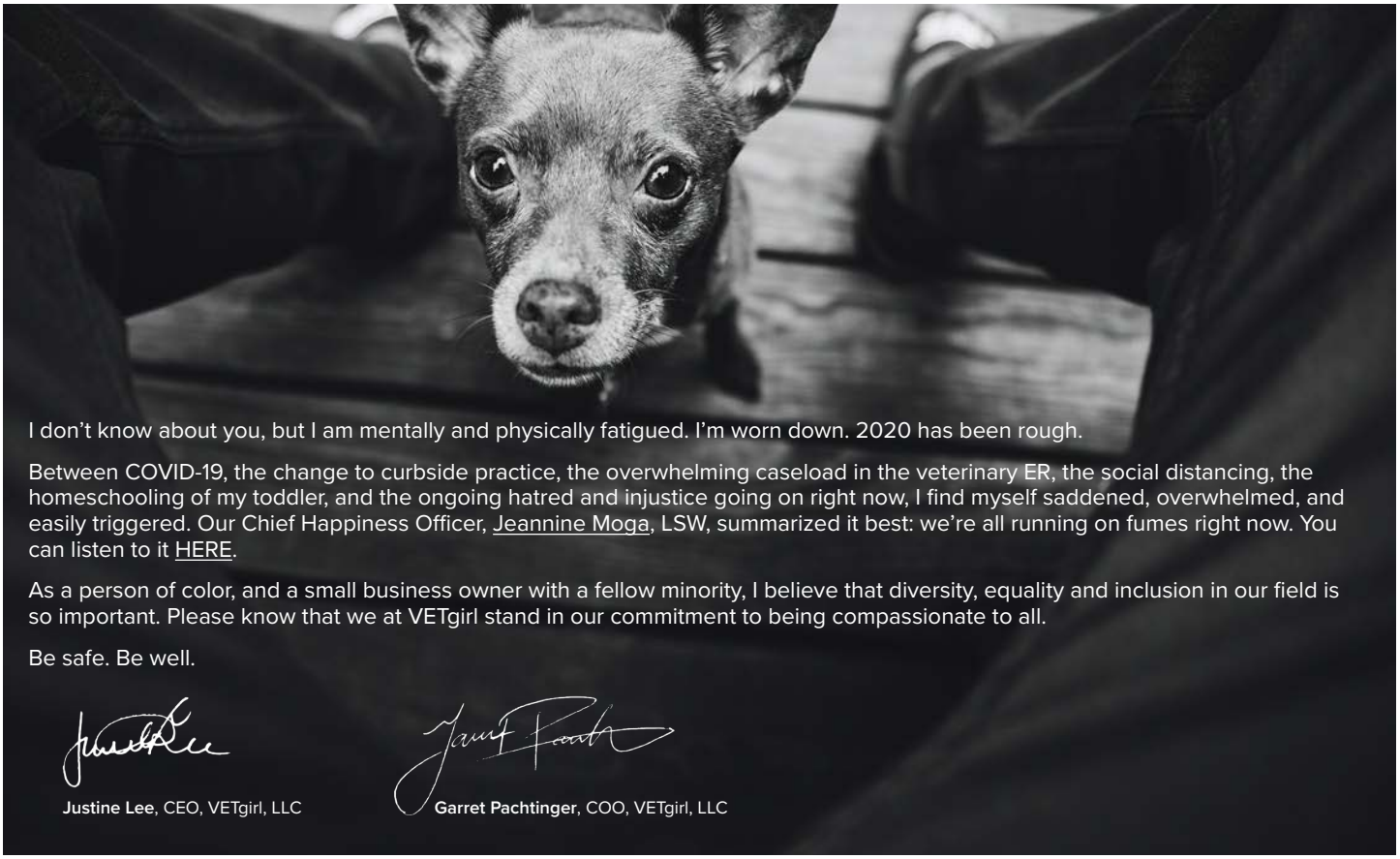
# VETgirlbeat



I don't know about you, but I am mentally and physically fatigued. I'm worn down. 2020 has been rough.

Between COVID-19, the change to curbside practice, the overwhelming caseload in the veterinary ER, the social distancing, the homeschooling of my toddler, and the ongoing hatred and injustice going on right now, I find myself saddened, overwhelmed, and easily triggered. Our Chief Happiness Officer, Jeannine Moga, LSW, summarized it best: we're all running on fumes right now. You can listen to it HERE.

As a person of color, and a small business owner with a fellow minority, I believe that diversity, equality and inclusion in our field is so important. Please know that we at VETgirl stand in our commitment to being compassionate to all.

Be safe. Be well.

**Justine Lee**, CEO, VETgirl, LLC

**Garret Pachtinger**, COO, VETgirl, LLC

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## PODCASTS

CE training on the run

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## IN THIS ISSUE



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# morning glory muffins

## ingredients

2 cups flour
1¼ cups granulated sugar
2 teaspoons baking soda
2 teaspoons cinnamon
½ teaspoon salt
2 cups grated carrot
½ cup raisins
½ cup nuts
½ cup flaked coconut
1 apple, peeled, cored, and grated
3 eggs, slightly beaten
1 cup salad oil
2 teaspoons vanilla extract

## directions

**1** Preheat oven to 350 °F.

**2** Combine flour, sugar, baking soda, cinnamon, and salt in large bowl. Stir in carrots, raisins, nuts, coconut flakes, and apple.

**3** In another bowl, combine eggs, oil and vanilla; stir into flour mixture until mixture is just combined. Spoon into well-greased muffin cups, filling to the top.

**4** Bake in oven for 20 minutes.

*Yield: 24 muffins*

Submitted by Margaret Root Kustritz

# soft pretzels

## ingredients

1 cup warm water
1 package dry active yeast
2¾ cups flour, divided
2 tablespoons vegetable oil
½ teaspoon salt
4 cups water
2 tablespoons baking soda
2 tablespoons coarse salt

## directions

**1** Dissolve the yeast in the warm water and let stand for 10 minutes.

**2** Add the vegetable oil, salt and 1½ cups of flour. Stir together until thoroughly combined. Add remaining 1¼ cups of flour and knead dough for 5 minutes. Let the dough rest for 1 hour.

**3** Divide the dough into 12 equal shapes and reform them into small balls. Let them rest for 15 minutes. Roll them into 18" lengths and form them into pretzel shapes or cut each length in half to make sticks. Let the pretzels rise for a ½ hour.

**4** In a large pot, place the baking soda and 4 cups water to a boil.

**5** Preheat oven to 475 °F.

**6** Add the pretzels to the boiling water for 1 minute. Remove and place on a greased sheet pan. Sprinkle with coarse salt and bake for 12 minutes.

