Lyme Disease (Lyme Borreliosis)

Manitoba Health
Public Health
Communicable Disease Control Unit

Case Definition

The following are surveillance definitions and not intended to guide clinical management.

Confirmed Case: One of the following:

1. Isolation of *Borrelia burgdorferi* from tissue or body fluid, generally blood (currently this testing is undertaken principally at the Canadian Science Centre for Human and Animal Health in Winnipeg).
2. History of exposure in an endemic area (see note below) and **either** of the following:
   a) Erythema migrans observed by a physician.
   b) At least one clinically compatible late manifestation of Lyme disease **and** laboratory evidence of *Borrelia burgdorferi* infection (i.e., positive ELISA and Western blot, see below under Diagnosis).
3. No history of exposure in an endemic area and **both** of the following:
   a) Erythema migrans observed by a physician.
   b) Laboratory evidence of *Borrelia burgdorferi* infection (i.e., positive ELISA and Western blot, see below under Diagnosis).

Probable Case: One of the following:

1. History of exposure in an endemic area and physician recognition of erythema migrans as reported by the patient.
2. No history of exposure in an endemic area and **both** of the following:
   a) At least one clinically compatible late manifestation of Lyme disease.
   b) Laboratory evidence of *Borrelia burgdorferi* infection.

Exposure in an endemic area
This includes living in or visiting an endemic area. Such exposure should have occurred no more than 30 days prior to the onset of erythema migrans or no more than one year before the onset of late manifestations. A history of a tick bite is **NOT** required.

An endemic area is one in which the risk of transmission of Lyme disease to humans is supported by either the presence of an established vector population known to be infected with *Borrelia burgdorferi* or the occurrence of at least three confirmed human cases, with adequate histories, for whom there are no histories of exposure in previously identified endemic areas. There is no time limit in which cases must occur or infected vectors be identified for an area to be declared endemic. The geographic limits of the endemic area will be defined by health authorities. Currently Manitoba is not considered an endemic area for Lyme disease, but research on the vector population is ongoing.

Reporting Requirements

- All cases of positive serology or other positive laboratory tests are reportable by laboratory.
- All clinical cases are reportable by the attending health care professional.

Clinical Presentation/Natural History

This tickborne, spirochetal, zoonotic disease is characterized by a distinctive skin lesion, systemic symptoms and neurologic, rheumatologic and cardiac involvement, occurring in varying combinations, over a period of months to years.

Early Localized Symptoms
Early symptoms may be intermittent and changing. The illness typically begins in the summer and the first manifestation in about 60% of patients appears as a red macule or papule at the site of the tick bite that expands slowly in an annular manner, with central clearing. It should be at least 5 cm in diameter. This distinctive skin lesion is called erythema migrans (EM). EM lesions can vary greatly in size and shape and may have vesicular or necrotic areas in the centre, or only partial central clearing. The lesion generally occurs within 30 days of exposure. Annular erythematous lesions occurring within 48 hours of a tick bite may represent hypersensitivity reactions and not represent EM. With or without EM, early systemic manifestations may include malaise, fatigue, fever, headache, stiff neck, myalgia, migratory arthralgias and/or lymphadenopathy, possibly lasting several weeks or more in untreated persons.

Early Disseminated Disease
The most common manifestation of early disseminated disease is multiple erythema migrans. This rash usually occurs three to five weeks after the tick bite with secondary lesions similar to but smaller than the primary lesion. These lesions reflect spirochetemia with dermal dissemination. Other common manifestations of early disseminated illness, which may occur with or without rash, are palsies of the cranial nerves (Bell's palsy), meningitis and conjunctivitis. Systemic symptoms such as arthralgia, myalgia, headache and fatigue are also possible in this stage.

Late Disease
Late disease is commonly characterized most by recurrent arthritis that usually affects the large joints, especially the knees. Chronic arthritis is uncommon in children who are treated with antimicrobial agents in the early stage of the disease. Arthritis may occur without a history of manifestations of earlier stages of illness (including EM). Central nervous system manifestations also occur in late disease (encephalopathology and neuropathy) as well as cardiac manifestations.

Etiology

The causative spirochete of North American Lyme disease, *Borrelia burgdorferi*, was identified in 1982.

Epidemiology

Reservoir: Certain ixodid ticks. In Canada, the primary vector tick is *Ixodes scapularis*.

Wild rodents (especially *Peromyscus spp*., commonly known as deer mice) and other animals maintain the enzootic transmission cycle. Deer serve as important mammalian hosts for the tick vectors. Larval and nymphal ticks feed on small mammals, while adult ticks feed primarily on deer.

Transmission: Tickborne. In experimental animals, transmission by *I. scapularis* does not occur until the tick has been attached for 24 hours or more. This is also thought to be true in humans.

Occurrence:

General: In the United States, endemic foci exist along the upper Atlantic coast, the upper Midwest and on the West Coast. Increasing recognition of the disease is redefining endemic areas. Cases have been reported from many states, southern Ontario, British Columbia and other provinces. Elsewhere, it has been found in Europe, the former Soviet Union, China and Japan.

Initial infection occurs primarily during spring and fall, particularly the latter, but may occur in other seasons, depending on the life cycle of the tick in different geographic areas. The distribution of cases coincides with the distribution of *Ixodes scapularis* ticks in Canada and the United States.

Reported cases in areas without known enzootic risks may be imported or may be misdiagnoses resulting from false-positive serologic test results or reliance on a clinical diagnosis.

