Equine infectious diseases continue to emerge and re-emerge, infecting horses across the US and beyond. Infectious disease identification and treatment remain a cornerstone of equine practice. This lecture will discuss infectious disease updates and will review pigeon fever, piroplasmosis, MRSA, and others. The clinical syndromes, diagnostic techniques, and therapy will be included.

Equine piroplasmosis

Piroplasmosis is caused by the protozoan parasites Babesia caballi and Theileria equi (formerly called Babesia equi). It also can affect donkeys, mules, and zebras; but clinical disease in those equids is rare. The disease is transmitted by ticks and other biting insects; however, shared needles and/or blood contamination has been implicated in several disease outbreaks. Once horses are infected with T. equi, carrier status may be lifelong. Carrier horses are also capable of transmitting the disease to ticks—vectors that can transmit it to other horses. The disease is considered endemic in Africa, Central and South America, Asia, the Middle East, the Caribbean, and the Mediterranean. The U.S. has not been considered an endemic region. When infection occurs, T. equi tends to be the most common agent, rather than B. caballi. However, infection with both parasites can occur simultaneously.

Once horses become infected with the parasite, it usually takes between 5 and 30 days for any signs of the disease to appear. As previously stated, infected horses may not have any signs of EP at all. Generally, affected horses display nonspecific signs that can look similar to other diseases. Fever, depression, anorexia, pale or icteric mucous membranes, and edema of the limbs or along the ventral abdomen have been commonly reported. Reddish-brown or discolored urine may also be observed. Laboratory abnormalities typically include anemia and thrombocytopenia.

Several laboratory tests are available for diagnosis of EP. Occasionally, the parasite can be seen on microscopic examination of a blood smear. The U.S. Department of Agriculture (USDA) standard test is the cELISA (competitive enzyme-linked immunosorbent assay). Specific laboratories (the National Veterinary Services Laboratories, Texas Veterinary Diagnostic Services Laboratories, Florida’s State Diagnostic Laboratory) have been identified to run the tests and report the results. The National Veterinary Services Laboratories is still testing all international transport samples.

Horses that test positive for equine piroplasmosis MUST be quarantined. Local veterinarians can work with state and federal veterinarians to ensure that manageable quarantine guidelines are being followed and are in place. Although there are several drugs (imidocarb, etc) that have been identified for treatment of piroplasmosis, the organisms can be refractory to treatment, and the carrier state is difficult to clear. Euthanasia for positive horses is not required, nor is it being recommended in every case by the USDA, especially since so many positive horses are asymptomatic. State and USDA veterinarians are working in conjunction with local veterinarians and owners to determine the best recommendations for each positive horse. Some owners elect to transport positive horses out of the country—to countries that have endemic piroplasmosis—but that is not a palatable option for most. In addition to quarantine, there is a treatment research program available for positive horses. This program is in conjunction with Washington State University and Dr. Don Knowles. Owners and their local veterinarians work with the USDA and Dr. Knowles to determine if they have a horse that is eligible for enrollment. Recent published research out of that program is showing promise for clearing infection in horses treated with imidocarb.

Fortunately, it does not appear that tick transmission has been significantly involved in EP transmission outside of the affected premises in Texas. However, people can spread this disease from horse to horse, and we can prevent that mode of transmission. All dental, surgical, and tattoo equipment must be thoroughly disinfected between horses. Horses have contracted the disease though the use of shared needles and/or syringes, as well as from blood transfusions. A new sterile needle and syringe should be used for each injection, whether into a muscle or a vein. Additionally, a previously used needle should never be inserted into a drug or vaccine multidose vial—and owners/trainers should be reminded of these infection control measures. Work with your veterinarian to ensure that all equipment is thoroughly cleaned and disinfected between horses. EP is still a very uncommon disease in the U.S., but it is critical to be vigilant and follow preventative measures.

Pigeon fever

This disease is caused by Corynebacterium pseudotuberculosis, which is a gram positive rod shaped bacteria. Horses and small ruminants typically get different strains of the infection, but cattle can get both types. In goats, the disease is known as caseous lymphadenitis, and affected animals will have external abscesses (the head, behind the ears, on the neck, shoulder or flank are some typical locations). Abscesses also occur in horses and cattle infected with this bacteria. Natural transmission from horses to goats or vice versa is not thought to commonly occur. Corynebacterium pseudotuberculosis is a soil organism that can survive for months to even years in direct sun. The largest numbers of cases are typically reported in the dry months of fall and winter.
Many things about this disease in horses are still not completely understood, such as the incubation period. The incubation period is the time it takes to develop clinical symptoms of the disease after being infected with the bacteria, and can be variable…. from weeks to even months. The bacteria can enter the horse through the skin, wounds, or abrasions in the mucous membranes. Horses with pigeon fever may have a poor appetite, fever, lethargy, swelling along the chest or ventral abdomen, and/or lameness. Three forms of the disease can occur in the horse: external abscesses, internal abscesses, and ulcerative lymphangitis. The most common form of pigeon fever is the development of external abscesses. These occur in about 90% of the cases. The disease got its name because abscesses will commonly occur in the pectoral region which becomes swollen and painful. In addition to the pectorals, abscesses may form on the prepuce, mammary gland, axilla, limbs, inguinal region, head, and other areas. There is no breed or sex predisposition for acquiring the infection, although young horses may have some increased risk. The second form of the disease is internal abscessation, which has been reported in about 8% of cases. The most common site of internal abscesses is the liver, although they can be associated with other organs as well. The third form, ulcerative lymphangitis, is a severe cellulitis that occurs in the fewest number of cases. Clinical cases of ulcerative lymphangitis have severe lameness and swelling of the limb.

