Utah Department of Health & Human Services

Lyme disease

Disease plan

Quick links

Last updated: August 25, 2022, by Hannah Rettler

Questions about this disease plan?

Contact the Utah Department of Health and Human Services Office of Communicable Diseases: 801-538-6191.

Critical clinician information

Clinical evidence

Signs/symptoms

- Early localized
  - Erythema migrans (EM) "bulls-eye" rash (≥ 5cm in diameter)
  - Malaise
  - Fatigue
  - Fever
- Early disseminated
  - Arthralgia
  - Meningitis
  - Neurologic abnormalities or paralysis
- Late disease
  - Arthritis
  - Joint pain
  - Swelling

Period of communicability

- Not communicable person-to-person

Incubation period

- Ranges from 3–23 days, with an average of 7–14 days

Mode of transmission

- Lyme disease is spread by the black-legged ticks *Ixodes scapularis* and *Ixodes pacificus*

Laboratory testing

Types of appropriate tests

- Isolation of *B. burgdorferi* or *B. mayonii* in culture
- Detection of *B. burgdorferi* or *B. mayonii* in a clinical specimen by a *B. burgdorferi* group-specific nucleic acid amplification test (NAAT) assay
- Detection of *B. burgdorferi* group-specific antigens by immunohistochemical assay on biopsy or autopsy tissues
- Positive serologic tests in a two-tier or equivalent format, including:
  - Standard two-tier test (STTT): a positive or equivocal first-tier screening assay, often an enzyme immunoassay [EIA] or immunofluorescence assay [IFA] for immunoglobulin M (IgM), immunoglobulin G (IgG), or a combination of immunoglobulins, followed by a concordant positive IgM or IgG immunoblot interpreted according to established criteria
  - Modified two-tier test (MTTT): positive or equivocal first-tier screen, followed by a different, sequential positive or equivocal EIA in lieu of an immunoblot as a second-tier test.*

*The MTTT algorithm should be performed using assays specifically cleared by the US Food and Drug Administration (FDA) for this purpose.

Types of Specimens

- Serum or CSF
- Minimum volume required (0.5ml at 4˚C)

Treatment recommendations

Types of treatment (treatment is dependent on the onset of disease and symptoms; see Table 1 for more information) • Doxycycline • Amoxicillin • Cefuroxime axetil • Ceftriaxone
Case management
Isolation of case • None
Infection control procedures
• Standard body substance precautions

Why is lyme disease important to public health?

Lyme disease is the most common tick-borne illness in the United States. Utah is not considered an endemic state for Lyme disease; therefore, surveillance efforts to determine where the disease was most likely contracted are critical. Lyme disease can cause mild symptoms and can be completely treatable with antibiotics. However, if left untreated, infection can spread to joints, the heart, and the nervous system, and cause life-long problems.

Disease and epidemiology

Clinical description

Symptoms can be vague and diagnosis can be difficult. Clinical manifestations occur in 3 stages.

Early localized

About 60–80% of infected cases will have a skin lesion that begins as a red macule or papule at the site of the tick bite and expands slowly in a circular manner, often with a central clearing. This skin lesion is referred to as a "bulls-eye" rash or erythema migrans (EM). EM may be single or multiple. For purposes of surveillance, a single primary lesion must reach 5 cm or 2 inches in diameter to be considered EM. The center of the rash may be vesicular or necrotic. The early localized stage usually occurs within 3–32 days following the tick bite (average 7 days). 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 unapparent.

Early disseminated

If untreated, approximately 5% of patients will develop chronic disease weeks to months after the initial symptoms. Early disseminated disease can occur several weeks after the primary tick bite and presents as multiple erythema migrans, usually smaller than the primary lesion. Other symptoms may include arthralgia, meningitis, neurologic abnormalities such as facial paralysis or Bell's palsy, and carditis (see Case definition).

Late disseminated

Arthritis is the typical manifestation of late disease. Since only 60–80% of cases have a visible acute (or early localized) presentation, late disease may be the first indicator of Lyme disease. Patients with untreated infection may begin to have intermittent bouts of arthritis, with severe joint pain and swelling, particularly in the large joints and knees. Other arthritic presentations are not indicative of Lyme disease.

Causative agent

Lyme disease is a zoonotic disease caused by the tick-borne spirochete, *Borrelia burgdorferi*.

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 multiple sclerosis (MS), ALS (Lou Gehrig's Disease), arthritis, chronic fatigue syndrome (CFS), ADHD, fibromyalgia, and other difficult-to-diagnose multi-system syndromes.

