2017 LYME DISEASE
CASE INVESTIGATION TOOLKIT

This toolkit can be used by local health department staff to facilitate Lyme disease case investigations. Items in the toolkit include:

• Case Investigation Flowchart
• Form A for Healthcare Providers
• Form B for Patients with Erythema Migrans (EM)
• Enzyme Immunoassay (EIA) Tips
• Interpretation IgM/IgG Western Blots
• 2017 Case Ascertainment Guide
• Provider Quicksheet
• 2017 Low and High Incidence Lyme Disease States
Lyme Disease Case Investigation Flowchart

1. Positive lab report received at health department
2. Call healthcare provider, advise that a faxed request for case details is being sent¹
3. Fax "Form A" to healthcare provider to collect relevant clinical data (include Provider Quicksheet)
4. Follow up if no response after 3-4 days (repeat faxes if needed)
5. Call patient and use "Form B" to collect exposure information from patient
6. If EM is documented, attempt to contact patient
7. Enter all data into WVEDSS and send case to regional review
8. Regional review is sent to state and state sends final notification to CDC

¹ Request copies of any supplemental lab results; also ask for demographic data (e.g. race and ethnicity).
² Attempt to get in contact with patients through different methods. Try calling at least three times at different times of the day. Try alternate contact numbers and addresses. Mail a certified letter to the patient’s address. Be sure to document all attempts.
Form A: Lyme Disease Assessment Tool (2017)
For Healthcare Providers

Dear Healthcare Provider:
The ______________ County Health Department has been notified of a positive Lyme disease laboratory report for patient _____________________ (DOB: ____/____/____). In order to comply with state and federal infectious disease reporting requirements, we are requesting the following information about this patient. Please return this completed sheet via fax to (304 _____-_____) within 72 hours of receipt.

A. Have you contacted this patient about Lyme disease positive laboratory results? ☐YES ☐NO

B. Date of first symptom onset (month/day/year): ____ / ____ / _______. ☐YES ☐NO

C. Did this patient have an erythema migrans measuring at least 5 cm in diameter? ☐YES ☐NO
If yes, where was the patient when he/she was likely bitten by an infected tick in the past 30 days?
(County): ____________________ (State): ____________________

D. Did patient exhibit any of the following symptoms of late-stage Lyme disease? ☐YES ☐NO

Rheumatologic/musculoskeletal (mark one):
☐ Recurrent, brief attacks objective joint swelling (one or few joints)
☐ Chronic arthritis preceded by brief attacks (one or few joints)
☐ Other: ____________________________
☐ No rheumatologic/musculoskeletal symptoms associated with LD were observed

Neurologic (mark all that apply):
☐ Lymphocytic meningitis ☐ Facial palsy (may be bilateral) ☐ Cranial neuritis
☐ Radiculoneuropathy ☐ Encephalomyelitis ☐ Other: ____________________________
☐ No neurologic symptoms associated with LD were observed

Cardiovascular (mark one):
☐ Acute onset of high-grade (2nd or 3rd degree) atrioventricular conduction defects (that resolves in days to weeks)
☐ Other: ____________________________
☐ No cardiac symptoms associated with LD were observed

E. Did you diagnose this patient as having Lyme disease? ☐YES ☐NO

F. Please indicate what testing was ordered for this patient and any known results.

<table>
<thead>
<tr>
<th>Test Ordered</th>
<th>Date</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serology screen (IFA/EIA)</td>
<td>/ /</td>
<td>Positive</td>
</tr>
<tr>
<td>Borrelia burgdorferi IgG WB</td>
<td>/ /</td>
<td>Positive</td>
</tr>
<tr>
<td>Borrelia burgdorferi IgM WB</td>
<td>/ /</td>
<td>Positive</td>
</tr>
<tr>
<td>Other:</td>
<td>/ /</td>
<td>Positive</td>
</tr>
</tbody>
</table>

A. Why was Lyme disease testing ordered for this patient? Mark all that apply.
☐ Patient had clinical evidence of infection ☐ Patient requested Lyme testing
☐ Patient had exposure to tick habitats ☐ Other: ____________________________

B. Did you prescribe antibiotics for this patient? ☐YES ☐NO
If yes, indicate type of antibiotic and # of days: ____________________________

Comments: ____________________________

Thank you for filling out this form. This information is important to Lyme disease surveillance in West Virginia.
Form B: Patient Lyme Disease Exposure Assessment Tool (2017)
Note: Call patients with erythema migrans (EM)

**THIS STEP SHOULD BE LIMITED TO CASES WITH DOCUMENTED EM BY HEALTHCARE PROVIDER**

Optional Script

“Hello, this is (your name), a (nurse/sanitarian) from (county name) County Health Department. I am following up on a recent report our department received about (case name)’s Lyme disease illness. In order for us to better understand the risk for Lyme disease in our county, I would like to ask you a few questions about the time leading up to your illness.”

