

Lyme Disease Prevention and Treatment

Information for Patients

What is Lyme disease?

Lyme disease is an infection caused by a bacteria carried by some ticks. It can occur after a black-legged or deer tick bite. Lyme disease cannot be transferred from one person to another.

Where do ticks live?

Ticks like wooded, brushy, overgrown grassy areas that are moist and shady and have lots of leaf litter and low-lying vegetation.

Where and when do most cases of Lyme disease occur?

In the United States, Lyme disease occurs most commonly in the northeastern, mid-Atlantic, and upper north-central regions and in several northwestern California counties. In fact, the vast majority of all Lyme disease cases reported in the United States in recent years were from Connecticut, Delaware, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, and Wisconsin. Although uncommon, Lyme disease can occur in Canada, especially in the areas of Ontario and British Columbia. Sporadic cases have been reported in other provinces as well.

Lyme disease occurs most often during the late spring and summer months, particularly in May, June, July, and August.

What signs and symptoms occur with Lyme disease?

The hallmark sign of Lyme disease that occurs in 80% of all patients is a slow spreading “bull’s-eye” rash. This red rash typically occurs days to weeks after a tick bite. Other symptoms you may experience include tiredness, fever, headache, stiffness, muscle aches, and joint pain. Weeks to months after exposure, patients who do not receive treatment may develop arthritis-like symptoms, particularly in large joints like the knee. Other problems involving the heart or nervous system can also occur.

Can Lyme disease be prevented?

The best way to prevent Lyme disease is to avoid a tick bite. If you must be in an area where contact with ticks is likely, wear a long-sleeved shirt tucked into long pants that are

tucked into socks or boots. This helps prevent ticks from reaching the skin. Also, wear light-colored clothing so ticks can be easily spotted. An insect repellent that contains DEET (n,n-diethyl-m toluamide) should be applied to clothing and exposed skin. Permethrin, an insecticide that kills ticks on contact, can also be applied to clothing. Finally, do daily skin checks for ticks. Most people who remove a tick within 24 to 36 hours of attachment will not develop Lyme disease.

If I find a tick, how do I remove it?

Ticks that are attached to the skin should be removed with fine-tipped tweezers. Grasp the tick firmly and as close to the skin as possible and then pull the tick slowly away from the skin. Cleanse the area with an antiseptic. Petroleum jelly, a hot match, or nail polish should not be used to remove a tick because they are not always effective.

How is Lyme disease treated?

Most patients who develop Lyme disease can be treated successfully with an oral antibiotic that is administered for 10 to 21 days. Oral antibiotics that are commonly prescribed for Lyme disease include doxycycline (brand name *Vibramycin*), amoxicillin (brand name *Amoxil*), and cefuroxime axetil (brand name *Ceftin*). In some cases, if the heart or nervous system is involved, intravenous antibiotic therapy will be necessary for 14 to 28 days. An intravenous antibiotic that is commonly prescribed for Lyme disease is ceftriaxone (brand name *Rocephin*).

Are there any long-term complications?

Some patients may continue to experience symptoms after antibiotic treatment. Your healthcare provider may elect to give you a second course of antibiotic therapy if this occurs. In most cases, more than two courses of antibiotics are not recommended. If symptoms persist, a nonsteroidal anti-inflammatory drug may be prescribed.

If a tick has bitten me should I take an antibiotic?

Currently, early antibiotic therapy is not routinely recommended after a tick bite.

Summary of 2006 IDSA Guidelines for Treatment of Lyme Disease

—Doxycycline should not be used for pregnant or lactating women or children < 8 years—

STAGE	DIAGNOSIS	DRUG OF CHOICE	ALTERNATE THERAPY	COMMENTS
PROPHYLAXIS	Confirmed tick bite	<p><u>Adults:</u> Doxycycline 200 mg po x 1 dose</p> <p><u>Children ≥ 8 years old:</u> Doxycycline 4 mg/kg po x 1 dose (max 200 mg)</p>	None recommended.	<p>Prophylaxis recommended only if all four criteria are met:</p> <p>Tick identified as an adult or nymphal <i>I. scapularis</i>, estimated to have been attached for ≥ 36 hours. Prophylaxis must be started within 72 hours of tick removal.</p> <p>Local rate of infection of ticks with <i>B. burgdorferi</i> is ≥20%.</p> <p>Doxycycline must not be contraindicated.</p>
EARLY LOCALIZED, EARLY DISSEMINATED	Erythema migrans, with no neurologic or cardiac manifestations	<p><u>Adults:</u> Doxycycline 100 mg po bid x 14 days</p> <p>Amoxicillin 500 mg po tid x 14 days</p> <p>Cefuroxime axetil 500 mg po bid x 14 days</p>	<p>Azithromycin 500 mg po daily x 7–10 days</p> <p>Clarithromycin 500 mg po bid x 14–21 days (if patient is not pregnant)</p> <p>Erythromycin 500 mg po qid x 14–21 days</p>	<p>Doxycycline is also effective x 10 days.</p> <p>Macrolides are not recommended as first-line therapy. They have been less effective than other antimicrobials in clinical trials.</p>

More . . .

