

# KENNELS CONTRIBUTE TO CANINE CHAGAS DISEASE RESEARCH

An avid field trial competitor, Dave Flint of Martindale, Texas, has chalked up 14 years working with English Springer Spaniels. Before he had springers, he owned and competed with retrievers.

His springer, “Roadie” (AFC Strong’s One For The Road MH), was extremely promising. “He’s the best young dog I have ever seen,” says Flint, remembering with heartfelt emotion a dog who died prematurely in January 2019 at almost 3 years of age.

Living in a hotbed area for kissing bugs — the well-known triatomine insects that carry the parasite *Trypanosoma cruzi*

and cause the potentially fatal Chagas disease — Flint was aware of the dangers should a dog become infected. When Flint discovered a kissing bug in Roadie’s water bowl, he had the bug tested. It was positive for *T. cruzi*.

“It was scary knowing Roadie was exposed to the parasite that causes Chagas disease, yet he had no symptoms,” Flint says. “He was healthy and happy, so I continued to enter him in field trials.”

Ironically, only six months later, a mean seed disease killed Roadie. “Although it is speculative, we felt the *T. cruzi* infection may have weakened Roadie,” says Flint. “He did not survive



A young English Springer Spaniel with field trial potential, “Roadie” was exposed to a kissing bug infected with the *T. cruzi* parasite that causes Chagas disease. As a result, owner Dave Flint invested in protective screens to help keep kissing bugs out of his kennel.

surgery. The surgeon said his lungs appeared to be damaged, but he died of heart failure.”

The loss was heartbreaking. Flint made efforts to prevent another kissing bug from invading his kennel by investing \$11,000 in protective screens. He hoped this would provide a secure, well-sealed environment for his 10-dog Avalon Gundogs kennel.

Meanwhile, Roadie’s breeder, David Jones of Tivoli, Texas, who operates Strong Gundogs and breeds Saighton English Springer Spaniels from the famed Welsh bloodline, also was familiar with kissing bugs. He had been collecting bugs, storing them in plastic bags in the freezer, and sending them to researchers at Texas A&M University for its Kissing Bug Citizen Science Program.

“About five or six years ago, we had a really bad kissing bug infestation,” Jones says. “Eighty percent of the bugs we sent in tested positive for *T. cruzi*. We found that most of our older dogs had been exposed to *T. cruzi*. They initially experienced high fever and diarrhea, and then got better. Later, they died of heart failure.”

Among the goals of the Kissing Bug Citizen Science Program are to learn more about the distribution and behavior of the triatomine insects. Since the study began in 2013, more than 6,000 bugs have been submitted from thousands of people across 27 Southern states for the research that aims to characterize the transmission of Chagas disease and determine the risk factors for exposure in animals and humans.

“Our Citizen Science Program allowed us to recognize early on that many of these submitters were finding the bugs in and around large dog kennels,” says Sarah A. Hamer, PhD, DVM, DACVPM (Epi), associate professor of epidemiology and the Richard Schubot Endowed Chair at Texas A&M University. “We conducted fieldwork at several large kennels to try to identify the natural habitats where bugs originate before dispersing into the kennel where they pose a risk of transmission to dogs.”

This work led to a two-year \$160,407 study that began in January 2018 investigating canine Chagas disease. Dr. Hamer is the lead investigator of the research, which is funded by the AKC (American Kennel Club) Canine Health Foundation. The research team is trying to understand the impact of Chagas disease on dogs using blood and cardiac monitoring not only of positive dogs but also of age/breed/location-matched negative dogs. The comparison allows them to control for other causes of cardiac disease.

Part of this research is to identify the parasite strains found in kennels. Working with 10 kennels that have provided insect samples through the Kissing Bug Citizen Science program, including Jones’ Strong Gundogs, they hope to advance understanding about this zoonotic disease considered an emerging public health threat.

Sadly, Chagas disease can cause acute death and chronic heart disease in dogs, and there is no vaccination or approved

## YOU THINK YOU FOUND A KISSING BUG?

Many bugs look similar to kissing bugs (triatomine insects), though there are distinguishing differences. The 11 species of kissing bugs found in the U.S. have in common a cone-shaped head, thin antennae, thin legs, and a mainly black or very dark brown body with red, orange or yellow stripes around the edge.

