> Lyme borreliosis

Factsheet

for health practitioners

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Tick-borne diseases

Name and nature of infecting organism

Lyme borreliosis (LB) is a tick-transmitted bacterial infection caused by some members of the spirochete group *Borrelia burgdorferi* sensu lato. It is the most prevalent tick-transmitted infection in temperate areas of Europe, North America and Asia, and its geographic distribution is ever-increasing.

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The *B. burgdorferi* complex comprises at least 15 genospecies worldwide; only five are significantly pathogenic to humans. All pathogenic genospecies can cause erythema migrans, the early skin rash of LB. *Borrelia afzelii* and *B. garinii* are the major pathogenic genospecies found in Europe and are associated with skin and neurological complications respectively. *B. burgdorferi* sensu stricto (the only pathogenic genospecies found in North America) is present in some parts of Europe and can cause neurological and arthritic complications. Two other pathogenic genospecies have been identified in Europe: *B. bavariensis*, associated with neurological complications and *B. spielmanii*. Additionally *B. valaisiana* and *B. lusitaniae* rarely cause disease in humans.

The overall mean prevalence of B. burgdorferi genospecies in ticks in Europe has been estimated at about 12% with higher prevalence in adult ticks than nymphs. The regions with highest tick infection rates (nymphs >10%; adult ticks >20%) are located in central Europe and include Austria, Czech Republic, southern Germany, Switzerland, Slovakia and Slovenia.

Transmission

Reservoir

In Eurasian endemic areas *B. burgdorferi* genospecies circulate between hard ticks of the *Ixodes ricinus* complex and vertebrate hosts, including many species of small mammals and ground-feeding birds, which are the principal feeding hosts for larva and nymphs.

Adult ticks usually feed on larger animals such as deer, which are not reservoir-competent for borrelia, but help to maintain the ticks' reproductive stage.

The most suitable microhabitats for tick development and survival have >85% relative humidity. Optimal habitats are represented by deciduous or mixed woodland, but *I. ricinus* ticks can also be found in heathland, open grassy meadows and in suburban and urban environments, including urban parklands.

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Transmission mode

Transmission of *B. burgdorferi* to humans occurs through a bite from an infected tick, mainly a nymph or an adult. Larval tick bites do not pose a significant risk, as it is rare for larvae to carry infection. Infected ticks are unlikely to transmit the organisms in the early hours

Clinical features

Borrelia burgdorferi infection can be asymptomatic.

• Early manifestation

Erythema migrans, the early skin rash of localised infection, occurs in about 80-90% of cases. It is an erythematous rash that gradually expands from the site of a tick bite and is not significantly raised or painful. Some patients may also have systemic 'flu-like' illness but without significant respiratory symptoms.

Borrelial lymphocytoma is an uncommon skin manifestation of early infection, usually affecting the earlobe, nipple or scrotum. It may persist for some months if left untreated, and can be mistaken for cutaneous lymphoma because of its associated intense lymphocytic infiltrate.

• Late manifestations

Neuroborreliosis is the main complication, seen in about 10% of cases. Acute neuroborreliosis can present: facial palsy, lymphocytic meningitis, radiculoneuritis. It usually occurs within about six to twelve weeks of infection. Meningoencephalitis is a less common feature. Occasional cases of more indolent radiculopathy can develop over a period of months, mainly in older people. Radicular pain can be very severe, but usually reduces rapidly following antibiotic treatment. Other uncommon features of disseminated infection include multiple erythema migrans, intermittent arthritis and carditis, which can cause rhythm abnormalities. These also present within a few weeks to several months of infection.

Presentations of late (previously untreated) Lyme borreliosis can affect the skin, nervous or musculoskeletal systems. Manifestations include acrodermatitis chronica atrophicans, a persistent skin infection usually affecting the extremities, causing inflammation and eventually thinning of the affected skin with an associated neuropathy. Late neuroborreliosis usually presents as an encephalomyelitis and can resemble multiple sclerosis. Lyme arthritis usually affects a large joint, most commonly the knee. All are caused by active infection which will respond to antibiotic therapy, but recovery may be incomplete depending on the degree of underlying tissue damage prior to treatment.

of a feed, but the risk rises steadily with increasing duration of the blood meal, so early removal of attached ticks within the first hours is very useful in reducing transmission risk.

Risk groups

All persons exposed to risk of tick bites are at risk of becoming infected.

Prevention measures

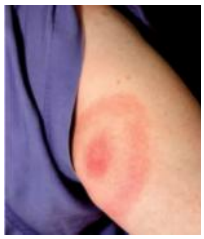
No licensed vaccine is currently available, so the main methods of preventing infection are avoiding tick bites and early removal of attached ticks. The most effective tick-bite avoidance strategies include wearing protective clothing (long trousers and long-sleeved shirts) and using DEET repellents on skin and clothes. Skin should be checked periodically for attached ticks and these should be removed with tweezers or fine-pointed forceps, grasping the tick as closely as possible to the skin, pulling gently upwards and trying not to break off the mouth parts. The risk of borrelial infection is not increased if tick mouth parts are left behind. A skin disinfectant should be applied afterwards to prevent pyogenic infection.

Areas to check for ticks that should have particular attention include skin-folds – groins, armpits, under breasts, waist band area, backs of knees – as ticks seek out more humid areas for attachment. The head (including scalp) and neck area of young children should also be checked carefully, as tick bites are relatively more common at these sites in this age group.

Diagnosis

No laboratory tests are required in the diagnosis of erythema migrans, which depend on a clinical evaluation and an assessment of tick exposure risk.

Laboratory tests are necessary to confirm a diagnosis of later stage infection. Antibodies to *B. burgdorferi* are usually detectable within 4-8 weeks of infection. Patients with late-stage infection are rarely seronegative and usually have very strongly positive antibody tests. However, the occurrence of false-positive tests in patients with other infections or conditions such as autoimmune diseases, can lead to misdiagnosis and inappropriate treatment.



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Other specialised investigations can be helpful in certain cases, for example antibody testing and borrelial DNA detection studies on CSF from patients with suspected neuroborreliosis. Borrelia DNA detection can also be useful on skin biopsies from patients with suspected erythema migrans and acrodermatitis chronica atrophicans and on synovial fluid from patients with suspected Lyme arthritis.

Management and treatment

All patients with symptomatic *B. burgdorferi* infection should be treated with appropriate antibiotics (amoxicillin and cephalosporin and macrolides for disseminated infections). Early treatment can prevent the risk of developing late stage complications, but even patients with late stage Lyme can benefit from antibiotics, although clinical recovery may be incomplete if severe tissue damage had occurred prior to treatment.

Key areas of uncertainty

Areas for further research include more detailed knowledge of the ecological aspects of Lyme borreliosis on a local, regional and EU scale, including distribution and prevalence of pathogenic and non-pathogenic genospecies and more data on the epidemiology of Lyme borreliosis. Further improvements in diagnostic tests are also required.

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> For more information on tick-borne diseases, please consult the HPSC website www.hpsc.ie