**MVC**

**Antibiotic Selection in Pyoderma**

Bacterial pyoderma is one of the most commonly diagnosed dermatologic diseases in dogs. Although β-lactam antibiotics such as cephalaxin were once effective in treating pyoderma, the growing emergence of resistant bacteria, particularly methicillin-resistant *Staphylococcus*, has made treatment of this condition much more complicated. At the 2018 Midwest Veterinary Conference in Columbus, (continued on page 11)

**THE SCOOP**

**WANTED: High-quality Veterinary Job Candidates**

Even if you’re not in tune with the world of business and finance, you’ve likely heard of the law of supply and demand. To set the stage for this article, I’d like to share its official definition, courtesy of dictionary.com: “the theory that prices are determined by the interaction of supply and demand: an increase in supply will lower prices if not accompanied by increased demand, and an increase in demand will raise prices unless accompanied by increased supply.”

I share this definition because it’s very applicable to what is happening within the veterinary profession today. Working as a search consultant and recruiter in the veterinary profession and animal health industry for close to 21 years, I’ve seen a lot, but (continued on page 30)

**PARASITOLOGY**

**Developing a Vaccine for Lyme Disease**

Lyme disease is the most commonly reported vector-borne disease in humans in the United States.1 Its incidence in dogs has been increasing steadily due to expanding tick populations.2 In a webinar hosted by online continuing education provider VETgirl (vetgirlontherun.com), Richard T. Marconi, PhD, talked about (continued on page 24)

**FEATURE**

**Electroceuticals: The Wave of the Future Is Now**

Increasingly, treatment for a host of conditions and ailments is based on electroceuticals rather than pharmaceuticals. Instead of prescriptions for chemical molecules, some doctors are prescribing specific frequencies, waveforms, and amplitudes for their patients. This is not science fiction—it’s happening right now.

It’s not really a stretch to see how this can be. Every day, car engines are started and doors are opened from a distance using a fob. This is made (continued on page 16)

**LIFELINES**

**Owning It: The Power of Admitting Your Mistakes**

The prevalence of medical mistakes resulting in harm to patients is high. In fact, each year more than 250,000 deaths in U.S. hospitals are attributed to medical errors.1 If this figure included diagnostic errors, the number of preventable deaths would rise to approximately 400,000 annually.2 Related surveys on the topic have also revealed that 83 to 92 percent of physicians have made a mistake in their career that resulted in a near miss (NM), adverse event or serious error.3,4 Most recently, a 2018 survey study from the Veterinary Information Network (VIN) found that 74 percent of (continued on page 32)

**ONLINE TOOLBOX**

**Email Marketing 101**

Email marketing is one of the leading ways for businesses to connect with customers and build loyalty and brand awareness. Veterinary practices are no exception. “A newsletter can be a very effective way of communicating with pet owners,” said Karen E. Felsted, CPA, MS, DVM, CVPM, CVA, founder and president of PantheraT Veterinary Management Consulting. Even more, email newsletters serve as a reminder (continued on page 36)

**UROLOGY**

**Canine Urinary Incontinence**

Urinary incontinence (UI), a common problem encountered in small animal practice, can result from congenital anatomic abnormalities, urine retention and overflow incontinence, or sphincter incompetence. The timing of the onset of UI and the ability of a dog to empty its bladder are important in determining the underlying cause. Behavioral changes are important factors as well. This review focuses on 2 of the most common causes of UI: urethral sphincter mechanism incompetence (USMI) and functional urethral obstruction, (continued on page 18)
Pet owners already have a lot to remember. Give them one less thing to forget.

Protect your patients from fleas & ticks for up to 12 weeks* with BRAVECTO®

Ask your Merck Animal Health Rep about BRAVECTO or Visit Bravectovets.com

*BRAVECTO kills fleas and prevents flea infestations for 12 weeks. BRAVECTO Chew and BRAVECTO Topical Solution for Dogs kill ticks (black-legged tick, American dog tick, and brown dog tick) for 12 weeks and also kill lone star ticks for 8 weeks. BRAVECTO Topical Solution for Cats kills ticks (black-legged tick) for 12 weeks and American dog ticks for 8 weeks.

IMPORTANT SAFETY INFORMATION: BRAVECTO has not been shown to be effective for 12-weeks' duration in puppies or kittens less than 6 months of age. BRAVECTO Chew: The most common adverse reactions recorded in clinical trials were vomiting, decreased appetite, diarrhea, lethargy, polydipsia, and flatulence. BRAVECTO is not effective against lone star ticks beyond 8 weeks of dosing. BRAVECTO Topical Solution for Dogs: The most common adverse reactions recorded in clinical trials were vomiting, hair loss, diarrhea, lethargy, decreased appetite, and moist dermatitis/rash. BRAVECTO is not effective against lone star ticks beyond 8 weeks of dosing. For topical use only. Avoid oral ingestion. Use caution in dogs with a history of seizures. Seizures have been reported in dogs receiving fluralaner, even in dogs without a history of seizures. BRAVECTO Topical Solution for Cats: The most common adverse reactions recorded in clinical trials were vomiting, itching, diarrhea, hair loss, decreased appetite, lethargy, and scabs/ulcerated lesions. BRAVECTO is not effective against American dog ticks beyond 8 weeks of dosing. For topical use only. Avoid oral ingestion. The safety of BRAVECTO has not been established in breeding, pregnant and lactating cats. Use with caution in cats with a history of neurologic abnormalities. Neurologic abnormalities have been reported in cats receiving BRAVECTO, even in cats without a history of neurologic abnormalities. See full Prescribing Information on the following page.

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BRAVECTO® (fluralaner topical solution) for Dogs

BRIEF SUMMARY (For full Prescribing Information, see package insert)

Caution:
Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Indications:
Braecto kills adult fleas and is indicated for the treatment and prevention of flea infestations [Ctenocephalides felis] and the treatment and control of tick infestations [Leodes scapularis (black-legged tick), Dermacentor variabilis (American dog tick), and Ixodes simulans (brown dog tick)] for 12 weeks in dogs and puppies 6 months of age and older, and weighing 4.4 pounds or greater.

Braecto is also indicated for the treatment and control of Amblyomma americanum (lone star tick) infestations for 8 weeks in dogs and puppies 6 months of age and older, and weighing 4.4 pounds or greater.

Contraindications:
There are no known contraindications for the use of the product.

Warnings:
Not for human use. Keep this and all drugs out of the reach of children. Do not contact or allow children to contact the application site until dry. Keep the product in the original package until use in order to prevent children from getting direct access to the product. Do not eat, drink or smoke while handling the product. Wash hands thoroughly with soap and water immediately after use of the product.

Precautions:
Braecto has not been shown to be effective for 12-week duration in puppies less than 6 months of age. Braecto is not effective against Amblyomma americanum ticks beyond 8 weeks after dosing.

Adverse Reactions:
In a well-controlled U.S. field study, which included 294 dogs (224 dogs were administered Bravecto every 12 weeks and 70 dogs were administered a oral active control every 4 weeks and were provided with a tick collar); there were no serious adverse reactions. All potential adverse reactions were recorded in dogs treated with Bravecto. In a well-controlled U.S. field study over an 84-day period. The most frequently reported adverse reaction in dogs treated with Bravecto was vomiting.

Percentage of Dogs with Adverse Reactions in the Field Study

<table>
<thead>
<tr>
<th>Adverse Reaction (AR)</th>
<th>Braecto Group: Percent of Dogs with the AR During the 182-Day Study (n=224 dogs)</th>
<th>Active Control Group: Percent of Dogs with the AR During the 84-Day Study (n=70 dogs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vomiting</td>
<td>14.3%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>4.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Lethargy</td>
<td>5.4%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Polydipsia</td>
<td>3.7%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Fainting</td>
<td>1.3%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

In a well-controlled laboratory dose confirmation study, one dog developed edema and hyperemia of the upper lips within one hour of receiving Bravecto. The edema improved progressively through the day and had resolved without medical intervention by the next morning.

For technical assistance or to report a suspected adverse drug reaction, contact Merck Animal Health at 1-800-224-5318. Additional information can be found at www.bravecto.com. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at www.fda.gov/AnimalVeterinary/SafetyHealth.

How Supplied:
Braecto is available in five strengths (112.5, 250, 500, 1000, and 1400 mg fluralaner per chew). Each chew is packaged individually into aluminum foil blister packs sealed with a peelable paper backed foil lid stock. Product may be packaged in 1, 2, or 4 chews per package.

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BRAVECTO® (fluralaner topical solution) for Cats

BRIEF SUMMARY (For full Prescribing Information, see package insert)

Caution:
Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Indications:
Braecto kills adult fleas and is indicated for the treatment and prevention of flea infestations [Ctenocephalides felis] and the treatment and control of tick infestations [Ixodes scapularis (black-legged tick), Dermacentor variabilis (American dog tick), and Ixodes simulans (brown dog tick)] for 12 weeks in cats and kittens 6 months of age and older, and weighing 2.6 pounds or greater.

Braecto is also indicated for the treatment and control of Amblyomma americanum (lone star tick) infestations for 8 weeks in cats and kittens 6 months of age and older, and weighing 2.6 pounds or greater.

Contraindications:
There are no known contraindications for the use of the product.

WARNINGS
Human Warnings:
Not for human use. Keep this and all drugs out of the reach of children. Do not contact or allow children to contact the application site until dry. Keep the product in the original packaging until use in order to prevent children from getting direct access to the product. Do not eat, drink or smoke while handling the product. Avoid contact with skin and eyes. If contact with eyes occurs, rinse eyes slowly and gently with water. Wash hands and contacted skin thoroughly with soap and water immediately after use of the product.

For topical use only. Avoid oral ingestion. Use with caution in cats with a history of neurologic abnormalities. Neurologic abnormalities have been reported in cats receiving Bravecto, even in cats without a history of neurologic abnormalities. Braecto has not been shown to be effective for 12-week duration in kittens less than 6 months of age. Braecto is not effective against Dermacentor variabilis ticks beyond 8 weeks after dosing. The safety of Bravecto has not been established in breeding, pregnant and lactating cats.

Adverse Reactions:
In a well-controlled U.S. field study, which included a total of 165 households (84 cats were treated with Bravecto every 4 weeks and were provided with a tick collar); there were no serious adverse reactions.

Percentage of Cats with Adverse Reactions (AR) in the Field Study

<table>
<thead>
<tr>
<th>Adverse Reaction (AR)</th>
<th>Braecto Group: Percent of Cats with the AR During the 105-Day Study (n=224 cats)</th>
<th>Control Group: Percent of Cats with the AR During the 84-Day Study (n=87 cats)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vomiting</td>
<td>15.0%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Pruritus</td>
<td>3.6%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2.7%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Decreased Appetite</td>
<td>0.9%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Most Common/AR</td>
<td>0.9%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

In the field study, two dogs treated with Braecto were observed by the owner to be off balance for about 30 minutes five days after its first dose and had no similar observations after the second dose. One dog with a history of seizures had a seizure the day after the second dose of the active control.

In two well-controlled laboratory dose confirmation studies, one dog showed mild to moderate redness, scaling, crusts/scabs and alopecia at the treatment site from Day 1 through 14 after application of Bravecto on Day 0, and one dog developed self-limiting generalized erythema (possible allergic reaction) one day after treatment with Bravecto.

In a European field study in cats, there were three reports of facial dermatitis in humans after close contact with the application site which occurred within 4 days of application.

For technical assistance or to report a suspected adverse drug reaction, or to obtain a copy of the Safety Data Sheet (SDS), contact Merck Animal Health at 1-800-224-5318. Additional information can be found at www.bravecto.com. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at www.fda.gov/AnimalVeterinary/SafetyHealth.

How Supplied:
Braecto is available in three strengths for use in cats (112.5, 250, and 500 mg fluralaner per tube). Each tube is packaged individually in a pouch. Product may be supplied in 1 or 2 tubes per carton.

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NADA 141-426, Approved by FDA

NADA 141-459, Approved by FDA
The Information Revolution: We Can All Benefit

Every political or social revolution has driving forces, winners, and losers. The same is true for the ongoing information revolution: Technology continues to be a primary driver, and consumers are winning in terms of the convenience, breadth, and accessibility of content.

The casualties of this revolution have included traditional news outlets such as newspapers and television, which have been replaced by social media as the most popular source of news. To survive in this tumultuous era, shrewd content producers know that their value is no longer a function of the number of followers, but the depth and breadth of content that can be used to improve your online presence and build your business.

Is your practice website engaging and interactive? Is it updated regularly? Does it contain a library of articles and blogs that pet owners can turn to when they have questions related to the health of their 4-footed family members? Is your website mobile-friendly? Does it spur the user into action?

Do you send a practice newsletter to your clients? Are you following email best practices? Are your emails personalized? Do they offer a link for recipients to visit your website, Facebook, Instagram, or Pinterest page? Do you use your newsletter as a vehicle for asking your clients to leave online reviews for your practice? Does your newsletter convey trust and a sense of partnership?

If you answered no to most of these questions, then it’s probably time to rethink your electronic marketing strategy. To remain engaged with current clients and win new customers, practices today absolutely must be using technology to their advantage. We are committed to helping veterinary practices—and their clients and patients—be counted among the winners in the information revolution.

Thank you for reading!

Mike Hennessy, Sr
Chairman and CEO

REFERENCES

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IMPORTANT SAFETY INFORMATION:

NexGard® (afoxolaner) is for use in dogs only. The most frequently reported adverse reactions included pruritus, vomiting, dry/flaky skin, diarrhea, lethargy, and lack of appetite. The safe use of NexGard in pregnant, breeding, or lactating dogs has not been evaluated. Use with caution in dogs with a history of seizures. For more information, see full prescribing information or visit www.NexGardForDogs.com.

Preferred by dogs¹ and dog owners² –

NexGard® (afoxolaner) makes it easy to protect your canine patients against fleas and four of the most common species of ticks in North America.

¹Data on file at Merial.
²Data on file at Merial. Based on veterinary dispensed dose data.

NexGard is a Merial product. Merial is now part of Boehringer Ingelheim.

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FEATURE

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Electroceuticals: The Wave of the Future Is Now

Although still in its infancy in veterinary medicine, targeting neural circuits with electricity offers huge potential to provide focused, personalized treatment for a variety of ailments.

