a lack of central pallor. Although their presence is not considered pathognomonic for IMHA, marked spherocytosis is certainly very suggestive of the disease.

Neutrophilic leucocytosis with a left shift is also frequently encountered in dogs with IMHA. When severe, leucocytosis is suggestive of tissue necrosis secondary to anemic hypoxia.

Approximately 50-70% of dogs with IMHA have concomitant thrombocytopenia caused by Evans syndrome (immune destruction) and/or DIC (reported in 45% of dogs with primary IMHA).

Finally, a blood smear may also allow identification of infectious agents (ex: Mycoplasma heamofelis, Ehrlichia and Babesia).

Saline test

A positive saline test is reported in 50-90% of cases of IMHA, and is associated with a higher mortality rate.
Direct antiglobulin test (Coombs test)
The sensitivity of the Coombs test is reported to be between 60-90%; therefore, a negative Coombs test does not exclude a diagnosis of IMHA. Flow cytometry is an interesting alternative, with sensitivity reported between 67-100%, and specificity of 87.5%.(1)

Coagulation assays

Because of the risk of DIC and thromboembolisms, coagulation times (PT and PTT) and platelet count are among the basic diagnostic tests for all patients with suspected IMHA. Evaluation of fibrin degradation products, d-dimer, thromboelastography can help with diagnosis.

Bone marrow aspiration/biopsy

Aspiration and biopsy of the bone marrow are particularly important in patients with non-regenerative anemia or additional cytopenia.
Serology and/or PCR testing for infectious agents & Imaging

The definitive exclusion of infectious or neoplastic causes requires a thorough investigation through imaging (abdominal ultrasound and thoracic radiographs) and screening for infectious diseases, based on geographical localization and travel history.

TREATMENT

The success rate of therapy ranges from 40-70% with frequent relapses. The mortality rate is reported between 26-60%. In spite of this variability, publications agree that thromboembolic diseases are the main cause of death.

Blood transfusion

About 70-90% of IMHAs will require one or several blood transfusions. Packed RBC (pRBC), ideally no older than 7-10 days, are usually preferred when available given the normovolemic state of the anemia.(3) Transfusion of older pRBC was associated with increased risk of mortality in dogs with hemolysis and of hemolytic transfusion reaction.(4, 5) The decision to transfuse should ultimately be based on the patients clinical signs, but most dogs with a PCV < 15% will require blood transfusion.

Prior to transfusion, blood typing for DEA 1 should be performed in addition to crossmatching if previous transfusions were administered > 4 days ago (or unknown transfusion history). Persistent autoagglutination can preclude interpretation of blood typing and crossmatch; if present, washing RBC may allow compatibility testing to be performed.

Immunosuppressive therapy

An ACVIM consensus statement recently proposed a treatment algorithm for IMHA treatment.(3)

Glucocorticoids:

Glucocorticoids remain the cornerstone of IMHA therapy, and work by inhibiting phagocytosis of antibody-coated RBCs and reducing the production of cytokines and immunoglobulins. A typical starting dose of prednisone is 2-3 mg/kg PO daily, or 50-60 mg/m2/day for dogs > 25 kg. Dexamethasone can also be used on a temporary basis, but it is essential to remember that it is 7 to 8 times more potent than prednisone (the dose should therefore be reduced accordingly). Unless the side effects are unacceptable, the glucocorticoid dose should not be decreased until the patient›s PCV has stabilized close to normal values, with improvement in disease activity indices (e.g. spherocytosis, agglutination, [bilirubin] and reticulocyte count). Once IMHA is stabilized for 2-3 weeks, the glucocorticoid dose can be reduced by 25% every 2-4 weeks. Unfortunately, glucocorticoids are associated with numerous side effects that can frustrate the owners and compromise the quality of life of the patient: polyuria / excessive polydipsia, almost obsessive polyphagia, incontinence and excessive panting. More serious complications of the therapy include secondary infections, steroid-associated myopathy, and gastrointestinal ulcers.

Other immunosuppressants:

Additional immunosuppressive agents should be administered if glucocorticoids alone fail to induce remission, cause significant side effects, or fail to control IMHA unless given consistently at high doses. In addition, additional immunosuppressive drugs should be considered at the onset of IMHA in severe cases: presence of marked persistent autoagglutination, intravascular hemolysis, or non-regenerative anemia. The most commonly used immunosuppressive agents in dogs are azathioprine, cyclosporine and more recently mycophenolate molfetil(6, 7). Cyclophosphamide, in combination with prednisone, was associated with decrease therapeutic success. Leflunomide, human intravenous immunoglobulin and splenectomy have been used in refractory cases with variable success rates.

Anticoagulant

A significant proportion of patients with IMHA will die from complications related to coagulation (DIC and mostly venous thromboembolism).(8)All dogs with IMHA, except those with severe thrombocytopenia (platelet count < 30 000/ul)(3). Based on the pathophysiology of venous thromboembolism, using anticoagulants (ex.: heparin, LMWH or rivaroxaban) +/- antiplatelet therapy may be preferred for thromboprophylaxis, particularly during the first 2 weeks after diagnosis when the risk of thrombosis is greatest. The ideal anticoagulant (or ideal combination) is unknown. Low dose aspirin (30% dogs with «aspirin resistance»), clopidogrel, heparin, low molecular weight heparin or rivaroxaban are all options to consider.(9, 10)

PROGNOSIS

Several laboratory findings have been associated with increased mortality rates in the short or long term(11-13). This led to the development of the Canine Hemolytic Anemia Objective Score (CHAOS), which was recently re-evaluated and was positively associated with mortality during hospitalization and at 30 days.(13)The latter includes the following parameters: age of the animal (> 7 years), temperature (> 38.9oC), presence of autoagglutination, albumin (<30 g / L), hyperbilirubinemia (> 85 µmol / L).

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WSV - 110

THE COMPLETE ORAL HEALTH ASSESSMENT AND TREATMENT (DENTAL COHAT)

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The complete oral health assessment and treatment (Dental COHAT) comprises of 10 steps:
Chlorhexidine Rinse– a solution of Chlorhexidine Gluconate 0.1% is applied to the surfaces of the teeth. This solution kills surface bacteria on the teeth and gingiva, reducing the amount of bacteria which is aerosolized during cleaning.

Supragingival Scaling– removal of plaque and calculus from tooth crowns. This can be done manually, with calculus removal forceps and hand scalers, or with dental cleaning machines such as ultrasonic scalers.

Calculus removal forceps are used to remove heavy calculus deposits from teeth by placing the hooked blade at the top of a calculus deposit (being careful not to damage the gingiva!) and the other blade on the lingual surface of the tooth. The forceps are gently squeezed (being careful not to damage the tooth surface!) and pulled or rolled coronally to dislodge a large chunk of tartar.This instrument speeds up the cleaning process, decreases wear and tear on more delicate hand instruments and ultrasonic instruments tips, and decreases aerosolization of bacteria.

Hand scalers are used supragingivally only as their pointed tip and sharp back will damage soft tissues. They are used in a push or pull stroke away from the gingiva to remove tartar. Curettes may also be used in this way on the crowns of teeth.

Ultrasonic scalers vibrate at high frequencies which generate significant heat, therefore a steady stream of water is used to cool the tip. The side of the tip (not the end!) is placed in contact with the tooth, and calculus is removed by mechanical kick(metal tip vibrating against calculus) and cavitation(energized water spray). The tip should not be held in contact with the tooth for more than 10 seconds at a time to prevent thermal damage and tooth death. If you cannot complete cleaning a tooth within that time, move onto the next tooth and come back to the first one later.

Once all of the teeth surfaces have been cleaned, ensure that all plaque has been removed. Plaque is often not apparent to the naked eye. Two methods can be used to detect missed plaque: 1) drying the teeth with an air/water syringe. Any missed plaque will be visible as a chalky substance. 2) a commercial plaque-revealing product. These brightly stained liquids are painted onto the teeth, then the mouth is rinsed with water. Any stain remaining on the teeth is an area of missed plaque. These liquids can also stain the patient's fur, so care must be used when applying and rinsing them.

Subgingival Scaling– removal of plaque and calculus from the gingival sulcus. Curettes or most ultrasonic scalers can be used for this. A curette is gently introduced into the sulcus, then angled to bring the blade into contact with the tooth or root surface (root planing), and a pull stroke (either vertical, horizontal, or oblique) is used to dislodge calculus and debris and remove it. Continue until the surface of the tooth feels smooth – this can be verified with a dental explorer: if there are no rough areas, the subgingival portion of the tooth is clean. Subgingival curettage may be performed to clean the tissue of the sulcus in periodontal pockets: the curette is introduced gently into the sulcus, then is angled to bring the blade into contact with soft tissue. Another finger applies light pressure on the outside surface of the gingiva, and the curette is used with a pull stroke to debride any diseased or necrotic tissue, bacteria, or debris.

Oral Examination & Charting: Evaluate the head, face, the oral cavity including throat and tongue, and the gingiva for any abnormalities including malocclusion, stomatitis, lacerations, granulomas, foreign bodies, etc. Then, beginning in quadrant 1 (upper right) and continuing through each quadrant, evaluate each tooth and record any pathology on the patient's dental chart.
Polishing– use a fine polishing paste (medium and coarse pastes are not advised as these remove too much tooth enamel) in a polishing cup on a prophy angle attached to a low speed handpiece to smooth tooth surfaces. A light hand should be used during polishing to decrease heat production from the polishing cup. Keep the speed of the handpiece even throughout polishing by maintaining steady pressure on the pedal. Most compressors and electric motors have a speed gauge. The handpiece speed should not exceed 3000 rpm.
Irrigation–flush tooth surfaces and pockets to remove all loose debris and polishing paste. Any material left behind can cause inflammation or abscesses of the gingiva. There are several different methods of irrigating teeth and periodontal pockets: 1) an air/water syringe, 2) a blunt-tipped needle or urinary catheter on a large syringe filled with water, saline, or chlorhexidine rinse, 3) an abscess-flushing syringe filled with water, saline, or chlorhexidine rinse.

Radiography–Often, radiography will reveal more pathologies such as bone loss, tooth resorption, tooth root fracture, tooth impaction, dentigerous cysts, internal root resorption, retained root tips, etc.

Additional Procedures (as required) – for veterinary technologists, this usually comprises of closed root planing and perioceutic application. Root planing is performed when normal gingival attachment has been lost and the tooth roots must be cleaned of calculus and debris. Closed root planingcomprises of thorough subgingival scaling and curettage. Its aim is to remove all debris and necrotic tissue, and to create a smooth root surface so that gingival attachment may occur.

Closed root planing may be performed on teeth with pockets of 6mm or less. Open root planing, which may be performed to salvage teeth with periodontal pockets greater than 6 mm, requires the creation of a gingival flap and is considered a surgical procedure that must be performed by a veterinarian.

Perioceuticsare instilled into cleaned periodontal pockets to aid in gingival reattachment. Perioceutics typically consist of a biodegradable gel, which acts as a carrier for antiobiotics such as Doxycycline. The gel is usually kept refrigerated, and must be mixed before use. Follow the manufacturer's instructions for storing and mixing. The gel is injected into the bottom of a root-planed periodontal pocket using a blunt-tipped needle. Once solidified (a few drops of cold water can be used to speed up this process), the gel is packed down into the pocket with a plastic or metal packing instrument (a curette or periodontal probe may also be used for this). The gel will release antibiotics into the pocket at much higher levels than systemic antibiotics, and dissolves within two weeks.

Any other required procedures such as extractions, biopsies, endodontic treatment, etc. are now performed by the veterinarian, and recorded on the dental chart by the technologist.

Fluoride Application (optional)– In humans, fluoride has been proven to kill oral bacteria, help prevent tooth sensitivity, and strengthen teeth by encouraging enamel remineralization. This has not been proven in animals, though many veterinarians choose to use it due to the similarities of tooth structure and composition across different species. Several different types of fluoride are available, including acidulated phosphate fluoride and sodium fluoride. Fluoride solutions come in foams, liquids, or gels. These are applied directly to the animal's teeth (make sure the teeth are dry to ensure maximum effectiveness) using a gloved finger or gauze, left on for the required amount of time (usually 1-3 minutes, see label directions), then are thoroughly wiped off so that none remains to be swallowed by the patient.

Regardless of what type is used, remember that fluoride is toxic, even in small doses! Do not rinse with water, as this will interfere with the fluoride's action.

10. Suctioning of the oral cavity and/or removing of any packing material such as gauze from the throat.
Note: The above steps may be altered somewhat in their order depending upon personal preference or situation, ie. radiographs may be performed first if a client or veterinarian wishes to know exactly what dental work needs to be done on the patient. As long as all steps are completed thoroughly and in an order that makes sense, ie. polishing must always be followed by irrigation to remove polishing paste from the gingival sulci, the patient will reap the benefits of a dental COHAT.

WSV - 065

BRACHYCEPHALY AND OTHER BREED-ASSOCIATED PROBLEMS IN CATS

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The issue

-Breeding of pedigreed cats is relatively recent; the first pedigreed cat show was held in 1871. Since that time, there has been active selection for desirable traits (e.g., attributes associated with hair coat, facial conformation, eye colour and shape, body size and conformation, tail length and conformation, ear shape, etc.) to establish cat breeds. The number of new cat 'breeds' continues to increase through crossbreeding existing breeds or perpetuating new mutations.

-Sadly, some cat breeds have become handicapped by selection for traits that appeal to our anthropomorphic perceptions without regard to related health concerns. This has resulted in an increasing number of breed-related disorders and diseases, putting untold numbers of cats at risk of pain and suffering.

-Over time, some conformational traits have become 'normalized' in the eyes of owners, breeders, veterinarians and veterinary team member, and related animal health professionals so that potential health consequences are not recognized or are not considered important. Normalization of the abnormal occurs as the prevalence of the trait increases and it becomes accepted as typical for the breed. It can also be driven by positive depictions of cats with abnormal conformation in advertising and social media.

-Traditionally, brachycephalic breeds have ranked in the top ten most popular cat breeds based on registration statistics. For example, in 2017 the Cat Fanciers' Assoc. most popular breed was the Exotic for the fourth year in a row. The Persian was the fourth most popular cat breed.

-Breed registries often reward extreme conformations. For example, four of the top ten winning cats in the Cat Fanciers' Assoc for 2018 belonged to belonged to breeds with conformation abnormalities (Persian, Exotic, Scottish Fold, Manx). In 2018, four of the top 10 winning cats in The International Cat Assoc. belonged to breeds with conformation abnormalities (Persian, Scottish Fold, Manx).

-Research into the health consequences of breed conformation in cats has lagged that in the dog, although the last few years has seen an increase in research on brachycephaly. This conformation is known to be associated with:

-Brachycephalic airway syndrome (stenotic nares, elongated soft palate)
-Exposure keratitis, corneal ulceration, chronic epiphora
-Dental, mandibular, and maxillary abnormalities leading to malocclusion, malpositioning, and dental disease
-Cerebellar crowding, herniation through the foramen magnum
-Dystocia and increased neonatal mortality
-Excessive facial skin folds leading to dermatitis

The way forward

-Owners and breeders have a duty of care as expressed in the Five Freedoms, one of which is freedom from pain, injury, and disease. Veterinarians and other animal health professionals should be aware of breed-related health problems in order to help educate breeders, owners, and the general public.
-Cat registries should scrutinize the health of breeds and consider refusing registration to breeds based on conformational abnormalities that contribute to poor health and changing breed standards to promote less extreme conformations.
-Veterinary, welfare, and breed groups can raise awareness about the pain and suffering caused by extreme conformations, such as the #HealthOverLooks campaign in the UK for dogs, cats, and rabbits.
-Veterinary organizations should adopt position statements on the breeding of animals with extreme conformation. It should be considered an important health and welfare issue.
-Veterinary organizations and companies should avoid using cats with extreme conformations in promotional materials and advertising.
-Veterinary organizations can consider a campaign to contact advertisers that use brachycephalic animals in advertising to alert them to the associated pain and suffering. For example, the British Veterinary Assoc. has established guidelines for pets in advertising to influence companies to refrain from using brachycephalic pets.

Resources and reading

-International Cat Care: brachycephaly in Persians and related breeds: https://icatcare.org/advice/cat-health/brachycephalic

-International Cat Care/British Veterinary Assoc #HealthOverLooks campaign: https://icatcare.org/news/icatcare-and-bva-unite-urge-cat-lovers-avoid-breeds-designed-have-extreme-or-unusual-features

-British Veterinary Association: Pets in Advertising Guidelines: https://www.bva.co.uk/workplace-guidance/ethical-guidance/advertising-guidelines/

-Vets Against Brachycephalism: http://vetsagainstbrachycephalism.com/

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WSV - 309

DETAILED ABDOMINAL ULTRASOUND IN THE HORSE: WHEN IT PAYS TO TAKE YOUR TIME

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Learning objectives:
knowing in which specific cases it's worth taking the time for a complete abdominal ultrasound and what to hunt for in those cases.
Technical considerations: a large curvilinear (2-6 MHz) transducer is required. Horses with a sport clip frequently don't require additional clipping. In horses with thick hair, clipping is needed. The skin should be cleaned and soaked in alcohol. Coupling gel is applied.
A detailed abdominal ultrasound evaluation of the abdomen is indicated in cases with chronic colic, weight loss, fever of unknown origin and horses with other vague presenting complaints. As opposed to the fast decision-making required in acute colic, these cases benefit from a thorough detailed ultrasound examination. This lecture will cover the abnormal details to pay attention to which make a difference in case management.

Intestinal wall thickness and layering
The normal wall thickness of the cecum, colon and most of the small intestine is less then 3 mm. The ileum has a more prominent muscular layer and can measure up to 5 mm. Diseases such as Inflammatory Bowel Disease (IBD) and alimentary lymphoma can cause thickening of the intestine. Ultrasound examination is not able to identify cells and as such can't differentiate thickened bowel caused by IBD versus lymphoma. Colitis can also cause thickening of the colon wall, with the more specific right dorsal colitis imaged in the wall of the right dorsal colon. Although the right dorsal and right ventral colon have little sonographic difference, they can easily be differentiated by their relative position, provided there is no displacement. The right dorsal colon is found ventral to the liver in the right 11thto 13thintercostal space. In horses with this condition, a hypoechoic layer can be imaged, corresponding to submucosal edema, inflammatory cell infiltrates and granulation tissue which was confirmed on necropsy in a study of 5 cases(1). Aside from this study, the association between abnormal wall layering and specific diagnoses has not been critically assessed. It makes sense that conditions such as IBD and lymphoma, which cause cellular infiltration of the submucosa, result in an echoic, thickened submucosal layer, whereas edema of the colon wall which occurs in colitis and colon torsion result in an anechoic wall.

Ileal muscular hypertrophy has been described as a cause of weight loss in the horse. In these cases, the hypoechoic muscular layer is markedly thickened on necropsy(2), which was recently sonographically described in a case report as well(3).

Other gastro-intestinal abnormalities
More obvious findings such as intra-abdominal abscesses or masses can be rewarding findings in horses with a fever of unknown origin or weight loss. However, in a case series of intra-abdominal abscesses, ultrasound evaluation had a 38% sensitivity for detecting the abscess(4). Despite this, other clues such as increased peritoneal fluid can help raise the suspicion.

Abnormalities of the liver
Liver disease can cause colic, fever, weight loss and depression. Ultrasonographic abnormalities include rounded margins which indicate liver enlargement, an increase in echogenicity which indicates cellular infiltration, a granulomatous response, fibrosis or hepatic lipidosis, distended biliairy ducts which result in a "parallel channel sign" and decreased vascular markings(5). Choleliths and hepatoliths can also be imaged.

Abnormalities of the kidneys
Small kidneys are generally associated with chronic renal failure, whereas enlarged kidneys can be associated with acute renal failure but also urolithiasis, pyelonephritis or neoplasia. Perirenal anechoic edema can be seen in horses with acute renal failure. Nephroliths can be imaged in the renal pelvis.

Abnormalities of the spleen
Splenic abnormalities have been described in horses with weight loss, fever and depression. Splenic abscesses appear as hypoechoic masses. Splenic neoplasia, most commonly lymphosarcoma can result in a diffuse mixed echogenicity, or distinct which can be difficult to differentiate sonographically from other splenic neoplasia or even splenic abscesses and hematoma(5).

In conclusion, a thorough sonographic evaluation of the equine abdomen provides valuable information in cases of chronic colic, weight loss, fever of unknown origin and other more vague signs.

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LASER TURBINECTOMY: HELPING BRACHYCEPHALICS BREATHE BETTER

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Brachycephalic Obstructive Airway Syndrome (BOAS) refers to a group of conditions resulting from the abnormal conformation of dogs with short noses (brachycephalic dogs). Brachycephalic dog breeds include English and French bulldogs, Pugs, Shih-Tzus and Pekingese. Breeds with short noses have a compacted skeleton, causing a number of malformations, including in their nasal cavities, vertebrae and tails, but have normal amounts of skin and soft tissue. Their soft tissue is therefore excessive for their skeleton, explaining the amount of skin folds brachycephalic dogs have on their faces and bodies.

