

Lyme Disease

Summary

Lyme disease (or borreliosis) is a tick-borne infection caused by certain species of the *Borrelia* genus (*B. burgdorferi* in the US; predominantly *B. afzelii* and *B. garinii* in Asia and Europe). There are three stages of Lyme disease. Stage I (early localized disease) is characterized by erythema migrans, an expanding circular red rash at the site of the tick bite, and may be associated with flu-like symptoms. In stage II (early disseminated disease), patients may present with neurological symptoms (e.g., facial palsy), migratory arthralgia, and cardiac manifestations (e.g., AV block). Stage III (late disease) is characterized by chronic arthritis and neurological involvement (late neuroborreliosis) with possible progressive encephalomyelitis. In Asia and Europe, further skin manifestations may also occur in stage II (lymphadenitis cutis benigna) and stage III (acrodermatitis chronica atrophicans). Lyme disease is a clinical diagnosis in patients with erythema migrans. For all other patients, Lyme serology is recommended. Antibiotic treatment varies depending on the stage of Lyme disease and presentation. Options include oral doxycycline, amoxicillin, or cefuroxime axetil, and, in severe cases, intravenous ceftriaxone. Postexposure prophylaxis (PEP) for Lyme disease after a tick bite may be required in selected cases.

A. **Definition.** This reactive inflammatory disorder of the skin, heart, CNS, and connective tissues is caused by spirochetal infection with *Borrelia burgdorferi* (in the United States) and transmitted via a tick bite.

B. **Epidemiology.** High-risk areas reflect the natural habitat of ticks of the *Ixodes* species, which are the vectors for Lyme disease transmission. These ticks are especially prevalent in woodlands and fields in the New England states and parts of the Pacific coast and Midwestern United States. Disease onset typically occurs during the summer months.

C. Etiology

1. **Vector.** In the United States, most human infections occur during feeding by an infected deer tick, *Ixodes scapularis*. Transmission from *Ixodes pacificus*, which is the tick most prevalent in the Western United States, is less common.
2. **Organism.** *B. burgdorferi* is passed into the bloodstream of the human host while the tick engorges itself with blood. The infected tick must be attached for more than 36–48 hours before the risk of *B. burgdorferi* transmission becomes substantial.



D. **Clinical features.** Clinical features are initially caused by the invasion of *B. burgdorferi* into local and distant tissues, and in later stages by a systemic inflammatory response against the spirochete. The untreated clinical course of Lyme disease is, therefore, divided into **two stages, early and late disease**. Early disease is further broken down into **early localized** and **early disseminated** disease.

1. Early disease (<4 months after transmission)

a. **Early localized disease** can occur within days of transmission, resulting from local cutaneous invasion and subsequent inflammation.

1. **Erythema migrans** is the classic rash of Lyme disease and is typically the first manifestation. It occurs in two-thirds of patients and is described as **annular and "targetlike"** with variable degrees of central clearing. Erythema migrans may be asymptomatic, pruritic, or painful and, if untreated, may expand (thus the term *migrans*) to more than 12 inches in diameter. It is the only manifestation that permits diagnosis without laboratory confirmation.
2. **Constitutional symptoms** may begin to occur during this stage and include fever, headache, neck pain, myalgias, fatigue, arthralgias, and lymphadenopathy.

b. **Early disseminated disease** typically occurs within 1–4 months after the tick bite. In addition to cutaneous findings, it is characterized by involvement of other organ systems.

1. **Skin.** Up to 25% of children may develop **multiple secondary erythema migrans** lesions, which tend to be smaller than the initial lesion.
2. **Constitutional symptoms** [see section VII.D.1.a.(2)] may initially appear and continue through this stage.
3. **Neurologic**
 - a. **Aseptic meningitis** may occur at this stage but is rare (1%).
 - b. **Facial nerve palsy** is seen in approximately 3% of children. Lyme disease must therefore be considered in a child with unilateral or bilateral palsy of the seventh cranial nerve.
 - c. **Encephalitis**
4. **Carditis** is rare but usually presents as **heart block or myocarditis**.