One important difference between kissing bugs and insects that look similar is that the bite of a kissing bug is generally benign, whereas non-kissing bugs can have a strong mouthpart and inflict a painful bite if disturbed or threatened. Note that not all kissing bugs are infected with *T. cruzi*. Likewise, despite being infected with *T. cruzi*, some dogs live long, healthy lives.

See below photos of kissing bugs and look-alike bugs that resemble them. If you believe you have found a kissing bug but are not sure, go to this link to get expert advice from researchers at Texas A&M University on how to safely collect the bug and where to send it for analysis: <https://bit.ly/2EuN7JB>.

### Kissing Bugs



Photos provided by Texas A&M University

### Look-Alike Bugs



*Leptoglossus brevisrostris*

*Brochymena*

*Leptoglossus clypealis*

anti-parasitic treatment. Humans also can contract the disease and may remain asymptomatic for life or develop acute or chronic Chagas cardiac disease. About 30 percent of humans develop chronic disease.

## HISTORY OF CHAGAS DISEASE

Named for Carlos Chagas, the Brazilian physician and bacteriologist who discovered the *T. cruzi* pathogen in 1909, Chagas disease is transmitted to animals and people via the feces of an infected kissing bug. The ancestor of *T. cruzi* is believed to have been introduced to South America from bats 7 to 10 million years ago.

Triatomine insects are found worldwide, but those carrying the *T. cruzi* parasite that causes Chagas disease are only found in the Americas, particularly in poor, rural areas of Latin America, where the disease is endemic. Thus, Chagas disease is sometimes referred to as American trypanosomiasis.



Kissing bugs have been recognized in the U.S. since the mid-1800s, and 11 species of the nocturnal bloodsucking insects have been identified in this country. Named for their habit of biting humans around the mouth or eyes, kissing bugs have a high prevalence in Southern states, notably Texas, New Mexico and Arizona. Their broad geographical span runs from south of Oregon to south of Pennsylvania.

It is estimated that millions of dogs in the U.S. are infected with *T. cruzi*, yet it is challenging to pinpoint the number because many cases are likely undiagnosed or misdiagnosed. Not all kissing bugs are infected with *T. cruzi*, though it is believed that 60 percent of the seven species found in Texas carry the infection.

Dogs may become infected if they eat the bug or its feces on the ground or from licking their paws or coat. Many infected dogs don't show clinical signs, yet as asymptomatic carriers they can pass the disease on to their offspring. Thus, unborn puppies can contract the disease from an infected dam. When this happens, puppies may even die in utero or as neonates.

Chagas disease in dogs can cause severe heart disease, including cardiac rhythm or conduction abnormalities, sudden death,

and ventricular myocardial dysfunction that results in congestive heart failure. The cardiac signs often resemble dilated cardiomyopathy and even look similar on an echocardiogram. Ascites, or abnormal buildup of fluid in the abdomen, may occur due to reduced cardiac function resulting in an inability to properly pump blood through the body.

Dogs may show signs within weeks of an infection — the acute form of the disease — or months to years later — a chronic infection. Dogs under 1 year of age typically develop acute disease, and older dogs are more likely to have chronic disease. Early treatment for the clinical cardiac signs provides the best prognosis, bearing in mind there is no approved treatment for the infection.

Clinical signs in dogs may include:

- Diarrhea
- Vomiting
- Lethargy or depression
- Seizures
- Enlarged lymph nodes and/or spleen
- Fever
- Fainting
- Cardiac abnormalities including increased heart rate, abnormal heart rhythm and fluid buildup in the abdomen and lungs

## KENNELS PARTICIPATE IN STUDY

At Texas A&M University, the researchers are analyzing over 300 kissing bugs collected from the 10 kennels in the study.

