



# Tick-borne Disease: Prevalence, Prevention, and Treatment

*Peer Reviewed*

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## Introduction to Tick-borne Disease

Tick-borne disease occurs when ticks infected with a pathogen bite a dog and transmit the pathogen into the dog's body. Many of these pathogens are zoonotic, meaning they can also infect humans. Disease is not spread between dogs and humans directly because these pathogens must complete their lifecycle phase within the tick to become infectious. Therefore, while humans and other non-canine family members can also become infected, a direct tick bite is required to transmit disease. The most common tick-borne diseases are Ehrlichiosis, Anaplasmosis, Rocky Mountain spotted fever, Hepatozoonosis, Babesiosis, and Lyme disease. The feeding time required to allow disease transmission from a tick to a dog or person varies between ticks and disease agents. Ehrlichiosis and Rocky Mountain Spotted Fever-causing bacteria can be transmitted within 3-6 hours of tick attachment, while Lyme Disease-causing bacterial transmission can require 24-48 hours of feeding before a host is infected.



## Regional Prevalence of Tick-borne Disease

Distribution of tick-borne disease is associated with the species of tick endemic to a given region. Distribution of tick species, prevalence of ticks within a region and the prevalence of infectious pathogens they carry is not stable and fluctuates on a seasonal basis depending on weather, rainfall and climate. For this reason monitoring of tick-borne disease is a dynamic, ongoing process.

This [interactive map](#) shows the number of reported positive cases of Ehrlichiosis, Lyme disease, Anaplasmosis and heartworm disease in dogs. Maps are available for all regions of the United States and Canada. Because so many dogs go untested for tick-borne diseases, the actual number of dogs infected by ticks is likely many times higher than reported figures.

### Keep Your Dog Safe from Tick-borne Disease

- Learn about the ticks and diseases in [your area](#).
- Use preventives, including topical medication and tick collars. Be aware that tick preventatives do not prevent disease transmission; they reduce risk by reducing the tick burden in the dog's environment.
- If your dog spends time outdoors, check them daily for ticks. Pay close attention to the head, ears, shoulders, and upper leg areas.
- Remove ticks immediately upon finding them, using tweezers to safely pull the tick from the dog's skin. Avoid squeezing the tick to prevent transfer of the tick's bodily fluids.
- Never spray human tick repellent on your dog as these chemicals are toxic if ingested.
- Talk to your veterinarian about annual testing for tick-borne disease. Testing is fast, effective, and can save costly veterinary bills if disease is not caught in its early stages.
- If your dog displays symptoms of tick-borne disease they may test negative at first. This is because most tests measure for the presence of antibodies against the pathogen, and antibodies take time to reach measurable levels in the blood. For that reason your veterinarian may test twice using an initial "acute" sample followed by a "convalescent" sample two weeks later. Alternately, discuss the use of Polymerase Chain Reaction (PCR) diagnostic testing for the pathogens themselves.



## Species of Ticks That Carry Infectious Pathogens

[American Dog Tick](#) (*Dermacentor variabilis*)

[Deer Tick](#) (or Black-legged Tick) (*Ixodes scapularis*)

[Brown Dog Tick](#) (*Rhipicephalus sanguineus*)

[Gulf Coast Tick](#) (*Amblyomma maculatum*)

[Lone Star Tick](#) (*Amblyomma americanum*)

[Rocky Mountain Wood Tick](#) (*Dermacentor andersoni*)

[Spinose Ear Tick](#) (*Otobius megnini*)

[Western Black-legged Tick](#) (*Ixodes pacificus*)

Brown dog ticks live and can infest inside and around homes and kennels where dogs are present, including in colder regions of North America such as Canada and Alaska.

Lone Star ticks, black-legged ticks and Western black-legged ticks are most commonly found in the understory or leaf litter associated with natural wooded areas frequented by wildlife. The edge habitat often found surrounding a home or yard provides ample habitat to support these ticks.

American dog ticks, Rocky Mountain wood ticks, and Gulf Coast ticks are more commonly found in tall, grassy meadows; open woods, particularly along trails; and open fields in agricultural areas.

Spinose ear ticks are found in arid areas west of the Mississippi, particularly in the south central and southwestern United States.

### **If My Dog Tests Positive, Does This Necessitate Treatment?**

Veterinarians are able to effectively treat most tick-borne infections; however, the decision of whether to treat an asymptomatic dog remains a point of controversy. Dr. Adam Birkenheuer, DVM, PhD, DACVIM, an Internal Medicine and Infectious Disease specialist at North Carolina State University College of Veterinary Medicine recommends treatment after a positive test, followed by a complete blood cell count, serum biochemistry and urinalysis in 6 month intervals for 1 year. According to Dr. Birkenheuer "There are currently no evidence-based recommendations on whether or not to treat your pet if he or she is found to be exposed to a tick-transmitted infection like *Ehrlichia* or *Borrelia*. Some doctors may recommend treatment while others may not. The most important thing is to continue to monitor your pet for signs of illness with examinations and laboratory testing. I recommend this yearly for the rest of the pet's life."



## Ehrlichiosis

Ehrlichiosis [pronounced er-lick-ee-o-sis] is caused by Ehrlichia species of bacteria (*Ehrlichia canis*, *Ehrlichia ewingii*, *Ehrlichia chaffeensis*). *Ehrlichia canis* is transmitted by the brown dog tick; *Ehrlichia ewingii* and *Ehrlichia chaffeensis* are transmitted by the lone star tick. The highest concentration of *Ehrlichia canis* cases is reported in southwestern and Gulf Coast regions of the United States. The distribution and number of *Ehrlichia ewingii* and *Ehrlichia chaffeensis* cases are on the rise and can be found in states as far north as Massachusetts and as far west as central Oklahoma and Kansas.