Similar folds and excessive soft tissue are present in the pharynx further leading to airway obstruction.
The list of the abnormalities and conditions most commonly seen in brachycephalic dogs, can be explained by this characteristic conformation. The abnormalities below are commonly found and treated in clinical practice.

Stenotic nares: surgical correction
Elongated soft palate : surgical correction
Laryngeal collapse: correction of other obstructive anomalies, tie-back
Hypoplastic trachea: no treatment generally needed
Bronchial collapse: medical therapy
Enlarged tonsils
Pharyngeal collapse
Everted saccules : surgical removal (controversial)
Increased nasal mucosal contact points/caudal aberrant nasal turbinated : Laser turbinectomy

Until recently, excessive and aberrant turbinates were not considered an important aspect of BOAS. Brachycephalic breeds have the same size and number of nasal turbinates in a smaller nasal cavity, resulting in increased nasal mucosal contact points and aberrant turbinates blocking the nasopharynx1. Despite correction of other features of BOAS, significant nasal obstruction and therefore inspiratory effort can persist in some brachycephalic breeds if these anomalies are not addressed. Laser-assisted turbinectomy for the correction of these anomalies will be discussed. Although this technique is currently poorly available in North America (performed by the author at the CHUV in St Hyacinthe) significant improvement in quality of life and respiratory scores have been noted following the procedure2,3. In the future, this procedure will become increasingly available and should be recommended in brachycephalic breeds in which other BOAS factors have been corrected yet significant airway obstruction persists.

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WSV - 299

FACEBOOK: THE EVER-EVOLVING SOCIAL MEDIA PLATFORM AND HOW VET CLINICS CAN BENEFIT FROM NEW FEATURES

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Social media consumes an important part of our lives. Facebook is one of the most used apps and companies quickly saw the potential of this platform that attracts all socio-demographic profiles. On the other hand, the return on investment of time and resources that we spend on it is not clear. Many veterinary clinics dedicate body and soul without having a concrete plan to convert users to customers. Many feel they are wasting their time.

To entertain and raise awareness is commendable. However, converting users into customers who will offer their pets proper care, that's even better. The two major challenges on social media:
Drawing the attention of those who have little to no awareness of us. (attract)

Converting these prospects into consumers. (convert)
These issues are not unique to our profession. In fact, these two concerns are the first steps of conversion funnels, a concept in sales which has become more relevant since the Web is now seen as fertile ground to renew one's clientele. In theory, this is true. In practice, it is a major challenge. Internet users are constantly bombarded by advertisements. Here are some tactics that you can use for your veterinary practice.

Attract customers with the help of influencers. Influencers are for the most part humans and, sometimes, famous animals who have more than 10,000 subscribers to their pages and are willing, in exchange of a certain amount of money or trade (exchange of services or goods), to mention you in their posts. It's a powerful and flourishing industry, especially on Instagram. In 2017, an estimated more than US $8 billion was paid to influencers. The FYRE documentary illustrates their power, to the point of being able to attract thousands of participants to an exclusive festival on an island in the Bahamas, which turned out to be total chaos, without food nor water, and very few beds. The reason is simple: Internet users now have more trust in people than in companies to influence their consumer choices. This is the rise of personal brands as seen with the friendly Dr. Andy Roark!

How to make the most of it in veterinary medicine? Find someone local, who is friendly and of influence, who's conveyed values and messages are similar to yours. Carefully follow this person on social media for a few months to be sure:
That the image they project is constant and professional. Their reputation could have an impact on yours!
That they are not allied with a company whose messages go against your own (e.g.: a business against vaccination or for the raw food diet).

Of the type of subscribers to this person and of their involvement with them.
That they are not overexposed in promoting multiple companies at the same time.
You must have the general feeling that this person will not bring you shame, but rather that they will have you enjoying a new pool of Internet users. This influencer must also be able to have a sincere interest in animals and in you.

A quality influencer, without being a megastar, can make stories by tagging you and adding a swipe-up link to your website. You then create connections within their group of subscribers and are discovered. Favour videos, and if you are adventurous enough, "Live" ones. Facebook now offers screen sharing to make Facebook Live videos, which makes for very interesting logistics. Now, how much might an influencer request? Many say $100 for every 10,000 subscribers; but this varies according to the time required, if the post is ephemeral (story) or permanent, if it's a photo or a video in IGTV (the new TV section that allows long-form videos in vertical format), and the number of interactive options (ex.: survey in the post).

Converting visitors into consumers with ads (sponsored posts containing a Call-to-action [CTA]): even if your online presence is engaging and you have a budget to ensure a better range, your results may be disappointing if you do not have a CTA that encourages users to act. Here are the call-to-action features offered as of writing these notes (good news, additions are common):

Book Now: take appointments or reservations on your page. If your page does not have many thousands of subscribers, my experience is that the activation of reservations without promoting it will disappoint you. However, you can activate it in a precise context for which you will have a media plan. For example, you might be organizing a tour day for students interested in veterinary medicine, organizing training for puppy owners on care basics or a lesson on first aid, etc.

Get in Touch: receive messages from visitors to the page through Facebook Messenger or encourage them to contact you using the information you have provided. It is important to configure email options so that automatic

replies are sent when you are closed or too busy. Sunday night is a popular time for pet owners who are trying to contact their veterinarians after seeing their animal being sick over the weekend.

Learn More: direct people to your professional link or your informational video. Although we tend to choose this option because we often wish to inform pet owners, this is the option with the least conversion. It is best to collect email addresses in exchange for the information they are trying to get. This technique is frequently used with free e-books where you are offered a subscription. Be aware that this technique is possible (and relatively simple) if you use an automated marketing platform such as Mailchimp that offers landing pages and subscription forms. In the email confirmation of the subscription, you simply add a link to the tool that you promised them!

Make a Purchase or Donation: direct people to your website's shop or donation page. It's a way of showing your involvement in the community and demonstrates your values. However, beware of fundraising for a sick animal that has been abandoned or of which the owner does not have the means to pay. Internet users often think that by giving money, they are entitled to receiving news from the patient. Should the animal be euthanized, you could be the subject of a smear campaign. Social media, the cost of veterinary care and abandoned animals are an explosive cocktail for the reputation of veterinary practices.

Forms: lead ads allow you to collect information from potential customers. Information that you can collect includes but is not limited to names, email addresses, telephone numbers, and much more. Lead ads can be used to collect subscriptions to newsletters, names for specific training on the development of the puppies and how to encourage good behaviour, or for starting a weight loss program group for overweight dogs. It's actually a great way to find potential clients and then to share relevant information with them or to organize an event according to the theme.

Another significant advantage to using a CTA is that the ad is more visible, the CTA area is highlighted.
Important reminder: invite all who interact positively to your posts to subscribe to your page; this small gesture will have a real impact on your total number of followers over time. If users like or comment on your post, they might forget to subscribe to your page. Therefore, you can invite them individually to follow your page. People are rarely offended by the request. At the very worst, they ignore it. Many accept it. Knowing that your subscribers know you or have already shown an interest, it will be easier to target them with sponsored campaigns. Targeting remains a challenge with social media.

Some will tell you that it is rather easy to target pet owners as they represent 50% of the population. Personally, I find it's not so straightforward. Fifty percent is a large proportion of the population, without the being the majority. A big budget is needed to reach it. In addition, you may reach individuals who no longer have animals or who are loyal to their veterinarians. The best is to have mostly existing customers as subscribers. By targeting them, we can hope to remind them to return for a preventive exam or for dental care, to not forget to apply their broad spectrum antiparasitic, etc. It's certainly easier to convince a client that you already know than converting one with whom you have no relationship of trust.

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A PROBLEM NAMED IS A PROBLEM SOLVED – CREATING THE PROBLEMS LIST

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Objective Statement:
The goal of this presentation is to develop the skills needed to create a comprehensive problem list of clinical behavior problems. In order to successfully address behavior problems and to provide solutions it is critical to name the problem to be solved. This seems to be a simple task, however in this lecture we will find out why this is harder than it seems. And why it is so critical to have this skillset mastered. We will further address those challenges. We will learn in this presentation how to create a problem list that is useful to the clinician in solving the behavior problem at hand. The quality of the problem list is tightly connected to the solution and veterinarians cannot afford to ignore this important skill. And although this approach is emphasized in the veterinary education when it comes to medical cases, it doesn't seem intuitive to most clinicians when trying to solve behavioral cases.

"A problem named is a problem solved".
There is certainly some truth to this saying when it comes to solving behavior problems. Why does it seem to be challenging for many students and practitioners to create a problem list in behavior medicine? Most clinicians are very familiar in creating a problem list for their medical cases, most use the "SOAP" approach to help them stay organized with their cases. When it comes to behavior cases however, objective documentation is often missing in the medical record.
Why?: It seems more difficult for some reason to stay away from subjective descriptors or "lay-term" diagnosis provided by owners. We need to keep in mind that only veterinarians can diagnose a medical or behavioral condition and hence we are obligated as professional health care providers to conduct our own data collection in an objective manner using professional language and document them into the medical data base of the patient.

Example 1: Doctor, my dog has "separation anxiety".
This is a commonly heard sentence in veterinary practice. Starting with this comment, or "lay term diagnosis" the practitioner is now obligated to follow up with a series of questions to extract the objective descriptors of the ethogram or behavior catalogue. The clinician must go beyond this statement and create a problem list. "Separation anxiety" is a diagnosis and not a problem, hence should not be entered in the medical record as a problem. It can be entered under S: owner reports Fluffy is exhibiting "separation anxiety" consisting of vocalization when left alone.

Problem: Vocalization when left alone
It is especially critical in behavioral medicine to create a complete and accurate problem list, because in behavioral medicine there are no, or only very few, diagnostic tests available to help reach a diagnosis. In behavioral medicine the clinician must rely heavily on history and observations for the diagnosis. Hence it all starts with the statement of the problem or issue and based on this, the collection of good data can begin. But even before we can begin this process of collecting the data, there is a preliminary step that can not be overlooked. It must begin with recognizing that there is a problem or an issue. In some cases the problem is brought to the clinician's attention:

Example 1: Dog is vocalizing when left alone. This was reported to the owner as a complaint by a neighbor. Clearly a problem for the owner and the neighbor.
In other cases, the owner is unaware of the problem. The general practitioner is overall very familiar with bringing medical issues to a client's attention, even if the client does not name the problem in the history or during the exam.

Example 2: Mrs. Smith, while listening to Fluffy's heart today, I was able to detect a slight murmur.
Similarly, veterinarians need to learn to treat behavioral observations the same way and understand that they need to be brought to owner's attention to address the overall welfare of their patients.

Example 3: Mrs. Smith do you notice how Fluffy startled and then hid behind your legs when I dropped my otoscope accidentally on the table? Have you noticed similar fear behavior with any noises at home?
Therefore, the first step in creating the problem list is indeed identifying the issue. In some cases, the client brings the issue to the attention of the veterinarian or staff, in other cases the owner is unaware and the DVM needs to bring the issue to the client's attention.

Step 1: Identifying the issue
Once the issue or issues are clearly identified, research then needs to be conducted in form of collecting data. The data needs to be specific, objective and documented in the medical record. Behavioral data needs to be entered along with any medical problems for a complete picture of the patient's health status.

Step 2: Gather objective data: history and observation (this may require further diagnostics)
Before proceeding to the next step, it is critical to discuss the problem list with the owner and clearly communicate everyone's interests (owner, family members, DVM), as well as the impact on the animal's overall welfare.

Step 3: Understand everyone's interests and needs
Once all the data is gathered, the analysis of the data can begin. In behavioral medicine we need to fully understand that many problems are situational or context specific. Behavior needs to adapt constantly and what can be viewed as a behavior problem by some owners, may serve the function of coping or survival. With this in mind, the problem at hand could likely have multiple solutions. In order to find the right solution later in the process, it is critical to define the problem clearly and evaluate and explore the issue(s) in detail. This allows a root cause analysis to be performed. As veterinarians, we understand that systems and events are connected: What happened and why. With a root cause analysis approach, we can prevent problems from happening again in the future and then create (a) solution(s).

A detailed problem list would read as follows:
Example 1: Destruction (chewing, scratching) of door frames at main exit door, high pitched vocalization and urination immediately starting every time when owner when owner has left the home
Example 2: Grade 2/6 holosystolic heart murmur
Example 3: Startle response followed by hiding behind owner's legs after loud sudden noises only at the veterinary office or any other novel places
"A problem named is a problem solved": With a detailed problem list the decision can be made based on the problem named AND the context in which the problem occurs. The next step is moving towards creating the solution.

Step 4: Decision making process
Throughout the process it is critical to communicate clearly and frequently. It is also vital to not try to solve multiple problems all at the same time, but to triage and prioritize them one by one. With a detailed and comprehensive problem list success can be defined and progress can easily be tracked leading to higher owner compliance and a better outcome.

Step 5: Follow up
It is important to referring back to the original problem list when re-assessing the patient. Commonly a client feels there is no progress because a new problem arises. Clients will often bring up new emerging behavior problems during recheck appointments. Hence, it is very helpful to refer back to what problem was addressed and how that particular problem is progressing. I will add terms like "managed", "resolving", or "resolved" to the problem list to keep track of progression during the treatment period. This will allow the owner as well as the clinician to objectively track progress or lack thereof. By referring back to the original problem list the owner can easily be reminded how much progress has been made, owner compliance can be checked, and treatment plans can be adjusted if needed.

Summary:
Implementing the skills:
Problem solving approach acronym: IDEAL* (*adapted from source www.tedsf.org)
Identify: History and observation. May have to bring problems to owner's attention
Define: Objective collection of ethogram before, during and after the event causing the concern(s)
Explore: Understand everyone's interests and patient's welfare needs
Action: Root cause analysis and problem-based solutions
Lookback: Evaluate progress and overall success

Recommended Readings:
1) 2015 AAHA Canine and Feline Behavior Management Guidelines.
2) Addressing Any Behavior Problem. Bergman L. and Gaskins L.; Clinican's Brief 2013.
4) Psychogenic Stress in Hospitalized Dogs: Cross Species Comparisons, Implications for Health Care, and the Challenges of Evaluation; Hekman JP., Karas AZ., and Sharp CR. Animals (Basel). 2014 Jun; 4(2): 331–347.
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WSV - 074

HOW TO USE ORTHOPEDIC WIRE AND PINS EFFECTIVELY

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CERCLAGE WIRES

Orthopaedic cerclage wires are made of medical quality stainless steel. Monofilaments are used because they are more rigid and easier to twist. They come in several diameters that are expressed in gauges (GA). The most commonly used are 18 GA in dogs and 20-22 GA in small dogs and cats.
There are 2 types of cerclages :
· cerclages that we need to be cut from a reel and that are twisted with an instrument.
o cerclage
o cutter
o periosteal elevator
o large needle holder (Berry) or wire twister
· loop-cerclages that are tied with a special tightening instrument.
o cerclage
o cutter
o periosteal elevator
o wire tightener.
Indications :
· Neutralisation of forces acting on fractures
- alone, but most frequently in combination
- cerclages and pins, cerclages + plate/screws
· Can also be used to immobilise/stabilize bone fragments after reduction. Then a permanent mode of fixation will supplement to adequately neutralize all forces acting upon the fracture.
· Generally used in fracture repair
- Long oblique
- Spiral
- Comminuted when diaphyseal reconstruction is possible and when a primary mode of fixation will be used.
i. Plate/screws
ii. External fixator
iii. Interlocking nail
Principles of application :
· Use when the fracture line is at least twice the diameter of bone
· Use if the fracture can be perfectly reduced.
· Use an appropriate size cerclage.
· Use to provide a rigid and stable fixation; the cerclages must not be mobile.
- Impairs vascularisation
- Impairs bone healing
- Leads to non-union
· Apply circumferentially directly on bone, avoiding the inclusion of soft tissues and vascular supply.
· Apply perpendicular to bone
· Use at least 2 cerclage wires.
· Space them at least 1cm apart; to avoid interference with bone healing.
· Apply them at least placer à 0.5 cm from the extremities of the fracture line
· Use cerclage wires with other means of fracture fixation.
Hemicerclage wires
Hemicerclage wires can be used to:
· Prevent rotation in short oblique or transverse fractures
· Immobilize bone fragments
· stabilize fissures
Their use implies that hemicerclages perforate/traverse at least one cortex on each side.
Tension band
When traction or tension is the dominant force, the use of a mode of fixation implying a tension band is of utmost importance. We can observe sur a force to neutralize when a muscle group, or a tendon/ligament attaches on a bone:
· greater trochanter, olecranon, tibial tuberosity, calcaneum, malleolus, etc..
The most efficient method to resist a traction force is by using a tension band. They are used when avulsion fractures are observed or when using targeted osteotomies in surgical approaches. We need to combine :
· 2 Kirschner wires placed perpendicularly to the fracture/osteotomy line and a figure of 8 orthopedic wire that passed through bone distally and around the 2 K-wires proximally.
This allows a perfect reduction of the fracture/osteotomy and, most importantly, the conversion of a tensile force into a compressive force!

INTRAMEDULLARY PINS

The use of IM pins in small animal surgery started in the ‘40s. It seems to be associated with the development of anesthesia, aseptic technique, antibiotics and expertise. Despite the limitations of their use, IM rods remain the most widely used and widespread method of fixation in veterinary orthopedics worldwide.

ADVANTAGES

· The most rigid implant in angulation
· Easy to put in place
· Little traumatic
· Affordable
· Versatile
· Less inventory
o Pins
o Material for insertion
· Easier to remove when needed

DISADVANTAGES

· Do not neutralize all forces
o Compression
o Rotation
o slippage
· Dissemination of infection during open fractures, by seeding contaminants proximally and distally within the medullary cavity
Steinmann pins
Smooth stainless-steel pins are available in many sizes with a variety of tips:
- trocar (3 sharp sides)
- chisel (2 sharp sides)
- threaded either at the end or at the center
Kirschner wires (also called K-wire) :
These are very small pins <1/16 «(0.5 to 1.5 mm)
- more elastic than Steinmann pins
- in small dogs and cats
- They are also used with some external fixators.
- Diameter:
o 0.028 ‹›; 0.035 ‹›; 0.045 ‹›; 0.054 ‹›; 0.062 ‹›
o 0.7mm; 0.9mm; 1.1mm; 1.4mm; 1,6mm

Principles of application

· Used mostly for fractures
· Can be introduced retrograde (through the fracture site) or normograde (through one end of the bone).
· Must fill 60 to 75% of the medullary cavity (the smallest diameter of the cavity) during fractures of the diaphysis of long bones
· Have a minimum of 3 points of contact with the bone (insertion point, fracture cortex and metaphysis opposite to the insertion site) because their ability to reduce movement depends on the contact surface with the endosteum.
· Two or more pins can be used, as this increases the resistance to rotational forces by increasing the contact points.
o Technique called «stack pinning».
· Distal fractures or Salter-Harris fractures
o Multiple crossed rods can be used
· Resists bending forces,
o but offers very little resistance to forces
§ Rotation
§ Compression
§ tension (axial), therefore:
o during unstable fracture
§ in combination with orthopedic cerclage and / or hemicerclage wires
§ external fixation device
§ independent of IM rod
§ attached to the IM rod
· «tie-in»
§ plate
Contraindications
· infection
· comminuted fracture whose reduction cannot be adequately maintained
Post-operative care
· does not require special post-operative care
· the end of the pins coming out of the bone can cause irritation and the formation of a seroma
· the pin can be removed when indicated, when the union is completed (6-12 weeks)

OTHER TYPES OF PINS

Interlocking nails
· Intramedullary rod (nail) with the addition of screws inserted through the bone and stem partly proximal and distal to the stem
· provides additional resistance against torsional and compressive forces
o neutralizes forces that IM pins cannot
· In general, we insert 2 screws/bolts proximally and 2 screws/bolts distally
Crossed dynamic pins
· Uses
o either Rush pins
§ (more flexible than Steinmann›s stem and offering an oblique tip for sliding in the medullary cavity and a hook at the other end)
o either small Steinmann pins or K-wire
· Indicated for bone end fractures
o ex. : metaphysis, growth plate
· Must have 3 points of contact with the bone to ensure that the fracture is stable
· Fracture stability due to the elasticity of the pins

WSV - 367

MAXIMIZING ULTRASOUND IMAGE QUALITY - KNOBOLOGY

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Ultrasound is an interactive sport with the ultrasonographer playing a major role in obtaining quality diagnostic images. Ultrasound probe selection and an understanding of ultrasound machine settings is vital to obtaining quality diagnostic ultrasound images.
Probe selection
High quality diagnostic ultrasound images start with good probe selection. Most ultrasound machines have a variety of ultrasound probes. The probes vary in frequency of sound they emit, shape of the imaging field of view and shape and size of the probe surface that is in contact with the patient ("footprint"). These qualities of ultrasound probes need to be taken into consideration when choosing which probe to use on a particular patient/particular part of the patient.
Higher frequency probes result in better image resolution at the expense of decreased depth of penetration (ie, you can get really nice images of the urinary bladder with a high frequency probe but it would not be a good choice for evaluation of a large dog's liver).
There are a variety of shapes of ultrasound probes used in abdominal imaging. These include microconvex, linear and curvilinear probes.
Microconvex probes have a diverging field of view (narrow in the near field and wide in the far field) and a small footprint. They are generally in the middle to high frequency range.