*Servings – 12*

Submitted by Tara Sager

# A PRIMER ON BOUNDARIES (AND WHY WE NEED THEM)

JEANNINE MOGA, MA, MSW, LCSW
Chief Happiness Officer, VETgirl, LLC

## KEY HIGHLIGHTS

Boundaries are the dynamic and flexible system of 'yes's' and 'no's' that defines (and helps us to maintain) our identity and our well-being. Boundaries serve as the limits communicating where our ideas, physical space, emotional experiences, and time both begin and end. These limits can shift based on relationship, situation, and culture, but they always play an important role in how we feel about ourselves and the way our lives are managed.

Boundaries, whether they be physical, material, time-based, or emotional, can be too loose ("porous") to serve any protective function. Those of us with ***porous boundaries*** often struggle with saying "no" (even when we want to), which leaves us to feel resentful, tired, and perpetually taken advantage of. It's super tough to say no when we fear what will happen when we turn down a request; it's even tougher when we fear missing out on something important that we otherwise don't have the time or energy to engage.

The other side of the coin is represented by those of us with rigid boundaries. ***Rigid boundaries*** arise from a different kind of fear related to over-sharing, exposure, overstimulation, and/or exhaustion. In our efforts to protect ourselves from all of these things, we sometimes say "no" compulsively, which then leads us to feel isolated, left out, and marginalized. The unfortunate latent function of rigidity is that others may well stop asking for our contributions, our involvement, and our feedback.

So, what is the alternative to the "all or nothing," porous vs. rigid debate? Healthy boundaries are aligned, defined, asserted, consistent, and realistic; they will likely entail some flexibility as we determine "right action" moment-to-moment and relationship by relationship. And here's how to get there:

### 1 REALITY CHECK YOUR THINKING

Black and white thinking often reflects cognitive distortions, and those distortions are marked by words like "always" and "never," "either" and "or." They might also be led by the popular word, "should" (emphasis on eye roll). The reality of most situations is that we are surrounded by gray area and more wiggle room than we often realize. Defining, aligning, and defending boundaries for health and well-being means fighting the cognitive distortion gremlins at every turn. Boundaries are more often useful than catastrophic, which is what our distortion gremlins lead us to believe.

### 2 DEFINE YOUR VALUES, GOALS, AND NEEDS

What is most important to you? What are you unwilling to give up, regardless of the stakes or payoff? What decisions and actions will most clearly reflect your goals and your needs, not just now but in the near future? Clarifying your values, your short- and long-term goals, and your most pressing needs in this moment is the first step to creating healthier boundaries.

*(continued)*

# A PRIMER ON BOUNDARIES (AND WHY WE NEED THEM)

JEANNINE MOGA, MA, MSW, LCSW
Chief Happiness Officer, VETgirl, LLC

*(cont)*

### 3 ALIGN YOUR DECISIONS WITH THOSE VALUES, GOALS AND NEEDS – ALL THE TIME

Get clear on the difference between capacity and willingness: just because you technically *can* do something doesn't mean you *should* or *have to*. Make sure that every 'yes' is minimizing the risk of later resentment and anger. When we are working out of alignment, we are giving people consent to breech our boundaries... and that makes us miserable in return.

### 4 COMMUNICATE CLEARLY AND CONSISTENTLY

Boundaries cannot be honored if their presence is unknown -- remember that invisible fences box us in more effectively than they keep others out! Once you determine what you want, need, and are willing to do (and not do), it is your job to communicate that, preferably early and often. The dictum that we must manage expectations on the front end of any process applies here. If clients know that you will return calls at the end of the business day, this helps them recognize there are boundaries on your time. Likewise, if they are told at the beginning of a call that you are dedicating the next 5 minutes to addressing their questions, they will not be surprised when you wrap up that call at a hard stop. Boundaries that are communicated well make us more efficient and more effective.

### 5 MAINTAIN AND ENFORCE YOUR BOUNDARIES

We do this by rehearsing how to say "no" clearly and kindly, which helps develop the muscle that allows us to sustain that "no" even when discomfort, judgment, and vulnerability start to rise. It's a big ask, but it's an invaluable tool to have in your arsenal. It's never a bad thing to front load boundary enforcement with gratitude *("Thank you for that suggestion...")* and emphasize it with alternative choices, when available *("I don't see appointments after 6pm, but I can offer you my next available opening or a Saturday morning slot with my colleague, if that works better for your schedule.")*

Above all else, remember that sometimes it is necessary, appropriate, and compassionate to wiggle a bit (like when a trusted co-worker asks to swap shifts or trade appointments in order to respond to a family emergency). When people already know and respect our boundaries, the choice to flex is ours – and the feelings that come from flexibility are more positive on all sides. Healthy boundaries make saying both "Yes!" and "Sorry, that's a no" a lot more comfortable, in both process and product.

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# LEPTOSPIROSIS: WHY AWARENESS AND DIAGNOSIS IS CRUCIAL TO THE HEALTH OF YOUR PATIENTS, CLIENTS AND PRACTICE

DR. NATALIE MARKS, DVM, CVJ

In this VETgirl Merck Animal Health webinar, Dr. Natalie Marks, DVM, CVJ reviews canine leptospirosis in a webinar entitled Why Awareness and Diagnosis is Crucial to the Health of your Patients, Clients and Practice.

## KEY HIGHLIGHTS

Leptospirosis is the most common zoonotic disease worldwide, affecting up to 60,000 humans annually. And, there are 100-150 human cases of Leptospirosis in the United States each year! Yet, in as recent as 2011, only 4% of the canine population was vaccinated against this potentially fatal disease! As veterinarians and public health officers, we can all help to protect our patients, families and team members through better screening, diagnostics and treatment for Leptospirosis.

How do we improve as clinicians? Here are my top TEN TIPS to help in your practice:

### 1 KEEP AN OPEN MIND!

When I was in school (yes, many, many years ago!) we were taught that Leptospirosis was a disease of outdoor, intact male hunting dogs in rural areas. We know that is absolutely not true. In fact, Leptospirosis affects any age, any breed, any sex and any environment, whether it be urban, rural or suburban areas. Recent studies have shown that prevalence is highest in dogs under 15 pounds and terrier groups, specifically the Yorkshire terrier, had highest hospital prevalence! Anecdotally, some of these small terrier pet parents can also be some of the most challenging clients to convince about vaccinations.

### 2 THESE PATIENTS CAN PRESENT VERY DIFFERENTLY

Yes, the acute Leptospirosis patient will often present with fever, gastrointestinal signs and hyporexia/anorexia, but we know that others will be simply polyuric/polydipsic and THESE are the dogs we don't want to miss as they can continue to shed bacteria into the environment to other dogs and humans in the household. Remember that Leptospirosis is not always an acute illness, but as of today's research, it is thought that as many as 20% of dogs can be chronic carriers.