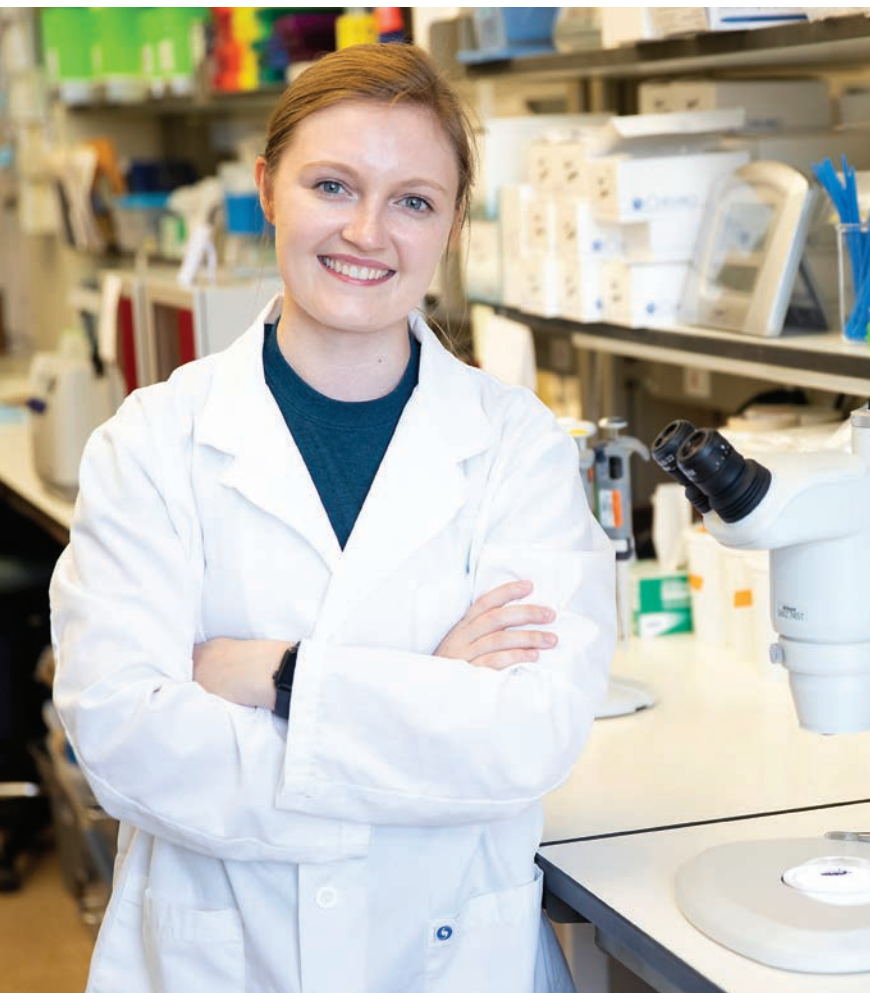
"We initially analyzed 20 kissing bugs from each kennel to learn the species' composition, infection prevalence with the Chagas parasite, and the genetic strain of the parasite," says Rachel Busselman, lead doctorate student working on this project.

"We are able to discern from the insects' gut contents whether a kissing bug recently fed on a host or was 'starved' and seeking a blood meal.

"We also are able to figure out from the gut contents what hosts the bug previously fed upon — dogs, wildlife or humans. Once we have a complete dataset of the genetic strains of the parasite in the bugs versus in the dogs, we will compare the patterns to learn if particular genetic variants are associated with different disease outcomes in dogs."

The work is tedious and takes several months of laboratory analysis after field samples are collected and submitted. The geographical extent of the kennels being studied spans central, south and west Texas, capturing four different ecoregions of the state. Texas provides a unique opportunity for research due to its diversity of kissing bug species and the high parasite infection prevalence.

Interestingly, the research team is using a trained bug scent detection dog to identify kissing bugs and help determine vector infection prevalence. "One of our colleagues has been training a German Shorthaired Pointer named 'Ziza,' a former explosives



Texas A&M doctorate student Rachel Busselman is leading the Chagas disease analytical work studying kissing bugs collected from kennels.

detection dog, for scent detection of triatomines,” says Dr. Hamer. “Ziza is Chagas positive, and fortunately she is healthy to withstand the work. However, we regularly monitor her heart. Otherwise, a healthy dog doing this work would be at high risk of exposure to infected insects and feces.