Laboratory identification

Laboratory testing is poorly standardized and test results should be interpreted with caution. Testing is generally performed through a 2-step process, similar to HIV/AIDS. Initially, serological tests, such as an enzyme immunoassay (EIA) or an indirect immunofluorescence assay (IRA), are used to screen patients. Samples that are reactive or equivocal on the screening tests are then tested with a western blot. The usefulness of PCR in routine management of Lyme disease cases has yet to be verified.

Initially, a total immunoglobulin serology test should be performed. If reactive, the following tests should be performed to confirm the diagnosis:

A. If the symptom onset is <30 days, perform BOTH, an IgM western blot and IgG western blot or a second-tier total immunoassay (EIA) approved by the FDA for use as a second-tier test.
B. If the symptom onset is >30 days, perform an IgG western blot, or test paired acute- and convalescent-phase serum samples, or second-tier total immunoassay (EIA) approved by the FDA for use as a second-tier test.

Figure 1: Lyme disease testing algorithm

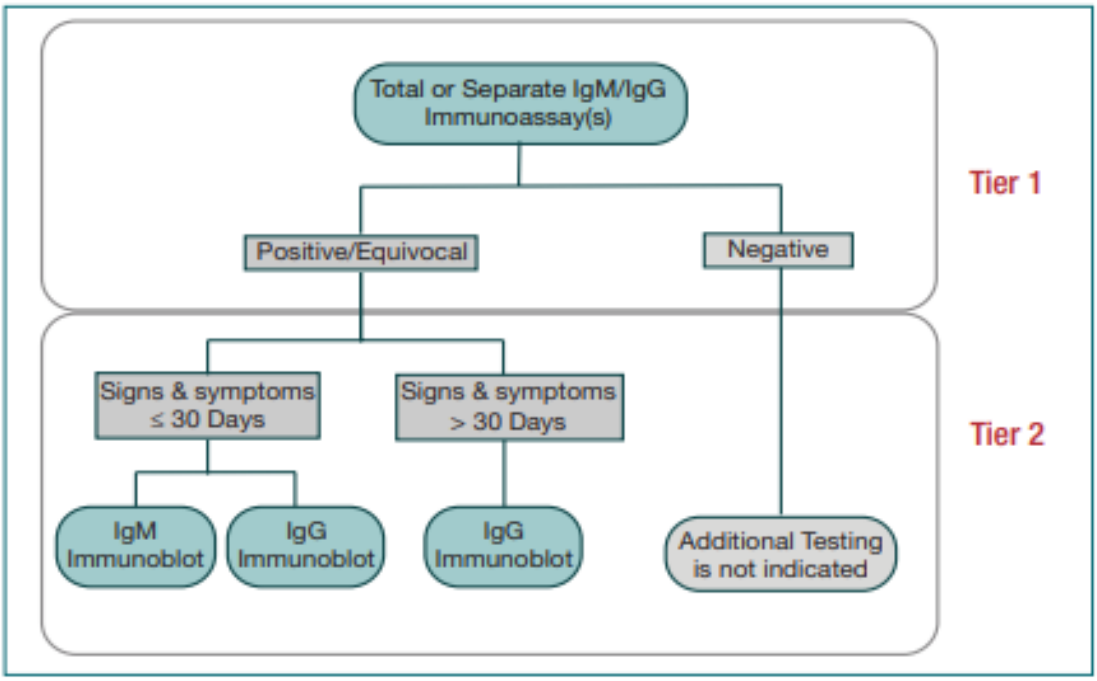


Figure 1: Standard Two-Tiered Testing (STTT)

Note: From "Suggested Reporting Language, Interpretation, and Guidance Regarding Lyme Disease Serologic Test Results," by the Association of Public Health Laboratories, 2021, p. 4 (https://www.aphl.org/aboutAPHL/publications/Documents/ID-2021-Lyme-Disease-Serologic-Testing-Reporting.pdf). Copyright 2021 by the Association of Public Health Laboratories.

Interpretation

- Samples may fail to react when the disease is in its early stages, yielding a false negative result.
- Samples may fail to react when a patient is treated early in the disease, also yielding a false negative result.
- The antibodies (IFA or EIA/ELISA) can cross react in patients with antibodies to other spirochetal infections (e.g., syphilis, relapsing fever, or leptospirosis), certain viral infections (e.g., HIV, varicella, Epstein-Barr, or Rocky Mountain spotted fever) or certain autoimmune diseases (e.g., lupus erythematosis or rheumatoid arthritis). The presence of these diseases may yield false positive results on Lyme disease antibody tests.
- 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 should not be used to support a diagnosis for Lyme disease when disease manifestations have existed for longer than one month.