### 3 THERE ARE OVER 10 IMPORTANT SEROVARS FOR PETS

Serovars help determine epidemiologic importance AND sometimes the affected organ predilection. Icterohaemorrhagiae (mostly from rats) is the most common serovar infecting humans, where Gryppotyphosa (mostly from raccoons) and Pomona are the most common serovars infecting canines and often prefer the liver.

*(continued)*

# LEPTOSPIROSIS: WHY AWARENESS AND DIAGNOSIS IS CRUCIAL TO THE HEALTH OF YOUR PATIENTS, CLIENTS AND PRACTICE

DR. NATALIE MARKS, DVM, CVJ

*(cont)*

These serovars can help steer towards the reservoir host. Remember, 'urban wildlife' like rats, raccoons, opossums and skunks aren't the only sources – cows and pigs can also act as reservoirs for other important serovars. This is important to consider when screening a patient for environmental risk factors.

### 4 TRANSMISSION CAN OCCUR THROUGH VARIOUS ROUTES

Urine is shed in the urine of the host (this bacterium is in almost 90% of urban rat urine!) and infection occurs after ingestion of contaminated water or contact with mucous membranes most commonly. However, dogs can become infected after direct penetration of infected skin through bite wounds or through indirect transmission through contact with water sources, soil, food and contaminated bedding. This is incredibly important to remember as our team members fall into this last category.

The website www.stoplepto.com has invaluable resources to make sure all team members understand risk factors and how to keep themselves safe when obtaining diagnostics and performing treatments on suspect Leptospirosis cases in hospital.

### 5 DOGS WITH LEPTOSPIROSIS CAN HAVE SOME UNUSUAL CLINICAL SIGNS

While we've talked about the acute and chronic presentations, don't forget that some dogs with conjunctivitis and uveitis are actually Leptospirosis patients! Remember, this is a spirochete, and very similar to other tick transmitted diseases with spirochetes, this organism can enter the eye and cause inflammatory change. We can also see abnormal bleeding patterns in these patients, and in rare instances, a recently recognized pulmonary hemorrhagic syndrome has been recognized.

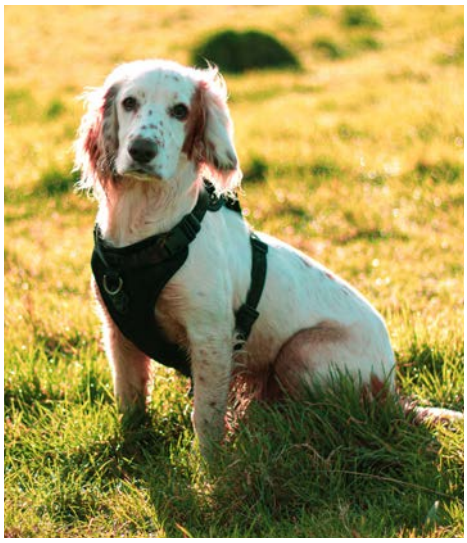
### 6 KEEP MY CHEESY PNEUMONIC IN MIND!

When to suspect Lepto:

**L**iver/Kidney
**E**nzyme elevations
**P**olyuria/polydipsia
**T**hrombocytopenia
**O**liguria

### 7 THERE ARE A FEW KEY CLINICAL PATHOLOGY FINDINGS TO TRIGGER LEPTOSPIROSIS TESTING AND TREATMENT

More than 80% of canines will be azotemic with this disease. But, keep in mind, there are some serovars that



have predilection for the liver and, if liver values are the only enzymes elevated, don't exclude Leptospirosis immediately. Some dogs will also be hyperbilirubinemic in these cases. However, a newer discovery that is very helpful with screening our patients is that up to 58% of patients will be thrombocytopenic, and I encourage new associates to think Lepto and Lyme (and other tick diseases) with mildly thrombocytopenic cases. And, on urinalysis, not only will our patients have less concentrated urine due to most being polyuric/polydipsic at first, over 50% of our patients will have glucosuria from proximal tubular damage.

*(continued)*

# LEPTOSPIROSIS: WHY AWARENESS AND DIAGNOSIS IS CRUCIAL TO THE HEALTH OF YOUR PATIENTS, CLIENTS AND PRACTICE

DR. NATALIE MARKS, DVM, CVJ

*(cont)*

## 8 TESTING SHOULD BE PERFORMED KNOWING BENEFITS AND LIMITATIONS OF THE TESTS

Right now, we have both MAT (microscopic agglutination testing) or antibody testing as well as PCR testing. Testing can be a bit confusing – please refer to my flow chart to help discern which test to choose and how to interpret the results.

If Snap or MAT test is **POSITIVE** = check if vaccinated

- if vaccinated, run PCR
- if NOT vaccinated = POSITIVE test

If Snap or MAT test is **NEGATIVE** =

NOT Leptospirosis or TOO early (needs 10 days)

If PCR is **POSITIVE** =

patient has Leptospirosis

If PCR is **NEGATIVE** =

either NOT Lepto or not enough DNA for test

## 9 TRANSMISSION CAN OCCUR THROUGH VARIOUS ROUTES

The first line of therapy is antibiotics. I use Ampicillin at 20-30mg/kg IV q 6-8 hours with critical or vomiting patients – it does terminate bacteremia in the hospitalized patient. However, in stable patients, the gold standard currently is Doxycycline at 10mg/kg PO once daily for 14 days to clear the leptospires from the kidney – treat ALL dogs in the household to prevent transfer back and forth. For azotemic patients, fluid therapy is essential and aggressive. Make sure to monitor ins and outs and give clients the expectation of several days in the hospital ahead of time. Continue supportive care with antacids, anti-emetics and liver support if indicated. With prompt and aggressive care, survival rates are approximately 80% but many of these patients can develop chronic renal insufficiency with time.

## 10 VACCINATION IS KEY TO PREVENTION

Screen your patients for environmental risk and, if indicated, utilize a vaccination that protects against the 4 most common serovars. There are still many misconceptions around vaccinations, reaction rates and other historical myths. Don't hesitate to educate clients on how new protein diafiltration procedures have made these vaccines "smoother" and much less reactive. Patients who are vaccinated have much less kidney and liver disease, and the Nobivac vaccine specifically has label claims for prevention of leptospiremia, thrombocytopenia and prevention of mortality. Besides vaccination, encourage clients avoid contact with dog's urine, wash hands after handling pets, clean up urinary accidents in the home with household disinfectants and minimize wild animal contact with fencing/rodent control.

Let's make a difference together in protecting our patients, families and teams!

