

Equine Lyme Disease

Abstract

The seroprevalence (the level of a pathogen in a population) for *Borrelia* in the mid-Atlantic and northeastern is relatively high within the equine population. What's more, in New England, 45% of horses have *Borrelia* antibodies (antibodies indicate infection or exposure). To determine if the horse is currently infected is difficult, and furthermore to determine whether clinical disease is associated with *Borrelia* is extremely difficult! Current serologic tests are very sensitive and specific for detecting either infection (previous or concurrent) or exposure, but may not distinguish between them.

Etiology

Lyme disease is caused by a bacterium called *Borrelia burgdorferi* and has three different strains associated with it. The strain that is found in North America is called *B. burgdorferi sensu stricto*. The bacteria are not free living (an organism that is directly dependent on another organism for survival) and maintain a two-year enzootic life cycle involving *ixodid* ticks such as *I. scapularis* found in the eastern US. The white-footed mice are the most common mammal that helps to maintain the life cycle of the bacteria. The infection first begins by the attachment and prolonged feeding (greater than 24 hours) of an infected adult *Ixodes* spp. tick. These ticks are most active in the fall and throughout the winter with temperatures above freezing. The bacteria live within the gastrointestinal tract of the tick and is transferred to the animal when feeding, which generally takes 24-48 hours to successfully transfer the bacteria in the mammalian host. Once transferred, the bacteria reside mostly in the skin near the tick bite in addition to connective tissue, muscle, around nerves and blood vessels.

Clinical signs

There is a wide variety of clinical signs attributed to *Borrelia* infection. In addition, Lyme disease is most often a controversial disease especially in the eastern region of the US because there is a high prevalence of antibodies against *Borrelia* in horses in this area. Common clinical signs related to Lyme disease include stiffness and lameness in more than one limb (shifting limbs at time), muscle tenderness, hyperesthesia (response to light palpation), uveitis, lethargy and behavioral changes. In horses that have high titers also show muscle wasting and pain over the thoracolumbar area. There has

also be some reports of horses being neurologic due to the infection causing them to be ataxic, having lumbar muscle wasting and occasional muscle fasciculations and neck stiffness. Other clinical signs can be seen if the horse is concomitantly infected with another agent such as *Anaplasma phagocytophila*. If the tick is also carrying *Anaplasma*, the horse may show signs of limb edema and have a high fever.

Diagnosis

On necropsy, the bacterium has been identified by using Steiner silver impregnation in affected dura mater of the brain and within the spinal cord. It can also be identified by PCR (polymerase chain reaction) using tissue with inflammation such as the spinal cord, muscle and joint capsule. However, ELISA (enzyme-linked immunosorbent assay) or IFA (immunofluorescent antibody) testing have been the most common used screening tests for detection of antibodies indicating exposure. A multiplex antibody test for OspA, OspC and OspF with quantitative antibody detection has been available for serodiagnosis. A high level of OspA suggest vaccination or exposure, a high level of OspC indicates recent infection and OspF suggest either chronic infection or more long-lasting antibodies. The most challenging aspect of diagnosing Lyme disease is determining if the horse is positive due to a current infection or whether is due to a passed exposure. In experimental horses, a large number of apparently asymptomatic horses (showing no symptoms) are seropositive. Clinical diagnosis is therefore difficult and should be based upon exposure (geographic location and serologic testing), probability of the clinical signs being related to *Borrelia* infection and anatomic locations for the organism to reside in the horse (synovial membranes, skin, meninges, nerves).

Treatment

The two most common drugs used to treat *Borrelia* in the horse are tetracycline given intravenous (IV) and doxycycline/minocycline (current oral treatment of choice) given orally (PO). In experimental horses, it was shown that IV tetracycline was more effective and obtains much higher tissue concentration than oral doxycycline. Doxycycline cannot be given via the IV route to horses because of potential side effects and tetracycline should not be given via orally because of its low bioavailability and its effect on the colon causing diarrhea. In addition, renal function should be monitored with IV tetracycline as high dose or prolonged treatment can induce acute renal failure in horses. Another drug called minocycline has better bioavailability than doxycycline and obtains higher concentration in the CSF (cerebrospinal fluid) and aqueous fluids because its more lipophilic (tending to combine with or dissolve in lipids) compared

to doxycycline. Response to treatment is determined by both clinical response to antibodies and serologic testing.

Prevention

The means for prevention of Lyme disease in endemic areas includes the prevention of tick exposure or prolonged (greater than 24h) attachment, the provision of early antimicrobial treatment after known Ixodes exposures and vaccination. The suggested way to determine if a horse should receive a vaccine is to evaluate the OSP A levels on the titer. If high, this helps protect the horse from infection due to the process of inoculating the horse (the tick must down regulate OSP A in order to spread the bacteria). The vaccine used in horses is a canine-approved Lyme vaccination that is commonly used, however the duration of protection, adverse effect, and efficacy in horses with the use of the canine vaccine is not yet known. Late summer, fall and early winter (after fly season) are the most common times for adults to attach. Therefore, during these seasons, the use of insecticides and close observations for ticks should be a high priority. Good pasture maintenance is also indicated to help minimize exposure to ticks.

If you have any questions or concerns regarding Equine Lyme Disease do not hesitate to contact the doctors of New England Equine Medical & Surgical Center.

Reference

Sellon D.C and Long M.T, Equine Infectious Diseases, 2nd edition, Elsevier Philadelphia.