Lyme disease

Arthritis and other disorders may stem from missed bull's eye rash

BY MUHAMMAD MORSHED, PhD

Lyme disease is caused by the spirochete *Borrelia burgdorferi sensu lato*, and it's most often transmitted by Ixodes ticks. This is one of the most common vector-borne diseases in North America. It also exists throughout the world, including Scandinavia, Central, Southern and Western Europe, the former Soviet Union, Japan and China. In Canada, depending on the area, the incidence is either low or absent. Lyme disease is treatable using appropriate antibiotics, but myths and misconceptions are prevalent across the globe, even among medical professionals. It's important, therefore, to be able to recognize both a tick bite and the disease it causes.

Muhammad Morshed, PhD, SCCM is a Clinical Microbiologist at the BC Centre for Disease Control, as well as a Clinical Associate Professor in the Department of Pathology and Laboratory Medicine at the University of British Columbia. He has been researching Lyme disease in Canada since 1997.

Borrelia burgdorferi

- 3 major clades
- different clinical manifestations
- *B. burgdorferi sensu stricto* — eastern and western parts of N.A.
- *B. afzelii* — Europe, frequently isolated from patients with acrodermatitis chronica atrophicans
- *B. garini* — Europe, may be found in lymphocytic meningoradiculitis (Bannwarth's syndrome) and white matter encephalitis

Signs and symptoms

- multiple organs affected if untreated
- bull's eye rash — erythema migrans (EM) — may appear within 1-30 days at site of tick bite
- flu-like symptoms — fever, chills, fatigue, body aches, headache
- early or late disseminated form
  - in small number of individuals who overlook or don't develop EM
  - involves joints, heart, nervous system
  - arthritis — typically mono-articular or oligoarticular; more common than other disseminated forms
  - cardiac — impaired con-duction to atrioventricular node, resulting in arrhyth-mias, heart block and episodes of syncope
  - neurologic — uncommon; if present, includes cranial neuropathies, meningitis, radiculoneuropathy, encephalopathy and myelopathy
- late or post-Lyme disease
  - only in a few unlucky individuals whose early infection has gone either undetected or not been adequately treated
  - symptoms may include arthritis, meningitis, peripheral and cranial neuritis, encephalopathy
- acrodermatitis chronica atrophicans — primarily in Europe; chronic skin changes

Epidemiology

- exists throughout the world
- one of the most common arthropod-borne infections in N.A.
- transmitted by *Ixodes scapularis*, or deer tick — northeastern and mid-Atlantic states and eastern part of Canada
- *Ixodes pacificus,* or western blacklegged tick — on Pacific coast
- both ticks may also carry other pathogens — e.g. *Anaplasma phagocytophila*, *Babesia microti*
- common tick hosts — white-footed mouse (*Peromyscus leucopus*) in eastern N.A. and deer mouse (*P. maniculatus*) in West
- migratory passerine birds (songbirds, etc.) — might transport ticks and spirochetes long distances, to new habitats

Diagnosis

- clinical — EM rash after known tick bite, symptomatic, within Lyme-endemic area
- in absence of rash — any geographical location, with symptoms — test for antibodies against Lyme spirochetes, as follows
  - investigations: screen with commercially available enzyme immunoassay or immunofluorescent assay
  - test all positive or indeterminate specimens with IgM and IgG Western blot
  - polymerase chain reaction (PCR) and culture — not clinically useful
- lab false positives — exercise caution, as most Canadian provinces and territories are either low or non-endemic for Lyme disease
- patients with persistent rheumatic or neurologic manifestation or fatigue, but no recollection of tick bite
  - serologic testing as above
  - if results are negative, investigate for other infectious agent or non-infectious causes

Treatment

- depends on infectious stage, severity of illness, and demography
- early localized disease — doxycycline 100 mg orally, b.i.d. for 14-21 days; or amoxicillin 1 g, b.i.d. for 14-21 days
- early disseminated, multiple EM and late disease — same, 21 days
- isolated facial palsy and late arthritis — as above, 28 days
- carditis — ceftriaxone 75-100 µg/kg (max 2 g/day) intravenously (IV) for 30-60 days
- meningitis or encephalitis — ceftriaxone IV, as above
- preventing EM after a tick attachment for > 72 hours — adults, hyperendemic area (not Canada) — a single dose 200 mg of doxycycline
- for details, see IDSA guidelines: **http://www.journals.uchicago.edu/CID/journal/issues/v43n9/40897/40897.html**

Prevention

- outdoor clothing: long pants and sleeves
- insect repellents for outside activities — 10-30% concentration of DEET to exposed skin and clothing
- reduce environmental burden — clear brush and leaves where ticks live, keep woodpiles in sunny, dry areas
- tell patients to check for ticks after time outdoors — on themselves, children and pets
- remove tick with tweezers immediately
  - gently grasp tick near its head or mouth
  - don't squeeze or crush tick, but pull carefully and steadily
  - once entire tick is off, apply antiseptic to bite area
- no human vaccine available

References:

1. Canadian Public Health Laboratory Network. *Can J Infect Dis and Med Microbiol* 2007;18(2) 145-8.
2. Health Canada: **http://www.hc-sc.gc.ca/iyh-vsv/diseases-maladies/lyme_e.html**.
3. Wormser GP et al. *Clin Infect Dis* 2006;43(9):1089-134.
4. U.S. Centers for Disease Control: **http://www.cdc.gov/ncidod/dvbid/lyme/index.htm**.