WVC
Who’s at Risk for Bartonellosis? A One Health Perspective

Bartonellosis is a zoonotic bacterial infection that can lead to serious disease in animals and humans. At the 2017 Western Veterinary Conference in Las Vegas, Nevada, Edward Breitschwerdt, DVM, DACVIM, and Christopher Woods, MD, discussed Bartonella infection from both human and animal perspectives, covering epidemiology, disease manifestations, potential risk to veterinary personnel, and the role of veterinarians in education and prevention.

Our understanding of the Bartonella genus is changing rapidly, said Dr. Breitschwerdt, a professor of medicine and infectious diseases at North Carolina State University College of Veterinary Medicine in Raleigh. Advances in diagnostic (continued on page 10)

COMMENTARY
One Health: New Term, Ancient Concept

In September 2001, I was entering the master’s degree program in public policy at Princeton University’s Woodrow Wilson School of Public and International Affairs. I had already earned MD and MPH degrees but felt that a policy degree would enable me to rise higher in government and have a greater influence on public health policy. I had been working in patient safety and hospital quality oversight at the New Jersey State Health Department. The work was important but hamstrung by politics. (continued on page 31)

SPECIAL FEATURE
Medical Marijuana in People and Pets: History, Controversy, and the Future

By Don Vaughan

Bucky, a 16-year-old Queensland heeler, had been athletic until a leg injury, hip dysplasia, and arthritis conspired to limit his mobility. Bucky’s owner, Sand Brim, discussed her concerns with her veterinarian, Gary Richter, MS, DVM, CVA, CVC, who talked about the potential benefits of medical marijuana. Brim, an attorney in Oakland, California, purchased an oil containing a 1:1 ratio of the cannabinoids tetrahydrocannabinol (THC) and cannabidiol (CBD) from (continued on page 20)

WVC
Getting to “Yes”—Keys to a Successful Oral Health Protocol

At the 2017 Western Veterinary Conference in Las Vegas, Nevada, Thomas Klein, DVM, outlined the key steps involved in setting up an oral health care protocol in a general veterinary practice. The primary goals, he said, are to establish standards of dental care excellence for the practice, make sure the entire staff is aware of those standards, (continued on page 14)

WVC
An Immunotherapy Vaccine for Canine Cancer

An immunologist with more than 30 years of experience researching human cancer, John Yanelli, PhD, discussed newer views on cancer treatment at the 2017 Western Veterinary Conference in Las Vegas, Nevada. Dr. Yanelli and his collaborator, Don Cohen, PhD, have shifted their research focus at the University of Kentucky from cancers in humans to solid tumors in dogs. (continued on page 12)

WVC
End-of-Life Care at Its Best: Part 1

Dani McVety, DVM, and Mary Gardner, DVM, founded Lap of Love Veterinary Hospice—a network of veterinarians dedicated solely to end-of-life veterinary care—in 2009. Their unique practice has grown steadily over the years to become the largest practice of its kind in the country, comprising more than 90 veterinarians around the United States.

American Veterinarian™ caught up with these pioneering veterinarians at the 2017 Western Veterinary Conference in Las Vegas, Nevada to talk about palliative care, hospice care, and euthanasia. Our candid conversation revealed why these doctors do what they do and how they do it with grace and an unwavering commitment to empowering veterinarians to provide the highest standards of care and support for patients and pet owners.

Here is the first part of our conversation; look for the conclusion in our June issue. (continued on page 17)

WVC
Mirtazapine for Appetite Stimulation in Cats

Jessica Quimby, DVM, DACVIM, PhD, has a long-standing interest in chronic kidney disease in cats. One important issue in managing chronic kidney disease is ensuring that patients eat. At the 2017 Western Veterinary Conference in Las Vegas, Nevada, Dr. Quimby spoke about the popularity and success of pharmacologic appetite stimulation with mirtazapine, provided tips on how (continued on page 13)
Flea and tick protection that goes on and on and on...all month long

Introducing Simparica

Monthly chewables for dogs that offer persistent protection from fleas and ticks.

Simparica acts fast—it starts killing fleas within 3 hours and ticks within 8 hours—and keeps going strong for 35 days without losing effectiveness at the end of the month.

IMPORTANT SAFETY INFORMATION: Simparica is for use only in dogs, 6 months of age and older. Simparica may cause abnormal neurologic signs such as tremors, decreased conscious proprioception, ataxia, decreased or absent menace, and/or seizures. Simparica has not been evaluated in dogs that are pregnant, breeding or lactating. Simparica has been safely used in dogs treated with commonly prescribed vaccines, parasiticides and other medications. The most frequently reported adverse reactions were vomiting and diarrhea. See full Prescribing Information on the back of this page and at www.zoetisUS.com/SimparicaPl.


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FOR ORAL USE IN DOGS ONLY

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

Description: SIMPARICA is a flavored, chewable tablet for administration to dogs over 6 months of age according to their weight. Each tablet is formulated to provide a minimum sarolaner dosage of 0.91 mg/lb (2 mg/kg) body weight. Sarolaner is a member of the isoxazoline class of parasiticides and the chemical name is 1,5-bis[[(2S)-2-(5'-((5S)-5-(3,5-Dichloro-4-fluorophenyl)-5-(trifluoromethyl)-4,5-dihydroisoxazol-3-yl)-3'-H-spiro(azetidine-3,1'-[2]benzofuran)-1-yl)-2-(methylsulfonyl)ethanone. SIMPARICA contains the S-enantiomer of sarolaner. The chemical structure of the S-enantiomer of sarolaner is:

Indications: SIMPARICA kills adult fleas, and is indicated for the treatment and prevention of flea infestations (Ctenocephalides felis), and the treatment and control of tick infestations (Amblyomma americanum (Lone Star tick), Amblyomma maculatum (Gulf Coast tick), Dermacentor variabilis (American dog tick), and Rhipicephalus sanguineus (brown dog tick)) for one month in dogs 6 months of age or older and weighing 2.8 pounds or more. 

Dosage and Administration: SIMPARICA is given orally once a month at the recommended minimum dosage of 0.91 mg/lb (2 mg/kg).

Dosage Schedule:

<table>
<thead>
<tr>
<th>Body Weight</th>
<th>SAROLANER per Tablet (mg)</th>
<th>Number of Tablets Administered</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8 to 5.5 lbs</td>
<td>5</td>
<td>One</td>
</tr>
<tr>
<td>5.6 to 11.0 lbs</td>
<td>10</td>
<td>One</td>
</tr>
<tr>
<td>11.1 to 22.0 lbs</td>
<td>20</td>
<td>One</td>
</tr>
<tr>
<td>22.1 to 44.0 lbs</td>
<td>40</td>
<td>One</td>
</tr>
<tr>
<td>44.1 to 88.0 lbs</td>
<td>80</td>
<td>One</td>
</tr>
<tr>
<td>88.1 to 132.0 lbs</td>
<td>120</td>
<td>One</td>
</tr>
<tr>
<td>&gt;132.1 lbs</td>
<td>Administer the appropriate combination of tablets</td>
<td></td>
</tr>
</tbody>
</table>

SIMPARICA can be offered by hand, in the food, or administered like other tablet medications. Care should be taken that the dog consumes the complete dose, and treated animals should be observed for a few minutes to ensure that part of the dose is not lost or refused. If a dose is missed, administer SIMPARICA and resume a monthly dosing schedule. SIMPARICA should be administered at monthly intervals.

Flea Treatment and Prevention: Treatment with SIMPARICA may begin at any time of the year. In areas where fleas are common year-round, monthly treatment with SIMPARICA can continue the entire year without interruption. To minimize the likelihood of flea re-infestation, it is important to treat all dogs and cats within a household with an approved flea control product.

Tick Treatment and Control: Treatment with SIMPARICA can begin at any time of the year (see Effectiveness).

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

Warnings: Not for use in humans. Keep this and all drugs out of reach of children and pets. For use in dogs only. Do not use SIMPARICA in cats.

Precautions: SIMPARICA may cause abnormal neurologic signs such as tremors, decreased conscious proprioception, ataxia, decreased or absent menace, and/or seizures (see Animal Safety). The safe use of SIMPARICA has not been evaluated in breeding, pregnant, or lactating dogs.

Adverse Reactions: SIMPARICA was administered in a well-controlled US field study, which included a total of 479 dogs (315 dogs treated with SIMPARICA and 164 dogs treated with active control) monthly for three treatments. Over the 90-day study period, all observations of potential adverse reactions were recorded. Table 1. Dogs with adverse reactions

<table>
<thead>
<tr>
<th>Adverse reaction</th>
<th>sarolaner</th>
<th>sarolaner</th>
<th>active control</th>
<th>active control</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>% (n = 315)</td>
<td>N</td>
<td>% (n = 164)</td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td>3</td>
<td>0.95%</td>
<td>9</td>
<td>5.50%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2</td>
<td>0.63%</td>
<td>2</td>
<td>1.20%</td>
</tr>
<tr>
<td>Lethargy</td>
<td>0</td>
<td>0.32%</td>
<td>2</td>
<td>1.20%</td>
</tr>
<tr>
<td>Inappetance</td>
<td>0</td>
<td>0%</td>
<td>3</td>
<td>1.80%</td>
</tr>
</tbody>
</table>

Additionally, one female dog aged 8.6 years exhibited lethargy, ataxia while posturing to eliminate, elevated third eyelids, and inappetence one day after receiving SIMPARICA concurrently with a heartworm preventative (vermectin/pyrantel pamoate). The signs resolved one day later. After the day 14 visit, the owner elected to withdraw the dog from the study.

For a copy of the Safety Data Sheet (SDS) or to report adverse reactions call Zoetis Inc. at 1-888-963-8471. Additional information can be found at www.Zoetis.com. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or http://www.fda.gov/AnimalVeterinary/SafetyHealth.

Clinical Pharmacology: Sarolaner is rapidly and well absorbed following oral administration of SIMPARICA. In a study of 12 maximum plasma concentration (Cmax) was 1100 ng/mL and the mean time to maximum concentration (Tmax) was observed at 3 hours following a single oral dose of 2 mg/kg to fasted animals. The mean oral bioavailability was 86% and 107% in fasted and fed dogs, respectively. The mean oral T1/2 values for fasted and fed animals was 10 and 12 days respectively.

Sarolaner is distributed widely, the mean volume of distribution (Vdss) was 2.81 L/kg body weight following a 2 mg/kg intravenous dose of sarolaner. Sarolaner is highly bound (>99.9%) to plasma proteins. The metabolism of sarolaner appears to be minimal in the dog. The primary route of sarolaner elimination from dogs is bile excretion with elimination via the feces.

Following repeat administration of SIMPARICA once every 28 days for 10 doses to Beagle dogs at 1X, 3X, and 5X the maximum intended clinical dose of 4 mg/kg, steady-state plasma concentrations were achieved after the 6th dose. Following treatment at 1X, 3X, and 5X the maximum intended clinical dose of 4 mg/kg, sarolaner systemic exposure was dose proportional over the range 1X to 5X.

Mode of Action: The active substance of SIMPARICA, sarolaner, is an acaricide and insecticide belonging to the isoxazoline group. Sarolaner inhibits the function of the neurotransmitter gammaaminobutyric acid (GABA) receptor and glutamate receptor, and works at the neuromuscular junction in insects. This results in uncontrolled neuromuscular activity leading to death in insects or aracines.

Effectiveness: In a well-controlled laboratory study, SIMPARICA began to kill fleas 3 hours after initial administration and reduced the number of live fleas by ≥96.2% within 8 hours after flea infestation through Day 33.

In a separate well-controlled laboratory study, SIMPARICA demonstrated 100% effectiveness against adult fleas within 24 hours following treatment and maintained 100% effectiveness against weekly re-infestations for 35 days.

In a study to explore flea egg production and viability, SIMPARICA killed fleas before they could lay eggs for 35 days. In a study to simulate a flea-infested home environment, with flea infestations established prior to the start of treatment and re-infestations on Days 7, 17, and 67, SIMPARICA administered monthly for three months demonstrated ≥95.6% reduction in adult fleas within 14 days after treatment and reached 100% on Day 60.

In well-controlled laboratory studies, SIMPARICA demonstrated ≥99% effectiveness against an initial infestation of Amblyomma americanum, Amblyomma maculatum, Dermacentor variabilis, and Rhipicephalus sanguineus 48 hours post-administration and maintained ≥96% effectiveness 48 hours post-re-infestation for 30 days.

In a well-controlled 90-day US field study conducted in households with existing flea infestations of varying severity, the effectiveness of SIMPARICA against fleas on Day 30, 60 and 90 visits compared to baseline was 99.4%, 99.8%, and 100%, respectively. Dogs with signs of flea allergy dermatitis showed improvement in erythema, papules, scaling, alopecia, dermatitis/pyoderma and pruritis as a direct result of eliminating fleas.

