Managing Wounds in Wildlife

Most wild birds, reptiles, and small mammals that are presented to veterinary practices have traumatic injuries, reported Kate E. Archibald, DVM, at the Wildlife Rehabilitators of North Carolina annual symposium held at North Carolina State University College of Veterinary Medicine in Raleigh.

Wounds in wild animals brought in for treatment are typically infected, contain debris, and/or were inflicted by a predator, said Dr. Archibald, a zoological medicine resident at the college and the North Carolina Zoo. These wounds fall outside the “golden period” – the few hours after wound initiation during which they can be closed safely with sutures. Most wounds in wildlife heal by second intention: The edges are not apposed, and the wounds heal via granulation.

(continued on page 12)

Global Guidelines Put Dental Health in the Spotlight

Dental disease is among the most common medical issues in small animal medicine, yet oral health traditionally has been one of the most underserved areas in the veterinary field. Not only is it overlooked or underemphasized, but veterinarians also have not accepted a universal standard of care or adopted a singular mindset when it comes to preventing or early intervention to combat osteoarthritis. The American Veterinary Association (AVMA) can create dependency, transform people into strangers sometimes given to harmful deeds, and bring on the distinct possibility of death.

(continued on page 16)

Raising Awareness of Emerging Superbugs

Veterinarians should be concerned about zoonotic disease transmission for several reasons, according to Meghan Frost Davis, MPH, DVM, PhD, assistant professor at Johns Hopkins Bloomberg School of Public Health in Baltimore, Maryland. Beyond disease manifestation in animals, zoonoses present a public health risk for pet owners and an occupational health risk for veterinarians.

At the 2017 American College of Veterinary Pathologists Annual Meeting in

(continued on page 16)

Evaluating and Addressing Feline Aggression

Cats are notorious for their aloof demeanor and sometimes feisty behavior. Most veterinarians can likely recall some of the more memorable feline patients that made it abundantly clear they did not want to be examined – and many have the battle wounds to prove it. When “cattitude” becomes violent, however, pet owners may find themselves at a loss for what to do, and relinquishment or euthanasia becomes part of the conversation.

(continued on page 14)


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Practitioners tend to give the topic short shrift. For example, the importance of early intervention to combat osteoarthritis is widely accepted, but preventive

(continued on page 16)

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CHAIRMAN’S LETTER

WHAT IS A VETERINARIAN?

On the surface, this seems like a simple enough question, but it actually proves a difficult one to answer. As it turns out, there are countless adjectives that can be used to characterize veterinarians. Knowledgeable, compassionate, engaged, ambitious, kind, energetic, tough, authoritative, gentle, dedicated—the list goes on and on.

For the past several weeks, we’ve been posing this very question to veterinarians and pet owners both in person and online with the launch of the hashtag #AVeterinarians and its complementary social media campaign. And now, we’re asking you.

Participating in the campaign is simple. To let us know what “A Veterinarian Is” to you, complete the short form on AmericanVeterinarian.com or use #AVeterinarians in your own social media posts and tag us (@Am_Veterinarian on Twitter and American Veterinarian on Facebook).

We initiated our #AVeterinarians campaign to celebrate veterinarians around the world in advance of World Veterinary Day, which takes place on Saturday, April 28. In the weeks and days leading up to World Veterinary Day, we’ll be posting your submissions, photos, and videos, as well as stories from pet owners, on our website and social media pages. It’s just another way we hope to honor the invaluable services you provide for pets, their owners, and people everywhere who are passionate about the health and well-being of animals of all kinds.

So far, we’ve been duly impressed by the thoughtful and unique responses we have received. In most cases a single word has been insufficient to answer the question. “When a veterinarian is taking care of our pets, they really become a part of our family,” said one industry professional. “A veterinarian is a tremendous force for good in the world,” added another. Veterinarians are “colleagues coming together to find ways to help the less fortunate. Coming together to change lives,” remarked a Twitter follower.

Upon further reflection, the variety and length of the responses make perfect sense because, although veterinarians first and foremost are medical professionals, your role extends well beyond that. You are scientists, business owners, marketing gurus, educators, authors, mentors, and advisors. And that doesn’t even begin to encompass all of your passions outside the clinic.

But it doesn’t stop there. At American Veterinarian®, we believe that celebrating veterinarians and other veterinary professionals shouldn’t be limited to a single day or event. We hope you’ll join us in highlighting the triumphs and generosity of veterinarians (self-promotion is OK too) by using #AVeterinarians in your own social media posts throughout the course of the year.

Mike Hennessy, Sr
Chairman and CEO

Scan the QR code for complete back issues, clinical and research news, and expert video insight.

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AVMA Establishes Antimicrobial Policy for Veterinary Medicine

By Amanda Carrozza

A unanimous vote by the American Veterinary Medical Association (AVMA) House of Delegates to enact a policy on antimicrobial stewardship has been touted as a “call to action” for the profession to advocate for preserving antimicrobial effectiveness.

Enacting the policy is an important development toward the committee’s goals of working with counterparts in human medicine and regulatory agencies, among others, to determine how antimicrobials should be used, according to AVMA Board member Rena Carlson-Lammers, DVM.

Developed by the AVMA’s Committee on Antimicrobials, the policy comes in response to the call to reevaluate how often the drugs are prescribed for animals and, specifically, how their overuse misuse relates to increased resistance. It is likely that the amount of inappropriate use of antimicrobials in companion animal settings nears the CDC’s most recent estimates in human medicine of 50%.

Previously, the AVMA board considered proposals urging veterinarians to change their use of antimicrobials, but those proposals were thought to be too prescriptive. Recognizing the importance of taking a One Health approach and encouraging joint efforts between human and veterinary medicine, the new AVMA policy adapted much of its language from the CDC’s Core Elements of Outpatient Antibiotic Stewardship.

The CDC noted that a “growing body of evidence [in human medicine] demonstrates that hospital-based programs dedicated to improving antibiotic use, commonly referred to as antibiotic stewardship programs, can both optimize the treatment of infections and reduce adverse events associated with antibiotic use. These programs help clinicians improve both the quality of patient care and patient safety through increased infection cure rates, reduced treatment failures, and increased frequency of correct prescribing for therapy and prophylaxis.” They also significantly reduce antibiotic resistance.

The same is expected to be true in veterinary medicine. According to Michael Whitehair, DVM, chair of the AVMA board of directors, the policy shows veterinarians’ commitment to their patients, clients, and the public.

The AVMA defines antimicrobial stewardship as “the actions veterinarians take individually and as a profession to preserve the effectiveness and availability of antimicrobial drugs through conscientious oversight and responsible medical decision making while safeguarding animal, public, and environmental health.” As outlined in the policy’s core principles listed below, antimicrobial stewardship is an all-encompassing policy that involves both veterinary teams and clients.

• Commit to stewardship. Engage practice members in the stewardship effort; develop plans that incorporate dedication to disease prevention; and create plans to optimize the prescribing, administration, and oversight of antimicrobial drugs.
• Advocate for a system of care to prevent common diseases. Work with clients to adopt preventive strategies to minimize the need for antimicrobial drugs.
• Select and use antimicrobial drugs judiciously. Refer to relevant veterinary guidelines, and assess outcomes when antimicrobials are used.
• Evaluate antimicrobial drug use practices. Develop a program that includes sharing of antimicrobial drug use data among veterinary practices and preserves veterinarian-client confidentiality.
• Educate and build expertise. Strive to remain up-to-date on innovative uses of antimicrobial alternatives, and educate clients on instances when antimicrobial drugs are not needed.

The complete policy and extended details on each of the core principles are available on the AVMA website (avma.org).

The AVMA said it will rely heavily on staff and leadership to circulate the new policy to veterinarians across the country. The association also said it hopes to work with the FDA and the and Department of Agriculture as they develop regulations that guide daily antimicrobial use. Additionally, the AVMA plans to lobby for regulations and laws that preserve the ability of veterinarians to administer or prescribe needed antimicrobials.

Banfield Releases Anesthesia and Analgesia Guidelines

By Kerry Lengyel

For the past 15 years, Banfield Pet Hospital has supplied veterinary teams with free and publicly available guidance on anesthesia.

The latest iteration of Anesthesia and Analgesia for the Veterinary Practitioner: Canine and Feline offers new and updated guidance and protocols available fordownload. The goals of the guidelines, according to Karen Faunt, DVM, MS, DACVIM, vice president of veterinary quality and operations for Banfield Pet Hospital, are to improve “the safety of anesthetic procedures and the quality of pain management for the pets in our care.”

The revision offers updated protocols and dosing information, as well as information on assessment, prevention, and treatment of pain in dogs and cats. “Providing high-quality medicine is at the heart of what we aim to do for every pet that walks through our doors,” Dr. Faunt said. “Banfield’s new anesthesia program was thoughtfully designed to support not only our hospitals but also thousands of other veterinary teams in delivering on that goal.”

The guidelines were developed by Banfield veterinarians, anesthesiologists, research analysts, and industry experts to help improve patient outcomes related to anesthesia. The new guidelines comprise 3 books:

• Anesthesia Quality, Medical Quality Standards, Equipment & Physiology
• Individualized Anesthesia & Analgesia Plan, Sedation & Immobilization, Induction, Monitoring & Recovery
• Protocols, CPR Guidelines & Appendix

In addition, Banfield created more comprehensive resources, including:

• Medical quality standards–clinical essentials and best practice huddle cards, as well as an anesthesia machine checklist
• Patient-specific tools—a dosage calculator, which offers guidance in selecting equipment and medications appropriately for anesthesia, and a monitoring form to help capture correct information
• Job aids—a program to improve concordance with the established guidelines during each phase of anesthesia

“At Banfield Pet Hospital, we are passionate about and feel a responsibility to share our insights and resources with the broader veterinary profession to help promote quality care practices and build sustainable outcomes for pets,” Dr. Faunt said.
Toxoplasma Reshedding Rates in Domestic Cats

By Natalie Stilwell, DVM, MS, PhD

Toxoplasmosis is a common parasitic disease found in a wide range of species, including humans. As the only known definitive hosts for Toxoplasma gondii, felids typically infect other hosts by shedding T. gondii oocysts in feces. Existing literature suggests that cats experience temporary immunity against reshedding of oocysts when reinfected with T. gondii and that oocyst shedding is quantitatively lower after subsequent infections. Researchers in Brazil, a location known for high genetic diversity of Toxoplasma, recently explored the effect of multiple strains of T. gondii on oocyst reshedding up to 36 months after initial infection.

Thirteen domestic short-haired cats aged 3 to 6 months were chosen for the study based on negative T. gondii serum titer on indirect immunofluorescence assay and negative fecal examination results. While anesthetized, the cats were inoculated via stomach tube with approximately 800 T. gondii cysts isolated from the brain tissue of challenged mice. Inoculations were performed at 3 time points with strains belonging to the 2 most common genotypes implicated in human and animal toxoplasmosis cases.

Five cats were inoculated initially with a genotype II strain and reinfected at 12 months with a genotype III strain. Another group of 5 cats was infected with genotype II strains at 0 and 12 months, followed by reinfec-
tion with a genotype III strain at 36 months. The final group consisted of 3 cats initially inoculated with a genotype II strain and reinfected at 36 months with a genotype III strain.

Fecal samples, collected daily for the first 20 days after each inoculation, were used to calculate the total oocysts per gram of feces (OOPG) for each cat. Levels of 3 immunoglobulin classes (IgG, IgM, and IgA) were measured in serum samples via enzyme-linked immunosorbent assay (ELISA) to determine antibody response. Among the 13 inoculated cats, the mean prepatent period after initial infection was 3.4 days, and oocyst shedding lasted an average of 7.0 days. Peak shedding occurred, on average, 6.9 days after inoculation. All cats shed similar amounts of oocysts after primary inoculation regardless of T. gondii strain and genotype, while just 1 of 10 cats shed oocysts after the 12-month reinfection and 5 of 7 shed oocysts after the 36-month reinfection.

Average OOPG count for cats that shed oocysts was lower after reinfection at 12 months (118,500) and 36 months (179,000) compared with after initial infection (749,141). The average prepatent period during reinfection was slightly increased, and shedding duration decreased by more than 50% compared with initial infection.

Serum IgM, IgA, and IgG were all measurable from just after the first infection shedding period until 3 months after the 12- and 36-month reinfections, indicating long-term antibody response. Interestingly, reinfection did not significantly change antibody concentrations in the cats.

Reshedding rates were higher in cats that received a genotype II strain before receiving a genotype III strain, while those that received a genotype III strain first demonstrated lower reshedding rates.

Study Examines Primary Rabies Immunization in Young Dogs

By Natalie Stilwell, DVM, MS, PhD

Researchers in Greece recently performed a retrospective study examining whether variables such as age, breed, vaccine type, and number of vaccine doses affect rabies antibody titer in young dogs.

Serum sample records were retrieved from the Greek National Reference Laboratory for Rabies, an approved rabies serology laboratory that verifies vaccine effectiveness via titer measurement using fluorescent antibody virus neutralization testing. The laboratory follows international standards for titers: 0.5 IU/mL or higher is acceptable, and less than 0.5 IU/mL is considered vaccine failure.

Serum samples were included in the study if the dog was younger than 12 months at the time of the most recent rabies vaccination and if serologic testing was performed prior to the first annual booster after 12 months of age.

Serum antibody titer data were available for 332 male and 330 female dogs from 2008 to 2015. Purebreds and mixed breeds were represented equally. There were 215 (32.5%) small dogs, 75 (11.3%) medium, and 149 (22.5%) large; size data were not recorded for 223 (33.7%) dogs.

Acceptable titer threshold (≥0.5 IU/mL) was achieved for 573 (86.5%) dogs, and 89 (13.5%) experienced vaccine failure as indicated by titer values less than 0.5 IU/mL; 546 dogs (82.5%) received 1 vaccine before 12 months of age, and 116 (17.5%) received 2 vaccines. Dogs that were vaccinated twice were more likely to have an acceptable titer (91.1%) compared with those vaccinated once (83.9%), and median titer was higher after 2 vaccine doses compared with 1 (13.77 vs 4.56 IU/mL).

The age of most recent vaccination was 0 to 3 months in 35 (5.3%) dogs, 3 to 6 months in 275 (42.5%), 6 to 9 months in 168 (25.4%), and 9 to 12 months in 142 (21.3%). The time interval between vaccinations was not recorded for dogs that received 2 vaccines. The median interval between most recent vaccination and blood sampling was 5.29 weeks, and seropositivity decreased with increasing time interval. Results suggest the optimal time to measure viral titers is 4 to 6 weeks after rabies vaccination.

Most (88.7%) dogs received a monovalent rabies vaccine, which was more likely to provide acceptable titers compared with a polyvalent vaccine (91% vs 54% acceptable rate). Mixed-breed dogs had higher antibody titers than purebred dogs did, and the vaccine failure rate was significantly higher in puppies younger than 3 months compared with older dogs. Body size did not significantly affect vaccination outcome.

Administering 2 rabies vaccines resulted in significantly higher viral titers in dogs younger than 1 year. Monovalent vaccines provided a superior response compared with polyvalent vaccines, and the highest titers were achieved when vaccines were administered in puppies at least 3 months of age.
Reverse Vaccinology: A New Approach to Controlling Cat Fleas

By JoAnna Pendergrass, DVM

Ctenocephalides felis, the domestic cat flea, causes clinical signs such as allergic reactions and general discomfort. Found worldwide, it transmits such pathogens as Yersinia pestis that affect human health. Cat flea control is challenging and often requires a multimodal approach with insecticides that disrupt growth and development. C felis, though, is reportedly becoming resistant to these compounds.

Vaccines offer an environmentally friendly alternative to insecticides. Rather than prevent infestations, vaccines reduce infestations by negatively affecting an ectoparasite’s biological activity after it feeds on an immunized animal. To date, vaccine development against C felis has been limited due to the difficulty of identifying protective antigens against ectoparasites and a lack of genetic information on Ctenocephalides spp fleas.

Reverse vaccinology, which uses omics technologies to screen a pathogen’s genome and identify potential protective antigens, has been used with success in developing antibacterial and anti-tick vaccines. The authors of a recent publication reported the use of reverse vaccinology to identify protective antigens for controlling cat flea infestations.

The investigators extracted RNA and protein from unfed male and female domestic cat fleas. They then used transcriptomics (RNA transcript analysis) and proteomics (large-scale protein analysis) to select genes encoding 6 candidate protective antigens with functions potentially relevant to cat flea biology:

- F1: energy metabolism regulation
- F2: cellular volume and energy regulation
- F3: proteolytic cascade regulation
- F4: regulation of insect development and reproduction
- F5: general development
- F6: development and immune response

The antigens’ genes were cloned using reverse transcriptase polymerase chain reaction to produce recombinant proteins that were then formulated into vaccines. Healthy domestic cats received subcutaneous injections of either the vaccines or adjuvant (control) on study days 0 and 14, then were infested with adult unfed fleas on day 28.