Linear probes have a rectangular field of view and a long footprint. They are generally high frequency.
Curvilinear probes have a diverging field of view, large footprint and are generally lower frequency.
RULE OF THUMB: Select the highest frequency probe (to maximize resolution) that allows adequate depth of penetration for organ you are evaluating.
Probe handling
Use of a "pencil grip" is recommended. The probe can be moved in a variety of ways, including distance motion (sliding), non-distance, angular motion (fanning) and non-distance, rotational motion. If possible, keeping the probe perpendicular to the body wall and sliding the probe to scan through the organ of interest in sagittal and transverse orientation will result in the most accurate representation of the anatomy and avoid obtaining oblique images of the organs.

The 5 "knobs" everyone needs to know:
1.Frequency: Most modern ultrasound probes are multifrequency allowing the operator to select different frequencies without switching probes. Use the highest frequency that allows for penetration of the organ of interest.

2.Depth: Adjust the depth of the field of view so that the organ/structure of interest takes up approximately 75% of the field of view.

3.Focal Zone: Adjusting the focal zone maximizes lateral resolution (resolution in the horizontal plane). Place the focal zone at the mid to deep portion of the organ/structure of interest. Some machines allow for the operator to select multiple focal zones, however realize that this will result in a slower frame rate.

4.Gain: Controls the overall brightness of the image. Increasing the gain will increase the brightness of the image across the entire field of view.

5.Time Gain Compensation: Selectively controls the brightness of the image at various depths. This is usually a collection of multiple slider bars on the ultrasound machine with the top bar representing the near field and the bottom bar representing the far field with various points in between. At the left side of each slide bar representing no gain and the right side representing maximal gain. As sound travels through tissue, various interactions take place that results in less sound waves reaching deeper tissues than superficial tissues. Time gain compensation is a means for evening out image brightness to compensate for the decreased amount of sound reaching deeper tissues. In general, the time gain compensation is set so that there is less gain in the superficial tissues and more gain in the deeper tissues.

Other good knobs to know:
Dynamic range: Controls the contrast of the ultrasound image. A high dynamic range setting allows for many shades of gray and a less contrast-y image. A low dynamic range setting allows for less shades of gray (more black and white) and results in a more contrast-y image.
Doppler: Being familiar with the Doppler options on your machine is helpful in many situations. Types of Doppler include color, power, pulse wave and continuous wave. Color Doppler identifies the direction and relative velocity of blood flow.

Power Doppler is sensitive to slow flowing blood but does not identify direction of blood flow.
Pulse wave Doppler allows for evaluation of velocity and direction of flow in a specific vessel.
Continuous wave Doppler is used in echocardiography and allows for evaluation of high velocity blood flow.
Keep in mind that Doppler signal is dependent on the angle of the ultrasound probe in relation to blood flow. Best Doppler results are obtained when the angle the probe is small (less than 60 degrees) in comparison to the direction of blood flow.

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STONES STONES GO AWAY....COME AGAIN ANOTHER DAY. NO!

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Removal of lower urinary tract urolithiasis is amenable to various interventional approaches depending on the species, sex, type of stone present and stone burden. Considering minimally invasive approaches to stone removal in lieu of surgical cystotomy is recomended1. Figure 1. An example of a decision making algorithm in the evaluation of a patient with bladder stones. Procedures are considered in order or least to most invasive.

Voiding urohydropulsion

Allows antegrade removal of bladder stones through the urethra. Recommended for small stones in female cats and dogs but should not be attempted in male cats2. Under general anesthesia, a urinary catheter is used to fill the bladder with saline (avoid overfilling, estimated bladder capacity 10-15 ml/kg). The urinary catheter is removed, in females, the patient is positioned vertically, males are placed in lateral recumbency. The urinary bladder is palpated, shaken gently, pulled cranially to straighten the urethra. Gentle but steady pressure is applied to the urinary bladder to induce micturition and allow for expulsion of stones.

Percutaneous cystolithotomy (PCCL)

Urolith removal of any size/number in dogs and cats of any breed, sex and size. This procedure can be considered when uroliths are too large to be removed by urohydropulsion. Under general anesthesia, a urinary catheter is placed and the bladder is filled with saline. A 1-1.5cm abdominal incision is made over the bladder apex. The bladder apex is exposed, stay sutures are placed and a screw trocar is advanced into the lumen of the bladder following a stab incision. Rigid/flexible cystoscope is inserted through the trocar under continuous saline irrigation. A stone basket passed through the working channel of the cystoscope is used to remove the stones. In males, all or most of the urethra can be examined in an antegrade manner with a flexible cystoscope. Following removal of the trocar, the bladder incision is closed in a standard manner.

Cystoscopy and intracorporal lithotripsy

Allows urolith removal in female dogs and cats and some male dogs. Male cats, small male dogs or patients with large stone burdens should undergo PCCL. Under general anesthesia, a retrograde urethrocystoscopy is performed.

Small uroliths are removed using a stone basket. Larger uroliths are fragmented by a holmium: Yag laser or electrohydraulic lithotripter3. Direct contact of the tip of the laser fiber is required. Once fragments are small enough, they can be removed using the stone retrieval basket. Smaller fragments and debris can also be voided by urohydropulsion.

	Size and number of uroliths	Sex and species	Advantages	Disadvantages
Voiding urohydropulsion	Stones < 3-4mm in small female dogs Stones < 2.5 mm in female cats Male dogs limited by size of penile urethra	Female dogs and cats Not indicated in male cats as risk of urethral obstruction	Quick Low cost equipment Can be done in general practice	Stones may remain in the bladder Large and spiculated stones may obstruct the urethra
Percutaneous cystolithotomy (PCCL)	No restrictions	No restrictions	Excellent visualization of the entire lower urinary tract and easy retrograde stone removal	Specialized equipment
Cystoscopic basket retrieval	Access to lithotripsy may be necessary for large or embedded stones	Female dogs and cats Male dogs >7kg (penile urethra must allow passage of the flexible scope)	Quick No suture material in the bladder	Specialized equipment
Intracorporal lithotripsy	Low stone burden preferable	Female cats and dogs Male dogs > 7kg	No suture material in the bladder	Specialized equipment Long procedural length with large stone burden

Figure 2. Summary of minimally invasive options and guidelines for patient selection for the removal of bladder uroliths in dogs and cats.

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WSV - 113

THE SCIENCE BEHIND DENTAL HOMECARE PRODUCTS

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There are hundreds of products on the market, each advertising itself as the best, most effective, and easiest to use item ever designed in the history of pet care. Every day, more products appear on the market. How are we as Veterinary Technologists to know how each works, which of them work, which will be readily accepted by pets, and which will be used consistently by pet owners?

No matter a product's hype, most dental home care products fall under one (or more) of these categories:
1)Mechanical removal of plaque & calculus
2)Chemical control of calculus formation
3)Anti-microbial agents
4)Barriers against plaque attachment

1) Mechanical

Mechanically remove or prevent the accumulation of plaque and tartar.
Toothbrushes – should be soft-bristled, not medium or hard
-can be designed for pets or for humans, as long as the size of the head is appropriate to the patient's mouth
-plastic or nylon "fingerbrushes" are more useful for training than for actual brushing. Try to get owners to graduate to bristled brushes.
-rotating "spin" brushes are a favorite for many large-breed dogs
-special round head brushes are available for cats
-pets who won't tolerate a brush in their mouth may tolerate the owner's finger wrapped in gauze or a rag
-can be used with or without pet toothpastes
Diets – scrub plaque and calculus from teeth during chewing
-large kibble size ensures each piece must be chewed, not swallowed
-some have a special texture allowing teeth to sink into the kibble, scrubbing the entire surface of the tooth (but not under the gumline)
-may be coated with a chemical agent (see Chemical Control below) to reduce calculus formation
-must be at least 25% of the pet's total diet to provide expected results
-only clean teeth which grind food (not incisors or canines)
Treats – use mechanical abrasion from a wide variety of ingredients to scrub plaque and tartar from teeth
-may also contain anti-microbial agents (see Anti-Microbials below)
-are a source of calories, but not the main source of calories, in a pet's diet
-designed to be effective while allowing the pet to eat its regular diet
-only clean teeth which grind food (not incisors or canines)
-very hard treats can cause tooth fractures
Chew Aids – meant to be consumed, but not a significant source of calories
-use mechanical abrasion from a wide variety of ingredients to scrub plaque and tartar from teeth
-pet receies psychological satisfaction and boredom relief from chewing
-may also contain anti-microbial agents (see Anti-Microbials below)
-some can cause digestive upset
-must be used under supervision as can cause choking or intestinal blockage
-very hard or compressed chew aids can cause tooth fractures
Chew Toys – non-consumable items
-wide variety of materials: rubber, rope, nylon, natural bones, tennis balls
-some can cause tooth fracture
-fuzz from tennis balls can cause tooth abrasion and pulp exposure
-may have holes for treats or food to increase chewing compliance

2) Chemical Control

Chemical compounds called polyphosphatesbind the calcium in saliva, decreasing the mineralization of plaque into calculus. When sprayed onto the surface of diets, treats, or chew aids, these chemicals reduce the formation of tartar, even on non-chewing teeth. They don't remove plaque, which is the true cause of periodontal disease, but may increase the efficacy of mechanical plaque removal methods such as toothbrushing.
Another agent which inhibits calcium precipitation into calculus is xylitol, but as it also inhibits the growth of plaque bacteria, it will be discussed further in Anti-Microbials.

3) Anti-microbials

Anti-microbial agents used to control plaque.
Chlorhexidine Gluconate – chemical antiseptic rinse which combats both Gram-positive and Gram-negative bacteria, as well as some fungi and viruses.
-is bacteriostatic and bactericidal
-disrupts the cell membranes of microorganisms
-prevents plaque, gingivitis, and halitosis
-binds to tissues in the oral cavity and is released over a period of up to 12 hours

-can escalate calculus formation by increasing the mineralization of plaque
-can cause tooth staining
-products containing chlorhexidine should be kept out of the eyes (can cause corneal ulcers) and ears (can cause deafness at high concentrations)
Lactoperoxidase, Lactoferrin & Lysozyme – 3 enzymes which are often marketed together as the "Triple Enzyme System."
-some products contain only one or two of these enzymes
-decrease plaque by killing bacteria, fungi and viruses by disrupting cell membranes or depriving them of iron
-also fight free radicals
-found in toothpastes and treats
Mutanese & Dextranase – enzymes which disrupt the glycan bonds in plaque, making it water-soluble and unable to adhere to teeth
-found in oral gels, rinses, and water additives

Papain –enzyme which reduces the buildup of salivary glycoproteins in the mouth, reducing plaque formation
Zinc - has antiseptic activity against both Gram-positive and Gram-negative bacteria
-decreases bacterial growth, plaque formation, and gingivitis
-usually found in oral gels and liquids which are rubbed, sprayed, or brushed onto the teeth, as well as some drinking water additives
Ascorbic Acid (Vitamin C)
–essential for wound healing, collagen production, and fighting free radicals, among other functions
–may provide unfavourable conditions for bacterial growth
–found in oral gels, rinses, and water additives
Xylitol – a natural sugar alcohol that is also used in human products such as chewing gum to reduce plaque formation and gingivitis
-inhibits bacterial growth, forms extracellular polysaccarides which make plaque less adhesive to teeth, and decreases the precipitation of calcium into calculus

-use is controversial in animals, particularly in dogs, because of concerns about xylitol causing severe hypoglycemia and liver failure. It has also been anecdotally reported as causing hemorrhagic gastroenteritis in dogs. Though the dose of xylitol in pet dental products is much less than should ever be able to cause these effects [suggested use: 5-10 mg/kg/day, toxic dose: 150 mg/kg/day (Note: one stick of chewing gum may have as much as 1000mg xylitol!)], some veterinarians are still reluctant to recommend its use. However, it seems to have no ill effects in cats, and has been shown to be effective in reducing plaque, calculus, and halitosis, and increasing gingival health.
-found in drinking water additives
-well-accepted by pets, requires no particular effort on the part of the owner

4)Barriers
These are waxy polymers that electrostatically adhere to tooth enamel. Because the wax is attached to the surface of the teeth, plaque is prevented from attaching. The teeth must be free of plaque and calculus in order for the product to adhere properly to the enamel, so it's best used following a professional dental cleaning. Also, a thick layer of 'professional' wax must be applied first in the hospital, then the owner is sent home with a thinner version that is to be applied once or twice weekly. The reason for this is that the wax is sloughed off in microscopic layers during normal salivation and chewing. The initial 'professional' wax contains many more layers than the home care version, whose weekly reapplication is meant to replace the lost layers.
Miscellaneous Agents
Antioxidants (acanthocyamins, vitamins) & EFA's– can increase the immune response to oral bacteria
-Essential Fatty Acids such as Omega 3 can aid in reducing inflammation in the oral cavity

Chlorine Dioxide– oxidizes the sulphur compounds that contribute to halitosis
-may help reduce gingivitis
-found in drinking water additives

CoQ10 – an anti-oxidant which has been shown to improve gingival health in humans when ingested
-no veterinary studies so far

Alcohol – used in human products such as mouthwash to reduce plaque
-have been linked to oral cancers in humans
-can cause GI irritation if swallowed
-a small study of dogs showed efficacy against gingivitis, though no long-term safety studies have been done

Acetic Acid – may inhibit plaque transformation into calculus similarly to polyphosphates
Veterinary Oral Health Council

The best way to be sure that a product you are recommending is safe and effective is to look for the VOHC seal of approval. Products are awarded the VOHC Seal of Acceptance following review of data from trials conducted according to VOHC protocols. No product is required to undergo testing, and it is a voluntary, expensive, and time-consuming process. What this means is that a product may be effective, but its manufacturers may not have chosen to pursue clinical trials and submission to the VOHC. However, a product with the VOHC seal of approval is KNOWNto be effective when used as directed. A continuously updated list of VOHC approved products is available at www.vohc.org.

WSV - 066

USING GENETIC TESTING AND GENETIC COUNSELING IN YOUR PRACTICE

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The genomes of hundreds of dogs and cats have been sequenced, for cats as part of the 99 Lives Cat Genome Sequencing Initiative. Most veterinary colleges teach genetics in their core curriculum. But why should a feline practitioner care about genetics?

Advertisements for direct-to-consumer genetic testing, such as, 23andMe, are commonplace and the lay public now understand genetics at a higher level than ever before. The same genetic information can be had for cats and dogs. DNA is the basis of life and the foundation of organismal biology. If you accept comparative anatomy, you must accept comparative genetics as a majority of genes are the same in all mammals.

Hundreds of thousands of humans have had their whole genome sequenced to improve their own health or to help identify health-related DNA variants in their children as part of Precision Medicine. Precision Medicine can be defined as using an individual's DNA profile to use specific drugs and treatments that will have a more predictable and positive response in that individual. Many veterinary health care centers, especially veterinary teaching hospitals, have diagnostic capabilities comparable to human medicine, such as 3T MRI and 64-splice CT. The genetic and genomic resources for cats and dogs have vastly improved within the past 3 years, including more accurate genome assemblies. The vastly improved assemblies have enabled the development of resources needed for Precision Medicine, such as whole exome sequence (WES) and whole genome sequencing (WGS). The costs of Genomic Medicine have also radically reduced. WGS can be accomplished for ~$1200 USD and WES for ~$350 USD. These costs are well within the costs of current diagnostics used in veterinary medicine. Whether treatments are required for an allusive disease or to determine biomarkers for chemotherapy targets, Precision / Genomic Medicine can be applied to companion animals.

Hundreds of DNA variants causing diseases, morphologies and pehontypes are now documented in cats and dogs. The clinical descriptions and phenotypes of each of these diseases and traits have been curated at the Online Mendelian Inheritance in Animals (OMIA) website (http://omia.angis.org.au/home/), which is an invaluable resource comparison of the phenotypes across 2216 animal species.

Most of the identified disease tests in pets are very specific to breeds and populations are available as commercial genetic tests offered by university-associated and private laboratories. Many DNA alterations identified in random bred pets and disease conferring variants that have not propagated within a breed. These genetic variants should not be part of routine screening by breeders and registries, but clinicians should know that genetic tests are available for diagnostic purposes, especially from research groups with specialized expertise. If similar conditions are suspected in cats or dogs, researchers will generally consider testing for the known variant as a non-commercial service and may continue analysis of the entire gene to determine if new DNA alterations can be identified and causative for this particular condition. Other biomarkers are also available at these specialized laboratories to help decipher between specific conditions, such as the lysosomal storage diseases and metabolism orders.

Genetic Counseling in Veterinary Medicine

Veterinarians are expected to obtain, understand, and interpret DNA results and provide "genetic counseling." Unlike dogs, because a majority of the cat population does not represent pedigreed cats, breeders are not generally the largest portion of clientele in a standard veterinary practice. Genetic testing in random bred cats is currently rather minimal and occurs primarily for rare and orphan diseases, such as mucopolysaccharidoses or porphyrias. With regard to genetic testing, what pertains to cats likely pertains to other domestic animals, including dogs, cattle, and horses. Genetics courses are a standard prerequisite for veterinary school admission; and for the past 10 to 15 years, many U.S. veterinary schools have formally added genetics into their curriculum. At a minimum, different modes of inheritance are reviewed and graduate veterinarians should be able to provide minimal genetic counseling as a result. The mode of inheritance (i.e., autosomal, sex-linked, recessive, dominant), incomplete penetrance, variable expression, age of onset, and risk are terms the modern veterinarian should come to know, understand, and hopefully embrace.

Genetic counseling can be structured into three distinct processes. The initial process is the procedure conducted by the veterinarian to obtain a diagnosis for a clinical presentation. Collection of the patient's signalment and history should include considerations of the pet's breed and the general health of its lineage, including parents, siblings, and offspring. Thus, the veterinarian may be looking for clues to a possible genetic cause for a condition by asking if this clinical presentation has been documented in the breed or noticed in any close relatives.

Any early presentation of a disease that normally affects older pets, such mediastinal lymphoma, may indicate a potential genetic influence. Bilateral presentation, such as vessel attenuation in both eyes in normotensive cats or dogs, is a hallmark for heritable disease, such as retinal degeneration. At this time, the veterinarian and client will need to discuss if a DNA-based diagnostic test, such as DNA test for PKD, is more warranted, perhaps in lieu of or prior to additional more costly diagnostics, such as ultrasound examinations. Considerations such as what happens if the DNA test is positive or negative need to be considered and discussed.

Once a DNA test is obtained, test interpretation and prognosis need to be considered, which is a major secondary step in genetic counseling. The client and the veterinarian need to recognize that the current DNA tests do not predict severity of disease. In the case of PKD, many mildly affected cats will never develop renal failure and will die of causes not related to PKD, whereas others develop end-stage renal disease within a few years and have an early death attributed to the disease. Thus, ultrasound imaging is an important diagnostic in the cat's healthcare management for PKD. Another important example is HCM in Maine Coon cats. The presence of the genetic mutation clearly confers risk, but the extent of the risk is nebulous. Thus, genetic tests should be used as a tool for the veterinarian and the owner, supporting the overall picture of a given cat's healthcare plan. In the case of PKD, ultrasound and/or serum creatinine levels should be used to monitor disease progression in PKD-positive cats. Echocardiographic monitoring remains the standard for HCM patients, although early detection cardiac biomarkers are being explored. Genetic testing should be used to enhance (not replace) interactions among the patient, client, and veterinarian.

The third step in genetic counseling is communication with the client, which hopefully is a long-lasting interaction over the healthcare management of the pet. Directed (active) versus non-directed (passive) counseling is a concept that should be considered. Most veterinarians want to provide "directed" counseling. For example, "Your cat has PKD. You should never breed the cat again and should spay or neuter the cat." Directed counseling is unacceptable in human medicine, and if the "big picture" is considered, directed counseling should also be nonstandard in veterinary medicine. The "big picture" pertains to not only the cat itself but also the breed population and the livelihood of the breeder. Thus, a more passive, non-directed approach where all the information regarding the patient's health and likely information regarding the owner's breeding program will need to be considered.

As noted with the gangliosidoses in the Korat breed, a passive approach led to a slow eradication of the disease variant in the population, without the production of unhealthy cats, but with maintenance of high genetic diversity in the breed population - the "big picture." In individual cases, the veterinarian caused no harm to the patient or the breed, likely kept the breeder as a client, the client developed a healthier breeding program, and the veterinarian and breeder improved the overall health of the breed.

