

PUBLIC HEALTH REFERENCE SHEET

Lyme Disease



Name	<i>Borrelia burgdorferi</i> and rarely <i>Borrelia mayonii</i>
Reservoir & Transmission	Ixodid ticks and wild rodents Tickborne transmission: bite from blacklegged ticks: <i>Ixodes scapularis</i> and <i>Ixodes pacificus</i>
Incubation Period	30 to 32 days after exposure to tick habitat or tick bite
Common Symptoms	Erythema migrans (EM) is a “bulls-eye” rash 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. EM is often accompanied by fatigue, fever, headache, mildly stiff neck, arthralgia, or myalgia. Late clinical manifestations (LM) include involvement of the musculoskeletal system, nervous system, or cardiovascular system
Gold Standard Diagnostic Test	Presentation of EM with or without knowledge of a tick bite with 2-tiered serological testing
Risk Groups	All persons susceptible
Geographic Significance	North America, Europe, and Northern Asia

What is Lyme disease?

Lyme disease is a tickborne illness caused by the bacterium *Borrelia burgdorferi* and rarely *Borrelia mayonii*.

How is Lyme disease transmitted?

The Lyme disease is transmitted through the bite of infected ticks. The blacklegged tick (or deer tick, *Ixodes scapularis*) spreads the disease in the northeastern, mid-Atlantic, and north-central United States. The western blacklegged tick (*Ixodes pacificus*) spreads the disease on the Pacific Coast.

Most humans are infected through the bites of immature ticks called nymphs. Nymphs are tiny (less than 2 mm) and difficult to see; they feed during the spring and summer months. Adult *Ixodes* ticks, most active during the cooler months of the year, can also transmit Lyme disease bacteria; however, they are much larger and more easily discovered and removed before transmitting the bacteria. Ticks can attach to any part of the human body but often cling to hard-to-see areas, such as the groin, armpits, and scalp. In most cases, the tick must be attached for 36 to 48 hours or more before the Lyme disease bacterium can be transmitted.

What are the signs and symptoms of Lyme disease?

Untreated Lyme disease can produce a wide range of symptoms, depending on the stage of infection. These include fever, rash, facial paralysis, and arthritis.

Early signs and symptoms (3 to 30 days after tick bite) include: Fever, chills, headache, fatigue, muscle and joint aches, or swollen lymph nodes.

An Erythema migrans (EM) rash:

- Occurs in approximately 70% to 80% of infected persons.
- Begins at the site of a tick bite after a delay of 3 to 32 days (average of 7 days).
- May appear on any area of the body.

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- May feel warm to the touch but is rarely itchy or painful.
- Expands gradually over a period of days reaching up to 12 inches or more across.
- Sometimes clears as it enlarges, resulting in a target or bull's-eye appearance.

Late clinical manifestations (LM) (days to months after a tick bite) include:

- Severe headaches and neck stiffness
- Additional EM rashes on other areas of the body
- Arthritis with severe joint pain and swelling, particularly the knees and other large joints
- Facial palsy
- Intermittent pain in tendons, muscles, joints, and bones
- Heart palpitations or an irregular heartbeat
- Episodes of dizziness or shortness of breath
- Inflammation of the brain and spinal cord
- Nerve pain
- Shooting pain, numbness, or tingling of hands or feet
- Problems with short-term memory

How is Lyme disease diagnosed?

Lyme disease is diagnosed based on signs and symptoms, a history of possible exposure to infected blacklegged ticks, and 2-tiered serologic testing. First, an enzyme immunoassay (EIA) or immunofluorescence assay (IFA) is used. If the first test is negative, then no further testing of the specimen is recommended. If the first test is positive, indeterminate, or equivocal, then a second EIA or a western immunoblot assay is used. Results are positive if both the first and second test are positive. Key points to remember include:

- Most Lyme disease tests are designed to detect antibodies made by the body in response to infection.
- Antibodies can take several weeks to develop, so patients may test negative if infected only recently.
- Antibodies normally persist in the blood for months or even years after the infection is gone; therefore, the test cannot be used to determine cure.
- Infection with other diseases, including some tickborne diseases or some viral, bacterial, or autoimmune diseases, can result in false positive test results.
- Some tests give results for two types of antibodies: IgM and IgG. Positive IgM results should be disregarded if the patient has been ill for more than 30 days.

How is Lyme disease treated?

Early diagnosis and proper antibiotic treatment can help prevent late clinical manifestations of Lyme disease. Patients treated with appropriate antibiotics in the early stages of Lyme disease usually recover rapidly and completely. Consult an infectious disease specialist regarding individual patient treatment decisions.

There are treatment regimens for the following four manifestations of Lyme disease:

- Erythema migrans (EM) rash: The most common manifestation of early Lyme disease may include doxycycline, amoxicillin, or cefuroxime.
- Neurologic Lyme disease: Facial palsy is treated with oral antibiotics. Lyme meningitis or radiculoneuritis can be treated with oral or intravenous antibiotics, depending on severity.
- Lyme carditis: "heart block" can be treated with oral or intravenous (IV) antibiotics, depending on severity.

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- Lyme arthritis: Inflammation of the joints should be treated with a 4-week course of oral antibiotics: doxycycline, amoxicillin, or cefuroxime. Persistent joint inflammation and pain may require a second course of antibiotics, and in some cases, joint swelling and pain persist or recur.

How can Lyme disease be prevented?

Tick exposure can occur year-round but are most active during warmer months.

- Avoid direct contact with ticks in wooded and bushy areas with tall grass.
- Treat clothing and gear with products containing 0.5% permethrin or clothing can be sent for treatment to specific facilities that provide such service.
- Use U.S. Environmental Protection Agency (EPA)-registered insect repellents external icon containing DEET, picaridin, IR3535, Oil of Lemon Eucalyptus (OLE), para-menthane-diol (PMD), or 2-undecanone.
- Check clothing for ticks. Tumble dry clothes in a dryer on high heat for 10 minutes.
- Check gear and pets for ticks.
- Check entire body for ticks, to include in and around the hair, ears, under arms, inside belly button, around waist, between legs, and behind knees.
- Shower within 2 hours of possible contact with ticks.

How can a tick be removed from the skin?

Several tick removal devices are commercially available. A fine-tipped tweezer can effectively remove a tick.

1. Use a clean, fine-tipped tweezers to grasp the tick as close to the skin's surface as possible.
2. Pull upward with steady, even pressure. Do not twist or jerk the tick which can cause the mouthparts to break off and remain in the skin. If this happens, remove the mouthparts with tweezers. If the mouth cannot be removed easily with tweezers, leave it alone and let the skin heal.
3. After removing the tick, thoroughly clean the bite area and hands with rubbing alcohol, or soap and water.

Dispose of a live tick by submersing it in alcohol, placing it in a sealed bag/container, wrapping it tightly in tape, or flushing it down the toilet. Never crush a tick.

Visualization of this process can be found at: <https://www.cdc.gov/lyme/removal/index.html>.

What is the human tick test kit program?

MiiTICK is a free tick testing and identification service available for ticks removed from Department of Defense (DoD) personnel and their dependents. For more information about services provided, including identifying tick species; assessed for how long the tick has been attached; and testing the tick for human pathogens, and contact information, go to:

<https://ph.health.mil/topics/envirohealth/epm/Pages/HumanTickTestKitProgram.aspx>.

What are some public health considerations?

- Document the circumstances under which the case patient was exposed, including duty exposure, occupational activities, environmental exposures, or other high-risk activities.

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