The investigators collected blood from all cats before immunization and before and after infestation to analyze the gamma electrophoretic mobility (IgG) response. They also determined vaccine efficacy by analyzing 6 factors of cat flea development: flea fertility, viability, mortality, and fecundity; oviposition; and egg hatchability.

The IgG response remained higher in immunized cats than in control cats throughout the study. Further analysis demonstrated that the sera of immunized cats “recognized the recombinant proteins, showing that the IgG antibody response in vaccinated cats was directed against these protective antigens,” the authors wrote.

Overall vaccine efficacy ranged from 32% to 46%. Compared with controls, vaccination with each protective antigen reduced egg hatchability and flea fertility but had no effect on flea mortality or fecundity. A few antigens reduced oviposition and flea viability.

In control and immunized cats at infestation, the investigators observed reduced egg hatchability and fertility with increasing antibody levels. This negative association indicated an important relationship between vaccination and cat flea reproductive capacity.

The vaccines’ effect on hatchability and fertility correlate with the metabolic and developmental functions of the protective antigens, the authors noted.

The study’s findings support the use of vaccines to control cat flea infestations, the authors concluded. Reverse vaccinology can help improve the identification of protective antigens that negatively affect cat flea reproduction and development. These antigens, the authors suggested, could be used singly or in combination in vaccines to achieve effective cat flea control.

Dog Treats: Packing Too Much Punch?

By Kerry Lengyel

A dog’s daily treat intake should not exceed 10% of its energy needs, according to World Small Animal Veterinary Association nutrition assessment guidelines. But new study findings reveal that most commercially available dog treats do exceed the recommended daily maintenance energy requirement (MER).

A research team from Italy and Belgium analyzed 32 commercially available dog treats (4 biscuits, 9 tender treats, 2 meat-based strips, 5 rawhides, 8 chewable sticks, and 4 dental care sticks) to determine levels of minerals, starch, simple sugars (glucose, fructose, and sucrose), and the amino acid hydroxyproline. “This is the first investigation to categorize dog treats and determine their nutrient profile,” the authors wrote.

After analyzing all 32 treats, the investigators identified several label miscommunications, such as:

- About 3 out of 4 treats (76%) contained 4 to 9 ingredients, many of which had ambiguous label descriptions.
- Almost half mentioned “sugars” in their ingredient list (sucrose was the most prevalent).
- All the treats contained different amounts of minerals.
- Biscuits were the most calorically dense, and dental sticks were the least.

The investigators originally set out to determine whether the treats exceeded the recommended MER. They found that:

- Biscuits accounted for 16% of MER for dogs of any size.
- Rawhides exceeded 25% of MER for small dogs and 18% of MER for medium-size dogs.
- Chewable sticks exceeded 10% of MER for dogs of all sizes and accounted for 16.9% of MER in small dogs.

Only the dental sticks were below 10% of MER for dogs of any size, meeting the guidelines.

Although the study analyzed just a small number of treats in each category, the results suggest that labeling needs vast improvement, especially for small dogs. “Small dogs receive the highest percentage of maintenance energy requirement when producers’ feeding instructions are followed,” the authors wrote. They also suggest that treat manufacturers and producers consider dogs with ingredient sensitivities and conditions such as heart failure and kidney disease because these dogs could be harmed by the high mineral content found in all the examined products.

“We considered the study’s findings to show that dog treats can exceed the recommended MER, leading to potential nutritional imbalances,” the authors concluded. “This is a concern, as the authors wrote, that treat labeling should include more information on the ingredients used,” the authors concluded, “and the varying nutrient and caloric density of treats should be considered.”

Accuracy of Auricular and Axillary Versus Rectal Thermometry

By Natalie Stilwell, DVM, MS, PhD

Rectal thermometry, the gold standard for small animal temperature assessment, can be difficult in patients with rectal disease or an uncooperative temperament. Axillary and auricular methods offer alternatives, but their reference ranges in dogs are not yet established. A recent report assessed the accuracy of axillary and auricular temperature in a healthy canine population using rectal temperature as the gold standard comparison.

Fifty canine patients admitted for various elective surgical procedures at either the Dallas Veterinary Surgical Center in Texas or Oklahoma State University, this took place on the day of presentation, the day of surgery before premedication was administered, and after full recovery from anesthesia. At Dallas Veterinary Surgical Center, temperature measurements were obtained 10 to 15 minutes after admission, after full recovery from anesthesia, and the morning of discharge (typically 1 day after surgery).

Study participants included 26 female and 24 male dogs representing over 20 breeds and ranging from 1 to 11 years in age and 4 to 64 kg in weight. Body condition score, recorded for all but 1 dog, averaged 5.8/9 (range, 4-8).

Pearson’s linear correlation coefficient showed that axillary temperature had poor agreement with rectal temperature. Overall, axillary temperature underestimated rectal temperature with an average discrepancy of 1.2°C and a maximum discrepancy of 4.0°C. Only 1 of 50 axillary temperature readings was the same as the rectal temperature, and axillary temperature had an overall sensitivity of 68% and a specificity of 58%.

Although auricular temperature agreed more strongly with rectal temperature, the average discrepancy was still 0.6°C, with a maximum difference of 2.2°C. Six of 50 auricular readings were the same as the rectal temperatures, and the method had an overall sensitivity of 75% and a specificity of 76%.

Axillary and auricular temperatures also had poor agreement with each other, with auricular temperatures generally higher. Axillary temperature decreased as body size increased, but body condition score itself was not correlated with either axillary or auricular temperature.

The investigators concluded that both axillary and auricular temperatures are poor predictors of rectal temperature in dogs. Although auricular temperature is commonly used in human medicine, this method may be less predictable in dogs due to the unique anatomy of the canine ear canal. Nevertheless, auricular temperature was more accurate than axillary and the suggested method for cases in which rectal temperature cannot be obtained.

Scientists Confirm the Harm in Feeding Raw Pet Foods

By Amanda Carrozza

Incorporating raw meat into the diet of companion animals has been widely debated. Proponents argue that raw foods provide nutritional value that can’t be achieved through kibble, promote healthier digestion, and reduce periodontal disease. Critics, including the FDA, deny such benefits and warn that raw pet foods expose animals to bacterial infection. Several raw pet food products have been recalled in recent months due to the potential for contamination.

Hoping to provide evidence either way, a team of scientists from Utrecht University in the Netherlands tested for the presence of zoonotic bacterial and parasitic pathogens in raw meat-based pet foods. The results, published earlier this year, revealed the presence of Escherichia coli, Listeria monocytogenes, and Salmonella. What’s more, people are at risk when they handle raw pet food or are licked by an animal that consumed the food.

The investigators analyzed samples from 35 raw meat diet products across 8 brands available in the Netherlands. After thawing the meat, the investigators looked for the presence of Salmonella, L monocytogenes, E coli, and antibiotic-resistant E coli, as well as 2 types of parasites, Sarcocystis and Toxoplasma gondii.

E coli serotype O157:H7 was found in 23% (8/35) of the products, and the antibiotic-resistant beta-lactamase-producing E coli was found in 80% (28/35). L monocytogenes was present in 54% (19/35); other Listeria species in 43% (15/35); and Salmonella species in 20% (7/35).

Concerning parasites, 11% (4/35) of the products contained Sarcocystis cruzi; another 11%, Sarcocystis tenella. Six percent (2/35) of products contained T gondii.

“The results of the study demonstrate the presence of potential zoonotic pathogens in frozen raw meat-based diets that may be a possible source of bacterial infections in pet animals and, if transmitted, pose a risk for human beings,” according to the investigators. “If nonfrozen meat is fed, parasitic infections are also possible.” They added that pet owners should be made aware of the risks associated with feeding their pets raw meat.

Raising Awareness of Emerging Superbugs

Bacterial strains that have become resistant to antibiotics—particularly gram-positive organisms such as *Staphylococcus*—pose a growing threat to both people and animals.

By Nicola M. Parry, BVSc, MRCVS, MSc, DACVP, ELS

(continued from front cover)

Vancouver, British Columbia, Canada, Dr. Davis discussed the risks posed by the emergence of antibiotic resistance in some bacteria, focusing on staphylococci.

Gram-positive bacteria such as staphylococci are typically more environmentally hardy than gram-negative organisms are, she said, because gram-positive bacteria have a relatively thick cell wall made up of multiple layers of peptidoglycan. The thinner cell wall of gram-negative bacteria comprises fewer layers of peptidoglycan, although these organisms also have an outer membrane containing lipopolysaccharide.

Because gram-positive bacteria tend to persist longer in the environment, they pose a concern from a One Health perspective, Dr. Davis said. Multiple factors affect environmental longevity. In general, staphylococci can survive on surfaces for weeks to months, and Dr. Davis stressed that “at least weeks” is a good rule of thumb.

These organisms do not simply transmit from person to person, she noted. They also can move around on dust particles—even making the bed has been associated with airborne re-suspension of *Staphylococcus aureus*. Because dust that goes up eventually comes down, surfaces that typically go untouched, including upper surfaces in veterinary hospitals and necropsy rooms, can become contaminated. The bacteria also may persist on dry fomites, such as keyboards and cell phones, and be transmitted through contact with these surfaces.

**ANTIMICROBIAL RESISTANCE IN STAPHYLOCOCCUS SPECIES**

Methicillin-susceptible *S. aureus* strains become methicillin-resistant *S. aureus* (MRSA) strains by acquiring a staphylococcal cassette chromosome mec (SCCmec) element carrying the mecA gene, which is responsible for methicillin resistance, Dr. Davis said.

Currently, all *Staphylococcus* species that infect humans and domestic animals exhibit some degree of antimicrobial resistance. Over the past decade, methicillin resistance has become a serious and increasing problem in both veterinary and human medicine.

**IMPORTANT METHICILLIN-RESISTANT STAPHYLOCOCCUS SPECIES IN VETERINARY MEDICINE**

According to Dr. Davis, MRSA and methicillin-resistant *Staphylococcus pseudintermedius* (MRSP), in particular, have emerged as clinically important pathogens causing infections in dogs and cats. However, coagulase-negative staphylococci, such as methicillin-resistant *Staphylococcus schleiferi* (MRSS) and *Staphylococcus lugdunensis*, also have become increasingly problematic in veterinary medicine.

The prevalence rates of these methicillin-resistant strains may vary according to animal species, she said. For example, *S. pseudintermedius* occurs more in dogs than cats. In cats, however, all 3 organisms tend to have similar prevalence rates.
MRSA

Although *S. aureus* is primarily a pathogen of people, it can colonize and infect animals. In human medicine, skin and soft tissue infections due to MRSA have caused significant public health and economic burdens for several decades, especially in relation to hospital-associated infections. However, MRSA also poses a risk to companion animals, Dr. Davis said.

Most cases of MRSA in dogs and cats tend to result from exposure of animals to infections in their owners, Dr. Davis said. She discussed the Pets and Environmental Transmission of Staphylococci (PETS) study, in which her research team analyzed swabs collected from 196 pets that lived with a MRSA-infected person.2 “Despite being exposed to a pet owner with a MRSA infection, dogs were still more likely to be carriers of *S. pseudintermedius* [20% vs 41%],” she said, noting that this study supports the species adaptation of *S. pseudintermedius* to dogs. In comparison, 17% of cats were carriers of MRSA, she said, and just 3% of *S. pseudintermedius*.

Veterinarians do not necessarily have to determine whether an animal living with an infected owner also has MRSA, Dr. Davis said. Instead, she recommends that veterinarians consider both routine contact isolation of the animal and environmental decontamination while the owner is being treated. “A key message is ‘remember the environment,'” she said.

Nevertheless, sometimes a veterinarian might need to determine whether an animal is a reservoir of MRSA, such as in cases involving intractable infections in the owner's family or for research purposes. In these instances, veterinarians should collect swabs from the animal’s mouth, which the PETS study findings showed to be the most sensitive anatomic site to sample for isolation of staphylococci in this kind of population, Dr. Davis said. The site may differ for animals not exposed to an owner with MRSA infection.

Genetic testing has shown that companion animals such as dogs and cats typically carry MRSA strains associated with humans, such as MRSA clonal complex (CC) 8. In contrast, large animal species tend to carry animal-adapted strains, such as CC398 and CC9 in livestock. Interestingly, many of the livestock-adapted strains do not carry the staphylococcal complement inhibitor (scn) gene, an immune evasion cluster gene that encodes an immune-modulating protein.

Two main lineages of livestock-associated MRSA exist, Dr. Davis said. One, CC398, associated with tetracycline resistance, typically is transmitted from animal to animal and has become a rapidly emerging cause of human infections, usually through livestock exposure. The other, CC9, is an emerging strain first identified in Asia in association with pigs and pork products.

MRSP

Dr. Davis described MRSP as the kissing cousin of MRSA and a major concern in veterinary medicine. This leading cause of dermatologic disease in dogs is becoming increasingly multidrug resistant, she said, with the potential to infect humans, especially people with dog bite wounds. Dr. Davis reported carriage rates of up to 12% for owners in contact with MRSP-infected dogs.

Coagulase-Negative Staphylococci

Although MRSA and MRSP are coagulase-positive staphylococci, coagulase-negative staphylococci are also emerging as significant pathogens in veterinary practice, according to Dr. Davis.

*S. schleiferi* is one such emerging pathogen in both pets and people, with some evidence for increasing drug resistance. It was originally characterized as 2 subspecies: 1 coagulase-negative and 1 coagulase-positive. However, recent genome sequencing studies have shown that these are not different subspecies but, rather, simply variants within 1 particular species. *S. schleiferi* species are considered “coagulase variable,” she said.

*S. lugdunensis* is another coagulase-negative organism and emerging pathogen in pets and people. It typically causes skin infections or endocarditis in people. “So, don’t assume that just because a *Staphylococcus* strain is coagulase negative that it is not the cause of infection,” Dr. Davis emphasized.

IDENTIFYING METHICILLIN-RESISTANT STAPHYLOCOCCI

Culture is the gold standard laboratory method used to detect staphylococci, Dr. Davis said. However, she noted, it typically uses a broth-based enrichment technique to address contamination with nontarget bacteria and favor staphylococcal growth. In addition, because the epidemiology, pathogenicity, and drug resistance of these bacteria vary depending on their species, it is important to speciate any staphylococcal isolates identified in a clinical specimen.

Strain typing provides additional useful information, she said, and is important for diagnosis, treatment, and epidemiologic surveillance of these bacterial infections. Several molecular typing methods are used to characterize these bacteria, although there is no consensus regarding the single best method. Pulsed-field gel electrophoresis has traditionally been considered the gold standard for molecular strain typing, particularly because of its high discriminatory power and standardized protocols. Its downside: Results may differ from one laboratory to another.

Other methods, such as multilocus sequence typing and staphylococcal protein A typing, are also widely used for distinguishing genetic relationships between groups of methicillin-resistant staphylococcal strains. Whole-genome sequencing, a relatively new technique that uses next-generation DNA technology to compare the genomes of bacterial isolates, is rapidly becoming the new gold standard typing method, Dr. Davis said, although it typically costs more than other typing methods. Prices have been dropping as the technology improves, she added.

OCCUPATIONAL EXPOSURE TO MRSA

To illustrate the occupational health risks of MRSA, Dr. Davis discussed a study that investigated MRSA carriage in people who worked on pig farms.3 The findings showed that workers who always wore masks when working with the animals had the lowest rates of nasal colonization with livestock-associated drug-resistant MRSA strains. Those who wore masks only occasionally saw no benefit.

Emergence of MRSA, especially ST188 isolates, also has been reported in nonhuman primate collections, Dr. Davis said, highlighting captive nonhuman primates as an underrecognized source of MRSA.4-6 She described a recent report of a severe MRSA skin infection in an animal technician who had been bitten by a MRSA-colonized primate.4

Because methicillin-resistant staphylococci are relatively common pathogens in animals, Dr. Davis reminded veterinarians to be aware of the associated public health and occupational health risks. The exposures of pig farm workers and the technician to MRSA underscore the need to use personal protective equipment when working with potentially colonized animals or infected tissues, she said: “Both pathologists and clinicians could be at risk for exposure.”

References available at AmericanVeterinarian.com.
Managing Wounds in Wildlife

Key considerations when evaluating wound treatment options for wild animals involve the type of injury and the individual patient’s needs.

By Laurie Anne Walden, DVM, ELS

In her presentation, Dr. Archibald discussed wound biology, wound dressings, factors affecting healing, and current therapies.

PHASES OF HEALING

The phase of wound healing partly determines the choice of wound care product, according to Dr. Archibald. The initial inflammatory phase lasts about 4 days and is characterized by redness, swelling, and pain. Blood flow to the wound increases and platelets aggregate. Exudate forms as part of the natural debridement process.

The repair phase begins 3 to 5 days after wound initiation, fibroblasts contract the wound and granulation tissue forms. In the next days to weeks, a fragile layer of epithelial cells migrates across the granulation bed at a rate (in mammals) of about 1 mm per day.