*LEARN MORE*

# VETgirl certification program

**As on-the-floor clinicians, we know what you need to practice better medicine, provide better patient care, and ultimately save that patient's life. VETgirl certification is designed to give you the expertise that you need, geared for clinical veterinary professionals. Offered in unique tracks, these courses range from 12-60 hours of RACE-Approved CE for both veterinarians and veterinary technicians.**

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**Course Outline : 60 hours**

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**Course Outline : 12 hours**

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**Course Outline : 12 hours**

**Visit vetgirlontherun.com/certificates/ for more information on course offerings and certification details!**

** Note: The basic emergency medicine certificate should be completed prior to the advanced course.*

# VETERINARY TECHNICIANS: THE KEY TO CLINIC INFECTION CONTROL AND PROTECTING PATIENTS FROM DISEASE

DR. JASON STULL, VMD, MPVM, PHD, DACVPM

In the VETgirl-Zoetis webinar, Dr. Jason Stull, VMD, MPVM, PhD, DACVPM, assistant professor of veterinary epidemiology and preventive medicine at The Ohio State University and University of Prince Edward Island, presented a 1-hour webinar reviewing veterinary infection control and the role technicians can play in developing and improving a program for their facility. You can view it here: https://vetgirlontherun.com/webinars/april-19-2020-veterinary-technicians-the-key-to-clinic-infection-control-and-protecting-patients-from-disease/

## KEY HIGHLIGHTS

1 **Hospital-associated infections (HAIs) are infections acquired by patients while in the hospital.** In human hospitals, HAIs are a well-recognized contributor to illness and death, with tens of thousands of patients dying from HAIs each year. Similar HAI risks have been reported in veterinary medicine, such as HAIs in 16% of ICU patients in one study and many published HAI outbreaks in veterinary facilities.

Recent experiences with COVID-19 highlight the importance of veterinary practices having a well-established infection control program. Given their background knowledge, integral role in patient care, awareness of practices by personnel, veterinary technicians can play a key role in developing and overseeing their facility's infection control program.

2 **Every veterinary practice should have a documented infection control program.** At a minimum, this should be a collection of infection control standard operating procedures (SOPs), growing into a formal manual including staff education and training, client education, surveillance, and compliance programs.

3 **A seven-step process is recommended to develop and optimize an infection control program.** Some of those steps are highlighted below (further details, including numerous resources to accomplish each step are available at: https://www.aaha.org/biosecurity).

- Identify a staff member to oversee the development and implementation of the program. This person, termed an infection control practitioner (ICP), serves a critical role in a clinic infection control program. These individuals are involved in program development, maintenance, compliance, and evaluation. Veterinary technicians are perfect for this job.

- Perform an infection control assessment. ICPs should identify clinic-specific infection control strengths and weaknesses, allowing for targeted work on most needed areas. The ICP should then begin to develop and refine an infection control manual containing protocols for identified areas of need.

  A suggested assessment tool is available (https://www.aaha.org/biosecurity).

- Identify and develop protocols and checklists. Written SOPs should be the main source of guidance for an infection control program. These protocols should clearly describe the roles, duties and actions of all team members for specific key practices. Checklists should be developed and used to help remind and track compliance with SOPs when applicable. Infection control topics to include in SOP development, include:

  - Hand hygiene (see below)
  - Cleaning and disinfection
  - Personal protective equipment
  - Identifying high-risk patients (e.g. questions to ask when booking appointments; how to admit, handle and discharge these patients)
  - Isolation/dedicated areas for high-risk patients (i.e., when and how to use these facilities).

*(continued)*

# VETERINARY TECHNICIANS: THE KEY TO CLINIC INFECTION CONTROL AND PROTECTING PATIENTS FROM DISEASE

DR. JASON STULL, VMD, MPVM, PHD, DACVPM

*(cont)*

4 **Hand hygiene (hand cleaning) is considered to be the most important measure to prevent HAIs in healthcare facilities.** This process involves the removal of disease-causing organisms from hands using either soap and water or alcohol-based and sanitizer. Studies show that hand hygiene compliance among veterinary staff is relatively poor (i.e., performing at < 50% of the times it is indicated). Increasing hand hygiene of veterinary staff (through convenience by using alcohol-based hand sanitizers, education, and motivation) can have a large impact on reducing HAIs in veterinary clinics for relatively little cost. Every team member should know:

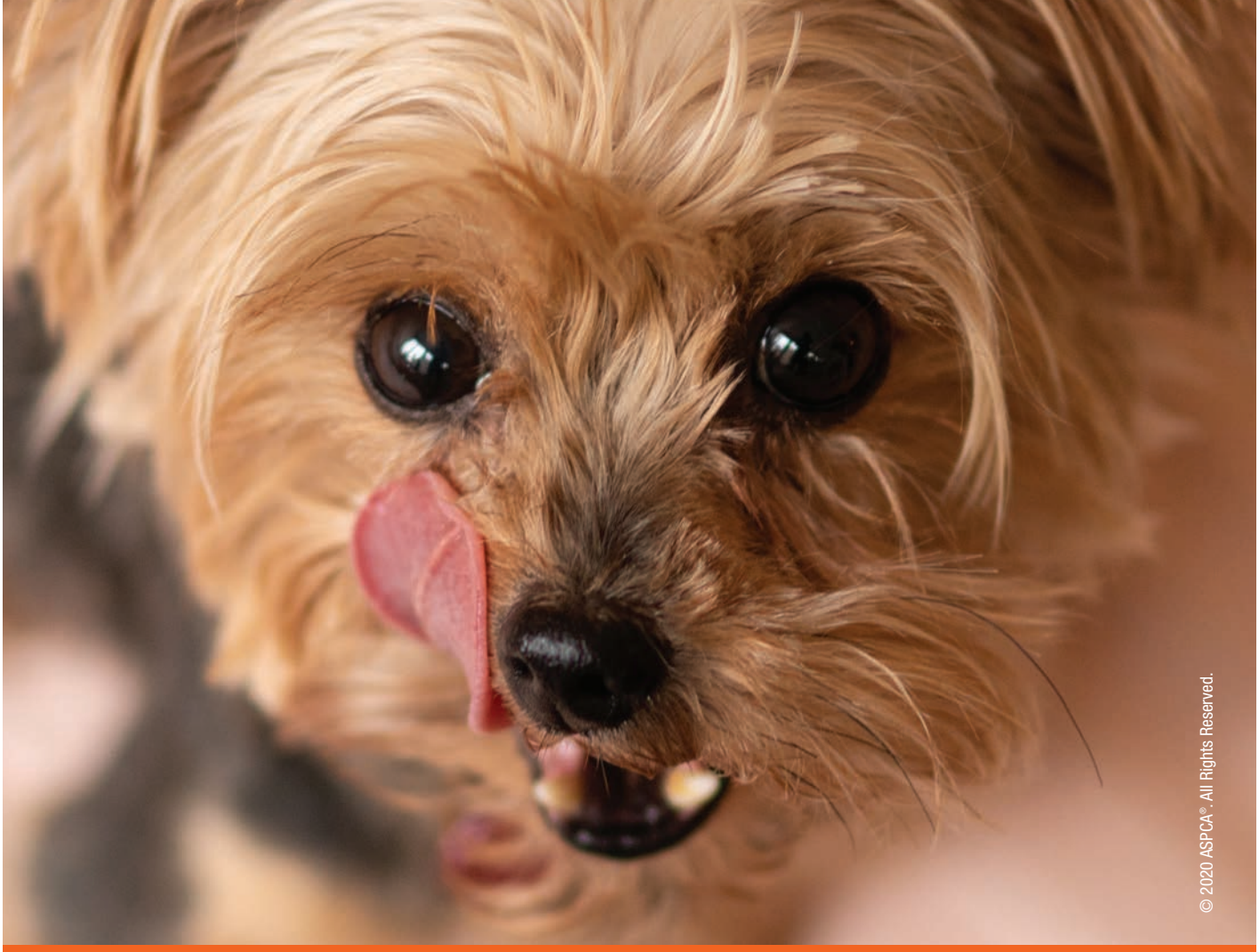
- When to perform: immediately before and after contact with a patient or environment, after contact with a patient's body fluids, before putting on gloves and especially after glove removal, before eating, after using the restroom
- How to perform: by rubbing hands for a minimum of 20 seconds into all aspects of hands, with special attention to fingertips, between fingers, backs of hands and base of the thumbs
- What to use: using soap and water when hands are visibly soiled or there is suspicion for a pathogen that is relatively resistant to alcohol-based hand sanitizer (i.e., Clostridium, non-enveloped virus such as parvovirus); otherwise alcohol-based hand sanitizer is preferred given its comparable ease of use.

