

# Lyme disease in Canada

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Lyme disease is an infection caused by the spirochete bacterium *Borrelia burgdorferi*, and spread by the blacklegged tick, also known as the deer tick. The disease has been reported in the United States, Europe, China, Japan, and the former Soviet Union.<sup>1</sup> In Canada, where reporting is voluntary, the total number of cases reported to the Public Health Agency of Canada (PHAC) from 1994 to 2004 was 345, with a high of 54 cases in the year 2000.<sup>2</sup>

Lyme-bearing ticks are endemic in a small number of regions across Canada, including Long Point, Point Pelee National Park, and Rondeau Provincial Park in Ontario; the Fraser Valley, Okanagan Valley, and parts of Vancouver Island in British

Columbia; and Lunenburg in Nova Scotia. A possible new site was identified in the fall of 2005 in Bedford, NS. There were also 3 cases of Lyme disease diagnosed in southeastern Manitoba in 2005, but it was suspected that the ticks had been brought in on migratory birds rather than being from newly established populations.<sup>2-5</sup>

One study of climate change suggests that warming trends will favour a northern range expansion of the main Lyme disease vector in Canada, *Ixodes scapularis* (in BC, the vector is the western blacklegged tick, *I. pacificus*). More significantly, PHAC scientists have discovered that there are more endemic areas of blacklegged ticks than previously known, and ticks could, in theory, be

transported anywhere in Canada by migratory birds.<sup>6</sup> However, not all ticks are infected with the Lyme disease bacterium. The highest infection rate is among the tick population in Long Point, where 50% to 60% test positive, while in Point Pelee, the rate is 5%.

## Symptoms

The symptoms of Lyme disease are often described in 3 stages, although not all patients have symptoms of each stage. If contracted during pregnancy, adverse effects, including

### How Lyme disease is spread

*Borrelia burgdorferi* normally lives in mice, squirrels, and other small animals. When a young tick feeds on an infected animal, the bacterium is ingested along with the blood.<sup>7</sup> The infected nymph or adult tick crawls (it does not fly or jump) from this host onto another animal, such as a mouse, deer, bird, or human.<sup>8</sup> If the tick bites, it can potentially infect the animal with the *B. burgdorferi* spirochete. A tick may feed for up to 3 days, and disease transmission appears to take 12 to 24 hours.<sup>3,9</sup> The tick's bite is painless, so only about half the people with Lyme disease recall being bitten.<sup>10</sup> Infected humans cannot pass the spirochete to other humans by any means, including infected blood or urine or sexual contact.<sup>10</sup> Pets can, however, carry infected ticks into their owner's home or yard.



A bite from a deer tick (left) can lead to such symptoms of Lyme disease as a bull's eye rash, which affects about 80% of those infected.

stillbirth, can occur, although other fatalities from Lyme disease are rare.

#### *First stage*

During this stage of infection, patients often experience the following symptoms:<sup>3,6,11-13</sup>

- **Rash:** A small, red bump may appear within a few days at the site of the tick bite. It may be warm to the touch and mildly tender. Over the next few days, the redness expands, forming a rash that resembles a bull's-eye, with a red ring surrounding a clear area and a red centre. The rash, erythema migrans (EM), is at least 5 cm in size and is one of the hallmarks of Lyme disease, affecting about 80% of infected people.
- **Flu-like symptoms:** These include fever (100 to 103°F), chills, fatigue, body aches, and headache (usually in the back of the head).
- **Migratory joint pain:** If the infection remains untreated, bouts of severe joint pain and swelling may develop for several weeks to months. The knees and other large joints are especially affected, but the pain can shift from one joint to another.

#### *Second stage*

The second stage of the disease lasts up to several months, with possible symptoms including the following:

- **Rash:** Up to 3 to 6 weeks later, multiple but smaller EM rashes can occur.<sup>3</sup>
- **Arthritis and arthritic symptoms:** In 60% of untreated patients, an inflammatory arthritis develops, typically affecting a large joint such as the knee. Arthritic attacks, lasting days to weeks, may recur over several years.<sup>9</sup>
- **Neurological problems:** In some cases, inflamma-

tion of the membranes surrounding the brain (meningitis), temporary paralysis of one side of the face (Bell's palsy), numbness or weakness in the limbs, or poor muscle movement may occur weeks, months, or even years after an untreated infection.<sup>3</sup>

- **Less common signs and symptoms:** Some people may experience cardiac problems. The most common is an atrioventricular block (second or third degree).<sup>9</sup> Other cardiac manifestations may include acute myopericarditis, left ventricular dysfunction, and cardiomegaly. Although most cardiac symptoms tend to be brief, lasting 3 days to 6 weeks, and rarely lead to residual dysfunction, increasing evidence suggests that Lyme disease carditis may be of long duration and lead to permanent heart damage.<sup>9</sup> Ophthalmologic manifestations in the early stage may include conjunctivitis, iritis, and uveitis, while in late-stage illness optic neuritis and optic atrophy may occur.<sup>3,9</sup>

#### *Third stage*

This stage of the disease can last months to years, with possible symptoms including:<sup>2,9</sup>

- Ongoing symptoms of arthritis
- Polyneuropathy, with profound fatigue and sensory loss
- Mild to severe encephalopathy, characterized by subtle disturbances in mood, memory, and sleep

Lyme disease can also mimic a wide variety of conditions, including multiple sclerosis, rheumatoid arthritis, Parkinson's, lupus, amyotrophic lateral sclerosis, as well as psychiatric illnesses.