### Symptoms of Ehrlichiosis

Ehrlichia species infect white blood cells and platelets, causing symptoms associated with inflammation and problems with blood clotting. Common symptoms can include any of the following:

- Depression and/or lack of energy
- Loss of appetite
- Runny eyes and nose/discharge
- Spontaneous nose bleeds
- Bruising on gums and belly
- Lameness/joint pain
- Spontaneous and shifting leg lameness, reluctance to move

## Rocky Mountain Spotted Fever

Rocky Mountain spotted fever (RMSF) is caused by *Rickettsia rickettsia* bacteria. RMSF is transmitted by the American dog tick and the lone star tick. In dogs, Rocky Mountain spotted fever appears suddenly with severe illness lasting about two weeks. If not treated early enough, Rocky Mountain spotted fever can result in death. Rocky Mountain spotted fever is also a zoonotic disease, which means it can infect people as well as pets. While Rocky Mountain spotted fever is most prevalent in the Rocky Mountain States, it is also prevalent in the Southeast and can be found throughout the United States and Canada.

### Symptoms of canine Rocky Mountain spotted fever (can be moderate to severe):

- Acute fever
- Depression and/or lack of energy
- Arthritis-like stiffness when walking
- Neurological abnormalities



## Lyme Disease

Lyme disease is caused by *Borrelia burgdorferi* bacteria. Lyme disease is transmitted by the deer tick and the western black-legged tick. Lyme disease has been found throughout the United States and Canada, but infections are most frequently diagnosed in the northeastern, mid-Atlantic and north-central states, as well as in California.

### Symptoms of Lyme disease

- Spontaneous and shifting leg lameness that lasts 3–4 days, recurrent lameness due to inflammation of the joints
- Reluctance to move, fatigue
- Loss of appetite and depression

More serious complications include damage to the kidney, and rarely heart or nervous system disease symptoms may come and go and can mimic other health conditions. Cases vary from mild to severe with severe cases sometimes resulting in kidney failure and death.

## Anaplasmosis

Canine anaplasmosis [pronounced an-uh-plaz-moh-sis] is caused by *Anaplasma species* of bacteria, specifically *Anaplasma phagocytophilum* and *Anaplasma platys*. Both forms of canine anaplasmosis are found throughout the United States and Canada. Areas where canine anaplasmosis is more common include the northeastern, mid-Atlantic and north-central states, as well as California.

*Anaplasma platys*, specifically, is more common in Gulf Coast and southwestern states

*Anaplasma phagocytophilum* is transmitted by the deer tick and the western black-legged tick.

These are the same ticks that transmit Lyme disease which increases the risk of co-infection with multiple tick-borne diseases. *Anaplasma phagocytophilum* is also a zoonotic disease, which means it can infect people as well as pets.

*Anaplasma platys* is transmitted by the brown dog tick.

### Symptoms of *Anaplasma phagocytophilum*

*Anaplasma phagocytophilum* infect white blood cells, causing symptoms associated with inflammation. Symptoms are often vague and nonspecific.

- Loss of appetite
- Lethargy
- Lameness, reluctance to move
- Neck pain or neurologic signs in some cases

### Symptoms of *Anaplasma platys*

*Anaplasma platys* infects platelets, causing symptoms associated with failure of blood clotting:

- Bruising on the gums and belly
- Spontaneous nosebleeds



## Babesiosis

Babesiosis [pronounced ba-bee-zee-oh-sis] is caused by *Babesia species* of bacteria: *Babesia gibsoni* and *Babesia vogeli*. *Babesia vogeli* organisms are transmitted by the brown dog tick, but other species like *Babesia gibsoni* can also be transmitted from dog to dog if an infected dog bites another (fighting, etc.) or a blood transfusion. Babesiosis is found throughout the United States and Canada.

### Symptoms of babesiosis

Babesiosis affects red blood cells, and as a dog's immune system tries to eliminate the infected blood cells, anemia, pallor and general weakness may result.

- Lack of activity/lethargy
- Generalized weakness
- Vomiting
- Loss of appetite
- Weight loss

## Hepatozoonosis

Canine hepatozoonosis is caused by infection with *Hepatozoon species* of parasites: *Hepatozoon americanum* is transmitted by the Gulf Coast tick, and *Hepatozoon canis* is transmitted by the brown dog tick. Cases of canine hepatozoonosis have been reported in the eastern and middle-southern regions of the United States. Unlike other vector-borne diseases that are transmitted by tick bite, both forms of canine hepatozoonosis are transmitted when a dog ingests an infected tick.

### Symptoms of *Hepatozoon canis*

*Hepatozoon canis* infects white blood cells, causing vague, non-specific symptoms:

- Loss of appetite
- Weight loss
- Lethargy

### Symptoms of *Hepatozoon americanum*

*Hepatozoon americanum* affects muscle cells, resulting in a debilitating and potentially fatal condition. A dog infected with *Hepatozoon americanum* will typically show severe symptoms that occur intermittently. These can include any of the following:

- Fever/depression
- Generalized pain
- Loss of muscle mass with chronic weight loss
- Discharge from the eyes

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