Canine Vector Borne Diseases: *Anaplasma* and *Borrelia*

Katherine A. Sayler, MEd and A. Rick Alleman, DVM, PhD

**Ixodes scapularis & I pacificus**

Distribution:

- *Ixodes scapularis* (the black-legged tick or the deer tick) is found along the Eastern coast of the United States as far north as Maine, spreading westward to Iowa. Florida to central Texas forms the lower boundary of its range.
- The abundance and distribution of the tick follows that of the white-tailed deer (*O. virginianus*), which are reportedly increasing in number.
- *Ixodes pacificus* is found only on the western coast of the United States; throughout Washington, Oregon and California. Colonies have also been found in Arizona, Utah, and in the southwestern tip of Nevada.

It is a vector for:

*I. scapularis* and *I. pacificus* are similar tick species with regard to the gross morphology of the ticks and the infectious agents they transmit. *Ixodes* ticks transmit *Anaplasma phagocytophilum* and *Borrelia burgdorferi*

Illness and clinical signs associated with *Ixodes scapularis* pathogens in dogs:

1) *Anaplasma phagocytophilum* is the causative agent of canine granulocytotropic anaplasmosis.

   - Clinical signs: Dogs typically develop clinical disease during the acute phase of infection with *Anaplasma phagocytophilum*. Infected animals most frequently present with clinical signs of lameness associated with polyarthritis. Nonspecific signs of illness include fever, lethargy and anorexia. Less likely, vomiting, diarrhea or evidence of respiratory disease can be seen.

   - Onset: Approximately two weeks. The incubation period for *A. phagocytophilum* is much shorter than that of *B. burgdorferi*, the other pathogen carried by this vector. Therefore, acute infection with *A. phagocytophilum* is often seasonally diagnosed; most commonly in the early summer and fall, whereas clinical disease resulting from *B. burgdorferi* may be non-seasonal.

   - Clinical pathology: Mild to moderate thrombocytopenia is the most commonly observed laboratory finding, seen in approximately 80% of clinically affected dogs. Neutropenia and lymphopenia may also occur.

2) *Borrelia burgdorferi* is the causative agent of Lyme disease

---

Clinical signs: In naturally infected, seropositive dogs, acute signs of fever, shifting leg lameness, anorexia, malaise and lymphadenomagly have all been commonly reported. One of the earliest signs of clinical disease is often lameness (arthritis) in the limb where the tick bite occurred. Polyarthritis may eventually develop as the agent migrates to other joints or as the host immune response causes inflammatory disease at distant locations.

Onset: Clinical illness in experimentally infected dogs occurs 2 to 6 months after tick exposure.

Clinical pathology: Borreliosis is not associated with any specific biochemical or hematologic abnormalities. However, synovial fluid analysis may be used to document inflammatory joint disease and urinanalysis may be important in animals with glomerulonephritis and protein losing nephropathies.

Diagnostic Tests:

Microscopic Evaluation: Dogs with acute infections of *Anaplasma phagocytophilum* can be identified by finding morula in circulating neutrophils or in synovial fluid in dogs with polyarthritis. Morulae are usually only present during acute stages, at 1 to 10 weeks post-infection. Microscopic identification is not useful in identifying dogs infected with *B. burgdorferi*.

Serology: A point-of-care ELISA test is available for serological diagnosis of *Anaplasma phagocytophilum* infection. The same point-of-care test is available for *B. burgdorferi* infections. These tests are widely used in the detection of antibodies to their respective organisms. IFA tests for both organisms are available at commercial laboratories, and will allow quantification of antibody levels. However, false positive results are more likely with these assays because the test antigen is comprised of whole organisms.

PCR: If *A. phagocytophilum* morula are not microscopically identified but infection is suspected, nucleic acid detection by PCR analysis can be performed using whole blood collected in EDTA. Dogs in the acute phase of clinical disease are usually PCR positive, even prior to seroconversion. However, PCR analysis is not reliable in detecting subclinical, seropositive persistently infected carriers. PCR testing for *A. phagocytophilum* is available at national and state diagnostic laboratories. PCR analysis is rarely used in the diagnosis of infection with *B. burgdorferi*. If nucleic acid detection of the organism is desired, biopsies of synovial tissue must be collected and submitted to the lab for laborious DNA extraction and analysis.

Treatment:

- For *Anaplasma phagocytophilum*: Doxycycline typically results in rapid remission of clinical signs however, an effective dose and length of therapy for clearance of the organism has not been established. 10 mg/kg, BID for 30 days is currently recommended.
- For *Borrelia burgdorferi*: Doxycycline is the drug of choice at a dose of 10 mg/kg, BID for 30 days. Azithromycin and third generation cephalosporins have been used to treat refractory cases in infected humans.

---


- Although resolution of clinical disease often occurs, antimicrobial therapy may not clear the organism from animals infected with either organism.
- Nonsteroidal anti-inflammatory drugs or anti-inflammatory doses of glucocorticoids can be judiciously used in dogs after a course in antimicrobial therapy has failed to relieve clinical signs of joint disease.