Animal Safety: In a margin of safety study, SIMPARICA was administered orally to 8-week-old Beagle puppies at doses of 0, 1X, 3X, and 5X the maximum recommended dose (4 mg/kg) at 28-day intervals for 10 doses (8 dogs per group). The control group received placebo tablets. No neurologic signs were observed in the 1X group. In the 3X group, one male dog exhibited tremors and ataxia post-dose on Day 0; one female dog exhibited tremors on Days 1, 2, 3, and 5; and one female dog exhibited tremors on Day 1. In the 5X group, one female dog had a seizure on Day 6 (5 days after third dose); one female dog had tremors post-dose on Day 0 and abnormal head coordination after dosing on Day 140, and one female dog exhibited seizures associated with the second and fourth doses and tremors associated with the second and third doses. All dogs recovered without treatment. Except for the observation of abnormal head coordination in one dog in the 5X group two hours after dosing on Day 140 (dose 6). There were no treatment-related neurological signs observed once the dogs reached the age of 6 months.

In a separate exploratory pharmacokinetic study, one female dog dosed at 12 mg/kg (3X the maximum recommended dose) exhibited lethargy, anorexia, and multiple neurological signs including ataxia, tremors, disorientation, hypo- and hyperreflexia, decreased conscious proprioception, and absent menace, approximately 2 days after a third monthly dose. The dog was not treated, and was ultimately euthanized. The first two doses resulted in plasma concentrations that were consistent with those of the other dogs in the treatment group. Starting at 7 hours after the third dose, there was a rapid 2.5 fold increase in plasma concentrations within 48 hours, resulting in a Cmax more than 7-fold higher than the mean Cmax at the maximum recommended use dose. No cause for the sudden increase in sarolaner plasma concentrations was identified.

Storage Information: Store at or below 30°C (86°F) with excursions permitted up to 40°C (104°F).

How Supplied: SIMPARICA (sarolaner) Chewables are available in six flavored tablet sizes: 5, 10, 20, 40, 80, and 120 mg. Each tablet size is available in color-coded packages of one, three, or six tablets.

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December 2015

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A growing number of pet owners are turning to cannabis to treat their ailing animals, and more and more veterinarians are also expressing interest.
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The compliance date for USP <800> is July 2018.
MAKING ONE HEALTH A PRIORITY

Although we haven’t had a pandemic in quite some time, the Ebola and Zika outbreaks serve as examples of what can happen when a dangerous pathogen becomes easily transmissible. This is why many epidemiologists are watching out for the next “big one”—on the scale of the 1918 flu outbreak.

Although Ebola and Zika are no longer considered public health emergencies by the World Health Organization, other potentially deadly disease loom—and many of them are spread by animals to people.

Are public health agencies as ready as they should be for a zoonotic pandemic? The short answer is no: When it comes to major disease outbreaks of any kind, we can’t be overprepared. Investigative journalist Sonia Shah, author of *Pandemic: Tracking Contagions from Cholera to Ebola and Beyond*, cited a survey that revealed many experts believe that some time in the next 20 years a pandemic will occur that will “sicken a billion people, kill 165 million people, and cost the global economy about $3 trillion.”

Indeed, a 2015 outbreak of avian flu killed 48 million birds and had an economic toll of $3 billion; the health and monetary effects of an outbreak on this scale in humans would be monumental.

Veterinarians are vitally important in the battle against zoonotic diseases. Epidemiologists, physicians, and other human health experts can’t do it alone. That’s why the concept of One Health—that achieving optimal health for people, animals, and the environment requires the collaboration of professionals from multiple health and medical disciplines—has never been more important.

In our ongoing effort to infuse One Health information throughout *American Veterinarian™*, this issue includes multiple topics that affect both people and animals. A commentary (page 31) from Laura H. Kahn, MD, MPH, MPP, a physician and research scholar with the Program on Science and Global Security at the Woodrow Wilson School of Public and International Affairs at Princeton University, details her journey to discovering the importance of DVM-MD collaboration and what led her to take the next step in founding the One Health Initiative.

We also report on a lecture given at the Western Veterinary Conference by Edward Breitschwerdt, DVM, DACVIM, and Christopher Woods, MD, infectious disease specialists in veterinary and human medicine, respectively (page 10). They reported on bartonellosis, a zoonotic disease that can have serious consequences in both people and animals.

This and other diseases threaten both human and animal health, and as the risk for a zoonotic pandemic grows, veterinarians and medical doctors must work together to develop programs that protect animals and people.

Thank you for reading.

Mike Hennessy, Sr
Chairman and CEO
How Trump’s Plan to Build a Wall Affects Wildlife

By Kerry Lengyel

As president, Donald Trump has an enormous impact on almost every aspect of the world we live in—including animals. The president’s executive order in late January called for the “immediate construction of a physical wall on the southern border,” which he says will give the United States control of its borders.

His plan is to build a 1300-mile, 40-foot solid wall containing 19 million tons of concrete that could cost more than $25 billion. But while this wall may block immigrants from entering the United States, it could also have the unintended consequence of blocking many species of animals from entering and leaving.

A report created last year based on U.S. Fish and Wildlife Service data explained that construction of the wall could have a negative impact on 111 endangered species, 108 species of migratory birds, 4 wildlife refuges and fish hatcheries, and an unknown number of protected wetlands. Under current laws, the government is exempt from environmental regulations when it comes to building “security” infrastructure.

Many species have already been affected by the existing wall that lies between the United States and Mexico, which spans about 650 miles along the 1954-mile border. The current border wall has put more than 50 species at risk, according to a 2011 study in the journal Diversity and Distributions. The authors of that article warned, “New barriers along the border would increase the number of species at risk, especially in [the border regions of California, Madrean Archipelago, and Gulf Coast], which should be prioritized for mitigation of the impacts of current barriers.”

If the extension and addition of the new wall are completed, more species could see their habitats torn apart. Studies have found that smaller populations of wildlife that occur in more specialized habitats are the most at risk when a barrier is erected. When certain animals are separated by walls and barriers, their ability to move and populate is very limited. Some experts believe inbreeding will increase and genetic diversity will decrease.

Behavioral Differences Between Purebred and Mixed-Breed Dogs

By JoAnna Pendergrass, DVM

Purebred and mixed-breed dogs have behavioral, demographic, and environmental differences, according to online surveys completed by dog owners. Survey results, published recently in *PLoS ONE*, suggest that mixed-breed dogs may “represent a special group with characteristic behavioral traits,” according to the authors.

Mixed-breed dogs often have complex or unknown ancestry. According to the American Veterinary Medical Association, about 53% of dogs in American households are mixed breeds. In other countries, this percentage ranges from 33% (Germany, United Kingdom) to 50% (Australia).

Several studies have noted behavioral differences between purebreds and mixed breeds. In one study, mixed-breed dogs were found to be more disobedient, nervous, and excitable than purebreds. In contrast, another study found no personality differences between mixed breeds and purebreds. Behavioral comparisons were not the main aim of these studies, however, indicating that the observed differences (or lack thereof) could have reflected other factors, such as dog-keeping practices.

For the current study, the authors collected data from two online surveys completed by dog owners in Germany. Part 1 of each survey pertained to demographics (dogs and dog owners) and dog-keeping practices. Part 2 of survey 1 focused on 4 behavioral traits: calmness, trainability, sociability (toward other dogs), and boldness. Part 2 of survey 2 pertained to behavioral problems in the dogs, such as stubbornness and leash pulling.

In total, information on approximately 15,400 dogs (purebred, n = 7700; mixed-breed, n = 7691) was collected.

**Behavioral Trait Differences**

Compared with purebreds, mixed breeds were significantly less calm and less sociable with other dogs. Other significant differences were observed in trainability or boldness. Behavior was significantly more problematic with mixed breeds.

**Demography**

- Mixed breeds were older and more likely to be female.
- Mixed-breed owners were primarily younger and female with less dog-owning experience.

**Dog keeping**

- Mixed breeds were older when acquired.
- More mixed breeds were neutered.
- Mixed breeds were primarily indoor-only pets, but they got walked for longer periods than purebreds.

Notably, factors related to commitment to dog ownership (eg, buying gifts, hours spent playing) were not significantly different between dog groups.

Only “neuter status” and “age when acquired” had differences exceeding 10% between dog groups. For the other factors, the magnitude of differences was too small for clinical relevance.

**Relation Between Behavioral Traits and Other Factors**

Using linear regression, the authors identified several significant associations between behavioral traits and demographic and dog-keeping factors. Importantly, dog group was significantly associated with several traits: Mixed breeds were less calm, more trainable, and had more behavioral problems than did purebreds.

Other factors also had significant associations. Compared with younger dogs, older dogs were calmer, less trainable, and less sociable toward other dogs. Females were more sociable than males and had fewer behavioral problems.

The authors mentioned possible genetic and developmental influences on the observed differences. Breeders genetically select for more desirable behaviors in purebred dogs. Developmentally, mixed-breed dogs tend to spend more time in shelters before adoption; the stresses of shelter life could lead to more behavioral problems.

**Study Limitations and Conclusion**

Owner subjectivity was an important study limitation. Owners of purebreds may have assumed their dogs were behaviorally superior to mixed-breed dogs and thus downplayed problematic behaviors.

These survey results highlight the multifactorial differences between mixed-breed and purebred dogs. Such differences suggest that mixed-breeds are more than just “average” dogs.
Poaching Causes Staggering Population Losses in Central African Elephants

By JoAnna Pendergrass, DVM

Elephant populations are at risk in many places around the world, particularly in Central Africa. At the turn of the 21st century, Gabon, a Central African nation along the Atlantic coast, established Minkébé National Park (MNP) to protect forest elephants. This remotely located park is Gabon’s largest protected area, shares borders with Cameroon and the Republic of Congo, and is buffered by a no-hunting zone.

Despite having the highest density of Central African forest elephants in the early 2000s, MNP experienced a 78% to 81% drop in forest elephant population from 2004 to 2014, according to a report in Current Biology. This population loss, largely caused by cross-border poaching from Cameroon, “is a considerable setback for the preservation of the species,” the authors wrote.

The authors observed a marked drop in dung density along the park’s northern border with Cameroon, indicating intense cross-border poaching. Access to MNP from Cameroon’s national road is relatively easy, putting the park’s forest elephant population at serious risk. In addition, Cameroon is active in the ivory trade, fueling the elephant poaching industry. The authors noted that “much of the ivory seized on the international market has been traced back to the trinational area of Cameroon, Gabon, and Congo that includes MNP.”

Despite the marked decline in MNP’s forest elephant population over 10 years spanning 2004 to 2014, Gabon’s national park service remained underresourced and understaffed until its government was made aware of the elephant poaching in 2011. Since 2011, Gabon’s government has made important strides, including categorizing forest elephants as “fully protect-ed” and creating the National Park Police.

Because the ivory market is international, the authors mentioned, the efforts of Gabon’s government do not go far enough to prevent poaching of Central African elephants. They suggested several other actions:

• Creating protected areas that spread across several countries
• Coordinating the activities of law enforcement between countries
• Prosecuting those who either commit or encourage international wildlife crimes
• Listing Central African elephants as “critically endangered” on the International Union for Conservation of Nature’s Red List

Taken together, the report’s findings highlight the need to recognize the plight of Central African elephants and garner international support to prevent their extinction due to poaching.

Cancer Drug Improves Survival in Dogs, Shows Potential for Human Use*

By Jennifer Barrett

An experimental drug is improving survival rates in a common and aggressive canine cancer and may also have implications for cancer treatments in humans, according to a study findings from University of Minnesota researchers. The results were reported in a study published in Molecular Cancer Therapeutics.

The treatment, called eBat, positively impacted survival rates for dogs diagnosed with hemangiosarcoma (HSA), an incurable sarcoma likened to angiosarcoma, a cancer that affects humans. HSA is especially deadly because it often spreads before a diagnosis is made and has a low survival expectancy. Less than 50% of dogs with HSA survive 4 to 6 months, and about 10% are alive after 1 year.

The clinical trial tested 23 dogs of varying breeds diagnosed with HSA of the spleen. Each of the dogs received 3 treatments of eBat following surgery to remove the tumor and before conventional chemotherapy. The results showed that 6-month survival rates improved approximately 70%, and 5 of the 23 dogs that received the drug lived for more than 450 days. “eBat was created to specifically target tumors while causing minimal damage to the immune system,” Daniel Vallera, PhD, professor at the University of Minnesota Medical School and Masonic Cancer Center, said in a news release. “HSA is a vascular cancer, meaning it forms from the blood vessels. eBat was selected for this trial because it can simultaneously target the tumor and its vascular system.”

The researchers are optimistic that the drug’s positive results in trial could potentially translate to improved survival rates in human cancer patients as well. HSA’s similarity to angiosarcoma indicates that the drug may be a strong candidate for testing in human trials and might provide a better chance for survival.

*This article originally appeared on pharmaceuti.com.
Horses May Be Key to Curing Ebola

By Kerry Lengyel

Scientists have been trying to develop a cure for the deadly Ebola virus since it was discovered in 1976, and it looks like the answer may be within reach through, of all things, horse antibodies.

Ebola virus causes severe bleeding, organ failure, and potentially death. Typically, 50% of those who contract Ebola die within 6 to 16 days of the first signs of the disease. The initial cases of the longest and most complex Ebola outbreak were reported in March 2014 in West Africa. Between 2014 and 2016, the virus infected 30,000 people and killed more than 11,000 in that region.

A team from Australia’s University of Queensland produced equine antibodies against the Ebola virus and has shown that the antibodies are effective in preventing death in primates if given within 24 hours after exposure to a lethal dose of the virus.