“Initially, Ziza was trained on live insects in our colony, but she can now identify habitats where reproducing colonies of the bugs naturally occur — like under woody debris. Ziza has certainly enhanced the collection of kissing bugs from the kennels in our study. A goal is for trained scent detection dogs to help by identifying key areas where bugs can be found that might otherwise be overlooked and thus aid in vector control efforts.”

Meanwhile, Ashley B. Saunders, DVM, DACVIM (Cardiology), professor of cardiology at Texas A&M, a collaborator on this study, has received a three-year \$65,691 grant from the AKC Canine Health Foundation that will begin in June 2019. As the lead investigator, she is characterizing cardiac disease and developing screening tests for asymptomatic dogs that test positive for *T. cruzi*. “Many dogs have a positive titer for *T. cruzi* but no observable cardiac abnormalities,” she explains. “We also are investigating how many dogs with titers have evidence of heart disease.”

Holter monitor testing, which records a dog’s heart rhythm over a 24-hour period, and cardiac troponin I, a noninvasive biomarker of cardiac injury, will help her describe the heart abnormalities of infected dogs. “The 24-hour Holter monitor studies have allowed us to determine that abnormalities of the electrical activity of these dogs’ heartbeats are more common than was previously known,” Dr. Saunders says. “Cardiac troponin I elevations can help us detect early disease in asymptomatic dogs.

“Cardiac motion relies on appropriately functioning cardiac myocytes. When *T. cruzi* infects the heart muscle, inflammation and ultimately fibrosis develop. This damage to the cardiac myocytes means they are unable to contract as they should, which impairs contractility and cardiac function. Importantly, this damage to the heart affects its electrical conduction and accounts for why arrhythmias and conduction abnormalities occur in infected dogs.”

Although some experimental treatments have been successful, none have been approved by the Food and Drug Administration. “There are two main problems that need to be addressed in treating dogs infected with *T. cruzi*,” Dr. Saunders says. “One is to destroy the *T. cruzi* organism, and the other is to manage the inflammation and



The outside runs of this dog kennel are enclosed by protective screening to help reduce the infiltration of insects, such as kissing bugs.

## HOW TO REDUCE KISSING BUGS IN KENNELS

- Limit outdoor lighting, particularly around a dog kennel, as kissing bugs are mainly active at dusk or night and are attracted to outdoor light
- Bring dogs indoors at night or move them to a secure, well-sealed environment. If you have an outdoor kennel, consider protective screens
- Examine pet bedding for signs of the bugs
- Keep your yard free of woodpiles and brushy areas, as these are a breeding ground for the insects
- Seal cracks and crevices around kennel windows, walls, doors, and roof
- Begin a pest control plan to combat kissing bugs, though the effectiveness of spraying is limited due to the large migration pattern of kissing bugs

fibrosis and the damage that occurs to the myocardium. While addressing the infection is important, the secondary damage to the heart can be detrimental to a dog as well.”

Caution is the best advice when it comes to kissing bugs. Climate change may be causing their range to expand northward, and these bloodsucking insects are not to be taken lightly. Similar to Flint who added protective screens to his kennel

after his young springer Roadie died, Jones built a 2-foot perimeter around his kennel and he keeps the grass short to avoid giving kissing bugs a breeding ground and to help keep them from crawling into the kennel.

“Over the past 38 years, I’ve had a number of dogs drop dead at around 9 to 10 years old,” Jones says. “I always attributed it to heart attacks that occur in very hard-working dogs. That was until Chagas disease surfaced.” ■



The AKC Canine Health Foundation is supporting two research studies focused on learning more about American trypanosomiasis (Chagas disease), which is considered an emerging public health threat to dogs and humans. Go to this link to access its Information for Dog Owners and Key Facts: <https://bit.ly/2Wh2FKN>. Purina and the AKC Canine Health Foundation have been partners since 1997 in supporting canine health research to benefit all dogs.