LYME DISEASE
(Lyme Arthritis, borreliosis)

REPORTING INFORMATION
- **Class B:** Report by the end of the next business day in which the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
    - Ohio Confidential Reportable Disease form (HEA 3334, rev. 1/09), Positive Laboratory Findings for Reportable Disease form (HEA 3333, rev. 8/05), the local public health department via the Ohio Disease Reporting System (ODRS) or telephone.
    - The Centers for Disease Control and Prevention (CDC) Lyme Disease Case Report form (CDC 52.60, rev. 2/06) is available for use to assist in local health department disease investigation. Information collected from the form should be entered into ODRS and not sent to the Ohio Department of Health (ODH), unless otherwise requested. If requested, the mailing address for this form is: Ohio Department of Health, Zoonotic Disease Program, 35 E. Chestnut Street, Columbus, OH 43215.
- Key fields for ODRS reporting include: date of illness onset, fields under Symptoms and Signs of Current Episode, fields in the Epidemiology Information module and fields in the Travel History module.

AGENT
Borrelia burgdorferi, a spirochete-type bacterium.

CASE DEFINITION
Clinical Description
A systemic, tick-borne disease with protean manifestations, including dermatologic, rheumatologic, neurologic and cardiac abnormalities. Typical symptoms include fever, headache, fatigue, and a characteristic skin rash called erythema migrans. If left untreated, infection can spread to joints, the heart, and the nervous system.
The best clinical marker for the disease is the initial skin lesion (i.e. erythema migrans [EM]) which occurs in 60% - 80% of patients.

Laboratory Criteria for Diagnosis
- A positive culture for *B. burgdorferi* or
- Demonstration of diagnostic immunoglobulin M (IgM) or immunoglobulin G (IgG) antibodies to *B. burgdorferi* in serum or cerebrospinal fluid (CSF). A two-test approach using a sensitive enzyme immunoassay or immunofluorescence antibody followed by Western blot / immunoblot is recommended. [Patients with syphilis, infectious mononucleosis, systemic lupus erythematosis (SLE), and other diseases may have false-positive IFA or ELISA for Lyme Disease.]
    - All specimens positive or equivocal by a sensitive EIA or IFA should be tested by a standardized Western immunoblot. Specimens negative by a sensitive EIA or IFA need not be tested further. When Western immunoblot is used during the first 4 weeks of disease onset (early LD), both immuno- globulin M (IgM) and immunoglobulin G (IgG) procedures should be performed. A positive IgM test result alone is not recommended for use in determining active disease in persons with illness greater than 1 month's duration because the likelihood of a false-positive test result for a current infection is high for these persons. If a patient with suspected early LD has a negative serology,

serologic evidence of infection is best obtained by testing of paired acute- and convalescent-phase serum samples. Serum samples from persons with disseminated or late-stage LD almost always have a strong IgG response to Borrelia burgdorferi antigens. It was recommended that an IgM immunoblot be considered positive if *two* of the following three bands are present: 23-25 kDa (OspC)*, 39 kDa (BmpA), and 41 kDa (Fla). It was further recommended that an that IgG immunoblot be considered positive if *five* of the following 10 bands are present: 18 kDa, 21 kDa (OspC)*, 28 kDa, 30 kDa, 39 kDa (BmpA), 41 kDa (Fla), 45 kDa, 58 kDa (not GroEL), 66 kDa, and 93 kDa, or

- Single-tier IgG Western blot / immunoblot seropositivity interpreted using established criteria (see bullet point directly above).
- CSF antibody positive for *B. burgdorferi* by Enzyme Immunoassay (EIA) or Immunofluorescence Assay (IFA), when the titer is higher than it was in serum

Case classification

Confirmed: a) a case of EM with a known exposure (as defined below), 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 below) 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."

Comments

The surveillance case definition was developed for national reporting of Lyme disease; it is not intended to be used in clinical diagnosis. Definitions of terms used in the clinical description and case definition sections are listed below.

Erythema migrans (EM)

For purposes of surveillance, EM is 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 5 cm in size. Secondary lesions may also 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, but with compatible symptoms.

