

Lyme Disease

Lyme disease is caused by the spirochete *Borrelia burgdorferi*, which is usually transmitted to people by deer ticks.

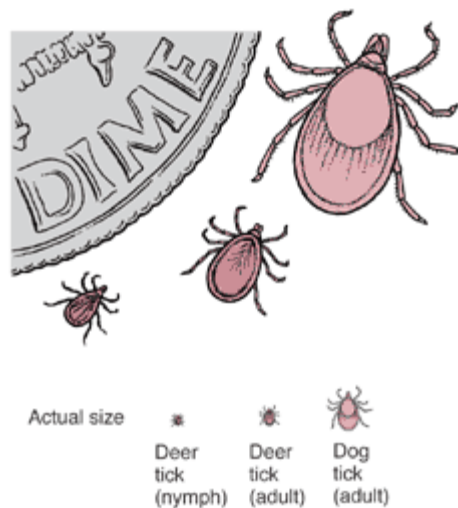
Lyme disease was recognized and named in 1975 when a cluster of cases occurred in Lyme, Connecticut. It is now the most common insect-borne infection in the United States, occurring in 47 states. About 80% of the cases in the United States occur along the northeastern coast from Massachusetts to Maryland. Most of the remaining reported cases are from Wisconsin, Minnesota, and the coastal regions of northern California and Oregon. Lyme disease also occurs in Europe and has been reported in China, Japan, Australia, and the former Soviet Union.

Usually, Lyme disease occurs in the summer and early fall. Children and young adults who live in wooded areas are most often infected.

The bacteria that cause Lyme disease are transmitted by the deer tick (*Ixodes*), so named because the adult ticks often feed on the blood of deer. The young forms of these ticks (nymphs) feed on the blood of rodents, particularly the white-footed mouse, which is a carrier of Lyme disease bacteria. Deer do not carry or transmit Lyme disease bacteria—they are simply another food source for the adult ticks.

Preventing Tick Bites

People can reduce their chances of picking up a tick by staying on paths and trails when walking in wooded areas and by not sitting on the ground or on stone walls. Wearing light-colored clothing makes ticks crawling on clothing easier to see. Applying an insecticide containing diethyltoluamide (DEET) to the skin and one containing permethrin to clothing may help protect against tick bites. People who may have been exposed to ticks should inspect their whole body for ticks daily. Deer ticks, which



transmit Lyme disease, are very small, much smaller than dog ticks. So people should check the whole body very carefully, especially hairy areas. Inspection is effective because ticks must be attached for more than a day to transmit Lyme disease.

To remove a tick, a person should use fine-pointed tweezers to grasp the tick by the head or mouthparts right where they enter the skin and should pull the tick straight off. The tick's body should not be grasped or squeezed. Petroleum jelly, alcohol, lit matches, or any other irritants should not be used.

The bacteria that cause Lyme disease are transmitted to people when an infected tick bites and stays attached for one or two days. Brief periods of attachment rarely transmit disease. At first, the bacteria multiply at the site of the tick bite. After 3 to 32 days, the bacteria migrate from the site of the bite into the surrounding skin and also spread through the blood to other organs or sites in the skin.

Symptoms

Lyme disease has three stages: early-localized, early-disseminated (widespread), and late. The early and late stages are usually separated by a period without symptoms.

The early-localized stage typically begins with a large, red spot at the site of the bite, usually on the thigh, buttock, trunk, or armpit. The spot (erythema migrans) typically expands to a diameter of 6 inches (15 centimeters), often with a central clearing (bull's eye). Although erythema migrans does not itch or hurt, it may be warm to the touch. About 25% of infected people never develop—or at least never notice—any red spot.