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Idiopathic Epilepsy and Cognitive Dysfunction in Dogs

According to findings from several human studies, epilepsy is strongly associated with cognitive dysfunction. This dysfunction varies widely in severity, but it tends to be more severe with symptomatic epilepsy than idiopathic epilepsy (IE). However, whether epilepsy-associated cognitive dysfunction is progressive (due to recurrent seizures), static (present from epilepsy onset), or the result of other comorbidities, like dementia, remains debatable.

In dogs, IE is the most common chronic neurologic disorder, typically beginning between 6 months and 6 years of age. Its effect on canine cognition is unknown. Canine cognitive dysfunction (CCD), on the other hand, has been widely researched and is characterized by various deficits in senior dogs, including learning and memory.

Geriatric disorders like CCD have become increasingly important in veterinary medicine. Because CCD and IE can have a negative effect on quality of life, particularly as comorbidities, investigators from the United Kingdom and Australia recently analyzed cognitive impairments in dogs with IE.

Using an online survey, the investigators collected data from the owners of over 4000 dogs. A short series of questions determined whether the dogs had IE; dogs without IE served as controls. The canine cognitive dysfunction rating (CCDR) scale was used to measure the frequency and progression of cognitive deficits, with a score of 50/80 or higher indicating CCD. Training history data were also collected to account for environmental effects on canine cognition.

Basic demographic data on all dogs were collected. For dogs with IE, information on seizure activity was obtained. Of the 4051 dogs for whom data were collected, 286 had IE. Compared with controls, dogs with IE were younger, heavier, and had less training.

CCD prevalence was higher at a much younger age for dogs with IE (4.1 to 6 years) than for controls (>14 years), signifying a strong association between IE and age. Four major risk factors for CCD were identified: IE, older age, less training, and lower body weight.

Cognitive impairments (eg, walking into walls or doors) were more frequent in dogs with IE and primarily reflected memory deficits. Interestingly, social impairments—a hallmark of classic CCD—were not more frequent in dogs with IE than in controls, suggesting a difference between IE-associated CCD and classic CCD.

Progression of cognitive impairments was not reported in dogs with IE, suggesting early progression and stabilization by the time of the survey, the investigators believed. Progression was reported in the control dogs, however, likely due to the natural aging process.

For the dogs with IE, the median CCDR score approached 35/80, with 11 dogs scoring 50 or higher. The median age for the first seizure was 32 months. Approximately 75% of the dogs had cluster seizures, and 40% experienced status epilepticus. Nearly 90% were on antiepileptic drugs at the time of the survey, with variable changes in seizure frequency. The investigators identified several factors related to increased CCDR scores in dogs with IE: status epilepticus, higher seizure frequency, and history of cluster seizures.

Noteworthy FDA Approvals

Centragard: Feline Heartworm Prevention
Centragard (eprinomectin and praziquantel transdermal solution)—manufactured by Merial, now a part of Boehringer Ingelheim—is indicated for the prevention of heartworm disease caused by Dirofilaria immitis. It is also approved for the treatment and control of roundworms (adult and fourth-stage larval Toxocara cati), hookworms (adult and fourth-stage larval Ancylostoma tubaeforme, adult Ancylostoma braziliense), and tapeworms (adult Dipylidium caninum and Echinococcus multilocularis) in cats and kittens 7 weeks of age and older and weighing at least 1.8 lb. The topical medication is applied monthly and available by prescription only.

The effectiveness of Centragard was demonstrated in 18 controlled laboratory studies, with no adverse effects reported in any of the 226 cats administered the labeled dose. Study results indicate that Centragard is effective against induced heartworm infections after a single dose, as well as roundworms, hookworms, and tapeworms after a single dose or when given monthly as a preventive.

Mirataz: Feline Appetite Stimulant
Developed by California-based Kindred Biosciences, Mirataz (mirtazapine transdermal ointment) is intended for the management of weight loss in cats. It contains mirtazapine, a tetracyclic compound originally developed as an antidepressant for humans. Formulated with proprietary Accusorb technology, Mirataz is administered by applying a 1.5-in ribbon (about 2 mg) to the cat’s inner ear once daily for 14 days.

“This is the first and only drug approved by the FDA for this very serious condition,” KindredBio CEO Richard Chin said. “Not only that, but it is the first transdermal drug for cats approved by the FDA ever.”

Semintra: Systemic Hypertension Control
Available in Europe since 2013, Semintra (telmisartan oral solution) has become the first FDA-approved drug to control systemic hypertension in cats. With a highly targeted mode of action, Semintra provides rapid and reliable reduction in proteinuria in cats with chronic kidney disease. The drug’s active ingredient is telmisartan, an angiotensin II receptor blocker that reduces blood pressure by relaxing blood vessels. According to study results, the drug is well tolerated in cats (>90%), with its excetration almost exclusively independent of kidney function.

Designed by California-based Kindred Biosciences, Semintra is dosed twice daily for 14 days at 1.5 mg/kg and then decreased to once daily at 2.0 mg/kg. The oral solution can be administered either directly into the cat’s mouth or on top of a small amount of food.
The FIRST AND ONLY FDA-approved transdermal medication for the management of weight loss in cats

For more information, contact your KindredBio Sales Specialist at 1-888-608-2542, your preferred Distributor Sales Representative, or go to kindredbio.com/Mirataz.

In clinical studies, Mirataz™ (mirtazapine transdermal ointment) resulted in significant weight gain in cats in as little as 14 days following topical application of 2 mg per day

Mirataz gives your clients a practical way to manage their cat’s weight loss without administration of oral medication and does not rely on the cat to eat to be medicated

Due to proprietary Accusorb™ technology, Mirataz achieves measurable plasma concentrations of mirtazapine in cats

Mirataz was well tolerated both locally and systemically in clinical studies

Important Safety Information

Mirataz™ (mirtazapine transdermal ointment) is for topical use in cats only under veterinary supervision. Do not use in cats with a known hypersensitivity to mirtazapine or any of the excipients. Do not use in cats treated with monoamine oxidase inhibitors (MAOIs). Not for human use. Keep out of reach of children. Wear gloves when handling/applying, wash hands after and avoid contact between the treated cat and people or other animals for 2 hours following application. Use with caution in cats with hepatic and kidney disease. Cat’s food intake should be monitored upon discontinuation. Safety has not been evaluated in cats less than 2 kg, less than six months of age or in breeding, pregnant or lactating cats. The most common adverse reactions observed during clinical trials were application site reactions, behavioral abnormalities (vocalization and hyperactivity) and vomiting. For additional safety information, see brief summary of prescribing information on page 10.


ANOTHER PILL? GIVE IT TO THE DOG.
CDC Warning Echoes CAPC Tickborne Disease Predictions

The Centers for Disease Control and Prevention (CDC) is warning Americans of the significant diseases related to mosquitoes, fleas, and ticks that may affect people in the United States. Much like the Companion Animal Parasite Council’s (CAPC) forecast of increased tickborne disease throughout much of the country, the CDC’s report is not encouraging—and provides further proof that vector-borne diseases are a One Health issue.

According to the CDC, 642,602 cases of human illnesses caused by ticks, fleas, or mosquitoes were reported between 2004 and 2016. The agency also noted the presence of 9 types of germs not previously found in the United States. Of these, 7 were tickborne. Moreover, the rate of reported diseases transmitted through ticks more than doubled over the 13-year period, accounting for over 60% of all mosquito-, flea-, and tick-associated illnesses.

The CDC also reported that the most common tick-transmitted diseases in the United States in 2016 were Lyme disease, ehrlichiosis, and anaplasmosis. These data closely mirror CAPC’s prediction that nonendemic areas will start to see a rise in Lyme disease cases in 2018, including North Dakota, South Dakota, Iowa, Missouri, southern Illinois, Ohio, Kentucky, Tennessee, North Carolina, western Pennsylvania, eastern Ohio, West Virginia, and the Appalachian region in Virginia.

Flea, Environmental Allergies on the Rise, Says Banfield

Pet allergies, and the skin problems they cause, were the focus of the 2018 State of Pet Health Report released recently by Banfield Pet Hospital. This year’s report included data from more than 3 million dogs and cats cared for at Banfield hospitals in 2017. Here are some of the key findings:

- **Flea allergy:** Fleas are the most common external parasite affecting Banfield patients, and the prevalence of flea allergy is on the rise. Banfield reported significant increases in flea allergy cases in cats (67.3%) and dogs (12.5%) over the past 10 years.
- **Environmental allergy:** Banfield has also seen an increase in environmental allergy cases among canine (30.7%) and feline (11.5%) patients over the past decade. Pollen, dander, molds, and cleaning solutions are just a few of the culprits, but certain dog breeds are more prone to environmental allergies, such as golden and Labrador retrievers, German shepherds, cocker spaniels, boxers, French bulldogs, and West Highland white terriers.
- **Food allergy:** Although food allergies in people are on the rise, the same cannot be said for pets. Only 0.2% of dogs and 0.1% of cats treated at Banfield are affected by food allergies. Banfield also reports that 30% of dogs and cats with food allergy have some allergic skin condition. Food-allergic dogs are 6 times more likely to develop a bacterial skin infection, and food-allergic cats are 15 times more likely.

For topical application in cats only. Not for oral or ophthalmic use.

**CAUTION:** Federal law (USA) restricts this drug to use by or on the order of a licensed veterinarian.

Before using this product, please consult the product insert, a summary of which follows:

**INDICATION:** Mirataz™ is indicated for the management of weight loss in cats.

**DOSEAGE AND ADMINISTRATION:** Administer topically by applying a 1.5-inch ribbon of ointment (approximately 2 mg/cat) on the inner pinna of the cat’s ear once daily for 14 days. Wear disposable gloves when applying Mirataz™. Alternate the daily application of Mirataz™ between the left and right inner pinna of the ears. See Product Insert for complete dosing and administration information.

**CONTRAINDICATIONS:** Mirataz™ is contraindicated in cats with a known hypersensitivity to mirtazapine or to any of the excipients. Mirataz™ should not be given in combination, or within 14 days before or after treatment with a monoamine oxidase inhibitor (MAOI) [e.g. selegiline hydrochloride (L-deprenyl), amitripty] as there may be an increased risk of serotonin syndrome.

**HUMAN WARNINGS:** Not for human use. Keep out of reach of children. Wear disposable gloves when handling or applying Mirataz™ to prevent accidental topical exposure. After application, dispose of used gloves and wash hands with soap and water. After application, care should be taken that people or other animals in the household do not come in contact with the treated cat for 2 hours because mirtazapine can be absorbed transdermally and orally. However, negligible residues are present at the application site and the body of the cat at 2 hours after dosing. In case of accidental skin exposure, wash thoroughly with soap and warm water. In case of accidental eye exposure, flush eyes with water. If skin or eye irritation occurs seek medical attention. In case of accidental ingestion, or if skin or eye irritation occurs, seek medical attention.

**PRECAUTIONS:** Do not administer orally or to the eye. Use with caution in cats with hepatic disease. Mirtazapine may cause elevated serum liver enzymes (See Animal Safety in the product insert). Use with caution in cats with kidney disease. Kidney disease may cause reduced clearance of mirtazapine which may result in higher drug exposure. Upon discontinuation of Mirataz™, it is important to monitor the cat’s food intake. Food intake may lessen after discontinuation of mirtazapine transdermal ointment. If food intake diminishes dramatically (>75%) for several days, or if the cat stops eating for more than 48 hours, reevaluate the cat. Mirataz™ has not been evaluated in cats <2 kg or less than 6 months of age. The safe use of Mirataz™ has not been evaluated in cats that are intended for breeding, pregnant or lactating cats.

**ADVERSE REACTIONS:** In a randomized, double-masked, vehicle-controlled field study to assess the effectiveness and safety of mirtazapine for the management of weight loss in cats, 115 cats treated with Mirataz™ and 115 cats treated with vehicle control were evaluated for safety. The vehicle control was an ointment containing the same inert ingredients as Mirataz™ without mirtazapine. The most common adverse reactions included application site reactions, behavioral abnormalities (vocalization and hyperactivity), and vomiting. See Product Insert for complete Adverse Reaction information. To report suspected adverse events, for technical assistance or to obtain a copy of the SDS, contact Kindred Biosciences, Inc. at 888-608-2542. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at http://www.fda.gov/AnimalVeterinary/SafetyHealth.

**EFFECTIVENESS:** The effectiveness of Mirataz™ (mirtazapine transdermal ointment) was demonstrated in a randomized, double-masked, vehicle-controlled, multi-site field study involving client-owned cats of various breeds. Enrolled cats were ≥ 1 year of age and had existing documented medical history of ≥ 5% weight loss deemed clinically significant. The most common pre-existing conditions included renal insufficiency, vomiting, and hyperactivity. Some cats had more than one pre-existing condition. Cats were randomized to treatment groups in a 1:1 ratio of Mirataz™ to vehicle control. A total of 230 cats were enrolled and received either Mirataz™ (115 cats) or a vehicle control (115 cats) containing the same inert ingredients without mirtazapine. The cats were 2-24.6 years of age and weighed 2.1-9.2 kg. The dosage was a 1.5-inch ribbon (approximately 2 mg/cat) mirtazapine or vehicle ointment applied topically to the inner pinna of the cat’s ear. A total of 177 cats were determined to be eligible for the effectiveness analysis; 83 cats were in the Mirataz™ group and 94 cats were in the vehicle control group. The primary effectiveness endpoint was the mean percent change in body weight from Day 1 to the Week 2 Visit. At Week 2, the mean percent increase in body weight from Day 1 was 3.94% in the mirtazapine group and 0.41% in the vehicle control group. The difference between the two groups was significant (p<0.0001) based on a two-sample t-test assuming equal variances. A 95% confidence interval on the mean percent change in body weight was (2.82, 5.06) at Week 2, with a 95% confidence interval on the mean percent change in body weight for the Mirataz™ group is (2.77, 5.11), demonstrating that the mean percent change is statistically different from and greater than 0.

**STORAGE:** Store below 25°C (77°F). Multi-use tube. Discard within 30 days of first use.

**HOW SUPPLIED:** Mirataz™ is supplied in a 5 gram aluminum tube.

**MANUFACTURED FOR:** Kindred Biosciences, Inc. 1555 Bayshore Highway, suite 200 Burlingame, CA 94010

**NADA 141-481, Approved by FDA**

Made in USA.
NDC 86078-686-01
REG-MTZBS-008 Rev. 26Apr2018
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Antibiotic Selection in Pyoderma

Growing antibiotic resistance has complicated the treatment of bacterial skin conditions. Here’s what to consider when making therapeutic decisions for your patients.

