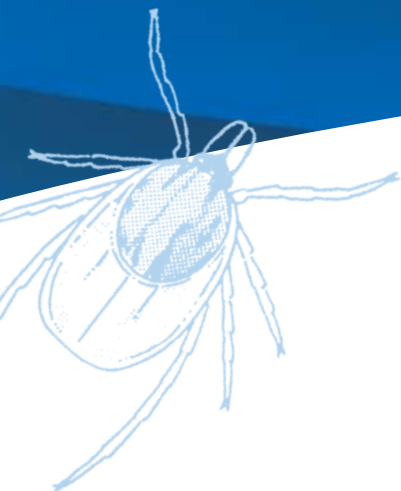


Tick-borne Diseases
**Laboratory Testing
to Confirm Diagnosis**



Tick-borne Diseases



Ticks are the number one vector of infectious disease in the United States, and tick-borne illnesses constitute an important health problem.¹ Because of the diverse – and often overlapping – clinical presentation of these diseases, laboratory testing is an important tool to help health professionals diagnose tick-borne illnesses.

Tick-borne illnesses, including babesiosis, anaplasmosis, ehrlichiosis, Lyme disease and Rocky Mountain spotted fever, are caused by infection with a variety of pathogens. Since certain ticks can harbor more than one disease-causing agent, a single tick bite can transmit multiple pathogens, compounding the difficulty in diagnosis and treatment.

LabCorp offers a variety of laboratory testing to help with the diagnosis of tick-borne illnesses. The following table lists the available testing by disease state and the utility and limitation of each methodology.

Babesiosis

Methodology	Test Name	Number	Utility/Limitations ²⁻⁵
Serology (IFA)	<i>Babesia microti</i> IgG and IgM	138315	<ul style="list-style-type: none"> IgM and IgG titers rise rapidly within a few weeks of infection A four-fold rise in titers ($\geq 1:160$) is typically associated with recent exposure. Frequently positive at time of clinical presentation High negative predictive value (99%)
Nucleic-Acid Amplification (PCR)	<i>Babesia microti</i> PCR	138318	<ul style="list-style-type: none"> Higher sensitivity than blood-smear examination Useful for case confirmation (especially low-level parasitemia) More rapidly differentiates babesiosis, HGE, and Lyme disease in endemic areas
Blood smear (Wright-Giemsa)	Parasite Examination, Blood	008185	<ul style="list-style-type: none"> High sensitivity for diagnosis of severe cases (high parasitemia) Low sensitivity in most cases as there are typically fewer than 10% of erythrocytes infected, especially in early-stage infection Limited use in early course of illness

Rocky Mountain Spotted Fever (*Rickettsia rickettsii*)

Methodology	Test Name	Number	Utility/Limitations ^{6,7}
Serology (EIA/IFA)	Rocky Mountain Spotted Fever, IgG	016592	<ul style="list-style-type: none"> Gold Standard of serologic testing for rickettsial diseases Positive IgM and/or IgG titer of ≥ 128 is suggestive of recent infection. IgG and IgM titers increase concurrently by the second week of illness. IgM titers wane after 3 to 4 months; IgG titers persist for 7 to 8 months. Antibodies are not typically present at time of clinical presentation. Test results should be interpreted in the context of clinical presentation and should not delay treatment.
	Rocky Mountain Spotted Fever, IgM	016667	
Serology (Direct agglutination)	Febrile Agglutinin Profile	138552	<ul style="list-style-type: none"> Detects heterophile antibodies (Weil-Felix reaction) Less sensitive and specific than RMSF-specific Ab testing Test results should be interpreted in the context of clinical presentation and should not delay treatment.

Rickettsial fever panels (Typhus Fever Group and Spotted Fever Group) are also available.

Anaplasmosis/Ehrlichiosis

Methodology	Test Name	Number	Utility/Limitations ^{6,8,9}
Nucleic-Acid Amplification (PCR)	<i>Ehrlichia</i> Profile, PCR	138412	<ul style="list-style-type: none"> • Detects organismal DNA in infected leukocytes • Most sensitive test during early phase of infection • Acute-phase IgG titer of $\geq 1:64$ strongly suggests recent exposure.
	<i>Ehrlichia chaffeensis</i> , PCR	138168	
	<i>Anaplasma phagocytophilum</i> , PCR	138172	
Serology (IFA)	Human Granulocytic Ehrlichiosis (HGE), IgG and IgM	164672	<ul style="list-style-type: none"> • IgG seroconversion provides definitive evidence of recent infection with erlichiosis. • Acute-phase IgG titer of $\geq 1:64$ strongly suggests recent exposure. • Similar detection rates for IgG and IgM Abs because they share a similar period of reactivity • Antibodies are often not detectable at time of clinical presentation because seroconversion may not have occurred.
	Human Monocytic Ehrlichiosis (HME), IgG and IgM	164680	
	Ehrlichiosis (HGE and HME) Profile, IgG and IgM	164722	
Blood smear (Wright-Giemsa)	Parasite Examination, Blood	008185	<ul style="list-style-type: none"> • Visualization of inclusions (morulae) in leukocytes • Moderate sensitivity (20% to 80%) for HGA/HME • Very low sensitivity (<20%) for HME