“The post-exposure treatment commenced at 24 hours after Ebola infection and was continued daily for 5 days,” said Alexander Khromykh, BSc, PhD, professor of molecular virology at the university and part of the research team. “This was sufficient to greatly suppress Ebola virus replication in animals and allowed [them] to develop their own immune response, which subsequently cleared the virus.” This discovery marks the first economically viable cure for the disease.

This cure is somewhat similar to the treatment developed for infected medical professionals using monoclonal antibodies. The issue with monoclonal antibody treatment, however, is that manufacturing large quantities of the antibodies is expensive and requires specialized facilities. Equine antibodies, on the other hand, are widely manufactured and already used worldwide to treat such injuries as snake bites. There are facilities in Africa where horses are used to produce snake bite antivenom, making this cure a cost-effective option for resource-poor countries where the largest outbreaks of the virus have occurred.

For this treatment to be available, monetary support is needed to generate enough material to make the cure ready for the next Ebola outbreak. Although Dr. Khromykh noted that this is not an easy task because “preparedness is not usually high on anyone’s agenda,” this new finding offers great hope.

The 3 A’s of Coping with Anthropogenic Noise

By JoAnna Pendergrass, DVM

Anthropogenic noise (eg, road traffic, industrial noise) is generated by human activity. This type of noise, which can affect animals’ acoustic communication, has altered the natural landscape since the Industrial Age. Compared with natural noise sources (eg, water, wind, animals), anthropogenic noise has more energy; this energy can vary over time or stay consistent.

How anthropogenic noise affects animals has become an increasingly popular research topic involving multiple fields of study. To date, most anthropogenic noise studies have used birds, given that acoustic communication in birds is essential to their survival and reproduction. However, the effects of anthropogenic noise have also been studied in other species, including marine mammals and amphibians.

THE EFFECT OF ANTHROPOGENIC NOISE ON ANIMAL COGNITION

Anthropogenic noise affects an animal’s behavior and hearing. Exposure to chronic, elevated anthropogenic noise can damage an animal’s eardrums, leading to temporary or permanent hearing loss. This hearing loss can affect an animal’s ability to perceive and respond to acoustic signals effectively.

Whether anthropogenic noise is a stressor remains under debate. Studies have reported the negative effects of elevated glucocorticoid levels, indicative of a stress response, on cognition in animals. Other studies investigating a potential link between anthropogenic noise and long-term elevated glucocorticoid levels, though, have reported conflicting results. As the author noted, “The link between noise, elevated glucocorticoids and cognition is still primarily theoretical.”

The relationship between chronic noise and neurotransmission has also been evaluated. Rats exposed to chronic noise have demonstrated spatial memory loss, indicated by increased levels of the excitatory neurotransmitter glutamate in the hippocampus. Chronic noise exposure has also caused sleeplessness and depression in rats, likely due to altered neurotransmission. Despite these findings, it is not yet known how and why chronic noise affects neurotransmission; the effect of chronic noise on cognitive neural pathways also remains unknown.

COPING MECHANISM #1: AVOIDANCE

Avoidance, either spatial or temporal, is one type of coping mechanism for anthropogenic noise. Studies have reported animals establishing habitats away from noisy areas; notably, species richness is low near roadsides. How animals decide to actively avoid noisy areas is unknown. It is possible that they perceive anthropogenic noise as a predator threat. Temporally, animals avoid anthropogenic noise by communicating during noise gaps, known as “gap calling behavior.” Because anthropogenic noise can mask acoustic communication, animals use their cognition to perceive noise volume and decide when to make acoustic signals.

COPING MECHANISM #2: ADJUSTMENT

Animals that cannot avoid loud anthropogenic noise can make immediate or long-term behavioral adjustments. Immediate adjustments include making louder acoustic signals or, in the case of songbirds, adjusting song type; the neural mechanisms underlying these adjustments are unknown. Long-term adjustments resemble acclimation and are learned through repeated trial and error.

Learning to make these adjustments indicates behavioral phenotypic plasticity, or the ability to adjust phenotypic behavior according to environmental changes. Such plasticity can affect how well an individual or population can thrive in a noisy environment when noise avoidance is not feasible.

COPING MECHANISM #3: ADAPTATION

Animals can adapt to anthropogenic noise by selecting which acoustic signals will be most effective in certain environments. This adaptation occurs over multiple generations but is more likely to be cultural than genetic. Whether anthropogenic noise directly selects for heritable traits is unknown.

Overall, cognition’s role in how wild animals respond to anthropogenic noise requires further investigation. As the author wrote, “Progress in this field is ongoing, and our current knowledge provides a solid foundation from which to pursue many exciting opportunities.”
Who’s at Risk for Bartonellosis?
A One Health Perspective

By Laurie Anne Walden, DVM, ELS

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

(continued from front cover)

technology have enabled the discovery of new Bartonella species (the current count is 36). New vectors and reservoir hosts have also been identified.

According to the Centers for Disease Control and Prevention, the most common human diseases caused by Bartonella worldwide are cat-scratch disease (caused by Bartonella henselae, vectored by cat fleas, and transmitted to people via cat scratches), trench fever (caused by Bartonella quintana and transmitted by human lice), and Carrion disease (caused by Bartonella bacilliformis and transmitted by sand flies). Reservoir hosts such as cats are usually asymptomatic carriers of the bacteria.

However, the potential spectrum of bartonellosis—and thus the potential risk to animals and humans—is wider. “We don’t know exactly who is at risk,” said Dr. Breitschwerdt, “but we do know that everyone sitting in this room is at risk. That’s the most important message that I’d like to be transmitted to you today.”

EPIDEMIOLOGY AND PATHOGENESIS

Bartonella are fastidious bacteria that do not grow well in culture. The genus is closely related to Brucella, noted Dr. Breitschwerdt. These bacteria are “extremely difficult to diagnose, extremely difficult to treat, and we never know if we’ve actually cured the patient and eliminated this infection.”

Bartonella can invade many cell types, including bone marrow progenitor cells, erythrocytes, and endothelial cells. Evidence suggests that some Bartonella species can suppress the immune response, potentially predisposing patients to infections with other organisms.

Bartonella are maintained in mammalian reservoir hosts and transmitted between hosts by arthropod vectors. Reservoir and vector species vary according to the species of Bartonella. For B. henselae, the main reservoir species are domestic dogs and cats, and the most well-known vector is the cat flea. Recent research indicates that ticks can also transmit the organism. Known mammalian hosts for various Bartonella species include rodents, rabbits, cats, dogs, ruminants, several wildlife species, and humans. In general, vector-borne disease organisms do not necessarily cause serious illness in their adapted host species but can cause severe signs in other species.

More than one Bartonella species can be transmitted from fleas to cats, said Dr. Breitschwerdt. The organisms can pass via flea feces into the environment, where, according to a recent study, they are viable for up to 9 days. Flea control is of paramount importance, he said. “We need to think of [the cat flea] as a threat risk to the family.”

CLINICAL SIGNS IN DOGS AND CATS

The full spectrum of disease caused by bartonellosis is not yet known, said Dr. Breitschwerdt. Sequelae of Bartonella infection in animals may include the following:
• Cardiac disease, such as endocarditis and myocarditis
• Polyarthritis
• Vasculitis
• Lymphadenitis
• Seizures
• Epistaxis
• Skin lesions
• Fever
• Weight loss

“We now know that Bartonella kills cats,” he added. Certain strains of Bartonella can induce myocarditis and endocarditis in cats even though cats are usually asymptomatic hosts.

CLINICAL SIGNS IN HUMANS

Dr. Woods, an infectious disease specialist at the Duke Global Health Institute in Durham, North Carolina, described human manifestations of bartonellosis through a series of case reports.

Endocarditis

Infective endocarditis may be misdiagnosed because of the difficulty in growing Bartonella in culture. “Bartonella endocarditis is one of the most frequent causes of culture-negative endocarditis,” especially in areas of the world that do not have access to the newest diagnostic technology, he said. The session included a video of a physician describing his own experience with Bartonella endocarditis. He ultimately required an aortic valve replacement.
**Visceral Abscesses**
Visceral abscesses are “a well-known, very infrequent complication of cat-scratch disease,” Dr. Woods said. He described splenic abscesses in a man and visceral abscesses in a 4-year-old boy who had cat-scratch disease. The boy’s mother also developed endometritis (leading to a miscarriage) secondary to bartonellosis.

**Neurologic Manifestations**
Although cat-scratch disease is usually a self-limiting condition, Dr. Woods said, complications can occur. Neurologic complications can include encephalopathy, transverse myelitis, radiculitis, cerebellar ataxia, optic neuritis, and seizures. Most acute neurologic manifestations resolve within several weeks, he noted, but some patients have chronic deficits. Dr. Woods stated that some bartonellosis patients have concurrent mental health problems (partly because of the stress of having this difficult-to-diagnose condition), but occasionally this can manifest as “Bartonella psychosis.” He described one teenage bartonellosis patient who eventually began to have hallucinations and was diagnosed with schizophrenia. Her symptoms resolved after appropriate antibiotic treatment.

**Bone Involvement**
Dr. Woods described the case of a veterinarian who developed deterioration of the hip joint and required hip arthroplasty. *B. henselae* was isolated from the excised femoral head.

**Sequelae of a Needlestick Injury**
One month after sustaining a needlestick while aspirating a skin lesion on a dog with a history of ehrlichiosis, a veterinarian developed headache, fever, and paresthesia in one arm. Polymerase chain reaction testing revealed *Bartonella vinsonii.* Her clinical signs resolved after antibiotic treatment.

**OCCUPATIONAL RISK AND THE ROLE OF VETERINARIANS**
Veterinarians and veterinary technicians are at particular risk for bartonellosis, said Dr. Woods. In a study of veterinary personnel recruited from a large veterinary conference and a veterinary teaching hospital, 28% had at least one *Bartonella* species detectable in blood samples. Symptoms such as headaches and irritability were more common in participants with positive results for *Bartonella.* “Persistent bacteremia is frequent in self-identified high-risk populations,” he concluded.

“I believe this genus will be the biggest challenge for our profession in the context of public health,” said Dr. Breitschwerdt. He suggested that in the future when veterinarians treat a pet with fleas, the main concern will be zoonotic disease risk, not necessarily the pet’s skin condition. “The goal,” he stressed, “is to educate the family as to the risk that those fleas are posing to them.”

With regard to vector-transmitted infectious diseases, veterinarians “are the most important part of the public health infrastructure in the United States of America,” Dr. Breitschwerdt concluded. Veterinarians receive education about diseases transmitted by fleas and ticks, unlike most physicians in the United States, he said. “You cannot diagnose a disease process that is not on your differential list.”

**Regarding vector-transmitted infectious diseases, veterinarians are the most important part of the public health infrastructure in the United States.**
An Immunotherapy Vaccine for Canine Cancer

By Beth Thompson, VMD

As Dr. Yannelli reminded the conference audience, the immune system can and does distinguish cancerous cells from healthy cells. “Our bodies kill neoplastic cells every day,” he said, “long before any tumor develops.” Sometimes, even overt tumors that appear to have escaped the immune system disappear. In fact, Dr. Yannelli said, “about 2% of human melanomas spontaneously regress.” For some reason, the humoral and cell-mediated immunity that was initially “fooled” enough to suppress the tumor re-engages and successfully mounts a new attack on the mass. The more targeted and active the immune system is, the better the protection will be. Most often seen in patients with compromised, immature, or insufficient immune systems, neoplasia primarily affects the old, the immunosuppressed, and the young.

THE IMMUNE SYSTEM APPROACH TO CANCER

Immunotherapy that engages and activates natural immunity is an attractive approach to treatment because of its high specificity and minimal impact on normal tissues. For example, vaccines use host immune machinery to generate anti-tumor effects. Proof of that principle is well established in lung cancer clinical trials.

Detectable solid neoplasia has evaded the immune response. Much research concentrates on examining the multitude of methods tumors use to invoke and sustain evasion. Evasion can and does happen even in the face of a competent immune system. Tumors may target antigen presentation, downregulate T-cell function, or produce immune-suppressive substances, to name a few tactics. Tumors that are “under attack” by the immune system may mutate and make remaining cells less vulnerable to culling.

FROM OLD APPROACHES TO NEW THINKING

“Historically, we’ve approached cancer seeking a complete cure or, in other words, a disease-free state,” said Dr. Yannelli. Through the 1990s, a strong success rate utilizing aggressive treatments caused tumors to regress, but cancer was cured completely in only a small number of cases. The traditional approach—surgical debulking or removal of the mass followed by radiation and chemotherapy—was aimed at killing rapidly dividing cells. The unwanted side effects of that approach are collateral damage to healthy cells and compromise of overall patient health, quality of life, and well-being. What’s more, these treatments are very time-consuming.

With the advent of successful medical management of formerly fatal diseases such as HIV, the thinking has changed. Perhaps we should consider cancer as more of a chronic condition and induce an equilibrium state with the immune system in which tumors, although present, do not grow any larger and progressive illness remains delayed.

Before Dr. Yannelli and his laboratory started its work on dogs, their focus was late-stage non-small cell lung cancer. In his immunotherapy work with 56 stage III or stage IV patients followed over 6 or 7 years, 67% generated a response with immunotherapy. In 2005, he was part of the team that treated 21 patients with non-small cell cancer whose expected survival was 3 to 12 months. Thirteen of the original 21 patients returned for follow-up in 2011. The notable finding was that they survived all that time without any sign of tumor regression. Rather, the tumor existed in equilibrium with the person’s immune system.