By JoAnna Pendergrass, DVM, MS

(continued from front cover)

Ohio, Paul B. Bloom, DVM, DACVD, DABVP (Canine & Feline), discussed the diagnosis and treatment of pyodermas, with a particular focus on using a bacterium’s minimum inhibitory concentration (MIC) to select the proper antibiotic.

The frequency of antibacterial resistance in both human and veterinary medicine has been increasing. This increased resistance heightens the risk of spreading antibacterial resistance genes between animals and people, said Dr. Bloom, an adjunct assistant professor in the Department of Small Animal Clinical Sciences at Michigan State University College of Veterinary Medicine and a practitioner at the Allergy, Skin and Ear Clinic for Pets in Livonia, Michigan. Previous studies, for example, have reported the transfer of drug-resistant *Escherichia coli*, methicillin-resistant *Staphylococcus aureus* (MRSA), and methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) between pets and people.

CHARACTERIZING PYODERMAS

Pyodermas are typically caused by a staphylococcus. In recent years, methicillin-resistant *Staphylococcus*-MRSA, MRSP, MRSS (*schleiferi*), MRSI (*intermedius*)—has been identified increasingly in canine pyodermas.

Superficial bacterial folliculitis (SBF), a superficial pyoderma, is characterized by such clinical signs as variable pruritus, multifocal alopecia, follicular papules or pustules, and epidermal collarettes. In addition, serous serocellular crusts can be found on the trunk and abdomen, and in axillary regions. Short-haired breeds with SBF may present with a moth-eaten appearance. Notably, cocker spaniels with SBF can present with vegetative plaques that can be mistaken for seborrheic plaques.

Deep pyoderma lesions can be found on the nose, chin, elbows, hocks, and interdigital spaces.

DIAGNOSING PYODERMAS

Diagnosing bacterial pyodermas requires a systematic approach, which includes obtaining a thorough history and performing a dermatologic examination.

**History**

Obtaining a detailed history involves asking numerous questions about a dog’s condition:

- When did the signs first occur? Have they progressed rapidly or gradually?
- Has the dog been treated previously for skin or ear disease? If yes, what was used and for how long? What was the dog’s response?
- Does the dog live indoors, outdoors, or both?
- Is the dog pruritic? If so, did the rash develop first, or did the pruritus and rash begin simultaneously?
- Compared with the first appearance of signs, is today’s clinical presentation better, worse, or about the same?
- Are there other pets living in the household? If so, do they have skin problems?
- What is the dog’s diet?
- What medication is the dog currently receiving?

**Dermatologic Examination**

The dermatologic examination serves to identify primary lesions (eg, papules, pustules, nodules) and secondary (eg, ulcerations, crusts) lesions, detect ectoparasites, observe evidence of self-trauma, and determine hair coat quality and skin appearance. The exam should include an impression smear of a lesion, in which infectious agents, neoplastic cells, inflammatory cells,
and pemphigus foliaceous-associated acantholytic keratinocytes can be evaluated. Skin scrapings for ectoparasites and flea combing are essential parts of a dermatology minimum database.

The patient history and results of the dermatologic examination form the basis for the differential diagnosis. This list is important, given that canine pyodermas are never primary diseases and are always “due to” something, Dr. Bloom noted. Potential differentials include hypersensitivities (eg, atopy), endogenous or exogenous steroid exposure, ectoparasites, hypothyroidism, and follicular dysplasias.

It is especially important to rule out demodicosis in dogs with lesions that are consistent with SBE. In addition, the presence of pustules requires ruling out pemphigus foliaceous.

**Culture and Susceptibility Testing**

Culture and susceptibility (C/S) testing is an important diagnostic component and is recommended for poorly responsive SBE. It is also warranted at the first visit for the following scenarios:

- Deep bacterial pyodermas with predominantly rods on cytology
- Pyoderma accompanied by systemic illness
- Recent antibiotic therapy

There are several ways to obtain samples for C/S testing. For example, mini-tip culturettes, rather than large swabs, are ideal for sampling from draining tracts and pustules. A papule, Dr. Bloom mentioned, can be sampled like a pustule in which the papule or pustule is ruptured with a needle and then the swab is touched carefully to the surface of the lesion. For patients with epidermal collarettes, he recommended swabbing just underneath the collarette’s edge. Because lesions can have bacterial strain heterogeneity, which can lead to different antibiotic susceptibilities, samples should be taken from 3 or 4 locations but all can be sampled with the same swab.

Sampling can be done while a patient is on antibiotics; to date, there is no empiric evidence to support waiting until the end of antibiotic therapy to obtain a sample for C/S testing. “When a client is there and you can do something,” Dr. Bloom emphasized, “go ahead and do it [right] then,” because clients may be too busy or may not see the importance of returning to the veterinary office for a recheck of the pyoderma, particularly if the signs have improved.

That said, if a dog is not currently on antibiotics, Dr. Bloom advised waiting until after culture results come back before starting antibiotic therapy, unless the dog has a fever or a life-threatening illness. Starting antibiotic therapy before the results come back could result in altered susceptibility patterns, thus complicating results.

The old method of C/S testing was the disk diffusion method (Kirby-Bauer method), which determines susceptibility (susceptible, intermediate, resistant) based on the zone of inhibition in a solid medium. This method, however, does not provide an accurate measure of how susceptible a bacterial strain is to a particular antibiotic.

The tube dilution method, which is quantitative, is the preferred method of C/S testing. Each test tube contains the same concentration of bacteria (10^5/mL) and serially increasing antibiotic concentrations (which vary among antibiotics); each tube contains double the antibiotic concentration as the previous tube. This method tells how susceptible a bacterial strain is to an antibiotic by reporting the MIC: the concentration of the first tube in which there is no visible bacterial growth.

**The MIC and Breakpoint**

Simply having the MIC is not enough to determine which antibiotic to use to treat bacterial pyodermas. Another value—the “breakpoint”—is also important. The breakpoint is a standard concentration for specific antibiotics that determines susceptibility or resistance: MICs below the breakpoint indicate susceptibility and MICs above the breakpoint represent resistance. A document developed by Michigan State University’s Diagnostic Center for Population & Animal Health contains a list of breakpoint values for antibiotics commonly used in animals. These values, Dr. Bloom noted, do not change.

Selecting the most appropriate antibiotic requires calculating the efficacy ratio, which can be done as follows:

1. From the C/S results, select the antibiotics with MICs reported as “≤ X,” where X is any number.
2. Divide the breakpoint by X for each individual antibiotic. The higher the calculated number, the higher the susceptibility will be.
3. Rank the antibiotics in order from greatest to least susceptibility.

For example, consider a *Staphylococcus* bacterial strain that has an MIC of ≤ 1 µg/mL to enrofloxacin (breakpoint = 4) and an MIC of ≤ 4 µg/mL to cephalexin (breakpoint = 32). The efficacy ratio is 4 for enrofloxacin (4/1) and 8 for cephalexin (32/4), indicating that the bacterium is most susceptible to cephalexin. This same calculation can be performed for antibiotics for which the MIC is not reported as “≤ X.”

Calculating this efficacy ratio is particularly important because of the bacterial strain heterogeneity and subsequent antibiotic susceptibility variation within pyoderma skin lesions.

Although the ratio is key to appropriate antibiotic selection, other factors influencing antibiotic selection should be considered, including adverse events, level of tissue penetration, cost, and convenience.

Formularies, Dr. Bloom mentioned, list dose ranges and varying administration frequencies, making it potentially difficult to decide which dose and administration frequency to choose. These recommendations, he explained, are based on susceptibility and the MIC: The closer the MIC is to an antibiotic’s breakpoint, the higher the dose and more frequent the administration needs to be. For empiric antibiotic therapy, the highest listed dose should be used; however, Dr. Bloom warned, this increases cost and the risk of adverse events.

**Resistance Genes**

Despite a calculated approach to appropriate antibiotic selection for pyoderma treatment, combating methicillin-resistant *Staphylococcus* (MRSS, MRSP, MRSA) remains a challenge.  

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**References**

- Paul B. Bloom, DVM, DACVD, DABVP (Canine & Feline Practice)
DOGS: Indicated in the treatment of periodontal and skin and soft tissue infections such as wounds, abscesses, cellulitis, and superficial/juvenile and deep pyoderma due to susceptible strains of bacteria.

CATS: Indicated in the treatment of urinary tract infections (cystitis) and skin and soft tissue infections such as wounds, abscesses, and cellulitis/dermatitis due to susceptible strains of bacteria.

Available in 62.5 mg, 125 mg, 250 mg, and 375 mg tablets supplied in foil strip packs. Each carton holds 15 foil strip packs with 14 tablets per strip (210 tablets per carton).
Traditionally, clindamycin has been used widely in veterinary medicine for treating *Staphylococcus* infections. However, *S. aureus* contains 2 inducible genes—*msrA* and *erm*—that can mutate spontaneously and confer antibiotic resistance. *msrA* confers resistance to macrolides (ie, erythromycin), and *erm* confers resistance to lincosamides (clindamycin and lincomycin).

These resistance-conferring mutations, which occur every $10^9$ to $10^{12}$ mutations, are unlikely to show up on C/S testing, though, because of the bacterial concentration used for the tube dilution method; the concentration is not high enough for bacterial replication to produce enough mutations for the resistance-conferring mutations to occur.

This is important because clindamycin resistance may not be observed during C/S testing. For MRSA cases with the *msrA* mutation, clindamycin resistance may go undetected until after treatment begins. To circumvent this treatment complication when dealing with any methicillin-resistant *Staphylococcus* for which the culture indicates resistance to erythromycin, Dr. Bloom strongly advised against using clindamycin even if the culture shows susceptibility to clindamycin because the bacteria will likely develop resistance to the medication.

**TREATING PYODERMAS**

**Topical Therapy**

Resistance to systemic antibiotics warrants the use of topical therapies for treating bacterial pyoderma. Topical therapy can reduce or even eliminate the need for systemic antibiotic treatment. However, its use may be limited by an owner’s time constraints as well as cost constraints if the affected skin area is large.

Bathing with shampoos that contain ingredients such as chlorhexidine or benzoyl peroxide is an important topical therapy, Dr. Bloom explained, because doing so gets bacteria off the skin. Which ingredient is the most effective is difficult to determine, though, because of the lack of systematic reviews and randomized double-blinded controlled studies evaluating the ingredients. However, in a review of studies on shampoo therapy, chlorhexidine had the highest evidence of effectiveness, followed by benzoyl peroxide-containing shampoos.

Although 10 to 15 minutes of contact time is typically recommended for baths, there are no studies that justify this recommendation. Notably, a study evaluating bathing with 2% chlorhexidine found that just 1 to 2 minutes of contact time every other day for a week was as effective as 10 minutes every other day. 6 Bleach is another effective topical therapy. One option is to use Dakin’s solution, which is commercially available dilute bleach. You can mix it up yourself, daily, using 2 oz of bleach (6%-8%) with 32 oz of water and 0.5 tsp baking soda. Allow a 1- to 2-minute contact time for the shampoo and then rinse. Then bathe the dog with an antimicrobial shampoo and apply a moisturizer.

Because shampoos are not considered a drug, Dr. Bloom advised using high-quality shampoos only from companies that follow Current Good Manufacturing Practices, which are FDA regulations that ensure proper manufacturing.

Clipping is another component of topical therapy, facilitating visualization of the full extent of skin lesions.

When treating SBF with topical antibiotics, treat for either 21 days or 14 days past clinical resolution (as determined by a veterinarian), whichever is longer. Deep pyoderma requires at least 6 weeks of treatment or 21 days past clinical resolution, whichever is longer. Regarding glucocorticoids, a 21-day tapering dose of prednisone can be used in SBF if there is intense pruritus and the dog has a fairly localized pyoderma; glucocorticoids should never be used for deep pyoderma.

**Systemic Therapy**

When discussing systemic antibiotic therapy for bacterial pyoderma, Dr. Bloom focused on the use of third-generation cephalosporins (cefdodoxime, cefovecin) and fluoroquinolones.

The higher-generation cephalosporins have broad-spectrum activity against gram-negative bacteria. Using broad-spectrum antibiotics in a “go big or go home” approach, though, can select for resistance in nontargeted and nonpathogenic microorganisms; these microorganisms can then spread resistance genes to pathogenic bacteria. In particular, third-generation cephalosporins and fluoroquinolones increase the incidence of extended-spectrum β-lactamase-producing bacteria, which are frequently multidrug resistant.

Not only does the extended-spectrum β-lactamase enzyme have a comparatively broader range of activity than standard β-lactamase enzymes, its resistance spreads through plasmid, widening its distribution among humans and animals.

Given the risk of widespread multidrug resistance, human and veterinary health organizations have developed consensus statements and guidelines regarding the use of higher-generation cephalosporins and fluoroquinolones. For example, Swedish Veterinary Association guidelines state that “third- or fourth-generation cephalosporins should only be used in situations where their use is considered of the utmost importance to the animal’s welfare and where there is a sound basis to suspect that alternative treatments will not have the desired effect.” 7 The American College of Veterinary Internal Medicine consensus statement indicates that “limiting use of classes such as the third-generation cephalosporins and fluoroquinolones is widely accepted and consistent with principles of antimicrobial stewardship.” 8

On the human side, the World Health Organization has categorized antibiotics as critically important, highly important, or important, according to their usefulness in human health. Among the critically important antibiotics, third- and fourth-generation cephalosporins and fluoroquinolones are further classified as “highest priority.” Moreover, the European Medicines Agency has designated third- and fourth-generation cephalosporins and fluoroquinolones as the most important critically important antibiotics.

**BRINGING IT TOGETHER**

For treating canine bacterial pyoderma, Dr. Bloom emphasized that veterinarians should be very selective with antibiotics, particularly third- and fourth-generation cephalosporins and fluoroquinolones. As a concluding thought, he said that “we have to look at the impact on human medicine when selecting an antibiotic in veterinary medicine.”

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**References available at AmericanVeterinarian.com.**
Give your patients sustainable relief, quickly and safely

Alpha-Stim is an FDA cleared, handheld prescription medical device that effectively treats pain, anxiety, insomnia and depression. Easy to use with no lasting side effects, Alpha-Stim is proven by more than 100 clinical studies over 37 years.

The brain functions electrochemically and can be readily modified by electrical intervention. Alpha-Stim utilizes Cranial Electrotherapy Stimulation (CES) and Microcurrent Electrical Therapy (MET) to deliver the only patented waveform for a device of its class.

