

## LYME DISEASE

### ✓ DISEASE AND EPIDEMIOLOGY

#### Clinical Description:

Symptoms can be vague and diagnosis can be difficult. Clinical manifestations occur in three stages:

##### Early localized:

About 70-80% will have a red macule or papule that expands slowly in a circular manner, often with a central clearing (referred to as a “bull’s-eye” rash). This lesion is called EM for erythema migrans. The EM occurs at the site of the tick bite. For case surveillance purposes, they must reach 5 cm/2” in diameter to be considered EM. The center of the rash may be vesicular or necrotic. The early localized stage usually occurs 1-2 weeks following exposure.



Other clinical manifestations include malaise, fatigue, fever, headache, stiff neck, myalgia (muscle aches), arthralgia (joint pain), and/or lymphadenopathy (swollen lymph nodes). The initial disease may last for weeks in untreated patients; symptoms may be intermittent and variable. In some patients, this initial presentation will be inapparent.

##### Early disseminated:

If untreated, approximately 10% of patients may develop chronic disease weeks to months after the initial symptoms. This can occur about 3-5 weeks after the primary tick bite and presents as multiple erythema migrans, usually smaller than the primary lesion. Other symptoms can include neurologic and cardiologic (see Case Definition).

##### Late disease:

Arthritis is the typical manifestation of late disease. Since only 80% of cases have a visible acute (or early localized) presentation, late disease may be the first indicator of Lyme disease. It is important to note that the arthritis initially presents as recurrent, brief attacks. Other arthritic presentations are not indicative of Lyme disease.

#### Causative Agent:

Lyme Disease is caused by *Borrelia burgdorferi*, a spirochete that is tick-borne. It is a zoonosis.

#### Differential Diagnosis:

The differential diagnosis for acute Lyme disease includes dermatologic conditions such as insect bites. For chronic (late disease) Lyme disease, the differential includes MS, ALS, arthritis, CFS, ADHD, fibromyalgia, and other difficult-to-diagnose multi-system syndromes.

**Laboratory identification:**

Laboratory testing is poorly standardized and someone familiar with this disease should interpret test results. Testing is generally performed in stages, similar to HIV/AIDS. Initially, serological tests are run to screen patients. Samples that are reactive or equivocal on the screening tests are then tested with a Western Blot. PCR testing is also available.

Generally, an appropriate testing algorithm would include:

Order an initial total immunoglobulin serology test. If reactive, the following tests should be ordered to confirm the diagnosis:

- a. If the symptom onset is <30 days, order BOTH an IgM Western Blot and IgG Western Blot
- b. If the symptom onset is >30 days, order an IgG Western Blot, or test paired acute- and convalescent-phase serum samples

Problems with testing include:

- Samples that fail to react when the disease is in its early stages (false negative)
- Samples that fail to react when a patient is treated early in the disease (false negative)
- The antibodies (IFA or EIA/ELISA) can cross react in patients with antibodies to syphilis, relapsing fever, leptospirosis, HIV, Rocky Mountain spotted fever, infectious mononucleosis, lupus, or rheumatoid arthritis (false positives).
- Generally, the test sensitivity increases as the disease progresses, but some patients fail to seroconvert even during the chronic phase of the illness.
- IgM Western Blots shouldn't be used to support a diagnosis for Lyme disease when disease manifestations have existed for longer than 1 month.

Some tests are more sensitive than others.

- IgM EIA or ELISA using recombinant proteins are more sensitive than those using whole cells.
- IgG Western Blots that use of VIsE or C6 are more sensitive than those that do not use these antigens.
- Culture is difficult.

**Treatment:**

	<b>Adults</b>	<b>Children</b>
<b>EM</b>	Doxycycline Amoxicillin 2-3 week course of oral agents	Under 8: Amoxicillin
<b>Lyme arthritis</b>	4 week course of oral agents	4 week course of oral agents
<b>Neurologic</b>	IV ceftriaxone	

<b>symptoms</b>	IV penicillin Treat for 3-4 weeks	
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\* If allergic to penicillins or tetracycline, try cefuroxime axetil or erythromycin.

