

 PURINA[®]
PRO PLAN[®]

DOG Update

A NESTLÉ PURINA PUBLICATION DEDICATED TO DOG ENTHUSIASTS VOLUME 17 | SUMMER 2019



TICK-BORNE DISEASES IN DOGS

AKC Canine Health Foundation
Sponsors Research Initiative

 PURINA[®]

Your Pet, Our Passion.[®]

STUDIES OF LYME DISEASE, BARTONELLOSIS & AMERICAN CANINE HEPATOZOONOSIS IN DOGS FOCUS ON PREVALENCE & UNDERSTANDING

Veterinarian Jon Spelke, DVM, wants to know more about Lyme disease, or borreliosis, in dogs. As the owner of Androscoggin Animal Hospital in Topsham, Maine, one of the worst states in the country for Lyme disease, Dr. Spelke realizes the challenges in diagnosing and treating affected dogs that rarely show signs of disease.

“We still don’t know a lot about Lyme disease,” he says. “We have

been assuming that many positive dogs have no signs, but I am concerned that maybe we are just missing the signs. Most symptomatic dogs present with lameness, and some have increased body temperature and joint swelling.”

This is why Dr. Spelke has been helping to enroll dogs — patients seen at his veterinary clinic — that are tested for *Borrelia burgdorferi*, the bacteria that causes the most common tick-transmitted disease in the U.S., for a study looking at disease prevalence, clinical illness and the prognosis of canine Lyme disease. The purpose is to follow healthy dogs that test positive for *B. burgdorferi* and check in with their owners at three-month and six-month intervals.

“The majority of dogs that test positive for Lyme disease, or more accurately develop antibodies against *B. burgdorferi*, never get sick,” says principal investigator Jason Stull, VMD, PhD, assistant professor of veterinary preventive medicine at The Ohio State University and the University of Prince Edward Island. “This is why Lyme disease is not easy to diagnose. Results of a blood test alone do not indicate whether a dog has Lyme disease and treatment is needed.”

Dr. Stull and his research team will soon complete the [three-year study funded by the AKC \(American Kennel Club\) Canine Health Foundation](#) via its Tick-Borne Disease Research Initiative. The investigation has focused on patients seen at veterinary clinics



WHAT HAPPENS WHEN A TICK INFECTED WITH *B. BURGDORFERI* BITES A DOG?

The two tick species that transmit *Borrelia burgdorferi* or Lyme disease to dogs are *Ixodes scapularis*, the blacklegged tick or deer tick, and *Ixodes pacificus*, the Western blacklegged tick. Although dogs commonly do not show signs of illness until two to six months after being bitten, an infected tick can transmit Lyme disease after only 24 hours of attachment.

Here's what can happen when a dog is bitten by an infected tick:

- Nothing – The dog doesn't get infected with *Borrelia* or other tick-borne organisms.
- The dog tests positive for Lyme disease on a blood test because of developing antibodies after being exposed to or infected with *Borrelia*. However, the dog does not get sick because its immune system gets rid of the bacteria.
- The dog is infected with *Borrelia* and gets sick with Lyme disease. An infected dog usually tests positive on a blood test due to exposure to *Borrelia* and making antibodies in an attempt to fight the infection.
- The dog acquires an infection with another organism that isn't detected by a Lyme-only blood test.

Source: [Lyme Disease \(Borreliosis\) Information for Dog Owners](#)



Blacklegged tick, also known as deer tick



Western black-legged tick

from Maine to western Pennsylvania, an area spanning the gradient of canine Lyme disease risk, explains Dr. Stull.

In the decade from 1996 to 2016, the number of counties in the U.S. in which the tick species that transmit *B. burgdorferi* were established doubled to 45 percent of all counties, says Dr. Stull. "A combination of changes in climate, wildlife and land use are likely involved in the expansion of these ticks and *B. burgdorferi* and account for Lyme disease's classification as an important emerging infectious disease that is moving into other regions of the U.S. and Canada."

A survey of dog owners who are participating in the study indicates that only about half of respondents have taken steps to reduce ticks on their properties. "Simple effective measures can reduce the disease risk for our two-legged and four-legged family members. These include keeping grass short and

building a narrow wood chip or gravel barrier between adjacent wooded areas and property grass where dogs and people spend time," Dr. Stull says.