Sensitivity

- During the first 4 weeks of infection, serodiagnostic tests are insensitive and are not generally recommended.

- An IgM EIA or ELISA that uses a recombinant antigen is more sensitive than those using whole cell ELISA.
- An IgG western blot that uses VIsE or C6 recombinant antigens increases the sensitivity of the test.
- Culture is difficult and not recommended.
    - There is a “home-brewed” urine culture test that some laboratories use (mainly a Pennsylvania laboratory) which has not been validated by the CDC.

Treatment

Table 1a

Treatment of erythema migrans rash				
Age category	**Drug**	**Dosage**	**Maximum**	**Duration, Days***
Adults	Doxycycline **OR**	100 mg, twice per day orally	N/A	10–14
	Amoxicillin **OR**	500 mg, three times per day orally	N/A	14
	Cefuroxime	500 mg, twice per day orally	N/A	14
Children	Doxycycline **OR**	4.4 mg/kg per day orally, divided into 2 doses	100 mg per dose	10–14
	Amoxicillin **OR**	50 mg/kg per day orally, divided into 3 doses	500 mg per dose	14
	Cefuroxime	30 mg/kg per day orally, divided into two doses	500 mg per dose	14

*When different durations of antibiotics are shown to be effective for the treatment of Lyme disease, the shorter duration is preferred to minimize unnecessary antibiotics that might result in adverse effects, including infectious diarrhea and antimicrobial resistance.

Note: For people intolerant of amoxicillin, doxycycline, and cefuroxime, the macrolide azithromycin may be used, although it is less effective. People treated with azithromycin should be closely monitored to ensure symptoms resolve.

Table 1b

Treatment of neurologic Lyme disease				
Facial palsy				
Age category	**Drug**	**Dosage**	**Maximum**	**Duration (days)**
Adults	Doxycycline	100 mg, twice per day orally	N/A	14–21
Children (any age)	Doxycycline	4.4 mg/kg per day orally, divided into 2 doses	100 mg per dose	14–21

Lyme meningitis or radiculoneuritis				
Adults	Doxycycline **OR**	200 mg per day orally, divided into 1 or 2 doses	N/A	14–21
	Ceftriaxone*	2 grams intravenously, once a day	N/A	14–21
Children (any age)	Doxycycline **OR**	4.4 mg/kg per day orally, divided into 1 or 2 doses	100 mg per dose	14–21
	Ceftriaxone*	50-75 mg/kg intravenously once a day	2 g per day	14–21

* Oral therapy can be substituted when the patient is stabilized or discharged to complete the course.

Table 1c

Treatment of Lyme carditis				
Mild (1st degree AV block with PR interval <300 milliseconds)				
Age category	**Drug**	**Dosage**	**Maximum**	**Duration (days)**
Adults	Doxycycline	100 mg, twice per day orally	N/A	14–21
	Amoxicillin	500 mg, three times per day orally	N/A	14–21
	Cefuroxime	500 mg, twice per day orally	N/A	14–21
Children (any age)	Doxycycline	4.4 mg/kg per day orally, divided into 2 doses	100 mg per dose	14–21
	Amoxicillin	50 mg/kg per day orally, divided into 3 doses	500 mg per dose	14-21
	Cefuroxime	30 mg/kg per day orally, divided into 2 doses	500 mg per dose	14–21
Severe (symptomatic, 1st degree AV block with PR interval ≥300 milliseconds, 2nd or 3rd degree AV				

block)*				
Adults	Ceftriaxone	2 grams intravenously, once a day*	N/A	14–21
Children (any age)	Ceftriaxone	50–75 mg/kg intravenously, once a day*	2 grams per day	14–21

*After resolution of symptoms and high-grade AV block, consider transitioning to oral antibiotics to complete the treatment course (Table 1).

Table 1d

Treatment of Lyme arthritis				
Oral antibiotic regimens for Lyme arthritis.*				
Age category	**Drug**	**Dosage**	**Maximum**	**Duration (days)**
Adults	Doxycycline	100 mg, twice per day orally	N/A	28
	Amoxicillin	500 mg, three times per day orally	N/A	28
	Cefuroxime	500 mg, twice per day orally	N/A	28
Children ≥8 years old	Doxycycline	4.4 mg/kg per day orally, divided into 2 doses	100 mg per dose	28
	Amoxicillin	50 mg/kg per day orally, divided into 3 doses	500 mg per dose	28
	Cefuroxime	30 mg/kg per day orally, divided into 2 doses	500 mg per dose	28
Children <8 years old	Amoxicillin	50 mg/kg per day orally, divided into 3 doses	500 mg per dose	28
	Cefuroxime	30 mg/kg per day orally, divided into 2 doses	500 mg per dose	28