Late manifestations

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, arthralgias, myalgias 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 *B. burgdorferi* in the CSF, evidenced by a higher titer of antibody in CSF than in serum. Headache, fatigue, paresthesias or mildly stiff neck alone are not criteria for neurologic involvement.

- Cardiovascular system: Acute onset of high grade (2° or 3°) 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 accepted as criteria for cardiovascular involvement.

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.

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*.

SIGNS AND SYMPTOMS

The first sign of infection is often a circular rash called erythema migrans or EM. This rash occurs in approximately 60-80% of infected persons and begins at the site of a tick bite after a delay of 3-30 days. A distinctive feature of the rash is that it gradually expands over a period of several days, reaching up to 12 inches (30 cm) across. It may be warm but is not usually painful. Some patients develop additional EM lesions in other areas of the body after several days. Patients also experience symptoms of fatigue, chills, fever, headache, and muscle and joint aches, and swollen lymph nodes. In some cases, these may be the only symptoms of infection.

Untreated, the infection may spread to other parts of the body within a few days to weeks, producing an array of discrete symptoms including loss of muscle tone on one or both sides of the face (Bell's palsy), severe headaches and neck stiffness due to meningitis, shooting pains that may interfere with sleep, heart palpitations and dizziness due to changes in heartbeat, and pain that moves from joint to joint. Many of these symptoms will resolve, even without treatment.

After several months, approximately 60% of patients with untreated infection will begin to have intermittent bouts of arthritis, with severe joint pain and swelling. Large joints are most often affected, particularly the knees. In addition, up to 5% of untreated patients may develop chronic neurological complaints months to years after infection. These include shooting pains, numbness or tingling in the hands or feet, and problems with concentration and short term memory.

DIAGNOSIS

The IFA and ELISA serum antibody screening tests are available through many commercial laboratories. A two-test approach on an appropriate specimen, using an approved EIA or IFA assay followed by a Western Blot is recommended. A positive culture for *B. burgdorferi*

is also diagnostic.

EPIDEMIOLOGY

Source

The Lyme disease bacterium, *Borrelia burgdorferi*, normally lives in mice, squirrels and other small animals. It is transmitted among these animals – and to humans – through the bites of certain species of ticks. The white-footed mouse is the primary vertebrate reservoir.

Occurrence

Onset of EM is generally in the late spring or summer (peak in June or July); late manifestations may occur at any time of the year.

Mode of Transmission

The spirochete is transmitted through the bite of a tick: *I. scapularis*, in the eastern and midwestern and *I. pacificus* in the western United States. Other species of ticks are not known to transmit Lyme Disease.

Period of Communicability

Although the spirochete has been isolated from the EM lesion, blood and CSF, human-to-human transmission is not known to occur. Transplacental transmission (mother to fetus) may occur. Humans are not considered to be a source of the spirochete for ticks.

Incubation Period

For EM, 3 to 32 days after tick bite (mean 7 to 10 days); early stages may be unapparent and the patient may present with later manifestations.

PUBLIC HEALTH MANAGEMENT

Case

Investigation

A complete history of travel and tick contact for the 30 days prior to onset should be obtained.

Treatment

Antibiotic therapy is recommended during the acute phase to reduce the incidence and severity of arthritic, neurologic and cardiac manifestations. Antibiotics commonly used for oral treatment include doxycycline, amoxicillin, or cefuroxime axetil. Patients with certain neurological or cardiac forms of illness may require intravenous treatment with drugs such as ceftriaxone or penicillin. A few patients, particularly those diagnosed with later stages of disease, may have persistent or recurrent symptoms. These patients may benefit from a second 4-week course of therapy. Longer courses of antibiotic treatment have not been shown to be beneficial and have been linked to serious complications, including death.

Isolation and Follow-up Specimens

Isolation is not indicated. Follow-up specimens are usually not indicated.

Contacts

Prophylaxis of contacts is not indicated.

Prevention and Control

A Lyme disease vaccine is no longer available. The vaccine manufacturer discontinued production in 2002, citing insufficient consumer demand. Protection provided by this vaccine diminishes over time. Those vaccinated before 2002 probably no longer are protected against Lyme disease. Tick avoidance in endemic areas is probably the best preventive measure at present. Tuck pants cuffs into sock tops, spray insect repellent on pants and socks and wear light-colored clothing to facilitate frequent checks for crawling ticks. Inspect every hour or two for attached and crawling ticks. Remove ticks promptly. Inspect pets for ticks every day. Keep grass and weeds mowed short. Reduce mouse populations by habitat reduction and exclusion from and to buildings.