5 Due to the potential for pathogens in the environment to be picked up by animals and people, attention to appropriate cleaning and disinfection protocols is important in preventing HAIs. Cleaning involves the removal of visible organic matter (e.g., feces, urine, dirt) with soap or detergent, whereas disinfection involves the application of a chemical to kill the remaining microbes. Some pathogens are highly resistant to disinfection; cleaning in these circumstances is particularly important to mechanically remove the organisms. The appropriate steps for cleaning and disinfection should be carefully followed:

- Cleaning to remove gross contamination (if a detergent was used, rinse with clean water)
- Allow area to dry or do so manually
- Apply disinfectant at the appropriate concentration and ensure the adequate contact time (time required for disinfectant to remain wet on the surface to kill the pathogens)
- Rinse with clean water (especially important for disinfectants that leave a residue or for surfaces vulnerable to damage from the disinfectant).

Selection of an appropriate disinfectant requires consideration of many factors, including spectrum of efficacy, staff safety, convenience, and cost. Resources are available to guide you.

*LEARN MORE*

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Animal Poison Control Center

# VETgirl HEPATOTOXICANT TABLE

ASPCA® Animal Poison Control Center (888) 426-4435

| TOXIN | SOURCE | MECHANISM OF ACTION | CLINICAL SIGNS | CLIN PATH | TOX TEST | TREATMENT | PROGNOSIS |
|---|---|---|---|---|---|---|---|
| **Mothballs** | Paradichlorobenzene (PDB)<br>*(NOTE: Make sure to differentiate from naphthalene)* | Organochlorine insecticide | Vomiting, abdominal pain, liver and kidney damage | Hemolytic anemia<br>Hemolysis<br>Methemoglobinemia (rare in dogs and cats; reported in humans) | | • Prompt GI decontamination<br>• Fluid administration to induce diuresis<br>• Symptomatic response to adverse signs<br>• Supportive care of vital functions<br>• Seizure control with parenteral benzodiazepines | Organochlorine insecticide with an $LD_{50}$ of approximately 500 mg/kg |
| **NSAIDs** | Carprofen<br>Deracoxib | Inhibit PG synthesis → mostly GI and renal effects, reported liver effects as well (chronic) | DOG DOSES:<br>> 20 mg/kg: vomiting, GI ulcers<br>> 40 mg/kg: AKI<br>Idiosyncratic liver toxicity (1.4 cases out of 10,000) | ↑↑↑ ALT<br>GI and AKI related findings:<br>• anemia<br>• hypoproteinemia<br>• azotemia<br>• hyperphosphatemia, etc. | | • Immediate discontinuation<br>• Treatment for hepatic failure<br>• Hepatoprotectants (SAMe or NAC) | DOG DOSES:<br>Hepatotoxicity, when observed, typically develops with **chronic** dosing (e.g., 5-30 days of chronic use; median 19 days) |
| **Acetaminophen (APAP)** | Analgesic and antipyretic derived from paracetamol<br>(*Note: Not an NSAID)* | Metabolized to NAPQI, binds to macromolecules and causes lipid peroxidation of membranes; induces direct cell injury and death leading to hepatic necrosis<br>Oxidative damage in cats, resulting in metHb, Heinz body formation | DOG:<br>GI signs, CNS depression, hepatotoxicity (icterus, coagulopathy); metHb can occur at higher doses (cyanosis, dyspnea) but not as common as in cats<br>CAT:<br>Respiratory distress, hypoxemia, cyanosis, edema of face and paws, metHb | ↑↑ LES (AST thought to be most sensitive)<br>MetHb, Heinz bodies, chocolate-brown appearance to blood | Plasma, urine or tissue | NAC replenishes glutathione, provides sulfur and will directly bind NAPQI<br>Others:<br>• Vitamin C<br>• SAMe<br>• IV Fluids<br>Methylene blue has been described, but not recommended, especially in the cat (due to Heinz body formation) | DOGS:<br>100 mg/kg hepatotoxicity;<br>200 mg/kg methemoglobinemia<br>CATS/FERRETS:<br>10 mg/kg methemoglobinemia<br>KCS can occur in dogs after even therapeutic doses |
| **Xylitol** | Sweetener in sugar-free products, such as chewing gum and baking products | Induces hypoglycemia by stimulating insulin secretion from the pancreas of dogs<br>Hepatic necrosis thought to be from decrease ATP production (xylitol uses pentose phosphate pathway instead of TCA [Kreb's] cycle) | Clinical signs develop in as short a time as 30 to 60 minutes<br>Weakness, ataxia, collapse, and seizures from hypoglycemia may last 12 to 24 hrs, perhaps caused by the slow xylitol release from the ingested formulations and its absorption<br>Liver injury (within 24 hrs), including signs of melena, hepatic encelopathy, hemorrhage | Hypoglycemia,<br>↑↑ LES, DIC, coagulopathy | | • Stat BG and treatment for hypoglycemia; emesis if recent ingestion and normoglycemic<br>• Activated charcoal not indicated<br>• Fluid support and glucose support (dextrose can correct hypoglycemia and is liver supportive by providing ATP) even in the face of euglycemia<br>• Response from clinical effects is usually rapid and within 12 to 24 hrs<br>• Recheck liver values at 24 and 48 hrs to evaluate for liver involvement<br>• SAMe for 1-2 weeks if hepatotoxic dose ingested | > 0.1 g/kg → hypoglycemia<br>> 0.5 g/kg → acute hepatic necrosis |