WHY DOGS?

Dr. Yannelli told the audience that he turned to dogs as research subjects in 2015. It made sense to him because dogs have an 80% genetic similarity to humans, while the more commonly used mice only have a 67% genetic similarity. Furthermore, if the immunotherapeutic intervention in people who had been told they had only months to live allowed them to survive for years, those same results in survival and quality of life would be much more significant in the shorter lifespan of our canine companions.

According to Dr. Yannelli, 6 million of 70 million dogs in the United States get cancer, including more than 50% of dogs over 10 years of age. Of those dogs stricken with cancer, 25% will die of the disease. Research with owners of these dogs shows that 20% of them seek advice, and 60% to 80% want to do something to help their pet. All the conventional cancer therapies available to humans are also available to dogs, but cost, quality of life, and the time required for therapy dissuade many owners from pursuing treatment.

IMMUNOTHERAPY IN THE FIGHT AGAINST CANCER

Oncept, the only cancer vaccine licensed by the US Department of Agriculture for use in dogs, works against oral melanoma. Dr. Yannelli and colleagues have used their research and other learnings to develop a solid tumor vaccine for dogs (K9-ACV) suffering from any peripheral solid tumor that is accessible for surgical resection. Examples include hemangiosarcoma, mammary tumor, melanoma, squamous cell carcinoma, basal cell carcinoma, sebaceous gland tumor, rod cell tumor, and mast cell tumor.

The principle behind the intradermal vaccine is that it presents a “danger signal” to the patient’s antigen-presenting cells. That signal is designed specifically to make the patient’s tumor appear foreign and thereby induce both humoral and cellular immunity.

In the initial pilot study of 124 dogs, 54 were vaccinated and evaluated. Of those, 86% showed a measurable antibody response and 40% are alive and well today. Further clinical trials are currently under way at Kansas State University School of Veterinary Medicine, and the vaccine is available commercially for veterinary use.

More information about patient selection, sample submission, and cost of this autologous solid tumor vaccine is available at medivetbiologics.com.
Mirtazapine for Appetite Stimulation in Cats

By Beth Thompson, VMD

(continued from front cover)

to lessen side effects, and offered insight into research findings and the future of this drug.

FROM HUMAN TO VETERINARY MEDICINE

Originally developed as a human antidepressant medication, mirtazapine is a tetracyclic compound whose mechanism of action is largely unknown. Although successful as a human antidepressant, the drug has the unwanted yet significant and common side effect of appetite stimulation, which decreased its popularity as an antidepressant in people. However, because of that and its concurrent antinausea effect, the drug found a new niche in treating human cancer patients.

Mirtazapine’s introduction to veterinary medicine came via a physician who gave it to his dog as an appetite stimulant. Encouraged by that report, further work on 24 dogs and 17 cats yielded good to robust responses within 30 minutes in 25 of the test subjects. Cats displayed more side effects than did dogs, most notably pronounced vocalizations. An anecdotal dose of one-quarter of a 15-mg tablet every 72 hours was prescribed for cats based on the knowledge that the drug was glucuronidated in the liver and excreted through the kidneys.

RESEARCH FINDINGS

The benefit of the drug was evident, but the side effect of what Dr. Quimby called the “kitty crazies” was detrimental. The most common side effects noted by the ASPCA Poison Control include vocalization, agitation, vomiting, ataxia, restlessness, trembling, and hypersalivation. Researchers like Dr. Quimby wondered whether the same positive results could be achieved and the side effects mitigated if the drug were given at a lower dose. Furthermore, so far, the test subjects had all been young, healthy cats, yet the drug was wanted for use in older, chronically ill cats. Would there be a difference in onset, duration, and excretion of the drug in those patients? Finally, would the accepted every-3-day dosing in cats give the best results with the fewest side effects?

Results of a 2011 study led by Dr. Quimby suggested that the active appetite-stimulating effects of mirtazapine in young, healthy cats occur at a dose of one-eighth of a tablet (1.88 mg) versus the traditional higher dose of one-quarter of a tablet (3.75 mg). In their blinded trial, cats receiving mirtazapine consumed significantly more food than cats receiving placebo. However, there was no significant difference in appetite stimulation or calorie ingestion between cats given either dose. Fewer side effects were reported in the lower-dose group. What’s more, the half-life of the drug was 15.9 hours at the higher dose and 9.2 hours at the lower dose. Pharmacokinetics in the cat appear nonlinear, and metabolism may be slower at higher doses.

In that same study, Dr. Quimby and her team compared the drug’s action in normal young cats versus healthy old cats. Results for both groups showed equally useful appetite-stimulation effects at the lower dose and more side effects at the higher dose. As with humans, clearance of the drug is affected by disease state. The human data show that with moderate kidney disease, clearance is decreased by 33%. That rises to 50% in severe kidney disease. In patients with liver disease, one can expect a 33% reduction in clearance. The half-life of mirtazapine increased to 15 hours in cats with chronic renal failure. Research is currently under way to determine the effects of feline liver disease on drug clearance.

In a placebo-controlled, double-masked clinical trial of 16 cats with chronic kidney disease and no comorbidities, cats were given either mirtazapine at 1.87 mg every other day or a placebo for 3 weeks. The cats were then “washed out” for 4 days and placed in the other group for an additional 3 weeks. The owners kept daily logs, and cats were routinely examined, weighed, and body condition scored. Eleven cats completed the study. Of those, 91% of mirtazapine cats gained weight and 71% had improved body condition scores, while 82% of cats lost weight when taking the placebo. There was a significant (P = .002) increase in appetite in the cats treated with mirtazapine.

SUMMARY

In conclusion, mirtazapine works as an appetite stimulant in cats. Current dosing recommendations for mirtazapine in young, healthy cats is 1.88 mg/day. In older cats and those with chronic kidney or liver disease, 1.88 mg can be given every 48 hours. This dose, while effective, results in fewer undesirable side effects than the traditional 3.75-mg dose. Transdermal preparations are easier to administer and work well when compounded correctly. Dr. Quimby looks forward to commercially available transdermal preparations in the future.

References available at AmericanVeterinarian.com.
Getting to “Yes”—Keys to a Successful Oral Health Protocol

By Maureen McKinney

(continued from front cover)

and ensure that every staff member who speaks with clients can (and does) discuss dental disease with knowledge and authority.

Every hospital will enter the protocol at different levels of knowledge, interest, experience, and ability, Dr. Klein noted, and that’s fine. The key is getting everyone on board and educated. “If your entire team understands the practice’s oral care standards of excellence, then they are going to hold the practice’s veterinarians accountable for maintaining those standards,” he said.

Dr. Klein, who co-owns East Hilliard Veterinary Services in Hilliard, Ohio, has performed oral procedures on animals ranging from dogs and cats to rodents and rabbits to polar bears and apes. “Seventy-five percent to 80% of your canine and feline patients over 2 years of age are affected by dental disease,” noted Dr. Klein. “No other disease has that kind of predominance level.”

“Our process went from a very standard general practice to a focused dental practice,” Dr. Klein said, and the return on investment has been immense. “In addition to the obvious benefit of healthier patients, there are many spinoff benefits, including added technological improvements, communication improvements, staff enjoyment, and staff empowerment.”

**ESTABLISH STANDARDS OF EXCELLENCE**

Establishing standards of excellence in oral care is the first step in setting up your protocol because standards, Dr. Klein noted, allow for consistency of oral care services among the entire team. “Getting clients to ‘yes’ is the goal, and having set standards enables the entire team to know how to refer cases to other team members who are more focused on dentistry.”

Standards also make it more likely that any staff veterinarians who are not interested in dentistry will recommend dental disease treatment for their patients. “Not every doctor in the practice needs to be an expert in dentistry,” said Dr. Klein, “but they do need to be aware of the practice’s abilities and oral care principles” (see Consistency Among Staff Veterinarians).

Technicians can play an important role here as well by making relevant notes in the patient chart regarding treatment needs discussed during the exam. Because the technician knows what is routinely required for a particular dental problem, he or she can simply make a note and ask the doctor to sign the chart.

“Compliance will go way up,” said Dr. Klein, if your support staff, particularly those who have been there the least amount of time, know what the standards are and know that all the practice doctors are at least going to recommend the right care. “Doctors will be more likely to recommend the right care if the entire team knows what that care plan should look like,” he said.

**CREATE AN ORAL CARE PROMISE**

Once you’ve set the oral care standards for your practice, it’s time to get the team fully involved. “Start with an oral health care promise,” suggested Dr. Klein, “which is a simple statement that all staff members sign.” Schedule a staff meeting or team outing to talk with the entire staff about the planned oral care protocol and have each one sign the promise (see The Oral Care Promise).

To implement the promise and move your oral care initiative along, assign a few staff to spearhead the protocol. In a larger practice, 2 or 3 people can fill this role—1 doctor, 1 technician, and 1 client care representative (eg, head or mid-level receptionist). In smaller practices, it’s not necessary to involve a veterinarian from the start; a technician and client care representative can get the ball rolling. “In my practice,” Dr. Klein recalled, “we started with an associate (who had more time than me), a technician who was interested in dentistry, and a receptionist who liked dentistry but didn’t know much about it.”

This group works because clients will get the deep knowledge and advice about protocols from the technician, and the receptionist—who has the most client contact—can then reinforce the recommendations. “If your receptionist is well trained on oral home care,” said Dr. Klein, “you’ll dispense more products than if just the veterinarian or technician were talking about it to the client.”

**CONSISTENCY AMONG STAFF VETERINARIANS**

Consistency of oral care among veterinarians within a hospital is very important but can be difficult to achieve, according to Dr. Klein. This is where oral care standards come in.

When the standards are clear, said Dr. Klein, then all veterinarians on staff are at least going to recommend the right care, even if they are not performing that care themselves. “If the entire staff knows how to address dental issues like a broken tooth or a gingival mass,” he said, “then it’s much easier for the veterinarian to recommend treatment or for the technician to outline a plan of care and have the veterinarian initial his or her OK to go ahead and schedule the treatment.”

It’s important to remember that not all veterinarians on your staff need to have the same ability level or interest in dentistry, Dr. Klein stressed. “What is vital is that they all know what the expectations are. That’s when your compliance rate will go up quite a bit.”

**DETERMINE YOUR PRACTICE’S PROFICIENCY LEVEL**

Once you choose the people who will initiate the protocol, find out how familiar the practice is overall with dental disease, including equipment and product knowledge. Is someone...
Periodontal disease is the #1 untreated disease in pets today. Left undiagnosed, it can lead to bigger health problems and a lot of pain for pets. Industry-leading VetPro® dental solutions by Midmark are built to work together to detect and treat disease at the onset—today and for years to come. We’ll be with you every step of the way with top-notch clinical support before and after you buy and on-demand access to product info, training and webinars.

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perform it themselves.

If your practice’s oral care standards are clear, then all staff veterinarians are going to recommend the proper care, even if they don’t perform it themselves.

EDUCATE THE WHOLE TEAM

Once you know where you are as a practice, engage and educate your entire team, advised Dr. Klein. There are a number of avenues you can take for teaching and training, such as inviting a local veterinary dental specialist, if there is one in your area, to provide oral care education and training.

Alternatively, he suggested, you can consider a comprehensive oral care educational program like that offered by Midmark Academy. “They come to your office, review your equipment, and talk about all aspects of periodontal disease,” he explained. They recommend closing the practice for an entire day or doing the training on a weekend. “After about 3 hours with a Midmark veterinarian, my receptionist was using dental lingo and could identify teeth on x-rays,” said Dr. Klein (see The Language of Dentistry). Again, he noted, it’s your front office staff who are most critical in guaranteeing the success of your oral health protocol. “It’s amazing how much dental work we do now because the staff knows so much,” said Dr. Klein.

Of course, veterinarians know that pet care recommendations often must be made multiple times before a client follows them. If dental care recommendations are reinforced with multiple messages from multiple people on multiple visits, then compliance will increase greatly. “When the receptionist can talk specifics about dental anatomy, disease stages, and bone loss,” noted Dr. Klein, “the client receives multiple messages and often says, ‘OK, I guess I have to do this because everybody is saying it.’”

THE ORAL CARE PROMISE

Your practice’s oral care promise to clients can be a very simple statement:

“At [hospital name], we treat your pet like our own. We promise to provide your pet with the best possible oral health care. We’ll offer the latest in diagnostic imaging, proper oral therapies, and the safest anesthetic agents. We’ll provide the most up-to-date anesthetic monitoring for the safety of your companion and educate you on the most appropriate in-home dental care products.”

The key is to have the entire staff sign the promise as their pledge to uphold it and then display it prominently in the waiting area for all clients to see. At Dr. Klein’s practice, the promise is displayed alongside small photos of staff with their own pets. “It may seem trite,” Dr. Klein said, “but it isn’t because even your most recent hire will know where your practice stands in terms of oral care standards.”

THE LANGUAGE OF DENTISTRY

Using appropriate dental terminology is an important part of the oral care protocol. Once trained, the whole team should use veterinary dental nomenclature when speaking with clients. “It’s important to speak the part,” said Dr. Klein. “Doing so provides a forum for discussing disease specifics.” The American Veterinary Dental College website (avdc.org) offers comprehensive nomenclature (including images) that covers oral anatomy, periodontal disease, general tooth abnormalities, tooth numbering, common procedures, and more.