Parenteral antibiotic regimens for Lyme arthritis.†				
Adults	Ceftriaxone*	2 grams intravenously, once a day	N/A	14–28
Children (any age)	Ceftriaxone*	50-75 mg/kg intravenously, once a day	2 grams per day	14–28

* For patients with an initial episode of Lyme arthritis, a full course of oral antibiotics is recommended. For patients with improving but persistent symptoms after an initial course of oral antibiotics, a second course of the same oral antibiotic or observation alone can be considered.

† Intravenous ceftriaxone is the preferred regimen for the second course of antibiotics for patients without any response after the initial course of antibiotics.

Case fatality

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

Reservoir

Lyme disease is tick-borne disease. Vectors include the black-legged tick, *Ixodes scapularis* (commonly known as the "deer tick"), in the eastern and midwestern United States and the black-legged tick, *Ixodes pacificus*, in the western United States. *Ixodes pacificus* ticks are present in Utah, though they have not yet been found to carry *borrelia burgdorferi* in Utah. White-tailed deer are an important maintenance host. Dogs, cattle, and horses are all susceptible to this disease.

Transmission

Lyme disease is a tick-borne illness. The length of time a tick must be attached to its host to transfer the spirochete is unknown, but in most cases, the tick must be attached for 24–48 hours or more before Lyme disease bacteria can be transmitted. Perinatal 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 incubation period from tick bite to EM ranges from 3–32 days with an average of 7–14 days.

Period of communicability

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

Epidemiology

Lyme disease was first recognized clinically in 1977 as "Lyme arthritis" during studies of a cluster of children in Lyme, Connecticut, who were thought to have juvenile rheumatoid arthritis. The etiology of Lyme disease was discovered to be a spirochete in the early 1980s. The incidence of Lyme disease in the United States has increased steadily since then. The incidence in some regions of Europe may be increasing as well. Lyme disease is currently the most commonly reported tick-borne disease in the United States and Europe. In 2012, 13 states accounted for 95% of all reported cases (confirmed and probable cases combined); these states included Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia, and Wisconsin.

In recent years, the incidence of Lyme disease in the northern New England states of Maine, Vermont, and New Hampshire has increased rapidly. An increase in the deer population in the northeastern United States and changes in land management practices have contributed to the rise in incidence of Lyme disease. Lyme disease occurs most commonly in forested regions, which includes some suburban areas such as those near Boston, New York, and Philadelphia.

While Utah has tick reservoirs capable of supporting Lyme disease, the vast majority of human cases reported to the Utah Department of Health and Human Services had exposures in other high incidence states. Very few human cases appear to have had acquisition in Utah to-date, and these cases had very limited exposure history reported, as well as incomplete lab results to confirm diagnosis, so it is unclear if they were truly endemic cases. Tick surveillance efforts have been implemented to better understand if the *ixodes pacificus* ticks in Utah are carrying *borrelia burgdorferi*, and enhanced human surveillance efforts have been put in place to better understand if Lyme is endemic in Utah.

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 getting a tick bite.
- Assess for erythema migrans (EM) (bullseye rash).

- Classify cases according to Centers for Disease Control and Prevention (CDC) and Council for State and Territorial Epidemiologists (CSTE) criteria so accurate records on Lyme disease can be maintained at the national level.
- If Lyme disease transmission is found to occur in Utah, public health will educate the public about the mode of tick transmission and ways to avoid infection.
- Educate physicians on diagnosis, testing, and reporting.

Prevention

Managing special situations: Response to a tick bite

The longer a tick remains attached to a person, the higher the likelihood of disease transmission. Individuals should promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out using steady pressure. Whenever an attached tick is removed from the body, a person should monitor one's health for the appearance of rash, fever, or flu-like symptoms, and should immediately seek the advice of a healthcare provider should any symptoms occur, especially if the tick was attached for more than 24 hours. There are 2 reasons it may be helpful to save the tick after removal: 1) if the person who was bitten develops signs or symptoms such as fever, flu-like symptoms, or a rash, it may be helpful for the physician to know the type of tick; and 2) depending on the circumstances of the bite (e.g., when a person was bitten, the type of tick, how long it was attached), a physician may choose to treat the person who was bitten. The tick may be kept either securely sealed in a small plastic bag or attached, with clear tape, to a piece of paper. For individuals who do not wish to keep the tick, it can be either drowned in alcohol or flushed down the toilet.

