

Canine Lyme Borrelia



Borrelia burgdorferi bacteria are the cause of Lyme disease in humans and animals. They can be visualized by darkfield microscopy as "corkscrew-shaped" motile spirochetes (400 x). Inset: The black-legged tick, *Ixodes scapularis* (deer tick), may carry and transmit *Borrelia burgdorferi* to humans and animals during feeding, and thus transmit Lyme disease.

Samples

Blood	EDTA-blood as is, purple-top tubes, or EDTA-blood preserved in sample buffer (preferred)
Body Fluids	Preserved in sample buffer
Notes: Send all samples at room temperature, preferably preserved in sample buffer MD Submission form .	

Interpretation of PCR Results

High positive (> 500 copies/ml, swab)	<i>Borrelia</i> spp. infection (interpretation must be correlated to clinical symptoms)
Low positive (< 500 copies/ml, swab)	
Negative	<i>Borrelia</i> spp. not detectable

Lyme Borreliosis

Lyme disease is caused by spirochete bacteria of a subgroup of *Borrelia* species, called *Borrelia burgdorferi sensu lato*. Only one species, *B. burgdorferi sensu stricto*, is known to be present in the USA, while at least four pathogenic species, *B. burgdorferi sensu stricto*, *B. afzelii*, *B. garinii*, *B. japonica* have been isolated in Europe and Asia ([Aguero-Rosenfeld et al. Clin. Microbiol. Rev. 18: 484, 2005](#)). *B. burgdorferi sensu lato* organisms are corkscrew-shaped, motile, microaerophilic bacteria of the order *Spirochaetales*. Hard-shelled ticks of the genus *Ixodes* transmit *B. burgdorferi* by attaching and feeding on various mammalian, avian, and reptilian hosts. In the northeastern states of the US *Ixodes scapularis*, the black-legged deer tick, is the predominant vector, while at the west coast *Lyme borreliosis* is maintained by a transmission cycle which involves two tick species, *I. neotomae* and *I. pacificus*.

Clinical Signs

Dogs show several different forms of the disease, but by far, the most common symptoms are fever of 103-105°F, shifting leg lameness, swelling in the joints, lethargy, inappetence, and maybe most importantly, a response to appropriate antibiotics. Arthritis may be a result of both short- and long-term infections. Most dogs that are promptly diagnosed and treated do not appear to develop arthritis, but some dogs that do not respond completely to treatment, or were not treated, will develop progressive degeneration of the infected joints. A minority of dogs have developed severe progressive renal disease as sequelae to Lyme disease. This severe kidney failure is non-responsive to treatment and death is often the outcome. Fortunately, this form appears to be rare.

Standard Diagnostic Methods

The variability of signs makes clinical diagnosis relatively difficult. There are no specific clinical, hematological, or biochemical pathognomonic changes that would confirm the diagnosis of Lyme borreliosis. Therefore, additional tests, such as antibody and organism detection, need to be considered in order to produce a specific diagnosis. Because of the poor specificity of the serological tests, many dogs are falsely diagnosed as positive for Lyme disease. However, many animals are exposed to the organism, but fight the infection off on their own.

These animals will have antibodies to *B. burgdorferi* but not have the disease. In an endemic area, almost 90% of all dogs will have a positive antibody test, so a single positive result means very little. Only around 10% of the exposed dogs actually will develop some form of Lyme disease. Therefore, diagnosis of an ongoing *Borrelia* spp. infection is essential, as shown by circulating bacteria in a clinically manifest stage of Lyme disease.

Our Method

We have developed a quantitative PCR approach that uses the highly conserved flagellin gene as the amplification target, and detects single copies of the genome present in the sample input to the PCR. This test will recognize all relevant *Borrelia* species and specifically diagnose the current ongoing infection only (acute or chronic).