"Thus far, in our study we have found about 11 percent of dogs test positive for *B. burgdorferi*, which is about what we expected," he says. "A high proportion — about 18 percent — of dogs that tested positive for *B. burgdorferi* also tested positive for *Anaplasma*, another tick-borne pathogen that can cause disease in dogs. This is higher than we expected. When all the data are collected, we want to investigate if co-infection with multiple pathogens results in a greater chance for clinical signs or more severe disease for dogs."

Among the insights Dr. Spelke hopes will come from the study is learning whether treatment is recommended for asymptomatic *Borrelia*-positive dogs. "Currently, antibiotic treatment is not used

Although tick-borne diseases are on the rise, knowledge about how to diagnose, treat and reduce the spread of ticks and their pathogens will pay dividends in helping dogs live long, healthy lives.

for healthy dogs with a positive Lyme antibody test and no signs of disease,” he says. “Perhaps we will learn that disease progression warrants antibiotic treatment as soon as a dog tests positive for *Borrelia*.”

WHY BARTONELLOSIS IS COMPLICATED

Bartonellosis is one of the most important emerging infectious diseases in dogs and humans, says Edward B. Breitschwerdt, DVM, DACVIM, the Melanie S. Steele professor of medicine and infectious diseases and co-director of the Vector Borne Disease Diagnostic Laboratory at North Carolina State University. Infections can be life-threatening in dogs, thus the importance of early diagnosis for a better prognosis.

Today, more than 44 *Bartonella* species and subspecies have been named. “Understanding this disease is complicated by the fact that bartonellosis is transmitted in myriad ways,” Dr. Breitschwerdt says. “*Bartonella* species are probably transmitted by more vectors than any

other pathogenic organisms that exist on the planet. Primarily arthropod vectors such as fleas, ticks, sand flies, and lice transmit the pathogen, though spiders, bedbugs and deer keds can carry and potentially transmit these bacteria as well.”

As the principal investigator of three recent AKC Canine Health Foundation research grants studying bartonellosis in dogs, Dr. Breitschwerdt understands the challenges in diagnosing the disease. He also recognizes that *Bartonella* is known to proliferate in the endothelial cells lining the blood and lymphatic vessels of the body and induce vascular tumor-like growths in immunocompromised dogs and humans.

Along with veterinary cardiologist Kathryn Meurs, DVM, PhD, DACVIM (Cardiology), and doctorate student Erin Lashites, DVM, DACVIM, both of North Carolina State University, Dr. Breitschwerdt began [a one-year study in February 2019 that is looking at how *Bartonella* infection may affect Boxers genetically predisposed to arrhythmogenic right ventricular cardiomyopathy \(ARVC\)](#). The disease



HOW TO SAFELY REMOVE A TICK

While tick prevention is key to protecting dogs, if you find a tick attached to a dog, it is important to remove the tick as soon as possible. Ticks only need to feed for a few hours to a day to pass on bacteria that can cause tick-borne disease. Here's how to safely remove a tick:

1. Use fine-tipped tweezers to grasp the tick as close to the skin's surface as possible.
2. Pull upward with steady, even pressure. Don't twist or jerk the tick, as this can cause the mouthparts to break off and remain in the skin. If this happens, remove the mouthparts with tweezers. If you are unable to remove the mouthparts easily with clean tweezers, leave them alone and let the skin heal.
3. After removing the tick, thoroughly clean the bite area and your hands with rubbing alcohol or soap and water.
4. Never crush a tick with your fingers. Dispose of a live tick by putting it in alcohol, placing it in a sealed bag, wrapping it tightly in tape, or flushing it down the toilet.

Source: [Centers for Disease Control and Prevention](#) (Adapted for dogs)

is triggered by degenerative myelopathy, which can cause heart arrhythmia and sudden death.

“As *Bartonella* endocarditis occurs in Boxers, it is possible that *Bartonella* can infect the heart muscle or alter cardiac conduction leading to or increasing the genetic tendency to develop ARVC,” says Dr. Breitschwerdt. “We hypothesize that chronic *Bartonella* infection may lead to ARVC in a subset of Boxers.”