Environmental measures

Prevention of disease spread by ticks involves making the yard less attractive to ticks:

- Keep grass cut short.
- Remove leaf litter and brush from around the yard.
- Prune low lying bushes to let in more sunlight.
- Keep wood piles and bird feeders off the ground and away from the home.
- Keep the plants around stone walls cut short.
- Use a 3-foot wide woodchip, mulch, or gravel barrier where the lawn meets the woods, and remind children not to cross that barrier.
- Ask a landscaper or local nursery about plants to use in the yard that do not attract deer.
- Use deer fencing (for yards 15 acres or more).

If an individual chooses to use a pesticide to reduce the number of ticks on his/her property, he/she should be advised to hire a licensed applicator who is experienced with tick control. A local landscaper or arborist may be a licensed applicator. In general, good tick control can be achieved

with no more than 2 pesticide applications in any year. Advise individuals to ask, when selecting an applicator, if they will provide:

- A written pest control plan that includes information on the pesticide to be used.
- Information about non-chemical pest control alternatives.
- Signs to be posted around the property after the application.

Personal preventive measures/education

If a person lives, works, or spends leisure time in an area likely to have ticks, he/she should be advised of the following:

- The single most important thing a person can do to prevent a tick-borne disease is to check for ticks once a day. Favorite places ticks like to go on the body include areas between the toes, back of the knees, groin, armpits, neck, along the hairline, and behind the ears. Remember to check children and pets too. Promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out using steady pressure.
- Stick to main pathways and the centers of trails when hiking.
- Wear long-sleeved, light-colored shirts, and long pants tucked into socks.
- Talk to a veterinarian about the best ways to protect pets and livestock from ticks.
- Use repellents containing DEET (N,N-diethyl-m-toluamide), and choose a product that will provide sufficient protection for the amount of time spent outdoors. Product labels often indicate the length of time a person can expect protection from a product. DEET is considered safe when used according to the manufacturer's directions. The efficacy of DEET levels off at a concentration of 30%, which is the highest concentration recommended for children and adults. DEET products should not be used on children <2 months of age. The following precautions should be observed when using DEET products:
    - Avoid using DEET products that combine the repellent with a sunscreen. Sunscreens may need to be reapplied too often, resulting in an over-application of DEET.
    - Apply DEET on exposed skin, using only as much as needed.
    - Do not use DEET on the hands of young children, and avoid applying repellent to areas around the eyes and mouth.
    - Do not use DEET over cuts, wounds, or irritated skin.
    - Wash treated skin with soap and water after returning indoors, and wash treated clothing.
    - Avoid spraying DEET products in enclosed areas.

Permethrin-containing products will kill mosquitoes and ticks on contact. Permethrin products are not designed to be applied to the skin. Clothing should be treated and allowed to dry in a well-ventilated area prior to wearing. Because permethrin binds very tightly to fabrics, once the fabric is dry, very little of the permethrin gets onto the skin.

Chemoprophylaxis

Routine use of antimicrobial prophylaxis is not recommended. The risk of Lyme disease following a tick bite in Utah is low.

Vaccine

There is currently no licensed vaccine available against Lyme disease.

Isolation and quarantine requirements

Isolation: None.

Hospital: Standard body substance precautions.

Quarantine: None. Patients with active Lyme disease should not donate blood.

Case investigation

Reporting

Report all suspect and confirmed cases of Lyme disease

Table 2: CSTE reporting criteria

Criterion	Reporting
Clinical evidence	
Erythema migrans	S
Healthcare record contains a diagnosis of Lyme disease	S
Death certificate lists Lyme disease as a cause of death or a significant condition contributing to death	S
Laboratory evidence	
Culture positive for *B. burgdorferi*	S
Antibody positive for *B. burgdorferi* by EIA or IFA in serum or CSF	S
Western immunoblot positive for *B. burgdorferi*-specific IgM	S
Western immunoblot positive for *B. burgdorferi*-specific IgG	S

S = This criterion alone is sufficient to report a case

*A requisition or order for any of the "S" laboratory tests is sufficient to meet the reporting criteria.