BECOME MASTERS OF ANESTHESIA

Many clients are reluctant to have their pet undergo dental procedures because they fear the potential dangers of anesthesia. “They may have had a bad experience with a pet in the past, or they may have a neighbor or friend whose pet became very ill or died following an anesthetic episode,” said Dr. Klein.

That’s why it’s so important to ensure that you offer the safest anesthetic protocols available, including effective monitoring by support staff, said Dr. Klein. “You need to be able to apply specific anesthetic protocols that match patient needs, taking into consideration the pet’s age and coexisting health conditions.” Again, it helps when your front office team can address clients’ anesthesia concerns.

With the types of anesthetic regimens and the array of induction agents we have today, noted Dr. Klein, there really are very few patients that are not appropriate candidates for anesthesia. “As long as you have good protocols and monitoring practices that you’re extremely satisfied with, a protocol you’d be comfortable using on your own pet,” he said, “then your patients will be safe in getting the treatment they need.”
End-of-Life Care at Its Best: Part 1

(continued from front cover)

DO MOST VETERINARIANS UNDERSTAND THE BENEFITS OF PALLIATIVE AND HOSPICE CARE?

Mary Gardner, DVM: Veterinary hospice and palliative care offer a number of benefits, but there are misconceptions throughout the profession about this type of care. Many veterinarians think we’re prolonging suffering or avoiding the inevitable or trying to take money from families during their darkest time, but that’s not what it is at all.

SO, HOW DO YOU DEFINE IT?

MG: Veterinary hospice is about supporting families during a very difficult time by helping them decide when to say goodbye, letting them know what to expect when they do and, most importantly, supporting that pet medically and making sure he is as pain-free and anxiety-free as possible while still having a good life. It’s not about extending life; it’s about increasing the pet’s quality of life for the time he has left.

Studies in human hospice have shown that when people start the hospice process sooner, they actually increase their time with their families. I don’t think terminally ill and very advanced geriatric-stage pets are being seen enough in the veterinary clinic. If we start talking about hospice sooner or the things we can do to help manage these geriatric pets, we’re going to have much better success supporting that pet and that family toward the end. That way, when the time does come, the client is going to be well educated and well prepared.

Dani McVety, DVM: Our profession has been doing hospice care for generations—we just haven’t called it that. When you use the word “hospice” with a family, they immediately switch their thinking to, “Oh gosh, thank goodness my vet isn’t going to try to talk me into treatment or radiographs or anything!” They immediately know that you’re going to support the human–animal bond for as long as possible. Sometimes that means waiting a few days until the spouse returns from out of town or the kids can come back from college to be with them for Christmas.

SO HOSPICE CARE CONTINUES TO BE ABOUT THE HUMAN–ANIMAL BOND?

MG: Absolutely. We’ve found that using the word “hospice” really helps. Whatever an individual family’s circumstances, hospice care gives them a little bit more time to wade through the decision-making process. It also solidifies the bond between the pet and her family because now the family is not really worried about what’s going to happen—the end is kind of already known—and they’re more comfortable talking with their veterinarian about what is going to happen because they don’t feel like they’re going to be pushed into more treatment. So instead of hospice care being something we add on, it’s something that ends up providing a paved pathway, if the family chooses, to euthanasia.

LET’S TALK ABOUT CONVENIENCE EUTHANASIA. WHAT IS IT, AND HOW DO YOU FEEL ABOUT IT?

DM: Convenience euthanasia is a very hot topic in veterinary medicine. I don’t think I’m alone when I say that I was the freshman student in veterinary school saying I will never euthanize a healthy animal. We always say they’re adoptable, they’re treatable, they’re healthy.

But “adoptable” is very subjective. In the veterinary profession, we’re the ones who have the 1-eyed cats, the 3-legged dogs, and the other animals that in some way maybe the general population didn’t find adoptable.

“Treatable” is also very subjective. We don’t know what people are going through. We talk about people having 4 budgets: the financial budget—whether they can afford to pay for treatment; the emotional budget—whether they can deal emotionally with the treatment that’s going on; the physical budget—whether they can physically nurse the pet through recovery from a difficult surgery or other at-home treatment tasks; and the time budget—whether they have the time to give their pet an injection twice a day or bring her to the emergency room.

MG: Or let her out every 4 hours when she’s incontinent.

DM: Exactly. So all of these words are very subjective in our profession. But many of us tend to focus them into one thing, meaning that if this pet is treatable, adoptable, anything, then euthanizing that pet would be wrong.

WHAT OPTIONS SHOULD BE EXPLORED IN THESE CASES?

DM: Any nonmedical request for euthanasia, even if we don’t agree with it, means the human–animal bond is broken. Instead of looking at a request for euthanasia as “wrong,” I would rather us consider the other options for that pet because what are the alternatives? It might mean the pet is going to be let out of the carrier into a parking lot (which I’ve seen happen) or dropped off on the side of the road or put up for sale on Craigslist. A lot of things can happen if we say no.
We need above all to help—maybe it’s euthanasia, maybe it’s adopting the pet through our services, maybe it’s working with a rescue. I don’t know what it is, but what it is not is judging. Judging a family for what they’re going through when we don’t necessarily understand their situation is the one thing, in my opinion, that is going to harm our profession long-term. How about simply saying, “You know, I understand your pet doesn’t match your decor in your house anymore, so why don’t you let me take him?” Because if there’s somebody who says that to me, that’s my true definition of convenience euthanasia.

MG: Right, or “I’m moving to an apartment and I can’t take my pet.” But when you have a dog or a cat that’s urinating around the house, I call that inconvenience euthanasia because my husband would not like that and I wouldn’t like that. And sometimes it’s easy for us in the veterinary profession to handle urine, blood, vomit, and diarrhea, but it’s not as easy for the public to do. And about 3% of people still think pets are property. I’m not saying that’s right either, but if I don’t agree with it I will take that pet and find it a new home—but hopefully not in my house because I’ve got enough!

DM: The point is that we need to think about the alternative for these pets, and instead of sitting on a moral high horse and saying no, how about we say what can we do because the current situation isn’t sustainable?

WHAT ABOUT A PET THAT IS TERMINALLY ILL?
MG: I don’t need active suffering to be present for me to feel OK about the decision because when we took our oath we promised not only to stop suffering but also to prevent it from ever occurring. So, if a terminally ill pet is just diagnosed, I’m comfortable saying goodbye then. There are some veterinarians who would say that’s convenience euthanasia because the pet is not suffering yet, but I’m OK there.

YOU TALK ABOUT THE “EMOTIONAL QUOTIENT” OF VETERINARIANS WHO WORK IN END-OF-LIFE CARE. WHAT DO YOU MEAN BY THAT?
DM: The emotional quotient, or EQ, of the doctors who work with us or with any end-of-life care service is pretty high. It’s interesting because when we first start talking to other doctors who share our frame of mind they always say the same thing. They say, “I know this is strange, but I’m really good at euthanasia,” or “I really enjoy talking to people about euthanasia.” And it’s so funny how we have to qualify that, right? We’re the only medical profession licensed to perform euthanasia. We should be the best, we should be proud of being the best, and we should be proud of the fulfillment that we get.

Everyone says, “I get so many thank you cards for that euthanasia that I helped, and I certainly never got a thank you card for that 2 AM GDV I did. No, that was an expectation.” It’s a certain type of person who not only can help people through something compassionately and consistently without it draining them but who can also get fulfillment through it again and again and again.

SO IT’S NOT ALL DOOM AND GLOOM?
MG: Not at all! I think that’s the most important thing. Every time I leave a home, I actually feel good. So many people ask if I cry, and there are times that I do—I’m not saying I don’t—but I have such good feelings from helping the family that I actually feel good about it. So I think it takes the type of person who can appreciate that.

DM: A veterinarian who works with us sent us a wonderful quote. It goes like this: “I trust you understand what few can. I leave an appointment with a trail of grieving people in my wake, and I feel a glow of satisfaction and rightness and karmic return because I know that I have done good and profound work.” That, I think, says it the best. ■
PROVEN as the only closed system to prevent syringe plunger contamination – Standard syringe plungers accept contamination with almost every use. STOPS escape of hazardous drugs and vapor due to an internal sterile air chamber with a closed pressure equalization system. ADHERES to NIOSH, ISOPP, USP <800> and ONS definitions of CSTD. PREVENTS disconnection of connector due to a welded connection point and prevents pulling out of plunger by encapsulating lid. NEEDLESAFE: Fully encased needle eliminates exposure through needle residue and needle sticks. PREVENTS residuals of hazardous drugs on connectors and prevents microbial ingress for up to 7 days*.

*Equashield does not extend the shelf life and use date of the drug beyond manufacturer recommendations. Please refer to individual drug labelling or USP compounding guidelines for beyond use dating of a drug.
a local dispensary and began putting it in Bucky’s food. “I saw an immediate difference,” she reports. “He wasn’t running around like a puppy, but he was walking more easily and I could see that he was in less pain and had a little bit more energy.”

Brim is one of a growing number of pet owners who have turned to cannabis to treat their ailing pets. And despite the plant’s federal classification as a Schedule 1 drug, more and more veterinarians are also expressing interest, say advocates. “I speak regularly to groups of both pet owners and veterinarians, and I’ve never had a veterinarian say, ‘Absolutely not! Marijuana is evil and I don’t want to have anything to do with it,’” observes Dr. Richter, who owns Holistic Veterinary Care and Rehabilitation Center and Montclair Veterinary Hospital, both in Oakland. “Most say they are interested and want to know more.”

ANCIENT HISTORY, CURRENT ROADBLOCKS

In 1996, via Proposition 215, California became the first state to legalize medical marijuana, but the plant actually has a very long history as a medicinal compound. “In terms of medical use, it goes back at least 10,000 years,” reports Jahan Marcu, PhD, chief science officer with Americans for Safe Access, a national organization established in 2002 to ensure safe and legal access to cannabis for therapeutic use and research.

“There is documented ancient use around the world for pain relief and the treatment of various conditions.”

Until the 1930s, inexpensive cannabis-derived tinctures were readily available through physicians and pharmacies in the United States and were used to treat ailments ranging from arthritis to seizures to menstrual cramps. However, cannabis fell out of general use with the passage of the 1937 Marijuana Stamp Act, which added a dollar to every dose, and the plant became illegal in 1970 with the passage of the Controlled Substances Act, which placed marijuana in the same classification as heroin and methamphetamine.

Cannabis is widely used today to treat numerous conditions, including amyotrophic lateral sclerosis (Lou Gehrig’s disease), chronic pain, anorexia due to HIV/AIDS, Crohn’s disease, seizures, glaucoma, Tourette’s syndrome, multiple sclerosis, and nausea and vomiting associated with cancer treatment. According to Dr. Marcu, however, there is little consistency among states regarding what conditions cannabis can and cannot be recommended for. In California and Washington, DC, for example, doctors are free to make their own decisions, whereas other states have very specific guidelines. State laws “run the gamut from treating cannabis like regular medicine to treating it like it’s radioactive,” Dr. Marcu says.

The Drug Enforcement Agency (DEA) and Food and Drug Administration make it very difficult for researchers in the
United States to study marijuana’s potential medicinal qualities effectively, Dr. Marcu notes. However, there is hope for change through the Compassionate Access, Research Expansion, and Respect States (CARES) Act, which has bipartisan support in both the House and Senate. As of this writing, the legislation was still in committee. In addition, Americans for Safe Access is suing the DEA to update the information on its website, some of which is 40 years old, Dr. Marcu says.

**SUPPORT, SKEPTICISM, AND ENTREPRENEURSHIP**

Eight states and the District of Columbia currently permit the adult recreational use of marijuana, and 28 states have approved the medicinal use of marijuana for humans. The work of laws, however, hasn’t stopped veterinarians with an interest in alternative medicine from discussing the benefits of cannabis to relieve anxiety, pain, seizures, gastrointestinal problems, and other ailments in dogs and cats, as well as other species. As a result of this surging interest, marijuana entrepreneurs—many of them veterinarians—have developed a variety of medicinal cannabis products specifically for animals.

Stephen Katz, DVM, owner of Bronx Veterinary Center in the Bronx, New York, is one such practitioner. He is one of the founders of Therabis, an herbal formula containing CBD—a nonpsychoactive cannabinoid derived from industrial hemp—that he recommends for mobility problems, anxiety, and itching. “I had been working with natural anti-inflammatories for 15 years,” Dr. Katz says. “I started looking at cannabis and CBD about 6 years ago and decided to turn my scientific mind toward using it in an effective, medical way to benefit my clients’ pets.”

Sarah Brandon, DVM, witnessed the medicinal properties of marijuana 20 years ago when her husband, Greg Copas, also a veterinarian, started smoking it to ease injury-related joint pain. Based on his success, they began giving marijuana to their Rottweiler, Reilly, to ease the pain of his hip dysplasia, with similarly positive results. More research followed, and in 2014 Drs. Brandon and Copas co-founded Canna Companion, a company based in Washington State that manufactures 2 whole-plant hemp products for dogs and cats.