Lyme Disease (*Borrelia burgdorferi*)

Methodology	Test Name	Number	Utility/Limitations ^{10,11}
Serology (EIA)	Lyme Disease Ab, Total	015271	<ul style="list-style-type: none"> • A two-step approach (EIA plus WB confirmation) is recommended by the Center for Disease Control and Prevention (CDC) to definitively assign seropositive status. • IgM antibody appears relatively late (2 to 4 weeks) after onset of acute symptoms (eg rash) and has a sensitivity of only 50% in early acute disease. • IgG antibody appears 4 to 6 weeks after onset of acute infection. • The 2-step detection (EIA plus WB confirmation) is the recommended approach for diagnosing late-stage manifestations of Lyme disease and decreases the number of false-positive results. • Samples drawn more than 4 weeks after disease onset should be tested for IgG only because the risk of false-positive results with IgM at this late stage is high.
	Lyme Disease Ab, IgM	161992	
	Lyme Disease Ab, Total and IgM	223586	
Serology (EIA and Western Blot)	Lyme Disease Ab, IgG and IgM, reflex to WB	258004	<ul style="list-style-type: none"> • Samples drawn more than 4 weeks after disease onset should be tested for IgG only because the risk of false-positive results with IgM at this late stage is high.
	Lyme Disease Ab, IgM reflex to WB	160333	
	Lyme Disease, Total Ab, reflex to WB	160325	
Serology (Western Blot)	Lyme Disease Ab, Western Blot (CSF)	160457	<ul style="list-style-type: none"> • PCR sensitivity is generally low for Lyme disease, but has been used for positive predictive value (confirmation). • Because of low sensitivity, a negative result does not rule out presence of <i>B. burgdorferi</i>.
	Lyme Disease Ab, Western Blot (Serum)	163600	
Nucleic-Acid Amplification (PCR)	Lyme Disease (<i>B. burgdorferi</i>), PCR	138685	<ul style="list-style-type: none"> • PCR sensitivity is generally low for Lyme disease, but has been used for positive predictive value (confirmation). • Because of low sensitivity, a negative result does not rule out presence of <i>B. burgdorferi</i>.

References

1. Mathieu ME, Wilson BB. In: Mandell GL, Bennett JE, Dolin R, eds. *Mandell Douglas, and Bennett's Principles and Practice of Infectious Disease*. Sixth ed. Philadelphia, Pa: The Curtis Center; 2005;3312-3315.
2. Krause PJ. Babesiosis diagnosis and treatment. *Vector Borne Zoonotic Dis*. 2003;3: 45-51.
3. Weinberg GA, Olmor GJ. Laboratory diagnosis of ehrlichiosis and babesiosis. *Pediatr Infect Dis J*. 2001;20:435-438.
4. Krause PJ, Ryan R, Telford S III, Persing D, Spielman A. Efficacy of immunoglobulin M serodiagnostic test for rapid diagnosis of acute babesiosis. *J Clin Microbiol*. 1996;34: 2014-2016.
5. Krause PJ, Telford S III, Spielman A, et al. Comparison of PCR with blood smear and inoculation of small animals for diagnosis of Babesia microti parasitemia. *J Clin Microbiol*. 1996;34: 2791-2794.
6. Chapman A. Diagnosis and management of tickborne rickettsial diseases: Rocky Mountain Spotted Fever, ehrlichioses, and anaplasmosis – United States. *MMWR Morb Mortal Wkly Rep*. 2006;55(RR-4):1-29.
7. Hechemy KE, Michaelson EE, Anacker RL, et al. Evaluation of latex-Rickettsia rickettsii test for Rocky Mountain spotted fever in 11 laboratories. *J Clin Microbiol*. 1983;18:938-946.
8. Bakken JS, Dumler JS. Clinical diagnosis and treatment of human granulocytotropic anaplasmosis. *Ann NY Acad Sci*. 2006;1078: 236-247.
9. Yu XJ, Crocquet-Valdes PA, Cullman LC, Poppov VL, Walker DH. Comparison of Ehrlichia chaffeensis recombinant proteins for serologic diagnosis of human monocytotropic erlichiosis. *J Clin Microbiol*. 1999;37:1568-2575.
10. Depietropalo DL, Powers, JH, Gill MJ, Foy AJ. Diagnosis of Lyme disease. *Am Fam Physician*. 2005;72:297-304.
11. Aguero-Rosenfeld, ME, Wang G, Schwartz I, Wormser GP. Diagnosis of Lyme borreliosis. *Clin Microbiol Rev*. 2005;18:484-509.

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