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Treatment of Lyme Disease

Updated May 2026

Lyme disease is caused by *Borrelia burgdorferi* and spread by black-legged ticks (deer tick or western tick). It is the most common tickborne disease in North America.[3,7] Comprehensive information on tickborne diseases (e.g., Lyme disease, Rocky Mountain Spotted Fever, etc) can be accessed at https://www.cdc.gov/ticks/media/pdfs/2025/03/tickborne-diseases-manual-508.pdf?CDC_AAref_Val=https://www.cdc.gov/ticks/tickbornediseases/TickborneDiseases-P.pdf.

Stepwise Approach to Lyme Disease: From Tick Bite to Treatment

This algorithm provides steps to consider when Lyme disease is a possible diagnosis.

1

Identify a Tick Bite

- If the tick is still attached, remove it with fine-tipped tweezers. Grasp the tick as close to the skin as possible, use steady even pressure, and pull it straight out.[1,5]
- Wash the bite area with soap and water or rubbing alcohol after removal.[1]
- Take a photo of the removed tick, or seal it in a baggie or pill bottle for identification.[5]
- Do not squash the tick with bare fingers; infection could occur through breaks in the skin.[5]

2

Identify the Species

- Determine if the black-legged tick is an *Ixodes scapularis* (deer tick) or *Ixodes pacificus* (western tick).[1,2]
- Consider using https://web.uri.edu/tickencounter/fieldguide/id-guide/ or https://www.etick.ca/en.
- Ticks should be sent for testing in Canada where possible.[5] Contact your local or provincial public health agency for details.[5]

3

Determine Attachment Time

- Most cases occur after ≥24 hours of tick attachment.[3] There is high risk if the tick has been attached for ≥36 hours.[2]
- The time elapsed since attachment may be estimated by the extent of the tick's engorgement.[2] Images for comparison can be found at https://academic.oup.com/cid/article/72/1/e1/6010652/.

4

Consider Doxycycline Prophylaxis

If ALL conditions are met:

- The tick has been attached for at least 24 to 36 hours.[2,10]
- Prophylaxis can be started within 72 hours of tick removal.[2]
- The tick is identified as an *Ixodes* spp. vector species.[2]
- The local rate of tick infection with *B. burgdorferi* is at least 20% (e.g., parts of New England, the mid-Atlantic states, Minnesota, Wisconsin, Eastern Canada, Winnipeg, and Victoria]).[2,8]

5

Monitor for Symptoms (30 days)

- Red, ring-like (with or without a "bull's eye") or homogenous expanding skin lesion at the site of the bite.[1,3]
  - Most patients with Lyme disease will have this sign within seven days after a tick bite (range 3 to 30 days).[3]
  - Most common symptom; however, not seen in all patients with Lyme disease.[1]
  - The rash is usually not itchy or painful.[3]
  - Additional lesions may appear anywhere on the body.[6]
- Flu-like illness (e.g., chills, fatigue, fever, headache, joint and muscle aches)[1,3]

6

Treat with Appropriate Antibiotics

- Use current guideline recommendations depending on symptoms, age, allergies, and concurrent conditions such as pregnancy.
- Blood testing is not needed/helpful before treatment of early Lyme disease; it is diagnosed clinically (e.g., erythema migrans appears after being in an area where Lyme disease is common).[1] Serologic tests may be negative initially because it takes weeks for antibodies to develop.[1]

7

Test if Diagnosis is Uncertain

- A testing algorithm for tick-borne diseases is available at: https://www.mayocliniclabs.com/it-mmfiles/Acute_Tick-Borne_Disease_Testing_Algorithm.pdf.

8

Consider Untreated Lyme Disease

Consider the possibility of untreated Lyme disease in patients with early disseminated or "late" Lyme symptoms such as facial palsy, arthritis, carditis (dizziness, shortness of breath, heart palpitations) or chronic neurologic complaints (e.g., shooting pains, numbness or tingling of extremities, impaired memory or concentration).[3,4]

Information in the chart below is based on the 2020 guideline co-developed by the IDSA/AAN/ACR[2] unless otherwise cited.

Diagnosis	Drug of Choice[a,b]	Alternate Therapy	Comments
Prophylaxis Note: some pharmacists and prescribers participate in collaborative practice agreements to expedite prophylaxis.			
Confirmed tick bite	**ADULTS**: **Doxycycline** 200 mg po x 1 dose **CHILDREN**: **Doxycycline** 4.4 mg/kg (or 4 mg/kg[11]) po x 1 dose (max 200 mg)	None recommended	Prophylaxis recommended if tick is an adult or *nymphal I. scapularis*, estimated to have been attached for at least 24 to 36 hours, in an area where the local rate of infection of ticks with *B. burgdorferi* is 20% or greater.[2,10] (Contact your local health authority if you are unsure.) **Prophylaxis must be started within 72 hours of tick removal**.