Case definition (2021)

Lyme disease

Clinical presentation

A systemic, tick-borne 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 or 2 inches in size across its largest diameter. Secondary lesions also may occur. Annular erythematous lesions which occur 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 1 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 cerebral spinal fluid (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 (2nd or 3rd 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 criteria

For the purposes of surveillance, laboratory evidence includes:

Confirmatory laboratory evidence:

- **Recommended:** Positive serologic tests in a two-tier or equivalent format, including:
    - Standard two-tier test (STTT): a positive or equivocal first-tier screening assay, often an enzyme immunoassay [EIA] or immunofluorescence assay [IFA] for immunoglobulin M (IgM), immunoglobulin G (IgG), or a combination of immunoglobulins, followed by a concordant positive IgM or IgG immunoblot interpreted according to established criteria, **or**
    - Modified two-tier test (MTTT): positive or equivocal first-tier screen, followed by a different, sequential positive or equivocal EIA in lieu of an immunoblot as a second-tier test.
- Isolation of *B. burgdorferi* or *B. mayonii* in culture, **or**
- Detection of *B. burgdorferi* or *B. mayonii* in a clinical specimen by a *B. burgdorferi* group-specific nucleic acid amplification test (NAAT) assay, **or**
- Detection of *B. burgdorferi* group-specific antigens by immunohistochemical assay on biopsy or autopsy tissues.

Presumptive laboratory evidence:

- Positive IgG immunoblot, interpreted according to established criteria, without positive or equivocal first-tier screening assay.
    - While a single IgG WB is adequate for surveillance purposes, a two-tier test is still recommended for clinical diagnosis.

Case classification comments

High-incidence jurisdictions are those with an average Lyme disease incidence of ≥10 confirmed cases/100,000 population for a period of 3 consecutive years. At the time of CSTE position statement 21-ID-05 (spring 2021), those jurisdictions were: Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin, and the District of Columbia (http://www.cdc.gov/lyme/stats/tables.html).

Low-incidence jurisdictions are those without an average Lyme disease incidence of ≥10 confirmed cases/100,000 population for a period of 3 consecutive years. Once ≥10 confirmed cases/100,000 population have been observed in a low-incidence jurisdiction for a period of 3 consecutive years, they become a high-incidence jurisdiction for the purposes of surveillance and should permanently switch reporting criteria.

Calculations should be made at the state or territory level to determine incidence for case classification and reporting purposes. Case classification for reporting should not be differentially applied at the subdivision level.

A clinically compatible case is defined as a case that meets the clinical criteria defined above.

Epidemiologic criteria

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 3 reporting years (Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin, and the District of Columbia). **A low-incidence state** is defined as a state with a disease incidence of <10 confirmed cases/100,000. Calculations should be made at the state or territory level to determine incidence for case classification and reporting purposes. Case classification for reporting should not be differentially applied at the subdivision level. A history of tick bite is not required.

Case classification

Suspect

High-incidence jurisdictions (as defined in case classification comments above)

- A case that meets presumptive laboratory evidence.

Low-incidence jurisdictions (as defined in case classification comments above)

- A case that meets confirmatory or presumptive laboratory criteria, but no clinical information is available, OR
- A case of erythema migrans rash with no laboratory evidence of infection.

Probable

High-incidence jurisdictions (as defined in case classification comments above)

- A case that meets confirmatory laboratory evidence.

Low-incidence jurisdictions (as defined in case classification comments above)

- A clinically compatible case that meets presumptive laboratory criteria.

Confirmed

High-incidence jurisdictions (as defined in case classification comments above)

- N/A

Low-incidence jurisdictions (as defined in case classification comments above)

- A clinically compatible case that meets confirmatory laboratory criteria.

Note: This CSTE case definition is intended solely for public health surveillance purposes and does not recommend diagnostic criteria for clinical partners to utilize to diagnose patients with potential Lyme disease.

Case investigation process

- Complete CMR in UT-NEDSS. Some of the information on this form must be provided by a clinician or other medical personnel. The patient should not answer the medical questions.
- Verify case status.
- Complete disease investigation form.
- Determine whether patient had travel/exposure history consistent with acquisition of disease in Utah or elsewhere. If the clinician indicates the patient has EM, contact the patient and collect information on possible locations of infection.
- If the patient acquired the disease in Utah, identify the source of transmission and assist with elimination.

Outbreaks

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

Identifying case contacts

None.

Case contact management

None.

Testing guidance

Please refer to the American Public Health Laboratory (APHL) Guidance Regarding Lyme Disease Serologic Test Results for testing guidance tables.

Figure 2: High incidence lab interpretation algorithm

High-incidence jurisdictions are those with an average Lyme disease incidence of ≥10 confirmed cases/100,000 population for a period of 3 consecutive years. At the time of CSTE position statement 21-ID-05 (spring 2021), those jurisdictions were: Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin, and the District of Columbia.

