Lyme Disease

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To determine the incidence of Lyme disease, the degree of endemicity, and potential risk of contracting Lyme disease in Washington State.
2. To identify endemic geographic areas within Washington State.
3. To educate people about how to reduce their risk of infection.

B. Legal Reporting Requirements

1. Health care providers: notifiable to local health jurisdiction within 3 work days.
2. Hospitals: notifiable to local health jurisdiction within 3 work days.
3. Laboratories: no requirements for notification.
4. Veterinarians: notifiable to Washington State Department of Agriculture or to the local health jurisdiction within 7 work days.
5. Local health jurisdictions: notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. For cases exposed outside of highly endemic areas (especially those exposed in the Pacific Northwest), facilitate the transport of specimens to PHL for confirmatory testing. Call CDES to discuss appropriate specimens to collect for confirmatory laboratory testing.
2. Report all *confirmed* cases (see definitions below) to CDES. Beginning January 2008, report all *confirmed, probable*, and *suspect* cases. Complete the Lyme disease case report form (http://www.doh.wa.gov/notify/nc/lyme.htm) and enter the data into the Public Health Issues Management System (PHIMS).

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Lyme disease is caused by the spirochete *Borrelia burgdorferi*.

B. Description of Illness

1. Early Localized Lyme Disease

Early illness is usually marked by one or more non-specific signs and symptoms: fatigue, chills and fever, headache, myalgias, arthralgias, and lymphadenopathy.

Erythema migrans (EM), which occurs in 60%-80% of cases, is the most common and distinctive feature of early Lyme disease. EM lesions typically have a "bull's eye" appearance, with partial central clearing. The rash is usually >5 cm (2 inches) in

diameter, but may enlarge to a diameter of 30 cm (12 inches). Occasionally, EM may appear as a solid red rash with a vesicular center. EM begins at the site of the tick bite, commonly the thigh, groin, or armpits. The rash may be warm, but is generally not painful. EM develops 3–32 days after the tick bite; lesions occurring within hours of a bite are not caused by Lyme disease. EM usually resolves spontaneously within 3–4 weeks, if untreated, and within one week if treated.

2. Early Disseminated Lyme Disease

Lyme disease spirochetes disseminate from the site of the tick bite by cutaneous, lymphatic and blood borne routes. The signs of early disseminated infection usually occur days to weeks after the appearance of a solitary erythema migrans lesion. In addition to multiple (secondary) erythema migrans lesions, early disseminated infection may manifest in many ways including disease of the nervous system, the musculoskeletal system, or the heart.

Early neurologic manifestations include lymphocytic meningitis, cranial neuropathy (especially facial palsy), and peripheral radiculoneuritis. Musculoskeletal manifestations may include migratory joint and muscle pains with or without objective signs of joint swelling. Cardiac manifestations are rare but may include transient atrioventricular blocks of varying degree.

3. Late Disease

B. burgdorferi infection in the untreated or inadequately treated patient may progress to late disseminated disease weeks to months after infection. The most common objective manifestation of late disseminated Lyme disease is intermittent swelling and pain of one or a few joints, usually large, weight-bearing joints such as the knee. Lyme disease is rarely, if ever, fatal.

C. Lyme Disease in Washington State and the United States

DOH has received 7 to 18 reports of Lyme disease per year in recent years. Almost all Washington cases are the result of tick exposure out of state. Endemic Lyme disease is not common. Although little is known about the epidemiology of Lyme disease in Washington State, the risk of infection appears to be highest in counties around and west of the Cascade Mountains, reflecting the distribution of the local *Ixodes pacificus* tick vector.

Lyme disease is the most commonly reported vector-borne disease in the United States with approximately 20,000 cases reported annually. Lyme disease has a wide distribution in northern temperate regions of the world. In the United States, the reported incidence is highest in the Northeast (particularly in southern New England); the upper Midwest; and in northern California.

D. Vectors and Reservoirs

The principal vectors of Lyme disease are certain *Ixodes* species ticks. In Washington State and the rest of the West, *I. pacificus* is the only recognized vector. Limited tick collection studies in Washington have found *I. pacificus* primarily around and west of the Cascade Mountains. In the rest of the United States, *I. scapularis* is the major vector.

Important reservoirs in the western United States may include wood rats and other *Ixodes*

species that do not themselves feed on humans. Deer and other rodents may be of less importance here than in the eastern United States, although this is uncertain.