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Diagnosis	Drug of Choice[a,b]	Alternate Therapy	Comments
Early Localized Note: serologic testing of asymptomatic patients is not recommended, but it can help in diagnosing patients with atypical skin lesions. If the acute phase serum sample test is negative, a convalescent-phase sample can be tested two to three weeks later.			
Erythema migrans	**ADULTS**: **Doxycycline** 100 mg po bid or 200 mg po once daily x 10 days **OR** **Amoxicillin** 500 mg po tid x 14 days **OR** **Cefuroxime axetil** 500 mg po bid x 14 days **CHILDREN**: **Amoxicillin** 50 mg/kg/day po divided tid x 14 days (max 500 mg/dose) **OR** **Cefuroxime axetil** 30 mg/kg/day po divided bid x 14 days (max 500 mg/dose) **OR** **Doxycycline** 4.4 mg/kg/day po divided bid x 10 days (max 100 mg/dose)	**ADULTS**: **Azithromycin** 500 mg po daily x 5 to 10 days (7 days preferred in US based on clinical trial duration) **CHILDREN**: **Azithromycin** 10 mg/kg/day po daily x 5 to 10 days (max 500 mg/day; 7 days preferred in US based on clinical trial duration)	Macrolides are not recommended as first-line therapy. They have been less effective than other antimicrobials in clinical trials. Reserve macrolides for patients unable to take first-line therapies. Azithromycin has not been sufficiently studied for any Lyme manifestation except erythema migrans.
Early Disseminated Note: use two-tiered serum antibody testing when assessing patients for possible Lyme. For suspected central nervous system involvement, obtain CSF and serum samples simultaneously for determination of the CSF: serum antibody index. For a testing algorithm, see: https://www.mayocliniclabs.com/it-mmfiles/Acute_Tick-Borne_Disease_Testing_Algorithm.pdf			
Lyme meningitis, cranial nerve palsy, radiculopathy, or other peripheral nervous system manifestations	**ADULTS**: **Ceftriaxone** 2 g IV once daily x 14 to 21 days **Doxycycline** 100 mg po BID or 200 mg once daily x 14 to 21 days **CHILDREN**: **Ceftriaxone** 50–75 mg/kg/dose IV once daily x 14 to 21 days (max 2 g/dose) **Doxycycline** 4.4 mg/kg/day po divided bid x 14 to 21 days (max 100 mg/dose)	**ADULTS**: **Cefotaxime** 2 g IV q8h x 14 to 21 days **OR** **Penicillin G** 18–24 million units/day IV divided q4 h x 14 to 21 days **CHILDREN**: **Cefotaxime** 150–200mg/kg/day IV divided tid or qid x 14 to 21 days (max 6 g/day) **OR** **Penicillin G** 200,000–400,000 units/kg/day IV divided q4h x 14 to 21 days (max 18–24 million units/day)	Consider oral doxycycline for **cranial nerve palsy**. For other conditions, can start with IV, then switch to po doxycycline. For patients ≥16 years of age with facial nerve palsy, corticosteroids can be started if the diagnosis of Lyme is uncertain. The effects of corticosteroids in Lyme-associated facial palsy are uncertain, but failure to start them in a patient with idiopathic facial nerve palsy could be harmful.
Parenchymal involvement of the brain or spinal cord (encephalitis, myelitis)	Rare. Little data. Treat as above, but IV route is preferred. Usually treated for two to four weeks.		
Lyme carditis (e.g., AV nodal block, arrythmias, myopericarditis)	Outpatients: oral antibiotics as for erythema migrans (most experience with doxycycline), but duration is **14 to 21 days**. Hospitalized patients:IV ceftriaxone as for meningitis.	None recommended.	Once improved, hospitalized patients can be switched to oral regimen to complete treatment.
Borrelial lymphocytoma	Outpatients:oral doxycycline, amoxicillin, or cefuroxime. Dose as for erythema migrans (above) for **14 days**.	None recommended.	Usually acquired overseas.
Late Lyme Note: there is no role for long-term use of antibiotics for symptoms such as fatigue, pain, or cognitive impairment.			
Lyme arthritis	**Initial treatment**: oral doxycycline, amoxicillin, or cefuroxime. Dose as for erythema migrans (above), but for 28 days. **Recurrent or refractory arthritis**: If arthritis has improved but not resolved, a second course of oral antibiotics may be used for up to one month. If there is little or no response to oral antibiotics, a 2- to 4-week course of IV ceftriaxone (dose as per meningitis) is suggested over a second course of oral antibiotics.	None recommended.	Lyme antibodies (IgG) with reflex to Western blot is 95% to 100% sensitive for diagnosis and is also highly specific. This can be followed by PCR testing of synovial fluid or tissue for more definitive diagnosis if desired. Consider waiting several months before re-treating due to slow resolution of inflammation after treatment. If the patient fails both an oral and IV course, NSAIDs, intra-articular corticosteroids, and/or DMARDs could be used.
Late neurologic	See early neurologic manifestations, above.		
Acrodermatitis chronica atrophicans	Oral doxycycline, amoxicillin, or cefuroxime. Dose as for erythema migrans (above), but for 21 to 28 days.	None recommended.	Usually acquired overseas.

Abbreviations: **ACR = American College of Rheumatology**; **AAN = American Academy of Neurology**; AV = atrioventricular; bid=twice daily; CSF = cerebral spinal fluid; IDSA=Infectious Diseases Society of America; IV=intravenous; po=by mouth; qid=four times daily; tid=three times daily.

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Footnotes:
a. DOXYCYCLINE: individualize decision to use doxycycline in pregnant or lactating patients or children <8 years of age.[2] Limited evidence suggests that short courses (e.g., 14 to 21 days) of doxycycline during lactation or in young children does not cause tooth staining.[2,9] There is less information in pregnancy. The American Academy of Pediatrics recommends doxycycline as a treatment option for erythema migrans in children of any age.[2]

b. Antibiotics of choice are of similar efficacy and are not listed in any particular order. Choose based on factors other than efficacy (e.g., allergies, side effects, tolerability, adherence).

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