

# Tick-borne Disease Diagnostic Reference

## When To Consider Tick-borne Diseases (TBDs)

- TBD signs and symptoms may be nonspecific and include fever, headache, myalgia and gastrointestinal manifestations. Rash is not associated with all TBDs and may not be an early indicator.
- Most New Yorkers with TBDs get infected when traveling or working outside of NYC.
- Diagnostic testing can help guide clinical management, but do not delay therapy if a TBD is suspected. Prompt treatment can prevent severe disease.
- Coinfection is uncommon but more likely associated with TBDs caused by blacklegged ticks.
- Ticks emerge when snow melts and stay active until temperatures fall below freezing.
- Ticks found crawling and unattached on skin are not considered a risk for TBD transmission.

## Ticks Found in NYC

These ticks are found primarily on Staten Island and in focal areas of the Bronx (except American dog ticks, which are found across NYC) and can cause different diseases:



**Blacklegged ticks:** Lyme disease, babesiosis, anaplasmosis, Powassan virus and *Borrelia miyamotoi*



**Lone star ticks:** Ehrlichiosis, Heartland and Bourbon viruses, and tularemia



**American dog ticks:** Tularemia and *Rickettsia rickettsii*







**Gulf Coast ticks:** *R. parkeri*



**Asian longhorned ticks:** Not been found to carry pathogens that cause TBDs in the U.S.

## TBDs to Consider

	Lyme Disease	Babesiosis	Anaplasmosis and Ehrlichiosis	RMSF	<i>R. parkeri</i> and <i>R. akari</i>	Powassan, Heartland and Bourbon Viruses, <i>B. miyamotoi</i> , and Tularemia
Manifestations	<ul style="list-style-type: none"> <li>• EM</li> <li>• Cranial neuritis (usually facial palsy)</li> <li>• Acute oligoarthritis</li> <li>• Carditis (usually atrioventricular block)</li> </ul>	<ul style="list-style-type: none"> <li>• Hemolytic anemia</li> <li>• Thrombocytopenia</li> </ul> <p>Illness is more severe if asplenic, immunocompromised or an older adult.</p>	<ul style="list-style-type: none"> <li>• Thrombocytopenia</li> <li>• Leukopenia</li> <li>• Anemia</li> <li>• Mildly to moderately elevated hepatic transaminases</li> </ul> <p>Some rickettsial diseases, especially RMSF, can be life-threatening if untreated.</p>			<ul style="list-style-type: none"> <li>• Powassan meningitis or encephalitis</li> <li>• Travel to the Midwestern U.S. (Bourbon virus)</li> </ul>
Rash or Eschar	EM and occasional multiple secondary annular rashes	Not applicable	<ul style="list-style-type: none"> <li>• Anaplasmosis is rare</li> <li>• Ehrlichiosis is uncommon in adults and typically maculopapular, and occurs in up to 60% of pediatric cases</li> </ul>	<ul style="list-style-type: none"> <li>• Maculopapular (initially on wrists, forearms and ankles, then trunk and sometimes palms and soles, followed by a petechial rash)</li> <li>• Less than 50% of patients have a rash in the first three days of illness</li> </ul>	<ul style="list-style-type: none"> <li>• Eschar</li> <li>• Maculopapular or papulovesicular eruptions on trunk and extremities</li> </ul>	Rash is uncommon ( <i>B. miyamotoi</i> )
Testing	<ul style="list-style-type: none"> <li>• EM alone is diagnostic and should be treated empirically.</li> <li>• A two-tiered serologic test (most sensitive two weeks after illness onset) where the initial EIA or IFA is positive or equivocal, followed by a western blot or other FDA-cleared EIA test that is also positive or equivocal.</li> <li>• If symptoms began more than 30 days from the test date, use IgG serologic results only. Disregard IgM results, even if positive.</li> <li>• PCR is typically insensitive for most specimens.</li> </ul>	<ul style="list-style-type: none"> <li>• PCR</li> <li>• Intraerythrocytic <i>Babesia</i> parasite on blood smear</li> <li>• Serology (IFA for IgG offers evidence of infection but cannot distinguish between active and prior infection)</li> </ul>	<ul style="list-style-type: none"> <li>• PCR on whole blood (most sensitive during the first week of illness)</li> <li>• Serology</li> <li>• A negative acute test does not rule out infection.</li> </ul> <p>• Confirm a serologic diagnosis with a demonstration of a fourfold rise in IgG titers by IFA in serum samples collected two to four weeks apart. Single antibody results cannot be independently relied on for confirmation.</p> <p>• IgM antibodies are less specific than IgG antibodies and more likely to generate false positives.</p> <p>• IgM results alone should not be used for lab diagnoses. Antibody titers are frequently negative in the first seven to 10 days of illness.</p>	<ul style="list-style-type: none"> <li>• Serology</li> <li>• PCR on whole blood (less sensitive in early stages of disease)</li> <li>• A negative acute test does not rule out infection.</li> <li>• PCR of skin biopsy of rash available for detection of rickettsial DNA.</li> </ul>	<ul style="list-style-type: none"> <li>• Testing for rare or emerging TBDs, particularly viral diseases, may not be available at commercial labs. For diagnostic help, call 866-692-3641.</li> <li>• <i>B. miyamotoi</i> testing is available at several commercial diagnostic labs.</li> <li>• RMSF antibody tests often cross-react with <i>R. akari</i> and <i>R. parkeri</i>.</li> <li>• PCR of eschar swab and skin biopsy of rash available for detection of rickettsial DNA.</li> </ul>	
Treatment	<ul style="list-style-type: none"> <li>• For post-exposure prophylaxis and TBD treatment guidance, visit <a href="http://cdc.gov/ticks/tickbornediseases">cdc.gov/ticks/tickbornediseases</a>.</li> <li>• For practice guidelines on Lyme disease and babesiosis, visit <a href="http://idsociety.org">idsociety.org</a> and click <b>Guidelines</b>.</li> <li>• Consult with an infectious disease specialist.</li> </ul> <p>Antibodies may normally persist in the blood for months or years after infection, so testing cannot be used to determine a cure.</p>		<b>Images</b>		   	

EIA: Enzyme immunoassay  
IgG: Immunoglobulin G

EM: Erythema migrans  
IgM: Immunoglobulin M

FDA: Food and Drug Administration  
PCR: Polymerase chain reaction

IFA: Immunofluorescence assay  
RMSF: Rocky Mountain spotted fever

For more information, visit [nyc.gov/health](http://nyc.gov/health) and search for zoonotic providers.

Images on this poster were adapted from the Centers for Disease Control and Prevention.