

# Tick-Borne Disease in Dogs and Cats Diagnostic Reference

## When to Consider Tick-Borne Diseases (TBDs)

- TBD signs and symptoms may be nonspecific and include fever, anorexia, and lethargy.
- Ticks emerge when snow melts and stay active until temperatures fall below freezing.
- Ticks found crawling and unattached are not considered a risk for TBD transmission.

## Ticks Found in NYC

Ticks, especially blacklegged ticks (deer ticks) and Gulf Coast ticks, are found primarily on Staten Island and in parts of the Bronx.



**Blacklegged ticks:**  
Lyme disease and anaplasmosis



**Lone star ticks:**  
Ehrlichiosis (*Ehrlichia ewingii*), tularemia, and cytauxzoonosis (*Cytauxzoon felis*)



**American dog ticks:**  
Babesiosis, Rocky Mountain spotted fever, and cytauxzoonosis (*C. felis*)



**Brown dog ticks:**  
Ehrlichiosis (*E. canis*), babesiosis, Rocky Mountain spotted fever, tularemia, and hepatozoonosis (*Hepatozoon canis*)



**Gulf Coast ticks:**  
Hepatozoonosis (*H. americanum*)



**Asian longhorned ticks:** Not found to carry pathogens in the U.S. but in laboratory settings can transmit *Rickettsia rickettsii* and Powassan virus and is associated with *Babesia gibsoni* abroad

