Test Definition: LYWB

Lyme Disease Antibody, Immunoblot, Serum

Overview

Useful For

Aiding in the diagnosis of systemic Lyme disease

This test **should not be used** as a screening assay.

Testing Algorithm

For information see Acute Tick-Borne Disease Testing Algorithm.

Method Name

Immunoblot Microarray

NY State Available

Yes

Specimen

Specimen Type

Serum

Specimen Required

Collection Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Submission Container/Tube: Plastic vial

Specimen Volume:0.75 mL

Collection Instructions: Centrifuge and aliquot serum into a plastic vial.

Forms

If not ordering electronically, complete, print, and send 1 of the following with the specimen.

-Infectious Disease Serology Test Request (T916)

-General Test Request (T239)

Specimen Minimum Volume

0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject

Gross icterus	Reject
Heat-inactivated specimen	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	14 days	
	Frozen	30 days	

Clinical & Interpretive

Clinical Information

Lyme disease is caused by the spirochete *Borrelia burgdorferi.* The spirochete is transmitted to humans through the bite of *Ixodes* species ticks. Endemic areas for Lyme disease in the United States correspond with the distribution of 2 tick species, *Ixodes dammini* (Northeastern and upper Midwestern US) and *Ixodes pacificus* (West Coast US). In Europe, *Ixodes ricinus* transmits the spirochete.

Lyme disease exhibits a variety of symptoms that may be confused with immune and inflammatory disorders. Inflammation around the tick bite causes skin lesions. Erythema chronicum migrans (ECM), a unique expanding skin lesion with central clearing, which results in a ring-like appearance, is the first stage of the disease. Any of the following clinical manifestations may be present in patients with Lyme disease: arthritis, neurological or cardiac disease, or skin lesions. Neurologic and cardiac symptoms may appear with stage 2 and arthritic symptoms with stage 3 of Lyme disease. In some cases, a definitive distinction between stages is not always seen. Further, secondary symptoms may occur even though the patient does not recall having a tick bite or a rash.

The Second National Conference on the Serologic Diagnosis of Lyme Disease (1994) recommended that laboratories use a 2-test approach for the serologic diagnosis of Lyme disease. Accordingly, specimens are first tested by the more sensitive enzyme immunoassay (EIA). An immunoblot assay is used to supplement positive or equivocal Lyme EIA results. An immunoblot identifies the specific proteins to which the patient's antibodies bind. Although there are no proteins that specifically diagnose *B burgdorferi* infection, the number of proteins recognized in the immunoblot assay is correlated with diagnosis. Recently, the Centers for Disease Control and Prevention and US Food and Drug Administration approved the use of a modified two-tiered testing algorithm for diagnosis of Lyme disease (see SLYME / Lyme Antibody Modified 2-Tier with Reflex, Serum).

Culture or polymerase chain reaction (PCR) of skin biopsies obtained near the margins of ECM are frequently positive. In late (chronic) stages of the disease, serology is often positive and the diagnostic method of choice. PCR testing also may be useful in these late stages if performed on synovial or cerebrospinal fluid.

Diagnosis of neuroinvasive Lyme disease (ie, neuroborreliosis) can be achieved by determining the Lyme antibody index value using paired serum and cerebrospinal fluid samples (LNBAB / Lyme Central Nervous System Infection IgG with Antibody Index Reflex, Serum and Spinal Fluid).

Reference Values

IgG: Negative
IgM: Negative
Reference values apply to all ages

Interpretation

Per Centers for Disease Control and Prevention criteria, the Lyme IgG Immunoblot is interpreted as positive if IgG-class antibodies are detected to greater than or equal to 5 *Borrelia burgdor*feri proteins, and the Lyme IgM Immunoblot is interpreted as positive if IgM-class antibodies are detected to greater than or equal to 2 *B burgdorferi* proteins. Immunoblot patterns not meeting these criteria should not be interpreted as positive. Epitopes from certain *B burgdorferi* proteins (eg, p41) are conserved across other bacteria, which may lead to the detection of IgM- and/or IgG-class antibodies on the Lyme disease immunoblots in patients without Lyme disease. Immunoblot should only be ordered on specimens that are positive or equivocal by a US Food and Drug Administration-licensed Lyme disease antibody screening test (eg, enzyme immunoassay). Results of the Lyme IgM immunoblot should not be considered in patients with greater than or equal to 30 days of symptoms.

