

# Study Provides Insights into Neuropathologies Associated with Lyme Disease

The study, "A murine model of Lyme disease demonstrates that *Borrelia burgdorferi* colonizes the dura mater and induces inflammation in the central nervous system," was published in the journal *PLoS Pathogens*.



Prior to this, studies using inbred laboratory mice to observe *B. burgdorferi* infection and host immune responses in the central nervous system (CNS) were lacking, creating a major barrier to understanding the neuropathologies associated with Lyme disease.

The researchers developed a tractable animal model for investigating host-*Borrelia* interactions in the CNS and CNS pathogenesis. Using fluorescence-immunohistochemistry, intravital microscopy, bacterial culture, and quantitative PCR, they observed *B. burgdorferi* routinely colonized the dura mater of C3H mice, with peak spirochete burden at day 7 post-infection. Dura mater colonization was observed for *B. burgdorferi*, *B. garinii*, and *B. mayonii*.

RNA-sequencing and quantitative RT-PCR showed *B. burgdorferi* infection to be associated with increased expression of inflammatory cytokines and a robust interferon (IFN) response in the dura mater. The meninges showed histopathologic changes such as leukocytic infiltrates and vascular changes. The researchers did not find *B. burgdorferi*, infiltrating leukocytes, or large-scale changes in cytokine profiles in the cerebral cortex or hippocampus. However, both brain regions showed comparable changes in the expression of

IFN-stimulated genes as was observed in peripheral tissues and meninges.

The paper reads, "Taken together, *B. burgdorferi* is capable of colonizing the meninges in laboratory mice, and induces localized inflammation similar to peripheral tissues. A sterile IFN response in the absence of *B. burgdorferi* or inflammatory cytokines is unique to the brain parenchyma, and provides insight into the potential mechanisms of CNS pathology associated with this important pathogen."

The authors summarize, "Overall, these findings characterize the central nervous system responses to *Borrelia burgdorferi* infection in a cost-effective and genetically robust animal model, and provide insights into the mechanisms of neuropathologies associated with Lyme disease."

Read "A murine model of Lyme disease demonstrates that *Borrelia burgdorferi* colonizes the dura mater and induces inflammation in the central nervous system" in *PLoS Pathogens*.