#### **Diagnosis**

Lyme disease can be difficult to diagnose. Its variable symptoms mimic other conditions, including

viral infection, various joint disorders, muscle pain (fibromyalgia), and chronic fatigue syndrome. What's more, the ticks that transmit Lyme disease can spread other, similar diseases at the same time, such as human granulocytic ehrlichiosis (HGE) or babesiosis.<sup>3,10</sup>

The diagnosis of Lyme disease should be made after evaluation of a patient's symptoms and the risk of exposure to infected ticks. Blood tests may be used in conjunction with clinical diagnosis to demonstrate the presence of antibodies to the bacterium.<sup>1,6,12</sup> The PHAC recommends the two-tiered approach for blood testing (i.e., screening blood samples with one test and continuing testing only on samples that test positive) and cautions against the use of invalidated tests or the interpretation of results without appropriate guidelines. Blood tests may be negative in patients with early Lyme disease or in patients who have received antibiotic treatment. However, the accuracy of blood tests for patients with later stages of Lyme disease approaches 100%.<sup>2</sup> The recommended tests are the following:<sup>1,3,6</sup>

- **Enzyme-linked immunosorbent assay (ELISA):** The test used most often to check for Lyme disease, ELISA detects antibodies to *B. burgdorferi*. Because it can sometimes provide false-positive results, it is not used as the sole basis for diagnosis.
- **Western blot:** If the ELISA test is positive, a Western blot is usually performed to confirm the diagnosis. The Western blot detects antibodies to several proteins of *B. burgdorferi*.

## Treatment

Lyme disease is more effectively treated if diagnosed early in the course of illness. Most cases of Lyme disease can be cured with 2 to 4 weeks of oral doxycycline, amoxicillin, or cefuroxime.<sup>6,11,13</sup> Persons with certain neurological or cardiac forms of illness may require intravenous treatment with penicillin or ceftriaxone. Patients diagnosed in the later stages of disease may have persistent or recurrent symptoms requiring a longer course of antibiotic treatment. Treatment failure has been reported, requiring patients be retreated; the risk of treatment failure is greater in patients with long-term Lyme infection.<sup>3,6,10</sup>

### *Preventive antibiotics after a tick bite*<sup>10,13</sup>

In general, the risk of developing Lyme disease after being bitten by a tick ranges from only 1.1% to 3.4%; therefore, it has not been recommended that people bitten by deer ticks routinely receive prophylactic antibiotics. Nevertheless, a study in 2001

reported that a single 200 mg dose of doxycycline given within 72 hours of the tick bite was effective in preventing disease (87% protection). If 72 hours have passed, waiting for symptoms and then initiating treatment at that point is very effective and cures nearly all cases. Previous studies have found no benefits from taking a long course of antibiotics (10 to 14 days) for prevention.

### *Treating early-stage Lyme disease*<sup>1,3,6,10,13</sup>

- Doxycycline (100 mg bid) is the standard antibiotic for any patient over 8 years old (except pregnant women).
- Amoxicillin is the alternative for young children (50 mg/kg/day in 3 divided doses) and is the first choice for pregnant women (500 mg tid).
- Cefuroxime, erythromycin, azithromycin, or clarithromycin are used if none of the above agents are appropriate.

Effective treatment has been reported with therapy ranging from 10 to 21 days' duration.

### *Treating late-stage Lyme disease*<sup>3,10,13</sup>

Treatment for 2 to 4 weeks with either oral doxycycline or intravenous ceftriaxone or penicillin G has been successful.

### *Alternative therapies*

Some individuals use vitamin B complex, omega-3 and omega-6 fatty acids (found in primrose oil and fish oils), and magnesium supplements to help relieve symptoms. No evidence exists on their benefits. Newsletters and Internet sites have cropped up in recent years promoting untested treatments to long-term sufferers of Lyme disease who are frustrated with traditional medical channels. Most remedies are ineffective, and some are dangerous. Any such therapies should be discussed with a physician or pharmacist.

## Precautions

In areas where ticks are found, individuals should be aware of the risk of Lyme disease and should take appropriate precautions.<sup>3,6,11,14</sup>

- Find out from your local public health office if there are blacklegged ticks in your area.
- Wear protective clothing to limit exposed skin. This includes a long-sleeved shirt that fits tightly around the wrist and long-legged pants tucked into socks or boots.
- Insect repellents containing DEET can effectively repel ticks and can be applied to clothing as well as exposed skin. Choose the concentration based on the hours of protection you need — a 10% concentration is effective for about 2 hours,

# Insect repellents containing DEET can effectively repel ticks and can be applied to clothing as well as exposed skin

while higher concentrations last longer. Do not use DEET on the hands of young children or on infants under 6 months of age. According to the Centers for Disease Control, oil of lemon eucalyptus offers the same protection as DEET when used in similar concentrations.

- Check for ticks on clothing or attached to your skin after being in tick-infested areas. A total body inspection and prompt removal of attached ticks (i.e., within 18 to 24 hours) can reduce the risk of infection.
- Carefully remove an attached tick using tweezers. Grasp the tick's head and mouth parts as close to the skin as possible and pull slowly until the tick is removed. Do not twist or rotate the tick and try not to damage the tick (i.e., squash or crush it)

during removal.

- After removing the tick, wash the site of attachment with soap and water or disinfect it with alcohol or household disinfectant. If an EM rash appears, you are encouraged to photograph the lesion alongside a ruler to indicate the size of the rash. The photograph can then be shown to a physician.
- Contact a doctor immediately if you develop symptoms of Lyme disease, especially if you have been in an area where blacklegged ticks are found.

In February 2002, distribution of a Lyme disease vaccine (LYMERix) was halted because of concerns about its safety and effectiveness. Research is underway to find a better vaccine against *B. burgdorferi*.<sup>3</sup> ■

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