LATEST RESEARCH: The University of Texas MD Anderson Cancer Center, “Cranial Electrotherapy Stimulation for the Management of Depression, Anxiety, Sleep Disturbance, and Pain in Patients with Advanced Cancer”

REFERENCE
Electroceuticals: The Wave of the Future Is Now

Although still in its infancy in veterinary medicine, targeting neural circuits with electricity offers huge potential to provide focused, personalized treatment for a variety of ailments.

By Ava Frick, DVM, CVC, FAIS

(continued from front cover)

possible by matching frequency signals (waves) that are programmed to initiate a ligand-receptor type of reaction, allowing people to enter a warm space and be on their way. Photos and messages are relayed daily by the millions from one phone to another. Images and videos (waves, frequencies) travel through space, not getting crossed with others and reaching their intended destinations intact.

WHAT ARE ELECTROCEUTICALS?

Simply, electroceuticals, which are sometimes called bioelectronics, are electric waveforms that stimulate the nervous system electronically and modify bodily functions. Waveforms, frequencies, and microamperes—collectively called microcurrent electrical therapy (MET) and cranial electrotherapy stimulation (CES)—are being used to stimulate cell regeneration and treat injuries, acute and chronic pain, anxiety, depression, and insomnia.8-10

THE PIONEERS

Robert O. Becker, MD, an orthopedic surgeon known as the father of electromedicine and electrochemically induced cellular regeneration, began studying electric current therapy in 1970. Fifteen years later, he demonstrated that electric current is the trigger that stimulates healing, growth, and regeneration in all living organisms. Signals come from an electric control system that he called the current of injury, which is conducted through Schwann cells and the myelin surrounding neurons.7

In 1980, Candace Pert, PhD, published her research on ligand-receptor binding, providing a new understanding of cellular physiology and the connection between mind and body.6 Bjorn Nordenstrom, MD, proposed a model of biologically closed electric circuits analogous to closed circuits in electronic technology. He postulated in 1998 that mechanical blood circulation is closely integrated anatomically and physiologically with a controlling bioelectric system.5

Taking the research findings of these and other pioneers, neurobiologist Daniel L. Kirsch, PhD, DAAPM, FAIS—whose mentor was Dr. Becker—patented a unique waveform. He collaborated with engineer Raymond Chan to design medical devices for implementing pain and stress control technologies into clinical systems. His Alpha-Stim technology was the first dual electromedical device (MET and CES) to be cleared by the Food and Drug Administration to market in 1981. Dr. Kirsch remains at the forefront of research in this field.5 Today, the Alpha-Stim and Fisher Wallace Stimulator (formerly Liss Cranial Stimulator) are the primary electroceutical devices on the market.

EARLY RESEARCH

As for many drugs, early research on MET and CES was conducted using animals. Once safety was established, the focus turned to human studies and clinical trials. Because the current is subsensory, it lends itself well to double-blind placebo-controlled crossover studies.

Animal studies in neurophysiology and electromedicine continue to yield new discoveries on the efficacy of this therapeutic approach. Measurements have shown that CES current across the head sends electric impulses through every area of the brain. CES directly stimulates the brain’s neuromatrix, including the limbic area, or emotion center, of the brain.8-10

Results of an experimental study in rats with CES documented as much as a 3-fold increase in beta-endorphins after only a single CES treatment.11 Results of a double-blind study looking at 33 behavioral traits in horses treated with CES showed that all the changes were highly intercorrelated and strongly indicated a reduction in the horses’ state of arousal following CES treatment that was not noted in the sham treatments (Box).12,13

Neurosurgeon C. Norman Shealy, MD, assessed beta-endorphin and serotonin levels in plasma and cerebrospinal fluid (CSF) following a 20-minute session of CES and found that beta-endorphins measured 98% higher in plasma and 219% higher in CSF. Serotonin levels were 15% to 40% higher in plasma and 50% to 200% higher in CSF.14

Results from further research have shown the effectiveness of CES in treating fibromyalgia, posttraumatic stress disorder, spinal cord injury, cancer pain, and dental anxiety in humans.15-18

Results of low-resolution electromagnetic tomography and functional magnetic resonance imaging studies have shown that select waveforms can reach most cortical and subcortical areas of the brain, thereby altering the brain’s emotional centers (ie, thalamus, hypothalamus, basal ganglia, reticular activating system, cerebral cortex, and limbic system) where the amygdala controls the strength of emotional responses, especially for fear and anger.11

HOW ELECTROCEUTICALS WORK

Cells throughout the body manufacture peptides that act as ligands to surface receptors on other remote cells, communicating via the extracellular fluid and circulatory system. Cells within a specific organ or tissue system communicate through specific frequencies in the microamperage range, activating the current of injury and causing the system to tend toward homeostasis. Neuroumodulation imparts an electric signal with a frequency that perfectly matches the receptors in the body to resonate and activate intracellular responses.

MET can act similarly to ligands in activating receptors to send their messages into cells and produce effects resembling a wide range of chemical messengers. MET can be viewed as a catalyst...
in initiating and sustaining the numerous chemical and electrical reactions that occur in the healing process. An effective bihasic, squared, long-pulse-width waveform in the microamperage range (1000 times less than that of a transcutaneous electrical nerve stimulation device and below sensation threshold) will use resonant frequencies to activate central pain modulatory mechanisms.

The sensation of pain is transmitted through the body along billions of nerve cells that are designed specifically to transmit messages through electrochemical signals. Physics controls chemical reactions in the body, and most bodily functions can be normalized electrically. It is the application protocol that affects the peripheral pain site directly and accesses the central nervous system by directing the current through the spine. Combining MET and CES addresses all 4 pain pathways: transduction, transmission, modulation, and perception.

The resultant central and peripheral effects of CES include calmness, relaxation, reduced agitation and aggression, stabilized mood, improved sleep, and reduced pain. Results will vary with the exact technology used, the pathology of the disease being treated, the overall health and hydration of the patient, and owner compliance. Patient history, prior medical interventions, previous injuries, and surgical scars can affect overall outcome as well.

Waveforms can be used effectively to activate the body's natural electric impulses.

USE IN ANIMALS
CES and MET have been used extensively in the clinical setting for nearly 2 decades to initiate cellular regeneration and control not only acute and chronic pain situations, such as arthritis, spinal injury, nerve conduction deficiencies, cancer, sprains, strains, wounds, and surgical pain, but also such stress-related conditions as anxiety, insomnia, cognitive dysfunction states, noise phobia, and depression. Prescription MET and CES devices are long lasting, cumulative, safe, effective, easy to use, portable, and nonaddictive, and have no known tolerance concerns. Adverse effects are minor and self-limiting, primarily consisting of skin irritation.

Treatments can be applied in clinic by the technical team, and devices can be prescribed for use at home with a short in-clinic training session. Initially, the best results will be achieved when treatments are applied twice a day, but in-clinic treatments administered 2 to 3 times per week will also be beneficial. Follow-up patient assessment includes clinical observation, range of motion, change in posture, use of extremities, calmness, improved sleep, appetite, attitude, and behavior.

CONCLUSION
As an aid to endogenous bioelectric currents, electroceuticals can accomplish miraculous things. They may in fact work better in the absence of any interference from factors based on our previous, limited, chemical-dominant view of physiology. Today and in the future, disorders of both the body and mind might be better treated using a range of frequencies that have the potential to treat a variety of pathologies effectively without the risk of harmful adverse effects.

References available at AmericanVeterinarian.com.

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BOX. Pilot Study: Cranial Electrotherapy Stimulation in Horses

Researchers in the United Kingdom have evaluated the potential use of cranial electrotherapy stimulation (CES) in horses. In a pilot study that took place at De Montfort University Equestrian Center in Lincolnshire, anxiety-related behaviors and physiologic signs in adult horses were recorded before, during, and after 20-minute treatment sessions with the Alpha-Stim CES unit. An initial study with 6 apparently healthy adult horses determined acceptance of the Alpha-Stim device at incrementally increasing levels. Horses displayed relaxed behavioral signs, including wobbling of the head and quivering lower lip, beginning when exposure was set at level 2.

In the main study, 8 adult horses each received 4 treatment sessions with Alpha-Stim. During the sessions, an experimenter entered the horse's stall only to adjust the exposure level on the Alpha-Stim, then to record detailed behaviors related to locomotion as well as head, ear, and lip movements. A heart rate monitor was also placed to record changes in heart rate during the sessions. Each Alpha-Stim session included four 10-minute phases, with the device set as follows:

- **Phase 1**: Level 0
- **Phase 2**: Level 2
- **Phase 3**: Level 2 (including a “sham approach” by the experimenter pretending to adjust the device)
- **Phase 4**: Level 0

Although a high level of individual variation in heart rate existed, the investigators found that the mean heart rate in 7 of 8 horses significantly decreased within 10 to 20 minutes of Alpha-Stim treatment at exposure level 2 (see chart below). The decrease in heart rate was most pronounced for those horses with the highest baseline heart rates.

Additionally, the proportional amount of time spent displaying relaxed versus tense behaviors changed with Alpha-Stim treatment sessions. In particular, horses displayed relaxed behaviors, such as dozing and head wobbling, more frequently during and/or after Alpha-Stim treatment than before treatment. By contrast, other behaviors commonly associated with tension and frustration, such as alert body posture, a tense lower lip, ear flicking, and head shaking, were displayed less frequently by the majority of horses after 10 to 20 minutes of Alpha-Stim treatment. In many cases, the relaxed behaviors persisted when Alpha-Stim exposure was turned back to level 0, suggesting that the device offers persisting anxiolytic effects.

Thus, the authors proposed that Alpha-Stim has potential use for the treatment of anxiety-related issues in horses.

![Mean Heart Rate for Study Horses Across the 4 Trial Phases](chart below)
Canine Urinary Incontinence

The mechanisms behind this familiar condition are multilayered and poorly understood, and treatment must be individualized based on the cause of the problem.

By Julie K. Byron, DVM, MS, DACVIM

(continued from front cover)
also known as detrusor urethral dyssynergia (DUD).

HISTORY AND DIAGNOSIS
A careful history is essential when discussing UI with pet owners. UI must be distinguished from behavioral conditions and systemic problems (eg, polyuria, pollakiuria), and it is important to establish that the animal is unaware of the passage of urine. Young dogs that have never been continent or have been “difficult to housetrain” should be evaluated for congenital abnormalities, such as ectopic ureter(s). Patients whose UI has developed concurrent with an increase in water intake should be evaluated for disorders causing polyuria and polydipsia.

Physical examination should include a rectal examination with careful palpation of the urethra. Obstructive processes such as urethral neoplasia and prostatic hyperplasia can often be diagnosed this way. If possible, observe the dog while it is urinating. This is particularly important in males because functional obstruction and overflow incontinence may be more common than previously thought. Residual urine volume should be measured after voiding in dogs that have a narrow urine stream, exhibit stranguria, or only drip urine. Finally, a neurologic and orthopedic evaluation should be conducted if the dog is unable to posture normally to urinate, as this can lead to incomplete emptying of the bladder and UI.

Urinalysis with sediment examination should be conducted for all patients with UI. Although urine leakage may be exacerbated by a urinary tract infection (UTI), the incontinence itself may predispose the patient to a UTI. There is debate as to whether treating dogs with bacteriuria that lack signs, such as stranguria or dysuria, is appropriate. Bloodwork is indicated if the patient has a low urine-specific gravity, particularly in the face of dehydration.

UI typically develops in young or middle-aged dogs. Those with older onset may require additional diagnostic investigation as to an underlying cause. Some dogs may have mild USMI but are rarely incontinent until a secondary factor, such as increased urine volume, comes into play. If the underlying reason for polyuria can be addressed, the UI may improve.

URETHRAL SPHINCTER MECHANISM INCOMPETENCE
USMI is the most common cause of UI in dogs, affecting up to 20% of all neutered females and 30% of neutered females weighing over 20 kg. It is less commonly reported in neutered males and intact dogs of both sexes. In most dogs, incontinence occurs within 3 to 4 years of neutering, although it may not become a major problem until later in life when it can be complicated by diseases that cause polyuria and polydipsia. Among the most commonly affected breeds are the Old English sheepdog, Doberman pinscher, boxer, German shepherd, and Weimeraner. Results from a recent study indicate that earlier neutering may increase the risk of USMI development in dogs with a projected adult body weight greater than 15 kg.

Pathophysiology
Although many risk factors for the development of UI in dogs have been identified, the mechanism of development remains unclear. The underlying mechanism is likely multifactorial and involves the pituitary-gonadal axis, the anatomic structure of the lower urinary tract, and the integrity and tissue characteristics of the lower urinary tract’s supporting structures. Several things are important in the maintenance of a closed urethra, including vascular tone (which can represent up to 30% of closure pressure), the strength of supporting structures in the pelvic region, and the position of the bladder. Some studies’ findings have implicated a rise in luteinizing hormone and gonadotropin-releasing hormone (GnRH) levels as well as increases in their receptors in female animals secondary to the decline in estrogen levels after neutering. Changes may affect smooth muscle contractility in the lower urinary tract. In support of this theory, data from one study have shown that the administration of GnRH analogues to dogs with USMI can lead to improvement of continence.

In animal models, estrogen has trophic effects on the vascular and tissue matrix of the lower urinary tract and its support structures. The decline in estrogen levels after neutering in female dogs may cause a decrease in the vasculature of the urethra and its supporting tissues, which is an important part of maintaining a closed urethra. There is also a possibility that the collagen content may be altered in females with USMI; however, further studies are needed.

Another important factor in maintaining continence is bladder position. In healthy dogs, intra-abdominal pressure transmits to the bladder and proximal urethra. This equalizes the pressure between the bladder and its outflow tract, preventing leakage. In dogs with a caudally positioned bladder (pelvic bladder), the pressure increases that occur with movement, barking, and coughing transmit to the bladder, not the urethra, thus creating a pressure gradient from the bladder to the urethra and resulting in leakage. This may be more common in breeds such as greyhounds, Doberman pinschers, and Weimeraners.