Result	Interpretation
IgG and IgM negative	Specific serologic response to *B burgdorferi* infection is not detected but cannot rule out early infection during which low or undetectable antibody levels to *B burgdorferi* may be present. If clinically indicated, a new serum specimen should be submitted in 7-14 days.
IgG positive and IgM negative	Consistent with infection with *B burgdorferi* at some time in the past
IgG and IgM positive	Consistent with active or previous infection for *B burgdorferi*. IgM blot criteria is of diagnostic utility only during the first 4 weeks of early Lyme disease.
IgG negative and IgM positive	IgM-class antibodies to *B burgdorferi* (Lyme disease) detected. Results are consistent with acute or recent infection with *B burgdorferi*. Testing of a new specimen collected in 7-14 days to demonstrate IgG seroconversion may be considered to confirm infection if the diagnosis is in doubt. IgM immunoblot results should only be considered as indicative of recent infection in patients presenting within 30 days of symptom onset. Consideration of IgM immunoblot results in patients with symptoms lasting >30 days is discouraged due to the risk of false positive IgM immunoblot results and/or prolonged IgM seropositivity following disease resolution.
IgG and/or IgM uninterpretable	Immunoblot invalid due to blurring or indistinct reactivity. Due to an invalid Lyme IgG immunoblot, an interpretation cannot be provided. Please submit a new specimen.

Cautions

The immunoblot result may be negative in specimens that are weakly positive by enzyme immunoassay or in patients with early Lyme disease.

Test results should be used in conjunction with clinical evaluation and information related to tick exposure.

A negative test result does not necessarily rule out current or recent infection. The specimen may have been collected before demonstrable antibody developed. Patients with early disease often have serum antibody titers below the diagnostic threshold for several weeks following disease onset.

Test results from pregnant women or patients who are immunosuppressed may be difficult to interpret.

Positive test results may not be valid in persons who have received blood or blood product transfusions within the past several months.

Antibiotic therapy administered early following exposure or disease onset may suppress the antibody response to the point that diagnostic threshold levels are never attained.

Lyme disease serology should not be used for monitoring treatment response, as IgG can remain detectable for years post-resolution of infection.

False-positive reactions may occur with patients with other spirochetal diseases (syphilis, yaws, pinta, relapsing fever, or leptospirosis), recent Epstein-Barr virus infection (ie, infectious mononucleosis), influenza, autoimmune disorders (eg, present of extractable nuclear antigens), multiple sclerosis, or amyotrophic lateral sclerosis.

Clinical Reference

Theel ES. The past, present and (possible) future of serologic testing for Lyme disease. J Clin Microbiol. 2016;54(5):1191-1196

Performance

Method Description

The Viramed Biotech AG Borrelia B31 ViraChip IgM and IgG are protein microarray assays and can be considered modified solid-phase enzyme-linked immunosorbent assays. Highly purified antigens from the *Borrelia burgdorferi* B31 strain, including the 93 kD, 66 kD, 58 kD, 45 kD, 41 kD, 39 kD, 30 kD, 28 kD, 23 kD, and 18 kD proteins, are bound to the solid phase nitrocellulose membrane in triplicate. The positions of these antigen "spots" are well defined and are reliably identifiable using customized software. Each microarray also has "spots" for a negative control, serum controls, conjugate controls, and 6 calibrators. One microarray is fixed to the bottom of a well in a standard 96-well microtiter plate.

For each test to be performed, the diluted patient serum is added to each microarray (note: the *B burgdoreri* IgG and IgM microarrays are in separate wells). If specific antibodies recognizing a *B burgdorferi* antigen are present, they will bind to the specific antigens on the microarray. After incubation, the microarray is washed to remove unbound antibodies. Alkaline-phosphatase antihuman IgG or antihuman IgM (conjugate) is then added to the well and incubated. If antibodies are present, the conjugate will bind to those respective antibodies, and after a washing step to remove unbound conjugate, substrate solution is added. If the antibody/conjugate complex is present, the substrate will undergo precipitation and color change. After an incubation period, the reaction is stopped, and the presence of

precipitated substrate is visualized at specific locations on the microarray. The presence of a colored precipitation at various locations on the microarray is an indirect measurement of *B burgdorferi* specific antibodies in the patient specimen. Visualized spots from the reaction are compared for intensity with the integrated calibrator controls for evaluation.(Package inserts: Borrelia B31 ViraChip IgM and Borrelia B31 ViraChip IgG. VIRAMED Biotech AG; 01/2018)

PDF Report
No

Day(s) Performed
Monday, Wednesday, Friday

Report Available
Same day/1 to 4 days

Specimen Retention Time
14 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information
86617 x 2

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
LYWB	Lyme Disease Ab, Immunoblot, S	18203-0

Result ID	Test Result Name	Result LOINC® Value
5744	IgG Immunoblot	6320-6
2992	IgG detected against:	13502-0
23931	IgM Immunoblot	6321-4
23932	IgM detected against:	13503-8

6241	Interpretation	12781-1