In the maturation phase, which lasts days to months after wound initiation, more layers of epithelium and connective tissue are laid down. The new tissue has about 80% of the strength of the original epithelium. Scars formed during this phase are a particular concern in wildlife, Dr. Archibald said. For example, scars that distort critical structures such as the eyelid or patagium (wing membrane) can impair an animal’s ability to function in the wild. Deep wounds that disrupt follicles can also cause loss of feathers or fur.

INITIAL WOUND CARE

When a wild animal arrives for treatment, the first step is to stabilize the animal and address life-threatening injuries. Chest wounds can be accompanied by pneumothorax, for example. For animals with limb wounds, Dr. Archibald recommends determining whether innervation and blood supply to the distal limb are intact and ligaments and tendons are still present.

“Ideally, every animal that’s coming in to have a wound evaluated is given some form of analgesia,” Dr. Archibald said. Some animals require sedation or general anesthesia. Although wounds in wildlife are dirty, they should be evaluated and treated using aseptic technique.

DEBRIDEMENT

The goals of debridement, which occurs mainly during the inflammatory phase, are to remove infected or necrotic tissue, ensure that wound edges have sufficient blood supply, and—ideally—maintain aseptic technique, Dr. Archibald said. She classified debridement techniques as nonselective (encompassing the entire wound) and selective (directed specifically at the tissue to be removed).

Nonselective Debridement

Dr. Archibald reviewed 2 nonselective debridement techniques: irrigation and application of a gauze contact layer.

Wound Irrigation

Nearly every wound is irrigated to remove contaminants and improve visualization of the wound. Although a variety of fluids can be used to flush wounds, Dr. Archibald noted that “volume is significantly more important” than fluid type.

“The current literature recommends high-volume and, ideally, high-pressure [irrigation] unless it’s very delicate tissue,” she said. The suggested lavage volume is 50 to 100 mL of fluid per centimeter.
of wound. Low-pressure irrigation is gentle to tissues and does not force bacteria deeper into the wound, but it does not debride as well as high-pressure irrigation, which can be performed with a pressurized fluid bag or a large syringe with an 18-gauge catheter attached.

The ideal lavage fluid is balanced electrolyte solution or sterile phosphate-buffered saline, Dr. Archibald said. Tap water is also acceptable, although because it is hypotonic it can be cytotoxic to fibroblasts. Adding an antiseptic such as chlorhexidine or povidone-iodine to lavage fluid does not enhance the mechanical removal of debris. If antiseptic solutions are used, they should be diluted properly. Dr. Archibald added that scrub preparations should be avoided because detergents are cytotoxic to open wound tissue; these products are intended for use on healthy skin before surgery. Hydrogen peroxide (3%) and vinegar are also cytotoxic and should not be used to flush wounds.

**Gauze Contact Layer**

Adherent contact layers, such as wet-to-dry dressings (gauze soaked in saline and allowed to dry on the wound), are no longer recommended and should never be used on granulation tissue, Dr. Archibald said. Although this type of dressing provides mechanical debridement, it can delay healing, and removing it can be painful for the patient.

**Selective Debridement**

Selective techniques include surgical, enzymatic, and autolytic debridement. Surgical debridement allows large amounts of necrotic tissue to be removed quickly. Enzymatic products (eg, those containing protease or trypsin) are also available.

Autolytic debridement refers to the body’s natural debridement. Enzymes, cytokines, and other components of wound exudate kill bacteria and remove dead tissue while preserving healthy tissue. This natural process occurs only in a moist environment, Dr. Archibald noted.

**WOUND DRESSINGS**

“Moist wound healing is the current standard of care for open wound management in humans,” Dr. Archibald said. Moisture promotes autolytic debridement, helps granulation tissue form, and decreases bacterial populations by reducing oxygen content and facilitating antibiotic penetration into the wound.

Because moist wounds reepithelialize faster than dry wounds, moist wound healing shortens the time wild animals must be held in captivity for treatment, Dr. Archibald noted. She discussed several types of agents and dressings that maintain a moist wound environment.

**Hyperosmotic Agents**

Hypertonic saline, honey, sugar, and other hyperosmotic agents draw out exudate, reduce edema, and inhibit bacterial growth. Dressings containing these agents should be changed frequently, Dr. Archibald said, noting that hypertonic saline can dehydrate healthy tissue surrounding a wound. Honey, which acts as an antioxidant and contains a low concentration of hydrogen peroxide, is more effective than sugar, she said. Medical-grade honey is available.

**Hydrophilic Dressings**

Hydrophilic wound dressings are absorbent, semiocclusive materials that create a moist wound environment and promote granulation, but do not adhere to wounds. Dressings containing alginate, a biomaterial derived from seaweed, are highly absorbent and useful for wounds that produce heavy exudate. Polyurethane foam and hydrocolloids work well for mildly to moderately exudative wounds. Hydrogel dressings provide moisture for dry wounds with little or no exudate.

**Nonadherent Semiocclusive Dressings**

Dressings such as polyurethane film and gauze coated with nonadherent material are not hydrophilic and may be drying. They should be used only in wounds that have had time to develop an intact epithelial layer unless they are used as a secondary layer, Dr. Archibald said.

**Topical Antimicrobial Products**

Silver sulfadiazine and triple antibiotic preparations reduce the concentration of bacteria at the wound surface. These products slow wound contraction and can be used during the inflammatory and possibly early granulation phases of healing.

**FACTORS THAT INFLUENCE WOUND HEALING**

Dr. Archibald reviewed a number of factors that affect wound healing, including infection, wound location, nutrition, the environment, the overall health of the patient, and the species involved.

She noted the distinction between infection and contamination: Infection involves a host response, but contamination does not—bacteria are present in the wound but have not yet colonized. Infection inhibits healing by disrupting the blood supply, lengthening the inflammatory phase, and producing enzymes that interfere with the healing process.

Wounds in areas that are subjected to tension, pressure, or motion may undergo ischemia or dehiscence. Splints can be used to limit joint motion.

Dr. Archibald emphasized the importance of good nutrition for animals with traumatic injuries. “Wound healing is a catabolic state,” she said, adding that wild animals presented for treatment are often already undernourished.

Enclosures for wildlife should be designed to minimize animal stress, as well as cleaned and disinfected properly to reduce hospital-acquired infections. Reptiles should be housed at the upper end of their optimal temperature zone to facilitate healing.

**CURRENT TREATMENTS**

Dr. Archibald concluded with a discussion of current wound care therapies that can be used in wildlife.

- **Cold laser:** Studies of this therapy in veterinary patients are ongoing, Dr. Archibald said. Cold laser therapy is thought to stimulate capillary growth and vasodilation. This treatment is costly, requires safety training, and should not be used in patients with cancer.

- **Growth factors:** Recombinant platelet-derived growth factors are used to treat diabetic ulcers in humans. Like cold laser, this treatment is expensive.

- **Platelet-rich plasma:** This treatment uses the patient's own platelets as a source of natural growth factors.

- **Vacuum-assisted closure:** Applying subatmospheric pressure across a wound improves perfusion; stimulates granulation tissue; and decreases edema, exudate, and bacterial load. Dr. Archibald described an inexpensive way to achieve a vacuum: Punch small holes in the tubing of a butterfly catheter, lay the catheter in the wound, cover it with an occlusive bandage, and attach the catheter needle to an evacuated blood collection tube or a syringe with negative pressure applied.

“There are many, many treatment options for wounds,” Dr. Archibald concluded. Considering the type of wound and the patient's specific needs can help guide the veterinarian's choice of treatment.
Evaluating and Addressing Feline Aggression

Aggression in cats is a complex problem that requires open and honest client communication and an understanding of when medication should be part of the treatment plan.

By Amanda Carrozza

(continued from front cover)

Although it’s true that cats with aggressive behaviors can become a danger to people, other pets, and themselves, feline aggression may be a surface indicator of something deeper. Identifying the underlying causes of aggression and creating a treatment plan to ameliorate hostile situations may ultimately save patients’ lives. At the 2017 New York Vet conference in New York City, Lisa Radosta, DVM, DACVB, explained some of the complexities of dealing with feline aggression, including what clients may not realize are normal feline behaviors, the need to obtain a comprehensive patient history, and situations in which medications or supplements may—or may not—play a role.

GATHER A THOROUGH PATIENT HISTORY

The first step in treating a cat with a behavioral disorder is gathering an in-depth history, said Dr. Radosta, who owns Florida Veterinary Behavior Service in West Palm Beach. “For some reason, when veterinarians are faced with a behavior case, we freeze,” she said, “yet compiling as much detail as possible is as imperative for cases of feline aggression as for any other case that walks through your hospital door.”

Asking open-ended questions is vital to uncovering necessary information, said Dr. Radosta. Simply asking whether the cat is aggressive won’t establish the whole picture. Once in the examination room, many pet owners will forget important aspects or misjudge which details are relevant.

In most cases, gathering a comprehensive history means pressing the client for additional information. For example, if you ask whom the cat is biting, be prepared to probe for clarification to determine whether it’s just the client, his or her spouse, children, or other animals in the household. “A client may relay that the patient is biting her husband but forget to tell you that she has also been a victim of the cat’s aggressive behaviors,” explained Dr. Radosta. The client may also note that even though the cat bites her, the cat loves her. “The emotional aspects are not as important for diagnosis,” said Dr. Radosta. “You need the facts.”

For multicat households, veterinary teams must also determine exactly which cats are displaying negative behavior. The truth is, pet owners have favorites, Dr. Radosta said. A client may pin behavioral issues on the cat that has been labeled as the spouse’s when in reality more than 1 cat in the home is aggressive.

Be prepared for the true investigation to begin when you ask about the onset and evolution of negative behaviors, Dr. Radosta said. “You may find out that aggression started at 5 months, but the cat is now 5 years old,” she said. “Very often I ask ‘What brought you here today when this has been going on for a long time? What happened?’ Common reasons may include a new pregnancy or a new living situation in which someone in the home is less tolerant of the behaviors. “You need to know why there is an urgency now and how the behavior has progressed,” she added.

It’s also crucial to identify situations in which a cat is exuding aggressive or intimidating behaviors that the pet owner views as benign. Body blocking is a classic example. “Ask the client whether Teddy sits in the hallway to strategically block Fluffy from passing or whether Teddy spreads himself across the hallway to block access to the litter box,” Dr. Radosta said. Although not an outward attack, body blocking is a clear form of aggression.

Finally, Dr. Radosta explained that evaluating the risks associated with the situation is critical. Is the cat a threat to the public because it might bite a stranger who enters the home? Is this a welfare issue because the animal has a very poor quality of life? Is the owner considering relinquishment or euthanasia?

In her own practice, Dr. Radosta said she reviews an 8-page questionnaire with clients whose cats present with aggression or behavioral problems. Rather than implement the same lengthy form, Dr. Radosta encouraged veterinarians to create a simple yet detailed document with which they are comfortable. As a starting point, she offered a 2-page form on her practice website (flvetbehavior.com) that other hospitals can use or model for their own patient history forms. It covers topics ranging from changes in behavior and lifestyle to rate of recurrence and suggested recheck dates.

EXPLAIN NORMAL FELINE BEHAVIORS

It’s important to inform clients about the very natural reasons why their cats may be displaying
signs of aggression. Many domesticated cats live in settings that are contradictory to their instinctual behaviors, and this can lead to aggressive tendencies and hostile relationships with other cats living in the home. Other than in companion animal relat- ionships, cats don’t live in colonies with other unrelated cats.

“Studies have shown that cats who are related will live together, groom each other, and sleep together,” Dr. Radosta said. “It is unnatural for cats to live in a house or an apartment with another cat they’re not related to.” This information should be used to help pet owners understand that a big reason why their cats might be fighting is simply that the living situation is perverse. If cats are not sleeping in a pile or touching or even within 2 feet of each other, they are probably not friends, she said.

Socialization is another key contributor to aggressive behaviors within multicat households. “When cats are adopted, they typically never see another cat until the next one comes in,” she explained, and that situation in itself can be very jarring. “If I was raised by monkeys and then one day I saw a person, I’d be like ‘What is that strange thing, and why is it drinking out of my bowl,’” she added.

It is important for pet owners to understand that situations outside a cat’s normal socialization—which never before included another cat—are scary. Once pet owners begin to comprehend what is normal and abnormal for a cat, they recognize that introducing their cats to atypical situations, while never the intention, can induce aggression.

**DETERMINE THE NEED FOR MEDICATION**

Dr. Radosta stressed that veterinarians should be less concerned with aligning their diagnosis with textbook definitions and instead make a concerted effort to provide a detailed summary of what the patient is experiencing and why. “You don’t have to be perfect. You just have to be able to identify what is happening,” she said.

As a rule of thumb, compile enough information so that any veterinarian, even one unfamiliar with the case, could pick up the file and have a clear understanding of what has happened, what the presenting signs are, and what the cat’s home life is like. With a comprehensive patient history, a veterinarian can create a strategic course of treatment that is tailored to both the cat and the client. When treating cats with behavioral issues, Dr. Radosta reminded veterinarians, there are some instances in which prescribing medications or supplements is beneficial and others when it is unnecessary.

**Recovery Time**

Consider the period of time it takes the cat to recover after it has bitten someone or displayed another aggressive behavior, Dr. Radosta said. “If it’s a few hours or an entire day before the cat returns to a normal state, that is a long recovery,” she added, “and that animal most likely needs to be medicated.” On the other hand, if a cat bites but is playful and precocious again within an hour, the aggression is likely play induced and does not warrant medication.

**Environment and Welfare Issues**

Dr. Radosta also strongly recommends that veterinarians consider the cat’s welfare. If the owner shares that the cat spends long periods of time sequestered in a room with little to no positive interaction, it could be a sign that medication or a natural supplement is needed. Similarly, veterinarians must decide whether the cat’s environment is conducive to a positive outcome. “If there are children in the home, the answer 99% of the time is no. Children distract pet owners and keep them from doing what they’re supposed to for the cat,” she explained. “So, think about prescribing if there is a child in the home.”

**The Compliance Factor**

One key to successfully reversing aggressive feline behaviors is to create a relationship of honesty so that the owner understands that he or she is an integral part of the solution. “If you explain to the owner what steps need to be taken that do not include medications, but the owner admits he or she can’t comply, then you should think about prescribing,” Dr. Radosta said.

“It’s OK to be very clear to the client that you are prescribing medication because the client has been honest about the fact that there is no way he or she can do what the veterinary team is asking,” she said. “It’s also important to let the client know that the response is acceptable. The end goal is to ensure that the cat can live safely and happily in the home environment that has been created.

**Predictability**

Some pet owners can reasonably predict the hours of the day or the situations that will lead to aggressive behaviors. In those instances, the cat doesn’t need medication if the pet owner can learn to control interactions within those time periods by distracting the cat or removing triggers. If the cat randomly bites or the actions are predictable but the biting is deep and severe, a medication or supplement may be necessary to even out the cat’s neurochemistry.

Ultimately, judging the severity of the situation is subjective. Dr. Radosta admitted, but as long as a veterinary practice establishes a universal scale for all its feline patients, there will be a reliable measurement. “If you are faced with a severe or moderate to severe case, please consider adding medication to that pet’s plan,” she said.

**MANAGE OWNER EXPECTATIONS**

More than anything, Dr. Radosta emphasized that it is vital to manage client expectations, a key component of which is informing clients about what medications and supplements are and are not capable of doing. “You can expect a 25% change from a supplement and about a 50% change from medication if it is to be called successful,” Dr. Radosta said. Choosing which to utilize is sometimes based on client preference or the cat’s preexisting conditions.

“You should opt for a supplement in a geriatric pet with renal failure and heart disease because you know you don’t want to add another medication,” she explained. Be honest with the owner about your reasoning. Make it clear that it may take 2 supplements given at the same time to achieve the same result as a medication, but the supplements are in the best interest of the pet.

Other times, clients may ask for a holistic approach. They don’t want their pet on medication, and that’s fine as long as they understand the difference in behavioral changes they can expect. “If their expectations are managed and they’re on board with supplements, I am on board too,” Dr. Radosta said.

Still, she added, even with supplements, medications, and enrichment activities, make sure all parties involved (veterinarians included) accept and understand that you’re not fixing the problem; you’re suppressing it. And if the client stops doing the things you’re recommending, the problems will come back. In this regard, remedying aggression is like treating food allergies. The problem is still present; it’s just being avoided.

“Treating cats with medications is nothing to be ashamed of,” she concluded. “You are keeping cats in their homes, they are no longer biting people, and they are alive. Don’t feel that if you don’t have a resource in your community to perform behavioral treatments that you can’t treat aggression, because you can.”
Global Guidelines Put Dental Health in the Spotlight

This universal guide strives to provide clarity in an area of veterinary medicine that is widely ignored and subject to many myths and misconceptions.

By Amanda Carrozza

(continued from front cover)

oral care is nearly nonexistent in some practices. Although veterinarians agree on the importance of engaging in discussions with clients about the ramifications of pet obesity, many experts have long disputed the level of pain associated with oral decay.

To combat misinformation and ultimately improve the lives of animals, the World Small Animal Veterinary Association (WSAVA) released a comprehensive set of global dental guidelines in fall 2017. The 161-page document is divided into 9 sections that aim to support veterinarians worldwide in improving recognition of dental disease, understanding best practices for treatment, and creating realistic minimum standards for dental care. Digital copies can be downloaded from the WSAVA website.