STAGE	DIAGNOSIS	DRUG OF CHOICE	ALTERNATE THERAPY	COMMENTS
EARLY LOCALIZED, EARLY DISSEMINATED, continued	Erythema migrans, with no neurologic or cardiac manifestations, <i>continued</i>	<u>Children:</u> Amoxicillin 50 mg/kg/day po divided tid x 14 days (max 500 mg/dose) Cefuroxime axetil 30 mg/kg/day po divided bid x 14 days (max 500 mg/dose) If ≥ 8 years old: Doxycycline 4 mg/kg/day po divided bid x 14 days (max 100 mg/dose)	Azithromycin 10 mg/kg/day po daily x 7-10 days (max 500 mg/day) Clarithromycin 7.5 mg/kg/dose po bid x 14-21 days (max 500 mg/dose) Erythromycin 12.5 mg/kg/dose po qid x 14-21 days (max 500 mg/dose)	Reserve macrolides for patients unable to take first- line therapies. Observe patients treated with macrolides to ensure resolution of clinical manifestations.
	Lyme meningitis or radiculopathy	<u>Adults:</u> Ceftriaxone 2 g IV daily x 14 days	Cefotaxime 2 g IV q8h x 14 days Penicillin G 18–24 million units/day IV divided q4 h x 14 days For beta-lactam intolerance, Doxycycline 100–200 mg po/IV bid x 10–28 days	None.
		<u>Children:</u> Ceftriaxone 50–75 mg/kg/dose IV daily x 14 days (max 2 g/dose)	Cefotaxime 150–200 mg/kg/day IV divided tid or qid x 14 days (max 6 g/day) Penicillin G 200,000–400,000 units/kg/day IV divided q4h x 14 days (max 18–24 million U/day) If ≥ 8 years old: Doxycycline 4–8 mg/kg/day po divided bid x 10-28 days (max 100–200 mg/dose)	None.

STAGE	DIAGNOSIS	DRUG OF CHOICE	ALTERNATE THERAPY	COMMENTS
EARLY LOCALIZED, EARLY DISSEMINATED, <i>continued</i>	Seventh cranial nerve palsy	<p>Patients with normal CSF examinations and those in whom CSF examination is deemed unnecessary because of lack of clinical signs of meningitis: Treat with a 14-day course of the same antibiotics used for patients with erythema migrans.</p> <p>Patients with both clinical and laboratory evidence of CNS involvement: Treat with regimens effective against meningitis.</p>	None recommended.	None.
	Lyme carditis (AV heart block, myopericarditis)	<p>Treat with po antibiotics as for erythema migrans x 14 days</p> <p>Hospitalized patients should receive IV antibiotics as for meningitis.</p>	As for erythema migrans.	None.
	Borrelial lymphocytoma	Treat with same regimens recommended for erythema migrans.	None recommended.	None.
LATE LYME	Lyme arthritis	<p><u>Adults:</u></p> <p>Doxycycline 100 mg po bid x 28 days</p> <p>Amoxicillin 500 mg po tid x 28 days</p> <p>Cefuroxime axetil 500 mg po bid x 28 days</p>	None recommended.	<p>If arthritis has improved but not resolved, a second 4-week course of po antibiotics may be used.</p> <p>If arthritis has worsened or not improved, re-treat with 2-4 weeks of IV ceftriaxone.</p> <p>Consider waiting several months before re-treating due to slow resolution of</p>

STAGE	DIAGNOSIS	DRUG OF CHOICE	ALTERNATE THERAPY	COMMENTS
LATE LYME, <i>continued</i>	Lyme arthritis, <i>continued</i>	<p><u>Children:</u> Amoxicillin 50 mg/kg/day po divided tid x 28 days (max 500 mg/dose)</p> <p>Cefuroxime axetil 30 mg/kg/day po divided bid x 28 days (max 500 mg/dose)</p> <p>If ≥ 8 years old: Doxycycline 4 mg/kg/day po divided bid x 28 days (max 100 mg/dose)</p>	None recommended.	<p>inflammation after treatment.</p> <p>Symptomatic treatment may include NSAIDs, corticosteroids, DMARDs.</p>
	Late neurologic	<p><u>Adults:</u> Ceftriaxone 2 g IV daily x 14-28 days</p>	<p>Cefotaxime 2 g IV q8h x 14-28 days</p> <p>Penicillin G 18–24 million units/day divided q4h x 14-28 days</p>	Response to treatment is usually slow and may be incomplete. Re-treatment is not recommended unless relapse is shown by reliable objective measures.
		<p><u>Children:</u> Ceftriaxone 50–75 mg/kg/dose IV daily x 14-28 days (max 2 g/dose)</p>	<p>Cefotaxime 150–200 mg/kg/day IV divided tid or qid x 14-28 days (max 6 g/day)</p> <p>Penicillin G 200,000–400,000 units/kg/day IV divided q4h x 14-28 days (max 18–24 million U/day)</p>	
Acrodermatitis chronica atrophicans	<p><u>Adults:</u> Doxycycline 100 mg po bid x 21 days</p> <p>Amoxicillin 500 mg po tid x 21 days</p> <p>Cefuroxime axetil 500 mg po bid x 21 days</p>	None recommended.	None.	