Definitive diagnosis of pigeon fever is made by culturing the bacteria from an abscess or draining wound. There is a blood test available (called the synergistic hemolysis inhibition test) but the results depend on the severity and length of infection. This means that a negative blood test (titer) does not rule out the disease. In fact, early in the disease horses may have a negative blood test. The blood test is helpful in horses with internal abscesses, as the titers are typically very high (>1:512). Ultrasound examination may be a helpful diagnostic tool in these cases as well, especially for identifying internal abscesses in the abdominal cavity.

Treatment of pigeon fever is accomplished with drainage of external abscesses. The primary veterinarian should always be consulted about treatment. Abscesses should be allowed to mature and then drained. They should be flushed with antiseptic solutions. Purulent material drained from abscesses is highly infectious and must be carefully handled and disposed of. Collecting as much purulent material as possible into a waste bag for disposal is critical to reduce the risk of other horses being exposed. Bedding of infected horses should be properly disposed of as well. Pain medication may be indicated for horses with severe or deep abscesses or lameness. Topical fly treatment around wounds and draining areas is critical to reduce the possibility of biting insects transmitting the infection. Systemic antibiotics may be utilized for treatment on a case by case basis. In routine cases with external abscesses, antibiotics may prolong the course of the disease and are typically not required. However, antibiotics are appropriate in cases with severe disease or reoccurrence of infection. Long term systemic antibiotics are required for treatment of horses with internal abscesses. Fortunately, Corynebacterium pseudotuberculosis is usually sensitive to most antibiotics (including penicillin), but culture and sensitivity of a sample of purulent material is recommended to direct therapy.

A conditionally licensed vaccine was released and then removed from the veterinary market this past spring. It is recommended to isolate infected animals, especially if draining wounds/abscesses are present. Stalling affected horses will help reduce contamination of the pasture environment with infectious material. Horses should be treated in an area ideally with concrete or rubber flooring that can be disinfected. Although no reports exist of humans being infected from horses, there are reports of humans being infected with the sheep strain of the disease. Infection in people has occurred from the consumption of infected unpasteurized milk or milk products, close contact with infected animals, handling contaminated equipment, or exposure of wounds with infected material. Therefore, wearing gloves when handling infected horses is recommended. Fly sprays and feed through fly control may both be beneficial for insect control. If you suspect your horse is exhibiting signs of pigeon fever, contact your veterinarian for a thorough examination.

**MRSA**
The prevalence of Methicillin-resistant *Staphylococcus aureus* (MRSA) in routine infections in people and hospital outbreaks has initiated world-wide concern. *Staphylococcus aureus* is a common bacterium that colonizes the skin and has been found to cause disease in many species. *Staphylococcus aureus* began developing resistance to antibiotics almost as soon as they were introduced, beginning with penicillin, and progressing to methicillin resistance. MRSA is typically resistant to all beta-lactam antibiotics (penicillin and cephalosporin families) and often many other antibiotics as well. This antimicrobial resistance can make MRSA infections a challenge to treat. The percentage of community-associated infection (milder, outpatient type illness like skin infections/abscesses) from MRSA had risen from 35.1% in 2003 to 50.0% in 2006 in Florida.

Methicillin-resistant *Staph aureus* infections in the horse have manifested as wound and surgical site infections, cellulitis (soft tissue infections, typically of the limb), catheter-site infections, pneumonia, septic arthritis, and skin infections, among others. Historically, equine MRSA infections were uncommonly reported, and began to increase in prevalence in the late 1990s. More recent studies have demonstrated that MRSA is an important emerging pathogen in horses and can be zoonotic. It is also possible for humans to transmit the bacteria to horses as well. Approximately 25% of healthy children and adults can carry the *Staphylococcus aureus* bacteria in their nose or on the skin. For most people and horses, carrying the bacteria in the nose or on the skin causes no ill-effects. Certain circumstances such as a wound or an illness requiring hospitalization can result in active infection.
Studies done in horses have found that approximately 0-5% of horses carry the MRSA bacteria in their nasal passages, which is the most common site for colonization (Weese et al, 2005). Horses can also have the bacteria on their skin or in their intestinal tract. Although generally very few horses carry the bacteria, some farms with a history of MRSA infections in horses have demonstrated carrier rates of 0-45% (Weese et al, 2005). Horses that carry the bacteria in their nasal passages may not ever develop a clinical MRSA infection. However, these horses may transmit MRSA to other horses or people, and will sometimes develop active infections under certain conditions. People who work with horses seem to have a higher carrier rate of MRSA. Studies of equine veterinarians have reported colonization rates ranging from 10-14%, with predominantly the equine strain of the bacterium. This provides further evidence that carrier horses can transmit MRSA to humans.

Clinical infection with MRSA is certainly concerning. Fortunately, a multicenter study reported that 83% of horses with MRSA infections survived (Anderson et al, 2009). Many horses with clinical infections such as pneumonia or wound infections required prolonged hospital stays and needed additional surgeries. However, acceptable antibiotic options exist in most cases, especially when infection is identified early. In this author’s experience, catheter site infections with MRSA, while uncommon, result in the highest mortality rates if the infection spreads through the bloodstream and into the lungs or other sites. Early detection and treatment is certainly critical for the best outcome for the horse. Currently, there is no evidence that horses that carry MRSA need to be treated with antibiotics. Farms with documented MRSA prevalence have successfully eradicated MRSA with good hygiene and infection control practices.

Further references