### Tick-borne diseases primarily seen with dogs

### Tick-borne diseases primarily seen with cats

Disease	Lyme disease	Babesiosis	Anaplasmosis	Ehrlichiosis	Rocky Mountain spotted fever	Hepatozoonosis	Tularemia	Cytauxzoonosis
<b>Disease agent</b>	<i>Borrelia burgdorferi</i> *	<i>Babesia canis</i> <sup>†</sup> ( <i>B. canis vogeli</i> most common subspecies; rarely other <i>Babesia</i> species, including <i>B. gibsoni</i> <sup>†</sup> )	<i>Anaplasma phagocytophilum</i> *	<i>Ehrlichia canis</i> <sup>†</sup> <i>E. ewingii</i> <sup>†</sup> (Rarely other <i>Ehrlichia</i> species)	<i>Rickettsia rickettsii</i> *	Dogs: <i>Hepatozoon americanum</i> <sup>†</sup> or <i>H. canis</i> <sup>†</sup> Cats: <i>H. felis</i> <sup>†</sup> or <i>H. silvestris</i> <sup>†</sup> (Transmitted through ingestion of infected tick or reservoir species; information about feline hepatozoonosis is limited)	<i>Francisella tularensis</i> * (Animal should be isolated due to high zoonotic potential; use protective gear when handling)	<i>Cytauxzoon felis</i> <sup>†</sup>
<b>Pet affected</b>	Dogs	Dogs	Dogs; rarely cats	Dogs; rarely cats	Dogs; rarely cats	Dogs; rarely cats	Cats; rarely dogs	Cats
<b>Disease-specific manifestations</b> Nonspecific symptoms include fever, anorexia, and lethargy.	<ul style="list-style-type: none"> <li>• Most dogs have subclinical infection</li> <li>• New onset of malaise, joint swelling, or lameness in one or more legs</li> <li>• Rarely, Lyme nephritis is a complication</li> </ul>	<ul style="list-style-type: none"> <li>• Most dogs have subclinical infection, but it can cause severe illness</li> <li>• Hemolytic anemia</li> <li>• Splenomegaly</li> <li>• Jaundice</li> <li>• Bilirubinuria</li> </ul>	<ul style="list-style-type: none"> <li>• Most dogs have subclinical infection</li> <li>• Anemia, joint stiffness, or lameness</li> <li>• Moderate thrombocytopenia</li> <li>• Rarely severe gastrointestinal and respiratory system manifestations</li> </ul>	<p><i>E. canis</i> (acute phase):</p> <ul style="list-style-type: none"> <li>• Severe thrombocytopenia, possible splenomegaly, or lymphadenopathy</li> </ul> <p><i>E. canis</i> (chronic phase):</p> <ul style="list-style-type: none"> <li>• Epistaxis</li> <li>• Anemia or other cytopenias</li> <li>• Uveitis</li> <li>• Neurologic and renal manifestations</li> </ul> <p><i>E. ewingii</i> (less severe):</p> <ul style="list-style-type: none"> <li>• Joint stiffness</li> </ul>	<ul style="list-style-type: none"> <li>• Can cause severe illness and death</li> <li>• Thrombocytopenia</li> <li>• Leukopenia</li> <li>• Anemia</li> <li>• Vascular and organ damage resulting in petechial rash and renal, hepatic, or neurologic disease</li> </ul>	<p><i>H. americanum</i>:</p> <ul style="list-style-type: none"> <li>• Difficult to treat and may be fatal</li> <li>• Often characterized by persistent fever, gradual muscle atrophy, generalized pain, hyperesthesia, mucopurulent ocular discharge, and deterioration of body condition</li> </ul> <p><i>H. canis</i> can be asymptomatic or cause mild disease</p>	<ul style="list-style-type: none"> <li>• Thrombocytopenia</li> <li>• Leukopenia</li> <li>• Anemia</li> <li>• Hepatosplenomegaly</li> <li>• Lymphadenopathy</li> <li>• Oral ulcers</li> <li>• Pneumonia</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to treat and may be fatal</li> <li>• Thrombocytopenia</li> <li>• Leukopenia</li> <li>• Anemia</li> <li>• Jaundice</li> <li>• Hepatomegaly and splenomegaly</li> <li>• Circulatory compromise leading to dyspnea and tachypnea</li> <li>• Bilirubinuria</li> </ul>
<b>Testing</b> Combining molecular and serologic assays improves the chances of obtaining a diagnosis.	<ul style="list-style-type: none"> <li>• Serologic assays</li> </ul>	<ul style="list-style-type: none"> <li>• PCR</li> <li>• Serologic assays</li> <li>• Blood smear may detect parasites in erythrocytes</li> </ul>	<ul style="list-style-type: none"> <li>• PCR</li> <li>• Serologic assays</li> <li>• Blood smears to detect morulae in circulating monocytes or neutrophils</li> </ul>	<ul style="list-style-type: none"> <li>• PCR (less sensitive)</li> <li>• Serologic assays</li> </ul>	<ul style="list-style-type: none"> <li>• PCR (less sensitive)</li> <li>• Detection of organism in muscle biopsy or blood smear (detecting organism on smear is uncommon)</li> </ul>	<ul style="list-style-type: none"> <li>• PCR</li> <li>• Serologic assays</li> <li>• Blood culture</li> </ul>	<ul style="list-style-type: none"> <li>• PCR</li> <li>• Blood smear for intraerythrocytic piroplasms</li> <li>• Fine needle aspiration of liver or spleen to detect schizont-laden macrophages</li> </ul>	

**Molecular assays**, such as PCR, detect the genetic material of a pathogen. A positive result can confirm acute infection; however, a negative result does not rule out infection, as false negatives may occur if the pathogen load is below the limit of detection.

**Serologic assays** detect antibodies produced in response to an infection.

- A positive result may indicate acute or past infection or cross-reactivity with similar organisms. Antibody duration varies; for IFA tests, a fourfold rise in titers between acute and convalescent samples (collected two to four weeks apart) supports acute infection. Cross-reactions can occur with similar organisms (especially spotted fever group *Rickettsia*).
- A negative suggests no infection; however, false negatives may occur, as antibodies can take up to 10 days to become detectable infections. Repeat testing if specimens are collected early and there is high suspicion for infection.

**Blood smears** are used to look for intracellular organisms, which may present in red and white blood cells and platelets.

<b>Treatment</b>	Treatment is dependent on clinical manifestations and current guidelines and may include antibiotics, antiparasitics, and palliative care. For more information, visit <a href="http://capcvet.org">capcvet.org</a> or scan the QR code.		<b>Prevention</b>	Numerous tick bite prevention products are available and should be recommended for pets living in areas of NYC where ticks of concern are present, as well as pets that spend time in tick-endemic areas outside NYC. Additional measures include conducting tick checks and consideration of the Lyme vaccine.
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\* Same organism that affects humans

† Different organism than one that affects humans

‡ Does not affect humans