



## **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<sup>1</sup>. 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<sup>2</sup>. 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<sup>3</sup>. 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<sup>4</sup>. 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<sup>4</sup>.

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<sup>5</sup>. A high correlation has been found between the detection of *B. burgdorferi* by PCR and the presence of erythema migrans<sup>6,7</sup>. 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<sup>4</sup>.

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

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