The postneuter alteration to the urethral sphincter mechanism that is most often a therapeutic target in female dogs is the reduction in number and sensitivity of adrenergic α-receptors. Stimulation of these receptors leads to an increase in contraction of the urethral smooth muscle or “internal” urethral sphincter. Increasing the number of receptors with estrogen supplementation or increasing stimulation with α-agonists is the most common medical therapy for acquired UI in dogs.
Table. Drugs Frequently Used to Treat Bladder-Emptying Disorders in Dogs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Mechanism</th>
<th>Dosea</th>
<th>Adverse Effects/CAutiona</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prazosin</td>
<td>$\alpha_1$-agonist, smooth muscle relaxant</td>
<td>1 mg for dogs &lt;15 kg or 2 mg for dogs &gt;15 kg every 8 to 12 hours PO</td>
<td>Hypotension, weakness, syncope, GI upset, renal disease, cardiac disease</td>
</tr>
<tr>
<td>Tamsulosin$^b$</td>
<td>$\alpha_1$A-agonist, smooth muscle relaxant</td>
<td>0.01-0.2 mg/kg/day PO</td>
<td>Hypotension</td>
</tr>
<tr>
<td>Phenoxybenzamine</td>
<td>Non-specific $\alpha$-agonist, smooth muscle relaxant</td>
<td>0.25 mg/kg every 8-12 hours PO</td>
<td>Hypotension, tachycardia, miosis, first-dose hypotension</td>
</tr>
<tr>
<td>Acepromazine</td>
<td>Non-specific $\alpha$-agonist, skeletal muscle relaxant, anxiolytic</td>
<td>0.5-2.2 mg/kg every 6-8 hours PO</td>
<td>Sedation, hypotension</td>
</tr>
<tr>
<td>Diazepam</td>
<td>Skeletal muscle relaxant, anxiolytic</td>
<td>0.5-2 mg/kg every 8 hours PO or 30 min prior to voiding</td>
<td>Sedation, ataxia/liver dysfunction; do not use in cats</td>
</tr>
<tr>
<td>Methocarbamol</td>
<td>Skeletal muscle relaxant</td>
<td>22-44 mg/kg every 8 hours PO</td>
<td>Central nervous system sedation, weakness, hypersalivation</td>
</tr>
<tr>
<td>Baclofen$^a$</td>
<td>Skeletal muscle relaxant</td>
<td>1-2 mg/kg every 8 hours PO</td>
<td>Weakness, GI upset; do not use in cats</td>
</tr>
<tr>
<td>Dantrolene</td>
<td>Skeletal muscle relaxant</td>
<td>1-5 mg/kg every 8 hours PO</td>
<td>Weakness, liver disease</td>
</tr>
<tr>
<td>Bethanechol</td>
<td>Parasympathomimetic</td>
<td>2.5-15 mg every 8 hours PO</td>
<td>Diarrhea, GI or urethral obstruction</td>
</tr>
<tr>
<td>Cisaprole</td>
<td>Prokinetic</td>
<td>0.1-0.5 mg/kg every 8-12 hours PO</td>
<td>Ataxia, GI upset, GI obstruction</td>
</tr>
</tbody>
</table>

GI, gastrointestinal; PO = orally.
$^a$Unless otherwise noted, dose and adverse effect information from Plumb. $^{15}$
$^b$Data from Lane & Westropp. $^{16}$

In women, UI is often caused by detrusor hyperreflexia, or overactive bladder. This condition occurs when the bladder spontaneously contracts without reaching full capacity, resulting in the leakage of urine. This condition is treated with antimuscarnic drugs such as oxybutynin and imiprime. Some studies have suggested that this condition may occur in dogs with UI$^{16}$; however, the definitive diagnosis relies on urodynamic testing. In lieu of this, some practitioners place patients on these medications if they fail to respond to $\alpha$-agonist and estrogen therapy.

**Treatment**

In most USMI cases, otherwise healthy patients are treated initially with either $\alpha$-agonist medications, such as phenylpropanolamine (Proin, PRN Pharmacal), or estrogen compounds, such as diethylstilbestrol or estriol (Incurin, MSD Animal Health). $\alpha$-Agonists increase stimulation of the adrenergic receptors on the internal urethral sphincter, whereas estrogens may upregulate the expression of such receptors. There is anecdotal evidence that the 2 drugs in combination may be synergistic and benefit patients that do not respond to either drug alone. At The Ohio State University Veterinary Medical Center, we recommend obtaining baseline systolic blood pressure before starting phenylpropanolamine, because hypertension is a potential adverse effect (AE) of $\alpha$-agonist therapy. The dog should also have its blood pressure monitored after 2 to 4 weeks on the medication. Other AEs of phenylpropanolamine include restlessness, aggression, decreased appetite, and insomnia. AEs of estrogen therapy include mammary and vulvar swelling and attractiveness to male dogs. These effects generally resolve when the medication dose is decreased or stopped.

Dogs that do not respond to appropriate medical therapy should be evaluated for lower urinary tract disease via imaging, including abdominal ultrasound and/or contrast radiography. We routinely perform cystoscopy in patients with medically unresponsive UI to rule out anatomic abnormalities that may be contributing to clinical signs. In some cases, urodynamic evaluation can be performed at specialized centers to rule out overactive bladder and confirm the diagnosis of USMI.

Patients that cannot tolerate or do not respond to medical therapy may be candidates for surgical procedures.
Urinalysis with sediment examination should be conducted for all patients with UI.

FUNCTIONAL URETHRAL OBSTRUCTION

The poor response of male dogs with UI to traditional USMI therapy may be due to misdiagnosis. It is likely that many of these dogs have overflow incontinence secondary to an inability to empty the bladder rather than a weak urethral sphincter. The etiology of functional obstruction or DUD is elusive and may involve the reticulospinal tract. The net effect is incoordination between the reflexive relaxation of the urethral smooth and skeletal muscle when the bladder contracts. It appears that the obstruction can involve either the smooth or skeletal muscle of the urethra or a combination.

The diagnosis is made by assessing urine stream and residual urine volume. Otherwise healthy dogs should have less than 1 to 2 mL/kg of urine in the bladder after a normal void. Some dogs with DUD, however, will have more than 15 mL/kg. Other causes of obstruction, such as strictures, ureoliths, and extramural compressive lesions, must be ruled out before a diagnosis of DUD can be made. This can be accomplished easily with contrast cystourethrography, which may also assist in guiding therapy because the location of the most resistance usually sits just distal to an abnormally wide portion of the urethra.

Medical treatment for DUD generally consists of muscle relaxation and, occasionally, anxiolytic therapy (Table). The prostatic urethra contains primarily smooth muscle, and the penile urethra contains primarily skeletal muscle. The perineal urethra has the 2 types. It is often necessary to use both smooth and skeletal muscle relaxants in these patients to achieve the desired result. α-Antagonists are a mainstay of smooth muscle relaxation, while the addition of low doses of diazepam just before urination can relax the skeletal muscles. Some dogs exhibit worsening clinical signs when stressed or anxious, and these patients may benefit from trazadone, fluoxetine, or other anxiolytic medication. Clients should be instructed on indications for and technique of urethral catheterization in their male dog. This can prevent costly emergency visits and provide the dog with temporary relief.

Little is known about long-term outcomes in male dogs with DUD, and evidence for treatment efficacy is lacking. Some patients may require significant dose adjustments of medications to determine the optimal therapy. Dogs that do not respond to treatment may require urethral stenting—although this is considered a salvage procedure and may lead to significant AEs.

CONCLUSION

The mechanisms behind UI in dogs are multilayered and poorly understood. Treatment must be tailored based on whether the problem involves an inability to hold urine during bladder filling or an inability to empty the bladder during active urination. Medical therapy is directed at the smooth, and sometimes skeletal, muscle of the urethra to either improve contraction or enhance relaxation. Some surgical and cystoscopic interventions may improve outcome in these patients when medical therapy fails.

References available at AmericanVeterinarian.com.

Dr. Byron is a clinical professor in the Department of Veterinary Clinical Sciences at The Ohio State University. Her primary area of research and practice interest is lower urinary tract disease of the dog and cat, particularly disorders of urination.
IMPORTANT SAFETY INFORMATION:
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The most commonly reported side effects were vomiting, loss of appetite, diarrhea, excessive salivation, agitation, tiredness, vocalization, confusion, increased water consumption, weight loss, weakness, fever, panting, and reversible changes in skin color (flushing or bright pink). Abnormal gait, seizures or tremors, as well as liver enzyme elevations, kidney failure, blood in urine and urine retention have been reported. In some cases death, including euthanasia has been reported. Sudden death was sometimes preceded by vocalization or collapse.

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Clinical Focus

TOXICOLOGY

Code Green: The Risk From Toxic Household Plants

Ingesting certain plants can be deadly for dogs and cats. Here’s what you need to know to educate your clients and keep your patients safe.

By Don Vaughan

When 20-month-old Jessie started vomiting, her owners, Catherine and Bruce Campbell of Wilmington, North Carolina, were puzzled. The rambunctious golden retriever hadn’t gotten into dinner scraps, and nothing seemed out of place. The Campbells went to bed assuming Jessie would be better in the morning.

But Jessie wasn’t better. In fact, she had become so lethargic that the Campbells rushed her to Hanover Regional Animal Hospital, where John Manolukas, DVM, PhD, referred them to a specialty hospital in Cary, 2 hours away. The doctors there started treating Jessie for shock and questioned whether she had gotten into an ant nest or a beehive or had eaten candy containing xylitol. Finally, the veterinarian asked whether the Campbells had sago palms in their yard. They did, several of them. Bruce went out to check and found that Jessie had chewed up numerous budding fronds.

Jessie was given plasma transfusions because she had started bleeding out of her anus. Once she was stable, the Campbells returned with her to Wilmington, where Dr. Manolukas continued treatment. But nothing worked. “We saw Jessie on Saturday, and I could see that she had turned yellow from jaundice,” Catherine said. “My husband had left the room, and Jessie let out a huge puddle of blood. It was very disturbing. I had worked as an administrator at a veterinary hospital, so I knew what was happening. I was hoping they could save her, but the sago palm destroyed her insides. She died the following Monday.”

Although he has been a professional landscaper for more than 20 years, Bruce Campbell, like most pet owners, had no idea that sago palms are extremely toxic to dogs. As a result of their experience with Jessie, the Campbells immediately had every sago palm removed from their property. In an effort to educate others, Catherine created a brochure about the risk, which she hands out to the pet owners she meets while walking. “I just want people to be aware so they don’t go through the same thing we did,” she said.

The sago palm is just 1 example of the many popular plants that can be toxic to pets if ingested. According to Tina Wismer, DVM, DABVT, DABT, medical director of the American Society for the Prevention of Cruelty to Animals (ASPCA) Animal Poison Control Center in New York City and master gardener, this plant was once found only in warm regions of the United States, but miniature sago palms are now sold at many nurseries and home supply stores, giving pets even greater access to a deadly plant. “Sago palms usually are not labeled in stores, so people will buy them not knowing how toxic they can be,” she said. “It’s important that pet owners do some research before bringing a plant into their home or new plants to be used for landscaping.”
Increasing the risk for family pets is the common misconception that dogs and cats intuitively know which plants are OK to chew on and which are not. Such is not the case, said David Dorman, DVM, PhD, DABVT, DABT, professor of toxicology at North Carolina State University College of Veterinary Medicine in Raleigh. “Owners don’t quite appreciate that animals are just like us—they don’t know what’s good for them; they don’t know which plants are toxic,” Dr. Dorman explained. “Pets are just as ignorant as we are.”

PLANT POISONING STATISTICS

Just how common are cases of toxic plant ingestion? According to Dr. Wismer, plant ingestion comprised 5.4% of the more than 199,000 calls received by the ASPCA Animal Poison Control Center in 2017. “That’s more than 10,700 calls for the year, or around 29 calls a day,” Dr. Wismer reported.

Dogs and cats, because they commonly explore their environment by chewing or licking, are the largest patient cohorts in terms of plant ingestion calls, Dr. Wismer added. “They make up probably 96% of our cases. The next largest group is rabbits, followed by birds, which get into houseplants if allowed to fly inside the home.”

COMMON TOXIC HOUSEHOLD PLANTS

Toxic plants come in all types and affect the body in different ways, noted Bruce Kornreich, DVM, PhD, DACVIM, associate director of education and outreach at the Cornell Feline Health Center and clinical cardiologist in the Department of Clinical Sciences at Cornell University College of Veterinary Medicine in Ithaca, New York. Lilies, for example, are extremely toxic to cats and can result in renal failure and death, while plants such as foxglove—from which the heart medication digoxin is derived—can result in an abnormal cardiac rhythm, low blood pressure, and other potentially life-threatening effects. And the sago palm can result in liver failure, among other conditions.

“Some common houseplants, such as dieffenbachia and philodendron, contain insoluble oxalate crystals, which look like little needles,” Dr. Wismer added. “When an animal eats these plants, the crystals shoot into their tongue and gums, resulting in drooling as well as vomiting and gagging. It’s not life-threatening in most cases, but it can be extremely painful.”

Wild mushrooms, while not plants, are another area of concern. Identification is vital, Dr. Wismer noted, because the effects of wild mushrooms can range from mild gastrointestinal (GI) upset to liver failure and death. Unfortunately, owners may have no idea what their pets got into, and early symptoms may mimic those of other disorders. The treatment for mushroom toxicity is similar to that for toxic plant ingestion.

Pet owners should also be cautious about the use of herbs around their pets. Most herbs commonly used in cooking are nontoxic; the other 2 can cause cardiac signs.”

Toxic Plants: A Quick Review

Almost any plant material can cause gastric upset in dogs and cats, but some household plants pose a much higher toxic risk, attacking specific organ systems and leading to death if left untreated.

When dealing with toxic plant ingestion, it’s important that veterinarians avoid confusion by using a plant’s scientific name rather than its common name, said Tina Wismer, DVM, DABVT, DABT, medical director of the American Society for the Prevention of Cruelty to Animals (ASPCA) Animal Poison Control Center in New York City. “A common name can be used for a lot of different plants,” she explained. “For example, I know of at least 3 plants that have the common name of trumpet vine. One is nontoxic; the other 2 can cause cardiac signs.”

The ASPCA Animal Poison Control Center maintains an extensive list of plants known to be toxic to companion animals. Some of the most problematic include:

- Aloe (Aloe vera)
- Amaryllis (Amaryllis species)
- Autumn crocus (Colchicum autumnale)
- Azalea (Rhododendron species)
- Black nightshade (Solanum nigrum)
- Easter lily (Lilium longiflorum): very toxic to cats, nontoxic to dogs
- Foxglove (Digitalis purpurea)
- Poison parsnip (Cicuta maculata)
- Sago palm (Cycas revoluta, Zamia species)
- Spindle tree (Euonymus atropurpurea)
- Superb, or glory, lily (Gloriosa superba)
- Sweet pea (Lathyrus latifolius)
- Tulip (Liliaceae family): highest concentration of toxin is in the bulb.