STAGE	DIAGNOSIS	DRUG OF CHOICE	ALTERNATE THERAPY	COMMENTS
LATE LYME, <i>continued</i>	Acrodermatitis chronica atrophicans, <i>continued</i>	<u>Children:</u> Amoxicillin 50 mg/kg/day po divided tid x 21 days (max 500 mg/dose) Cefuroxime axetil 30 mg/kg/day po divided bid x 21 days (max 500 mg/dose) If \geq 8 years old: Doxycycline 4 mg/kg/day po divided bid x 21 days (max 100 mg/dose)	None recommended.	None.
OTHER INFECTIONS THAT MAY BE TRANSMITTED BY <i>Ixodes</i> TICKS	Human granulocytic anaplasmosis, or HGA (<i>A. phagocytophilum</i>)	<u>Adults:</u> Doxycycline 100 mg po (or IV if unable to take po) bid x 10 days	For mild illness in pregnant patients or those with drug allergy: Rifampin 300 mg po bid x 7–10 days Co-treat patients with <i>B.</i> <i>burgdorferi</i> with Amoxicillin or Cefuroxime as for erythema migrans.	All patients suspected to have HGA should be treated due to the risk of complications. HGA is infrequently diagnosed in children. Patients who receive abbreviated courses or rifampin should be closely observed to ensure resolution of clinical and laboratory abnormalities.

STAGE	DIAGNOSIS	DRUG OF CHOICE	ALTERNATE THERAPY	COMMENTS
OTHER INFECTIONS THAT MAY BE TRANSMITTED BY Ixodes TICKS, continued	Human granulocytic anaplasmosis, or HGA (<i>A. phagocytophilum</i>), continued	<p><u>Children:</u> If ≥ 8 years old: Doxycycline 4 mg/kg/day po (or IV if unable to take po) divided bid x 10 days (max 100 mg/dose)</p> <p>Treat severely ill children < 8 years with 4-5 days of Doxycycline (same dose as above)</p> <p>If co-infected with <i>B. burgdorferi</i>, continue treatment for a total of 14 days with Amoxicillin or Cefuroxime as for erythema migrans.</p>	<p>For mild illness or drug allergy: Rifampin 10 mg/kg/dose po bid x 7-10 days (max 300 mg/dose)</p> <p>Co-treat patients with <i>B. burgdorferi</i> with Amoxicillin or Cefuroxime as for erythema migrans.</p>	See adult section.
	Babesiosis (<i>B. microti</i>)	<p><u>Adults:</u> Atovaquone 750 mg po q12 h, plus Azithromycin 500–1000 mg po on day 1 followed by 250 mg po daily x 7-10 days</p> <p>For immunocompromised patients, higher doses of Azithromycin (600–1000 mg/day) may be used</p> <p>For severe babesiosis: Clindamycin 300–600 mg IV q6h or 600 mg po q8h, plus Quinine 650 mg po q6–8h x 7-10 days</p>	None recommended.	<p>All patients with active babesiosis should be treated with antimicrobials because of the risk of complications.</p> <p>Monitor patients with moderate-to-severe babesiosis closely to ensure improvement.</p> <p>Consider coinfection with <i>B. burgdorferi</i> or <i>A. phagocytophilum</i> or both in patients with especially severe or persistent symptoms, despite appropriate therapy. Patients found to have</p>

STAGE	DIAGNOSIS	DRUG OF CHOICE	ALTERNATE THERAPY	COMMENTS
OTHER INFECTIONS THAT MAY BE TRANSMITTED BY Ixodes TICKS, <i>continued</i>	Babesiosis <i>(B. microti),</i> <i>continued</i>	<u>Children:</u> Atovaquone 20 mg/kg/dose po q12 h (max 750 mg/dose), plus Azithromycin 10 mg/kg/dose po on day 1 (max 500 mg/dose) and 5 mg/kg/dose po daily (max 250 mg/dose) x 7-10 days For severe babesiosis: Clindamycin 7-10 mg/kg/dose IV or po q6-8h (max 600 mg/dose), plus Quinine 8 mg/kg/dose po q8h (max 650 mg/dose) x 7-10 days	None recommended.	coinfection should be treated with additional antimicrobial therapy.

IDSA=Infectious Diseases Society of America

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