A. On what date were symptoms first noticed? (month/day/year): _____/_____/_________

B. Did you travel outside of your home county within 30 days of the start of your symptoms?
   ☐ YES    ☐ NO

   a. If yes, report travel information:

      | Destination (city, state) | Date of departure (month/day/year) | Date of return (month/day/year) |
      |---------------------------|-----------------------------------|-------------------------------|
      |                           |                                   |                               |
      |                           |                                   |                               |

C. Is there anything else you would like to share about your illness?

__________________________________________________________________________________
__________________________________________________________________________________
__________________________________________________________________________________

   Thank the patient, and end the call.
Enzyme Immunoassay (EIA) Interpretation Tips

- EIA tests detect the amount of antibodies produced by the patient. Immunoglobulin M (IgM), immunoglobulin G (IgG), and combined (or quantitative) IgM/IgG EIA tests are common for Lyme disease diagnostics.
  - IgM antibodies are produced by the body early in an infection. The presence of IgG antibodies indicates that the patient was infected with Lyme disease at some point in life.

- If the Lyme disease test result you receive has numbers like “0.91” or “5.65,” it is an EIA/IFA test.
  - The higher the number, the more antibodies are being produced.

- Some tests will have a reference ranges for “positive,” “equivocal,” and “negative” test results listed on the laboratory report (see example below).

- An “indeterminate” or “equivocal” result means that the level of antibodies detected in the patient’s specimen is low. It could also indicate a false positive result. Either way, more information is needed to determine if the patient’s immune system produced a response to an infection with Lyme disease; therefore, the EIA and IgM/IgG Western blot are recommended.

- “Positive” also means “reactive.” “Negative” also means “non-reactive.”

| Sample reference ranges for LabCorp |
|----------------|----------------------------|
| ≤0.90 | Negative                     |
| 0.91-1.09 | Equivocal               |
| ≥1.10 | Positive                     |

Division of Infectious Disease Epidemiology
350 Capitol Street, Room 125, Charleston, WV 25301-3715
Phone: (304) 558-5358 or (800) 423-1271 Fax: (304) 558-8736 (www.dide.wv.gov)
Interpreting IgG and IgM Western Blots

IgM Western Blot

An IgM immunoblot should be considered positive if **two of the following three bands** are present:
- 24 kDa (OspC) band
- 39 kDa (BmpA) band
- 41 kDa ( Fla) band

Visit the CDC’s Lyme disease testing page for more information:
http://www.cdc.gov/lyme/diagnosistesting/index.html

IgG Western Blot

An IgG immunoblot should be considered positive if **five of the following ten bands** are present:
- 18 kDa band
- 21 kDa (OspC) band
- 28 kDa band
- 30 kDa band
- 39 kDa (BmpA) band
- 41 kDa ( Fla) band
- 45 kDa band
- 58 kDa band
- 66 kDa band
- 93 kDa band

Sample Western blot

No laboratory evidence of infection
OR
Insufficient/inappropriate laboratory testing conducted

Physician-diagnosed erythema migrans (EM) at least 5 cm with known exposure\(^2\) in a high incidence state

Physician-diagnosed EM at least 5 cm with known exposure\(^2\) in low incidence state

One or more late manifestations of disease\(^3\)

Physician-diagnosed Lyme disease lacking clinical criteria (EM and/or late manifestations) of a confirmed case

No/unknown clinical information available

Physician-diagnosed EM at least 5 cm with no known exposure\(^4\)

Confirmed Case

Probable Case

Suspect Case

Not A Case

Appropriate laboratory testing\(^1\)
- A positive culture for *B. burgdorferi*
  OR
- A positive two-tier test. (This is defined as a positive or equivocal enzyme immunoassay (EIA) or immunofluorescent assay (IFA) followed by a positive Immunoglobulin M (IgM)\(^*\) or Immunoglobulin G (IgG) western immunoblot (WB) for Lyme disease
  OR
- A positive single-tier IgG WB test for Lyme disease

\(^*\)EIA/IFA and the IgM WB need to be completed within 30 days of symptom onset.