The usual two-year life cycle of the tick includes larval, nymphal, and adult stages. Larvae and nymphs typically become infected while feeding on small rodents and remain infected as they mature (transstadial transmission).

E. Modes of Transmission

Lyme disease is acquired by a tick bite. While all stages of *Ixodes* ticks can feed on humans, nymphs are probably the most important source of human infections. In North America, most infections are acquired between May and August, when *Ixodes* nymphs are most active. Transmission of *B. burgdorferi* is directly correlated with duration of tick attachment. Studies suggest that attachment for at least 24 to 48 hours is required for spirochete transmission to occur.[1,2] Thus, prompt removal of ticks can prevent transmission. Ixodid tick bites are generally painless, and many Lyme disease patients have no recollection of a tick bite, so the absence of a tick bite history is not inconsistent with a diagnosis of Lyme disease.

[1] Falco RC, Fish D, Piesman J. Duration of tick bites in a Lyme disease-endemic area. Am J Epidemiol 1996;143:187–92.

[2]Piesman J, Mather TN, Sinsky RJ and Spielman A. Duration of tick attachment and *Borrelia burgdorferi* transmission. J Clin Microbiol 1987;25:557–558.

F. Incubation Period

The incubation period from infection to onset of erythema migrans is typically 7 to 14 days but ranges from 3 to 32 days.

G. Period of Communicability

There is no evidence of person-to-person transmission.

H. Treatment

Please refer to the following web site for specific antibiotic regimens for treatment of early localized, early disseminated and late Lyme disease:

http://www.cdc.gov/ncidod/dvbid/lyme/ld_humandisease_treatment.htm

Patients should be observed at the start of antibiotic therapy for a Jarisch-Herxheimer-like reaction which occurs in ~15% of patients with disseminated infection.

Prophylaxis is not routinely recommended for asymptomatic persons with histories of tick bites.

3. CASE DEFINITION

This surveillance case definition was developed for national reporting of Lyme disease; it is not intended to be used in clinical diagnosis.

A. Clinical Criteria for Diagnosis

A systemic, tick-borne disease with protean manifestations, including dermatologic, rheumatologic, neurologic, and cardiac abnormalities. The best clinical marker for the

disease is erythema migrans (EM), the initial skin lesion that occurs in 60%-80% of patients.

For purposes of surveillance, EM is defined as a skin lesion that typically begins as a red macule or papule and expands over a period of days to weeks to form a large round lesion, often with partial central clearing. A single primary lesion must reach greater than or equal to 5 cm in size across its largest diameter. Secondary lesions also may occur. Annular erythematous lesions occurring within several hours of a tick bite represent hypersensitivity reactions and do not qualify as EM. For most patients, the expanding EM lesion is accompanied by other acute symptoms, particularly fatigue, fever, headache, mildly stiff neck, arthralgia, or myalgia. These symptoms are typically intermittent. The diagnosis of EM must be made by a physician. Laboratory confirmation is recommended for persons with no known exposure.

For purposes of surveillance, late manifestations include any of the following when an alternate explanation is not found:

- *Musculoskeletal system.* Recurrent, brief attacks (weeks or months) of objective joint swelling in one or a few joints, sometimes followed by chronic arthritis in one or a few joints. Manifestations not considered as criteria for diagnosis include chronic progressive arthritis not preceded by brief attacks and chronic symmetrical polyarthritis. Additionally, arthralgia, myalgia, or fibromyalgia syndromes alone are not criteria for musculoskeletal involvement.
- *Nervous system.* Any of the following, alone or in combination: lymphocytic meningitis; cranial neuritis, particularly facial palsy (may be bilateral); radiculoneuropathy; or, rarely, encephalomyelitis. Encephalomyelitis must be confirmed by demonstration of antibody production against *Borrelia burgdorferi* in the cerebrospinal fluid (CSF), evidenced by a higher titer of antibody in CSF than in serum. Headache, fatigue, paresthesia, or mildly stiff neck alone, are not criteria for neurologic involvement.
- *Cardiovascular system.* Acute onset of high-grade (2nd-degree or 3rd-degree) atrioventricular conduction defects that resolve in days to weeks and are sometimes associated with myocarditis. Palpitations, bradycardia, bundle branch block, or myocarditis alone are not criteria for cardiovascular involvement.