**Case fatality:**

If untreated, Lyme disease can cause chronic illness, but is rarely fatal.

**Reservoir:**

Lyme disease is tick-borne disease. Vectors include *Ixodes scapularis (dammini)* and *I. pacificus*, which is present in Utah. White-tailed deer are an important maintenance host. Dogs, cattle, and horses are all susceptible to this disease.

**Transmission:**

Tick-borne. The length of time of tick attachment for transfer of the spirochete is unknown, but in experimental studies is 24 hours. Maternal transmission of this disease is possible but has not been well-documented.

**Susceptibility:**

All people are susceptible. Reinfection can occur in people who were treated with antibiotics early in the disease cycle.

**Incubation period:**

The average length of incubation between tick bite and EM is 7-14 days, but the range is from 3-32 days.

**Period of communicability:**

There is no evidence of person-person transmission. There are rare cases of congenital transmission, but without adverse outcomes.

**Epidemiology:**

Lyme disease has regional distribution in the US. Largest numbers of cases occur along the Atlantic coast, north central US (Wisconsin and Minnesota), and the Pacific coast (Oregon and California). It has been reported from 47 states. Few cases of Lyme disease are described as being possibly linked to Utah. Lyme disease is the most common vector-borne disease in North America, with 20,000 cases reported in the US annually. While Utah has tick reservoirs capable of supporting Lyme disease, cases acquired in Utah have been rare.

 **PUBLIC HEALTH CONTROL MEASURES**

**Public health responsibility:**

- Determine the probable source (location) of the infection
- Determine if and where transmission is occurring in Utah.

- Remember that due to the small size of this tick, many patients will not recall a tick bite during the investigation.
- Classify cases according to CDC/CSTE criteria so that accurate records on Lyme disease can be kept at the national level.
- If Lyme disease transmission is found to occur in Utah, then public health will need to educate the public about the mode of tick transmission and the ways to avoid infection.
- Educate physicians on diagnosis and reporting.

### **Prevention:**

Avoid tick-infested areas when feasible. Wear light-colored clothing with long sleeves and long legged pants. Tuck pant legs into socks to prevent ticks from crawling up legs. Wear DEET.

There is no current licensed vaccine available against Lyme disease.

### **Chemoprophylaxis:**

None. The risk of Lyme disease following a tick bite is quite low.

### **Vaccine:**

There is no current licensed vaccine available against Lyme disease.

### **Isolation and quarantine requirements:**

**Isolation:** None

**Hospital:** Standard body substance precautions.

**Quarantine:** Patients should defer blood donations.

## **CASE INVESTIGATION**

### **Reporting:**

Lyme disease is a reportable disease in Utah. Lyme disease is a nationally notifiable disease.

### **Case definition:**

#### **Lyme Disease (2008):**

##### **Clinical Presentation**

A systemic, tickborne disease with protean manifestations, including dermatologic, rheumatologic, neurologic, and cardiac abnormalities. The best clinical marker for the disease is erythema migrans (EM), the initial skin lesion that occurs in 60-80% of patients.

For purposes of surveillance, EM is defined as a skin lesion that typically begins as a red macule or papule and expands over a period of days to weeks to form a large round lesion, often with partial central clearing. A single primary lesion

must reach greater than or equal to 5 cm in size across its largest diameter. Secondary lesions also may occur. Annular erythematous lesions occurring within several hours of a tick bite represent hypersensitivity reactions and do not qualify as EM. For most patients, the expanding EM lesion is accompanied by other acute symptoms, particularly fatigue, fever, headache, mildly stiff neck, arthralgia, or myalgia. These symptoms are typically intermittent. The diagnosis of EM must be made by a physician. Laboratory confirmation is recommended for persons with no known exposure.