Genetics is not going to solve every health problem, even the ones with highly heritable influences. Interpretations and the determination of risk may be difficult for many conditions. As determined by sequencing of thousands of humans, each individual (human or pet) has several severe mutations in their genome that should render them unfit - we should all have some major health problem! It is important for veterinarians and pet owners to recognize that we do not yet understand how all the approximately 21,000 genes of the body interact and therefore cannot predict overall health of an individual based on the presence or absence of a single mutation. Thus, in genetic counseling, one should consider all the good things as well as the bad things that a cat has to determine future breeding and population management strategies. The present health condition of the pet should be the primary concern, but temperament, reproductive success, resistance to other health problems, and aesthetic qualities should also be considered. By understanding the mode of inheritance, diseases and undesirable traits can be slowly removed from the feline population. Veterinarians play a vital role in human public health. So too with pets, the health of the individual and the health of the population both need to be considered in health management plans.

WSV - 310

CARDIAC EVALUATIONS IN THE PRE-PURCHASE EXAM: HOW THE ECHOCARDIOGRAM HELPS ASSESS PROGNOSIS

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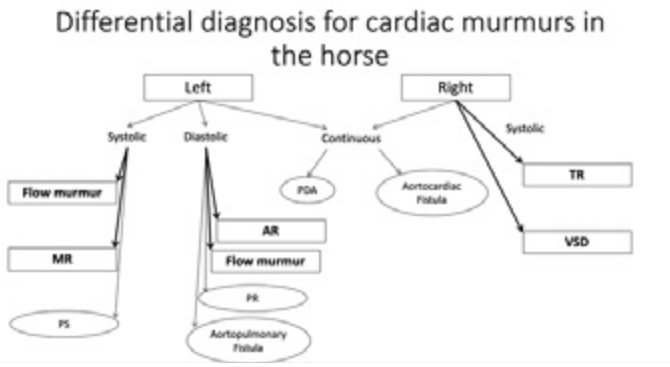
Learning objectives: provide valuable information to your client based on accurate cardiac auscultation and understand the common an uncommon findings on the echocardiogram and what they mean for the horse's athletic prognosis.

Cardiac murmurs are common in equine athletes, and in a large proportion of cases, these murmurs are compatible with performance at the highest level. The catch however, is that the intensity of the murmur doesn't correlate well with the severity of the disease.
For example, mitral regurgitation due to mitral valve prolapse, a benign condition with a very good athletic prognosis can have the same intensity murmur as mitral regurgitation due to degenerative valve disease with a dilated left atrium and a more reserved long-term athletic prognosis. Although over 90% of horses presented for cardiac evaluation as part of their pre-purchase evaluation (PPE) have mild heart disease unlikely to affect their athletic career, a small proportion of horses have severe performance-limiting and occasionally life-threatening cardiac conditions found on their PPE.

As such, a complete cardiac evaluation in any horse with an abnormality on auscultation, provides a unique opportunity to remove at-risk horses from the sport. Thankfully, the differential diagnosis for cardiac diseases in horses is relatively straight-forward. A through cardiac auscultation in a quiet setting provides the diagnosis in the majority of cases.



Abbreviations:
AR – aortic regurgitation
MR – mitral regurgitation
PDA – persistent ductus arteriosus
PR – pulmonic regurgitation
PS – pulmonic stenosis
TR – tricuspid regurgitation
VSD – ventricular septal defect
In bold square shapes are the common abnormalities, in smaller circular shapes are the much less common abnormalities.

An ACVIM/ECEIM consensus statement was recently published concerning recommendations for equine athletes with cardiovascular abnormalities(1), this is an extremely useful guide when assessing athletic prognosis based on the echocardiography findings.
Left-sided systolic murmur over the aortic to mitral valve area: mitral regurgitation.

Why recommend the echocardiogram?
Determine the cause if possible because this affects prognosis. Although in many cases there are no specific abnormalities of the mitral valve, in certain cases you can find mitral valve prolapse, which has a good prognosis, a ruptured cordae tendineae or endocarditis which have a guarded to poor prognosis or degenerative valve disease, for which the prognosis depends on the extent of the valve thickening and the age of the horse.
Determine the cardiac dimensions: left atrial enlargement will be the first change noted with advancing mitral regurgitation. In severe cases left ventricular volume overload and pulmonary hypertension can also occur. Horses with normal cardiac dimensions, even with a medium sized jet of mitral regurgitation are unlikely to be affected by this cardiac pathology.

Determine the size and number of jets: this assessment can be grossly over or under-estimated based on the Doppler capacities of your portable machine and the Doppler scale settings and prudence should be exerted when interpreting this parameter. However, finding multiple larger jets in a young horse, even with normal cardiac dimensions raises some concerns about the possible progression of this condition over time.

What is the risk with MR?
Enlarged let atrium is a risk factor for atrial fibrillation, which can affect performance at the highest level. Although many horses in atrial fibrillation are able to perform at lower and medium levels (and some even high levels of dressage and show jumping), they have been shown to exhibit ventricular arrhythmias during exercise(2), raising concern for their safety and that of their rider.

Severe mitral regurgitation can be a primary cause of poor performance.
An exercising electrocardiogram (ECG) is recommended in horses presented for PPE with moderate or severe MR.
Left sided diastolic murmur over the aortic valve: aortic regurgitation.
Why recommend the echocardiogram?
Determine the cause because this affects prognosis. Degenerative valve disease of the aortic valve is the most common lesion found in horses with aortic regurgitation over 15 years of age. In these cases, the aortic regurgitation typically progresses slowly. Finding a torn leaflet, endocarditis or valve scarring is associated with a more rapid progression and thus a more guarded prognosis.

Determine the cardiac dimensions: left ventricular enlargement is the first change noted with advancing aortic regurgitation. In severe cases, left atrial enlargement and concurrent MR can also occur. The cardiac dimensions are a major factor in assessing the severity of the AR (much more then the size of the jet).
What is the risk with AR?
Horses with AR are at an increased risk for ventricular arrhythmias(3)and sudden cardiac death due to fatal ventricular arrhythmias have been observed in horses with moderate to severe AR(1). Severe aortic regurgitation can be a primary cause of poor performance.
An exercising ECG is recommended in horses presented for PPE with moderate or severe AR.
Right-sided systolic murmur over the tricuspid valve: without concurrent murmurs, this is tricuspid regurgitation. With a concurrent slightly less loud systolic murmur over the pulmonic valve area, this is a ventricular septal defect.
Tricuspid regurgitation is common in equine athletes and typically very well tolerated.
Why recommend the echocardiogram?
Rule out endocarditis, especially in a horse with a history of a jugular vein catheter, which has a more garded prognosis then TR with a normal valve.
Determine cardiac dimensions: use right-sided enlargement to determine severity.
What is the risk with TR?
Unless the TR is caused by endocarditis or the right side is significantly enlarged, TR is well tolerated. Significant right-sided atrial enlargement also raises a concern for the development of atrial fibrillation.

Ventricular septal defect

Why recommend the echocardiogram?
Determine the size of the VSD and the shunt velocity: a defect of 2.5 cm or smaller and a shunt velocity above 4m/s has a good prognosis, where as a defect larger then 2.5 cm and shunt velocities under 4m/s are more likely to have hemodynamic consequences(1).
Determine cardiac dimensions: Left-sided enlargement is the first sign of the effect of over-circulation of the pulmonary vasculature induced by the VSD. Advanced cases can show pulmonary hypertension and congestive heart failure.
Determine the presence of concurrent abnormalities: due to it's most common location in the septum just below the aorta, the aortic valve can prolapse into the defect. This initially renders a functionally smaller defect, but destabilizes the aortic valve leading to aortic regurgitation, which worsens the left ventricular volume overload. Left sided enlargement can lead to MR, further worsening the left atrial volume overload.
The VSD can be a component of other more complex congenital abnormalities.
What is the risk with a VSD?
Large VSDs can lead to poor performance. Ventricular arrhythmias and atrial fibrillation have appeared in horses with VSDs for which the risks were detailed above.
An exercising ECG is recommended in horses presented for PPE with a VSD.
Other abnormalities less commonly encountered:
A continuous machinery murmur on the right side of the chest: aortocardiac fistula– these horses are unsafe to ride and this condition is life threatening. The reason to recommend the echocardiogram is to confirm the diagnosis before condemning the horse (for example concurrent tricuspid regurgitation and very loud aortic regurgitation could produce a somewhat similar sound on the right)

Any diastolic murmur in a Friesian should prompt an echocardiogram: these horses are prone to aortopulmonary fisulas which are incompatible with athletic use and life threatening.
Other abnormalities which can significantly affect performance, encountered on the echocardiogram without an associated murmur are myocarditis and cardiomyopathy. Although these are typically though to induce clinical signs that would preclude these horses from being presented to a PPE, a few of these cases have been detected on PPE, again underscoring the important role of the echocardiogram in removing at risk horses from the sport.

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TRACHEAL COLLAPSE: TO STENT OR NOT TO STENT?

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Tracheal collapse is a frequently encountered, progressive, chronic respiratory disease of middle aged, small and toy breed dogs. Yorkshire terriers, Pomeranians, Poodles and Chihuahuas are reported to the most commonly affected breeds. Tracheal collapse is characterized by a dorsoventral flattening of the trachea secondary to weakness of the tracheal cartilaginous rings and flaccidity of the dorsal tracheal membrane.

This results in a narrowing of the tracheal lumen that can range from mild to severe and can occur anywhere along its length. The cervical trachea and thoracic inlet have been described as the most commonly affected regions, however, collapse of the intrathoracic trachea, carina and mainstem bronchi can occur. The underlying pathogenesis of the disease has been the object of numerous studies and has yet to be determined. Tracheal ring cartilage of affected dogs shows markedly decreased amounts of chondroitin sulphate, calcium, glycoproteins and glycoaminoglycans. Congenital or acquired disruption of tracheal rings along with anomalies of the dorsal membrane ultra-structure may result in weakness, shape modification and inflammation which may contribute to the degenerative process. A 'W' malformation has been identified in a number of Yorkshire Terriers (other breeds can also be affected).

This tracheal malformation commonly occurs at the thoracic inlet and can result in misinterpretation of a mediastinal mass on standard thoracic radiographs.
Clinical signs are worsened by exercise or excitement, but may be present at rest in severe cases. These signs generally include coughing, gagging, typical "goose honking" respiratory sounds, loud/raspy breathing and dyspnea. Dogs generally present with 2 categories of clinical signs: coughing/gagging and those who obstruct acutely and often need emergency treatment. The latter group often do not present any or very little coughing with intermittent dramatic obstructive episodes.

Diagnosis is based on clinical presentation, physical exam and is confirmed by various imaging techniques. Radiographs have been reported to correctly identify affected dogs in 59 to 84% of cases. Ideally, the collapsed trachea should be visualized under fluoroscopy to observe dynamic airway collapse during the different respiratory phases and most importantly during coughing.

Tracheobronchoscopy is a useful and sensitive tool in the diagnosis of tracheal collapse, allowing direct visualization of the tracheal lumen.
Initially, medical therapy is recommended and results in long term resolution of clinical signs in greater than 80 % of dogs. Medical management includes the use of antitussives, anti-inflammatories (corticosteroids are important), bronchodilators, oxygen supplementation and sedatives as needed. In dogs for which appropriate medical management has not resulted in satisfactory results, tracheal stenting should be considered.

The use of various endoluminal stents has been described for the treatment of tracheal collapse in the dog. Use of endoluminal prosthesis for this condition was first reported by Leonard in 1978. Endoluminal stents share many advantages, including placement in extra and intrathoracic portions of the trachea, a non-invasive placement, ease and rapidity of placement, quick and effective relief of clinical signs and a better adaptability to various diameters (trachea, bronchus).

When should I consider placing a stent for tracheal collapse ?
Due to the expense, the reported short and long term complications and the need to continue medications in many patients, tracheal stenting is reserved for dogs that are unresponsive to conventional medical therapy and that have a seriously compromised quality of life. There is currently no evidence that early tracheal stenting slows progressive myelomalacia and should not be used prophylactically1.

A recent retrospective study on tracheal stenting reveals lots of important information that can help both veterinarians and clients make the decision to stent or not to stent2. In the study, half of dogs had a tracheal malformation and the other half presented for traditional tracheal collapse. Dogs with malformations tended to be younger (7 years) at the time of stenting than traditional collapse dogs (9 years). 75% of dogs undergoing stenting had positive bacterial airway cultures. Following tracheal stenting, 89% of dogs had improvement in goose-honking and loud breathing, 84% had improvement in dyspnea but only 43% had improvement in cough. 95% of dogs continued to receive medication long term (antitussives and corticosteroids: concurrent bronchial collapse).
Complications: 19% stent fracture needing re-stenting, obstructive tissue ingrowth 17% (treated with antibiotics and sometimes needing restenting), 10% progressive tracheal collapse. Pneumonia/tracheal infection at some point during the long term follow-up was found in 57% of patients and was mostly responsive to antibiotics. Mean survival time was 1000 days. Cause of death was respiratory related in 77% of dogs2,3.

Tracheal stenting is a useful procedure that can significantly restore quality of life to severely affected patients. Tracheal stenting does not cure these dogs and most remain symptomatic for cough and need long term medical therapy. Tracheal stenting is recommended in patients with goose-honking, loud-breathing and obstructive episodes in patients unresponsive to medical therapy. Tracheal stenting is not a treatment for cough.

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WEBSITES: A FEW THINGS TO CONSIDER BEFORE CHOOSING A PLATFORM OR WEBSITE BUILDER

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What importance should be given to your business website? What counts is the professionalism of my team and my services, you might say. It was perhaps the case a couple of years ago when information on the Web was not as interconnected and consumers had less the reflex to refer to it. Currently, studies show 80% to 90% of consumers check online before making a purchase. In 2019, your website is to the digital world what your practice is to your region. To neglect it is to leave room for a competitor. After human resources, website management is one of the subjects that give the most headaches to veterinarian owners.

When I'm talking about websites, I am systematically met with terms referring to performance and complex SEO techniques. To be honest with you, on-page optimization, as it is called, worries me fairly less in veterinary medicine compared to in retail businesses. If we were in the television industry and our two main competitors were Wal-Mart and Amazon, it would be imperative to have a website structured according to best practices. Search with the word "veterinarian" is considered by Google as a local search, meaning that the search engine strongly suspects that the user is searching for a service it will purchase near its search location. It's the same principle for dentists, cleaners, grocery stores, schools, etc. So, even if a veterinary clinic located 500 km from yours has a better website, you will come up way before them in someone's search who lives in the neighbourhood. Organic SEO becomes more of an issue in highly populated areas where many veterinary practices engage in fierce competition.

Another observation that tends to calm the panic of website performance: in the last few years, you can feel a wind of change in the importance Google places to its 200 analysis criteria that determine the order of the search results. In 2014, they created a specific algorithm for so-called local searches which has as its cornerstone the information contained in GoogleMyBusiness profiles (the algorithm has a name, it is called Pigeon!). Strategically, Google must remain relevant in its results in order to continue its dominance as a search engine. Should another engine be more efficient, it will be dethroned. So how can an algorithm know if its suggestions of local businesses are relevant? It finds the answer in reviews left by consumers.

So, cues left by users about you on the Web become more important for your search result ranking. The first 3 rankings reap 33%, 17% and 11% respectively of clicks. In light of these explanations, you can then understand that the three factors that will have a critical impact on your ranking in the results are your location, GoogleMyBusiness profile and reviews. To further consolidate their importance, know that veterinary facility searches on the Google Maps app exceeded those on the search engine in all the GoogleMyBusiness profiles that I've analyzed.

So, what should you infer when you decide to change your website or create a new one? We must see beyond the performance of the site and especially think about how your site will be a useful tool for your customers:

Content: the majority of websites in veterinary medicine are showcase websites, so they do not offer e-commerce. These are usually easy to create websites, but don't let a developer decide for you. Think about the tools that your site should offer to help you in your relationship with your customers who forget all the details that have been passed on to them or who don't want to waste paper:
- Pre- and post-op sheets for sterilization (spay and neuter)
- Video demonstrating how to clean the ears of a dog that you have made and put on social media. Same thing for cutting claws and how to walk a dominant dog on a leash.
- Checklist to prepare for a trip (vaccination, microchip, etc.)

- Refill prescription drugs
Container (platform) and CMS: There are many platforms. The most popular is WordPress, which accounts for about 33% of the website market. It is the structure that Google understands best and that most experts recommend. On the other hand, its CMS (content management system), the interface that allows you to make changes, is not the most user-friendly. If you opt for a website supported by WordPress, you'll have to consider training at least one person on your team for modifications or allocate a budget to get those done. Believe me, there are more than we think:
Adding and removing new employees
Changes in opening hours and holidays schedules
Adding or removing new services such as physiotherapy, boarding, grooming
Changing pictures
Blog posts

Photos: if possible, use your own photos! The beautiful pictures that we buy are often used by many other clinics. If a developer chooses them for you, you may find yourself with a picture of a kitten receiving a transcranial injection (you know, those pictures that have been taken by people who know nothing about veterinary medicine). Put smiling team pictures. We want the feeling of friendliness. Also, invest in a Google inside 360 virtual tour.

Texts: in my humble opinion, it is a big challenge which is underestimated. Writing for the Web is very different from writing for print. We must reduce the length of sentences and include keywords. The structure of tags (header) is very important for the readability with Google. The search for key phrases (keywords) that customers use is not a step that the web developer will do for you! I've once seen in a text that a microchip is like a GPS. You'll guess that this was not a member of the team that produced this description of the service!

When veterinarians write their texts, it is often too scientific or medical. We're talking about solutions (descaling, dentistry) rather than problems (bad breath, pain when the cat eats) in general. An agency that offers ready-made texts is not recommended, Google does not appreciate plagiarism that will then hurt you, as well as the site that contains the original texts. We must find the right one that includes your business environment, pet owners, as well as Web writing. Ask the person to offer you examples of texts that they have done in the past.

To facilitate their work, ask the receptionists to do a list of phrases that customers use most often when calling. Budget for updates. There were the ones for mobility, site security, and download speed. There will be others. Plan the budget and the frequency. With sites such as Wix, these updates are automatic.

Once on your site, it's in your best interest that potential customers find the information they are looking for quickly (we suggest 10–15 seconds), risking otherwise that they go elsewhere. It is usually your business hours, your address and your phone number that interest them the most. Headers and footers are therefore particularly important, both for users as for search engines. Your locations must be included.

Finally, it is mentioned somewhat, but an interesting leveraging tool is the referencing of your site on other sites called a backlink, when it contains your URL and citations, your mailing address or your phone number. It is a sign of credibility in Google's eyes to have other companies mention you. Therefore, add your profile on local directories, make agreements with a business partner, etc.

This adds up to several points to think about, I agree! The purpose of this reflection is that you have a website you can be proud and that serve as a tool for pet owners seeking to recall a detail given to them over the phone or during the consultation. Never forget the power of reviews and your GoogleMyBusiness profile. At least, you are completely in control of these two important aspects.

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HOW I TREAT ALMOST ANYTHING - THE 360° CARE BEHAVIOR TREATMENT PLAN

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Behavior treatment plan

The treatment of any behavioral problem includes a multi-facetted approach consisting of a 5-Step process. You might chose to implement some, or all of the 5 steps involved depending on the case, the circumstances, and your level of skills; however, any veterinarian should be able to recommend steps 1 and 2. An example of a generic discharge template for 5 step treatment plan that works for any behavior diagnosis look as follows:

Step 1. Management: Safety and Avoidance

In order to set up the patient for success, strict management is needed at the beginning of every plan. Initially, the owner will have to set the stage and manage the pet's environment so as to avoid any situations in which the pet has displayed the unwanted behavior in the past. Initially, the treatment process can be slow; hence, in the meantime, the owner must prevent those events from reoccurring. Every time a pet displays this behavior, the behavior is further rehearsed and this might be inadvertently reinforcing the behavior problem you try to treat. Therefore, as you are in the process of treating, the patient should not be exposed to the trigger(s) which cause the unwanted or unacceptable behavior(s). The owner should begin by mentally taking note of all situations where the pet displays the(se) behavior(s). In addition to supporting the overall success of the behavior modification, avoidance may also be a safety recommendation in some cases.