The first study to investigate the role of *Bartonella* in ARVC, the research involves evaluating Boxer patients being treated at North Carolina State’s cardiology service that are suspected of having the heart disorder to see if they have been infected with *Bartonella*.

[A two-year investigation completed in December 2018](#) focused on developing a sensitive diagnostic assay to identify bartonellosis in dogs and studying disease prevalence. The [November-December 2018 issue of the *Journal of Veterinary Internal Medicine* published an article of the research](#) in which the lead author was Pradeep Neupane, a doctorate student in the Breitschwerdt Laboratory.

“An improved blood test would help to establish an early and accurate diagnosis and aid a dog’s prognosis for recovery,” says Dr. Breitschwerdt. “As treatment is complicated, a dog can be sick for months prior to diagnosis.

“We made progress but continue to evaluate specific individual or combination of peptides that could be used for rapid screening of dogs. Importantly, we concluded that IFA (immunofluorescent antibody) assays, the historical ‘gold standard’ for *Bartonella* blood diagnosis, produces too many false negative results. The good news is that the test is highly specific with few, if any, false positives, so detection of IFA antibodies in a sick dog warrants directed therapy.”



Reflecting, he says, “This is information we did not know prior to this study. An ongoing objective for us is to develop a more reliable blood test to facilitate the diagnosis of *Bartonella* infection in dogs.”

[In the third bartonellosis study, Dr. Breitschwerdt is working with Matthew Breen, PhD, professor of genomics at North Carolina State University](#), to see if dogs with hemangiosarcoma in New York, Colorado and California have a high prevalence of *Bartonella* DNA similar to what they have found in dogs in North Carolina. Potentially, this study may show that *Bartonella* contributes to hemangiosarcoma in dogs.

“It is increasingly clear that chronic infections contribute to the development of cancer in humans,” Dr. Breitschwerdt says. “If *Bartonella* infection contributes to the development of hemangiosarcoma, both early diagnosis and preventive strategies become important mechanisms to decrease the impact of this common and devastating cancer.”



LOOKING TO REPRINT?

Dog Update articles may be reprinted provided the article is used in its entirety and in a positive manner. If you are interested in reprinting this article, please contact the editor at: Barbara.Fawver@purina.nestle.com. Reprints should include the following attribution: Used with permission from the *Dog Update*, Nestlé Purina PetCare.

HOW COMMON IS AMERICAN CANINE HEPATOZOONOSIS?

The goal of researcher Andrea Varela-Stokes, DVM, PhD, associate professor at Mississippi State University, in her [two-year study of American canine hepatozoonosis](#) is to identify Gulf Coast ticks, or *Amblyomma maculatum*, that are positive for the protozoan parasite and confirm the usefulness of a new assay. The investigation runs through January 2020.



Gulf Coast tick

“This disease is transmitted when dogs eat a tick carrying *Hepatozoon americanum*, the disease agent, or they may get infected by eating an animal with cyst stages of the agent in its tissues,” says Dr. Varela-Stokes.

Occasionally diagnosed in dogs in the southwestern and south central U.S., American canine hepatozoonosis until recently has only been detected via a blood test that screens dogs for infections. Although rare, this debilitating tick-borne has a poor prognosis and limited treatment options. Fever, muscle pain and body wasting are common, and some dogs have thickening of their long bones.

“We have been most interested in the role of the tick,” Dr. Varela-Stokes says. “To learn about the prevalence of infected Gulf Coast ticks, veterinary research students surveyed for the ticks in Mississippi during

the summer of 2018, and then we tested the ticks to see if they were infected with the pathogen.

“Based on our survey, we found two of 129 adult Gulf Coast ticks were positive, suggesting a low prevalence of infection that year. This summer, we will target previously identified hot spots that may help us identify positive ticks. Until now the percentage of Gulf Coast ticks carrying *H. americanum* has been unknown, though the Gulf Coast tick species is known to be increasing its geographical distribution further north from its historically coastal range.”

LEARNING ABOUT DOG ODORS & AIDING DIAGNOSIS OF TICK-BORNE DISEASES

Considering that one female brown dog tick may lay 5,000 eggs, it is not hard to grasp how quickly the vector-borne diseases they carry, ehrlichiosis and babesiosis, can get out of hand. Once introduced, ticks are hard to eradicate.