Dogs, cattle and horses develop systemic disease that may include the articular and cardiac manifestations seen in human patients.

Manitoba: One case of Lyme disease consistent with the present surveillance case definition was reported in 1999. Several clinical cases have been reported and sporadic cases have likely occurred, but the incidence of Lyme disease is thought to be low. Since 1996, annual public campaigns of passive surveillance have been undertaken to identify the *Ixodes scapularis* tick vector. As of 1999, 131 ticks were identified, and *Borrelia burgdorferi* was isolated from 10.

Incubation Period: For EM, from three to 32 days after tick exposure. However, the early stages of the illness may be asymptomatic, with the person presenting with later manifestations.

Susceptibility and Resistance: All persons are probably susceptible. Reinfection has occurred in those treated with antibiotics for early disease.

Period of Communicability: No evidence of natural transmission from person-to-person. There are rare case reports of congenital transmission, but epidemiologic studies have not shown a link between maternal Lyme disease and adverse outcomes of pregnancy.

Diagnosis

Diagnosis is based on the clinical picture, coupled with serologic data and epidemiologic findings. Consultation with an infectious disease specialist is recommended as differential diagnosis among Lyme arthritis, encephalopathy or polyneuropathy and other syndromes such as chronic fatigue or fibromyalgia is difficult and the management differs significantly. Confusion can occur between non-infectious cutaneous reaction to tick bites and Lyme-associated EM.

Blood specimens should be sent for ELISA testing to the Cadham Provincial Laboratory, which will forward positive and borderline ELISA specimens to the Canadian Science Centre for Human and Animal Health laboratory in Winnipeg for confirmation using Western blot testing. If the result of Western blot testing is indeterminate, repeat testing is recommended. Antibody titres are not currently performed. Only specimens which are positive on both ELISA and Western blot are considered positive.

Serologic tests are insensitive during the first several weeks of infection and may remain negative in persons treated early with antibiotics. Test sensitivity increases when persons progress to later stages of the disease, but a small proportion of chronic Lyme disease patients remain seronegative. Cross-reacting antibodies may cause false-positive reactions on ELISA in persons with syphilis, HIV infection, infectious mononucleosis, lupus or rheumatoid arthritis. False positive ELISA and Western blot IgM tests can also occur for unknown reasons.

Key Investigations

- History of tick exposure
- History of travel to an endemic area
- History of EM-like rash or other typical symptoms

Control

Management of Cases:

- Investigation for source of infection and other potential cases.

Treatment:

- Early treatment is important to prevent complications. Failure to meet a surveillance case definition does not preclude treatment which should be initiated on the basis of clinical judgment. Consultation with an infectious disease specialist is recommended. Based on a suggestive clinical exam and history, treatment should be started prior to receipt of serologic test results or assessment by an infectious disease specialist.

Early Erythema Migrans	Early Disseminated Infection
Adults: • [1,2] Doxycycline 100 mg orally, bid for 2 weeks OR • [2] Amoxicillin 500 mg orally, tid for 2 weeks OR • [2] Cefuroxime axetil or erythromycin can be used in those allergic to penicillin or those who cannot take tetracyclines	**Adults:** • [1,2] Doxycycline 100 mg orally, bid for 3 weeks OR • [2] Amoxicillin 500 mg orally, tid for 3 weeks OR • [2] Cefuroxime axetil or erythromycin can be used in those allergic to penicillin or those who cannot take tetracyclines
Children: • [2] Amoxicillin 50 mg/kg/day in 3 divided doses for 2 weeks	**Children:** • [2] Amoxicillin 50 mg/kg/day in 3 divided doses for 2 weeks

1 Not safe in pregnant or lactating women, or children <9 years old.
2 Treatment failures may occasionally occur with any of these regimens. Decisions about re-treatment should be made in consultation with an infectious disease specialist.

Management of Contacts:

- No public health management of contacts is required as person-to-person spread does not occur.

Preventive Measures:

- Educate the public about transmission by ticks and personal protection, including the following:
  - Avoid tick-infested areas when feasible.
  - To minimize exposure wear light-colored clothing covering legs and arms, tuck pants into socks and apply tick repellent such as diethyltoluamide (Deet) to the skin, or permethrin to pant legs and sleeves.
  - If working or playing in a tick-infested area, search the total body area every three to four hours and remove ticks. Nymphal deer ticks may be very small.
  - Remove any attached ticks promptly and carefully without crushing, using gentle steady traction with tweezers applied close to the skin to avoid leaving mouth parts in the skin.
  - Protect hands with gloves, cloth or tissue when removing ticks from humans or animals.
  - Save the tick in a container with a moist cotton swab. Mark the date and location where the tick was picked up. Send the tick to Dr. T. Galloway, Department of Entomology, University of Manitoba for identification. If it is *I. scapularis* it will be sent to the federal laboratory in Winnipeg for testing for *B. burgdorferi*.
  - If a rash or symptoms develop, seek medical attention.
- Measures designed to reduce tick populations on residential properties are available (host management, habitat modification, chemical control), but are generally impractical on a large-scale basis.

Additional Resources

For the public:

What You Should Know About Lyme Disease.

For health care professionals:

Lyme Disease: Information for Health Professionals.

Resources available from Audiovisual and Publications Department, Manitoba Health, telephone (204) 786-7112, fax (204) 772-7213.