Eager to educate the next generation of practitioners, Dr. Brandon recently gave a talk to veterinary students at Colorado State University and found them receptive to the idea of medical cannabis for pets. “They were open-minded but not to the point of blindly accepting it,” Dr. Brandon notes. “They were doing their due diligence.”

Pet owners are often skeptical as well. When Dr. Katz suggested to his client Yamahyra Lopez that she give Therabis to her pitbull-Rottweiler mix to treat his mobility issues, Lopez was unsure but decided she had nothing to lose. “It was like a miracle,” Lopez reports. “Within 2 weeks Lil Jeff started greeting us at the door like he used to. He was running again, and so engaged. We were thrilled.”

Anecdotal evidence like this abounds, yet most veterinarians remain reluctant to recommend cannabis to their clients for several reasons. Foremost is the fact that marijuana and hemp are still considered controlled substances by the DEA, which means it is illegal for veterinarians to prescribe them for pets. “We can, however, discuss the benefits of medical cannabis with pet owners and provide them guidance regarding what the best products would be for their pet and what a successful dosing regimen would look like,” notes Dr. Richter, who had such a discussion with Sand Brim.

Indeed, the issue of legality must be resolved before medical marijuana for pets can go mainstream, says Dawn Boothe, DVM, PhD, professor of anatomy, physiology and pharmacology at the Auburn University College of Veterinary Medicine and director of the college’s Clinical Pharmacology Laboratory. “For veterinarians to get on board, it’s going to take knowing they won’t be prosecuted for having products containing cannabis in their clinics or for promoting their use,” she explains. “Right now, that’s a big problem. As soon as that’s fixed, most veterinarians won’t hesitate to recommend cannabis products, in part because the products are incredibly safe.”

Equally concerning to many veterinarians is the lack of peer-reviewed clinical studies proving the efficacy of cannabis products for animals, another consequence of marijuana’s status as a controlled substance. However, that is slowly changing. The University of Pennsylvania School of Veterinary Medicine will soon begin controlled, double-blind studies on Dr. Katz’s Therabis line, and the Auburn University College of Veterinary Medicine has developed an assay to detect cannabinoids in the blood of dogs, cats, and horses in an effort to determine appropriate dosing. “It is our intent over the next couple of years to start doing randomized, controlled clinical trials,” Dr. Boothe says. “We will focus on epilepsy as well as the control of pain associated with lameness in dogs and cats.”

**WHERE DO WE GO FROM HERE?**

The American Veterinary Medical Association (AVMA) has no formal position regarding the veterinary use of medical marijuana but does agree that more studies are needed, says Sharon Granskos, the AVMA director of media relations. Its human equivalent, the American Medical Association, holds a similar position and has urged the National Institutes of Health to implement administrative procedures to facilitate grant applications and the conduct of clinical research into the medical utility of marijuana. It has also urged that cannabis be reclassified on the federal level.

Many veterinarians aren’t waiting. Dr. Richter, for example, has become a vocal advocate and encourages his colleagues to look deeper into what cannabis has to offer. “To my peers I would say, there is an enormous amount of research out there proving the benefits of medical cannabis if you take the time to look for it,” he says. “What you will find is an enormously effective medicine that very few people are using and very few pets are benefitting from. We as medical professionals have the power to change that.”

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**DEALING WITH THC TOXICITY**

As more and more states approve the medical/recreational use of marijuana, veterinarians are seeing a noticeable increase in cases of marijuana intoxication, reports Tina Wismer, DVM, medical director of the ASPCA Animal Poison Control Center in New York City.

“In 2015, there were about 714 cases reported to us, primarily by pet owners,” Dr. Wismer says. “We know that is way under-reported because most veterinarians know how to treat marijuana intoxication and don’t need to call us.”

Of particular concern are dogs that consume tetrahydrocannabinol (THC)-infused edibles, which often look and taste like regular candy or other snacks. “Most of our edibles cases involve dogs,” Dr. Wismer notes. “Cats seem to like the plant material better, though we did have a cat the other day that got into some marijuana lasagna.”

According to Dr. Wismer, signs of THC intoxication in dogs include hyperactivity, a wobbly gait, and incontinence. “If a dog is stumbling around the examination room dribbling urine, it’s almost always marijuana,” she says. Cats also display a wobbly gait, as well as vocalization and other odd behaviors.

Another concern over infused edibles is that they often contain ingredients that can be harmful to pets, such as chocolate, raisins, and sorbitol. This is something all veterinarians should keep in mind when treating a patient with marijuana intoxication, Dr. Wismer says.
Update on Pituitary Pars Intermedia Dysfunction in Horses

PPID is the most common endocrine disease in horses and occurs most often in animals over 15 years of age.

By Amy I. Bentz, VMD, DACVIM
Many horses today live 30 years or longer because of improvements in nutrition and management practices in recent decades. As they age, however, these animals may develop Cushing's disease, also known as pituitary pars intermedia dysfunction (PPID). PPID is the most common endocrine disease in horses and occurs most often in animals over 15 years of age. Some heavy breeds such as quarter horses are more predisposed to the disease than are lighter breeds such as thoroughbreds.

CLINICAL SIGNS AND PATHOPHYSIOLOGY

Although clinical signs in affected horses may vary, some horses exhibit the classic appearance of PPID: a wavy, dull, long haircoat that does not shed out completely in the spring and a pot-bellied appearance due to muscle wasting along the dorsum. Other clinical signs may include patchy sweating, abnormal fat deposition, laminitis, polyuria/polydipsia, or a depressed appearance. Additional possible clinical signs include narcolepsy, spontaneous lactation in mares without foals, tachypnea, and immunosuppression that leads to parasitism.

Horses with PPID are more prone to concurrent diseases, such as recurrent uveitis, heaves (recurrent airway obstruction), and sinusitis. Horses can often be categorized as having early or advanced clinical signs based on the Equine Endocrinology Group’s recommended categories. It is often easier to diagnose PPID in horses with advanced signs; much more subtle clinical signs in the early stages of the disease make diagnosis more difficult. For example, horses with suspensory desmitis have also recently been diagnosed with PPID. Abnormalities noted on blood tests may include hyperglycemia (blood glucose level >180 mg/dL), increased liver enzymes, neutrophilia, lymphopenia, and anemia. Hyperinsulinemia has been noted in approximately one-third of horses with PPID.

The pituitary gland is the focus of PPID. The hypothalamus, which is located above the pituitary, is the master endocrine gland of the brain and controls many other endocrine glands. It is located above the pituitary and has neurons with long axons that synapse on melanotropes in the pituitary pars intermedia. Dopamine secreted by these hypothalamic neurons normally inhibits the production of hormones by the pituitary pars intermedia. The melanotropes produce pro-opiomelanocortin, which is cleaved by pro-hormone convertases to produce substances such as adrenocorticotropic hormone (ACTH).

In PPID, however, dopaminergic neuronal degeneration in the hypothalamus affects the pituitary gland through the loss of inhibition by dopamine. This leads to hyperplasia of the pituitary gland and proliferation of melanotropes. The pituitary produces excessive hormones, including alpha melanocyte-stimulating hormone, ACTH, beta-endorphin, beta-lipotropin, and corticotropin-like intermediate peptide (CLIP). The increased secretion of ACTH and CLIP stimulates the adrenal glands and leads to hyperadrenocorticism, producing excessive cortisol.

DIAGNOSIS

Diagnosis of PPID is based on the horse's history, signalment, physical examination, and bloodwork. Tests typically include serial resting basal endocrine testing measurements of ACTH, insulin, and glucose as well as the dynamic thyrotropin-releasing hormone (TRH) stimulation test, which measures ACTH at specific time intervals after TRH stimulation. ACTH levels increase seasonally from mid-July to mid-November, so results should be interpreted in light of the time of year. The overnight dexamethasone suppression test had been used in the past but is no longer recommended.

In a prospective study published in the Journal of Veterinary Internal Medicine, 57 healthy horses were compared with 40 horses and ponies with PPID (n = 20) or equine metabolic syndrome (EMS) (n = 20). Serum was collected from the healthy horses, and archived serum was used from the horses with PPID and EMS. Samples were analyzed for insulin, total and free cortisol concentrations, and free cortisol fraction (FCF). Horses with PPID and horses with EMS that had hyperinsulinemia were combined into a hyperinsulinemia (insulin dysregulation) group.

Results demonstrated that the horses’ body condition significantly impacted free cortisol concentrations: Free cortisol concentrations were increased in overweight/obese controls compared with lean controls. The mean FCF was significantly higher in horses with PPID or insulin dysregulation as compared with controls; however, the total cortisol concentrations were similar. Because the total cortisol concentrations were similar across the three groups (PPID, EMS, and healthy control horses), the increased FCF result reflects decreased bound cortisol in the horses with endocrine disease.

According to the study authors, “There might be decreased availability or binding affinity of CBG [cortisol-binding globulin], the primary plasma binding protein for cortisol, in these endocrine diseases. Both obesity and aging also appear to be associated with a chronic low-grade inflammatory state in both people and animals, characterized by increased expression or activity of adipose-derived pro-inflammatory mediators such as interleukin-6 (IL-6) and leptin. In sepsis and other systemic inflammatory states, inflammatory mediators such as IL-6 and neutrophil elastase, respectively, inhibit hepatic production of CBG and perpetuate the cleavage of high-binding affinity CBG into a low-affinity confirmation. Thus, both mechanisms could lead to increases in FCE.”

TREATMENT AND MANAGEMENT

The primary treatment for PPID is the Food and Drug Administration-approved dopamine agonist pergolide mesylate (Prascend). Most horses with PPID respond well to treatment at the initial recommended dose of 0.5 mg/day PO for a 250-kg pony and 1.0 mg/day PO for a 500-kg horse (about 2 μg/kg). However, some horses require higher doses of pergolide, so periodic physical examinations and testing are useful to monitor the horse’s response to treatment.

Horses with PPID can fare well with careful management and optimal care. Feeding the horse judiciously to maintain an ideal body weight is crucial. The horse should have regular care such as periodic teeth examinations and foot trimming. Regular deworming, fecal egg count monitoring, and proper manure management (eg, weekly removal of manure from the pasture) will aid in parasite control. Horses with PPID often have poor thermoregulation and patchy sweating associated with hirsutism. These patients are more comfortable with regular body clipping to minimize hirsutism and using blankets in the winter as needed.

There might be decreased availability or binding affinity of cortisol-binding globulin, the primary plasma binding protein for cortisol, in these endocrine diseases.

References available at AmericanVeterinarian.com.
Feline heartworm disease is diagnosed less frequently than its canine counterpart. Several factors likely contribute to this discrepancy, including the inherent resistance of cats to heartworm infection, the limitations of diagnostic testing for cats, and the nonspecific (and frequently absent) clinical signs associated with feline heartworm disease.

Although cats infected with heartworms are less likely than dogs to develop adult worms, studies have shown that the arrival of immature heartworms at the pulmonary vasculature approximately 70 to 90 days postinfection can be associated with severe parenchymal, vascular, and airway disease in cats. These changes, which can be evaluated radiographically and histologically, have been defined as heartworm-associated respiratory disease (HARD). Associated clinical signs may include dyspnea, coughing, and tachypnea resembling feline asthma. However, differentiating HARD from asthma or other diseases can be difficult—another factor that complicates determination of prevalence rates for feline heartworm disease, even in areas where the disease is endemic in dogs.

Taiwan is considered a heartworm-endemic region, with canine infection rates ranging from approximately 13% to 57%. A study recently published in the Journal of Feline Medicine and Surgery evaluated the numbers of cats at risk for HARD in Taipei, Taiwan. The study also looked at correlations between clinical signs of heartworm-associated lung disease and actual heartworm exposure among cats to determine if cats with suspicious clinical signs were more likely to be heartworm positive.*

**STUDY DESIGN**

One hundred eighty-six client-owned cats completed the study. Of these, 83 cats had signs of lower airway or lung disease (LA/L; coughing, open-mouth breathing, or labored breathing), and 103 had no clinical signs. Investigators also included previously collected blood test results from a cohort of 40 stray cats to help estimate seropositivity among stray cats in the region. Combining results from both groups of cats, 226 blood samples were included in the final calculations. Feline heartworm antibody testing was used to determine heartworm exposure.

Patients in the study were enrolled prospectively over a period of approximately 1 year from a veterinary university teaching hospital and 4 private practices in Taipei. Cats younger than 6 months of age were excluded, as were cats that had received heartworm prophylaxis within the 6 months prior to study enrollment.

**RESULTS**

Among cats with clinical signs, the most common signs reported by owners were coughing (89%), open-mouth breathing (23%), and labored breathing (22%). Vomiting, diarrhea, and syncopal episodes were also reported.

The researchers found that cats with signs of LA/L disease were 1.8 times more likely to be heartworm-antibody positive than cats that didn’t have clinical signs, but the difference was not statistically significant.

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<tr>
<th>COHORT (N)</th>
<th>SEROPOSITIVITY (%)</th>
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<tr>
<td>Client-owned cats (186)</td>
<td>10.2</td>
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<tr>
<td>Client-owned cats with LA/L signs (83)</td>
<td>13.3</td>
</tr>
<tr>
<td>Client-owned cats without LA/L signs (103)</td>
<td>7.8*</td>
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<tr>
<td>Stray cats (40)</td>
<td>7.5</td>
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<td>All samples tested in the study (226)</td>
<td>9.7</td>
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LA/L = lower airway/lung disease.
*The difference in seropositivity between cats with and without LA/L signs was not statistically significant.
†The difference in seropositivity between client-owned and stray cats was not statistically significant.
between the groups was not statistically significant. Similarly, overall seropositivity among client-owned cats was 10.2%, and seropositivity among stray cats was 7.5%, but the difference in seropositivity between these two groups was not significantly different (TABLE).