Step 2. (Re-)Structuring the relationship with the pet and strengthening the human-animal-bond

Aware – Affirm – Award Approach

There are many advantages to using such a program as part of a training program for a pet. First, it is a program that fits all pets and all people, regardless of breed, age, size, gender or personality-type. It is a non-confrontational technique which is designed to never put the people or pets involved at risk. It will help improve behavior and teach the pet to trust people based in predictable interactions with positive outcomes. The pet will learn to consistently follow commands at home or other low stress situations which makes it easier for him/her to follow commands in potentially challenging situations such as when distracted, anxious or perhaps even while aggressive. Finally, it will help build confidence by providing clear communication and enjoyable outcomes for desired behaviors. This approach uses only positive, reward-based training methods to teach these valuable lessons. The program consists of predictable interactions with the pet based in Command – Response – Reward (C-R-R)

The 3 principles are:
Awareness of the good/desired behaviors
Affirm: Feedback is needed: communicate to the animal at the time of the behavior
Reward any positive behaviors, especially when they are incompatible with the unwanted behavior

Step 3. Tools

This is any equipment that will help with the implementation of the management plan and the reward-based training program. Specific recommendations should be provided to the client. The list is endless, but could include items such as baby gates, kennels, crates, screen doors, window covers, leashes, tethers, head halters, front buckle harness, basket muzzle, clicker, target stick, MannersMinder, treat pouch, treats, relaxation mat, feed dispensing toys and puzzles, interactive toys, Relaxation music (Thru the dogs ear), visual entertainment (DOGTV), litterboxes and litter type, nail caps for cats, scratching posts and many more.
NOTE: My list does NOT include anti-bark devices, shock collars, prong collars, shaker cans, throw chains and other pain and fear eliciting items – these are punishment based tools that help suppress behaviors rather than help teaching new positive behaviors and negative emotions can lead to increased fear, anxiety and aggression.

Step 4. Reintroduction: Positive Emotional Response and Incompatible Behaviors

First, the animal has to be prepared for the reintroduction to the triggers or situations that have to be avoided initially (see Step 1, 2 and 3). The positive emotional response and behaviors that will be practiced and rewarded should be simple and incompatible with the unwanted behavior. (Example: sitting quietly is a positive behavior that is incompatible with lunging). The pet will gradually learn to associate good things happening and have a positive response. The Command – Response – Reward (C-R-R) approach helps the dog to perform trained commands reliably in various types of situations and therefore the pet can then be reintroduced to previously challenging situations in a step by step process (DS) while the emotional response will be changed (CC). It is a technique that all people, regardless of age, size, or personality-type can do. It is a non-confrontational technique which is designed to never put the people or dogs involved at risk. The goal is that the unwanted behavior is never displayed – this process is called desensitizing and counter-conditioning (DS/CC). The client needs to receive specific homework. It is critical that the client understands the exercises, this will enhance owner's compliance and overall success of the treatment plan. With the client define success and how to measure miles stones or key performance indicators (KPI'S).

The stimulus or stimuli that were identified during an appointment as causing the pet's unwanted emotional reaction and subsequent problem behaviors need then be reintroduced in a series of gradual steps and intensities. The common gradients that are used for DS/CC are altering the intensity and changing the distance to the stimulus. The intensity can be changed by altering the location, loudness, speed of movement, duration, types of stimuli, or components and response of the stimulus. DS/CC needs to start at the lowest intensity that results in no signs of anxiety or concern. The stimulus (at the lowest intensity and/or at the furthest distance) is presented and the pet is rewarded for the new, relaxed attitude and behaviors. The stimulus is repeated over multiple sessions, while the pet is rewarded for the positive behavior. Every session should be brief and always end by rewarding the display of positive behavior(s). It is important to keep a log book or video tape session to track success.

Step 5. Medications

Medications can be part of any behavioral treatment. Medications should be used with a concomitant diagnosis and full laboratory testing (CBC, Chem and T4, UA, Urine culture). Medications can help lower the anxiety levels and be an adjunct to a behavior modification plan. Most medications are "off label" use and the client needs to be informed about the potential side effects and adverse effects with any other medication(s).

Key Points

Behavior treatment takes time and that the process may be gradual. Since progress is often slow, maintaining a journal of the behavior to track the progress is helpful. Problems usually arise from progressing too quickly and not taking small, incremental steps. In most cases the problem behavior took time to develop and hence the goal is small, incremental improvements rather than instant results.

Further reading:
www.cliniciansbrief.com/sites/.../Addressing%20Any%20Behavior%20Problem.pdf

WSV - 076

EFFECTIVE USE OF EXTERNAL FIXATORS IN PRACTICE

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External fixators are used for the immobilization of long bone fractures. Their use requires the use of transcortical fixation pins (minimum of 4) attached to one or more connecting bars. The fastening elements of the pins to the connecting bars are called clamps. Once set up, we call ‹montage› the resultant, the frame fixed in the bone
There are 3 types of external fixators:
· linear devices
· circular devices
· hybrid devices.

INDICATIONS

External fixators are versatile. They are used in various scenarios. Their indications are:
· Stable and unstable fractures
· Open fractures
· Gunshot fractures
· Corrective osteotomies for angular limb deformities
· Delayed unions and non-unions
· Arthrodesis of certain joints
· Stabilization of certain joints during ligament or tendon damage

ADVANTAGES are numerous

· Easy to use
· Versatile
· Preservation of soft tissues
· Remote stabilization of trauma site
· Allows treatment of open wounds
· Complementary to other methods of internal fixation
· Well tolerated
· Easy and simple removal (sometimes only deep sedation is enough)
· Reasonable cost

DISADVANTAGES are limited

· Blind insertion of IM pins
· Insertion is dependent of the operator
· Re-evaluation are more frequent (2X)
· Daily fixator care by the owner
· Watch out for furniture and legs at home !!

EXTERNAL FIXATOR COMPONENTS

The device is created using several components
· fixation pins
· clamps
· connecting bars
Fixation pins (fixator base)

There are 3 types of transcortical fixation rods:
1. Smooth pins:
a. Their insertion is easy
b. Poor retention force
c. Tendency to become loose with time
2. Threaded pins with negative profile
a. Easy insertion Better retention strength in the bone
b. Optimized stability at the rod / bone interface
c. Tend to break at the junction of the smooth part and the threaded part
i. Use Ellis type stems, where the thread is short and the junction is in the medullary cavity
3. Positive profile threaded pins
a. Insert must be preceded by drilling a hole, so more complex
b. Insertion must be unidirectional: avoid inserting and removing the rods otherwise this results in microfractures of the threads
c. The greatest retention force in the bone
d. Greater stability at the rod / bone interface
Clamps
Clamps are used to fix
· the fixation pins to the connecting bars
· connection bars between them
· intramedullary pins at connecting rods
o «Tie-in» type assembly
The clamps can be either single or double. Clamps are usually the weak link in the chain. For several years now, manufacturers have developed and marketed stronger, more versatile and more durable clamps!
Connecting bars
The connecting bars bind the fixation pins, thus stabilizing the bones involved in the fracture. The connection bars determine the rigidity of the frame !!
There are different types of connecting bars:
· stainless steel
o the most common, several sizes, but less rigid and heavier than others
· carbon
o rigid, light and radiolucent
· titanium
o rigid, light and expensive
· aluminum
o rigid and light
Nomenclature
Linear external fixators are classified into 3 types according to their configuration:
1. the number of sides (skin surfaces) perforated by fixation pins:
a. uni or bilateral
b. type I, type II or type III
2. the number of planes of the fixator:
a. uni or biplanar

i. Unilateral-uniplanar (type Ia)
ii. Unilateral-biplanar (type Ib)
iii. Bilateral-uniplanar (type II)
iv. Bilateral-biplanar (type III)
Principles of application

· REDUCTION OF THE FRACTURE
o First, proceed to the reduction of the fracture
§ Open
§ Closed: biological approach
§ «Open, but do not touch»
· visualization of the fracture, attends reduction, but no debridement

· FIXATION PINS INSERTION
o Number of rods
§ Use a minimum of 2 pins per bone fragment
§ Maximum of 4 pins
§ pins MUST engage both cortices
· Cis
· Trans
o Size of the pins
§ Diameter of 20% of the smallest diameter of the bone
o Distance from the fracture site
§ In general, □ to once the diameter of the bone
§ For example, a tibia has a diameter of 18mm in its mid-diaphyseal region, so the pin closest to the fracture site should be 9-18 mm away from it
o Distance between them
§ as far apart as possible
o Insertion technique

§ ALWAYS USE A DRILL WITH A MAXIMUM SPEED OF 100-150rpm. Higher speed will result in heat production: necrosis, premature pin loosening and replacement over time
§ Use a skin incision large enough to avoid rotational stretching lesions
§ Smooth rods
· Parallel placement on the ground for the most distant pins of the fracture site
· Placement at an angle (20o if possible) for the intermediate pins
§ Negative threaded pins (Ellis)
· Insert as smooth pins
· Less need to angulate the intermediate pins
§ Positive threaded pins
· Drill a guide hole with a drill bit
· The guide hole should be 0-10% smaller than the pin diameter
o 2.5 cm diameter bones, 5mm (20%) diameter pins are used, a 4.5mm diameter hole is drilled before insertion of the positively threaded rods
· Slow unidirectional insertion !!

CONNECTING BARS
o Use the appropriate connection bars, the most rigid possible
o The connecting bars should be AT LEAST one cm (1cm) from the skin, to avoid contact wounds
· CLAMPS
o The clamps should be towards the inside of the limb as this provides increased rigidity
CAUTION :
· Minimize the amount of soft tissue between bone and skin
· Avoid tendons, ligaments, nerves and vessels
· Make sure to avoid cracks, otherwise the bone will burst !!!

LET›S TALK BIOMECHANIC !!
Or, what are the factors influencing the strength and rigidity of the fixator

1. Configuration of the external fixator
a. The type of fixator used (type I / II / III) influences the rigidity of the assembly
b. Type I< Type II < Type III

2. Type of pins
a. Positively threaded rods> negatively threaded rods> smooth rods
b. Retention force at tearing and premature release
3. Positioning of the pins
a. Place the pins through the widest part of the bone to maximize grip and avoid cracking the bone
b. In the center of a round bone
c. In the widest part of a triangular bone
d. The pins should be well distributed along the length of the bone to distribute the stress and maintain the maximum strength of the fixator.
4. Inserting the fixing pins
a. The method of insertion of the fixing pins is very important.
b. Limited speed is used and irrigated (sterile saline) to dissipate the heat produced and thus reduce the risk of thermal necrosis of bone
5. Number of pins
a. The higher the number of pins per bone fragment (up to 4 per fragment), the more rigid the fixator and the greater the stress distribution at each bone / stem interface.
b. ON THE OTHER HAND, too many pins can cause too much stress on the bone and become a source of fracture.
c. In general, 3 pins per fragment are used.
6. Size of the fixation pins
a. Larger pins are more resistant to deformation
b. They are more resistant to tearing and premature loosening
i. SO

1. pins approaching but not exceeding 20% of the diameter of the bone are recommended
2. pins with a large diameter will result in weakening of the bone (fracture)
7. Connecting bars:
a. Distance of connecting bars with bone
i. Leave enough space to allow postoperative swelling (1cm in a 30kg dog)
ii. Increasing the distance between the bone and the connecting bars decreases the rigidity of the fixator.
8. Connecting bars
a. stiffness of these
i. The type of connecting bar influences the rigidity of the frame.
ii. Carbon or aluminum bars are stiffer than stainless steel because they are often of larger diameter
iii. The addition of a juxtaposed connecting bar doubles the rigidity of the frame !!

POSTOPERATIVE CARE

1. Immediately post-op and for the first 3-5 days
a. Use antiseptic / antibiotic ointment and sterile gauze at the skin/pin interface
b. Pack a substantial amount of sterile gauze between the skin and the connecting bars and cover the entire assembly with a sterile bandage
c. Change the bandage every day for 3-5 days
i. Remove the bandage
ii. clean the skin/pin interfaces with chlorhexidine (0.05 to 0.2%)
iii. apply ointment and redo bandage
iv. which will be changed every day for 3-5 days after the surgery
2. After 3-5 days
a. Remove the bandage and change it to a bandage that covers only the fixator, especially the tips that could hurt the patient or his owners
b. Apply a little ointment until the granulation tissue is visible around the fixation pins
i. In general 5-7 days
3. For the duration of the fixator
a. Verification of the frame by the owner every day and removal of crusts that form around the fixation pins and clean the skin/pin interface daily
b. Rechecks every two weeks at the veterinarian for
i. Verification of the frame condition
1. Wounds
2. Clamps
3. Pins
c. Radiographic reassessment every 4 weeks

COMPLICATIONS

1. Discharge at the skin/pin interface
a. This is the most common complication
b. Due in general to soft tissue movement
2. Infection
a. Differentiate between superficial infection VS osteomyelitis
i. During superficial infection, there is no loss of function
ii. During osteomyelitis, loss of function
iii. Radiographic evaluation justified in case of loss of function or change of weight bearing
3. Premature loosening of one or more fixation pins
a. Appearance discomfort and abundant discharge = loosening of one or more pins
b. Recheck as needed
i. Removal of pins
ii. Replacement of pins - new location
iii. Adding pins - new location
4. Frame failure
a. Inappropriate assembly - not rigid enough
b. Fracture of the bone
i. Pin diameter too large
ii. Too many pins per fragment
c. Too much stress on the frame because the patient was not kept at rest.
d. Consider an alternative method of fixation
Removal of the external fixation device
1. The device can be removed when the fracture demonstrates clinical and radiographic evidence of bone union.
2. The frame can also be dynamized, derigidified, for example
a. Type II to Type I
b. Remove a juxtaposed connection bar
c. Remove a pin per fragment
3. Can be removed under sedation or under anesthesia
a. Threaded pins must be unscrewed !!
4. The skin should not be sutured, wounds are cleaned daily until the end of healing by second intention (5-7 days)
5. The activity of the animal must be restricted for 6 weeks
a. time that the fracture remodels
b. holes left by the extraction of the pins are filled.

OTHER TYPES OF EXTERNAL LINEAR FIXATORS

There are linear external fixators on the market whose connecting bars and clamps are replaced by tubing and acrylic. The Innovative APEF system is an example: http://www.innovativeanimal.com/acrylic-pin-external-fixation-system.php
The same principles of application apply, except that the ends of the pins are perforated through a tube of large diameter corrugated plastic, the distal end is plugged and acrylic is poured into the tubing. Liquid acrylic form polymerizes thus becoming rigid. Polymethyl methacrylate (PMMA) is frequently used. The sterile form is expensive, but there is a non-sterile form used for the treatment of hooves in cattle (Tecnovit ™).

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ABDOMINAL ULTRASOUND: SYSTEMATIC APPROACH

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Developing a systematic approach to evaluation of the abdomen with ultrasound is crucial for accurate and efficient ultrasound examinations.1 Similar to doing a physical examination, it does not necessarily matter the order of organ/system evaluation as long as long as everything that needs to be looked at for a complete exam is evaluated. Additionally, if done in the same order each time, you can be confident that the exam is thorough with consistent evaluation of all structures.

Different approaches to systematic evaluation of the abdomen with ultrasound include organ by organ approach and quadrant approach. Obtaining orthogonal views (scanning in both long and short axis) of organs is recommended and allows the sonographer to mentally reconstruct the 2D images into a 3-D representation of the organ. Knowledge of normal anatomy is extremely important for the ultrasonographer. Taking every opportunity to scan healthy animals will give the ultrasonographer a good understanding of normal ultrasonographic anatomy and the normal internal architecture of different organs so that recognition of abnormalities is heightened and false positive findings are decreased. Knowledge of species differences will also increase accuracy of the ultrasound examination.
When first learning ultrasound, often the emphasis is on organ identification, however, the diagnostic potential of an ultrasound examination is dependent on thorough organ evaluation. Each organ/structure should be evaluated for number (how many? Is this normal?), location (Is this organ in a normal location? Is it displaced?), size (be familiar with normal reference ranges), shape, margination, echogenicity (anechoic, hypoechoic, hyperechoic, isoechoic, mixed/heterogenous) and echotexture (course vs fine, is echotexture appropriate for organ?).
Structures that should be evaluated on an abdominal ultrasound examination include the following:
Liver (including the gall bladder)
Spleen
Kidneys
Adrenal glands
Urinary bladder
Gastrointestinal tract (stomach, small intestine, colon, gastroduodenal junction/pylorus, ileocecocolic junction)
Pancreas
Lymph nodes (Typically medial iliac and jejunal lymph nodes are visible in all dogs, colonic lymph nodes are visible in cats. Other lymph nodes may be visible when abnormal.)
Greater vessels (caudal vena cava, aorta, portal vein)
Peritoneal and retroperitoneal spaces (evaluate for the fusion and abnormal mesentery/fat)
Systematic evaluation should include labeling of ultrasound images. This is helpful when looking at the images after the examination, comparing ultrasound findings to a previous ultrasound examination and when sending images to a radiologist for interpretation or as part of the medical record for patients referred for specialist care.
Knowledge of ultrasound artifacts, in particular, distal acoustic enhancement, distal acoustic shadowing and reverberation will be helpful for accurate interpretation of ultrasound images.2
Distal acoustic enhancement: This artifact occurs deep to fluid filled structures. Tissues distal to a fluid filled structure will be brighter than the adjacent tissues at the same depth. This is helpful for accurate identification of fluid filled structures such as cysts.

Distal acoustic shadowing: This artifact occurs when the ultrasound beam encounters structures that completely absorb and/or reflect soundwaves. Deep to these structures will be a hypo to anechoic region (shadow). In some respects distal acoustic shadowing is a nuisance as it is the reason intrapelvic structures cannot be visualized, but it also helps with recognition of abnormalities such as abnormal areas of mineralization (ex: urinary stones, prostatic mineralization) and gastrointestinal foreign material.

Reverberation: This artifact occurs when the ultrasound beam encounters gas and results in the visualization of successive hyperechoic parallel lines deep to the gas. This is often referred to as a “dirty shadow”. In general gas is not our friend in ultrasound as it inhibits visualization of structures deep to it (such as the lung parenchyma and far wall of gas filled bowel) however, if reverberation artifact is detected within a mass lesion it can indicate necrosis/abscessation. Also ultrasound is very sensitive for small volumes of free peritoneal gas due to identification of reverberation artifact.

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WSV - 089

FELINE BLOOD TRANSFUSIONS: UPDATES IN COMPATIBILITY TESTING AND ADMINISTRATION PRACTICES

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In cats, blood loss anemia and erythropoiesis deficiency are the main indications of transfusion.(1) Recent discoveries and technological advancements will be discussed, as well as practical recommendations.

RED BLOOD CELL ANTIGENS AND BLOOD GROUPS IN THE CAT

Cat AB Blood Group System

The AB blood group system is the predominant blood group system in cats. Three phenotypes occur: type A, type B, and type AB. Approximately one-third of type A cats have alloantibodies in their plasma capable of weak macroscopic agglutination of type-B RBC. Of major clinical significance is the fact that all type B cats have strong anti-A naturally occurring alloantibodies. Type AB cats do not possess alloantibodies against either A or B antigens.

Genetics

The blood group antigens A and B are inherited as simple autosomal Mendelian traits with A being dominant to B. In spite of extensive breeding experiments and pedigree analysis, the mode of inheritance of the AB phenotype remains unclear due to apparently different inheritance patterns in different breeds.(2)The aballele, causing blood type AB, was found to be separately inherited, being (co)-dominant to b and recessive to the Aallele.(3)Thus, all type B cats are homozygous for the ballele (genotype b/b), type A cats can be either homozygous (genotype A/A) or heterozygous (genotype A/b or A/ab), and the rare type AB cats can either be homozygous (genotype ab/ab) or heterozygous (genotype ab/b).

Incidence of the Antigens

The percentage distribution of types A and B in domestic cats can vary markedly with geographic location worldwide. Type B domestic cats are uncommon in some countries like the United States and Switzerland, however, in other countries such as Australia, Greece and Turkey, their prevalence can reach up to 36% of the non-pedigree feline population. Similarly, the variation per breed is significant. For instance, the incidence of type B in the United States ranges from 0% up to 60% among different purebred cats.

To this day, type B has not been documented in Siamese cats worldwide. In opposite, breeds such as Turkish Van and Angora cats are reported to have a prevalence of type B cats of 60% and 46.4%, respectively.

Type AB is exceedingly rare and only found in breeds in which type B is detected.(2)In a survey of cats in the United States and Canada, 13 of 9,239 cats (0.14%) were type AB.(2) Similarly, only 7 of 1895 cats (0.4%) were type AB in a survey conducted in Australia. Type AB has, however, been reported more frequently in certain random bred populations, such as in specific surveys from Israel (14.5%), in Japan (9.7%), in Portugal (6.3%) and in England (8.5%). Compared to all other cat breeds, Ragdolls are commonly type AB (frequency in Italy: 18-24%).

Molecular Characterization of the Antigens

The A and B blood types of cats are caused by differences in the neuraminic acid residues present on a ceramide dihexose backbone on the RBC membrane. Types A RBCs have mainly N-glycolylneuraminic acid (NeuGc), while N-acetylneuraminic acid (NeuAc) is the determinant of the B antigen. The lectin from Triticum vulgaris (wheat) will bind selectively with NeuAc and can be used to identified RBC expressing the type B antigen. Type AB cats have both NeuAc and NeuGc present on the RBCs in similar quantities, each at approximately 50% normal expression levels.