The question that Emma Weeks, PhD, assistant research scientist at the University of Florida, looked at in her [six-year study that was completed in February 2019](#) was how do brown dogs ticks — the most widely distributed tick in the world -- locate dogs. The rationale was that by identifying the chemicals ticks detect could aid tick control and disease prevention.

“Our studies showed that brown dog ticks are attracted to a blend of volatile chemicals in dog odor and this helps them find a blood meal,” Dr. Weeks says. “We wanted to identify the specific chemicals in dog odor that ticks can detect.”



Brown dog tick

Using electrophysiological techniques, the research team identified chemicals in dog odor and then tested 10 ticks against each of five

TICK-BORNE DISEASE RESEARCH INITIATIVE HELPS ADVANCE CANINE HEALTH

The AKC (American Kennel Club) Canine Health Foundation recognizes the importance of tick-borne diseases and thus since 2016 has sponsored the Tick-Borne Disease Research Initiative providing more than \$650,000 to fund nine research grants for canine health.



“We at the AKC Canine Health Foundation remain committed to finding and funding peer-reviewed research to address tick-borne diseases in dogs,” says Dr. Diane Brown, CEO of the AKC Canine Health Foundation. “We know that the spread of ticks and tick-borne diseases is on the rise and that all dogs and their human families are at risk from these zoonotic diseases.

“In particular, we are concerned about the need for accurate diagnosis and better understanding of the prevalence of chronic infections and co-infections, which occur when ticks carry and spread more than one disease agent through a tick bite. Our focus then is on effective preventive and treatment strategies that can be implemented to help dogs everywhere.”

Here is a link to the [Tick-Borne Disease Research Initiative](#), including published articles from funded research, educational materials and information on how you can donate to support this research.

dog breed samples plus a mixed-breed sample, producing consistent responses in the tick’s nose, the Haller’s organ located in the first pair of legs. The researchers then used mass spectrometry to identify the chemicals that the tick’s nose was detecting.

“The research is continuing, as we now are testing the chemicals in an olfactometer and once determined, we will test the most attractive chemicals in a tick trap,” Dr. Weeks says.

Meanwhile, [a two-year study that began in February 2019 at Purdue University](#) aims to aid the diagnosis of vector-borne disease pathogens. Principal investigator Rebecca Wilkes, DVM, PhD, assistant professor of molecular diagnostics, is using targeted next-generation sequencing (NGS) to detect and characterize the pathogens in clinical samples. She is adding primers to the NGS protocol, thereby reducing the number of sequencing reads needed to obtain results.

“The beauty of next-generation sequencing is the amount of sequencing data you can obtain,” says Dr. Wilkes. “We can target hundreds to potentially thousands of pathogens with a single test. For the test to work, we have to make sure the primers will detect all the different pathogens we plan to target and that the sensitivity is good and the results are valid and reproducible.”

Collectively, these studies plus others that are currently underway and those that are now completed, all part of the AKC Canine Health Foundation’s Tick-Borne Disease Research Initiative, will make a difference in advancing understanding about ticks and the diseases they carry. Although tick-borne diseases are on the rise, knowledge about how to diagnose, treat and reduce the spread of ticks and their pathogens will pay dividends in helping dogs live long, healthy lives. ■

Purina and the AKC Canine Health Foundation have worked together since 1997 to support canine health research to benefit all dogs.

WHAT IF YOUR PET HAD THE ADVANTAGE OF PROBIOTICS?



At Purina® Pro Plan®, we're always looking for ways to keep advancing, improving and offering your pet our best nutrition yet. Our latest addition? **Live probiotics in select SAVOR® dry formulas to support digestive and immune health.** We've studied probiotics for decades and carefully chose one that is known for being robust and stable. This probiotic is able to survive until the food reaches your pet's bowl. In fact, we guarantee it.

LEARN MORE AT ProPlan.com/Probiotics.

GUARANTEED LIVE

PROBIOTICS

TO SUPPORT DIGESTIVE & IMMUNE HEALTH

Purina trademarks are owned by Société des Produits Nestlé S.A. Any other marks are property of their respective owners.