Multiple sessions covering the guidelines were presented at Western Veterinary Conference in Las Vegas, Nevada, led by dental specialist Brook A. Niemiec, DVM, DA/WDC, DEVDC, FAVD, chief of staff at Veterinary Dental Specialties & Oral Surgery in San Diego, California, and animal welfare author and speaker Kymberley Stewart, DVM—both of whom were instrumental in creating the guidelines. American Veterinarian® interviewed these 2 experts at the conference to find out more about the guidelines and how they can be used to improve practice and patient welfare.

“The guidelines, first and foremost, were created to bridge the gap of a lack of knowledge,” Dr. Niemiec said. “There is a lack of knowledge in veterinary dentistry.”

He attributes much of the misinformation to a shortage of dental curriculum in veterinary schools. When recent graduates learn about dentistry, he said, it is often from doctors who didn’t properly learn about it during their own schooling 20 years earlier. “This ongoing cycle has resulted in a subpar level of care,” Dr. Niemiec said.

“Dentistry is probably one of the most important areas for standardization because it is practiced so differently and taught so differently everywhere—if it’s taught at all,” Dr. Stewart added.

The guidelines’ protocols were developed by a committee of WSAVA members that included veterinary dentists from North America, South America, Africa, Europe, and Australia, as well as experts in academia, anesthesiology, nutrition, and animal welfare advocacy and representatives from WSAVA’s other global-focused committees. They applied their varying areas of expertise to address many of the common misconceptions associated with oral health and provide practice standards to improve the overall quality of care companion animals receive.

PERIODONTAL DISEASE

In addition to being one of the most common ailments among animals, periodontal disease spreads quickly and can affect
seemingly unrelated body systems. To ensure that all veterinarians share a basic understanding of oral disease and how it progresses, the guidelines provide general knowledge of dental anatomy and physiology. The first section features a breakdown of the bones, nerves, and blood systems associated with the mouth, aided by images and tables that enrich the text.

The guidelines illustrate the quick and serious progression of oral decay: Plaque forms within 24 hours; calculus, within 3 days; gingivitis sets in as early as 2 weeks. Left untreated, periodontal infections have been linked to diabetes mellitus; heart, lung, liver, and kidney disease; and even early mortality. These facts are well supported by research and similarities in comparative medicine—including in humans—but are not widely understood by veterinarians.

**PAIN ASSOCIATED WITH DENTAL AILMENTS**

Central to the guidelines is a discussion about the level of pain experienced by animals with dental disease or injuries. According to Dr. Stewart, dentistry is one of the least addressed areas regarding animal welfare because veterinarians have wrongly been taught that these conditions don’t hurt or that simply monitoring the affected area is an acceptable standard of care. “We wouldn’t watch an animal with a broken leg, yet we watch an animal exist every day with a broken tooth,” she said. “To the animal, pain is pain.”

Many veterinarians assume that because a dog with a broken tooth continues to eat, the animal is not in pain, Dr. Niemiec said. However, animals know they need to eat to survive and will do so regardless of oral discomfort.

It is well documented in comparative species—rodents and humans—that fractured teeth, infected teeth and gums, and impacted teeth start to ache over time, Dr. Stewart added. “As more specialists in a variety of areas investigate how animals display pain, we’re discovering that perhaps they tell us they hurt in ways we wouldn’t expect, in ways that aren’t intuitive to us as humans,” she said.

Drs. Niemiec and Stewart, along with the other experts who collaborated on the guidelines, hope veterinarians will now better understand the need to address the misconception that oral ailments don’t hurt and work to alleviate the pain—and that veterinarians who rethink their current therapies will become better advocates for their patients.

**ANESTHESIA IS A MUST**

Another crucial takeaway from the guideline is that anesthesia is an integral part of veterinary dentistry. “There is not a veterinary dentist in the world [who] would say anesthesia-free dentistry is acceptable,” Dr. Niemiec said—but noted that this consensus follows a decades-long battle.

“If you don’t provide an oral cleaning under anesthesia, then you’re only scaling the surface of the teeth, which does nothing for the pet,” he continued. What appears to be a clean mouth may in fact be riddled with gum disease. “I’ve performed extractions on teeth that are perfectly clean but undetectable to the human eye. And taking x-rays, she continued, requires placing plates in unusual areas deep inside the mouth. The pain involved in manipulating the mouth, the intensity of restraint required to avoid risks associated with animal movement, and the invasiveness of the procedures themselves must be taken into consideration, according to Dr. Stewart. “Subjecting an animal to a proper complete dental cleaning is absolutely unacceptable without the removal of anxiety, pain, and awareness,” she said.

Dr. Stewart said she hopes that the guidelines’ information on how to perform better oral care—and why it’s so important—will change the way veterinarians view dentistry. After all, dental disease knows no geographical boundaries. ■

![Box. The 11 Steps of an Oral Exam](Image)

According to the guidelines, a complete dental prophylaxis includes the following steps (at a minimum).

1. **Presurgical exam and consultation:** Identifies obvious oral pathologies
2. **Chlorhexidine lavage:** Helps decrease the bacterial load, reducing the risk of contamination in the exam room
3. **Supragingival cleaning:** Ideally, uses a combination of mechanical and hand scaling
4. **Subgingival plaque and calculus scaling:** Treats periodontal disease (absolutely required)
5. **Residual plaque and calculus identification:** May be done manually, using a plaque-disclosing solution or air-drying the tooth surfaces
6. **Polishing:** Smooths the tooth surface following scaling; usually performed with a slow-speed handpiece
7. **Sulcal lavage:** Removes debris and helps improve healing
8. **Periodontal probing, oral evaluation, and dental charting:** A critical step that is often overlooked or improperly performed
9. **Dental radiographs:** Ideally, obtained for every area of pathology found
10. **Treatment planning:** Takes into account all the evidence gathered in earlier steps, as well as patient health and owner willingness to perform home care
11. **Application of a dental sealant (optional):** Helps prevent new plaque and calculus attachment.
MORE BACKYARD BIRDS MEAN GREATER SALMONELLA RISK

Raising backyard chickens has become more popular in the United States over the past 10 years because many municipal ordinances now allow property owners to keep a small number of hens (typically, fewer than 10) for egg production. “This has led to a large demand for small batches of chickens and an explosion of business for small hatcheries,” Dr. Fulton said.

However, he emphasized that most owners of backyard chickens have limited experience managing them, and they tend to treat these animals as household pets. This behavior increases the risk of transmitting diseases from the birds to humans, he said.

Although multiple zoonotic pathogens pose a risk to clients who keep backyard chickens, Dr. Fulton emphasized that most infections in humans from poultry are related to Salmonella and Campylobacter species. He shared tips on how veterinarians can educate their clients to reduce the spread of these infections.

RISK OF FOODBORNE ILLNESS FROM SALMONELLA AND CAMPYLOBACTER

Salmonella can infect humans who come in contact with poultry or eat improperly cooked eggs or egg products, Dr. Fulton said. Many cases of foodborne infection in people are due to Salmonella ser Enteritidis, he added. Although this bacterium causes only mild periportal hepatitis in chickens, it causes foodborne illness in humans. Most S Enteritidis infections in humans are associated with consuming undercooked food made with eggs, including bread pudding, Caesar salad, and custom-made mayonnaise, Dr. Fulton said.

He noted that recent Salmonella outbreaks in humans have also been associated with people having close contact with baby poultry. The most common species involved in those outbreaks have been Salmonella Montevideo, Salmonella Infantis, Salmonella Typhimurium, Salmonella Hadar, and Salmonella Braenderup, he said.

Dr. Fulton discussed results from a study of live poultry–associated salmonellosis reported by the Centers for Disease Control and Prevention (CDC). The data highlighted 53 disease outbreaks from 1994 to 2010 that involved 2630 human illnesses, 387 hospitalizations, and 5 deaths; 31% of cases occurred in children 5 years or younger, while 42% occurred in children younger than 10. Most cases (71%) were associated with exposure to baby poultry—including snuggling with and kissing baby birds. And even though 58% of the people involved indicated awareness of the risk of acquiring Salmonella infection from contact with poultry, 46% reported keeping birds in their house.

This study also showed an increasing number of Salmonella outbreaks from 2003 through 2013. Until relatively recently, some small hatcheries were one source of infection in people.
Training also allows curators and veterinary staff to better understand the animals, Dr. Van Bonn added. Whales, for example, sometimes exhale forcefully—a coughlike behavior known as chuffing. Veterinarians can learn much about a whale’s health and physiology by collecting the chuff and measuring hormone levels and other vital functions.

A DAY IN THE LIFE
An aquarium veterinarian’s daily responsibilities are both similar to and very different from those of a community veterinarian, say those in the field. Routine examinations and general animal care take up much of their time but by no means all of it. “Common problems range from vomiting and diarrhea to seizing animals to nutritional problems—issues you would see in a general practice,” Lance Adams, DVM, staff veterinarian at the Aquarium of the Pacific in Long Beach, California, said. “We see a lot of reproduction problems, because trying to manage reproductive issues in a managed population is a little difficult. We might not have the right sex ratios or the right water quality or the seasonal changes that the animals need to reproduce normally, and that can lead to problems. We try to stay on top of that and be selective with the animals that we acquire.”

Injuries resulting from interactions in mixed-animal exhibits are another common issue, according to Dr. Adams. “During encounters, they sometimes injure themselves or each other,” he said, “so we deal often with scrapes, infections, eye damage—things like that.” In 2007, a shark almost snapped off a sawfish’s rostrum at the Aquarium of the Pacific, requiring the veterinary staff to suture the bite wounds and splint the rostrum until it healed. “It turned out really well,” Dr. Adams said. “That was an exciting case.”

Aquarium veterinarians, like community practitioners, deal with geriatric issues, a happy result of quality care. “In captivity, fish and other animals are protected from food shortages, predation and disease, so we see geriatric problems that we would never see in the wild,” Dr. Adams explained. “For example, animals with arthritis that can’t swim as well are not going to survive very long in the wild, but in captivity, they do. So we deal with issues ranging from arthritis to vision problems to tooth wear.”

Emergent issues are also in a day’s work at the nation’s public aquariums, and some cases become memorable. Dr. Van Bonn once performed complicated knee surgery on a bullfrog (the patient recovered nicely), and Dr. Clayton recalls performing exploratory thyroid surgery on a knob-tailed gecko that resulted in removing a large cyst. The patient was then placed on a thyroid supplement, with the dosage determined by heart rate and shedding frequency because the animal was too small to provide a relevant blood sample.

Among Dr. Bossart’s most memorable experiences: the time his staff worked on an electric eel. “That was interesting because it required considering to anesthetize fish and amphibians so they can be examined. “This is a critical component to our daily practice and something that most community veterinarians aren’t going to have,” Dr. Clayton said. “In addition, we borrow liberally from all the technology that is used in human and veterinary medicine, and modify it so we can use it on really small creatures and really large creatures.” Because patients can weigh hundreds or even thousands of pounds, special equipment must be devised for hoisting and transport. At the other end of the spectrum, veterinarians use magnifying devices to examine and work on their smallest patients. Darting equipment, commonly known as jab sticks, is sometimes used to administer medication to species that are difficult to catch or would be too stressed by the attempt.

To promote innovation, Shedd Aquarium partners with the Northwestern University McCormick School of Engineering in Evanston, Illinois, challenging students to create custom equipment that would benefit its animals, such as an enrichment device for otters. When a trainer tosses in a special hollow ball stuffed with shrimp, the otter learns to slide the ball through the plexiglass maze at an opening at the bottom.

VAST RESEARCH
Unsurprisingly, research is an integral component at most aquariums, with vast areas of study. Shedd Aquarium’s microbiome laboratory, for example, has a DNA sequencer that promises to shine new light on unseen organisms, such as bacteria and fungi, that share space with the aquarium’s collections. The National Aquarium received a grant from the American Association of Zoo Veterinarian’s Wild Animal Health Fund to provide the first systemic description of the blood of horseshoe crabs, an important project because almost nothing is known about the health of these living fossils. The Aquarium of the Pacific is working to help save the severely endangered Guam kingfisher, as well as exploring ways to promote shark reproduction in captivity.

GETTING INVOLVED
Opportunities for veterinarians with an interest in aquatic medicine are broad, including large public aquariums, state fish and wildlife agencies, and community veterinary practices that provide services to fish enthusiasts. Interested students and practitioners are encouraged to attend meetings and conferences that emphasize aquatic medicine, and explore opportunities to shadow working aquarium veterinarians. “This is a great time to become involved in aquatic medicine because there are more and more opportunities,” Dr. Van Bonn said. “It’s a very exciting area of practice.”
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Going Viral With Video Marketing

Creating video content offers an inexpensive way to engage and build relationships with current and prospective clients. Here’s how to do it right.

By Amanda Carrozza

Video is now the preferred method of many people searching for information online, and significant research has been conducted to help marketers—including veterinarians—make the most of their campaigns. Follow these basic guidelines to start your video marketing off on the right foot.

MAKING VIDEOS

Content
Whether you’re creating your first video or your 50th, keep in mind some simple tactics and techniques. First, make sure you provide value; don’t create a purely promotional video. Use video to highlight a unique aspect of your practice, for example, but be clear about the value of that service or product for pets or pet parents.

Robin Brogdon, founder of BluePrints Veterinary Marketing Group and Veterinarian’s Money Digest® Editorial Advisory Board member, considers video a great way for practices to showcase new technology, equipment or services. “We’re so afraid to show pet owners what happens behind the scenes, but I think that sort of education helps them see the value in your services,” she said. If you have a new ultrasound machine, film a short video for clients that explains what the machine does and how it will help your team care for their pets, she added.

Tyler Lessard, vice president of marketing for Vidyard, an online platform for creating and deploying video, recommends creating video content that evokes emotion. “Pulled heartstrings and ha-ha moments drive action,” Lessard said. And don’t forget: Veterinary practices have at their disposal the magic ingredient that makes so many videos go viral—animals!

Length
When deciding how long a video will be, consider the information being conveyed, the platform for promotion and the ultimate goal, Brogdon suggested. For a standard Facebook video, her company generally recommends 60 seconds or less. “If you’re going to do a Facebook Live video or a tutorial, especially one that might reside on your website, then we recommend three minutes or less,” she said.

Polish
Above all else, Brogdon said, creating viral-worthy video content takes practice and polish. While she concedes that you don’t need special editing skills to create informative and entertaining videos, it’s important to familiarize yourself with editing software, test different lighting setups, and film rehearsal footage.

Eliminate shaky footage and enhance video shot on an iPhone by using a tripod. Take a few minutes to create a script and ensure that the person on camera or providing a voiceover does not stumble over his or her words.

MAXIMIZE YOUR REACH

Share your video on multiple platforms, starting with YouTube. The site not only stores your video library, but adding a title, description and keywords makes it searchable by all YouTube users. From there, use the “share” feature to access the video’s HTML code, which can be embedded onto your website. Videos do very well on business landing pages and can be used in conjunction with text for a blog post.

Rather than promoting a YouTube link on Facebook, consider uploading the video file directly to the social media website, where the content is more likely to be seen by your page’s followers. Most Facebook videos are viewed without sound, so make sure you’ve added captions that get your message across. Facebook’s caption generator automatically transcribes videos, which simplifies the process.

To make the most of your video marketing, share your videos frequently and monitor their engagement. As you expand your YouTube library, you’ll notice which topics perform best and can tailor future content to meet your audience’s needs.

References available at VMDtoday.com.

DID YOU KNOW?

79% Seventy-nine percent of consumers would rather watch a video to learn about a product than read text on a page.

2:00 Videos lasting up to two minutes get the most engagement. After two minutes, viewership drops off significantly.

1 billion YouTube has more than one billion users—almost one-third of all people on the internet.

135% A video on Facebook garners, on average, 135 percent more organic reach than a photo does.

85% Eighty-five percent of Facebook videos are watched without sound.

Using the word “video” in an email subject line can increase open rates by 19 percent and click-through rates by 65 percent.
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*BRAVECTO® kills fleas and prevents flea infestations for 12 weeks. BRAVECTO® Chew kills ticks (black-legged tick, American dog tick, and brown dog tick) for 12 weeks and also kills lone star ticks for 8 weeks.

Important Safety Information
BRAVECTO Chews for Dogs: The most common adverse reactions recorded in clinical trials were vomiting, decreased appetite, diarrhea, lethargy, polydipsia, and flatulence. Bravecto has not been shown to be effective for 12-weeks’ duration in puppies less than 6 months of age. Bravecto is not effective against lone star ticks beyond 8 weeks after dosing. Please see Prescribing Information on following page.
Flavored chews for dogs.

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

Description:
Each chew is formulated to provide a minimum dose of 11.4 mg/lb (25 mg/kg) body weight.

The chemical name of fluralaner is (±)-4-(3,5-dichlorophenyl)-5-(trifluoromethyl)-4,5- dihydrooxazol-3-yl)-2-methyl-N-(2,2-aminoo-2-(2,2-trifluoroethyl) ethyl benzenamide.

