

PhD Dissertation
Department of Environmental Science and Policy
George Mason University

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Title: Variation of *Borrelia burgdorferi* Strains in the White-footed Mouse (*Peromyscus leucopus*) in Fairfax County, Virginia

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ABSTRACT

Peromyscus leucopus (the white-footed mouse) is the known reservoir of the Lyme disease spirochete *Borrelia burgdorferi*. Surveillance of white-footed mice allows for year-round *Borrelia* surveillance as well as opportunities to establish the diversity of the different strains in a geographic region. This study aimed to determine the genetic variability of the *Borrelia* spirochete in Fairfax County, Virginia, correlations between infected tissues, correlations between *Borrelia* strains and the tissue of infection, and the optimum field methods for surveillance of *Borrelia*. A total of 90 mice and 573 tissues (spleen, liver, ear, tongue, tail, heart, and kidney) were sequenced for *B. burgdorferi* infections. A large amount of diversity in the spirochete was found with 10 different strains being identified from 7 different tissue types. Infections in a single mouse tissue (spleen, liver, ear, tongue and tail) were predictive of concurrent infection in other tissues of the same mouse at a statistically significant level. The lack of evenly distributed tissues and *Borrelia* outer surface protein C (OspC) strains made significant correlations between strain and tissue difficult, however strain 72a and JQ95096.1 had statistically significant odds of appearing in ear tissues. Ear tissues had the highest rate of infection (44.3%) and 90% of the overall observed diversity making them an ideal surveillance tissue for determining mouse infection rate and *Borrelia* diversity.