# VETgirl HEPATOTOXICANT TABLE

ASPCA® Animal Poison Control Center (888) 426-4435

| TOXIN | SOURCE | MECHANISM OF ACTION | CLINICAL SIGNS | CLIN PATH | TOX TEST | TREATMENT | PROGNOSIS |
|---|---|---|---|---|---|---|---|
| **Metaldehyde** | Known as a molluscicide, used for the control of slugs and snails (although recently replaced by less toxic iron phosphate) | Results in the disruption of the GABAergic system<br>Monoamine oxidase, 5-hydroxytryptamine, and norepinephrine may also be involved in the toxic mechanism | May be seen as soon as 30 minutes after ingestion but typically occur within 3 to 5 hrs<br>GI (vomiting, diarrhea) and CNS (hyperesthesia, incoordination, hyperthermia, seizures) signs<br>Liver damage and cirrhosis may occur 2-3 days after exposure<br>Death from respiratory failure may occur within 4-24 hrs after exposure | Acidosis, liver value abnormalities | Characteristic odor of formaldehyde may be present in the stomach contents along with bait material<br>No consistent and pathognomonic gross or histological lesions occur in metaldehyde poisoned animals | • Decontamination, if appropriate<br>• Gastric lavage with inflated ETT should be performed if the patient is symptomatic and evidence of pellets still in stomach on radiograph; administration of 1 dose of charcoal if gastric lavage performed<br>• Stabilization of vital signs, IV fluids, anti-emetics, acid-base monitoring, methocarbamol/anticonvulsant therapy, respiratory and CV system monitoring, supportive care | Acute median LD values are 210 to 600 mg/kg for dogs and 207 mg/kg for cats<br>Prognosis is good if survival is > 24 hrs from ingestion with early treatment |
| **Copper** | Coins, feeds, solutions, wire, jewelry, food | Breeds that are homozygous for a recessive gene (Bedlington Terrier, Skye Terrier, West Highland White Terriers, Labrador Retrievers, Doberman Pinschers) have excessive copper storage in the liver | Lethargy, anorexia, vomiting, weight loss, jaundice | | Quantitative hepatic copper values; genetic testing (some breeds) | • Chelation with penicillamine or trientine<br>• Supportive care for other derangements | Increasing zinc in diet can aid in prevention |
| **Benzodiazapines (oral)**<br>**CATS ONLY** | Oral diazepam (valium) and alprazolam (not seen with parenteral administration); typically seen with chronic oral dosing | Acute hepatic necrosis in 5-11 days of oral treatment | Sedation, malaise, ataxia, jaundice | Markedly ↑↑↑ ALT<br>↑ T-bili, PT/PTT | | | |
| **Amatoxin Mushrooms** | *Amanita* spp., *Galerina* spp., *Conocybe* spp., *Lepiota* spp. | Inhibit DNA and RNA transcription and protein synthesis; bind to actin filaments, deform cytoskeleton → hepatocyte death | Develop GI signs within 6-24 hrs<br>"False" recovery period, followed by fulminant liver failure and AKI in 36-48 hrs | ↑↑ Liver enzymes within 48-72 hrs | Centrilobular hemorrhagic necrosis | • Decontamination (emesis and AC if < 2 hrs post ingestion)<br>• IV fluids, sequester amatoxin bile in gallbladder with octreotide CRI, NPO), ultrasound-guided bile aspiration | Alpha amanitin $LD_{50}$ (human) = 0.1 mg/kg<br>Easily found in one mushroom |
| **Blue-Green Algae** | Cyanobacteria<br>Hepatotoxins (*Microcystis* spp., *Nodularia* spp., *Oscillatoria* spp. most common; *Anabaena* spp. less often)<br>Can also contain neurotoxins | Microcystin binds to protein phosphatase in cytoskeleton, disorganization of actin leads to cellular collapse, intrahepatic hemorrhage, death | Death in hrs to days with hepatotoxin<br>GI (e.g., vomiting/diarrhea), CNS (e.g., weakness, ataxia, tremors, seizures), cardiac (e.g., collapse, pallor, tachycardia, respiratory failure, hemorrhagic and hypovolemic shock)<br>Very acute clinical signs with neurotoxin (death can occur in minutes to hrs) – CNS signs and SLUDGE-like signs | ↑↑ Liver enzymes within a few to 24 hrs; ↑↑ PT/PTT; anemia | Diffuse hepatic necrosis | • Decontamination is often too late – gastric lavage +/- activated charcoal, bathe (use protective gear)<br>• PCV/TS/BG<br>• Baseline Chem, CBC PT/PTT | Toxic dose – 50-11,000 mcg/kg<br>Prognosis – often grave |