B. Laboratory Criteria for Diagnosis

For the purposes of surveillance, the definition of a qualified laboratory assay is (1) a positive culture for *B. burgdorferi*, (2) two-tier testing interpreted using established criteria, or (3) single-tier IgG immunoblot seropositivity interpreted using established criteria.

C. Exposure

Exposure is defined as having been (less than or equal to 30 days before onset of EM) in wooded, brushy, or grassy areas (i.e., potential tick habitats) in a county in which Lyme disease is endemic[*]. A history of tick bite is not required.

D. Disease Endemic to County

A county in which Lyme disease is endemic is one in which at least two confirmed cases have been acquired in the county or in which established populations of a known tick vector are infected with *B. burgdorferi*.

E. Case Definition (2008)

Confirmed: a) a case of EM with a known exposure (as defined above), or b) a case of EM with laboratory evidence of infection (as defined above) and without a known exposure or c) a case with at least one late manifestation that has laboratory evidence of infection.

Probable: any other case of physician-diagnosed Lyme disease that has laboratory evidence of infection (as defined above).

Suspected: a) a case of EM where there is no known exposure (as defined above) and no laboratory evidence of infection (as defined above), or b) a case with laboratory evidence of infection but no clinical information available (e.g. a laboratory report).

Lyme disease reports will not be considered cases if the medical provider specifically states this is not a case of Lyme disease, or the only symptom listed is "tick bite" or "insect bite."

[*] *CDES comment:* The incidence of Lyme disease in all counties in Washington is very low. For surveillance purposes, no Washington counties will be considered endemic at this time (January 2008).

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

The diagnosis of early Lyme disease is based primarily on clinical findings (presence of EM) since serologic testing is insensitive during the first few weeks after onset. In the later stages of Lyme disease, the diagnosis of patients is commonly based on clinical findings with support from serologic tests.

1. Serologic tests: Serologic tests from some commercial labs have been found to be unreliable*; if possible, all serology from patients exposed in Washington should be confirmed through CDC. When serologic testing is indicated, CDC recommends testing initially with either an enzyme-linked immunosorbent assay (ELISA) or an indirect fluorescent antibody (IFA) test, followed by testing with the more specific Western immunoblot (WB) test to corroborate equivocal or positive results obtained with the first test. Although antibiotic treatment in early localized disease may blunt or abrogate the antibody response, patients with early disseminated or late-stage disease usually have strong serological reactivity and demonstrate expanded WB immunoglobulin G (IgG) banding patterns to diagnostic *B. burgdorferi* antigens. Antibodies often persist for months or years following successfully treated or untreated infection. Thus, seroreactivity alone cannot be used as a marker of active disease.

   * CDC. Notice to Readers: Caution Regarding Testing for Lyme Disease. MMWR 2005; 54:125. Available at: http://www.cdc.gov/mmwR/preview/mmwrhtml/mm5405a6.htm

2. Tick identification: Identifying the species of tick removed from a patient can help to determine which pathogens should be considered if the person develops tick-borne disease. However, decisions to test and treat should be based on the patient's symptoms rather than the tick identified.

3. Tick testing: Ticks are not tested for *B. burgdorferi* (the agent of Lyme disease) in Washington through the public health system because the need for treatment should be based on symptoms, not positive or negative results from the tick. However, if a provider wants to test a tick to provide additional information, some commercial laboratories provide tick testing for a fee. The most common tests for *B. burgdorferi* are DFA, IFA, or PCR. Ticks need to be submitted alive for DFA or IFA but can be dead for PCR.

   Results of tick testing should be interpreted carefully. If a tick tests negative, undetected ticks may have been attached to the person and transmitted the agent of Lyme disease. In addition, the tick could be infected with other agents of disease. If the tick tests positive for *B. burgdorferi*, it is still unknown if the agent was transmitted to the host (keeping in mind that it usually takes at least 24 hours for bacteria to be inoculated into the host). For all these reasons, clinicians are encouraged to make treatment and testing decisions based on the clinical presentation of the patient.

B. Services Available at the Washington State Department of Health Public Health Laboratories (PHL)

PHL does not perform serologic testing for Lyme disease but will forward serum or CSF to the CDC for testing. All requests sent to PHL must have approval from the local health department and CDES.

PHL and CDC do **NOT** test ticks for agents of disease (bacteria, viruses). However, PHL will identify the species of a tick removed from a human. Ticks must be submitted by a health care provider.

