Lyme Disease in Horses: Serological and Antigen Testing Differences

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Equine Lyme disease is difficult to diagnose because of its nonspecific clinical signs and the high incidence of subclinical infection in endemic regions. In this study, horses from a highly endemic region that were clinically diagnosed with Lyme disease were more likely to have Borrelia burgdorferi spirochetal DNA in their blood and urine, as well as to have antibodies to certain B. burgdorferi proteins on immunoblot, than were subclinically B. burgdorferi infected horses from the same region. These results may help to improve diagnostic tests for equine Lyme disease. Authors’ addresses: Dept. of Pathobiology, The University of Connecticut, 61 North Eagleville Rd., Storrs, CT 06268 (Manion and Bushmich); Equine Care, 24 Fox Run, Sherman, CT 06775 (Mittel and Laurendeau); Equine Medicine and Surgery, 29 Godard Rd., North Granby, CT 06060 (Werner); and Connecticut Equine Clinic, 824 Flanders Rd., Coventry, CT 06238 (Reilly). © 1998 AAEP.

1. Introduction

Lyme disease is caused by systemic infection with the spirochetal bacterium, Borrelia burgdorferi. Lyme disease has been reported in humans, cats, dogs, sheep, cattle, and horses, but to date it has been studied extensively in humans and dogs only.1–4,11 An estimated 30–40% of horses in endemic areas show serologic evidence of B. burgdorferi exposure, with roughly 9% of those that are seropositive developing clinical disease.4–6 Shifting lameness is the most common presenting clinical sign, with a variety of other manifestations also reported.2,4,6,7,12 Affected horses are in obvious discomfort and frequently unable to work. A diagnosis is difficult, because of the many causes of equine lameness and the high incidence of subclinical infection in the equine population of endemic regions. A clinical diagnosis generally involves a physical examination, including functional and radiographic testing to rule out other causes of lameness, supportive serology, and response to treatment. To our knowledge, controlled clinical studies of equine Lyme disease are lacking. Differences in serology, antigen presence, hematology, blood chemistries, and clinical presentation that could distinguish clinically ill B. burgdorferi infected horses from those subclinically exposed would be of diagnostic importance to veterinary clinicians and their clientele. The purpose of this study was to address these basic questions regarding natural infection of horses with B. burgdorferi.

2. Materials and Methods

A. Animals

Group 1 (clinical) horses were selected by a small group of equine practitioners with considerable Lyme
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B. Experimental Plan

Horses were sampled twice; an initial sample was followed by a second sampling 2–4 months later. Initial sampling results are reported here. During sampling, each horse was given a physical examination and blood (plus urine if possible) was collected. Routine complete blood cell counts and serum biochemical profiles were performed. Serum immunoglobulins to B. burgdorferi were measured by an enzyme-linked immunosorbent assay (ELISA) and immunoblot test. Whole blood and urine samples were subjected to a polymerase chain reaction (PCR) with Southern blot hybridization for B. burgdorferi specific DNA. Median ELISA values were compared by means of the Mann–Whitney rank sum test. Immunoblots were compared by using Fisher’s two-tailed exact test. A value of p < 0.05 was considered significant.

3. Results

The mean ELISA values for horses in group 1 were higher (range 1:160–1:40,960) than those for group 2 (range <1:160–1:5120). Group 1 had a significantly higher frequency of positive immunoblots (77%) compared with group 2 (28%), and group 1 had significantly fewer equivocal and negative blots combined (23%) compared with group 2 (72%). Differences in immunoblot patterns were observed between groups. Antigen testing showed a significantly higher incidence of spirochetemia (53%) and spirocheturia (20%) combined (p < 0.001) in clinical group 1 horses compared with healthy group 2 horses (5% and 0%, respectively). Serum biochemical profiles and hematologic values were generally within normal limits and were not different between the groups. The most common clinical signs observed in group 1 were lameness involving multiple joints (74%), followed by behavioral changes (50%).

4. Discussion

A diagnosis of Lyme disease in horses is difficult, and it is usually based on clinical presentation, a history of tick exposure in an endemic region, supportive serology, and response to antibiotic therapy. Results of this study indicate that clinically ill B. burgdorferi infected horses are more likely to be spirochetemic and spirocheturic and have a higher incidence of positive immunoblots containing antibodies to certain B. burgdorferi proteins than clinically normal B. burgdorferi exposed horses. These data are important in that they may lead to the development of diagnostic strategies that can help distinguish healthy exposed animals from horses whose clinical disease is due to B. burgdorferi infection, thus lending more support to the clinical impression upon which the diagnosis is made.

References and Footnotes


Manion TB. Bushmich SL. Interpretation criteria of Western blots for the serodiagnosis of Lyme disease in horses. 1998; manuscript in preparation.

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