Indications:
Bravecto 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 Rhipicephalus sanguineus [brown dog tick]) for 12 weeks in dogs and puppies 6 months of age and older, and weighing 4.4 pounds or greater.

Bravecto 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.

Dosage and Administration:
Bravecto should be administered orally as a single dose every 12 weeks according to the Dosage Schedule below to provide a minimum dose of 11.4 mg/lb (25 mg/kg) body weight.

Bravecto may be administered every 8 weeks in case of potential exposure to Amblyomma americanum ticks (see Effectiveness).

Bravecto should be administered with food.

Dosage Schedule

<table>
<thead>
<tr>
<th>Body Weight Ranges (lb)</th>
<th>Fluralaner Content (mg)</th>
<th>Chews Administered</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4 – 9.9</td>
<td>112.5</td>
<td>One</td>
</tr>
<tr>
<td>&gt;9.9 – 22.0</td>
<td>250</td>
<td>One</td>
</tr>
<tr>
<td>&gt;22.0 – 44.0</td>
<td>500</td>
<td>One</td>
</tr>
<tr>
<td>&gt;44.0 – 88.0</td>
<td>1000</td>
<td>One</td>
</tr>
<tr>
<td>&gt;88.0 – 123.0*</td>
<td>1400</td>
<td>One</td>
</tr>
</tbody>
</table>

* Dogs over 123.8 lb should be administered the appropriate combination of chews.

Treatment with Bravecto may begin at any time of the year and can continue year round without interruption.

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. 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. Wash hands thoroughly with soap and water immediately after use of the product.

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

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 an 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 over a 183-day period and in dogs treated with the active control over an 84-day period. The most frequently reported adverse reaction in dogs in the Bravecto and active control groups was vomiting.

Percentage of Dogs with Adverse Reactions in the Field Study

<table>
<thead>
<tr>
<th>Adverse Reaction (AR)</th>
<th>Bravecto Group: Percentage of Dogs with the AR During the 182-Day Study (n=224 dogs)</th>
<th>Active Control Group: Percentage 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>14.3</td>
</tr>
<tr>
<td>Decreased Appetite</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Lethargy</td>
<td>7.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Polydipsia</td>
<td>4.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Flattulence</td>
<td>0.0</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.

Clinical Pharmacology:
Peak fluralaner concentrations are achieved between 2 hours and 3 days following oral administration, and the elimination half-life ranges between 9.3 to 16.2 days. Quantifiable drug concentrations can be measured (lower than necessary for effectiveness) through 112 days. Due to reduced drug bioavailability in the fasted state, Bravecto should be administered with food.

Mode of Action:
Fluralaner is for systemic use and belongs to the class of isoxafluturalin-substituted benzamide derivatives. Fluralaner is an inhibitor of the arthropod nervous system. The mode of action of fluralaner is the antagonism of the ligand-gated chloride channels (gamma-aminobutyric acid (GABA)-receptor and glutamate-receptor).

Effectiveness:
Bravecto begins to kill fleas within two hours after administration in a well-controlled laboratory study. In a European laboratory study, Bravecto killed fleas and Ixodes ricinus ticks and reduced the numbers of live fleas and Ixodes ricinus ticks on dogs by >98% within 12 hours for 12 weeks. In a well-controlled laboratory study, Bravecto demonstrated 100% effectiveness against adult fleas 48 hours post-infection for 12 weeks. In well-controlled laboratory studies, Bravecto demonstrated ≥99% effectiveness against Dermacentor variabilis, Ixodes scapularis and Rhipicephalus sanguineus ticks 48 hours post-infection for 12 weeks. Bravecto demonstrated ≥90% effectiveness against Amblyomma americanum 12 hours post-infection for 8 weeks, but failed to demonstrate ≥90% effectiveness beyond 8 weeks.

In a well-controlled U.S. field study, a single dose of Bravecto reduced fleas by ≥99.7% for 12 weeks. Dogs with signs of flea allergy dermatitis showed improvement in erythema, alopecia, papules, scales, crusting, and excoriation as a direct result of eliminating flea infestations.

Polyvalence: In a well-controlled U.S. field study, which included 559 doses administered to 224 dogs, 80.7% of dogs voluntarily consumed Bravecto within 5 minutes, an additional 12.5% voluntarily consumed Bravecto within 5 minutes when offered with food, and 6.8% refused the dose or required forced administration.

Animal Safety:
Marginal Safety Study: In a margin of safety study, Bravecto was administered orally to 8- to 9-week-old pups at 1, 3, and 5x the maximum labeled dose of 56 mg/kg at three, 8-week intervals. The dogs in the control group (0X) were untreated.

There were no clinically relevant, treatment-related effects on physical examinations, body weights, food consumption, clinical pathology (hematology, clinical chemistry, coagulation tests), and urinalysis, gross pathology, histopathology, or organ weights. Diarrhea, mucoid and bloody feces were the most common observations in this study, occurring at a similar incidence in the treated and control groups. Five of the twelve treated dogs that experienced one or more of these signs did so within 6 hours of the first dosing. One dog in the 5X treatment group was observed to be dull, inappetant, with evidence of bloody diarrhea, vomiting, and weight loss beginning five days after the first treatment. One dog in the 10X treatment group vomited food 4 hours following the first treatment.

Reproductive Safety Study: Bravecto was administered orally to intact, reproductively sound male and female Beagles at a dose of up to 168 mg/kg (equivalent to ≥3X the maximum labeled dose) on three to four occasions at 8-week intervals. The dogs in the control group (0X) were untreated.

There were no clinically relevant, treatment-related effects on the body weights, food consumption, reproductive performance, semen analysis, litter data, gross necropsy (adult dogs) or histopathology (findings (adult dogs and puppies). One adult treated dog suffered a seizure during the course of the study (46 days after the second treatment). Abnormal salivation was observed on 17 occasions in six treated dogs (11 occasions) after dosing and four control dogs (6 occasions).

The following abnormalities were noted in 7 pups from 2 of the 10 dams in only the treated group during gross necropsy examination: limb deformity (4 pups), enlarged heart (2 pups), enlarged spleen (3 pups), and cleft palate (2 pups). During veterinary examination at Week 7, two pups from the control group had inguinal testicles, and two and four pups from the treated group had undescended testicles, respectively. No undescended testicles were observed at the time of necropsy (dogs 50 and 71).

In a well-controlled field study Bravecto was used concurrently with other medications, such as vaccines, anthelmintics, antibiotics, and steroids. No adverse reactions were observed from the concurrent use of Bravecto with other medications.

Storage Information:
Do not store above 86°F (30°C).

How Supplied:
Bravecto is available in five strengths (712.5, 250, 500, 1000, and 1400 mg/0.5mg/Fluralaner per chew). Each chew is packaged individually into aluminum foil blister packs sealed with a pediatric paper backed foil/vid stock. Product may be packaged in 1, 2, or 4 chews per package.

NADA 141-426, Approved by FDA

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Dr. Fulton noted, because these businesses were relatively unaware of the Salmonella control programs implemented by commercial poultry producers. Great efforts have since been made by small hatcheries to control this situation.

Campylobacter infection, a foodborne illness, typically arises in people who eat poultry that is not cooked properly, Dr. Fulton said.

**TIPS FOR PROTECTING CLIENTS AGAINST INFECTION**

To help control Salmonella and Campylobacter infections, veterinarians should share these key points with clients who own backyard chickens, Dr. Fulton said.

**Protecting Against Salmonella Infection**

In the Home

Veterinarians should warn clients that even baby poultry harbor Salmonella organisms. Clients should not keep these animals inside the home, especially where food is prepared or eaten, or cuddle or kiss them. Children should be supervised when handling baby poultry, and everyone should wash their hands after handling the birds.

Rodent and Fly Control

Because the presence of rodents in the flock environment increases the odds of S Enteritidis infection, Dr. Fulton stressed the importance of rodent control in and around the poultry house.

“Up to 1 million S Enteritidis bacteria are excreted in 1 mouse pellet,” he noted, adding that birds like to peck at anything unusual. Clients should repair holes in poultry houses and ensure that windows and doors are screened properly. His rule of thumb: If an animal can fit its head inside a hole, it can squeeze its whole body inside the building. Clients should place bait stations every 25 feet around the outside perimeter of the building, rotating between anticoagulant and non-anticoagulant types of bait about every 3 months to prevent rodent populations from becoming resistant to any 1 type. Grass and weeds surrounding poultry houses should be less than 3 inches high to prevent rodents from hiding close to the buildings, he said. Finally, clients should avoid piling trash within 100 feet of the poultry building.

Dr. Fulton advised against using cats for rodent control because cats carry fleas and other infectious organisms that pose a risk to chickens, including Toxoplasma gondii and Pasteurella multocida, the latter of which can cause fowl cholera in the birds.

Clients should control flies, which transmit diseases, in the poultry house. In particular, they should control litter and keep manure moisture levels below 30% to prevent fly development, said Dr. Fulton.

In the Poultry House

Clients also can take measures inside the poultry house to control exposure of chickens to S Enteritidis. Stored feed should be covered to keep out rodents and other forms of wildlife so they can’t defecate in the feed. This will also prevent cats from using feed as a litter box.

Proper Egg Handling

Clients can also take steps during egg handling to reduce their risk of exposure to Salmonella, according to Dr. Fulton. They should provide a nest in which the hens can lay eggs, and they should collect the eggs at least once daily. After the eggs have been laid—usually before noon, he said—the nests should be closed off to prevent the birds from defecating in them and contaminating the eggs.

Eggs should be washed carefully with soap and water that is warmer than the eggs. Using cooler water will cause the air cell inside the egg to contract, sucking bacteria through the shell and contaminating the egg, Dr. Fulton said. Warmer water causes the air cell to expand, preventing this bacterial contamination. The clean eggs should be refrigerated until needed. Eggs should be cooked until the whites and yolks are firm, said Dr. Fulton, and dishes such as casseroles that contain eggs should be cooked to a temperature of 160°F.

Protecting Against Campylobacter Infection

Clients can substantially reduce their risk of infection with Campylobacter species by taking careful measures to reduce cross-contamination when preparing foods, Dr. Fulton said. For example, any fruits, vegetables, and other foods that won’t be cooked should be cut before raw meat is cut. After cutting the meat, clients should carefully clean anything that came in contact with it, including kitchen surfaces, cutting boards, and knives. Importantly, clients should wash their hands with soap and water. Dr. Fulton also emphasized that poultry should be cooked to 165°F.

**THE TAKE-HOME**

Dr. Fulton stressed this message in particular to help protect clients with backyard poultry against these zoonotic infections: “Your mom was right—always wash your hands.”

**REFERENCE**

Today's nationwide opioid epidemic is turning families and entire communities upside down. The most recent report from the American Society of Addiction Medicine states that prescription medication overdose is the leading cause of accidental death among people under 50. The group also noted that opioid addiction is driving this epidemic, with over 20,000 overdose deaths related to prescription pain relievers in 2015.1

OPIOIDS IN VETERINARY MEDICINE

How does this very human problem relate to the veterinary profession? After all, veterinarians prescribe opioids for animals—period. "They cannot and do not prescribe for people," said Larry J. Nieman, DVM, co-owner of the veterinary consulting firm Essential Elements. Licensed in 6 states, Dr. Nieman has been a veterinary clinician for 42 years and has had a Controlled Dangerous Substance license from the US Department of Justice Drug Enforcement Administration (DEA). He is past president of the Connecticut Veterinary Medical Society and served on the legislative council of the Oklahoma Medical Association. Veterinarians are not a part of the problem, Dr. Nieman said, and they typically do not prescribe the most commonly abused opioids, such as oxycodone and fentanyl.

Still, the opioid epidemic does affect animals, their owners, and even veterinary teams. Recent reports and expert insight show clearly how this crisis affects today's veterinarians.

Abuse Among Pet Owners

The most common opioid carried by veterinary practices and targeted by addicts is tramadol, which is prescribed to both animals and humans. There have been just enough reports of abuse or misuse to cause concern and prompt some states to increase regulations. Last fall, for example, following an investigation by the research firm Aurelius Value, the website Mercola reported that PetMed Express (also known as 1-800-PetMeds) was accused of selling pet opioids for use in people.2 PetMed Express denied the allegation.

Then there is the issue of pet owners supporting their own addictions by taking medications intended for their pets. In a 2017 NBC News report, David Gurzak, DVM, an associate at Brackett Street Veterinary Clinic in Portland, Maine, said that to him, the first sign that something is amiss is when a pet owner asks for a drug by name.3 He recalled a client who repeatedly requested a prescription for tramadol. "It was for a dog that had a condition…that normally would not require any medication at all," Dr. Gurzak said. "I suspected that she was using it herself."

Eli Landry, DVM, CVA, owner of Seminole Veterinary Hospital in Oklahoma, reported seeing pet owners coming into the practice looking for opioids for themselves. "Generally," he said, "it's a new client we've never seen before who comes with an old patient, and they'll ask for the drugs by name, like 'Oh, my ailing and aging dog really needs some tramadol for his lame leg.'"3

Remaining knowledgeable and observing relevant legal requirements will enable veterinarians to be strong advocates for the responsible use of opioids.

By Carolyn C. Shadle, PhD, and John L. Meyer, PhD
In a report on Florida’s WPBF News, Lisa Ciucci, DVM, owner of Gardens Animal Hospital in Palm Beach Gardens, Florida, told the reporter about “blacklisted” clients who go from veterinarian to veterinarian seeking medications such as tramadol, Xanax, and Valium by name. Some owners give excuses for why they need another refill of pills, such as spilling them on the floor; she said, while others go so far as to physically harm their pets to get a new prescription.

Jim Arnold, chief of policy and liaison for the DEA’s Diversion Control Division, told the New York Post: “They’ve gotten very sophisticated in how they obtain drugs and go about their activities… It’s an area that allows drug seekers to fly under the radar. We know it’s happening, but I wouldn’t be surprised if there’s a lot more activity than we’re aware of.”

Marsha Mercer reported in The Washington Post in September 2017, “Last year in Virginia, a dog owner took his boxer to 6 veterinarians to get antianxiety pills and painkillers for his own use before he was caught.” Eventually, according to Fairfax County police, the owner was charged with prescription fraud. Mercer also reported on other cases: “In Kentucky in 2014, a woman was accused of cutting her golden retriever twice with a razor so she could get drugs. And in the early 2000s, an Ohio man allegedly taught his dog to cough on cue so the owner could buy hydrocodone.”

The Potential for Pet Overdose
Another concern for veterinarians: the risk of accidental opioid overdose in pets. In a bizarre but true story from New Hampshire, a 3-month-old puppy named Zoey ingested an opioid while on a walk with her owner around her neighborhood. Zoey was rushed to the hospital and eventually died. Her owner, pleased with the outcome, noted that the incident indicates the extent of the opioid crisis.

Abuse by Veterinary Practice Employees
The rampant abuse of opioids creates yet another risk: staff access to these drugs, according to Kimberly Hammer, VMD, DACVIM (SAIM), a medical director at NorthStar Vets Veterinary Emergency Trauma & Specially Center in Robbinsville, New Jersey. Checks and balances within a veterinary hospital are essential with respect to ordering, storage, administration, and dispensing for the health and protection of the staff, as well as the legal protection of the doctor and hospital, Dr. Hammer said.

LEGAL RESPONSES
The opioid epidemic has prompted many states to sign control measures into law. In Maine, for example, professionals—including veterinarians—who can prescribe drugs are required to check a statewide database called the Prescription Monitoring Program (PMP) before prescribing opioids and benzodiazepines. This measure ensures that doctors notify the proper authorities if certain criteria are met when a patient comes in and has reason to leave with opioids.

Other states have variations of the PMP and are passing legislation with more stringent requirements for dispensing and reporting opioid prescriptions. For example, a New Jersey law limits initial opioid prescriptions to a 5-day supply, one of the strictest prescribing limits in the country. Pharmacies in the Garden State are required to report prescription data that is shared with 14 other states. Guidelines related to the legislation urge veterinarians who prescribing potentially addictive opioids, such as tramadol and oxycodone, to use the New Jersey PMP. Nine other states, including New York and Massachusetts, have legislation that limits opioid prescriptions to 7 days or less. A review of current prescription drug abuse legislation in the United States can be found on the National Conference of State Legislatures website (ncsl.org).

Pushback Among Veterinarians
The Maine Veterinary Medical Association (MVMA) put out a position statement against the state’s PMP law, writing that while the “opioid epidemic is a serious public health crisis that requires all prescribers and dispensers of opioids and benzodiazepines to assist in preventing the misuse or diversion of these drugs, [veterinarians] are ineffective participants in reducing drug abuse by the public [because they] do not have the human medical exposure or background to review medical prescription information for animal owners.” In an interview with American Veterinarian, Katherine Soverel, executive director of the MVMA, said that including veterinarians could dilute the data and make the PMPs less effective.