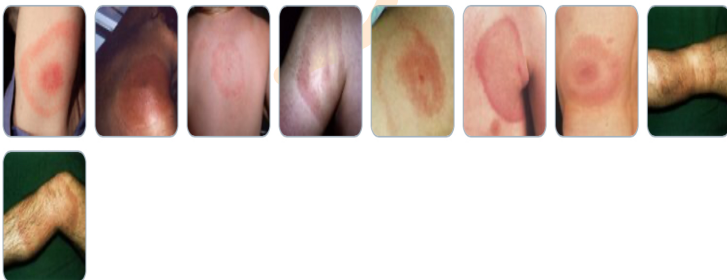
2. **Late disease** (months after transmission) is the second stage and presents with **arthritis** as the most common manifestation. Arthritis typically is mono or oligoarticular and involves the knee in >90% of cases.

في البيورود والأخ أميوس مقسمين ل 3stages، خلينا نمر عليهم 😊😊

Stage I (early localized Lyme disease) [2][3][4]

Symptom onset occurs 7–14 days after a tick bite.

- Erythema migrans
- Flu-like symptoms
 - Fever
 - Headache
 - Fatigue, malaise, lethargy
 - Myalgias, arthralgias



Stage II (early disseminated Lyme disease) [2][3][4]

Symptom onset occurs 3–10 weeks after a tick bite. [5]

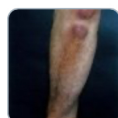
- Migratory arthralgia; can progress to Lyme arthritis if left untreated
- Early neuroborreliosis
- Lyme carditis
- Cutaneous manifestations
 - Multiple erythema migrans lesions
 - Borrelial lymphocytoma
- Ocular manifestations
 - Retinal vasculitis
 - Keratitis
 - Iridocyclitis
 - Uveitis



Stage III (late disseminated Lyme disease) [2][3][4]

Symptom onset occurs months to years after the initial infection. [5]

- Lyme arthritis
- Late neuroborreliosis
- Acrodermatitis chronica atrophicans



LYME DISEASE

Stage	Lyme disease clinical features
Early localized (days–1 month)	• Erythema migrans • Fatigue, headache • Myalgias, arthralgias
Early disseminated (weeks–months)	• Multiple erythema migrans • Unilateral/bilateral CN palsy (eg, CN VII) • Meningitis • Carditis (eg, AV block) • Migratory arthralgias
Late (months–years)	• Arthritis • Encephalitis • Peripheral neuropathy

1. Due to *B burgdorferi*
2. Diagnosis can be confirmed by
 - a. ELISA
 - b. Western Blot Testing

E. Diagnosis

1. **The diagnosis** is strongly suggested in the presence of epidemiologic risk factors and a classic erythema migrans rash.
2. **Laboratory diagnosis** is **important in establishing a definitive diagnosis** because erythema migrans is not always present, and the clinical features and routine laboratory test results may be nonspecific. Testing should only be performed on patients with appropriate risk factors and symptoms.

a. **Serologic testing** involves the **measurement of antibodies** to *B. burgdorferi* in the patient's serum and is the recommended laboratory approach. The US Centers for Disease Control and Prevention currently **recommends a two-step procedure**:

1. **Enzyme-linked immunosorbent assay (ELISA)**, which has a relatively high sensitivity. If negative, no further testing is indicated.
2. **Western blot**, if the ELISA is positive or equivocal, to confirm the diagnosis.

Patients require either five positive IgG bands or two positive IgM bands.

b. **Other laboratory tests** (e.g., polymerase chain reaction, cultures from body fluids or tissue) are occasionally used, but their clinical utility is limited, offering no advantage over the recommended serologic method.

F. **Management** is aimed at eradicating *B. burgdorferi*, with the caveat that symptoms caused by systemic inflammation may not resolve immediately.

1. **Early localized disease, or late disease with arthritis only**, is typically treated with doxycycline (for children ≥ 9 years of age), amoxicillin, or cefuroxime.
2. **Carditis and meningitis** require intravenous ceftriaxone.

G. **Prognosis**. Children who are treated, even with arthritis or neurologic manifestations, have an excellent prognosis. Recurrent symptoms or chronic sequelae are rare.