# VETgirl HEPATOTOXICANT TABLE

ASPCA® Animal Poison Control Center (888) 426-4435

| TOXIN | SOURCE | MECHANISM OF ACTION | CLINICAL SIGNS | CLIN PATH | TOX TEST | TREATMENT | PROGNOSIS |
|---|---|---|---|---|---|---|---|
| **Sago Palm** | Cycads (*Cycas* spp., *Macrozamia* spp.) (SE, South central or tropical areas of US usually) but can be found as bonsai household plant | All parts of the plant are poisonous, but seeds contain largest amount of toxin | GI signs (vomiting, diarrhea) within 15 minutes to several hrs, CNS signs (lethargy, seizures) (48-72 hrs), liver failure (24-72 hrs) | ↑↑ Liver enzymes (24-72 hrs) | Centrolobular and mid-zonal coagulative hepatic necrosis | • Baseline bloodwork, PT/PTT<br>• PCV/TS/BG/liver panel q 24 hrs x 2-3 days | 1-2 seeds can lead to severe signs<br>Grave prognosis once hepatoxicity seen |
| **Iron** | Multivitamins, iron supplements, fertilizers, snail/slug bait | When serum iron exceeds the binding capacity of transferrin and ferritin, free iron causes lipid peroxidation and damage to liver, heart and brain<br>Iron is also caustic to the GI mucosa | GI signs (e.g., vomiting, hematemesis, melena, diarrhea) within 0.5-6 hrs; liver failure 12-24 hrs later<br>With large doses can see hypovolemic shock, coagulopathy and acidosis | ↑↑ Liver enzymes; ↑↑ PT/PTT if liver necrosis | Serum iron levels; chelate warranted if iron > 400 mcg/dl) | • MgOH can be given while iron is still in the GI tract<br>• Emesis if appropriate. Activated charcoal does not bind and should not be used<br>• Other treatment includes antiemetics, GI protectants/antacids, hepatoprotectants, deferoxamine (chelator), supportive care, blood work monitoring | Toxicity dependent on amount of elemental iron<br>20-50 mg/kg = GI signs<br>50-80 mg/kg = GI ulcers<br>> 80 mg/kg = liver and other systemic effects |
| **Aflatoxins** | Mycotoxin (mold) found in corn, peanuts, cottonseed, rice and potatoes | Metabolized into reactive epoxide, binds to hepatocytes<br>Large acute exposures = hepatic necrosis; smaller chronic exposures = neoplasia | Vomiting, anorexia, lethargy, icterus, coagulopathy | ↑↑ Liver enzymes; ↑↑ PT/PTT | Acute – diffuse hepatic necrosis<br>Chronic – fatty liver | Fluid therapy, anti-emetics, blood work monitoring, hepatoprotectants, symptomatic and supportive care | |
| **Aspirin** | NSAID pain medication | Hepatotoxicity thought to be from inhibition of mitochondrial function | GI (e.g., anorexia, vomiting, melena, stomach ulcers), lethargy, icterus | ↑↑ Liver enzymes | Centrilobular hepatic necrosis | Fluids, anti-emetics, antacids, gastroprotectants, hepatoprotectants | Dogs > 400 mg/kg for liver effects |
| **Lectins (toxalbumins)** | Castor bean *(Ricinus communis)*, Precatory bean *(Abrus precatorius)*, Black locust (*Robinia* spp.), Mistletoe *(Phoradendron)* | Stops cellular protein synthesis in multiple organs | GI (e.g., anorexia, vomiting), lethargy, anorexia, icterus, weakness, tremors, death | ↑↑ Liver enzymes | | Fluids, anti-emetics, symptomatic and supportive, hepatoprotectants | All parts of plants are toxic. Seeds are most toxic part of *Ricinus* and *Abrus*. Seeds must be chewed to release the toxin. |
| **Essential oils** | Pennyroyal oil, melaleuca (tea tree) oil | Unknown | Vomiting, lethargy, ataxia, hind limb weakness, icterus | ↑↑ Liver enzymes | | Symptomatic and supportive (fluids, hepatoprotectants) | Usually associated with application of 100% oil to open wound, ear canal or oral ingestion |
| **Veterinary drugs associated with hepatotoxicity (albeit rare)** | isoniazid, ketoconazole, lomustine, methimazole, melarsomine, mitotane, sulfonamides, trazodone, zonisamide | | | | | • Discontinuation of drug<br>• Hepatoprotectants<br>• Symptomatic supportive care | |

Abbreviations: AKI: acute kidney injury; CNS: central nervous system; DIC: disseminated intravascular coagulation; GI: gastrointestinal; LD: lethal dose; LES: liver enzymes; Meth: methemoglobin; NAC: N-acetylcystine; PT: prothrombin; PTT: partial thromboplastin time

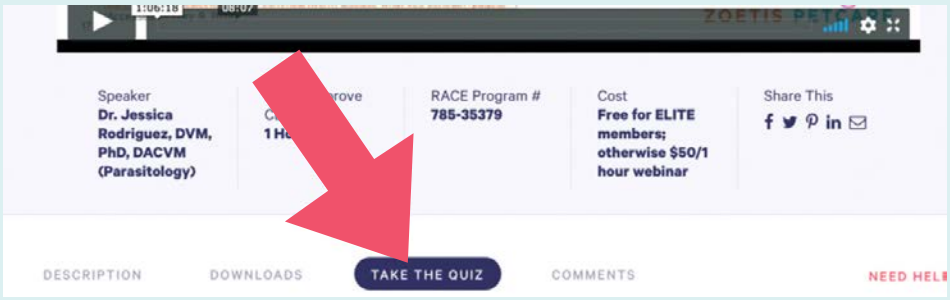
# TECH TIPS //

WITH VETGIRL COO, DR. GARRET PACHTINGER, DACVECC

The champagne flutes are empty and there are no more corks popping... VETgirl 3.0 (our updated website and platform) is almost 1 year old... but that doesn't mean the excitement has subsided! The VETgirl team has been hard at work, constantly working on improvements and upgrades with your help!

Each newsletter will highlight one of the notable features on the website. This newsletter we wanted to highlight the CE quiz feature. Did you know that while all interactive VETgirl webinars are initially given LIVE, after the live event they are placed in the VETgirl on-demand library for review on your time? If you missed a lecture... or... want to review a lecture to prepare for your upcoming case, as a VETgirl member you have access to our massive on-demand library 24/7/365! After watching the webinar, take a short quiz to obtain CE credit.

To take the quiz, first make sure you are logged in. Once logged, the quiz for each webinar, podcast, or rounds will be directly under the content. Need more help? Check out our quiz help center page.




**Forgot if you already took the quiz?** After you pass the quiz, the "TAKE THE QUIZ" button will automatically change to "CE CERTIFICATE" so you can download your CE certificate or go to your CE credit library to view or download any of your previous CE certificates. Need more help? Check out our Help-Center article on CE credits!

Thank you again for being part of the VETgirl CE experience, learning with the #1 CE resource for busy veterinary professionals.