Having advocated for veterinarians to have a seat at the table when such laws are drafted, Soverel is now working to change the law as it pertains to veterinarians. A bill under consideration in Maine would exempt veterinarians from the PMP and expand the types of continuing education (CE) that would meet the current requirements. The MVMA strongly supports this bill, according to Soverel. New Hampshire veterinarians who share that view worked successfully to get their state legislature to pass a revised bill exempting veterinarians from PMP requirements.

“I’m a veterinarian, not a physician. I shouldn’t have access to a human’s medical history,” said Kevin Lazarcheck, DVM, president of the California Veterinary Medical Association. He objects to checking a client’s use of controlled substances and points out that there is no protocol directing veterinarians if they suspect that a client is abusing drugs.

Amanda Bisol, VMD, director and legislative chair for MVMA, knows well that many consider the new legislation unfair to their profession, but she says veterinarians...
Veterinarians in all states need to be aware of new legislation—including laws under consideration.

Training Response
Veterinarians in all states need to be aware of new legislation—including laws under consideration—regarding the use and prescription of opioids, which might entail training. Maine's new law requires that veterinarians, along with other prescribers and dispensers of opioids, receive 3 hours of opioid CE every 2 years. As a result, MVMA has partnered with VetBloom, an educational platform owned by Ethos Veterinary Health, a network of hospitals providing specialty and emergency pet care. Directed by Patrick Welch, DVM, MBA, DACVO, VetBloom developed a variety of curricula to meet the needs of veterinarians in New England. Completing an online webinar, created for and with MVMA, enables MVMA members to maintain their state license.

The course consists of 2 sections. The first, created by Dr. Bisol, outlines what state-licensed veterinarians must do comply with the law. The second section is divided into 2 parts; the first deals with the safety and use of opioids. Created by Andrea Looney, DVM, DACVAA, DACVSMR, CCRP, an anesthesiologist with Ethos Veterinary Health, it addresses definitions related to opioid use in veterinary patients, including:

- What drugs constitute agonists and antagonists
- Opioid indications and contraindications
- How receptors and receptor subtypes translate into physiologic and pharmacologic effects
- How opioids are used in premedication, local blocks, postoperative and intensive care continuous-rate infusions, and in-home chronic care

The second part, developed by Jennifer Kelleher, PharmD, BCPS, FSVHP; formerly with Ethos and now a compounding pharmacist and educator, describes the legal nuances and recommendations for administering opioids in a veterinary clinic. It explains the requirements and considerations for dispensing opioids to clients, covers the steps for prescribing Schedule II-IV opioids using the Maine PMP; and discusses the requirements for electronic, hard-copy, telephone, and faxed opioid prescriptions in the state.

OTHER LEARNING
Beyond being aware of the legalities, veterinarians must understand the everyday practicalities of when and why opioids are recommended and how to avoid problems.

The most common reason cited by veterinarians for avoiding the use of opioids is the fear of adverse effects, according to Mark E. Epstein, DVM, DABVP, CVPP, director at Carolinas Animal Pain Management and TotalBond Veterinary Hospital in Gastonia, North Carolina. He advises veterinarians to understand how these drugs work within the peripheral and central nervous system and how to recognize and treat potential adverse effects. Veterinarians should be knowledgeable about 3 general drug categories, he said:

- Pure mu agonists (strong opioids), such as morphine and fentanyl
- Partial mu agonists and agonist-antagonists (weak opioids), such as buprenorphine and butorphanol
- Mu antagonists (reversal agents), such as naloxone, which are used in cases of overdose or severe adverse effects

With new drugs being introduced constantly, veterinarians must stay current, Dr. Epstein said. Tapentadol, for example, a new class of analgesic for humans, has shown some utility in animal models. A sustained-release injectable buprenorphine may be available soon, as well.

CONCLUSION
Even veterinarians who feel removed from the opioid crisis would be well served to become knowledgeable about and comfortable with the use of these drugs. By staying current with local, state, and national laws, veterinarians can be strong advocates for the responsible use of opioids and an important part of the conversation around the epidemic.

References available at AmericanVeterinarian.com.

RESOURCES
The following resources may aid practitioners in keeping up-to-date with changing opioid rules and regulations.

Guidelines for Veterinary Prescription Drugs: Found on the American Veterinary Medical Association website, these guidelines advise veterinarians to comply with relevant regulations of their state boards of pharmacy and veterinary medicine, as well as applicable federal regulations such as the FDA’s Extralabel Drug Use Rules. Visit avma.org/KB/Policies/Pages/Guidelines-for-Veterinary-Prescription-Drugs.aspx.

General Standards: Published by the American Animal Hospital Association, these standards cover such topics as dispensing and prescribing medications, hazardous medications, and adverse medication events. Visit aaah.org/professional/membership/general_standards.aspx.

VetBloom: This veterinary educational resource worked with the Maine Veterinary Medical Association to create the webinar described in this article and is available to partner with additional states to present training related to state laws and the safe use of opioids. Contact John Skitt, engagement lead at VetBloom: jskitt@vetbloom.com.

ASPCA Animal Poison Control Center (APCC): This website offers webinars and online courses such as “Perioperative Pain Prevention and Treatment: Evidence and Options.” Visit aspcapro.org.
A Promising Novel Treatment for Equine Herpesvirus Myeloencephalopathy

A new therapy shows promise for reducing a serious neurologic complication that may result from the potentially deadly equine herpesvirus-1 infection.

By Amy I. Bentz, VMD, DACVIM

quine herpesvirus type 1 (EHV-1) infection has become a concern for many horse owners, especially those whose horses are stabled in large barns with numerous other horses. Living in close quarters can cause outbreaks of not only respiratory disease and abortion but also acute and life-threatening neurologic disease.

EHV outbreaks are on the rise, and the associated morbidity and mortality can be quite profound, yet current vaccines formulated against EHV-1 are “not specifically preventive against the infection.” A US Department of Agriculture analysis of data from 6 neurologic EHV-1 outbreaks between 2001 and 2005 revealed a mean attack rate of 33% and a mean case fatality rate of 40%.2

Clinical signs due to EHV-1 often occur about 6 to 10 days after infection and include weakness, fever, and urinary bladder atony. Acute, symmetric hind limb ataxia can occur as well as tetraparesis leading to recumbency in severe cases. Coughing and abortion may occur 2 weeks prior to the onset of neurologic deficits. Treatment is often limited to symptomatic therapy because the infection is viral; however, antiviral medications (eg, acyclovir, valacyclovir, ganciclovir) may also be used, even though “their… efficacy has not been proven under clinical conditions.”1

During a neuropathogenic EHV-1 outbreak, infected horses may develop equine herpesvirus myeloencephalopathy (EHM), a severe manifestation of the infection.1 The neurologic deficits are due to gray and white matter injury of the spinal cord. The central nervous system can also be affected, with seizures and blindness reported occasionally. Affected horses that become recumbent often die or are euthanized.

CASE REPORT

In a recent case study, investigators in southern Germany used heparin as a novel treatment approach during an acute EHV-1 outbreak with the neuropathogenic G234/D232 Pol variant.1 Based on its ability to prevent EHV-1 entry into cells as well as its anticoagulation properties, the investigators hypothesized that heparin may reduce the incidence and severity of EHM during an outbreak of EHV-1. According to the investigators, “the pathogenesis of EHM is associated with vasculitis of small blood vessels within the central nervous system and subsequent thromboischemic damage to the surrounding neural tissue.” Thrombotic complications from EHV-1 infection are also due to the virus “activating platelets through virus-associated tissue factor-initiated thrombin generation,” as demonstrated in a previous study.3 Heparin has multiple actions, including acting on antithrombin to prevent clot formation and inhibiting leukocytes from adhering to the endothelial cells lining the inner surface of blood vessels, potentially limiting endothelial cell damage.

The outbreak started with an abortion in the broodmare barn, then spread to barns housing sport horses. Eventually, 79 horses in 7 barns were affected; 61 exhibited at least 1 clinical sign of EHV-1 infection (fever in 55 horses, EHM in 8, and abortion in 6). Starting on the 10th day of the outbreak, subcutaneous heparin (25,000 IU twice daily) was administered for 3 days to 31 horses with fever. The first 30 horses that initially demonstrated only 1 clinical sign (fever) comprised the untreated control group.1

The outcome for this EHV-1 outbreak was 8 cases of EHM, the majority of which were in the control group. Heparin-treated horses showed a “lower EHM incidence (1/31; 3.2%) than untreated horses (7/30; 23.3%; P = .03).” Horses that developed EHM also received a nonsteroidal anti-inflammatory drug (flunixin meglumine) daily.1

STUDY LIMITATIONS
The results from this preliminary case report using a novel treatment during a natural EHV-1 outbreak are promising, despite the investigators’ acknowledgment of some limitations. This was not a prospective randomized controlled study but rather a retrospective analysis, and treatment was determined during a clinical situation in the field setting. Nevertheless, it is a strong initial investigation to determine a useful modality for treating horses suffering from EHV-1 infection and avoiding potentially severe complications such as EHM.

Unfractionated heparin was used in this study to treat affected horses. While unfractionated heparin can have untoward adverse effects, such as erythrocyte agglutination, thrombocytopenia, and a propensity for the patient to experience bleeding, the results in this study were positive. In future studies, however, it may be ideal to investigate treatment of horses affected by an EHV-1 outbreak using low-molecular-weight heparin to assess prevention of EHM. Low-molecular-weight heparin has been administered to horses in various other studies with reportedly fewer adverse effects.

CONCLUSION
The results from this study are also interesting in light of another recent report that demonstrated heparin inhibition of ex vivo EHV-1 platelet activation.4 “Our results indicate that heparin anticoagulants and strong nonselective (3-isobutyl-1-methylxanthine; IBMX) or isoenzyme-3 selective (cilostazol) [phosphodiesterase] antagonists inhibit ex vivo EHV-1-induced platelet activation,” the study authors said. “These drugs have potential as adjunctive therapy to reduce the serious complications associated with EHV-1-induced thrombosis.”4

References available at AmericanVeterinarian.com.
Recognizing and Reporting Abuse and Neglect

Veterinarians are in a prime position to identify and address animal mistreatment. Here’s what you need to know.

By Meredith Rogers, MS, CMPP

When you became a veterinarian, you pledged an oath to use your "scientific knowledge and skills for the benefit of society through the protection of animal health and welfare, [and] the prevention and relief of animal suffering…"

Normally, carrying out that promise and caring for your patients is fairly straightforward, but on occasion you might see a case that doesn’t sit well with you. Maybe the abuse is obvious, but more often than not, you just have a feeling that this animal’s suffering has been caused by the hand of a person. Whether the situation is one of ignorance, neglect, or outright cruelty, turning your suspicion into action requires a careful approach.

It is a misconception that animal abusers do not seek veterinary care for their pets, so chances are you will see a neglected or abused animal at some point in your career. In a survey of veterinarians, 87% reported having treated abused patients and 60% reported treating an animal they suspected of being severely or intentionally abused. Thus, it is important to have a plan in place to which the entire practice can refer when this inevitability happens. This policy should identify which agencies need to be informed, what client and patient information should be conveyed, and how to collect and preserve evidence.

WHAT DOES THE LAW SAY?

State laws vary regarding whether reporting suspected abuse is mandatory or simply “allowed.” To complicate matters, the agencies responsible for investigating these cases range from community animal care and control to municipal or county law enforcement to the state department of agriculture. In human medicine, definitive privacy laws prevent disclosing patient information, but the waters are murky in animal health. Some states recognize the confidentiality of the veterinarian-client relationship, but others do not. In general, however, if the health or welfare of the animal (or associated humans) is at risk, nondisclosure is waived. It is a good idea to research the laws in your area and incorporate them into your standard operating procedures. You may even want to ask the agency responsible for investigating cases of cruelty and neglect to provide training for your staff.

Although your oath obligates you to recognize and report suspected abuse, you are not responsible for proving that the abuse or neglect occurred. That is the job of the local agency tasked with investigating and prosecuting these cases. However, you should understand and teach your staff how to collect, document, and preserve evidence properly.
GATHERING EVIDENCE
Perhaps the most important aspect of these cases is keeping meticulous records to maintain the chain of custody of evidence. Include distinguishing characteristics of the animal in the medical record, but avoid conjecture about breed or age. When labeling evidence, note the time collected and from whom (e.g., the client gave you the dog’s collar). If an object is too small to mark, place it in a container that can be labeled appropriately. Avoid contaminating evidence when tagging it, such as by writing over a bloodstain.

First collect the evidence that is most likely to be destroyed or degraded by time, environmental conditions, or deliberate action. To prevent tainting it, wear gloves, a cap, a mask, or other gear as appropriate. It’s wise to keep a digital camera handy; most of today’s equipment also takes video.

Besides noting obvious injuries, examine the pet’s coat, mouth, and paws for evidence of chemicals, fiber, or other materials that may indicate home remedies. If an animal is at the clinic for a fracture and you suspect abuse, it may be worthwhile to take whole-body radiographs to look for previous fractures. Necropsy should be performed on any deceased animals. Note: You should establish ahead of time whether any extra steps you take to collect evidence—e.g., additional diagnostic testing, blood work, or radiographs—are reimbursable by the agency pursuing the case.

WHAT IF YOU’RE WRONG?
Because you must often trust your instincts when deciding if abuse or neglect has occurred, how you address the situation might also take a judgment call. This mainly relates to cases of neglect but may also apply when the abuse was not malicious. Sometimes providing education about proper handling and management is all that is needed; for example, a referral to a reputable trainer may help a caregiver more appropriately address animal behavior issues. Regardless, it is important to follow up on these cases by scheduling repeat visits. Be clear that the actions were wrong and that not complying with your recommendations will necessitate calling the authorities. However, if you suspect that the person may disappear or will not make changes, don’t give the individual the benefit of the doubt—make the call now to the proper authority.

In all cases, it is important that you remain safe. Someone who readily abuses his or her pet may not be psychologically stable. Also, don’t break the law to help an animal—don’t trespass to check on a skinny horse, for example.

Another concern is what happens if you’re wrong: Can the person sue you? The short answer is yes, but many states provide absolute or limited immunity against both civil and criminal liability for reporting suspected animal maltreatment. Detailed documentation is critical in these cases. Take comfort that generally the only people who object to you intervening for the benefit of their pet are those who are guilty. However, we live in a technological era, so be prepared for a social media backlash. Monitor popular review sites, and have a prepared statement that explains your position in protecting the animal community.

CONCLUSION
Society has evolved such that animals are now considered family members more than just pets or beasts of burden. However, they are not always treated as well as they should be. As a significant point of contact and someone who has the knowledge and training to recognize abuse and neglect, you can be a champion for the animals in your care. Unfortunately, handling such cases requires not only clinical expertise but also a variety of out-of-the-norm proficiencies, such as tact when broaching the subject with clients and strong documentation skills, not to mention a little bravery for putting yourself out there.

Thankfully, society also has evolved to recognize that neglect and abuse of animals can be criminal, and authorities and resources are available to assist you. By not turning your back on suspected animal abuse, cruelty, or neglect, you not only help the animal in front of you but also make society as a whole more humane.

Animal Abuse and Domestic Violence
“When animals are abused, people are at risk. When people are abused, animals are at risk.”
— American Humane Association

Animal abuse and violence against humans are linked: In a landmark study of 11 metropolitan cities, investigators found that animal abusers were 7.5 times more likely to commit domestic partner violence. The results of another study showed that of those arrested for crimes against animals, 65% had a criminal record for battery against another person. Domestic abuse perpetrators often use actual or threatened violence against a pet as a way to control victims, and victims may be more likely to stay in an abusive situation if there is no safe haven for their pet. In addition, violence begets violence: Children who witness or experience violence at home are more likely to abuse animals, and children who are cruel to animals are more likely to grow up to commit crimes against people.

Along with the moral obligations to report suspected abuse, this link between animal and human violence has provided the impetus for some states to enact mandatory reporting of suspected animal abuse. Unlike animal control officers, veterinarians aren’t generally required to report suspected interpersonal violence; however, if you suspect that the person at the other end of the leash has been a victim of abuse, you should alert law enforcement, child protective services, or another appropriate agency.

References available at AmericanVeterinarian.com.
Heartworm: Where Are We Today?
Experts share their insight on why this disease is on the rise, whether resistance is a concern, and fresh approaches to prevention.

By Amanda Carrozza

(continued from front cover)
number diagnosed in 2013. The 5 states with the highest heartworm incidence: Mississippi, Louisiana, Arkansas, Texas, and Tennessee. But no state in the country is heartworm-free, and infection in dogs is considered at least regionally endemic in every state except Alaska.

Veterinary parasitologists continue to study heartworm infections extensively and periodically issue updated guidelines for the best methods of prevention, testing, diagnosis, and treatment. But what will it take to eradicate this potentially deadly disease?

Although longstanding preventive and treatment methods are highly effective, veterinarians should be aware of heartworm disease advances and updates, regardless of the prevalence of heartworm in their area.

