Molecular diagnosis of *Borrelia burgdorferi* infection

*Borrelia burgdorferi* is a gram negative helically shaped bacterium (a spirochete with multiple endoflagella for motility). Broadly speaking, the term *B. burgdorferi* includes three species, *B. burgdorferi, B. garinii,* and *B. afzelii.* All are human pathogens in Europe. Infection with *B. burgdorferi,* (including *B. garinii* and *B. afzelii*), can manifest itself in a range of dermatological, neurological, cardiac, and musculoskeletal disorders. Early infection with *Borrelia* can present as a classical rash (erythema migrans), subsequently the infection can disseminate to the skin, central nervous system (CNS) and heart. *Borrelia burgdorferi* is known to invade the CNS and be neurotropic, leaving the cerebrospinal fluid (CSF) to adhere to glial cells or other brain tissue. Once in the CNS, *B. burgdorferi,* may remain latent, only to re-activate and cause illness months later.

The early serodiagnosis of Lyme disease is difficult because the antibody response in the first weeks of infection is absent or barely detectable. Furthermore, there is little diagnostic value in antibody assays in distinguishing between active and inactive infection because antibody persists after therapy. *Borrelia burgdorferi* can be recovered from CSF, skin and blood by culture, however culture is not a gold standard for *Borrelia* due to its lack of sensitivity. The spirochaetes grow slowly and cultures need to be monitored for up to 12 weeks, with results confirmed by microscopy, PCR or staining by specific monoclonal antibodies.

Molecular amplification has the advantage of being potentially able to detect 1-50 bacterial cells per millilitre of body fluid. In blood, the bacteraemia is transient and high detection rates can be expected only during a short period of primary infection. A high correlation has been found between the detection of *B. burgdorferi* by PCR and the presence of erythema migrans. In 2010 the European Federation of Neurological Sciences published guidelines stating that although PCR on CSF samples has a low sensitivity, it may be useful in very
early Lyme neuroborreliosis with no detectable antibodies or in patients with immunodeficiency\(^4\).

At Micropathology Ltd we use a nested PCR assay with primers that target the *Borrelia* flagellin gene. The assay is included in external quality assurance schemes.

**References**