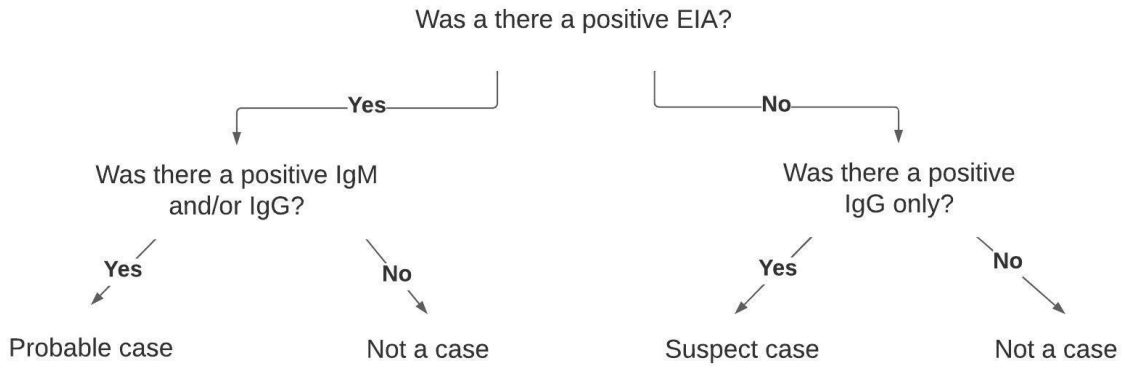
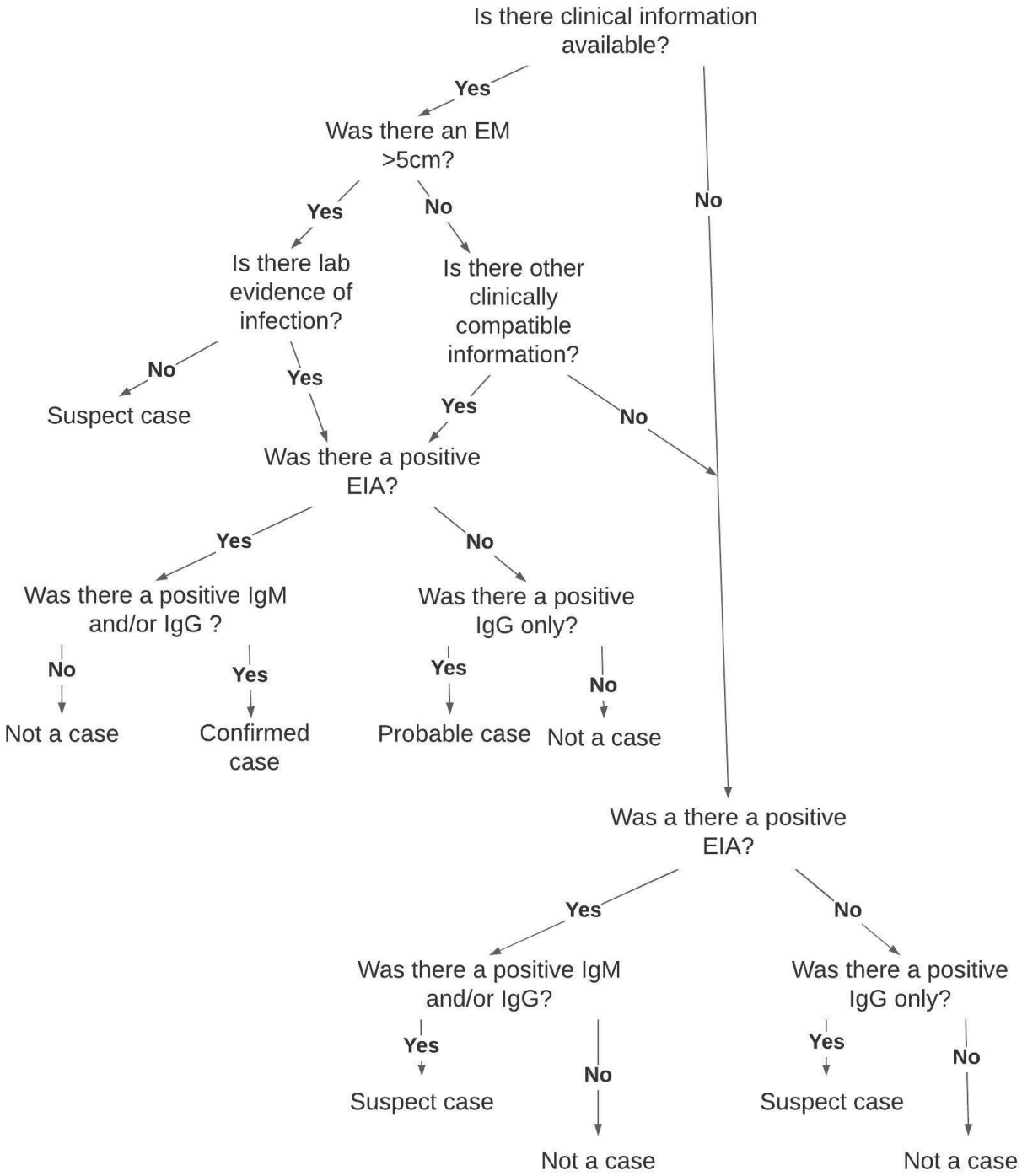