Molecular Genetics

Cytidine monophospho-N-acetylneuraminic acid hydroxylase (CMAH) is the enzyme that catalyzes the conversion of NeuAc (type B antigen) to NeuGc (type A antigen).The discovery of polymorphisms in CMAH ascribed to type B have allowed the development of commercially tests to identify the AA, Aband bbgenotypes. However, the assays have the significant limitation of not being able to differentiate between type A and type AB cats.(4)In addition, many examples of phenotype-genotype discordances for cats with type B and AB blood has been reported.(5)More recently, novel variants in CMAH have been identified in Ragdolls and other breeds, and represent a promising diagnostic scheme to genotype all cats, i.e. differentiating type A, type B and type B.(3, 5)

The Mik Antigen

Based on the presence of a naturally-occurring alloantibody, the Mik blood group system was described in 2007.(6)The clinical relevance of anti-Mik alloantibodies was documented after an acute hemolytic transfusion reaction following inadvertent transfusion of Mik-positive blood to a thereafter confirmed Mik-negative cat upon its first blood transfusion.(6)Unfortunately, anti-Mik antibodies are no longer available.

FELINE BLOOD COLLECTION

Blood donor selection and blood collection
Feline donors should ideally weigh > 4.5 kg and healthy indoor adult cats. They should be tested for transfusion-transmissible infectious agents, such as FIV, FeLV, Mycoplasma haemofelis and Bartonella hensalae.(7) Deep sedation/anesthesia is almost always required. About 10-15 ml/kg of blood can be collected (i.e. a total of 40-60 ml). No closed collection system suitable for cats is commercially available. Most commonly, an 18-19G butterfly needle connected by a three-way valve to 20-30 ml syringes containing CPDA-anticoagulant is used. Since this constitute an open-collection system, the blood collected should be used either immediately (whole fresh blood) or stored at 4 ° C and used within 24 hours to limit the risk of bacterial contamination. That said, if the sample is taken according to strict aseptic rules and non-essential manipulations of the product is avoided, many veterinary centers store it for a period of 20 days.

Feline patients are most often transfused using whole blood. That said, the separation of whole blood into components (RBC concentration and plasma) is quite feasible, even using simple sedimentation. Using RBC concentrate should be strongly considered in cardiac patients and in cats requiring more than one blood transfusions.

- Volume administered (ml) = Weight (kg) X 70 ml/kg (cat) X (Desired PCV - PCV of recipient)
PCV of blood unit
In contrast to findings in dogs, transfusion of feline RBCs using a syringe and microaggregate filter, compared to gravity, does not significantly impact short- or long-term survival of the transfused cells.(8)

Transfusion Reactions and importance of blood typing

Of up-most clinical significance is the presence of highly potent anti-A antibodies in virtually all type B cats, which can result in severe acute hemolytic transfusion reaction, and even death, if type A blood is administered to a type B cat. This highlights the importance of performing blood typing of donors and recipients, which is facilitated by commercially available typing kit for the AB system in cats (RapidVet-H® feline or IC; feline Alvedia®).

Naturally-occurring alloantibodies outside of the AB system and importance of crossmathcing
In recent literature, there is some evidence for the presence of other naturally occurring alloantibodies outside the AB blood group system, like anti-Mik.(9, 10)As such, McClosky et al documented major crossmatch incompatibilities outside of the AB system in 23 of 154 transfusion-naive cats (14.9%)

10)Similarly, Sylvane et al identified 10 of 52 major crossmacthes performed in transfusion-naïve cats to be incompatible (19%).(11) However, the crossmatch screening of 112 cats in the United Kingdom failed to detect any non-AB incompatibilities.(12) In a prospective controlled study, 48 transfusion-naïve anemic cats were randomized to receive either a type- and crossmatch-compatible packed RBCs transfusions or non-crossmatched blood type compatible pRBCs. No difference in the increase in PCV after transfusion or in the incidence of transfusion reactions were detected between groups, however, crossmatched-incompatible cats were not included (i.e. transfused) for obvious ethical reasons.(11)
Other RBCs antigens outside of the AB blood group system can also be suspected based on the prevalence of non-AB RBC incompatibilities in previously transfused cats, which has been reported to be approximately 25-27%.(9, 10) Again, the clinical significance of such alloantibodies remains unknown.

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WSV - 090

HOW I APPROACH A DOG WITH INCREASED SERUM ALT

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Clinical case presentation

Sofia, an 8 y.o. female spayed asymptomatic Labrador retriever presented with an increased in ALT (discussion on canine idiopathic chronic hepatitis in the dog, including canine copper-associated hepatitis)
Interpretation of complete blood count (CBC), biochemistry profile and liver function assays in hepatobiliary disease in the dog

CBC:

• Poikilocytosis: including acanthocytes, echinocytes, target cells, and stomatocytes (reflecting a decrease tolerance to oxidative stress)
• Anemia of chronic disease or chronic GI blood loss
• Microcytic and hypochromic anemia (iron deficiency)
Biochemistry profile:
I- Markers of hepatocellular injury

Increases in ALT (alanine aminotransferase):

• Fairly liver specific (although also found in liver, muscle (cardiac and skeletal) and kidneys)
• Increases occur due to cell damage (increased membrane permeability or necrosis) and induction (increased synthesis)
• Serum half-life is about 40-60 hours in the dogs: following an acute hepatic injury, ALT will increase within 12 hours and serum enzyme activity generally peaks at about 24-48 hours and then begins to decrease(1)
• Generally considered significative if increase is 2X normal
• In healthy dogs, the critical change value for ALT was found to be 47.7%.(2)In other word, ALT activity must change by at least 47.7% for it to be considered statistically.
• The degree of elevation of serum ALT activity is roughly proportional to disease severity and affected hepatic mass. However, liver injury can be present despite a normal ALT activity due to a decrease in the number of hepatocytes (i.e., advanced fibrosis, portosystemic shunting), in cases of non-inflammatory primary or secondary neoplasia (e.g., hepatocellular carcinoma or hemangiosarcoma), and potentially very early in the course of disease
• Increased ALT supports hepatocellular injury, but does not provide information on liver function

Generally speaking:

• Mild increases (up to 2-fold) can be rechecked every 2 weeks and possibly treated with nutraceutical hepatoprotectants. If increase persists more than 4-6 weeks, further investigation is warranted.
• Moderate increases (2- to 5-fold increases) require a diagnostic workup, e.g. liver function assays (bile acids or ammonia) and leptospirosis serology/PCR
• Severe increases (5-fold increases) or persistent increases in ALT warrant an immediate diagnostic workup, likely including liver biopsies.

Table 1: Causes of Increased Serum ALT Activities in Dogs

Primary Hepatopathies

Inflammatory (ex: acute hepatitis, idiopathic chronic hepatitis including copper-associated chronic hepatitis, lobular dissecting hepatitis, gallbladder mucocele)
Neoplasia (primary: hepatocellular carcinoma, lymphoma; metastatic)
Infectious (leptospirosis, infectious canine hepatitis, toxoplasmosis, Heterobilharzia infection)
Trauma (contusions, herniation, lobe torsion)
Nodular hyperplasia

Secondary Hepatopathies

Hyperadrenocortism
Diabetes mellitus
Local or systemic inflammation (enteritis, pancreatitis, peritonitis, SIRS, septicemia, anaphylaxis)
Cellular hypoxia (anemia, congestive heart failure, thromboembolism, circulatory shock)
Metabolic (storage diseases)

Toxic

Drugs (ex: glucocorticoids, barbituriques, carprofen, antimicrobials (ex: TMS, tetracycline), azathi-oprine, kétoconazole)
Toxin ingestion (aflatoxin, amanita mushroom, blue-green algae, copper, herbicides/insecticides, iron, sago palm, zinc, xylitol)

Extra-Hepatic Sources of ALT

Severe muscular injury (uncommon; higher increases in AST are typically seen)

Increases in AST (aspartate aminotransferase):
• Not specific to the liver (present in muscles, but also in brain, liver, kidney and erythrocytes)
• Muscle damage (CK activity may help differentiate origin as it should remain normal unless there is concomitant muscle disease) and hemolysis can cause considerable increases in AST activity
• The enzyme half-life is about 22 hours in the dog.
II-Markers of cholestasis:

Increases in ALP activity (alcaline phosphatase):
• Can indicate primary hepatobiliary disease, such as cholestasis, as well as canalicular cell necrosis, or alternatively increased hepatic synthesis
• Not specific to the liver, as several ALP isoenzymes have been identified in liver, bone, intestines, kidney and placenta.
• An increase in ALP has a good sensitivity (86%), but a poor specificity (49-51%) for the diagnostic of hepatobiliary disease.
• The specificity of ALP for the diagnostic of hepatobiliary disease increases to 94% if combined with an increased serum GGT.(3)
• Considered significant if increase is 2-3X normal
• The enzyme half-life is about 72 hours in the dog
• Enzymatic induction (isoenzyme):
- Hepatic: with usage of glucocorticoids or anticonvulsant therapy in dogs (ex.: phenobarbital)
- Bone: in young animal or with bone tumor
Increases in GGT activity (gamma-glutamyltransferase):
• Increases parallels ALP
• In dogs, GGT is often considered more specific but less sensitive than ALP for the detection of hepatobiliary disease.
• GGT has a half-life of approximately 72 hours in dogs. (4)
Hyperbilirubinemia:
• Poor sensitivity and specificity for hepatobiliary disease
• May be caused by hemolysis, primary hepatic disease and extrahepatic cholestasis
Important: Changes on biochemistry profiles suggestive of liver dysfunction/failure includes hypoalbuminemia, decreased urea, hypoglycemia (liver failure) and hypocholesterolemia.

Liver function assays
Ammonia (fasted):
• Degradation product of proteins in the GI tract ®portal circulation ®urea cycle (amino acids synthesis)
• Relatively insensitive marker of hepatic function, and it has been suggested that > 70% reduction of hepatic function is required for serum ammonia concentration to be increase(5)
• The sensitivity of plasma ammonia for the detection of congenital portosystemic shunts has been reported to vary between 81-100% in dogs.(5, 6)
• Needs to be analysed within the hour (volatile; heparinized sample on ice)

Bile acids:
• Normal cycle: Synthesized in the liver -> intestines -> absorbed in the ileum ®portal circulation (recaptured by hepatocytes)
• Increases in fasting or postprandial serum bile acids concentrations are consistent with hepatic dysfunction, portosystemic shunting, or cholestasis.
• Serum bile acids are measured as preprandial sample (after withholding food for 12 hours) or by collection paired preprandial and 2-hours postprandial samples
• For the diagnosis of hepatobiliary disease, the specificities of preprandial and postprandial bile acids concentrations are 100% (at values > 20 mmol/L and > 25 mmol/L, respectively).(7)

Important: Because the liver has a considerable reserve capacity, patients with liver disease can have normal liver function test results.

Canine Chronic Hepatitis (CCH)
• According to the WSAVA Standardization group, chronic hepatitis is characterized by hepatocellular apoptosis or necrosis, a variable mononuclear or mixed inflammatory infiltrate (mostly in the portal space), regeneration, and fibrosis.
• The proportion and distribution of these components vary widely (notably per breed).
• Histopathology is required to confirm the diagnostic and for prognostication.
• The activity of the disease is determined by the amount of inflammation and extent of hepatocellular apoptosis and necrosis.
• The stage of the disease, and the prognosis, may be determined by the extent and pattern of fibrosis and the possible presence of architectural distortion. Histochemical stains for connective tissue may be helpful in detecting the amount and pattern of fibrosis, particularly in early and mild disease.

Canine copper-associated hepatitis:
• Diagnosis is based on histopathology as well as on hepatic copper evaluation. Semi-quantitative evaluation can be performed using special stains (rubeanic acid or rhodanine). Preferably, a quantitative evaluation is performed on unfixed frozen biopsy.
• Several breeds have been reported with an increased prevalence of chronic hepatitis, including (*indicates breeds with copper-associated hepatitis):
• Strong evidence: Bedlington terrier*, Labrador retriever*, American and English Cocker spaniel, Doberman pinscher*, West Highland white terrier, Dalmatian*, English Springer spaniel

Treatment of chronic hepatitis
• According to the severity/stage of the disease, consider nutraceutical hepatoprotectants (ex,: ursodiol, SAM-e), protein restriction (should be limited to the maximum tolerated level to prevents signs of hepatic encephalopathy), GI protectant, +/- steroids or immunosuppressive agents, antifibrotic therapy

• Anticopper drug therapy is generally reserved for cases with documented primary or secondary excess copper accumulation Specific treatments includes low-copper diet, copper chelator (penicillamine is typically used, trientine is an alternative), increased alimentary zinc.

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INCREASING CLIENT DENTAL COMPLIANCE

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Pet owners are often reluctant to make an appointment to have their pet's teeth cleaned. To increase compliance, we must find out why.

General Anesthesia

The first thing that you should do is address your client's concerns. Is she worried about having her pet undergo a general anesthesia? Sometimes, you may find that the client has more than just a vague fear: a previous pet or even a human family member may have had a very slow recovery or died after anesthesia. Let your client know that her fears are common, but that advances in pre-anesthetic health screening, anesthetic drugs, and anesthetic monitoring during the past decade have minimized the risks of anesthesia for dental cleaning, even in older pets. Of course, your hospital must be capable of providing all of the above. If the pet is compromised in some way, such as with heart or kidney disease, you may want to offer referral to a board-certified veterinary dentist who will best be able to accomplish any required dental work in the least amount of time spent under anesthesia. Referral to a board-certified veterinary anesthesiologist may also help ease the client's anxieties.

Expense

Fear over general anesthesia may not be the driving force behind your client's objection to scheduling the dental procedure. The client may not see the necessity of paying for anethesia when he can have his own teeth cleaned while awake. In this case, the onus is upon us to educate the client about how periodontal disease develops and how it is treated. Because human patients are able to understand what is going on and cooperate, dental scaling of human teeth can be performed by a professional hygienist without anesthesia. In dogs and cats, however, access to the most important areas of a dental scaling (below the gum line where periodontal disease begins) is impossible while the pet is awake, not only because it's unlikely we will be able to get him to lie on his back under a bright light while holding perfectly still with his mouth wide open for a prolonged procedure, but because the areas under the gum line are often much more sore & diseased than comparable areas in a person's mouth due to lack of oral hygiene. Even a pet without any sore areas in his mouth would be frightened by all of this unusual poking around in his mouth, and only a small flinch during a dental scaling could result in severe damage to the oral tissues of the pet, not to mention the loss of the fingers of the technician!

Few Clinical Signs

Periodontal disease, and even conditions such as fractured teeth and tooth resorption may not have clinical signs that are recognized by the pet owner, and so are deemed unimportant or not affecting the pet's health or quality of life. We must educate the owner on the importance of dental hygiene, and the dangers of not resolving dental issues, such as pain, chronic infections, dental abscesses, osteomyelitis, oronasal fistulas, and pathological jaw fractures.

Distracted by Other Health Issues

Often, these conditions go unnoticed by pet owners until the pet presents for a physical examination at their annual vaccine appointment or for another health problem. A lack of veterinarian's time during the physical exam, especially if there is another problem the owner is more concerned about, means this duty often falls to the veterinary technologist. How do we make owners care about dental disease when the owner is more concerned about their dog's ear infection, or that their cat is urinating outside of the litterbox? Dental education and treatment may have to wait until the presenting problem is resolved, but it should not be forgotten. A no charge follow up appointment with the veterinary technologist can be useful in catching these patients who may otherwise slip through the cracks.

'Anesthesia-Free Dental Cleaning'

Another reason a well-meaning client may not bring her dog in for a complete oral health assessment and treatment, despite the fact that you have recommended it, is that she assumes the 'tooth brushing' or 'anesthesia-free dental scaling' that her groomer performs every time she takes her dog in for a clip and bath is the same service as your hospital would perform, except that you charge more. Again, educating the client about periodontal disease, and what must be done to treat it, is the best way of ensuring the dental health of their pet. By law, only licensed veterinarians or properly supervised and trained technicians can practice veterinary medicine, including veterinary dentistry. Groomers or other untrained individuals who are performing dental scaling can be charged with a criminal offence. Not only are they completely unable to treat periodontal disease beneath the gum line, they are also incapable of performing a complete oral examination. They are not trained to recognize oral pathology, and they are physically unable to see areas such as tooth surfaces facing the tongue or oral mucosa far back in the mouth, which can only be evaluated properly while the pet is anesthetized or sedated.

They cannot probe periodontal pockets, recognize problems such as oral masses, tooth resorption, or gum recession, or take dental x-rays. Even worse, they can give the pet owner the false sense that their pet's mouth is healthy when in fact only the crowns of the teeth are clean, while periodontal disease is raging beneath the gum line.

Don't be afraid of addressing your clients' concerns, whether they are about anesthesia, cost, or the necessity of professional veterinary dental procedures. Your clients want what's best for their pets – that's why they came to your hospital in the first place! Your role is to make them aware of the problem, educate them as to the best treatment, and to make that treatment available. The rest, ultimately, is up to them.

For further information, see the American Veterinary Dental College position statement on Companion Animal Dental Scaling Without Anesthesia online at http://avdc.org/AFD/

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LARYNGEAL ULTRASOUND IN PRACTICE: WHEN DOES THIS TOOL MAKE A DIFFERENCE IN CASE MANAGEMENT

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Learning objectives: being able to recognize the normal and abnormal structures of the equine larynx and understanding what the abnormal images mean in the context of case management.

Technical considerations: laryngeal ultrasound can be performed with the linear ultrasound probe (12.5 MHz) and as such is technically accessible to many practitioners. Horses with a sport clip frequently don't require additional clipping, but horses with thick hair will need clipping. The hair and skin are saturated with alcohol and then ultrasound gel is applied. A microconvex probe (8.5 MHz) can also be used, providing a smaller footprint and better penetration in horses with thick skin.

The laryngeal anatomy is relatively complex and identifying normal structures on the ultrasound exam can be challenging at first. Although this presentation focusses on the abnormal findings in clinical cases, a standardized approach including each of the ventral and lateral views is recommended for each ultrasound examination of the larynx.

Laryngeal ultrasound should be used in addition to other diagnostic modalities such as upper airway endoscopy and/or overground endoscopy. In the following cases, the ultrasound exam provides crucial information that changes the treatment plan or surgical approach:
Chondritis: although the diagnosis can be made endoscopically, ultrasound examination allows a better evaluation of the extent of the damage to the arytenoid and surrounding tissues(1).

View: in the lateral window evaluate the arytenoid cartilage in the longitudinal and transverse planes.
Abnormalities: enlarged, irregular cartilage, fluid or gas within the arytenoid, surrounding tissue or other cartilages.

Right sided laryngeal hemiplegia: for this uncommon presentation, laryngeal dysplasia is an important differential diagnosis(2). The prognosis and surgical approach in cases of laryngeal dysplagia is quite different then cases of recurrent laryngeal neuropathy.

View: in the lateral window, evaluate the articulation of the cricoid and thyroid cartilages.
Abnormalities: lack of articulation of the cricothyroid articulation (lack of overlap of these cartilages in a transverse plane), in the longitudinal view, the dorsal edge of the thyroid cartilage overrides de cricoid.

Comparison with the unaffected side is helpful.
Left sided laryngeal hemiplegia: cases with little neurogenic atrophy are better candidates for a nerve graft(3). Laryngeal ultrasound has good sensitivity (90%) and specificity (98%)(4)for diagnosing laryngeal hemiplegia but doesn't replace the overground endoscopy which can evaluate the functional effect of the hemiplegia and the concurrent presence of other dynamic upper airway abnormalities.

View: in the lateral window, evaluate the cricoarytenoidalis lateralis muscle (CAL) in the longitudinal and transverse planes, and if possible the crocoarytenoidalis dorsalis muscle (CAD)
Abnormalities: changes associated with neurogenic atrophy of the CAD are a reduction in size and increase in echogenicity(4,5). Compare the left and right CAD muscles. Although the CAD muscle is the one involved in abduction of the arytenoid, it is technically somewhat more difficult to image then the CAL. The CAD and CAL are innervated by the same nerve and several publications have shown changes in the CAD to be associated with recurrent laryngeal neuropathy(4,5).

In conclusion, laryngeal is technically accessible to most practitioners and the skills required to perform a diagnostic evaluation can be acquired with practice. When used as part of a multi-modal approach to the evaluation of the upper airway, it provides crucial information which can change the prognosis and treatment plan.

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LOWER URINARY TRACT TIPS: PART 1

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Physical examination

A thorough examination of the urinary tract is essential in patients presenting with signs of lower urinary tract disease (pollakiuria, dysuria, incontinence). In male dogs, the penile urethra can be palpated through the os penis ventrally. The perineal urethra and the urethra, at the proximal portion of the os penis, should be palpated as stones tend to get lodged as the urethral lumen narrows as it passes through the os. A rectal palpation allows identification of the prostate and prostatic urethra. In female dogs, a vaginal palpation to examine the vestibule, vestibulovaginal junction, urethral papilla and identify a paramesonephric remnant are important. A rectal palpation allows identification of the pelvic urethra. In male and female cats, sedation is usually necessary in order to perform a rectal palpation to examine the urethra.