Although living exclusively indoors did not eliminate heartworm exposure risk, having access to the outdoors was found to be a significant risk factor among client-owned cats, as cats that spent time outside were 3.7 times more likely to be seropositive. In the study, 11.9% of the client-owned cats had access to the outdoors.

**DISCUSSION**

The investigators noted that the presence of asymptomatic positive cats may have contributed to the lack of correlation between seropositivity and LA/L signs. The authors also acknowledged that confirming heartworm exposure (via antibody testing) in a cat with clinical signs of LA/L does not confirm that those signs are due to heartworm disease or HARD.

According to the authors, the small number of cats enrolled in the study may have limited the ability of the investigators to observe a significant difference in heartworm seropositivity between cats with and without LA/L signs.

Additionally, the researchers noted that the inherent shortcomings associated with feline heartworm antibody tests—including the recognition of false-negative results during the early stages of infection (<60 days), when antibody levels are too low to be detected, and when antibody levels wane over time—may have been a factor in determining heartworm status for cats in the study.

Confirming a diagnosis of HARD in client-owned cats is difficult, the authors commented, “There are diagnostic challenges because of the lack of a gold standard,” they said. Routine tests such as radiographs and bronchoalveolar lavage may offer supportive evidence but not conclusive proof. Even if eosinophilic inflammation of the lower airways can be confirmed via bronchoalveolar lavage, this does not rule out feline asthma or other differentials besides HARD. Further, the investigators caution that pet owners may be reluctant or unwilling to pursue more specific testing, such as lung biopsies. As such, definitive diagnosis of HARD is not always practical or possible.

The authors recommend that when seropositive cats living in heartworm-endemic areas present with suspicious clinical signs, a diagnosis of HARD should be considered. They also suggest that cats in endemic areas receive heartworm prophylaxis, even if they live exclusively indoors, because of the potential risk for developing HARD and the challenges inherent in confirming that diagnosis.

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Exotic Animals: Getting the Most from a Patient History

A host of factors can be at play when an exotic animal falls ill. Knowing what questions to ask in the patient history is key to making an accurate—and often life-saving—diagnosis.

By Laurie Hess, DVM, DABVP (Avian Practice)

For veterinarians, working with dogs and cats that can’t talk is challenging enough. But for veterinarians who work with exotic pets, it’s even worse. Exotic animal veterinarians must be versed in the care, diseases, and treatments not only of two species but of dozens of species that have different anatomies, nutritional and environmental requirements, and illnesses. To complicate matters further, the individuals bringing the sick small mammal, reptile, amphibian, or bird into the animal hospital often aren’t the pet’s main caretakers, so it’s not uncommon for them to have little to contribute to the patient history.

Obtaining a complete history on an exotic pet is key to diagnosis, as inappropriate diet, environmental setup, or even behavioral interactions with humans and other pets can contribute to the problems these animals develop. To obtain the most information possible about a sick exotic pet, asking the right questions is paramount. Following are lists of questions, organized by animal type, that a veterinarian treating an exotic pet should be asking to get as comprehensive a patient history as possible. Also included is information about why the questions are relevant and how the answers may reveal clues to the cause of the animal’s illness.

**SMALL MAMMALS**

These questions apply to owners of rabbits, guinea pigs, chinchillas, hamsters, gerbils, rats, mice, and ferrets.

**How long have you had the pet?** Many small mammals are late-in-life rescues.

**Where did the pet come from?** Small mammals from pet stores often have infectious diseases associated with poor housing conditions and overcrowding.

**Has the animal been boarded around other animals recently?** Again, think infectious diseases.

**Why do you think the pet is ill, and when did you first notice a change?** Remember, some small mammals, such as rats, mice, hamsters, and gerbils, live only 2 to 4 years, so a few months is a long time in these animals’ lives.

**What food is the pet offered, and what does it actually consume?** Most small mammals eat too many pellets and not enough fresh produce and hay (critical for rabbits, guinea pigs, and chinchillas).

**What treats does the pet eat?** Many of these animals eat too many sugary or fatty treats.

**What percentage of its regular diet is the pet eating?** Many owners have trouble answering this, as these animals’ food is often strewn around the cage.

**Is the pet given supplements or vitamins?** Guineas pigs, for example, need supplemental vitamin C to stay healthy.

**Does the pet get fresh water every day?** From a bowl or sipper bottle? Owners often forget to change water in the bottles or let the bottle run out of water completely.

**How active is the pet?** Many of these pets, such as some rabbits and guinea pigs, are relatively sedentary, so it is difficult to tell when they are lethargic.

**Is the animal passing normal stool?** Most herbivorous pets pass large numbers of formed fecal pellets. Lack of pellet feces or smaller fecal pellets can indicate reduced food consumption.

**What is the size of the pet’s cage, and where in the house is the cage?** Small mammal owners don’t always look at their pets every day.

**Does the pet live alone, or does it have contact with other animals?** Some diseases are transmissible between species, such as *Pasteurella* spp bacteria and *Bordetella* spp bacteria in rabbits and guinea pigs.

**Is the pet neutered or spayed?** More than 70% of unspayed female rabbits develop uterine cancer after age 3 years, and unneutered male rabbits notoriously spray urine.

**Does the pet chew on anything inappropriate?** Small mammals are very oral, constantly chewing inappropriately on wires, paint, baseboards, and foreign objects.

**Other questions to ask small mammal owners include:**

- What type of bedding is in the cage? In the litter pan?
- How often is the cage/bedding/litter changed?
- How much time does the animal spend outside the cage?
- Does the pet have past medical problems?

**BIRDS**

**How long have you had the pet?** Many birds, especially large parrots, live for decades and are passed from generation to generation within families, so current caretakers may not be aware of the bird’s history.

**Where did the pet come from?** Like small mammals, birds from pet stores often have infectious diseases due to poor environmental conditions and overcrowding.

**Has the bird been exposed to other birds in the past few years (eg, through boarding or grooming visits to the pet store)?** Birds housed near other sick birds commonly pick up infectious diseases, and the incubation period for some of these diseases can be as long as several years.
Do you know the bird’s gender? Some species of birds are sexually dimorphic, but many are not. Unless a bird has laid an egg or has been sexed through DNA analysis of a blood sample, gender may be unknown.

What does the bird eat? Many birds eat either an all-seed diet or a combination of people foods that ultimately don’t add up to a balanced diet. Formulated pellets are the best for birds.

Does the bird get treats? Many birds eat way too many salty, sugary, fatty treats and not enough pellets.

Does the bird chew on anything inappropriate? Parrots, with their large beaks, chew everything in sight.

What is the cage like? Many older birds live in old cages painted with powder coating that contains zinc.

Where in the house is the cage? Birds housed in the kitchen are often exposed to toxic fumes and smoke.

Does anyone in the house smoke? Bird owners often can’t answer this, as birds are very messy and waste much of what they are given to eat.

Does the bird chew on anything inappropriate? Parrots, with their large beaks, chew everything in sight.

What is the water like? It’s important to check variables such as ammonia, pH, nitrates, and nitrites to ensure that they are within safe levels.

Does the owner check the quality of the water provided in the tank/cage? It’s important to check variables such as ammonia, pH, nitrates, and nitrites to ensure that they are within safe levels.

What is the temperature in the tank/cage? Temperature is key.

What is the humidity in the tank/cage? Humidity in their enclosure is critical to keeping tanks clean.

Is the animal exposed to ultraviolet light? Ultraviolet light (unfiltered by a window) is critical to vitamin D formation in the skin of birds and proper absorption of dietary calcium.

What is the humidity in the tank/cage? Reptiles require a certain level of humidity to stay hydrated and to shed skin properly.

How is humidity provided? Do you soak or mist the pet or provide a humid hide box? Reptiles require a certain level of humidity in their enclosure.

What is the pet’s diet? Some reptiles and amphibians are carnivores, whereas others are herbivores, omnivores, or insectivores.

Does the pet receive any kind of supplements? Many reptiles and amphibians need supplemental vitamins and minerals, such as calcium.

For aquatic species, is there a filter in the tank? Filters are key to keeping tanks clean.

What is the temperature in the tank/cage? Many reptiles and amphibians are ectotherms whose body temperatures (which affect metabolism and immune system function) are determined by their surrounding temperatures.

Does the animal have ultraviolet light exposure? Most reptiles need ultraviolet light to produce active vitamin D in their skin; this is necessary for dietary calcium metabolism.

What is the humidity in the tank/cage? Depending on the species, reptiles and amphibians need adequate humidity to stay hydrated and to shed skin properly.

What is the pet’s diet? Some reptiles and amphibians are carnivores, whereas others are herbivores, omnivores, or insectivores.

Does the pet receive any kind of supplements? Many reptiles and amphibians need supplemental vitamins and minerals, such as calcium.

For aquatic species, is there a filter in the tank? Filters are key to keeping tanks clean.

What is the temperature in the tank/cage? Temperature is key.

What is the temperature in the tank/cage? Temperature is key.

What is the water quality in the tank/cage? Water quality is critical.

Does the owner check the quality of the water provided in the tank/cage? It’s important to check variables such as ammonia, pH, nitrates, and nitrites to ensure that they are within safe levels.

By no means are these lists of questions exhaustive, but starting here can help veterinarians who work with exotic animals learn more about the individual patients they are treating and whether the pet’s environment, diet, or husbandry could be contributing to its illness. The answers to these questions can help guide the plan for diagnostic testing and may be critical to determining a pet’s cause of illness.
A Novel Quantitative PCR Assay Improves Detection of Babesia

The new test uses mitochondrial DNA and shows higher sensitivity and better detection over testing with ribosomal DNA.

By JoAnna Pendergrass, DVM

Researchers have developed a novel quantitative polymerase chain reaction (qPCR) assay using mitochondrial DNA. Compared with an established qPCR assay that uses ribosomal DNA, this new assay has a broader range of Babesia spp detection and greater sensitivity, according to a study recently published in *Parasites & Vectors*.

Babesiosis is a tick-borne protozoal disease with global distribution. Several *Babesia* species, including *Babesia gibsoni* and *Babesia canis*, can infect dogs. Canine babesiosis can cause splenomegaly, anemia, and fever and may be fatal.

Current methods for diagnosing babesiosis include microscopic analysis of peripheral blood smears, immunofluorescence antibody testing, and PCR.

To amplify *Babesia* DNA using PCR, highly conserved genes—particularly 18S ribosomal RNA—are often the preferred gene targets. These conserved genes are useful for differentiating between genera but not species. Fortunately, sequences of ribosomal DNA contain hypervariable regions that allow for species differentiation.

Previously, researchers at North Carolina State University developed an 18S ribosomal DNA qPCR assay to detect and differentiate between a broad range of *Babesia* species. Because 18S ribosomal RNA sequences can vary between distantly related *Babesia* species, though, developing an assay to detect all *Babesia* species while excluding the DNA amplification of other eukaryotic pathogens has proven challenging. Species-specific PCR assays could address this challenge, but they are costly and can have low amplification efficiency.

Prior studies have investigated the use of mitochondrial DNA in qPCR. Although these studies’ results suggest greater sensitivity with mitochondrial DNA than 18S, 18S continues to be a method of choice for PCR.

For the current study, the authors used 13 *Babesia* mitochondrial DNA sequences to design three primers for a novel qPCR assay, named LSU qPCR. Plasmid clones, constructed using LSU qPCR amplicons from two *Babesia* species, were used as standards for evaluating PCR efficiency and analytical sensitivity.

The authors evaluated sensitivity and specificity using whole blood samples that were archived (retrospective testing) or more recently collected (prospective testing). Archived samples came from cats, dogs, and other mammals; samples were naturally infected with *Babesia* or *Cytauxzoon felis* (n = 31), naturally infected with a different vector-borne pathogen (n = 13), or uninfected (n = 4). In total, 12 *Babesia* species were represented in the archived samples.

Prospective testing was performed with canine blood samples (n = 394) initially collected for vector-borne diseases.

**qPCR EFFICIENCY**

PCR efficiency is a measure of how efficiently a PCR product duplicates during each cycle of the amplification phase. The LSU qPCR efficiency was 92% to 100%.

**ANALYTICAL SENSITIVITY AND SPECIFICITY**

To assess analytical sensitivity of LSU qPCR, the authors determined the limit of detection. For this study’s purposes, limit of detection was the lowest concentration of DNA primer (number of DNA copies/µL) needed to achieve a 95% detection rate of *Babesia*-positive samples. Two- or 3-primer combinations were added in one of two concentrations (3 or 5 copies/µL) to the reaction wells.

Detection rates were 95% to 100% with 5 copies/µL and 60% to 90% with 3 copies/µL. The limit of detection was thus determined to be 5 copies/µL for the LSU qPCR.

*C. felis* was the only non-*Babesia* vector-borne pathogen amplified in the LSU qPCR.