COMMUNICATING THE DANGERS TO CLIENTS

Toxic plant ingestion is an issue that veterinarians see often, and it falls on practitioners to remind clients regularly of the potential risk through email blasts, practice newsletters, and handouts featuring specific resources. Foremost is the ASPCA Animal Poison Control Center website (aspcapetcare.org/pet-care/animal-poison-control). In addition to providing treatment information to veterinarians and pet owners, the site features an extensive list of plants and their potential for toxicity.

“The most critical thing is prevention,” Dr. Dorman concluded. “In a lot of ways, I believe we in the veterinary profession tend not to be as proactive as we should be about informing pet owners, especially new owners of companion animals, about potential hazards they might encounter. Directing clients to resources such as the ASPCA website and other poison control websites is a good way to educate them about which plants to avoid. Prevention should always be our main goal.”

TREATMENT

Treatment for toxic plant ingestion is dependent on a variety of factors, including the type of plant, the amount ingested, and the plant’s effects on specific organ systems. Treatment typically begins by identifying the plant, if possible, and then performing blood tests to determine which organ systems might be damaged. “In the case of liver damage, you might find elevated enzymes,” Dr. Kornreich noted. “In the case of kidney damage, you might find elevations in the by-products that are normally removed from the bloodstream by the kidneys.”

In some cases, induced vomiting might be warranted to remove the plant material from the stomach. If that is not an option, activated charcoal may be used to absorb toxic substances in the GI tract. From there, gastric protectants such as sucralfate may be used to protect areas of the stomach damaged by local irritation or chemical principles within the plant, Dr. Kornreich explained.

The final stage of treatment is addressing the effects of the plant on specific organ systems, such as the heart, liver, kidneys, and GI system. “In dealing with the acute effects on organ systems, there may be chronic effects,” Dr. Kornreich warned. “If a cat ingests lilies and survives, it may be that the cat will experience kidney problems for the rest of its life and may benefit from dietary modification and other approaches to treat that specific organ.”

Don Vaughan is a freelance writer based in Raleigh, North Carolina. His work has appeared in Military Officer, Boys’ Life, Writer’s Digest, MAD, and other publications.
Developing a Vaccine for Lyme Disease

Recent advances such as chimeritope technology could potentially be used to develop vaccines against other tickborne diseases as well.

By Laurie Anne Walden, DVM, ELS

(continued from front cover)

the technology his laboratory used to develop a new Lyme disease vaccine for dogs. This chimeric recombinant vaccine, Vanguard crLyme, is produced by Zoetis, the webinar sponsor.

“Lyme disease is a very serious illness, and prevention is very, very important,” said Dr. Marconi, a professor in the Department of Microbiology and Immunology at Virginia Commonwealth University Medical Center. Lyme vaccines and tick control products have not been sufficient to stop the spread of the disease, he added.

Dr. Marconi began by describing the morphology of Borrelia burgdorferi, the causative agent of Lyme disease. The mechanism of motility of these spiral-shaped bacteria, or spirochetes, is similar to that of a drill bit. Once a spirochete enters a mammal’s body, Dr. Marconi said, “that corkscrew motility allows the Lyme disease bacteria to penetrate quickly through tissue and disseminate to distal organs and tissue sites throughout the body.”

Treatment of Lyme disease can be difficult once the spirochetes have penetrated deep into tissues and organs, he said. Three to 4 weeks of antibiotic treatment are required to clear an infection; in some cases it may be necessary to repeat treatment. For this reason, coupled with the serious clinical consequences associated with Lyme disease, prevention is crucial.

HOW SPIROCHETES ADAPT TO DIFFERENT ENVIRONMENTS

To be maintained in nature, the Lyme spirochetes must cycle between Ixodes ticks and mammals (enzootic cycle). Once spirochetes establish an infection in ticks, they reside for extended periods of time in the tick midgut, a harsh environment with few nutrients. When ticks ingest a blood meal, however, there is a dramatic increase in available nutrients, which allows the spirochetes to ramp up their metabolic activity, divide and begin transit from ticks to mammals (Box). However, this is a complicated process and spirochetes must be able to adapt rapidly to the radically different environments they encounter in the unfed tick, fed tick, and mammals. “One of the key things we need to know to develop an effective vaccine is exactly how the spirochetes adjust to these radically different environments,” Dr. Marconi said.

He used the analogy of human clothing to explain spirochete environmental adaptation. People wear different types of clothes in summer than in winter; that is, we change some of our surface properties to respond to changes in environmental conditions. Lyme spirochetes do the same thing, he said.

OUTER SURFACE PROTEINS: VACCINE TARGETS

Outer surface proteins (Osps) "play important roles in the biology and adaptive responses of the Lyme disease spirochetes," Dr. Marconi explained. They have also been at the center of Lyme disease research and vaccine development efforts. The 2 Osps that have received the most attention are OspA and OspC. These proteins are important in spirochete survival in ticks and in the transmission and infection process, respectively. The differential production of OspA and OspC is controlled by environmental conditions. OspA is a dominant protein on the surface of spirochetes residing in unfed ticks. However, as ticks feed, OspA production is turned off as OspC production is turned on. Upon entering a mammal, spirochetes are producing large amounts of OspC but no OspA.

OspA

Lyme disease vaccine development focused on OspA for many years, Dr. Marconi said. However, he added, the efficacy of OspA-targeting vaccines was approximately 72%. If a spirochete does not express OspA once it’s in a vaccinated animal, then how does a vaccine targeting OspA work at all? Dr. Marconi explained that the blood of an OspA-vaccinated mammal that has received sufficient booster immunizations contains anti-OspA antibodies. When a tick ingests this blood, the anti-OspA antibodies pass with the blood into the tick where they have the potential to kill spirochetes before they can transition to the production of OspC. “A transmission-blocking vaccine is a very attractive concept,” he remarked.

The problem, he continued, is antibody levels in blood decline over time, eventually dropping below the threshold required to kill spirochetes inside the tick. Because the spirochetes that make it into a mammal lack OspA, they cannot be targeted by vaccine-induced antibody in the mammal. In addition, vaccines against OspA do not induce immune memory because a vaccinated animal’s memory cells are never exposed to OspA antigen during a natural infection.

OspC

“We realized that OspC had significant potential to help improve the Lyme disease vaccine,” Dr. Marconi said. Spirochetes express very low levels of OspC while they are in an unfed tick. After the tick takes a blood meal, OspC expression is upregulated dramatically in response to changes in temperature and pH. Spirochetes continue to express high levels of OspC after they have entered a mammal. A vaccine that targets OspC, therefore, can kill
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Clinical Focus

PARASITOLOGY

Box. The Tick Life Cycle

The *Ixodes scapularis* tick is responsible for Lyme disease spread throughout most of the United States (*Ixodes pacificus* transmits the disease on the West Coast). Because *B. burgdorferi* is transmitted during only some of an *Ixodes* tick’s life stages, Dr. Marconi discussed the tick life cycle. A tick develops in 4 stages: egg, larva, nymph, and adult.

**Egg:** An adult female tick can produce thousands of eggs. Lyme spirochetes are not transmitted through tick eggs. Therefore, tick larvae are free of infection when they hatch.

**Larva:** Tick larvae usually take their first blood meal from a small mammal. If this animal is infected with *B. burgdorferi*, the larvae acquire the pathogen and carry it through the rest of their life stages.

**Nymph:** After the first feeding, larvae molt into nymphs, acquiring an extra pair of legs in the process (larvae have 6 legs; nymphs and adults have 8). Nymphs feed once before molting into adult ticks. If the nymphs acquire *Borrelia* as larvae, they can transmit the spirochetes during this feeding. The nymphal stage is the first stage of tick development that has the potential to transmit Lyme disease.

**Adult:** When nymphs molt into adults, they also sexually differentiate into males and females. Adult male ticks seldom take a blood meal, but adult females feed aggressively so they can produce huge numbers of eggs.

spirochetes inside a vaccinated animal. In addition, an OspC-based vaccine also has the potential to trigger immune memory.

**VACCINE DEVELOPMENT**

Vaccines that target OspA are transmission-blocking vaccines: They prevent infectious organisms from entering the body. However, an animal must have a high antibody titer for an OspA vaccine to be protective. The function of OspC-targeting vaccines is to clear infection, and these vaccines also provide immune memory. Combining the 2 targets in a single vaccine should improve vaccine efficacy by eliciting protection through 2 synergistic mechanisms, Dr. Marconi said.

He discussed 2 general types of vaccines used in veterinary medicine: bacterins and subunit vaccines. He described bacterins as “bacterial soups.” Lyme disease bacterin vaccines are generated by growing the bacteria in the laboratory. The bacteria are then collected, inactivated, and homogenized to render them more amenable to injection. Bacterins contain extraneous ingredients that do not contribute to protective immune responses. “In the context of veterinary medicine, where you are delivering multiple vaccines during a single visit, it would really be preferable to have vaccines that are of higher purity” and have fewer unnecessary ingredients, he said.

Subunit vaccines consist of 1 or more highly purified recombinant proteins that are produced in a laboratory under controlled conditions. Dr. Marconi said. His group’s aim was to create a combination OspA and OspC subunit vaccine.

Developing the OspA component was simple, he said, because this protein does not vary substantially among Lyme spirochetes. In other words, a single version of OspA in a vaccine will induce antibodies that are effective against many strains of *B. burgdorferi*.

OspC, on the other hand, has about 30 different variants. Most are designated with letters: OspC type A, OspC type B, and so forth. OspC variants are all the same protein, Dr. Marconi said, but their amino acid configurations differ. “Understanding the variation and diversity in this protein turned out to be critical in figuring out how to design a vaccine that could kill all the different strains that exist in nature,” he noted.

Dr. Marconi’s team found that dogs with positive Lyme antibody tests all had anti-OspC antibodies, but their antibodies were to different variants of the protein. Their next step was to isolate the specific parts of the OspC protein that induce antibody production. The parts of a protein that elicit antibody production are referred to as epitopes. “We reasoned that if we could identify the epitopes of OspC that we could then utilize those defined portions of OspC to make a focused, refined, and broadly protective vaccine,” he said.

Dr. Marconi’s group ran immunoblot analyses on OspC subfragments and located 2 epitopes that induce antibody formation. These epitopes became the basis of the new vaccine.

**CHIMERITOPE VACCINE TECHNOLOGY**

“The process that we applied is a new technology that we refer to as chimeritope technology,” Dr. Marconi said. The word chimeritope is a portmanteau meaning chimeric epitope-based protein. “Chimeric indicates that we are joining things together and what we are joining together are OspC epitopes derived from many different strains. Chimeritope vaccines are desirable vaccine antigens because they contain only the immunologically relevant parts of many different OspC type proteins,” he said. Dr. Marconi explained that a protein constructed this way “can trigger the formation of [antibodies] to the diverse OspC type proteins that exist in nature and, therefore, provide broad protection.”

Further testing showed that a vaccine made with the OspC chimeritope induced the production of antibodies that could kill *B. burgdorferi*. The spirochete elimination rate in the laboratory was higher with an experimental combination vaccine that contained both OspA and the chimeric OspC. Results from efficacy studies showed that compared with placebo and single-component vaccines, the combination vaccine significantly reduced lesions in the skin and joints of vaccinated dogs exposed to ticks carrying *B. burgdorferi*, Dr. Marconi said.

Tests of the chimeritope vaccine that was eventually brought to market confirmed that the vaccine prevented infection, protected dogs against skin and joint lesions after exposure to ticks carrying *B. burgdorferi*, and caused no major adverse effects. The most common immediate postvaccination reaction (<30 minutes after vaccination) was vocalization upon injection, occurring in 0.73% of dogs. The most common late postvaccination reaction (>30 minutes to 14 days after vaccination) was injection-site edema, which occurred in 3.81% of dogs.

Vanguard crLyme received approval from the Food and Drug Administration in January 2016, said Dr. Marconi. It is administered by subcutaneous injection. Dogs should receive an initial series of 2 doses given 3 weeks apart. A 15-month duration of immunity has been established for Vanguard crLyme.

References available at AmericanVeterinarian.com.

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Dr. Walden received her doctorate in veterinary medicine from North Carolina State University in 1994. After an internship at Auburn University College of Veterinary Medicine, she returned to North Carolina, where she has been in companion animal general practice for over 20 years. Dr. Walden is also a board-certified editor in the life sciences and owner of Walden Medical Writing.
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First TED Veterinarian Celebrated for Advancing ‘Zoognosis’

As the first veterinarian selected to become a TED Fellow, Dr. Claire Simeone has focused her career on improving health across all species through knowledge transfer.

By Kerry Lengyel

Becoming a TED Fellow was a goal Claire Simeone, DVM, had been working toward for a long time. But actually learning that she had been selected into the 2018 class was surreal. “It was amazing,” she recalled. “It was like a dream come true.”

Dr. Simeone has joined the ranks of 453 other TED fellows from 96 countries, ranging from scientists to artists, activists to entrepreneurs, doctors to journalists, and now 1 veterinarian. She was selected for her strength of character and her innovative ideas to help create positive change around the world through her knowledge of marine mammals.

REMARKABLE ACHIEVEMENTS

As a conservation veterinarian at The Marine Mammal Center in Sausalito, California—the largest rehabilitation hospital for marine mammals in the world—Dr. Simeone has been studying how the health of these creatures informs and influences human and ocean health.

She launched the Center’s International Veterinary In-Residence program, which mentors and trains veterinarians from around the world to help treat marine mammals and expand the web of knowledge in caring for these species. Participants have gone on to investigate unusual mortality events for large whales in Chile, create endangered species programs in Thailand, and develop initiatives to disentangle sea lions from trash in Mexico.

“I’ve been really proud of the great work these veterinarians have done in their own countries,” Dr. Simeone said. “It’s great that we can have a small part in supporting that,” she said.

In her previous position at the National Marine Fisheries Service, she was part of a team focused on developing the Marine Mammal Health Map, a tool designed to provide a centralized data reporting system to track marine mammal health. “The hope is that this will provide a place where marine mammal health data can be overlaid with existing data sets, like oceanographic data, to help give a clear picture of what is influencing health,” Dr. Simeone said, “and maybe even make predictions about disease outbreaks or toxin outbreaks.”
As a TED Fellow, Dr. Simeone now has the opportunity to share her innovative ideas on a much larger scale.