\(^1\)Laboratory tests in this guide are the only ones recommendation for case ascertainment. Other diagnostic tests (e.g. PCR) should not be used. CDC recommends a two-tier approach for Lyme disease testing using serum (EIA/IFA with reflex to Western blot). CSF and synovial fluid are not considered appropriate specimens for two-tier testing.

\(^2\)Exposure is defined as having been (less than or equal to 30 days before onset of EM) in wooded, brushy, or grassy areas (i.e., potential tick habitats) of Lyme disease vectors. Since infected ticks are not uniformly distributed, a detailed travel history to verify whether exposure occurred in a high or low incidence state is needed. An exposure in a high-incidence state is defined as exposure in a state with an average Lyme disease incidence of at least 10 confirmed cases/100,000 for the previous three reporting years. A low-incidence state is defined as a state with a disease incidence of <10 confirmed cases/100,000. (see [https://www.cdc.gov/lyme/stats/tables.html](https://www.cdc.gov/lyme/stats/tables.html)). A history of tick bite is not required.

\(^3\)Late manifestations include musculoskeletal (recurrent, brief attacks of joint swelling followed by chronic arthritis), nervous system (lymphocytic meningitis, cranial neuritis, facial palsy (may be bilateral), and radiculoneuropathy, or rarely encephalomyelitis), and cardiovascular (acute onset 2nd-3rd atrioventricular conduction defects that resolve in days to weeks) signs of disease.

\(^4\)Exposure in a low-incidence state is considered unknown exposure.
IMPORTANT INFORMATION ABOUT SELECTING LABORATORY TESTS

1. CDC recommends a two-tier approach for testing serological specimens: IFA/EIA antibody screen, followed by IgM\(^1\) and IgG western blot if IFA/EIA is positive or equivocal.

2. Other CDC recommended diagnostic assays for Lyme disease include:
   - A positive culture for *B. burgdorferi*, OR
   - A positive single-tier IgG\(^2\) WB test for Lyme disease\(^3\).

\(^1\) IgM WB is considered positive when at least two of the following three bands are present: 24 kilodalton (kDa) outer surface protein C (OspC)*, 39 kDa basic membrane protein A (BmpA), and 41 kDa (Fla). Disregard IgM results for specimens collected >30 days after symptom onset.

\(^2\) IgG WB is considered positive when at least five of the following 10 bands are present: 18 kDa, 24 kDa (OspC)*, 28 kDa, 30 kDa, 39 kDa (BmpA), 41 kDa flagellin (Fla), 45 kDa, 58 kDa (not GroEL), 66 kDa, and 93 kDa.

\(^3\) While a single IgG WB is adequate for surveillance purposes, a two-tier test is still recommended for patient diagnosis.

*THE USE OF SINGLE-TIER IGM WESTERN BLOT TESTING IS NOT RECOMMENDED AND WILL NOT BE CONSIDERED CONFIRMATORY FOR PUBLIC HEALTH SURVEILLANCE PURPOSES*

RESOURCES FOR PATIENTS

- CDC website has several brochures and info sheets for patients: [http://www.cdc.gov/lyme/](http://www.cdc.gov/lyme/).

RESOURCES FOR HEALTHCARE PROVIDERS

- CDC has a “Resources for Clinicians” page available at: [http://www.cdc.gov/lyme/healthcare/clinicians.html](http://www.cdc.gov/lyme/healthcare/clinicians.html)

- Information about two-tier testing for Lyme disease is available at: [http://www.cdc.gov/lyme/diagnosistesting/LabTest/TwoStep/index.html](http://www.cdc.gov/lyme/diagnosistesting/LabTest/TwoStep/index.html)

- The Infectious Disease Society of America (IDSA) has developed a FREE online CME case study about the diagnosis and management of Lyme disease available at: [http://lymecourse.idsociety.org/](http://lymecourse.idsociety.org/)

- The West Virginia Department of Health and Resources provides information about the state’s Lyme disease surveillance system as well as links to useful resources available at: [http://www.dhhr.wv.gov/oeps/disease/Zoonosis/Tick/Pages/Lyme.aspx](http://www.dhhr.wv.gov/oeps/disease/Zoonosis/Tick/Pages/Lyme.aspx)

- The CDC has a “Tickborne Diseases of the United States”, reference manual for healthcare providers located at: [https://www.cdc.gov/lyme/resources/tickbornediseases.pdf](https://www.cdc.gov/lyme/resources/tickbornediseases.pdf)