MULTIMODAL APPROACH TO PREVENTION
In human medicine, the common approach to averting a parasite-derived disease starts with thwarting contact with the vector. Consider Zika virus, for which the first line of defense is preventing the bite of mosquitoes. Although the vector for Zika and heartworm is the same, veterinary medicine historically has taken an entirely different approach to prevention. To date, the mosquito—which the World Health Organization called one of the deadliest animals in the world—has been an aspect of the heartworm life cycle that generally has been ignored.

“In the past, [veterinarians] were under the impression that heartworm preventives were 100% effective, and so whether a mosquito bit or not wasn’t really considered important,” explained Susan Little, DVM, PhD, DACVM (parasitology), a regents professor and Krull-Ewing chair in veterinary parasitology at Oklahoma State University. “We were allowing the natural infection cycle to take place and then relying on those ‘perfect’ preventives to keep the adult heartworms from developing.”

But with the understanding that preventives are not always 100% effective and pet owners are not always compliant in giving preventives to their pets, many veterinarians and parasitologists have begun calling for a stronger focus on the mosquito. “We should probably have been including mosquito prevention all along,” Dr. Little said. “For all other parasites we talk about the life cycle, but for heartworm, we hadn’t.”

This line of thinking has sparked a movement in veterinary medicine known as the Double Defense Heartworm Protocol, an initiative from Ceva Animal Health. The corresponding website fightheartwormnow.com is a resource for veterinarians and pet owners to use to educate themselves on the advantages of a multimodal approach to prevention. As the practice gains in popularity, continued research has been published in support of double defense.

In a 2017 study, a group of investigators led by John McCall, PhD, professor emeritus in the Department of Infectious Diseases at the University of Georgia College of Veterinary Medicine and past president of AHS, assessed the effectiveness of a topical ectoparasiticide combined with a macrocyclic lactone on transmission of heartworm from mosquitoes to dogs and subsequent development of worms in treated dogs exposed to infected mosquitoes. In the study, 32 beagles were allocated evenly to 4 groups:

- Group 1: untreated controls
- Group 2: treated orally with a macrocyclic lactone on day 51
- Group 3: treated topically with an ectoparasiticide on day 0
- Group 4: treated orally with a macrocyclic lactone on day 51

Dogs were sedated and exposed to D. immitis-infected Aedes aegypti mosquitoes for 1 hour on days 21 and 28. Upon study completion, the investigators concluded that the Double Defense protocol of a topical ectoparasiticide combined with a macrocyclic lactone had better efficacy for protecting dogs against heartworm transmission and infection than a macrocyclic lactone alone.

Still, preventing mosquitoes from biting isn’t a one-size-fits-all approach. As many as 80 different species of mosquitoes can transmit heartworm. Instead, Tanja McKay, PhD, director of environmental sciences at Arkansas State University, said it opens up a variety of channels for studying how these tiny insects play a pivotal role in intensifying the spread of such a pervasive disease. “Each mosquito species is very different in its biology, ecology, and habitat,” she explained. “It is a very complex issue, but one that must be part of the heartworm conversation.”

In the multimodal approach, preventing mosquitoes from biting doesn’t negate the need for continued use of preventives. Repellents should be used an adjunct, not as a replacement.

RISING TEMPERATURES, SHIFTING DISTRIBUTION
Environmental temperature is another contributing factor to the increasing rates of heartworm infection, and investigators have paid particular attention to climate change in the wake of continuing debates about global warming and the trend of once rural areas turning into densely populated cities.
**Temperature Increases**

As Dr. McKay explained, even the slightest temperature changes have the potential to escalate the mosquito life cycle and, in turn, the spread of heartworm. “The higher the temperature, the faster a mosquito will develop from egg to adult,” she said. “The same is true for the temperature requirement for the nematode within the mosquito. A higher temperature will decrease the amount of time it takes for a nematode to develop into the necessary larval stage for infection.”

Elevated temperatures also present the potential for an increase in the number of mosquitoes that have the capability of carrying the parasitic roundworm. “If it’s warmer outside, maybe you have 1 or more days on the front end and on the back end of the time period of when heartworm might be more of an issue,” she said. “Does that have an effect on the number of canine heartworm cases?”

Temperature fluctuations not only affect how quickly mosquitoes and nematodes develop but may also have an impact on the migration patterns of mosquito species. “We know that in the past 30 to 40 years, we’ve had a dramatic expansion of mosquitoes and new mosquito species introduced,” Dr. Little added.

**Urban Heat Island Effect**

Temperatures in urban areas are typically a few degrees higher than in neighboring rural regions, an occurrence known as the urban heat island effect. In fact, the annual mean air temperature in a city with 1 million people or more can be 1.8°F to 5.4°F warmer than the surrounding areas. In the evening, the difference can be as high as 22°F.5

Not only does the urban heat island effect impact energy demand, but it has been linked to the increased prevalence of mosquitoes where the average temperature might not have historically supported breeding. This is particularly true when manmade bodies of water, such as ponds or fountains, are introduced. “Mosquitoes take advantage of that and survive well in urban, developed areas,” Dr. Little pointed out.

**PREVENTIVE RESISTANCE**

Although instances are not widespread, Dr. Little noted that veterinarians should be aware that resistant biotypes of *D. immitis* have been confirmed. “We don’t have a feel yet for what percent of heartworm cycling in nature is resistant to the preventives,” she said, “and I don’t think anybody has been able to determine that…but resistance does happen.”

A veterinarian might suspect resistance if a dog whose owner has been compliant with giving a monthly preventive becomes infected. However, Dr. Little warned that it’s important to keep in mind that in such instances the dog may have vomited or spit out the tablet, or a topical product may not have been absorbed entirely. Resistance isn’t always the chief reason.

The best indication of a resistant isolate is when a veterinarian treating a dog for heartworm is unable to clear microfilariae with high doses of macrocyclic lactones. In these cases, Dr. Little recommends seeking assistance from a veterinary parasitologist at a local teaching hospital or calling a national specialist. “There are other strategies to clear the microfilariae,” she said, “but we definitely want to document resistance too.”

Globally, preventives are still largely effective. “The most common reason a dog gets infected with heartworm despite the fact that a veterinarian prescribed a preventive is that the dog wasn’t given the preventive,” Dr. Little said.

The official AHS statement on resistance echoes Dr. Little’s explanation.6 “Every compound currently marketed in every form of administration (oral, topical, and parenteral) has been shown to be less than perfect in at least 1 study. However, while the evidence indicates that resistance affects all macrocyclic lactones, differences in active ingredients, doses, and product formulation among the available preventives can result in varying rates of failures.” Perhaps most important, AHS reiterates that research findings do not demonstrate any widespread ineffectiveness of available heartworm preventives. And macrocyclic lactones continue to be successful in the vast majority of cases. >>
If anything, Dr. Little said, the notion of possible resistance further emphasizes the importance of regular heartworm testing.

**TESTING BY PRETREATING THE SAMPLE**

The standard strategies of testing for heartworm—both looking for microfilariae and antigen testing to detect the adult female worm—are considered highly sensitive and very effective in diagnosing infection. But these strategies are not without imperfections.

As Dr. Little explained, “We know that as many as 50% of dogs that are infected with heartworm won’t have that larval stage in their blood, that microfilariae.” Additionally, in antigen testing, sometimes the protein is present in the animal but is masked from detection. This block is believed to be attributed to immune complex formations that trap the antigen.

To combat false-negative results, Dr. Little said she has returned to the lapsed method of pretreating the sample prior to testing, via heat or the addition of an acid or a pepsin. This works to disrupt the immune complexes and reveal the protein. “Pretreating the samples was used routinely in the 1980s until about 1990,” she explained. It was not used again until around 2014, “when we realized there were many dogs that were infected with heartworm but didn’t have the antigen—the protein—in their blood. So we started pretreating again on subsets of dogs to try to figure how common it was, and realized that in animal shelters in the South, as many as 5 to 10% of dogs will be false-negative on a heartworm antigen test; whereas if you pretreat, they’ll become positive.”

Dr. Little recalled a particular instance in which a local working dog had so many heartworms that a cardiologist was able to see them while performing an echocardiogram, but heartworm tests came back negative. Once a sample of the dog’s blood was pretreated prior to testing, however, it revealed a strong positive.

While effective at unmasking previously undetected antigens, Dr. Little said, pretreating samples is not necessary in all cases. For one, it is a very involved process that requires a larger blood sample. And because many clinics don’t have the equipment necessary to spin the sample at the required centrifugal force, samples usually need to be sent to a lab for proper testing.

Instead, Dr. Little said pretreating the sample is recommended when a veterinarian strongly suspects heartworm infection even though previous tests were negative. It may also be effective in animal shelters, where dogs should be tested for heartworm to the best degree possible prior to being adopted.

**DRASTICALLY REDUCING INCIDENCE RATES**

Even with improved research and additional testing, experts report that one of the major obstructions—if not the chief hurdle—standing in the way of eliminating heartworm infection is pets falling to abide by preventive guidelines. Simply put, “we have a compliance problem,” said Christopher J. Rehm, Sr., DVM, president of AHS. And one of the major thrusts of AHS is to increase the number of pets that are being protected with heartworm preventives on a year-round basis, he explained. “Right now, roughly two-thirds of pets are not on prevention,” he said.

Although veterinarians can’t physically observe the administration of preventive treatments for every patient, they (and their teams) can help educate clients and engage in conversations about proper heartworm prevention.

“Sometimes I think we take for granted that our clients know more about it or have some more parasite common sense, if you will, than they actually do,” Dr. Rehm said. “And we don’t probe enough to find out where our clients are on the learning curve about parasite prevention.” To counteract this, he recommends that veterinarians ask open-ended questions, such as “When did you last give a parasite preventive?” rather than simply “Are you good on heartworm?” The latter question might elicit a knee-jerk, affirmative reaction.

“I think sometimes people have a false sense of security that they think their dog won’t get heartworm or, if it does, we’ll just treat it, and that’s just absolutely the wrong approach,” added Dr. Little. “It’s so much better to prevent the infection to start with, instead of trying to rescue the dog once it is infected.”

References available at AmericanVeterinarian.com.

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**Clinical Focus**

**PARASITOLOGY**

**HEARTGARD Plus**

*(ivermectin/pyrantel)*

**INDICATIONS:** For use in dogs to prevent canine heartworm disease by eliminating the tissue stage of heartworm larvae (*Dirofilaria immitis*) for a month (30 days) after infection and for the treatment and control of ascarids (*Toxocara canis*, *Toxascaris leonina*) and hookworms (*Ancylostoma caninum*, *Uncinaria stenocephala*, *Ancylostoma braziliense*).

**DOSEAGE:** HEARTGARD Plus (ivermectin/pyrantel) should be administered orally at monthly intervals at the recommended minimum dose level of 6 mcg of ivermectin per kilogram (2.72 mcg/lb) and 5 mg of pyrantel (as pamoate salt) per kg (2.27 mg/lb) of body weight. The recommended dosing schedule for prevention of canine heartworm disease and for the treatment and control of ascarids and hookworms is as follows:

<table>
<thead>
<tr>
<th>Dog Weight</th>
<th>Ivermectin Content</th>
<th>Pyrantel Content</th>
<th>Color Coding On Foil Backing and Carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25 lb</td>
<td>1 60 mcg</td>
<td>57 mg</td>
<td>Blue</td>
</tr>
<tr>
<td>26 to 50 lb</td>
<td>1 120 mcg</td>
<td>114 mg</td>
<td>Green</td>
</tr>
<tr>
<td>51 to 100 lb</td>
<td>1 272 mcg</td>
<td>227 mg</td>
<td>Brown</td>
</tr>
</tbody>
</table>

HEARTGARD Plus is recommended for dogs 6 weeks of age and older. For dogs over 10 lb use the appropriate combination of these chewables.

**ADMINISTRATION:** Remove only one chewable at a time from the foil-backed blister card. Return the card with the remaining chewables to its box to protect the product from light. Because most dogs find HEARTGARD Plus palatable, the product can be offered to the dog by hand. Alternatively, it may be added intact to a small amount of dog food. The chewable should be administered in a manner that encourages the dog to chew, rather than to swallow without chewing. Chewables may be broken into pieces and fed to dogs that normally swallow treats whole.

Care should be taken that the dog consumes the complete dose, and treated animals should be observed for a few minutes after administration to ensure that part of the dose is not lost or rejected. If it is suspected that any of the dose has been lost, redosing is recommended.

HEARTGARD Plus should be given at monthly intervals during the period of the year when mosquitoes (vectors), potentially carrying infective heartworm larvae, are active. The initial dose must be given within a month (30 days) after the dog’s first exposure to mosquitoes. The final dose must be given within a month (30 days) after the dog’s last exposure to mosquitoes.

When replacing another heartworm preventive product in a heartworm disease preventive program, the first dose of HEARTGARD Plus must be given within a month (30 days) of the last dose of the former medication.

If the interval between doses exceeds a month (30 days), the efficacy of ivermectin can be reduced. Therefore, for optimal performance, the chewable must be given within a month on or about the same day of the month. If treatment is delayed, whether by a few days or many, immediate treatment with HEARTGARD Plus and resumption of the recommended dosing regimen will minimize the opportunity for the development of adult heartworms.

Monthly treatment with HEARTGARD Plus also provides effective treatment and control of alsarcids (*T. canis*, *T. leonina*) and hookworms (*A. caninum*, *U. stenocephala*, *A. braziliense*). Clients should be advised of measures to prevent reinfection with intestinal parasites.

**EFFICACY:** HEARTGARD Plus Chewables, given orally using the recommended dose and regimen, are effective against the tissue larval stage of *D. immitis* for a month (30 days) after infection and, as a result, prevent the development of the adult stage. HEARTGARD Plus Chewables are also effective against canine alsarcids (*T. canis*, *T. leonina*) and hookworms (*A. caninum*, *U. stenocephala*, *A. braziliense*).

**ACCEPTABILITY:** In acceptability and field trials, HEARTGARD Plus was shown to be an acceptable oral dosage form that was consumed at first offering by the majority of dogs.

**PRECAUTIONS:** All dogs should be tested for existing heartworm infection before starting treatment with HEARTGARD Plus which is not effective against adult *D. immitis*. Infected dogs must be treated to remove adult heartworms and microfilariae before initiating a program with HEARTGARD Plus.

While some microfilariae may be killed by the ivermectin in HEARTGARD Plus at the recommended dose level, HEARTGARD Plus is not effective for microfilariae clearance. A mild hypersensitivity-type reaction, presumably due to parasitic or drug-induced microfilaricidal activity, has been observed in clinical trials with ivermectin alone after treatment of some dogs that have circulating microfilariae.

**HEARTGARD Plus** is not effective for microfilariae clearance. A mild hypersensitivity-type reaction, presumably due to parasitic or drug-induced microfilaricidal activity, has been observed in clinical trials with ivermectin alone after treatment of some dogs that have circulating microfilariae.

Keep this and all drugs out of the reach of children.

In case of ingestion by humans, clients should be advised to contact a physician immediately. Physicians may contact a Poison Control Center for advice concerning cases of ingestion by humans. Store between 68°F - 77°F (20°C - 25°C). Excursions between 59°F - 86°F (15°C - 30°C) are permitted. Protect product from light.

**ADVERSE REACTIONS:** In clinical field trials with HEARTGARD Plus, vomiting or diarrhea within 24 hours of dosing was rarely observed (1.1% of administered doses). The following adverse reactions have been reported following the use of HEARTGARD Plus: Depression/lethargy, vomiting, anorexia, diarrhea, mydriasis, ataxia, staggering, convulsions and hypersalivation.

**SAFETY:** HEARTGARD Plus has been shown to be bioequivalent to HEARTGARD, with respect to the bioavailability of ivermectin. The dose regimens of HEARTGARD Plus and HEARTGARD are the same with regard to ivermectin (6 mcg/kg). Studies with ivermectin indicate that certain dogs of the Collie breed are more sensitive to the effects of ivermectin administered at elevated dose levels (more than 16 times the target use level) than dogs of other breeds. At elevated doses, sensitive dogs showed adverse reactions which included mydriasis, depression, ataxia, tremors, drooling, paresis, recumbency, excitation, stupor, coma and death. HEARTGARD Plus has shown no signs of toxicity at 10 times the recommended dose (60 mcg/kg) in sensitive Collies. Results of these trials and bioequivalence studies, support the safety of HEARTGARD products in dogs, including Collies, when used as recommended.

HEARTGARD Plus has shown a wide margin of safety at the recommended dose level in dogs, including pregnant and breeding bitches, stud dogs and puppies aged 6 or more weeks. In clinical trials, many commonly used flea collars, dips, shampoos, anthelmintics, vaccines, antibiotics, vaccines and steroid preparations have been administered with HEARTGARD Plus in a heartworm disease prevention program. In one trial, where some pups had parvovirus, there was a marginal reduction in efficacy against intestinal nematodes, possibly due to a change in intestinal transit time.

**HOW SUPPLIED:** HEARTGARD Plus is available in three dosage strengths (See DOSAGE section) for dogs of different weights. Each strength comes in convenient cartons of 6 and 12 chewables.

For customer service, please contact Merial at 1-888-637-4251.

