



How prevalent is lyme disease?

With an annual incidence rate of 300,000, lyme disease¹ is the most frequently reported arthropod-borne infection in the United States. Lyme occurs in all states and at least 20 countries.

What is the risk of lyme disease in Washington State?

There are fewer than 20 cases of lyme disease reported in Washington each year, and most people are exposed outside Washington. Most of the cases acquired in Washington are exposed outdoors in counties west of the Cascade Mountains, or in the Cascade foothills, where Western blacklegged ticks and their deer and rodent hosts live. But the number of actual cases is unknown because of imprecise surveillance, misclassification, underreporting, poor testing, and incomplete clinical information.

What are early and late symptoms of lyme disease?

Early symptoms, between 0-6 months from infection, include fever, headache, fatigue, skin rash, or general flu-like symptoms.

Late symptoms usually appear after six months, but can occur as early as 28 days, and involve the joints, heart, and nervous system.

Late symptoms of lyme disease can include sore throat, swollen glands, low-grade fever, night sweats, fatigue, joint pain, arthritis, abdominal pain, nausea, diarrhea, headaches, eye pain, blurred vision, ringing in the ears, vertigo, dizziness, sleep disturbance, memory loss, irritability, and depression. Symptoms tend to vary in individuals and change in severity over time.

What is the treatment for lyme disease?

Effective treatment depends on a partnership between physician and patient. Lyme patients may work with family practice, infectious disease, and naturopathic physicians. Early treatment is important; if lyme disease is treated within 28 days of infection, a 28-day course of antibiotics may be sufficient.

However, many patients have found lyme to be difficult to treat, requiring long-term antibiotics, supplements, and various alternative treatments. Local lyme disease patient groups are good sources of information and support.



White-footed mouse, Nick Saunders, ©2014 nicksaundersnature.com.

What is the life cycle of the ticks that carry lyme disease?

The two-year tick life cycle occurs in three stages:

1. Larva (immature): Blood meal activities peak in mid August.
2. Nymph (immature): Blood meal activities peak in late June; this stage is primarily responsible for transmitting pathogens to humans.
3. Adult (mature): Blood meal activities peak in late October. Adults stay engorged on a host all winter and deposit an egg mass the following spring.

At each stage, the tick takes a single blood meal from a vertebrate host to fuel transition to the next stage, or, in adults, to fuel reproduction. During a blood meal, the tick stays attached to the host's skin for several days to a week. Between blood meals, ticks live on the forest floor.

Which species are the wildlife reservoirs for ticks?

Ticks seek hosts that emit carbon dioxide and infrared radiation. The most efficient wildlife reservoirs are white-footed mice, eastern chipmunks, shrews, American robins, and, possibly, raccoons. These species share a favorable response to human-caused disturbances, a tendency to favor low-diversity habitats, and an adaptive immune system.

White-footed mice are the preferred host of immature blacklegged ticks.

How does the natural world regulate the spread of lyme disease?

Several characteristics of natural habitats affect the prevalence of lyme disease:

Biodiversity: High vertebrate biodiversity protects humans from lyme infection. The arrangement and interactions of species is a better indicator of biodiversity than merely a higher number of species.

Climate: Blacklegged ticks thrive in the temperature range of 14 – 89.6°F and less than 90% humidity. Warmer than average temperatures can disrupt the tick life cycle so that blood meal activities occur early, late, or not at all.

Habitat: Blacklegged ticks live in low-elevation coastal sites and colder climates, moist deciduous forests with shrub under-stories, and forest-edges.

Food Webs: A close look at food webs can help predict an increase in lyme infection. For example, the population of white-footed mice and eastern chipmunks increases when there are lots of acorns. Larger populations of these hosts may result in increased lyme infection in humans.

Another food web tied to lyme infection is rodent-bird populations; a high rodent population when the bird population is low results in high lyme risk the next year. Low rodent and bird populations result in low lyme risk the next year.

A gypsy moth outbreak can regulate lyme transmission. Since mice eat gypsy moths, a low mouse population will lead to a large gypsy moth outbreak the following year. Gypsy moths defoliate oak trees and reduce shade, so the forest floor becomes hotter and drier, decreasing the number of ticks.



Adult Deer Tick, public domain image.



American robin in nest with chick and worm, William H. Majoros, Wikimedia Commons.

Where to Learn More

- **Cary Institute of Ecosystem Studies:** <http://www.caryinstitute.org/science-program/research-projects/lyme-disease>
- **Centers for Disease Control and Prevention:** <http://www.cdc.gov/lyme/>
- **International Lyme And Associated Diseases Society:** <http://ilads.org/>
- **Infectious Diseases Society of America:** <http://www.idsociety.org/>
- **Columbia University Medical Center Lyme and Tick-Borne Diseases Research Center:** <http://columbia-lyme.org/>
- **Lyme Disease Patient Group:** <http://lymedisease.org/>
- **National Institute of Allergy and Infectious Diseases:** www.niaid.nih.gov/topics/lymeDisease/Pages/lymeDisease.aspx
- **Documentary Film about Lyme Disease:** <http://underourskin.com/>

¹ We use a lowercase spelling of “lyme” throughout this fact sheet to indicate that sufferers may be dealing with multiple pathogens and co-infections. We also wish to remove the reference to a geographical place (Lyme, CT) since lyme disease occurs throughout the U.S. and the world.