Figure 3. Low incidence lab interpretation algorithm

Low-incidence jurisdictions are those without an average Lyme disease incidence of ≥10 confirmed cases/100,000 population for a period of 3 consecutive years. Once ≥10 confirmed cases/100,000 population have been observed in a low-incidence jurisdiction for a period of 3 consecutive years, they become a high-incidence jurisdiction for the purposes of surveillance and should permanently switch reporting criteria.



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Version control

August 2015 Update: Minor updates to most sections. Added minimum data set information.

October 2017 Update: Created CCI, added position statement flow chart, and updated references.

August 2018 Update: Updated CSTE classification and reporting criterion tables per new case definition, and added ELR processing rules.

August 2022 Update: Updated CSTE classification per new case definition, added links to APHL guidance for lab interpretation, added additional information to epidemiology section. Updated references to conform to APA 7th edition citation style.

UT-NEDSS minimum/required fields by tab

Demographic

- County
- State
- Street
- City
- ZIP code
- Date of birth
- Birth gender
- Race
- Ethnicity
- First name
- Last name
- Patient's occupation

Clinical

- Date diagnosed
    - Clinician name and phone number
- Died
- Date of death
- Disease
- Onset date
- Did the patient have a physician diagnosed erythema migrans (EM) at least 5 cm in diameter?
- Date of EM diagnosis
- Location of EM on body
- Did patient have fatigue?
- Did patient have headache?
- Did patient have fever?
- Did patient have mildly stiff neck?
- Did patient have arthralgia?
- Did patient have myalgia?
- Does patient have recurrent, brief attacks (weeks or months) of objective joint swelling in one or a few joints, chronic arthritis in one or a few joints?
- Does patient have lymphocytic meningitis; cranial neuritis, particularly facial palsy (may be bilateral); radiculoneuropathy; encephalomyelitis?
- Does patient have acute onset of highgrade (2nd or 3rd 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)
- Did patient ever have relapsing fever?
- Did patient ever have infectious mononucleosis?
- Did patient ever have leptospirosis?
- Did patient ever have Rocky Mountain spotted fever?
- Did patient ever have syphilis?
- Did patient ever have lupus?
- Is the patient pregnant?
- Was the patient hospitalized?
    - Location, admit date, discharge date
- Treatment
    - Doxycycline, Amoxicillin, other (list)
- Has the patient previously been diagnosed with Lyme disease?
    - Date

Laboratory

- Organism
- Specimen source

- Test result
- Test type

Epidemiological

- Imported from
- Date of exposure
- Exposure city
- Exposure name
- Exposure place type
- Exposure street
- Was patient bitten by a tick?
    - Location of attachment
    - Duration of attachment
- Was patient bitten in Utah?
- What date and state did the bite occur?
- Was patient in a wooded, brushy, or grassy area (potential tick habitat) <30 days prior to onset of symptoms?
- Did patient go camping <30 days prior to onset of symptoms? List places and dates
- Did patient go hunting <30 days prior to onset of symptoms? List places and dates
- Did patient visit any parks <30 days prior to onset of symptoms? List places and dates
- Did patient travel outside of Utah <30 days prior to onset of symptoms? List places and dates

Reporting

- Date first reported to public health

Administrative

- Outbreak name
- State case status
- Outbreak associated

Lyme disease rules for entering laboratory test results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-specific rules

Test-specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.

Test type	Test result	Create a new event	Update an existing event
IgG Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
IgM Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
PCR/amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
Total Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
Western (immuno) blot	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes

Whitelist rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Lyme disease morbidity whitelist rule: If the specimen collection date of the laboratory result is 2 years or less after the event date, the laboratory result should be added to the morbidity event.

Lyme disease contact whitelist rule: Never added to a contact.

Graylist rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.

Lyme disease graylist rule: If the specimen collection date of the laboratory result is 30 days before to 7 days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

Other electronic laboratory processing rules

- If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.