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Student Team Wins Award for One Health Efforts

The student organizers of Iowa One Health Day 2017 gain recognition for their work in bringing this important movement to the forefront.

By Kerry Lengyel

One Health Day—an international campaign launched in 2016 by the One Health Commission, the One Health Initiative, and the One Health Platform Foundation—is celebrated every year on November 3. Related events around the world help promote the campaign’s focus on improving quality of life for all humans, animals, and plants through collaborative efforts across various disciplines.

The goal of One Health Day is to engage as many people as possible through education and awareness events, and the concept is gaining momentum. In 2017, the day was commemorated in more than 115 worldwide events, many of which were student led and part of the One Health Day Student Events Competition.

IOWA ONE HEALTH CONFERENCE

Two student teams were recognized for their One Health Day campaigns and events and will be awarded $2000 for their efforts. One team, Iowa One Health—a group of graduate and undergraduate students, as well as recent graduates, from the University of Iowa and Iowa State University—organized the second Iowa One Health Conference on October 14, 2017, at the University of Iowa College of Public Health in Iowa City.

“The whole plan for the 2017 Iowa One Health Conference was for it to be bigger and better than the first one,” said conference cochair Neil Vezeau, a first-year veterinary student at Iowa State University College of Veterinary Medicine, “and we certainly did that.”

Open to the public, the conference boasted multiple sessions led by professionals to help increase students’ understanding of the One Health concept. The conference was divided into 2 tracks: geographic information systems and professional development, both of which can be applied broadly across the sciences.

Vezeau said one of the group’s biggest goals was to increase collaboration among Iowa universities and colleges. “Through sponsorship, attendees, planning team members, and conference speakers, we had participation from every major college or university within the state of Iowa,” Vezeau said. The group even gained government advocacy with a gubernatorial proclamation of November as Iowa One Health Month.

The professionals who presented at the conference helped it stand out among other student-led events, according to Vezeau. “It can actually be kind of a logistical challenge to get national- or international-level speakers out here,” he said. “I think one of the big differences between our event and other events competing for these sorts of grants is that we were actively bringing in or flying in or driving in people to come speak at the conference.”

The 2017 Iowa One Health Conference also took first place in the 2017 Student American Veterinary Medical Association One Health Grand Challenge, which awarded the student group $1700 toward the event.

LOOKING FORWARD

Although Vezeau has stepped down as cochair of the Iowa One Health Conference, he is excited to see what’s in store for the 2018 event. “The hope is that it will continue to be a massive collaboration. Our planning team last year was 20 people strong, including people from 15-plus fields,” he said. “It was an extremely collaborative venture, and there’s no doubt that it will continue to be as such.”

The 2 winners of the One Health Day Student Events Competition will be officially awarded their prizes at the 5th International One Health Congress, to be held in Saskatoon, Saskatchewan, Canada, in June.

AND THE SECOND WINNER IS...

The One Health Student Innovation Club at Makerere University in Kampala, Uganda, which organized a rabies vaccination and awareness campaign, was the second group to win the One Health Day Student Events Competition. From September 28 to 30, 2017, students helped vaccinate more than 100 dogs and cats against the disease. The club’s members also participated in a campaign to sensitize the community and create awareness about rabies and its impact in the communities of Kanyanya, Kabowa, and Kawaala.
Could Value-Based Veterinary Care Become the Future Standard of Care?

A patient-centered approach coupled with increased collaboration could lead to improved value, care, and outcomes in veterinary medicine.

By Lucas Pantaleon, DVM, MS, DACVIM, MBA

The concept of One Health evolved from the perception that specialization increases fragmentation and decreases collaboration. We know this to be true across human and veterinary medicine, where specialization has led to compartmentalization and a tendency to work in isolation. This siloed approach to treating patients could lead to negative outcomes, higher costs, and decreased patient and client satisfaction.

Although human and veterinary medicine differ in many ways, similarities do exist. Treatment decisions commonly are triggered by difficult-to-predict health episodes, care is provided by experts who often understand little about the associated costs, and emotional and financial trade-offs are important to the decision-making process. Furthermore, the pace of technologic advances is similar between the industries, and delivery of care requires lengthy training and occupational licensing.

In the United States, 68% of households include a pet. In 2017, an estimated $69.4 billion was spent on pets, of which $16.6 billion went toward veterinary care. Those expenditures show no signs of slowing down. Many pets are considered family members, so clients are likely to seek high-end medical care for them, particularly for serious illness.

In the spirit of One Health, veterinarians and medical doctors can and should learn from each other about better ways to deliver care to their patients, thus improving outcomes and increasing understanding of the costs of that care. For example, veterinarians can learn from their human health counterparts through the strategy of value-based health care (VBHC).

VALUE-BASED HEALTH CARE DEFINED

The cost of health care delivery worldwide has increased to unsustainable levels, now roughly double the rate of gross domestic product growth in most developed countries. Despite the greater spending, however, outcomes vary, and there is no clear causal relationship between money invested and health care delivered.

The crux of the VBHC strategy is to maximize value—achieving the best patient outcomes at the lowest cost. To reach this goal, 1 or more outcomes must be improved without raising costs, or costs must be decreased without sacrificing outcomes. By improving value, everyone involved in patient care benefits, and the sustainability of the health care system increases.

With value defined around the patient, VBHC involves shifting to a patient-centered health care system organized around patients’ needs. Measuring outcomes is a very important part of VBHC. More powerful yet is the concomitant measurement of outcomes and costs for the same clinical condition.

An important principle in structuring any business is to organize around customers and their needs. In health care, this requires a shift from organizing by specialty department and discrete service to organizing around medical conditions. Constructing teams—clinical and nonclinical—into integrated practice units (IPUs) allows for collaboration and cooperation as a means of providing better patient care. One early study of this concept found that heart failure patients had better outcomes when cardiology worked together, compared with either providing care alone.

Measuring outcomes is an intricate part of teamwork, as integrated care teams must take joint responsibility for outcomes. The objective of IPUs is to work toward the common goal of improving patient outcomes as efficiently as possible. In this instance, having outcome data is critical for delivering exceptional care.

VBHC is undergoing a transformation. Great advances have been made, but the work continues as the health care system learns from the challenges and opportunities created by its implementation.

WHAT CAN VALUE-BASED VETERINARY CARE DO?

Considering the overall One Health goal of improving health, value-based veterinary care (VBVC) could revolutionize the way we care for animals. Putting patients’ needs first and collaborating among disciplines could unlock a new way of increasing value to our patients and clients.

Similar to VBHC, a VBVC strategy would prioritize delivering outcomes that matter to pet owners in a financially sustainable way. Outcomes and costs should be measured and interventions toward increasing value implemented.

Veterinary care spending has followed health care spending closely, with 60% more money spent on pet health care in 2012 than in 1996. Additionally, there is a close correlation between human and pet health spending for end-of-life care, with a distinct spike in spending for both populations.

The increasing client demand for state-of-the-art veterinary care has resulted in an expansion in referral hospitals with numerous specialty services, creating a multitier care system similar to that in human health care. We veterinarians, however, have more to learn about working together for the better of our patients. Patient referral is often influenced by financial factors, such as the misperception of many primary care practitioners that a referral will lead to lost revenue.

A small 2016 study found that dogs with congestive heart failure lived 74% longer when care was provided collaboratively by a specialist and a primary care veterinarian. This study also showed that collaboration actually led to greater revenue for the primary care veterinarian, likely due to the increased survival and need for follow-up. Veterinary Specialists Outreach & Awareness Project, a nonprofit organization for which I serve on the advisory board, is researching the impact of collaboration between specialists and generalists on outcomes and economics. I am hoping this information will soon generate data on the importance of working together in a patient-centered way.

References available at AmericanVeterinarian.com.
LYMPH NODES: WHEN TO ASPIRATE
The most common time veterinarians perform lymph node aspiration is probably when the lymph node is enlarged, according to Anne Barger, DVM, MS, DACVP, clinical professor in pathobiology at the University of Illinois. “So, either on physical exam you palpate 1 or more lymph nodes and notice enlargement, or if a patient is having some sort of abdominal or thoracic imaging the structure is visualized and it’s able to be aspirated,” she says.

But the other time to aspirate a lymph node is when the animal has another kind of tumor and you’re worried that it may have traveled or metastasized to the lymph node. “That’s why we say part of the staging process for a tumor is to aspirate the draining lymph nodes,” Dr. Barger says.

SAFER ANESTHESIA IN 2 STEPS
The biggest thing we can do to improve safety during anesthetic events, says Khursheed Mama, DVM, DACVAA, professor of veterinary anesthesiology at Colorado State University, is prepare. “Making an anesthetic plan is step 1, so getting a good history, conducting a good physical exam, and doing additional lab work, imaging, and other diagnostics and having all that information when making an anesthetic plan,” she says. Step 2 is calibration. “We need to check our equipment, make sure everything is working, and make sure everything is calibrated,” she says.

CAUSES OF URINARY INCONTINENCE
When we look at urinary incontinence, says Heidi Lobprise, DVM, DAVDC, who practices at Main Street Veterinary Hospital in Flower Mound, Texas, we have to consider conscious and unconscious urinary issues. “If it’s in a very young animal, there could be an ectopic ureter,” she says. “Usually we find it in spayed females that are a little bit older. Large breeds are the most common. As we see this, the sphincter muscle is relaxing, not being able to close tight. And that’s why we have the leakage and the ongoing problems that can occur with it.”

THE BIGGEST CHALLENGE IN ASSESSING PAIN
It’s the perennial problem: Are animals painful or not? Perioperative pain and chronic pain pose different challenges, says James Gaynor, DVM, DACV, DACVP, pain specialist at Peak Performance Veterinary Group in Frisco, Colorado. “In the hospital, cats and dogs are really good at hiding their behavioral manifestations of pain, which means either the veterinarian needs to make an assumption about what is painful or we really need to palpate the animal,” he says.

For arthritis pain, owners can help. “They can really tell us whether the dog has had changes in behavior or activity, which are indicative of pain,” he says, “and as we treat them and their behavior and activity return to normal, then they are typically less painful.”

ACUTE ONSET OF NEUROLOGIC SIGNS? THINK TOXINS
“When a young animal is perfectly healthy, and then all of a sudden it’s sick, it can be a medical disease,” says Ken Drobatz, DVM, MSCE, DACVIM, DACVECC, professor of critical care at the University of Pennsylvania, “but I always wonder about toxins.” This is especially true with acute-onset neurologic signs, he says, such as ataxia, wobbliness, altered mentation, and the like. Of course, he notes, you must talk extensively with the pet owner to get to the bottom of things.

WHERE ANTIMICROBIAL RESISTANCE DEVELOPS
Jill Maddison, BVSc, PhD, FACVSc, SFHEA, MRCVS, professor of general practice in clinical sciences and services at the Royal Veterinary College, says that although it’s commonly believed that antibacterial resistance develops at the site of infection—and sometimes it can be if the infection hasn’t been treated appropriately—other causes are sometimes overlooked. “Whenever we give an antimicrobial,” Dr. Maddison says, “we are affecting the normal flora in the patient.” That normal flora lives in the skin and, importantly, in the gut. “Particularly if we give oral antibiotics, we’re going to be changing the gut flora, which is something we’ve always known. The issue of it causing bacterial resistance, or populations of resistance, or causing the bacterial population to potentially develop dysbiosis, is a more recent understanding that’s come out of research studies,” she says.

HANDLING FEARFUL OR AGGRESSIVE CATS
The single favorite thing Alison Gottlieb, BS, CVT, VTS (ECC), intensive care nurse and education coordinator for CARES (Center for Animal Referral and Emergency Services) in Langhorne, Pennsylvania, likes to use when dealing with fearful or aggressive cats is gabapentin. “Giving a cat 100 mg of gabapentin 2 hours before the visit is life changing for everyone involved,” she says. “The other things I like to use are towels and lots of catnip.”

UNIQUE ASPECTS OF THE AVIAN GASTROINTESTINAL SYSTEM
Most psittacine species have a segment of their esophagus called the crop, which is a sac-like area where food can accumulate, says Jennifer Graham, DVM, DABVP (Avian & Exotic Companion Mammal Practice), associate professor of zoological animal medicine at the Cummings School of Veterinary Medicine at Tufts University. “So, if they have any sort of motility issue, they can present with crop distention,” she says. Also, instead of a true stomach, birds have a proventriculus and a ventriculus. Depending on the type of bird, there can be a lot of differences in terms of that as well as the cecal anatomy.

Most clinically relevant, Dr. Graham says, is that birds have a cloaca, which is the common opening of the gastrointestinal, urinary, and reproductive tracts. “If a bird has pathology, such as passing blood in the stool, that could be originating from any one of those systems.”

Advice and insight from veterinary experts around the country
**Product Spotlight**

**VIRALYS ORAL GEL**

Marketed By: Vetoquinol

For use in cats only, Viralys helps support a healthy immune system, respiratory health, and eye function and is recommended for conditions that are known to respond to the amino acid L-lysine. This maple-flavored gel contains high levels of L-lysine (500 mg/0.5 teaspoon), with more than 50 servings per tube.

Dose: For kittens 6 months or younger, 0.25 tsp twice daily; for cats 6 months or older, 0.5 tsp twice daily; also available in powder form

For More Information: vetoquinolusa.com

**QUINICARN**

Marketed By: Nutramax Laboratories

This dietary supplement for cats and dogs provides L-carnitine to stimulate fatty acid metabolism for energy utilization, support recovery time after strenuous activity, and help maintain lean muscle mass. Quinicarn may also help support heart and liver health in both dogs and cats.

Dose: 250-mg chicken-flavored powder packets administered once daily to food

For More Information: quinicarn.com

**IVERHART MAX**

Marketed By: Virbac

As the first canine heartworm preventive approved to treat and control tapeworms, Iverhart Max (ivermectin/pyrantel pamoate/praziquantel) chewable tablets provide an even wider range of coverage. Available in 4 weight ranges for dogs 8 weeks and older, Iverhart Max protects dogs against the 4 most common worms: heartworms, roundworms, hookworms, and tapeworms.

Dose: Monthly chewable tablet

For More Information: us.virbac.com

**CREDELIO**

Marketed By: Elanco Animal Health

Available in 4 strengths, Credelio kills adult fleas, treats flea infestations, and treats and controls common tick infestations for 1 month in dogs 8 weeks and older and weighing a minimum of 4.4 lb. Its patented active ingredient, lotilaner, targets the nervous system receptors of ticks and fleas when the parasites bite.

Dose: Beef-flavored, chewable tablet given with or 30 minutes after meals; given monthly

For More Information: credelio.com

**TELAZOL**

Marketed By: Zoetis

This rapid-acting combination of tiletamine and zolazepam is used in cats for restraint or for anesthesia combined with muscle relaxation and in dogs for restraint and analgesia for minor procedures. Telazol should be administered by deep intramuscular injection in prescribed doses for either diagnostics or minor procedures in dogs and cats.

Dose: For diagnostic purposes
Dog: 3 to 4.5 mg/lb (6.6-9.9 mg/kg)
Cat: 4.4 to 5.4 mg/lb (9.7-11.9 mg/kg)
For minor procedures
Dog: 4.5 to 6 mg/lb (9.9-12.2 mg/kg)
Cat: 4.8 to 5.7 mg/lb (10.6-12.5 mg/kg)

For More Information: zoetisus.com

**TRIZCHLOR 4 MOUSSE**

Marketed By: Dechra Veterinary Products

While this recognizable formulation has been available for years as shampoos, wipes, and sprays, veterinarians now have the option to prescribe mousse. This antifungal and antibacterial mousse contains 4% chlorhexidine gluconate, USP, and can help with certain skin and coat conditions in dogs, cats, and horses.

For More Information: dechra-us.com

**VIRALYS ORAL GEL**

Marketed By: Vetoquinol

For use in cats only, Viralys helps support a healthy immune system, respiratory health, and eye function and is recommended for conditions that are known to respond to the amino acid L-lysine. This maple-flavored gel contains high levels of L-lysine (500 mg/0.5 teaspoon), with more than 50 servings per tube.

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For More Information: vetoquinolusa.com

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Dose: Monthly chewable tablet

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#1 USED PET GLUCOMETER

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1. Data on file. Zoetis Market Research: Blood Glucose Monitoring Report, July 2017, Zoetis Inc. All trademarks are the property of Zoetis Services LLC or a related company or a licensor unless otherwise noted. © 2017 Zoetis Services LLC. All rights reserved. ATK-00175
PREVENTS HEARTWORM DISEASE

TREATS AND CONTROLS 3 SPECIES OF HOOKWORMS

TREATS AND CONTROLS 2 SPECIES OF ROUNDWORMS

OWNERS PREFER IT1 AND DOGS LOVE IT2

IMPORTANT SAFETY INFORMATION: HEARTGARD® Plus (ivermectin/pyrantel) is well tolerated. All dogs should be tested for heartworm infection before starting a preventive program. Following the use of HEARTGARD Plus, digestive and neurological side effects have rarely been reported. For more information, please visit www.HEARTGARD.com.

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