



Lyme disease: A backgrounder for clinicians

What causes Lyme Disease?

Lyme disease is caused by a bacterial infection transmitted by ticks, specifically Blacklegged Ticks (or Deer Ticks) of the *Ixodes* genus. These ticks acquire the bacteria, known as *Borrelia burgdorferi*, by feeding on infected wild animals like mice. The bacteria can then be transmitted to humans through tick bites, typically after the tick has been attached for at least 36 hours.

Symptoms of Lyme disease

Acute symptoms

The early (acute stage) symptoms of the disease are flu-like symptoms, including severe fatigue, fever, muscle aches, and headache, which are often accompanied by a characteristic “bull’s eye” rash. Many patients with Lyme, however, never experience a rash, and only about 9% of Lyme rashes have the bull's eye shape. The absence of a rash does not rule out Lyme disease.

There is considerable variation in the appearance of the rash. The stereotypical bulls eye rash (erythema migrans) is a red rash that is not raised or bumpy, although the bite itself may be raised. Over the course of several days, the rash expands at the edges as the bacteria migrate outwards through the skin, typically reaching a diameter of at least 2 inches (5cm). The center of the rash may fade, resulting in the bulls eye shape.

Chronic symptoms

If Lyme Disease is not treated at the acute phase, it may progress to a chronic phase characterized by a wide range of autoimmune symptoms in tissues and locations throughout the body. These symptoms may include

- rheumatoid arthritis
- neurological symptoms (neuroborreliosis) involving the peripheral or central nervous system
- cardiovascular inflammation (endocarditis, myocarditis and pericarditis)
- skin disorders (acrodermatitis chronica atrophicans)
- abnormal levels of B-cells in the blood (borrelial lymphocytoma)

Diagnosis

Tick removal and identification:

Any attached ticks should be removed using fine-tipped forceps, using gentle, steady force. Pull gently and steadily upwards. The tick will often resist for a few seconds before releasing its grip. After removal, examine the tick under magnification to determine if the mouth parts are intact.

- Do not squeeze the body of the tick.
- Do not twist or pull the tick suddenly. The head may be torn off and remain in the skin.
- Do not use irritating chemicals, petroleum jelly, or other substances to induce the tick to release its grip.

If the tick is available for examination, an attempt should be made to determine if it is a black-legged tick, since this is the only species capable of spreading Lyme disease. Ticks that have not fed recently are relatively flat, but their body can expand considerably when they are engorged with blood from a host.

When should ticks be tested for Lyme Disease?

Testing of ticks for the presence of *Borrelia* is not a reliable way of predicting the risk of infection in a patient. Ticks may carry the bacteria but not pass it on when they bite, and tests may not reliably detect the bacteria in ticks, even if it is present at levels that can cause disease. While current guidelines do not recommend testing of ticks, it is still commonly practiced. Therefore, if testing is performed, one must not use a negative test result to rule out the possibility of Lyme disease.

When should patients be tested for Lyme disease?

Laboratory testing of asymptomatic patients, or immediately following a tick bite, is not recommended, however, these patients should be monitored for symptoms. Clinical diagnosis is usually sufficient for patients with the classic bulls-eye erythema migrans rash. Patients with rashes that do not conform to the typical bulls-eye shape, however, should undergo serum antibody testing.

Patients in whom chronic Lyme symptoms, such as arthritis, neuroborreliosis, or Lyme carditis are suspected should receive serum antibody testing. Additionally, patients exhibiting chronic Lyme symptoms such as arthritis, neuroborreliosis, or Lyme carditis should undergo serum antibody testing. antibody testing of cerebrospinal fluid (CSF) may be performed for patients with neuroborreliosis, accompanied by serum antibody testing, and the CSF-serum antibody index should be calculated. PCR or culture of patient specimens is not recommended for patients with chronic symptoms, or indeed for any patient suspected of having Lyme disease.

Treatment

Prophylactic antibiotic treatment

Prophylactic antibiotic treatment of asymptomatic patients is only recommended for tick bites that meet the following criteria:

- A. The bite occurred in an area where lyme disease known to be endemic
- B. The bite was caused by a black legged ticks or other ticks in the genus *Ixodes*
- C. The tick was attached for more than 36 hours.

The recommended Prophylactic antibiotic regimen for adults is a single oral 200 mg dose of Doxycycline. For children, the recommended dose is 4.4 mg/kg for children, up to a maximum dose of 200 mg.

Antibiotic treatment

In the acute stage, a 10-day course of doxycycline or a 14-day course of amoxicillin or cefuroxime axetil is recommended. Patients who cannot take these antibiotics may be given a 7-day course of Azithromycin.

Lyme arthritis is treated with a 28-day course of oral antibiotics, and if symptoms persist, a second course of oral or intravenous antibiotics should be administered. Recommended antibiotics include doxycycline, amoxicillin, cefuroxime axetil, or azithromycin. If symptoms persist, a second course of oral or intravenous antibiotics may be administered. This second course of antibiotics may consist of either oral antibiotics administered for up to 1 month, or a 2-4 week course of intravenous ceftriaxone. If symptoms are still not resolved, the patient should be referred to a rheumatologist.

Patients with acute neuroborreliosis symptoms such as Lyme-associated meningitis, neuropathy, or other peripheral nervous system symptoms should be treated with either a 14 -21 day course of oral doxycycline or intravenous ceftriaxone, cefotaxime, or penicillin G, depending on individual patient considerations. For patients with neuroborreliosis involving the central nervous system (ie, the parenchymal tissues of the brain and/or spinal cord), IV antibiotics are preferred, rather than oral antibiotics.

For outpatients with cardiac Lyme disease symptoms such as myocarditis or endocarditis, it is recommended that oral antibiotics such as doxycycline, amoxicillin, cefuroxime axetil, or azithromycin be administered. IV antibiotics may be more appropriate for hospitalized patients. The recommended regimen for either is 14-21 days, and there is no evidence to support the use of longer courses.