MAYO CLINIC LABORATORIES

Acute Tick-Borne Disease Testing Algorithm

Clinical suspicion of tick-borne disease based on patient characteristics:
- Illness during tick season: fever, chills, headache, muscle aches, joint pain, neck pain, skin rash, Bell's palsy, heart rhythm disturbances, hypotension, jaundice, sepsis[1]

AND
- Known tick exposure

OR
- Environmental exposure (outdoor activities, wildlife)

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Based on geographic exposure, consider the following tick-borne pathogens (choose all that are appropriate)[2]

At risk for tick-borne relapsing fever (states with highest incidence are Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming).

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Perform SPSM / Morphology Evaluation (Special Smear), Blood for detection of relapsing fever *Borrelia* species spirochetes.

At risk for Rocky Mountain Spotted Fever (states with the highest incidence include North Carolina, Oklahoma, Arkansas, Tennessee, Missouri, Arizona, and the tribal Southwest)

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Order: SFGP / Spotted Fever Group Antibody, IgG and IgM, Serum
Empiric treatment encouraged for high risk patients while awaiting results

POSITIVE
↓
Treat as appropriate

NEGATIVE
↓
- Report as negative
- If short disease duration, submit follow-up specimen for repeat testing in 2-3 weeks if clinically indicated

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At risk for Lyme disease, ehrlichiosis, anaplasmosis, babesiosis, and *Borrelia miyamotoi* disease (BMD)
- Endemic areas for Lyme disease, anaplasmosis, babesiosis, and BMD include the Northeastern and Upper Midwestern United States, into Canada
- Ehrlichiosis is most frequently reported from the Southeastern and South Central United States

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Classic erythema migrans (target lesion or bull's-eye rash)

YES
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- No laboratory testing for Lyme disease is needed
- Treat for Lyme disease
- Monitor for symptoms of other tick-borne illness

NO
Consider empiric treatment for ehrlichiosis/anaplasmosis while awaiting test results
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Order SLYME / Lyme Antibody, Modified 2-Tier, with Reflex, Serum[3]
- If systemic symptoms are present (eg, fever, chills, sepsis) also order TIKLB / Tick-Borne Panel, Molecular Detection, PCR, Blood.[4,5]
- For patients with exposure to ticks in Europe, consider ELYME / Lyme Disease European Antibody Screen, Serum
- If patient presents with >7 days of symptoms, consider collecting baseline serology (STICK / Tick-Borne Antibodies, Modified 2-Tier, ELISA, Serum)

TIKLB Results

POSITIVE
↓
Treat as appropriate

NEGATIVE
↓
- Report as negative
- If short disease duration, consider follow-up specimen for serologic tests in 2-3 weeks if clinically indicated using: STICK / Tick-Borne Antibodies, Modified 2-Tier, ELISA, Serum (includes Lyme disease serology)
OR
- Individual serologic tests:
- EHBAP / *Ehrlichia/Babesia* Antibody Panel, Immunofluorescence, Serum
- BABG / *Babesia microti* IgG Antibodies, Serum
- ANAP / *Anaplasma phagocytophilum* (Human Granulocytic Ehrlichiosis) Antibody, Serum
- EHRCP / *Ehrlichia* Antibody Panel, Serum

SLYME or ELYME Results

POSITIVE OR EQUIVOCAL
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- TLYME / Lyme IgM and IgG, Whole Cell Sonicate, ELISA, Serum (performed automatically when SLYME result is positive or equivocal)
- ELYMI / Lyme Disease European Immunoblot, Serum (performed automatically when ELYME result is positive or equivocal)

NEGATIVE
↓
Report as negative
- If short disease duration, submit follow-up specimen for repeat testing in 2-3 weeks if clinically indicated

POSITIVE
↓
- Treat as appropriate
- If neurologic or joint symptoms, consider LYMPV Lyme Disease, Molecular Detection, PCR, Varies (for CSF, synovial fluid, or fresh tissue samples)

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LNBAB / Lyme Central Nervous System Infection IgG with Antibody Index Reflex, Serum and Spinal Fluid Presence of neurologic symptoms consistent with neuroinvasive Lyme disease

See Lyme Neuroborreliosis Diagnostic Algorithm for more information.

NEGATIVE
↓
- Report as negative
- If short disease duration, submit followup specimen for repeat testing if clinically indicated
- In immunocompromised patient, consider LYMPV / Lyme Disease, Molecular Detection, PCR, Varies (for CSF, synovial fluid, or fresh tissue samples)
AND/OR
PBORB / Lyme Disease, Molecular Detection, PCR, Blood[6]

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[1] In the presence of severe neurologic symptoms, consider testing for Powassan/deer tick virus testing and other vector-borne diseases (see Meningitis/Encephalitis Panel Algorithm). Also consider contacting the public health department for additional testing options based on exposure history (eg, Heartland virus, Bourbon virus, Colorado tick fever virus).

[2] Covers testing for the most common tick-borne pathogens in the US. Not all inclusive.

[3] The standard 2-tiered testing algorithm remains an option for the diagnosis of Lyme disease. However, Mayo Clinic recommends performance of the modified 2-tiered algorithm due to improved sensitivity for detection of early Lyme disease.

[4] Test includes polymerase chain reaction (PCR) tests for *Babesia* species, *Anaplasma phagocytophilum*, *Ehrlichia* species, and *Borrelia miyamotoi*.

[5] In place of the PCR panel, PCR tests for the individual organisms and/or smear for *Babesia* species can be ordered based on the suspected organism(s).

[6] PCR testing of blood may be useful for detection of *Borrelia mayonii* (patients with exposure to ticks in Minnesota or Wisconsin).

See Lyme Neuroborreliosis Diagnostic Algorithm for more information.