**CLINICAL SENSITIVITY AND SPECIFICITY**

The authors compared the clinical sensitivity and specificity of the LSU qPCR and established 18S qPCR. The following results were observed:

- Retrospective testing (*Babesia*- or *Cytauxzoon*-positive archived samples)
  - 100% (31/31) were LSU qPCR positive
  - 84% (26/31) were 18S qPCR positive

- Prospective testing (canine samples)
  - 4.8% (19/394) tested *Babesia*-positive on LSU qPCR
  - 2.8% (11/394) tested *Babesia*-positive on 18S qPCR

Interestingly, 8 prospective samples that were 18S qPCR negative were LSU qPCR positive. Such discordance could be attributed to several factors, such as increased DNA copy numbers and whether the patient was treated or untreated at the time of sample collection. However, the authors noted, the reason for the discordance remained unclear.

The authors calculated the positive and negative percent agreements to determine the relative sensitivity and specificity between the 2 qPCR assays. Relative to 18S qPCR, LSU qPCR had 100% sensitivity. Relative to LSU qPCR, 18S qPCR had 58% sensitivity. Importantly, this finding suggests greater sensitivity with LSU qPCR than 18S qPCR.

**LIMITATIONS AND CONCLUSION**

One study limitation was the inability to determine the LSU qPCR assay’s true sensitivity and specificity. In addition, LSU qPCR was compared with only one other qPCR. Despite these limitations, LSU qPCR demonstrated improved sensitivity over that of 18S qPCR, both retrospectively and prospectively.

Taken together, this study’s findings demonstrate greater sensitivity and improved *Babesia* spp detection when performing qPCR with a highly conserved region from mitochondrial DNA rather than 18S ribosomal DNA.
Recent Research Highlights Infectious Potential of *Baylisascaris procyonis*

High worm fecundity and the potential for severe pathology in humans and other hosts make raccoon roundworm a double threat.

By Laurie Anne Walden, DVM, ELS

The raccoon roundworm *Baylisascaris procyonis* can cause severe disease in people who accidentally ingest the eggs. Articles published recently in the *Journal of Parasitology* describe the prevalence of *Baylisascaris* in California raccoons and the viability of eggs in south Texas soil.

In these 2 studies, 80% of the raccoon population carried adult *Baylisascaris*, and eggs remained viable at or near the soil surface for at least 2 years. The authors of both studies note the exposure risk to humans and other host species reflected in these results.

Raccoons, the definitive host of *B. procyonis*, are usually not clinically affected by the parasite. Small animals (particularly rodents, rabbits, and birds) that ingest eggs passed in raccoon feces can show signs of clinical illness. Dogs that eat infected small animals may become definitive hosts and shed eggs.

Humans become infected from exposure to environments frequented by raccoons. Human infection is uncommon in the United States. Fewer than 25 cases are known to have occurred, according to the Centers for Disease Control and Prevention. However, infection can lead to neural and visceral larval migrans, with symptoms ranging from nausea to death (6 patients have died).1

**BAYLISASCARIS IN CALIFORNIA RACCOONS**

Sara Weinstein, a graduate student in the Department of Ecology, Evolution, and Marine Biology at the University of California, Santa Barbara, examined the intestinal tracts of 189 raccoons collected by trappers or found as roadkill in Santa Barbara County from 2012 to 2015.

Adult roundworms were present in 152 of 189 raccoons (80.4%), with each infected raccoon carrying between 1 and 125 adult worms. Including immature roundworms in the count increased the prevalence to 183 of 189 raccoons (90.7%); most infected raccoons hosted up to 200 immature worms. Ms. Weinstein noted that one outlier carried more than 2000 immature roundworms.

Roundworm abundance was higher in juveniles (under 1 year old) than in adults. All the raccoons 4 to 7 months of age harbored at least 1 adult roundworm, and *Baylisascaris* was present in raccoons as young as 10 weeks. Most (68%) of the sampled raccoon population was younger than 1 year of age. Ms. Weinstein attributed the age difference in infection to the increased susceptibility of young raccoons.

Roundworm abundance peaked in the fall and winter seasons, reflecting the proportion of juveniles in the population, said Ms. Weinstein (raccoons born in the spring carry a high worm burden by the fall). She noted that in colder climates, *Baylisascaris* abundance tends to peak in the fall and drop during the winter.

“High worm fecundity, and the potential to cause severe pathology in humans and other hosts, makes raccoon roundworm a threat to human and wildlife health,” concluded Ms. Weinstein. Because juveniles represent the greatest risk for disease transmission, she suggests that management strategies focus on young raccoons.2

**VIABILITY OF EGGS IN TEXAS SOIL**

Investigators from the Caesar Kleberg Wildlife Research Institute at Texas A&M University studied the effects of soil condition on *B. procyonis* egg permeability and viability. They wrote, “A major objective of our work was to analyze the fate of *B. procyonis* eggs in south Texas soils: Do eggs move from the surface down into the soil? And if so, how long does this take? And is this movement affected by soil texture and moisture?”

The researchers distributed *B. procyonis* eggs onto grids containing 4 soil types (sand, silt, clay, or loam) with 2 sun exposures (shaded or full sun) and 2 moisture levels (wet or dry). For 2 years, they counted eggs in randomly selected soil samples and estimated egg viability by assessing the fraction of motile larvae.

Eggs percolated through wet soils faster than through dry soils. Sun exposure had no effect on egg movement. The most permeable soil type was wet sand, in which about 23% of eggs remained at the surface after 2 years. In contrast, 100% of the eggs in dry clay soil remained at the surface after 2 years. In wet sand, 23.1% of eggs percolated to 6 to 10 cm, the greatest depth measured. The authors pointed out that even at this depth, eggs are still accessible to potential host animals.

Egg viability was unaffected by soil type, moisture, sun exposure, soil depth, or time. For all soil types and environmental conditions, 92% to 100% of eggs remained viable at the end of the 2-year study period. Given the climate in south Texas, wrote the authors, this result highlights the “extreme persistence of *B. procyonis* eggs.”

“Based on our findings,” concluded the authors, “high exposure probabilities exist for intermediate, definitive, and dead-end hosts in areas where *B. procyonis*-infected raccoons are endemic within southern Texas.” They recommended that veterinarians, physicians, and people working with wildlife should be aware of *B. procyonis* risk and take appropriate precautions when working in environments where raccoons gather.3

*References available at AmericanVeterinarian.com.*

**Clinical Focus**

**PARASITOLOGY**

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

Veterinarians, physicians, and people working with wildlife should be aware of *B. procyonis* risk and take appropriate precautions.

References available at AmericanVeterinarian.com.
When she started Compassion Without Borders (CWOB) more than 15 years ago, Dr. Christi Camblor’s mission was a simple one: to provide a better and brighter future for animals in need on both sides of the United States–Mexico border. “It began after I traveled to Mexico between undergrad and veterinary school and saw firsthand how dire the situation was,” Dr. Camblor says. “I became inspired to do all that I could to help.”

FROM ONE TO THOUSANDS
Her mission started with a single dog. Dr. Camblor arranged for a starving and sick terrier named Chacha to be transported from Mexico to northern California to safety and a new home. She continued rescuing sick, injured, neglected, and starving dogs until she formally founded CWOB in 2001. The nonprofit organization has since arranged transport for more than 2000 dogs from the region. But Dr. Camblor’s work extends well beyond the Mexican border.

“One of the main goals of CWOB is direct rescue from low-resource areas where animals are at risk to higher-resource areas where there is a shortage of adoptable dogs,” says Dr. Camblor. The group’s interstate Chihuahua program fulfills this goal exceedingly well.

Poverty levels in the Central Valley of California are among the highest in the nation, and euthanasia rates and overcrowding in shelters are extremely high there. The Chihuahua is by far one of the most overrepresented breeds in the region, yet there is a shortage of small dogs in the upper Midwest region of the country.

Every 6 weeks or so, CWOB transports more than 40 Chihuahuas from California to Minneapolis to find forever homes, with more than 1500 dogs transported to date. “We rescue animals and save their lives by transporting them to areas where there is a void of adoptable dogs and where they will be easily adopted out into loving homes,” Dr. Camblor says. Each dog is sent in a crate in the cargo hold of a nonstop commercial flight, with the cost of each crate covered by donations. The transported dogs are usually adopted within days.

COLLABORATION BREEDS SUCCESS
Dr. Camblor believes the success of CWOB is due to the true collaboration behind it. The organization “became a reality thanks to a whole network of partner agencies, fellow rescuers, a very dedicated board member named Dr. Cindy Karsten, and an amazing shelter in Minneapolis—the Animal Humane Society,” Dr. Camblor says.

Another instrumental collaborator is Dr. Camblor’s husband, photographer and graphic designer Moncho Camblor. “None of what I have accomplished through CWOB would have been possible without Moncho,” she says. “He helped to co-found the organization and has worked every bit as hard as I have on all the programs over the years—also as 100% volunteer labor.”

PRIORITY: PREVENTION
While the nonprofit is dedicated to rescue, Dr. Camblor also works hard on the prevention side of animal homelessness by offering access to animal wellness care and spay/neuter clinics. The team hosts week-long spay/neuter clinics in Mexico as well as programs to give locals the knowledge and tools they need to set up permanent veterinary clinics in their area. CWOB offers several other programs created to save as many needy animals as possible. In fact, Dr. Camblor is excited to announce a new program that is set to begin this month. “This new program will dramatically improve and expand our ability to help animals both through direct rescue and by increasing our ability to offer free and affordable veterinary care to low-income families,” she says.

For more information or to make a donation to Compassion Without Borders, visit cwob.org.
Advances in public health will continue to be made at the human–animal interface.

By Laura H. Kahn, MD, MPH, MPP

(continued from front cover)

My plans were turned upside down by the terrorist attacks of September 11, 2001, and the subsequent anthrax mailings in October of that year. I decided to dedicate my career to bioterrorism, emerging diseases, and emergency preparedness instead.

PUTTING THE PIECES TOGETHER

The 1999 West Nile virus outbreak was also uppermost in my mind. That crisis was notable because 2 outbreaks had occurred: 1 in animals and 1 in humans. In May 1999, crows began displaying unusual behavior and dying by the thousands in Queens, a borough of New York City. Two months later, people began being hospitalized with neurologic signs and symptoms suggestive of St. Louis encephalitis (SLE), a deadly mosquito-borne disease.

But the pieces weren’t adding up. Tracey McNamara, DVM, DACVP, chief of veterinary pathology at the Bronx Zoo, played a key role in identifying the causative agent. She knew something wasn’t right because the European and African birds that should have been getting sick from SLE were healthy while the birds native to North America were dying. She and her staff performed necropsies on a number of zoo birds and found massive cardiac necrosis, horrific meningoencephalitis, and liver coagulative necrosis. She knew the causative agent wasn’t SLE, but the public health community wasn’t interested in her findings because they were in animals. They didn’t listen to her because she was a veterinarian. In the end though, she was right. West Nile virus had appeared for the first time in North America.

I discovered in my research that the medical and veterinary medical communities rarely, if ever, talk with each other even though around 60% of human pathogens and 75% of newly emerging pathogens are zoonotic. The vast majority of bioterrorism agents are zoonotic too. This is not news to the veterinarians who have taught me much about microbial ecology.

COMMUNICATION AND COLLABORATION ARE KEY

They’ve also taught me about comparative medicine: the study of disease processes across species. Animals suffer from many of the same diseases as humans—heart disease, cancer, diabetes, and so on. Many of these disease processes are similar across species. We could learn a tremendous amount if only we communicate and collaborate with each other. This is where One Health can play an important role.

The One Health concept is simply that human, animal, and environmental health are linked. Because they are linked, complex subjects such as emerging diseases and antimicrobial resistance must be examined using an interdisciplinary, holistic approach. The term “One Health” is relatively new, but the concept is ancient. The Greek physician Hippocrates (460 BC–370 BC) recognized that people who went to low-lying swampy areas often got sick. The term “malaria” literally means “bad air.” Over 2000 years would pass before people figured out that insects, such as mosquitoes, could transmit disease.

Some of the greatest discoveries in the history of medicine and public health were made at the human–animal interface. Dr. Edward Jenner coined the term “vaccination” from the Latin word “vacca” for cow. He used cowpox pus instead of smallpox pus during “variolation,” an ancient process developed in China or India by which small bits of dried pus from someone recovering from smallpox were scratched into the skin of a naïve person (usually a child) as a way to reduce smallpox mortality from more than 30% to less than 5%. A purified version of the vaccine was used to eradicate smallpox several centuries later.

Drs. Louis Pasteur and Robert Koch independently discovered the germ theory of disease by studying animal diseases. Drs. Theobald Smith and F.L. Kilbourne, a physician–veterinarian team, discovered that ticks could transmit disease. Their focus was cattle fever, caused by the parasite Babesia bigemina. The discovery that insects could spread disease was a monumental finding and helped set the stage for Dr. Walter Reed and his colleagues to prove that mosquitoes could transmit yellow fever. To fill the communications gap between physicians and veterinarians, my colleagues and I cofounded the One Health Initiative. The One Health Initiative website (onehealthinitiative.com) has been serving as a global repository for all news and information pertaining to One Health since 2008. We look forward to any feedback that you might have.

We could learn a tremendous amount if only we communicate and collaborate with each other.

This article originally appeared on mdmag.com.
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