It is important to evaluate the urethra, especially the pelvic/prostatic urethra in patients presenting with lower urinary tract signs as standard radiographs and abdominal ultrasound do not allow examination of this portion the urethra. Soft tissue masses along with stones are commonly missed. An oblique radiographic view of the pelvic urethra with the patient in lateral recumbency helps identify urethral stones that would otherwise be hidden by the pelvis. Transitional cell carcinoma may affect solely the urethra and therefore may only be identified by rectal palpation (missed by ultrasound) and contrast radiography.

Urethral Catheterization

Always pre-measure the urinary catheter to avoid knotting/kinking within the bladder.
Female dogs: I recommend doing this blind, guided by digital palpation. With the dog heavily sedated or in ventral recumbency, place a finger at the vestibulovaginal junction then slide the urinary catheter ventral to your finger. The catheter will not be able to enter the vagina as it is obstructed and will slide into the urethral papilla. If the vestibule is too small to allow digital palpation, place a Foley catheter in the vagina and fill the balloon. While gently pulling the balloon caudally, slide a urinary catheter into the vestibule. Again, as the vagina is occluded, the catheter will enter the bladder.
Hint: if following placement of a Foley catheter, the balloon is unable to be emptied, even if the catheter is cut, it can be punctured with ultrasound guidance.
Male dogs: 5-10 kg: 5 Fr catheter, > 10 kg 8Fr catheter
Female cats: The urethral papilla is much larger than the opening to the vagina and blind catheterization is usually successful as the catheter enters the urethra easily with the cat in ventral recumbency.
Male cats: If catheterization is difficult, an angled hydrophilic guidewire (0.018inch) can be used to slide through the urethral lumen and looped in the urinary bladder. An open-ended catheter can then be slid over the guidewire. If the cat cannot be catheterized, antegrade catheterization is recommended. See Lower urinary tract tips part 2.

Contrast Radiography

Nonionic iodine water soluble contrast agent should be used such as Iohexol (Hypaque, Omnipaque). Barium should NEVER be used in the urinary tract. Allows evaluation of the urethra for masses, strictures, urethral spasm, stones ect…). Contrast radiography is indicated in patients with lower urinary tract signs without signs of stones, infection or masses on radiographs and ultrasound. Cats presented with urethral obstruction unable to urinate following removal of a urinary catheter, should be evaluated by contrast radiography. The patient is catheterized and the bladder filled until it is firm with a mixture of 50/50 contrast/sterile saline. The urinary catheter is removed and the bladder is gently expressed and a radiograph is taken (voiding phase). Complete filling of the bladder and urethra are essential in order to obtain a diagnostic exam. This exam can be performed prior to removing a urinary catheter in a cat to ensure the urethra is patent. This exam can also be performed when a urethral or bladder tear are suspected1,2,3.

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LOWER URINARY TRACT TIPS: PART 2

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Voiding Urohydyropulsion

Allows antegrade removal of bladder stones through the urethra. Recommended for small stones in female cats and dogs but should not be attempted in male cats2. Under general anesthesia, a urinary catheter is used to fill the bladder with saline (avoid overfilling, estimated bladder capacity 10-15 ml/kg). The urinary catheter is removed, in females, the patient is positioned vertically, males are placed in lateral recumbency. The urinary bladder is palpated, shaken gently, pulled cranially to straighten the urethra. Gentle but steady pressure is applied to the urinary bladder to induce micturition and allow for expulsion of stones. If a female patient cannot be catheterized, filling of the vulva with saline will result in filling of the bladder and the voiding urohydropulsion can still be performed.

Percutaneous antegrade urethral catheterization
Percutaneous antegrade urethral catheterization is indicated when a urethral obstruction cannot be relieved by standard retrograde catheterization, when animals are difficult or too small to catheterize, have a urethral tear, or a distal urethral obstruction. It is most commonly performed in male cats with iatrogenic urethral tears secondary to trauma from serial attempts to catheterize. Because the tear is made in a longitudinal retrograde direction, the antegrade passage is effective. The procedure is done under general anesthesia (fluoroscopic guidance can help but is not obligatory). An intravenous catheter is percutaneously inserted into the apex of the full urinary bladder. Passage of a guidewire (angled hydrophilic 0.18 inch in cats) in an antegrade manner through the catheter, the bladder then down the urethra until it exits through the penis or vulva. The catheter withdrawn from the bladder apex. An open-ended urinary catheter advanced in a retrograde manner over the guidewire until it reaches the bladder. The guidewire is removed.
In cases of urethral tears, the urinary catheter should be left in place for 3-5 days to allow complete healing.

Retro-Urohydropulsion

This procedure flushes stones from the urethra into the urinary bladder to allow for dissolution or removal. The pelvic/prostatic urethra is compressed by digital rectal palpation. A urinary catheter is inserted into the distal urethra and the urethra is flushed with saline. This results in distension of the urethra. While continuing to flush, digital pressure is released from the urethra allowing the stones to be retropulsed into the bladder. This technique works well with embedded stones as distension of the urethral mucosa facilitates movement of the stones in a retrograde manner.

Bladder mass biopsies

Samples for cytology and histopathology can be obtained for bladder and urethral masses by using this technique. Under ultrasound-guidance, the patient is catheterized and the catheter advances to the mass. Aspiration through a syringe attached to the urinary catheter allows aspiration of the mass often obtaining pieces of tissue. For a urethral mass found on rectal palpation but not visible on ultrasound, the same technique can be performed except that the catheter is advanced to the level of the mass, guided by rectal palpation of the urethra. When the catheter is at the level of the mass, aspirations are performed. This technique works well to remove small stones or clots from the bladder that can be aspirated through the holes of the catheter.

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YOUTUBE: IMPROVING YOUR VIDEOS' RANKING IN AN OCEAN OF CONTENT

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In order to get involved in the distribution of content on a new platform, it is important to understand its functioning and strategy. We need to know where it stands compared to other tools used to adapt the content accordingly. In the cases of YouTube and Facebook, both platforms encourage the distribution of videos, but the type and format of each one differ.
YouTube by the Numbers…

YouTube was created in 2005 by three former PayPal employees and purchased by Google in 2006. The 1st video published in 2005 came from the San Diego zoo, and the showcase of animals - especially in comical situations - still attracts a lot of views.

The site now has more than 1.9 billion users per month, who watch each day more than 1 billion hours of videos, which represents more than Netflix's and Facebook's combined videos.

YouTube has launched local versions in more than 91 countries; you can browse in a total of 80 different languages (covering 95% of the Internet population). YouTube is the 2nd largest search engine to the world and the 3rd most visited website after Google and Facebook.

Searches for "How to?" type videos increase 70% year after year, demonstrating that YouTube is a powerful educational tool. Some experts suggest the possibility that YouTube could play a key role in the education of young people and the specialization of workers, especially in countries where education is less accessible.

In an average month, 8 out of 10 people aged 18 to 49 are watching YouTube. Men represent 62% of users. Age groups of 35 and over and 55 and over constitute the fastest growing audiences on YouTube. In addition, 37% of 18 to 34-year-olds binge-watch YouTube. And YouTube draws about one third of all Internet users.

Facebook vs. YouTube Videos
Since Facebook's algorithm prefers shorter videos, it is better to post videos of less than 60 seconds, while YouTube favours videos of 5 minutes or more.

YouTube is ideal for longer music videos and detailed tutorials (e.g.: how to?), while quick promotional content has more success on Facebook.

Most YouTube videos are discovered during searches on site and on Google, or in the form of suggestions based on other videos. Facebook videos are only viewed in the first place by people who like your page. This may change if the video is liked, commented upon or shared. 85% of the people do not enable sound on Facebook, while sound is by default enabled on YouTube.

A Few Tips to Improve your Video SEO on YouTube
Create your channel and select a striking graphic which stands out from others for the illustration that appears in the form of a banner at the top of your YouTube page (channel banner: recommended format 2560 1440 pixels).

Make longer videos of 8 to 12 minutes. Why? Because YouTube measures the performance of its platform by the average viewing per session of users. On YouTube, longer videos surpass shorter videos in search and video suggestions algorithms.

The first 30 seconds are critical to capture the attention of the user. Take for example trailers on Netflix that determine if you will watch an entire series. You must be succinct and quickly enter the heart of the matter, explaining to the user the benefits of listening to your video. Don't waste too much time introducing yourself. Be confident and engaging!

The beginning of your video should include a snippet of the subject matter. YouTube analyzes images to catalogue videos, the first images are therefore important. For example, if your topic is cutting claws on dogs, put at the beginning a picture or a segment representing that.

Choose for your title specific keywords including the topics covered in your video. The same key words must be found in the title, in the tags (to be entered when you program the video in the interface) and in the description. Don't put too many, though; YouTube being a search engine similar to Google, you don't want to make too wide a search field.

Titles are critical for click-through rates (CTR). Start with the most important keyword. Also, be aware that having a number in a title increase the CTR; for example, "Walking your dog on a leash: our 5 foolproof tips."
Add end-of-slides which allow to suggest other videos from the same channel as well as a subscribe to the channel button.

At the end, remember to insert a call to action asking a specific question to users so that they comment under the video. This level of commitment has a huge impact in the SEO of the videos. It should be noted that there are four types of actions on YouTube: Like - Share - Comment - Subscribe.

In this era when young people learn a lot online and in video form, positioning oneself as an expert on YouTube on animal health care is an attractive approach. You can put related explanatory videos on your website to refer your clients seeking explanations on how to clean ears or walk a dog on a leash. Finally, never underestimate the synergistic effect between Google and YouTube for your online presence's SEO.

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FEELINE BETTER? – APPLICATION OF THE THE FIVE FREEDOMS MODEL FOR CATS

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Objective Statement:

The goal of this presentation is to discuss the challenges in trying to balance the Five Freedoms for cats and provide solutions to address those challenges. We will learn in this presentation that all Five Freedoms are tightly interconnected and we cannot afford to ignore some of them when we are caring for animals in any environment. This comes with challenging decisions on what to prioritize for any given animal at any given time. It is important to be able to adequately triage the cat's needs. Enrichment is a critical component to happier and less stressed cats.

Introduction:

At the San Francisco SPCA we use the Five Freedoms Model to define our standards for care.
The Five Freedoms Model is the basis of international animal welfare standards. Over 50 years ago, British animal welfare researcher Ruth Harrison wrote a book called "Animal Machines," which described intensive livestock and poultry farming practices. By 1979, the Five Freedoms were developed to evaluate the physical and mental wellbeing of animals. Today, animal welfare is considered science and since 2014 the AVMA recognizes the field of Welfare a specialty in the veterinary field.

Balancing all five freedoms can pose a challenge, not only in shelter but also in many homes. Many caregivers are doing a good job of addressing the first 3 freedoms, however the last two are often neglected. Because all 5 freedoms are tightly interconnected, we cannot afford to ignore some of them. This may pose a challenging question on what to prioritize for any given animal at any given time. It is important to be able to adequately triage the needs for animals on a regular basis. We all strive to give our animals the best life possible. It is just as important to create an environment that is fear and stress free, as it is to allow animals to be comfortable and perform normal behaviors. Stress on a daily basis places cats at higher risk for diseases, as well as behavioral problems.

Implementing the Five Freedoms Model:

Multiple studies involving various species show the benefit of enriched environmental conditions, from increased learning capacity to improved immune responses. Enrichment includes a nutritionally well-balanced diet, controlled climate and good hygienic conditions, and catering to the animals' physical needs. Unfortunately, most natural behaviors are restricted within confined housing conditions. The operational definition of enrichment suggested by Leach et al. (2000) is based on previous discussions by Broom and Johnson (1993). According to this definition, in order to count as `environmental enrichment' any change to the housing system should increase the frequency and diversity of positive natural behaviors, decrease the occurrence of abnormal behavior, maximize the utilization of the environment and increase the animal's ability to cope with the challenges of captivity.

Restriction itself may act as a stressor by not allowing an animal to performing normal behavior patterns. The restrictive conditions in any environment limit the animals' potential for controlling their physical and social environment.

Enrichment Ideas: There are solutions for all budgets! Enrichment can come in the form of recycled boxes, trays from cat food cans, or automated toys.
Delivery: Define when, how, who, what and to whom enrichment should be delivered
Food Puzzle: Freeze dried or boiled chicken, Chicken baby food (just chicken nothing added)

Normal diet

DIY: Wrap food in a scrap of cloth or place in a paper bag, Place kibble in egg carton or ice cube tray, Toilet Paper Tube and Cat Food Tray, Place kibble in Toilet paper roll and fold the ends closed, Kibble in Muffin tin and put tennis balls on top
Scent Enrichment: Place in paper bag or fabric sachet, Spray on hard, sanitizable toy, Spray on towel or paper towel Never spray on animal
Animal scents, Cinnamon, Pumpkin spice, Ginger, Lavender, Chamomile tea bag, cat nip
Environment and Visual Enrichment:
Bring a place mat, yoga mat, or towel with a different texture for your foster animal to explore
Bring a mirror for the animal to "have company" (cave: territorial behaviors)
Plug in a nightlight
Hold up a Christmas ornament
Play YouTube videos of birds, fish, squirrels, etc.

Auditory Enrichment: **Do not play for longer than 2 hours at a time**
Bird Calls App: https://itunes.apple.com/us/app/bird-calls-bird-sounds-bird/id586869673?mt=8
Meditation App: https://itunes.apple.com/us/app/relax-melodies-oriental-meditation/id448207365
Audio books and CD: Through the Cat's Ear, Radio Stations preferred include classical, soft rock, reggae

Recommended Reading :

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Example of Enrichment Rotation Schedule for cats:

Day	Item 1 – AM application	Item 2 – PM application
1	Food Puzzle	App sounds
2	Through a Cat's Ear or other music	Gentle Handling
3	Toilet paper food puzzle	Scent enrichment
4	Visual enrichment	Egg carton food puzzle
5	Reading out loud or Audio book	Scent enrichment
6	Visual enrichment	Food enrichment
7	Egg carton food puzzle	Mock Vet handling
8	Tricks and commands	Scent enrichment
9	Mock Vet handling	Tricks and commands
10	Visual enrichment	Brushing/grooming
11	App sounds	Scent enrichment
12	Radio station	Food puzzle
13	Food puzzle	Environment enrichment
14	Scent enrichment	App sounds (Birds)

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MULTIMODAL APPROACH TO OSTEOARTHRITIS IN DOGS AND CATS

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OSTEOARTHRITIS: AN IMPORTANT DISEASE?

What is osteoarthritis?
Osteoarthritis (OA) is a disorder of diarthrodial joints characterized by deterioration of the articular cartilage, osteophyte formation and bone remodeling, changes in the periarticular tissues (synovium, joint capsule) and a low-grade inflammation of the synovial fluid. This condition invariably leads to clinical signs of pain and loss of function (disability).

The definition of OA has changed through the years. Here is one of the most recent reaching consensus: "OA diseases are a result of both mechanical and biological events that destabilizes the normal coupling of degradation and synthesis of articular chondrocytes and extracellular matrix, and subchondral bone. Although they may be initiated by multiple factors, including genetic, developmental, metabolic and traumatic, OA diseases involve all the tissues in the diarthrodial joint. … When clinically evident. OA diseases are characterized by joint pain, tenderness, limitation of movement, crepitus, occasional effusion and variable degrees of inflammation without systemic effects."

Sharma L and Kapoor D. Epidemiology of Osteoarthritis in Osteoarthritis 4th Edition, Moskowitz et al eds. Lippincot Williams & Wilkins. 2007. p3

Osteoarthritis has many forms: the most common one observed in veterinary medicine is degenerative joint disease. Degenerative joint disease leads to structural and functional changes.

Osteoarthritis can be qualified as either primary or secondary.

Primary osteoarthritis

Rare in small animal practice
Abnormal cartilage with normal forces
Primary cartilage disease
Osteochodrosis/OCD
Secondary osteoarthritis
The most frequent in veterinary medicine
Normal cartilage with abnormal forces
Repeated trauma/athletic trauma
Loss of cartilage

Osteochodrosis/OCD

Instability
Rupture of the cranial cruciate ligament
Suboptimal joint congruence
Canine hip dysplasia
Elbow dysplasia
Articular fractures
Inflammatory/immune mediated
Prevalence in our patients

CANINE

Is it frequent?
It is estimated that osteoarthritis affects 1 out of 5 dogs over the age of 1 year in North America.
19 million dogs afflicted by OA in north America
Reported that 50% of large breed dogs over 6 years of age have radiographic signs of OA
Are breeds at risk?
Mixed breed dogs and dogs of any breed, size weight and age can be afflicted by osteoarthritis.
The incidence increases with age
The incidence increases with the size of the dog
Breed predispositions
Genetics!!

FELINE

Several studies report the incidence of radiographic osteoarthritis in cats
Reported between 33,9 and 92 %
The incidence is correlated with age
Should we address it?
When we denote lameness clinically, what does it mean?
How significant is it?
Classification/quantification of lameness
Subjective
Semi-objective
Objective

SUBJECTIVE

Numerical rating scale
NRS: from 1 to 4-5
Visual analog scale
VAS: from 0 to 100
Poor correlation between scales and objective measures…

SEMI-OBJECTIVE

WOMAC
Humans
Cincinnati orthopaedic disease index
CODI, Gingerich
Used by our group and Lascelles
Canine brief pain inventory
CBPI, validated by Cimino-Brown

OBJECTIVE

Kinetics:Forces
The branch of mechanics that deals with the actions of forces in producing or changing the motion of masses
Biomechanics: study of forces generated by the musculoskeletal system
Ground reaction forces (GRF)
Peak vertical force (PVF) is the most commonly used
In Newtons (weight X acceleration)
Standardized as % in body weight
Gold standard
Kinematics:Motion
The branch of mechanics that deals with pure motion without reference with the forces involved during locomotion
Biomechanics: study of motion (angulation and rotation) generated by the musculoskeletal system
Activity
Podometer
3D actimetry
Using objective measures, how does it reflect the affliction of our patients?
In the normal patient, at a trot on a hind limb:
Weight bearing is around 72% BW
Stance: 20% BW
Walk: 54% BW

How much is the decrease in weight bearing in afflicted dogs?
We include dogs that have BW < 64% BW
Madore et al VCOT 2007
Using this cut off, accuracy >95% to detect lameness (personal communication)
When we observe lameness clinically, dogs usually decrease their weight bearing on the affected limb by at least 8% of their body weight
On a 35 kg dog, this represents 2,8 kg

Imagine for a 70 kg Human, it represents 5,6kg
CONCLUSION
Osteoarthritis is an important disease that affects the quality of life of our canine patients. When lameness is observed, we must thrive to alleviate the clinical signs associated with OA.

MULTIMODAL APPROACH TO OSTEOARTHRITIS

When faced with a patient that shows signs of osteoarthritis, the clinician must establish a therapeutic plan.
First it is imperative that a correct diagnosis has been given:
it frequently occurs that a patient is considered “arthritic” when it is not. The therapeutic plan in this case just doesn’t work!!
EVALUATION OF A PATIENT AFFLICTED BY OSTEOARTHRITIS
Lameness is defined as an alteration in gait. This alteration can originate from 3 sources:
Orthopedic
Neurologic
Metabolic

The complete lameness examination must comprise:
History/anamnesis
General health? PU/PD, vomiting/diarrhea, cough?
When? How? Since when? Exacerbation? Response to treatment?
Physical examination
Thorough PE to determine general health, anemia, cardiac disease, abdominal mass, etc..
Visual gait analysis
Determine is patient is lame or not
Shorter stride, stiffness
Which limb? Beware of owners…
Walk, trot, sit, down, up
Orthopedic examination
Muscle atrophy, pain, crepitus, effusion, fibrosis, decreased range of motion, instability
Partial neurological examination
Ataxia, proprioception, weakness, reflexes
Once completed, establish a problem list, list of differential diagnosis, a diagnostic plan, then confirm diagnosis.
With the confirmation of symptomatic OA, a therapeutic plan can be proposed to the owners
Correlation between the lameness, physical/orthopedic examination findings and the diagnostic results
No correlation between the severity of radiographic lesions and the degree of lameness

MULTIMODAL MANAGEMENT OF OA

The multimodal management of OA consists of the following:
surgically treating the primary cause if possible
OA is secondary
Primary cause can sometimes be surgically addressed
Rupture of the cranial cruciate ligament
reducing the patient’s weight
weight reduction is imperative
avoid weight gain…
using adapted activity combined with physical therapy
passive
active
using therapeutic nutrition
Polyunsaturated fatty acids (Ω-3’s)
Chondromodulators/Nutraceuticals, etc..
PSGAGs, glucosamine, chondroitin sulfate, QEVA, green lipped mussels (GLM)
Antioxidants
Vitamins
using pharmacological therapy.NSAIDS
Are the cornerstone of treatment of OA
Anti-inflammatory and analgesic effects
Corticosteroids
Opioids
NSSRI- SSRINon-selective/ Selective serotonine receptor inhibitor
tramadol
NMDA-antagonists

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ABDOMINAL ULTRASOUND: ADRENAL GLANDS, LYMPH NODES, VESSELS, PERITONEAL AND RETROPERITONEAL SPACES

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Abdominal ultrasound has the advantage over radiography in its ability to see small structures like adrenal glands and evaluate the abdomen in the presence of peritoneal effusion. Additionally, Doppler imaging allows us to evaluate blood flow, including direction and velocity.