Susceptibility

All persons are probably susceptible. Re-infection has occurred in those treated with antibiotics for early-stage disease.

What is Lyme disease?
Lyme disease (LD) is caused by a cork-screw shaped bacterium called *Borrelia burgdorferi*. It is transmitted by a tick called the blacklegged tick (formerly known as the deer tick). The bacteria are normally found in mice, squirrels, and other small mammals without causing illness. Lyme disease affects both humans and dogs.

Who is most at risk for getting Lyme disease?
People who spend time outdoors in tick-infested environments are at an increased risk of exposure. Most cases have reported an exposure to ticks or woodland/brush habitats during the months of May through August, but cases have been reported in every month of the year. Dogs or other pets frequenting tick infested areas may carry ticks home to their owners.

How is Lyme disease spread?
Lyme disease is acquired by the bite of an infected tick. Most cases are caused by immature ticks called nymphs, which are very small and may go unnoticed even when biting. Ticks must be attached for 24 hours or more before the Lyme disease bacteria are passed. No direct transmission occurs from person to person or from dog to person.

How is Lyme disease diagnosed?
Lyme disease is diagnosed by a physician based on clinical symptoms, exposure history and blood test results.

What are the symptoms of Lyme disease?
The illness usually occurs during the summer months and often starts as a roughly circular reddish rash around or near the site of the tick bite. The rash expands over several days to several weeks, becoming several inches across. The rash appears in 60-80% of the cases. Approximately 15% of people will develop multiple skin lesions. Other, general flu-like symptoms also occur: fever, headache, fatigue, stiff neck, joint and muscle pain. These may last for several weeks. If left untreated complications such as meningitis (inflammation of the lining of the spinal cord), facial paralysis or heart abnormalities may develop. Swelling and pain in the major joints, especially the knees, can recur over several months or years.

How soon do symptoms occur?
The early symptoms usually occur 3-30 days after the tick bite.

Does past infection with Lyme disease make a person immune?
Current information suggests that a person can be infected more than once.

What is the treatment for Lyme disease?
The disease is usually treated with antibiotics in the tetracycline group, administered either orally or by injection.

What can be done to prevent Lyme disease?
If you are in areas where ticks might be present, the following precautions can reduce the risk of acquiring Lyme disease or other tick-borne diseases:

- Wear light-colored, long pants, tuck pant cuffs into sock tops and spray pant legs and socks with insect repellent. Repellents containing 0.5% permethrin or 20-30% DEET are effective in repelling ticks. Follow application directions carefully.
- When possible, avoid walking in tall grass and weeds.

- Conduct visual “tick checks” on yourself and children every hour or two.
- Check pets for ticks before allowing them into the home.
- Carefully remove attached ticks as soon as possible.
- Keep yard and play areas well mowed to discourage ticks.

How should a tick be removed?
Although disease transmission occurs 36 to 48 hours or more after attachment, it is important to remove ticks as soon as possible after discovery.

To remove an attached tick, grasp it with tweezers as close as possible to the skin and pull with firm, steady pressure straight out. Do not twist or jerk the tick, as the mouthparts may break off. If tweezers are not available, protect fingers with rubber gloves or tissue paper.

- Do not handle ticks with bare hands.
- Do not squeeze, crush or puncture the body of the tick as it may contain infected fluids.
- After removing the tick, thoroughly disinfect the bite site and wash your hands.
- See or call your doctor if there is a concern about incomplete tick removal.

For more information, contact your local health department or the Zoonotic Disease Program at ODH by calling 614-752-1029.

For more information please visit the following websites:

CDC Learn about Lyme disease - http://www.cdc.gov/lyme/

CDC Public Information Guide - http://www.cdc.gov/ncidod/dvbid/lyme/lyme_brochure.pdf

ODH Zoonotic Disease Program Tick-borne Diseases (statistics and educational materials) - http://www.odh.ohio.gov/odhPrograms/dis/zoonoses/vbdp/vbtick.aspx