The symptoms of early-disseminated Lyme disease begin when the bacteria spread through the body from the initial bite area. In this stage, many people feel ill with fatigue, chills and fever, headaches, stiff neck, and aches in muscles and joints. Nearly half develop more, usually smaller, erythema migrans spots on other parts of the body. Less common symptoms include backache, nausea and vomiting, sore throat, swollen lymph nodes, and an enlarged spleen. Although most symptoms may come and go, feelings of illness and fatigue may persist for weeks. These symptoms are often mistaken for influenza or common viral infections, especially if erythema migrans is not present.

Sometimes symptoms that are more serious develop in the early-disseminated stage. Overall, abnormalities of nerve function develop in about 15% of people. The most common problems are headache, stiff neck, involvement of the tissues covering the brain and spinal cord (aseptic meningitis), and weakness on one side of the face (Bell's palsy); these may persist months before disappearing. Nerve pain and weakness may develop in other areas and persist longer. Irregular heartbeats (arrhythmias) and inflammation of the sac around the heart (pericarditis) that causes chest pain develop in 8% of infected people.

In untreated Lyme disease, the late stage begins months to years after the initial infection. Arthritis develops in about half of the people with late-stage Lyme disease. Episodes of swelling and pain in a few large joints, especially the knee, typically recur for several years. The knees are commonly more swollen than painful, often hot to the touch, and, in rare instances, red. Cysts may develop and rupture behind the knee, suddenly increasing the pain. About 10% of people with Lyme arthritis develop persistent knee problems. A smaller number of people develop neurologic abnormalities, including problems with mood, speech, memory, and sleep. Sometimes people who develop neurologic abnormalities have numbness or shooting pains in the back, legs, and arms.

Diagnosis

Cultures are not helpful because *Borrelia burgdorferi* is very difficult to grow in the laboratory. The most commonly used tests measure antibodies to the bacterium in the blood. However, antibody tests alone are not adequate because they are often negative in the early stages of Lyme disease and are sometimes positive in people who do not have the disease. Accordingly, the diagnosis depends on both test results and the presence of typical symptoms in a person who lives in (or has visited) an area where Lyme disease is common.

The lack of a definitive test for Lyme disease causes some difficulties. In areas where Lyme disease is common, many people who have painful joints, have trouble concentrating, or are always tired (chronic fatigue) often become concerned that they have late-stage Lyme disease, even though they never had a rash or any other symptoms of early-stage Lyme disease. Few of these people actually have Lyme disease; most of the time their symptoms are caused by other conditions. In people who never had symptoms of early-stage Lyme disease, the tests for Lyme antibodies are not reliable enough to make an accurate diagnosis. If a doctor makes the diagnosis based solely on the results of antibody tests, many people who do not have Lyme disease will be diagnosed with it. This typically leads to long and fruitless courses of antibiotic therapy.

Treatment

Most doctors do not give antibiotics to people who were simply bitten by ticks but have no rash or other symptoms. Sometimes an exception is made if the person lives in an area endemic for Lyme disease and the tick was engorged (indicating long attachment).

Although all stages of Lyme disease respond to antibiotics, early treatment is the most effective in helping to prevent complications. Antibiotics such as doxycycline

Some Trade Names
VIBRAMYCIN

, amoxicillin

Some Trade Names
AMOXIL

POLYMOX

TRIMOX

, penicillin, or erythromycin

Some Trade Names
E-MYCIN

ERYTHROCIN

ILOSONE

may be taken by mouth and are effective in the early stages of the disease.

Antibiotics are given intravenously for severe neurologic disease. Treatment is given for 3 to 4 weeks.

Antibiotics eradicate the bacteria in late-stage disease, and in most people this relieves the arthritis. However, a few people have persistent arthritis even after all the bacteria are gone because of continued inflammation. Nonsteroidal anti-

inflammatory drugs (NSAIDs), such as aspirinSome Trade Names

ECOTRIN

ASPERGUM

or ibuprofenSome Trade Names

ADVIL

MOTRIN

NUPRIN

, may relieve the pain of swollen joints. Fluid that collects in affected joints may be drained. The use of crutches may be helpful.

A vaccine against Lyme disease was available but was removed from the market.