THE IMPACT OF ZOOGNOSIS

At the international TED2018 conference held in Vancouver, British Columbia, Canada, Dr. Simeone explained her concept of zoognosis, which she described as a new kind of learning between humans and animals. “We often think about how knowledge transfer goes 1 way—we learn about animals and we treat animals—but really it goes in both directions,” Dr. Simeone said. “It’s like a circle.” Just as a zoonotic disease can pass from animals to people, zoognosis recognizes that knowledge transfer happens both ways as well.

“It’s so critical to understand the full circle to see that it leads back to us because we’re all connected and there’s so much to learn from those connections,” she continued. The concept of zoognosis, she said, considers the One Health perspective more broadly, so it’s not just diseases that transfer but the knowledge itself. Dr. Simeone discussed several examples of zoognosis during her TED talk.

Human-to-Animal Zoognosis

While treating corneal ulcers in sea lions at the Center, Dr. Simeone developed a combination of antibiotics and a human-intended medical gel. “[Sea lions] don’t like to sit still for an eye drop multiple times a day,” she said. Once injected, the medication infused in the gel stays viable for about a week. “Applying medical innovations developed for humans to help animals is one example of how human-to-animal knowledge transfer,” she said.

Animal-to-Animal Zoognosis

During pupping season at the Center, there are about 150 newborn animals on site, many of which come in starving because they were separated from their mother, were orphaned, or haven’t yet learned how to eat on their own.

To feed starving elephant seals, for example, a team at the Center developed a backpack that houses an intravenous pump to deliver nutrition directly into the animals’ blood while allowing them to move about freely. “That knowledge can then be used to help endangered species like Hawaiian monk seals,” Dr. Simeone said.

It can sometimes be too risky to develop new therapies for endangered species because each animal is critical to species survival. Adapting something used for one species—as such this backpack—to use in another is a perfect example of that knowledge transfer.

Animal-to-Human Zoognosis

“Marine mammals really are sentinels of the sea,” Dr. Simeone said. “They can give us an immense amount of information about the ocean that can benefit human health.”

At certain times of the year, for example, a biotoxin called domoic acid produced by algae becomes prevalent in the ocean around California. This biotoxin can cause seizures and brain damage in humans, but sick and seizing sea lions often come into the Center before high levels of domoic acid can be detected in water samples.

“The Center works very closely with the public health department, and by reporting these [sea lion] cases, they can help to target surveillance and help protect human health,” Dr. Simeone said.

ZOOGNOSIS IS EVERYWHERE

Although Dr. Simeone focused her TED Talk on the immense knowledge that can be shared between marine mammals and humans, she noted that zoognosis is not solely restricted to these species. “It’s not restricted to marine mammals or even medical innovations,” she said. “Once people start to really think about zoognosis and how it applies in their lives, they will realize that it’s everything” in everything that they do.”
WANTED: High-quality Veterinary Job Candidates

The law of supply and demand is transforming the veterinary profession, and the sky is the limit for many new grads.

By Stacy Pursell, CPC, CERS

(continued from front cover)

recent trends – in terms of the law of supply and demand – have been startling.

To more effectively illustrate the points that I’ll be addressing, I’d like to once again use the aforementioned definition, but with substitutions that convey the current state of the veterinary profession: “the theory that [starting salaries] are determined by the interaction of supply and demand: an increase in [quality candidates] will lower [starting salaries] if not accompanied by increased demand, and an increase in demand will raise [starting salaries] unless accompanied by increased supply.”

This adapted definition raises many questions about the veterinary profession, but I believe these are the two most important: Are quality candidates in demand? Are quality candidates in abundant supply? Let’s tackle each question separately.

ARE QUALITY CANDIDATES IN DEMAND?

As a recruiter, I’m in the trenches of the marketplace every day and speak with hundreds of people each month. Because I’m actively helping veterinary employers fill open positions, I can tell you unequivocally that quality candidates are in demand. In fact, we are now in a candidates’ job market, which is tied to the recovering economy. In a recovering economy, certain rules govern the marketplace:

• Job openings are plentiful.
• Job seekers have more employment options.
• Employers have more difficulty finding or identifying the best candidates for open positions.
• Employers have more difficulty keeping candidates engaged during the hiring process.
• Employers have more difficulty successfully hiring candidates.

Not only are quality candidates in demand, but this trend is going to intensify. According to the Bureau of Labor Statistics, opportunities for veterinarians are set to climb by 19 percent through 2026, while roles for veterinary technicians will increase by 20 percent in that same time frame.¹

ARE QUALITY CANDIDATES IN ABUNDANT SUPPLY?

Just as I can confidently answer yes to the first question, I can confidently answer no to this one. This answer is also tied to the recovering economy and a candidates’ job market. Typically, for there to be a lack of qualified candidates, there first has to be an abundance of job openings – and that’s currently the case in the veterinary profession. Some might say that there’s an overabundance.

Keep in mind that it is possible to have an abundance of job openings and an abundance of qualified candidates, as is the case in some other industries and niches. As you might imagine, this scenario presents a better situation for employers because even with a persistent and ongoing need to fill open positions, they can do so with the qualified talent available. However, this is not currently the case in the veterinary profession. What we have is an abundance of job openings but a smaller pool of talent to fill those open positions. The longer this situation continues, the more problematic it becomes for employers because it costs organizations money if an important position is left open for too long or if organizations are forced to hire subpar candidates.

THE CURRENT STATE OF THE MARKETPLACE

Quality veterinary candidates have higher salary requirements and increased expectations, and both are regularly being met. It’s a noticeable trend among recruiters that some recent graduates or those with less than two years of experience are expecting between $100,000 and $130,000 in base compensation – and, yes, they are receiving offers in that range.

My company recently met with a candidate who had two years of experience and had received three job offers. One of them included a $130,000 base, the second had close to a $130,000 base and the third offered $100,000 with a $130,000 guarantee.

This was not an isolated case. We also interviewed a recent graduate who was expecting a base salary of $120,000. Shortly after meeting, we already had a client that wanted to interview her. Think about that: no experience and commanding a $120,000 salary. That sums up almost perfectly how the law of supply and demand is affecting the veterinary profession. There is a tremendous demand for quality candidates and a glaring lack of candidates for veterinary employers to hire.

From all indications, this reality is set to shape the profession for years to come.

REFERENCE


Ms. Pursell is an award-winning executive search consultant and recruiter specializing in the animal health, veterinary and pet products industries. She is founder and CEO of The Vet Recruiter (thevetrecruiter.com).
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Nearly all veterinarians know what it feels like to make an unfortunate error. After all, we’re human. Take some comfort in knowing that you’re not alone, but also recognize that there are steps you can take to significantly decrease the lasting ramifications of medical errors for your patients, your clients and you.

THE PERSONAL FALLOUT FROM MEDICAL ERRORS
While many more studies have been published on the impact of medical errors on human health care providers, the effects are similar, if not identical, for veterinary professionals. The emotional impact on these individuals — who are considered secondary victims — is remarkable. Even though both human and veterinary health care professionals understand intellectually that serious mistakes happen, they routinely believe that errors can be prevented if correct procedures are followed. It should come as no surprise, then, that health care workers involved with a medical error or NM feel:

• Puzzled and shocked
• Fearful of discipline, litigation and loss of reputation
• Guilty and angry at themselves
• Anxious in general or specifically about making future errors
• Distressed
• Less satisfied with their jobs
• Less confident in their abilities
• Burned out

In my experience dealing with these emotions following a medical mistake, the symptoms are worse when I keep the error to myself. I’ve found that discussing my feelings provides quite a bit of relief, so I purposefully maintain a group of fellow practitioners on whom I can call in times of need.

Even if you don’t currently have a close-knit group you can turn to, a number of industry-wide outlets have been established to help combat the guilt and distress associated with making medical errors:

• VIN’s Venting Over a Venti is an online forum that provides members with an outlet to discuss their experiences and share ideas.
• Not One More Vet is a Facebook forum where veterinarians can solicit feedback anonymously from colleagues, which can be especially beneficial while the event is unfolding.
• The Veterinary Confessionals Project is a website that allows users to submit career-related thoughts and secrets on any topic.

DILEMMAS RELATED TO DISCLOSURE
Social psychologist Christina Maslach, PhD, who is well known for her research on occupational burnout, famously identified six areas of mismatch between people and their jobs that lead to burnout. Three of these — lack of control, absence of fairness and conflict in values — may be triggered by lack of disclosure to colleagues and/or clients. Moral distress, or knowing what to do in an ethical situation but not being allowed to do it, may also play a role.

Think about when a harmful mistake is acknowledged by the team but not shared with the client. How do those team members who are not in control of making that disclosure decision feel?

“I believe moral distress is one result of making a mistake or having an NM,” said Laurie Fonken, PhD, LPC, director of veterinary health and wellness programs at Colorado State University’s College of Veterinary Medicine & Biomedical Sciences (CVMBS). “For the veterinarian involved in these situations, there is a process of determining how to communicate about the situation and how to follow up. An observer of a mistake or NM may also experience moral distress, as they might not have control over how it is handled.”

This year’s VIN survey study revealed that veterinarians disclose to their colleagues, family and friends 83 percent of NMs and 92 percent of medical errors that result in harm (Table). They report 66 percent of NMs and 81 percent of harmful medical errors to their supervisor, most commonly because it is ethically the right thing to do. Finally, veterinarians report 40 percent of NMs and 77 percent of harmful

**TABLE. Disclosure Statistics in Veterinary Medicine**

<table>
<thead>
<tr>
<th>Disclosure to</th>
<th>Near Misses</th>
<th>Harmful Errors</th>
</tr>
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<tbody>
<tr>
<td>Family/friends/colleagues</td>
<td>83%</td>
<td>92%</td>
</tr>
<tr>
<td>Supervisor</td>
<td>66%</td>
<td>81%</td>
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<tr>
<td>Clients</td>
<td>40%</td>
<td>77%</td>
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Owning It: The Power of Admitting Your Mistakes
By disclosing clinical mistakes and dealing with the consequences and emotions that result, veterinary professionals can gain greater resilience and reduce burnout and depression.

By Tad Coles, DVM, CCFP, MRSS-P
medical errors to clients. The survey's respondents relayed that when they fail to report mistakes to their supervisors or clients, it's usually because they fear confrontation, upsetting their supervisors and losing clients.5

Regina Schoenfeld-Tacher, PhD, one of the study's authors,6 said, “Our research supported the hypothesis that NMs and harmful medical errors are not rare occurrences. They appear to result in both short- and long-term negative effects for a significant number of veterinarians. For many veterinarians, NMs and harmful medical errors lead to a diminished sense of job satisfaction and lower self-confidence. Clearly, this area warrants attention in the form of support systems and training to help veterinarians who have encountered these events.”

KNOWING WHAT TO DO NEXT
Most veterinarians have had little training in what to do after making a mistake. But the good news is that training is available to help veterinary practitioners and students learn how best to disclose medical errors.

Linda Fineman, DVM, DACVIM (Oncology), director of veterinary talent and knowledge strategy at Ethos Veterinary Health, suggested that when veterinarians are communicating with clients about an NM or a harmful medical error, they use the TEAM model to structure their thinking. The approach is broken down into four pillars:6
  • Truth: Tell the truth, explain the situation and then stop to ask how the client is feeling.
  • Empathy: Use reflective listening to rebuild trust and restore the relationship.
  • Apology: Saying you’re sorry is a vital part of making things right.
  • Managing through to resolution: Describe changes being implemented to prevent the error from recurring and, if appropriate, offer compensation to the client and transfer of the pet to another facility.

According to Dr. Fineman, by recognizing the error and expressing empathy, “we’re showing clients that we hear, acknowledge and understand the issues they’re having. And that it’s OK for them to have emotions and negativity about the bad experience that they had.”9

The American Veterinary Medical Association’s Professional Liability Insurance Trust (PLIT) encourages full disclosure, suggesting that if you’re concerned an error has been made or an upset client has threatened legal action, you should report the situation using the Notice of Potential or Actual Claim form. The insurance company will then contact you, and you can request to speak with a PLIT veterinarian for further guidance. This preference toward full disclosure has proved to be economically favorable in facilities outside veterinary medicine (Box).10-11

There are also opportunities for students to learn these valuable communication tools before they enter the profession. Since 2002, the Institute for Healthcare Communication’s Veterinary Communication Project has provided veterinary school faculty with training to address gaps in veterinarian-client communication training. To date, the project has produced 16 educational modules with tools and resources for improving communication skills on a variety of topics, including sharing bad news, managing team conflict and addressing ethical dilemmas.

At Colorado State University CVMBs, veterinary students receive 50 hours of communication training through the school’s Veterinary Communication for Professional Excellence curriculum.12 The program uses client simulations to teach critical communication skills, such as collecting a patient history, making a treatment plan, building trust and delivering bad news. The simulations are recorded and critiqued by peers, veterinarians and other professionals.

Lori Kogan, PhD, first author of the VIN survey study,10 said, “It is encouraging that some veterinary education programs are starting to implement courses describing cognitive errors and biases in the hopes of giving future veterinarians a language to talk about things when they go wrong, and help them think about strategies for reducing/preventing common errors.”

OWNING UP IS A VALUABLE TOOL
Admitting our errors is an important step in reclaiming personal power. Despite the difficulty in doing so, taking ownership of mistakes is essential because it allows us to assess our actions and take responsibility.

Admitting to and apologizing for mistakes are just the first steps. Veterinary professionals also need to amend their behaviors and work toward changing the system. Establishing system changes following a medical error is crucial to reducing the odds of recurrence. Such changes also foster a climate of openness that should make disclosure easier for the individual.

When faced with a medical error, many practitioners focus on the downside and become overwhelmed with fear. But Jane Shaw, DVM, PhD, an associate professor at Colorado State University CVMBs, reminds us that dealing with the aftermath of medical errors has great potential. “Disclosing medical errors effectively provides a path toward rebuilding trust and strengthening the relationship with your client,” she said. “Working through the conflicts that erupt within an organization after a medical error comes to light can strengthen relationships with colleagues and supervisors when a team comes together and faces such a challenge.”

Think of how much stronger your team could be after truthfully and successfully responding to a problem rather than sweeping it under the rug. I’ve found that being open to admitting mistakes starts with preparing the client at the outset of treatment for possible unexpected outcomes. Even if the prognosis is good, letting clients know there are risks with any treatment and providing at least a brief overview of what can go wrong will make it easier for them to accept unintended consequences.

References available at VMDToday.com.