For purposes of surveillance, late manifestations include any of the following when an alternate explanation is not found:

- Musculoskeletal system. Recurrent, brief attacks (weeks or months) of objective joint swelling in one or a few joints, sometimes followed by chronic arthritis in one or a few joints. Manifestations not considered as criteria for diagnosis include chronic progressive arthritis not preceded by brief attacks and chronic symmetrical polyarthritis. Additionally, arthralgia, myalgia, or fibromyalgia syndromes alone are not criteria for musculoskeletal involvement.
- Nervous system. Any of the following, alone or in combination: lymphocytic meningitis; cranial neuritis, particularly facial palsy (may be bilateral); radiculoneuropathy; or, rarely, encephalomyelitis. Encephalomyelitis must be confirmed by demonstration of antibody production against *B. burgdorferi* in the CSF, evidenced by a higher titer of antibody in CSF than in serum. Headache, fatigue, paresthesia, or mildly stiff neck alone are not criteria for neurologic involvement.
- Cardiovascular system. Acute onset of high-grade (2<sup>nd</sup> or 3<sup>rd</sup> degree) atrioventricular conduction defects that resolve in days to weeks and are sometimes associated with myocarditis. Palpitations, bradycardia, bundle branch block, or myocarditis alone are not criteria for cardiovascular involvement.

### Laboratory Evidence

For the purposes of surveillance, the definition of a qualified laboratory assay is:

- A positive culture for *B. burgdorferi*,
- Two-tier testing interpreted using established criteria [\[1\]](#), or
- Single-tier IgG immunoblot seropositivity interpreted using established criteria [\[1-4\]](#).

A two-test approach for active disease and for previous infection using a sensitive enzyme immunoassay (EIA) or immunofluorescent assay (IFA) followed by a Western immunoblot was the algorithm of choice. All specimens positive or equivocal by a sensitive EIA or IFA should be tested by a standardized Western immunoblot. Specimens negative by a sensitive EIA or IFA need not be tested further. When Western immunoblot is used during the first 4 weeks of disease onset (early LD), **both** immuno- globulin M (IgM) and immunoglobulin G (IgG)

procedures should be performed. **A positive IgM test result alone is not recommended for use in determining active disease in persons with illness greater than 1 month's duration because the likelihood of a false-positive test result for a current infection is high for these persons.** If a patient with suspected early LD has a negative serology, serologic evidence of infection is best obtained by testing of paired acute- and convalescent-phase serum samples. Serum samples from persons with disseminated or late-stage LD almost always have a strong IgG response to *Borrelia burgdorferi* antigens. [1]

### **Exposure**

Exposure is defined as having been ( $\leq 30$  days before onset of EM) in wooded, brushy, or grassy areas (i.e. potential tick habitats) in a county in which Lyme disease is endemic. A history of tick bite is not required.

### **Disease endemic to county**

A county in which Lyme disease is endemic is one in which at least two confirmed cases have been acquired in the county or in which established populations of a known tick vector are infected with *B. burgdorferi*.

### **Detailed definitions for case classification**

#### *Confirmed:*

- A case of EM with a known exposure (as defined above), or
- A case of EM with laboratory evidence of infection (as defined above) and without a known exposure or
- A case with at least one late manifestation that has laboratory evidence of infection (as defined above).

#### *Probable:*

Any other case of physician-diagnosed Lyme disease that has laboratory evidence of infection (as defined above).

#### *Suspected:*

- A case of EM where there is no known exposure (as defined above) and no laboratory evidence of infection (as defined above) or
- A case with laboratory evidence of infection but no clinical information available (e.g. a laboratory report)

Lyme disease reports will not be considered cases if the medical provider specifically states this is not a case of Lyme disease, or the only symptom listed is “tick bite” or “insect bite”.

### **Case Investigation Process:**

- Fill out an investigation form on each case of Lyme disease. Some of the information on this form must be provided by a clinician or other medical personnel, the patient cannot answer the medical questions appropriately.

- IF the clinician indicates that the patient has erythema migrans, contact the patient and collect information on possible locations of infection.

### **Outbreaks:**

An outbreak will be defined as 2 or more cases of locally acquired Lyme disease in a county in a 12 month period.

### **Identification of case contacts:**

None

### **Case contact management:**

None

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