



LYME DISEASE

1. **Agent:** *Borrelia burgdorferi*, a spirochete first identified in 1982.

2. **Identification:**

a. **Symptoms:** Lyme borreliosis generally occurs in stages.

Early Lyme Borreliosis: Although stages may overlap or occur alone, illness may begin with a characteristic skin lesion called erythema migrans (EM) in 60% of cases. This rash appears as a red macule or papule that expands in an annular manner, sometimes with multiple similar lesions. Fever, malaise, fatigue, headache, stiff neck, myalgia, migratory arthralgias, and lymphadenopathy may accompany or precede EM.

Neurologic Manifestations: Weeks to months after the onset of early Lyme disease, neurologic abnormalities may develop in untreated patients. The typical pattern is fluctuating meningoencephalitis with superimposed cranial (particularly facial) nerve palsy and peripheral radiculoneuropathy.

Cardiac Manifestations: Within several weeks after onset, about 8% of untreated patients develop cardiac involvement (most commonly fluctuating degrees of atrioventricular block— that resolves spontaneously).

Arthritis: Weeks to years after the original illness, about 50% of untreated patients develop arthritis. Early involvement typically is manifested by migratory pain, often without swelling. Frank arthritis may develop subsequently with marked swelling and pain in one or more joints, primarily large joints, e.g., the knee.

b. **Differential Diagnosis:**

Early disease: Aseptic meningitis, hepatitis, mononucleosis, ehrlichiosis.

Late disease: Rheumatic fever, disseminated gonococcal infection, multiple sclerosis, Guillain-Barré syndrome, Reiter's syndrome, rheumatoid arthritis, oligoarticular form of juvenile rheumatoid arthritis.

c. **Diagnosis:** Based on clinical findings and history of possible exposure to infected *Ixodes* sp. ticks. Serological testing (EIA or IFA) may be useful but lacks sensitivity, especially in early disease. The traditional two-tiered testing algorithm involves using a sensitive enzyme immunoassay followed by IgM and IgG Western blot of all positive and equivocal specimens. The modified two-tiered algorithm uses a first-tier screen, which if positive or equivocal is followed by a different, sequential positive or equivocal EIA in lieu of an immunoblot as a second-tier test. Modified algorithms must use FDA-cleared assays and have been shown to improve sensitivity and specificity of serologic testing for early Lyme disease. Culture from biopsy at the outer margins of EM lesion is 90% sensitive. PCR is available from research laboratories.

3. **Incubation:** 7-10 days average, range 3-32 days.

4. **Reservoir:** Wild animals (e.g., *Neotoma* spp., wood rat) and deer are important in California.

5. **Source:** Infected *Ixodes* species ticks; other arthropods have been found containing *B. burgdorferi*, but their ability to transmit is questionable.



6. **Transmission:** Bite of Ixodes tick. 36-48 hours of attachment is usually required for transmission.
7. **Communicability:** Not transmitted from person to person.
8. **Specific Treatment:** Doxycycline or amoxicillin or cefuroxime axetil are the preferred regimens for adults or children with early, mild disease. Intravenous penicillin or ceftriaxone is effective for meningitis, late stage, and refractory illness.

REPORTING PROCEDURES

1. Report any cases or suspected cases within 7 calendar days to ACDC or Morbidity Unit. California Code of Regulations, Title 17, Section 2500.
2. **Report Form:** [LYME DISEASE CASE REPORT \(CDPH 8470\)](#).
3. **Epidemiologic Data:**
 - a. Travel 30 days prior to onset of erythema migrans or early disease.
 - b. History of tick bite.
 - c. History of possible exposure to ticks, e.g., hiking in chaparral, dogs with ticks, etc.
 - d. Occupational exposure.

CONTROL OF CASE, CONTACTS & CARRIERS

CASE: Isolation: None.

CONTACTS: No restrictions.

CARRIERS: Not applicable.

PREVENTION-EDUCATION

1. Use tick repellents.

2. Wear protective clothing in wooded areas.
3. Control ticks on domestic animals.
4. Avoid tick-infested areas when feasible.
5. Check periodically for and carefully remove attached ticks after return from tick-infested areas.

DIAGNOSTIC PROCEDURES

Serology: Available at commercial laboratories. Can be run at CDC.

Laboratory Form: CDC 50.34 Specimen Submission Form.

Examination Requested: Lyme Disease Serology

Material: Serum.

Amount: 0.5 ml.

Storage: Sera may be stored at 2°-8°C for up to 10 days or frozen (-20°C or lower) for up to 60 days post-collection.

Remarks: Laboratory testing is not recommended for patients who do not have symptoms typical of Lyme borreliosis. Serologic tests for Lyme borreliosis lack sensitivity and are not standardized, so interpretation of test results is difficult. CDC recommends a two-step laboratory testing process: an EIA or another test cleared by the FDA as a first test followed by Western blot assay or another test cleared by the FDA as a second test interpreted using established criteria. The two tests are to be done simultaneously or sequentially. Skipping either test will increase the frequency of false positive results.

New tests may be developed as alternatives to the two-step process. However, before CDC will recommend new tests, they must be cleared by the Food and Drug Administration (FDA).



ADDITIONAL LABORATORY PROCEDURES

In general, tick testing is not recommended. For additional information, visit [CDPH Tick-Borne Diseases webpage for Health Professionals](#).