BOX. The Economics of Full Disclosure
In 1987, the Veterans Affairs Medical Center in Lexington, Kentucky, adopted a full disclosure policy after becoming swamped with malpractice judgments. There were more settlements but less monetary loss with fewer punitive suits. As a result, all Veterans Affairs facilities now require full disclosure.10 Likewise, when the University of Michigan transitioned from deny-and-defend to open-disclosure-and-offer, the rate of claims that resulted in lawsuits decreased by nearly 45 percent, time to resolution decreased from 1.36 to 0.95 years and the average cost per lawsuit was 56 percent lower.11 The founding principles of the Michigan Model are broken into three segments:
  • If unreasonable medical care caused injury, then compensate patients quickly and fairly.
  • If the care was reasonable and did not cause harm, fully support caregivers and the organization.
  • Learn from adverse events; reduce future patient injuries and claims.

Dr. Coles is a certified Compassion Fatigue Professional and Missouri Recovery Support Specialist - Peer. He has worked in industry, owned a practice, experienced compassion fatigue and burnout, and spent the past 26 years in continuous personal recovery from substance use disorder. He is currently the medical director of Two Dogs and a Cat Pet Club in Overland Park, Kansas.
Improve Compliance, Improve Your Bottom Line

Creating a culture of compliance within your veterinary practice benefits your patients, clients, staff and bottom line. Here’s how.

By Adam Christman, DVM, MBA

Most veterinary professionals agree that well-informed pet parents are integral to a practice’s success. However, regardless of how thorough your conversations are with clients during appointments, a lack of understanding or unasked questions can still lead to low compliance with your recommendations. Much of this disconnect can be traced back to a few factors, such as distractions in the exam room, the growing reliance on “Dr. Google” and not having the primary caregiver present for the appointment.

ONGOING COMMUNICATION

One way to combat the inevitability of missed or misinterpreted information is to provide clients with professional, practice-branded information related to what you have just recommended. Such take-home information helps ensure that clients understand the importance of your treatment recommendations and are invested in taking the next steps. Remember, a confused client will never comply.

At my practice, our veterinary technicians follow up with clients by phone two days after an appointment to reiterate the recommendations and ask whether the client has any questions or concerns about the visit. Having technicians make these calls allows the veterinarian to take on other tasks. Training your team to take the lead on these calls is paramount to increasing client compliance. Not only does this conversation foster exceptional compliance, but it demonstrates to the client that your team has a vested interest in ensuring the health of their pet.

Lastly, take advantage of your software systems to aid in increasing compliance. For example, many programs can generate personalized report cards for clients to take home with them from appointments. Here you can include recommendations, identify a credible website for additional information and even provide the reasoning behind your suggestions. This offers the opportunity not only to recommend a dental cleaning, for example, but also to describe why the pet needs one.

UTILIZE THE DIGITAL AGE

We live in a smartphone-obsessed world, and this reliance on technology can be used to your hospital’s advantage. Consider some of the ways you use digital media to market your team as authorities on pet health care. The more your clients associate your veterinary hospital with simplicity and expertise, the more likely they’ll be to comply with your recommendations for their pets. 

Providing take-home information is vital to ensuring that clients understand the importance of your treatment recommendations.
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NEEDS, WANTS AND PROFITS: TAKING DIRECTION FROM DISNEY

What Disney Does: Disney does a wonderful job of understanding its customers’ journey and meeting their needs within its theme parks. As you enter the Magic Kingdom in Walt Disney World, for example, you’re met on the right side of the park with a plethora of necessities, such as maps, sunscreen, fans and sunglasses. Upon leaving the park, you will find the “wants”—souvenirs, cotton candy and beverages—on the right. The deliberate placement of these “needs” and “wants” serves the multipurpose strategy of delivering a “magical” experience while driving the company’s profitability.

What You Can Do: Think about your clients’ wants and needs and how you can implement them strategically into your practice. Clients go to you because they need a plan to keep their pets healthy. This presents an opportunity to educate clients—through posters, brochures, handouts and electronic messaging—in your waiting area about the importance of vaccines, preventive medications, nutrition and dentistry. When exiting the exam room, however, clients want to reward their pets with a positive experience. Your invoicing area offers a strategic location for positioning a retail section that includes items such as squeaky toys, baked goods, treats, pill pockets and leashes. This creates a very “magical” experience for clients, and they won’t feel guilty about making extra purchases for the love of their pet.

One of the most valuable ways to promote your practice and provide beneficial information to clients is through the use of video. Clients love to see their veterinary teams actively engaging through social media, and YouTube is an excellent platform for you to do so. Fun and informative videos encourage team building and are a great way to send a positive message to your clients. They also allow clients who are visual learners to better understand your recommendations.

For example, my YouTube channel includes a video on how ticks can affect pets. My technicians will sometimes play this video in the examination room while clients are waiting for me. There have been countless circumstances when, upon entering the room, pet owners have asked me, “What can I buy right now to prevent those ugly ticks from biting my pet?” Try this and you will see compliance in action and your profits rise.

If your hospital offers a pet portal, market it through your social media channels to remind clients that they can access their pet’s digital records easily. Pet owners want to feel that they have a role in the treatment process, and by involving them, you are more likely to gain their buy-in to proceed with further treatment. For example, if a client has a copy of his dog’s elevated liver values, he can better understand the need for both a bile acid test and an abdominal ultrasound.

Another way to encourage compliance is to use technology to make it easy. If you have an app for your practice, encourage your clients to enable push notifications. This feature will allow you to send appointment reminders as well as alerts about when to administer parasite preventives.
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- medications are available for pickup
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Email Marketing 101

Jump-start your practice’s email marketing campaign with these tips on content, design and frequency.

By Amanda Carrozza

(continued from front cover)

that your knowledge is accessible outside the exam room, further portraying you and your veterinary team as relatable experts who care about your patients.

Emails are an extension of your brand and should be composed with that in mind. They should be also unique to your practice and will take a bit of trial and error to perfect, but this simple guide can help get you started.

CONTENT
Your first instinct might be to fill your digital newsletter with information about how wonderful your practice is. As true as that may be, it’s not what your clients want to read. Instead, a good rule of thumb is to provide content that is about 90 percent educational and 10 percent promotional. Your email campaign should be viewed as a way to further your relationship with clients rather than to blatantly pitch them on services.

As you develop email content, there are a few key factors to consider. First, think about the tone of your email and any content on your website that you intend to link to. It’s important that you brand yourself as an expert, but steer clear of using overly clinical language filled with medical jargon that might be misinterpreted as being pretentious or, worse, fly over the heads of your audience. Clients want the best of both worlds: a veterinarian who is a knowledgeable expert but one with whom they also feel comfortable speaking.

Focusing on pet owners doesn’t mean you can’t write about important animal health topics; you may just need to rephrase how you present the idea or action item. “You need to make sure it’s something people want to read,” Dr. Felsted noted. “Pet owners don’t want to read an entire article about the cellular impact of a preventive you are recommending. What they really want to read are patient success stories that incorporate and reinforce the recommendations you’re making. So maybe you talk about a heartworm-positive dog that was treated successfully at the practice, noting that the patient did well but it’s important to prevent heartworm infection and here’s how.”

Other content ideas include profiles of staff members and how-to guides. Keep a running list of the questions your clients regularly ask or interesting topics you see online. This will help ensure that your content is always fresh and you’re not struggling to find something new to write about.

DESIGN
You specialize in protecting animal health, not graphic design, so putting together an email newsletter can seem daunting — but it doesn’t have to be. A number of online programs make it easy to upload audience lists and design beautiful emails through provided templates. You can explore the features and even take advantage of free trials with companies like Constant Contact, MailChimp and Benchmark.

Once you decide on the email marketing program and template you want to use, lay out your content based on a hierarchy of importance, leading with your clinic’s name, contact information and logo. Dr. Felsted suggested incorporating eye-catching graphics or imagery and not being afraid of white space. Be conscious of not making emails too copy heavy either. Provide a few lines of text that can serve as a snippet of information or a preview of a larger article that the email’s recipients can click through to. The idea behind an email newsletter is to get people to act — either by visiting your website for more information or by making an appointment for their pet.

FREQUENCY
When planning your email newsletter campaign, it’s important to consider the frequency. It’s OK to send an email related to a product release or news of particular importance, but for the most part your email deployment should follow a predetermined schedule.

If you send emails too frequently, you risk annoying your clients. On the other hand, if you send them too sparsely or randomly, your clients might not remember that they signed up for your newsletter to receive more information or by making an appointment for their pet.

TEST. AND THEN TEST AGAIN
Before you hit “Send” to share an email with your clients, make sure you’ve tested it thoroughly. Email programs allow you to send a test version to your personal email address as one of the final steps in the creation process. Click on all links in the email to confirm that they work, and run content through a program such as Grammarly to help ensure everything is spelled correctly. Broken links and misspelled words will distract from your message and create a poor impression of your practice. Only after you’ve rechecked your work should you deploy the email.

It might take some time to construct your first few emails, but you’ll soon learn what layout you prefer and which types of content your audience responds to best. And that will lead to more appointments, better client relationships and increased revenue.
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Does your dog or cat cower in the corner or hide in the bathtub on New Year’s Eve and the Fourth of July? How about during thunderstorms? Although most animals don’t love loud noises, for a large subset of pets—nearly half, by some estimates—the sensitivity to sudden, loud noises is more than a dislike. It reaches fear- and anxiety-inducing levels that can lead to behavioral and health challenges. This extreme reaction is called noise aversion.

The sounds associated with noise aversion share the common characteristics of being extremely loud, difficult to localize, and lacking in pattern—think fireworks, thunder, construction, and honking horns. Researchers do not know why some animals experience significant anxiety when they hear loud noises. Some pets may already suffer from anxiety disorders that are heightened by high-pitched noises, while others may develop the fear following a traumatic experience or learn the trait from another pet in the home. Regardless, it’s important for pet owners to recognize that their furry friend may be suffering and that noise aversion is a real medical condition that can be treated.

As with any illness or behavioral change you notice in your pet, noise aversion requires veterinary attention. Your veterinarian is the best source of knowledge and will be an invaluable resource for helping your pet find effective relief from this very real and potentially dangerous phobia.

**THE DOS AND DON'TS OF TREATING NOISE AVERSION**

You can institute a variety of remedies—both medical and environmental—to relieve your pet of the fretfulness that results from noise aversion. In many cases, it’s a combination of treatments that garners the best results.

First, it’s important to pinpoint the triggers of your pet’s fear, as not all animals respond to loud sounds in the same way. For instance, if you know fireworks cause extreme anxiety for your pet, you’ll want to have measures in place before holidays such as New Year’s Eve and Independence Day to help him get through the celebrations unscathed. Similarly, if storms cause your cat to hide in a closet or defecate outside the litterbox, but slamming doors barely makes her flinch, you can deduce that thunder is likely the trigger.

**Don’t Scold**

When your pet does something wrong, such as chewing your favorite slipper or scratching at the couch, your initial reaction may be to
yell at or punish him. But when the destructive or negative behavior is correlated directly with fear and anxiety, consider that yelling could escalate the already negative situation. And then your pet will associate loud noises not only with fear but with punishment from you as well.

**Don’t Force the Experience**
At no point should you force your dog or cat to endure the noises that trigger anxiety—such as making her stay outside during a thunderstorm or go to the July 4th block party—to show her that there is nothing to fear. This will not work. Instead, doing so may make your pet even more fearful. And, to escape the situation, she may struggle and potentially injure herself or you.

**Don’t Overreact**
As much as you want to console your pet in his time of need, don’t overcompensate for his anxiety by fussing over him or becoming anxious yourself. Your pet may feed off your increased nervousness, and the situation will escalate.

**DOES YOUR PET SUFFER FROM NOISE AVERSION?**

There are some indicators that pets might be predisposed to noise aversion, particularly if they display other signs of nervousness, such as separation anxiety and extreme aggression toward strangers. When loud sounds occur, a pet with noise aversion might exhibit signs that include:

- Abnormal clinginess
- Chewing on furniture or walls
- Cowering or hiding
- Excessive panting
- Inappropriate elimination
- Persistent barking or whining at the sound
- Refusing to eat
- Trembling or shaking
- Trying to escape
- Uncharacteristic aggression

Similarly, while it can be helpful for your pet to see that you’re in the room with him—your presence alone may provide a calming effect—hovering over him or sitting alongside him while he cowers in a corner may make him more anxious. Instead, stay in the room, but let your pet approach you as he sees fit.

**Do Create a Safe Space**
When faced with a loud noise that initiates your pet’s natural instincts to flee, many pet owners find it helpful to provide their cats and dogs with a confined space that they consider a haven, such as their crate or a closet. Outfit this area with familiar blankets and toys, and acclimate your pet to the location by feeding meals or treats there.

**Do Provide Distractions**
While your pet is experiencing an episode of anxiousness, you may want to offer treats to create a positive correlation with the noise—or, at the very least, offer a bit of distraction. If your pet’s instinct is to chew on furniture or exhibit some other destructive pattern, provide chew toys as an alternative. Also consider offering puzzle toys or a Kong filled with peanut butter to double up on the distractions and stress relief.

**Do Consider Natural or Pharmaceutical Remedies**
Depending on your pet’s signs and the level and frequency of anxiety, your veterinarian may recommend or prescribe medications and supplements designed specifically for their calming effects:

- **Pheromone products.** Available for both cats and dogs, synthetic pheromones are designed to decrease signs of stress, including shaking, aggression, and overall nervousness, that pets with noise aversion may exhibit. Although undetectable to the human nose, they replicate natural cat or dog pheromones and come in various forms, including sprays, diffusers, wipes, and collars.

- **Compression vests.** Available in a variety of sizes, these vests apply gentle, constant pressure—comparable to swaddling a baby—that produces a calming effect.

- **Nutraceuticals.** Anxitane (L-theanine; Virbac Animal Health) has been shown to provide effective relief for thunderstorm sensitivity. Additionally, supplements containing alpha-casozenine, such as Zylkene (Vetoquinol), can provide effective relief for situational anxiety associated with thunderstorms and other events.

- **Sileo.** In 2016, the FDA approved the drug Sileo (Zoetis) for the treatment of noise aversion in dogs 16 weeks and older. The product comes as an oral gel that is administered between the dog’s cheek and gum and is designed to calm the pet without sedation, so the dog remains fully functional.

**HOW YOUR VETERINARIAN CAN HELP**
If you suspect your pet is suffering from noise aversion, be sure to consult with your veterinarian, even if you have already started to institute some of the nonmedical solutions.

Left untreated, the chronic anxiety associated with noise aversion has the potential to cause health problems and shorten the lifespan of the affected animal.

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