Adrenal glands

Due to their small size, a good anatomic understanding of where the adrenal glands are located is crucial for adrenal gland identification with ultrasound. The position of the adrenal glands in relation to regional vasculature is very consistent making vascular landmarks quite helpful for identification of adrenal glands.

Left adrenal gland: The left adrenal gland is located caudal to the celiac and cranial mesenteric arteries (first two branches of the abdominal aorta; these vessels exit the ventral aspect of the aorta a short distance from each other) and cranial to the left renal artery and vein (these have a distinct curve just prior to entering the aorta and caudal vena cava). The left phrenicoabdominal vein crosses the left adrenal gland ventrally and is usually visualized with ultrasound. The left phrenicoabdominal artery crosses the left adrenal gland dorsally and is often too small to visualize with ultrasound. The left adrenal gland lives to the left of the aorta and medial to the cranial pole of the left kidney. The left adrenal gland in dogs is bilobed in shape (peanut or dumbbell shape) and more ovoid in cats.
Right adrenal gland: The right adrenal gland is more dorsal and cranial than the left adrenal gland making visualization more difficult. Additionally obesity, bowel gas and deep chested conformation can hinder identification of the right adrenal gland. The medial surface of the right adrenal gland is in close proximity to the lateral wall of the caudal vena cava. The right adrenal gland is cranial to the right renal artery and vein and is it the same cranial – caudal level as the celiac and cranial mesenteric arteries. Similar to the left adrenal gland, the right phrenicoabdominal vein crosses the right adrenal gland ventrally and is usually well visualized and the right phrenicoabdominal artery crosses the adrenal gland dorsally and not usually visualized. In dogs, the shape of the right adrenal gland is variable (elongated, arrowhead or boomerang shaped). In cats the right adrenal gland is oval in shape similar to the feline left adrenal gland. In cats, the right adrenal gland is often located fairly cranial in respect to the cranial pole of the right kidney.

Normal adrenal gland size:

In dogs the size of the adrenal gland varies with patient body weight. In a study that evaluated adrenal size in populations of dogs under 10 kg with and without hyperadrenocorticism, a cut off of 0.6 cm thickness of the caudal pole of the adrenal gland was 75% sensitive and 94% specific for differentiating normal adrenal glands from adrenal hyperplasia.1 As there is a small population of canine patients with pituitary dependent hyperadrenocorticism that do not have adrenal gland enlargement and larger dogs will normally have larger adrenal glands, interpretation of adrenal size should be made in conjunction with clinical and laboratory findings.
In cats, because they are more uniform in size there is a fairly narrow normal range of adrenal gland size which is 0.4 cm to 0.5 cm in thickness. Cats can also have incidental mineralization of the adrenal glands.

Alterations to adrenal gland size include:

Bilaterally small adrenal glands: Addison's disease (hypoadrenocorticism), chronic steroid therapy
Bilaterally large adrenal glands: pituitary dependent hyperadrenocorticism
Focal adrenal nodules and masses (unilateral or bilateral): hyperplasia, adenoma. If lesion is greater than 2.0 cm in diameter there is increased likelihood of neoplastic etiology (adenocarcinoma, pheochromocytoma) versus benign causes.2 Metastasis can occur in the adrenal glands. If a functional tumor is present in an adrenal gland, the contralateral adrenal gland may be small in size. When an adrenal gland mass is identified, evaluate for vascular invasion (most often into the phrenicoabdominal vein and caudal vena cava).

Abdominal vasculature, lymph nodes and peritoneal and retroperitoneal spaces
In addition to vascular structures serving as landmarks for identification of other structures, ultrasound is utilized to evaluate the vessels themselves for size, echogenicity, thrombi, velocity and direction of blood flow. Particular vessels of interest during an abdominal ultrasound evaluation include evaluation of the aortic trifurcation. This is a common site for thrombi, especially in cats and is a landmark for the sublumbar lymph nodes. A right intercostal window is helpful for evaluating the vasculature at the level the hepatic hilus including the aorta, caudal vena cava and portal vein in patients with suspected portosystemic shunt, right heart disease or portal hypertension.
Doppler imaging is helpful for evaluation of abdominal vasculature. Types of Doppler include color, power, pulse wave and continuous wave.

Color Doppler identifies the direction and relative velocity of blood flow.

Power Doppler is sensitive to slow flowing blood but does not identify direction of blood flow.
Pulse wave Doppler allows for evaluation of velocity and direction of flow in a specific vessel.

Continuous wave Doppler is used in echocardiography and allows for evaluation of high velocity blood flow.
Keep in mind that Doppler signal is dependent on the angle of the ultrasound probe in relation to blood flow. Best Doppler results are obtained when the probe angle is small (less than 60 degrees) in comparison to the direction of blood flow.

Lymph nodes

Knowledge of normal lymph node anatomy and drainage patterns is important for identification and interpretation of abnormal lymph node findings. Normal lymph nodes are generally hyperechoic compared with vasculature and slightly hypoechoic compared to surrounding mesentery. The jejunal and medial iliac lymph nodes are normally the largest lymph nodes in the canine abdomen and thus are generally visible even in normal patients. Other abdominal lymph nodes are not often visualized unless lymphadenopathy is present. Normal lymph nodes size is dependent on patient size and age. Normal lymph nodes are elongated in shape and are much longer than they are thick.

Jejunal lymph nodes: Paired, one on either side of the cranial mesenteric artery. Usually on midline at the level of the umbilicus and just medial to the ileocecocolic junction.

Medial iliac lymph nodes: Paired, located lateral to their respective external iliac arteries at the level of the aortic trifurcation.

When lymph nodes are enlarged the big question is are they reactive or metastatic. Cytologic or histopathologic sampling is required for definitive diagnosis, however there are some trends that may prioritize one differential over the other. Metastatic lymph nodes tend to get rounded in shape and have a short axis to long axis ratio greater than 0.5, whereas reactive lymph nodes will be enlarged but generally retain an elongated shape. Metastatic lymph nodes tend to be hypoechoic versus reactive lymph nodes that either retain normal echogenicity or may have a hypoechoic outer rim. Reactive lymph nodes tend to retain a normal hilar blood flow pattern, whereas metastatic lymph nodes may exhibit peripheral blood flow.

Peritoneal and retroperitoneal spaces
The mesentery and abdominal fat provides the background echoes between abdominal organs. Inflamed mesentery and fat will be hyperechoic and hyperattenuating. When mesenteric inflammation is focal it can act like a neon sign pointing to the area of pathology. This can be quite helpful for identification of lesions. For instance, when surrounding the pancreas in acute pancreatitis, adjacent to a ruptured gallbladder or focal intestinal mass. The mesentery can also be a site of metastasis as is the case with carcinomatosis.

Peritoneal effusion can occur for a variety of reasons. Although the echogenicity of peritoneal effusion can imply the cellular/protein content (ex. transudates, urine likely anechoic; hemorrhage, exudates likely echogenic) cytology is necessary for diagnosis. Be aware that machine settings (ex: gain) can alter the echogenicity of fluids.

Ultrasound is more sensitive than radiology for identification of small volumes of free peritoneal fluid or gas. When small volumes of abdominal effusion are present it tends to collect in typical locations. These include between the splenic head and left body wall, between loops of small intestine, cranial to the urinary bladder and surrounding the gallbladder. Small volumes of free fluid can be identified by their triangular or angular shape. Pneumoperitoneum can be identified by reverberation artifact caused by gas which most often collects in the most non-gravity dependent portions of the abdomen. If large volumes of gas are present within the abdominal cavity (such as in a postoperative abdomen) positional imaging can be utilized to help visualize abdominal structures as the reverberation artifact associated with gas can inhibit visualization of structures.

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WSV - 091

HOW I APPROACH A DOG WITH INCREASED SERUM ALP

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Clinical case presentation

• Lily, a 10-year-old sterile female Yorkshire terrier with an increase in ALP (brief return on a common endocrine cause: Cushing disease)
• Griffin, a 10-year-old male American Cocker with an increase in ALT, ALP and bilirubins (discussion leading to the diagnosis and management of a biliary mucocele)
Interpretation of complete blood count (CBC), biochemistry profile and liver function assays in hepatobiliary disease in the dog

1- CBC:
- Poikilocytosis: including acanthocytes, echinocytes, target cells, and stomatocytes (reflecting a decrease tolerance to oxidative stress)
- Anemia of chronic disease or chronic GI blood loss
- Microcytic and hypochromic anemia (iron deficiency)
2- Biochemistry profile:

a) Markers of hepatocellular injury
Increases in ALT (alanine aminotransferase) Refer to Conference proceeding on «How I approach a dog with increased serum ALT» for more information)
- Increases occur due to cell damage (increased membrane permeability or necrosis) and induction (increased synthesis)

- The degree of elevation of serum ALT activity is roughly proportional to disease severity and affected hepatic mass. However, liver injury can be present despite a normal ALT activity due to a decrease in the number of hepatocytes (i.e., advanced fibrosis, portosystemic shunting), in cases of non-inflammatory primary or secondary neoplasia (e.g., hepatocellular carcinoma or hemangiosarcoma), and potentially very early in the course of disease

- Increased ALT supports hepatocellular injury, but does not provide information on liver function

Increases in AST (aspartate aminotransferase):
- Not specific to the liver (present in muscles, but also in brain, liver, kidney and erythrocytes)

- Muscle damage (CK activity may help differentiate origin as it should remain normal unless there is concomitant muscle disease) and hemolysis can cause considerable increases in AST activity
- The enzyme half-life is about 22 hours in the dog.
b) Markers of cholestasis:
Increases in ALP activity (alcaline phosphatase):
- Can indicate primary hepatobiliary disease, such as cholestasis, as well as canalicular cell necrosis, or alternatively increased hepatic synthesis
- Not specific to the liver, as several ALP isoenzymes have been identified in liver, bone, intestines, kidney and placenta.
- An increase in ALP has a good sensitivity (86%), but a poor specificity (49-51%) for the diagnostic of hepatobiliary disease.
- The specificity of ALP for the diagnostic of hepatobiliary disease increases to 94% if combined with an increased serum GGT.(1)
- Considered significant if increase is 2-3X normal
- The enzyme half-life is about 72 hours in the dog
- Enzymatic induction (isoenzyme):
• Hepatic: with usage of glucocorticoids or anticonvulsant therapy in dogs (ex.: phenobarbital)
• Bone: in young animal or with bone tumor

General rule (if not a growing animal):

- Obtain a complete history including glucocorticoid administration (PO or other route) and any clinical signs suggestive of hyperadrenocorticism
- If slight to moderate increase (2-4X) recheck in 1 month
- If persistent or severe increase (> 4X), abdominal ultrasound is recommended

Table 1 : Causes of increased serum ALP activity in dogs

Biliary duct disease
• Biliary neoplasm
• Cholelithiasis
• Cholecystitis
• Biliary mucocele

Hepatic parenchymal disease
• Cholangitis
• Chronic canine hepatitis
• Hepatic neoplasm: primary or secondary
• Nodular hyperplasia
• Toxins (eg aflatoxin, amanita fungus, blue green algae, copper, herbicides, insecticides, iron, zinc, xylitol, sago)
• Vacuolar hepatopathy (idiopathic)

Extrahepatic disease
• Bone neoplasm / osteolytic condition
• Growth
• Congestive heart disease
• Diabetes mellitus
• Hypothyroidism
• Pancreatitis / pancreatic neoplasm
• Sepsis
• Exogenous or endogenous glucocorticoids (cushing): enzymatic induction and vacuolar hepatopathy

Increases in GGT activity (gamma-glutamyltransferase):
- Increases parallels ALP
- In dogs, GGT is often considered more specific but less sensitive than ALP for the detection of hepatobiliary disease.
- GGT has a half-life of approximately 72 hours in dogs.

Hyperbilirubinemia:
- Poor sensitivity and specificity for hepatobiliary disease
- May be caused by hemolysis, primary hepatic disease and extrahepatic cholestasis

Changes on biochemistry profiles suggestive of liver dysfunction/failure includes hypoalbuminemia, decreased urea, hypoglycemia (liver failure) and hypocholesterolemia.
Important: Because the liver has a considerable reserve capacity, patients with liver disease can have normal liver function test results.

Biliary mucocele

A biliary mucocele corresponds to the excessive dilation of the gallbladder following the accumulation of mucus (hyperplasia of the mucosa of the gallbladder and overproduction of very compact mucus that can accumulate within the gallbladder). This accumulation of thick, gelatinous mucus may eventually fill the entire bladder, obstruct the hepatic and cystic ducts, and lead to extrahepatic cholestasis. The pressure exerted on the wall of the gallbladder can lead to necrosis and eventually to a rupture of the gallbladder.
Although this condition is now recognized frequently in certain dog breeds, it has been described for less than 20 years, which may reflect increase awareness of the condition, improvement (quality and access) of modern imaging and/or an actual increase in its prevalence.

Several risk factors have been identified, including:
1- genetic predisposition (Shetland Sheepdog, American cocker Spaniel, Chihuahua, Pomeranian, Miniature Schnauzer and Border terriers) (3)
2- presence of an endocrinopathy(4) and/or dyslipidemia (e.g. hyperadrenocorticism (29x more at risk) and hypothyroidism)
3- increased serum leptin(5)
4- older dogs (age > 10 years)

Clinical signs may vary greatly from an accidental finding on abdominal ultrasound to shock in patients presented with a ruptured gallbladder and bile peritonitis. Other clinical signs include nonspecific chronic GI signs (dysorexia, diarrhea, vomiting), lethargy, abdominal pain and fever.
Biochemistry profile may reveal a significant increase in liver enzymes (ALP and GGT, ALT, AST). Increased bilirubins will reflect the degree of obstruction. Neutrophilia has been documented in 50% of cases, reflecting the inflammatory nature of the disease. Abdominal ultrasound will allow confirmation of the condition. Ultrasonographically, mucoceles are characterized by the appearance of the stellate or finely striated bile patterns and differ from biliary sludge by the absence of gravity dependent bile movement.(6)A recent retrospective study including 219 dogs with gallbladder mucocele revealed that dogs presented with a ruptured gallbladder and bile peritonitis at the time of surgery were 2.7 times more likely to die than dogs without gallbladder rupture and bile peritonitis. Although ultrasound was fairly specific to diagnosed a gallbladder rupture (91.7%), it only had a 56.1% sensitivity.(7)When the patient does not have clinical or biochemical abnormalities, i.e. when gallbladder mucocele is a fortuitous finding, close monitoring by follow-up ultrasound examinations may be considered along with a medical treatment (ex.: ursodiol, investigate and treat for predisposing condition, antibiotics ideally based on fine needle aspirate). In the presence of a distended gallbladder with an immobile ultrasonographic stellate or finely striated bile pattern, a surgical cholecystectomy is indicated when clinical or biochemical signs of hepatobiliary disease are present. Because 22-75% of mucocele has been documented to be infected, aerobic and anaerobic cultures are always indicated. Interestingly, no significant associations were identified between survival and positive bacteriologic cultures, antibiotic administration, or time (days) from ultrasonographic identification of gallbladder mucocele to the time of surgery.(7)

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WSV - 302

LINKEDIN: WHY KEEPING YOUR PROFILE UP-TO-DATE IS IMPORTANT

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LinkedIn is sure to leave an impression. It is far from being an entertainment social network like Facebook, and it does not push the same holiday fantasies as Instagram. Many find it too boring or stressful! However, LinkedIn is a great tool that has improved since it was purchased by Microsoft in 2016 for the modest sum of 26 billion US dollars. A statistic that dates from 2017 mentions that 93% of recruiters are inspecting the profile of candidates on social media before an interview.

Why Being on LinkedIn Is Important

For veterinarian owners: what good is it to be there if we don't need to look for employment? When the market is almost at full employment, we are literally snatching away the right employees. It is important to know the trends of the market, meaning what competitors offer and how they recruit.

If you are interviewing a candidate who asks you if you offer a signing bonus or a leadership program, you'll feel better knowing exactly what that is. LinkedIn has become an indispensable tool for headhunters, and their agencies are engaging in real seduction campaigns to attract candidates.

With a presence on LinkedIn, you will be inspired by what you find, and your offer will be more interesting. In such a market, you must stand out … or give fat salaries. Following a few headhunters allows to read relevant articles full of tricks to attract and retain skilled labour.

Another advantage of a nice LinkedIn profile is that you post it publicly. Millennials are addicted to pictures and videos. I call them generation "Tinder" when it comes time to find a job. They are quickly charmed by what they see. Without an online presence, these young people who are looking for a job can find it difficult to form an opinion about you.

Do they look nice? What is their style? About how old are they? As experts say, ads to find a veterinarian that begin with "young and dynamic team, with cutting edge equipment" no longer work.

For veterinarians and AHTs who are looking for a job: there are so many good reasons! Your LinkedIn profile becomes your resume, accessible at all times, with a picture as well. Hands up those who do not like to update their resume! If your profile is complete, interested employers can find it all. Several positions are available on this platform.

For veterinarians and AHTs who are happy and are seeking employment: you are content, why trouble yourself with building a profile? You are now, but a day may come when your situation might change, which will require an adjustment in your career.

Here are some examples: the arrival of a child that limits your ability to work at night, your spouse finds a job in another region, you want to get closer to your aging parents, your kids are grown and you wish to work while travelling, etc. Better be ready!

Another underrated point is that veterinarians and AHTs are often volunteering for community organizations with low operating budgets. Imagine if your pet project could have a sponsorship, many more animals would benefit from your good care.

What are companies usually looking for when investing in non-profits: visibility. You can offer it to them on social media and LinkedIn. By regularly posting photos and videos of your commitment, you might attract the attention of a benefactor. If you are saving animals anonymously, that is commendable! However, it would be valuable to get those resources to increase aid.

LinkedIn Profile

Good news, updating your profile only requires little time! First, download the app on your mobile phone, it will be easier to see how the information is viewed. The goal is succinct writing.

The most important elements are your picture and your title. Having a professional photo is probably the best cost-benefit investment of your career. You only need a single nice picture, taken by a professional. Magenta studios regularly offer deals for less than $100. Completing your profile is simple: follow what is asked of you by each section. If you wish to expand your scope beyond your region, write it in English. Always review the end result on the app and not on your computer. The area is reduced in the mobile version.

Add your volunteering activities, governing boards in which you participate, spoken languages, completed training and work experiences. Don't downplay details, those who will be viewing your profile will appreciate them.

Several veterinarians fear getting approached by customers asking them questions of a medical nature. Remember that you can change the display settings. For example, you can make only your name visible. In the very hypothetical case where a customer wants advice for free, you should answer them to communicate with you at the veterinary facility during your working hours. If applicants or potential employers can't find you, your efforts will be in vain.

LinkedIn Contacts

Like Facebook, you need contacts to be seen. Aim for at least 500 contacts. Even if you don't personally know each individual, ask them to connect with you. I have more than 1300 contacts, and only one refused my request. I am linked to many veterinarians in English Canada and the United States that I yet have never met. We have common knowledge, which validates the interest. Don't forget that we publish professional content on this platform and not pictures of our trips or children.

You can start with your work colleagues or classmates. Then, add pharmaceutical and food company representatives. In the section of the menu named "My Network", LinkedIn will offer you, according to your contacts, people you may know. It's a great way to build your network, and the effect becomes exponential. You'll be surprised you know so many people.

Groups and Businesses

A good technique to learn about emerging trends and issues is to follow interest groups and companies that appeal to you. With the search bar, you can write "veterinary," and more than 1,500 companies appear: Vet Recruiter, Colorado State University, Hill's Pet Nutrition, VCA Canada, Passionimo, Vet Strategy, Royal Canin, AAHA, NAVC, etc. Do the same with related areas (human resources, animal shelter, etc.).

You can thus read articles a few times a week from these companies or experts and learn more about the evolution of the market. If you want to get noticed, comment on articles. There are few comments on LinkedIn, therefore we notice those who bother to give their opinion.

Looking for a Job or to Have an Idea of What is Offered

You can download the "LinkedIn Jobs" app, which is even more specific to this activity. Otherwise, you can use the LinkedIn app and choose in the "Jobs" filter for a veterinarian position, for example. Alternatively, you can enable the option "Let recruiters know you're open to opportunities" to be approached.

LinkedIn has not experienced the same explosive development as Facebook or Instagram. Nevertheless, we feel a wind of change with the possibility of creating targeted ads at an affordable cost, and the offer of online training (LinkedIn Learning app). The majority is paid, but the initial costs are often free to lure you in. Those that I did were very professional.

Come on, shine to the level of the good care you offer!

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