C. Specimen Collection

Serologic tests: For antibody testing, 1–2 mL of serum is needed. Ideally, both acute and convalescent sera should be collected at least 2 weeks after onset and 2–4 weeks apart. Submit serum in a tightly sealed screw-cap tube with Parafilm M® or pressure-sensitive labeling tape. Place labeled tubes in individual self-sealing plastic bags. Use sufficient absorbent material to secure contents and contain any leakage during shipment. Ship cold, not frozen, with a completed PHL serology form available at: (http://www.doh.wa.gov/EHSPHL/PHL/Forms/Serology.pdf).

Tick submission: A health care provider can request tick identification when a tick is removed from a human. The tick should be removed properly to ensure the mouthparts remain intact. If the mouthparts are not intact, identification may not be possible. Guidelines on tick removal can be found on the CDC website: http://www.cdc.gov/ncidod/dvbid/lyme/ld_tickremoval.htm. Travel history must be obtained.

Ticks approved for identification should be placed in a sealed **unbreakable** container. Ticks can be sent to PHL alive or dead with a parasitology form (http://www.doh.wa.gov/EHSPHL/PHL/Forms/Parasitology.pdf).

5. ROUTINE CASE INVESTIGATION

Interview the case and others who might provide pertinent information.

A. Evaluate the Diagnosis

Using the case report form, itemize signs and symptoms. Get copies of laboratory reports that support the diagnosis. **For cases exposed outside of highly endemic areas (especially those exposed in the Pacific Northwest), call CDES to arrange for confirmatory laboratory testing offered through the PHL.**

B. Identify Potential Sources of Infection (i.e. Assess the Possibility of Tick Exposure)

Ask about tick bites and known or possible duration of tick attachment. If the exposure occurred in the Pacific Northwest, get a detailed description of the geographic location where the exposure may have occurred. If there is no known tick bite, collect information about exposure to hard tick habitats (woods, tall grasses, etc).

C. Identify Potentially Exposed Persons

Identify other persons potentially exposed to Lyme disease and educate them about the symptoms of Lyme disease to facilitate early diagnosis.

D. Environmental Evaluation

Notify local environmental health program and/or vector control of locally acquired cases.

6. CONTROLLING FURTHER SPREAD

A. Infection Control Recommendations

1. Hospitalized patients should be cared for using standard precautions.
2. There is no need for patient isolation or work/day care restrictions.
3. Educate patients/others about avoiding exposure to ticks in the future.

B. Management of Other Exposed Persons

Educate others persons potentially exposed to Lyme disease about the symptoms of the disease to facilitate early diagnosis. Prophylactic antibiotics are not generally recommended for asymptomatic persons with a history of a tick bite.

C. Environmental Measures: In general, none.

7. MANAGING SPECIAL SITUATIONS

Not applicable

8. ROUTINE PREVENTION

A. Immunization Recommendations

A Lyme disease vaccine is not currently available.

B. Prevention Recommendations

When spending time outdoors in risk areas, persons should:

1. Wear long pants and a long-sleeved shirt. Tuck your pant legs into socks or boots and shirt into pants. This can help keep ticks on the outside of your clothing where they can be more easily spotted and removed.
2. Wear light colored, tightly woven clothing which will allow the dark tick to be seen more easily. The tight weave makes it harder for the tick to attach itself.
3. Use tick repellent when necessary, and carefully follow instructions on the label. Products containing DEET or permethrin are very effective in repelling ticks. Take special care when using repellents on children.
4. Check yourself, your children and pets thoroughly for ticks. Carefully inspect areas around the head, neck and ears. If you find a tick attached to your skin, promptly remove it. Grasp the tick using tweezers as close to the skin as possible. With a steady motion, pull the tick straight out. Wash your hands and apply antiseptic to the bite. Do not crush ticks *in situ*; this could result in direct inoculation of spirochetes. For more information about removing a tick, visit: http://www.cdc.gov/ncidod/dvbid/lyme/ld_tickremoval.htm
5. Monitor the bite and be alert for early symptoms of tick-borne disease particularly "flu-like" symptoms or rash over the next month or so. If you develop symptoms, contact your health care provider.

ACKNOWLEDGEMENTS

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UPDATES

January 2008 Revisions

Section 3: Revisions were made to the case definition