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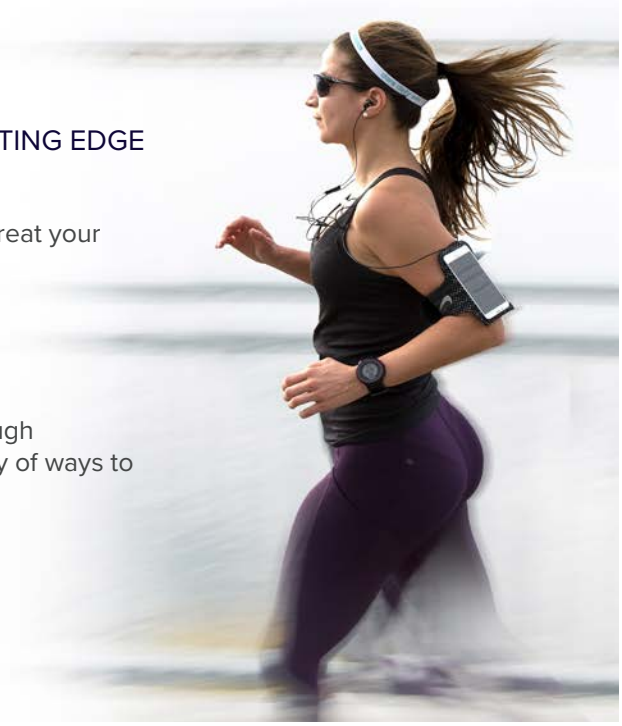
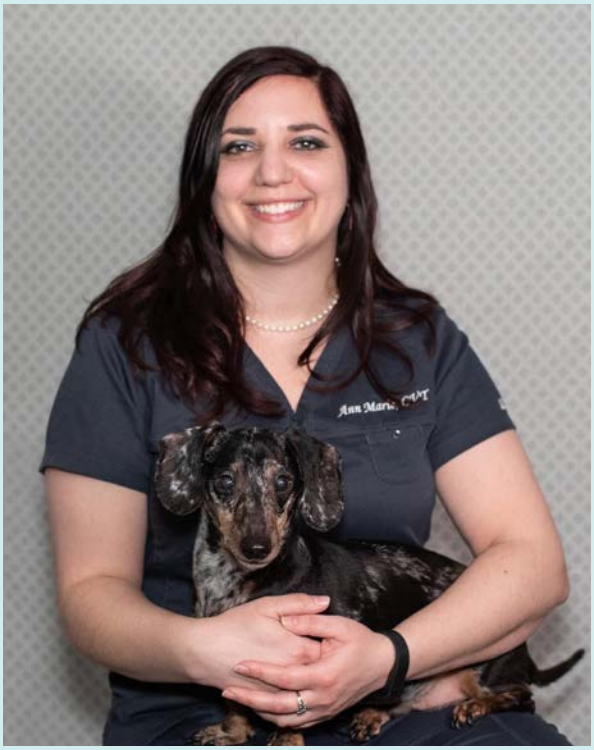


# PROVIDER SPOTLIGHT //

## **ANN MARIE CUMELLA,** CVT

CE COORDINATOR, VETGIRL, LLC



Ann Marie Cumella, CVT obtained her bachelors in Animal Science with a minor in Biology from the University of Minnesota in 2008. She then obtained her AAS degree in veterinary technology from Argosy University in 2013. Since becoming a Certified Veterinary Technician, she has worked in both small animal general practice and emergency clinics alike and is currently working at an Emergency and Specialty practice as a critical care technician in Minnesota. She has a cat named Kitty and a mischievous dachshund named Dexter and in her free time she enjoys hiking, a good book, traveling and trying as many different foods as she can!

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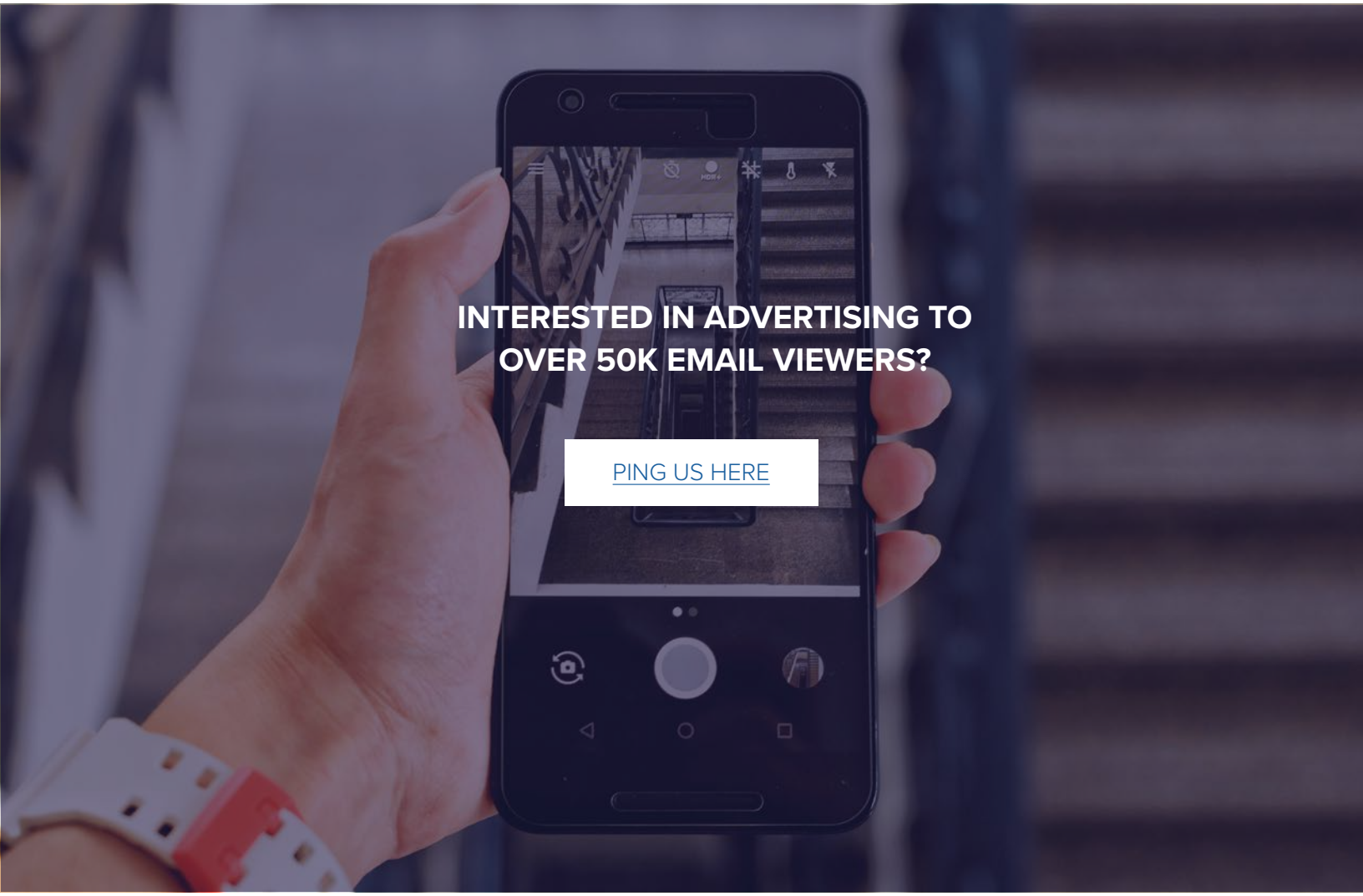



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NOTE: When in doubt, all drug dosages should be confirmed and cross-referenced with a reference guide such as Plumb's Veterinary Drug Handbook.