Equine Piroplasmosis
(Theileria equi, Babesia caballi, T. haneyi)

Definition

Equine piroplasmosis (EP) is a tick-borne or blood-borne protozoal disease of equids (horses, donkeys, mules and zebras). The etiologic agent is one of two protozoan parasites, *Theileria equi* or *Babesia caballi*. An organism related to *T. equi* was described in horses in 2018 and confirmed as a new species, *Theileria haneyi.* Its clinical significance is currently undetermined.

An equid that survives the clinical phase of the disease continues to carry parasites in red blood cells. These persistently infected equids pose a risk for infection to other equids.

The parasites that cause EP are endemic in parts of Africa, the Middle East, Asia, Central and South America, Mexico, the Caribbean, and Europe. The United States is considered free of natural tick-borne transmission of the disease except on the islands of Puerto Rico and the U.S. Virgin Islands. EP is considered a foreign animal disease in the U.S. and suspect or confirmed cases of EP require notification of State and Federal animal health officials.

Clinical Signs

Equids infected with *T. equi* or *B. caballi* become life-long carriers of the organism and may present with or without clinical signs.

Acute cases may begin as febrile illness, with non-specific signs such as inappetence, malaise, labored or rapid respiration, and congested mucous membranes. Some cases can be mild and transient, while a few cases can become markedly ill. Acute cases of EP usually have some degree of anemia, may have pale or icteric mucous membranes with or without petechiae, weakness, increased heart and respiratory rate, and hemoglobinuria or bilirubinuria.

Chronic EP can present as nonspecific illness with mild inappetence, poor exercise tolerance, weight loss, and transient fevers, although many chronically infected horses show no outward clinical signs. Anemia is often present, but may be minimal in chronically infected horses.

Incubation Period

The incubation period for tick-transmitted EP is 12 to 19 days for *T. equi* and 10 to 30 days for *B. caballi*. Incubation period can be highly variable when the disease is transmitted by iatrogenic means and may be dose-dependent.

Risk Factors	● Equids residing in EP endemic regions with potential tick exposure ● Re-use of blood-contaminated needles, syringes, intravenous administration sets, or multi-dose drug products ● Re-use of blood-contaminated equipment (dental, tattoo, surgical, etc.) ● Blood transfusion from a donor horse of non-negative or unknown EP status ● Use of illegally imported or poorly regulated biologics and blood products ● Stress, such as racing, heavy exercise, or transport, may increase the number of parasites present in the blood of the infected horse, thereby increasing the risk of disease spread.
Transmission	*B. caballi and T. equi* are transmitted by certain species of competent ticks, which act as biological vectors. Dermacentor, Hyalomma, Haemaphysalis, Ixodes, Rhipicephalus, and Amblyomma have been implicated as natural or experimental tick vectors. *B. caballi and T. equi* can be transmitted transstadially in ticks, but transovarial transmission in ticks is only known to be significant for *B. caballi*. Iatrogenic transmission via the use of infected blood or blood products, or use of blood contaminated equipment such as needles, syringes, surgical instruments, dental equipment, tattooing equipment, or any other equipment may spread the pathogen to a naïve horse. Additionally, infrequent in utero vertical infection in infected pregnant mares can occur.
Diagnostic Sampling, Testing and Handling	Due to variable levels of circulating EP organisms in the bloodstream and the predominant antibodies present during different stages of infection, diagnosing infection in an individual equid may require multiple diagnostic tests. Equine piroplasmosis in acute or clinical stages may be diagnosed by visualizing the parasite within erythrocytes on microscopy of stained blood smears using Giemsa, Wright's, or Diff-Quik stains. Blood smears must be thoroughly examined, as the level of parasitemia can be low. Both organisms are usually difficult or impossible to visualize on blood smears in chronically infected animals, therefore serological and antigen testing is recommended to increase the likelihood of detection, especially in non-clinical or chronically infected equids. Serological tests may be used to diagnose clinical cases and to detect chronic carriers. The tests most commonly used are the complement fixation test (CFT) and the competitive enzyme-linked immunosorbent assay (cELISA). An immunofluorescence assay (IFA) is also available, but is more subjective to interpret in the laboratory and less commonly used in the U.S. The CFT, cELISA, and IFA are available for each specific EP-organism, *T. equi* and *B. caballi.* The CFT detects antibodies as early as 8 days after infection, however

titers decline around 2-3 months post-exposure. Thus, the CFT is a reliable test in acute infections or cases of recent exposure but has low sensitivity in cases of chronic infection. The cELISA detects IgG antibody, which takes longer to develop post-infection, but the assay has shown high sensitivity and specificity for identifying chronically infected animals.

Both nested and real-time polymerase chain reaction (PCR) assays are available for antigen detection of *T. equi* or *B. caballi* in EDTA-anticoagulated blood and are more sensitive than direct parasite observation. However, false positive results have occurred at improper sample dilutions and false negatives have occurred in cases with very low levels of circulating organisms. Therefore, PCR diagnostics should be used only in conjunction with serologic assays and not alone for EP screening.

Foals born to an EP-positive mare will test serologically positive for EP on the cELISA and sometimes on the CFT due to maternal antibodies, but they may not be infected. An uninfected foal will remain PCR negative and will lose their positive serology when maternal antibodies wane, usually a few months post-weaning.

Testing for Equine Piroplasmosis must be performed at a USDA-approved laboratory. For a listing of approved laboratories visit https://www.aphis.usda.gov/animal_health/lab_info_services/downloads/ApprovedLabs_piroplasmosis.pdf

Positive EP tests are reported by the laboratory to local state or federal animal health officials within 24 hours of the positive test result, as EP is a foreign animal disease in the U.S. A state or federal animal health official will locate and isolate the positive animal, issue a quarantine, and may obtain additional samples for regulatory confirmation testing.

If an EP-positive equid is confirmed at a facility, a regulatory veterinarian will perform an investigation to identify exposed equids, which may include:

- Any equid that resides with or near a positive equid.
- Any equid that may have shared blood, blood products, or blood-contaminated equipment such as needles, syringes, IV sets, dental equipment, tattooing, or surgical equipment with a positive equid.
- If the positive equid is female, any offspring of the positive equid born during the time she was infected.
- Equids otherwise epidemiologically-linked to the positive equid either in the past or present, including those located at another facility.

All equids classified as exposed are placed under quarantine and tested for EP. Exposed equids testing negative on an initial test will remain under quarantine until EP-negative results are obtained on a retest to occur at least 30 days after removal/isolation from the positive.

Post-mortem	The gross lesions in acute illness may include evidence of anemia and icterus in the internal organs, hemorrhagic lesions (e.g., petechiae in the kidneys, subepicardial and subendocardial hemorrhages in the heart, ecchymoses) and/or an enlarged spleen. The liver is often enlarged and may be either dark orange-brown or pale from anemia. Post-mortem findings in a chronic case of EP may be unremarkable.
Treatment	Equids found positive for EP in the United States must be placed under state quarantine and may enroll in the USDA-APHIS-approved EP treatment program, remain under life-time quarantine, or be euthanized. The USDA-APHIS-approved EP treatment program uses a high-dose imidocarb dipropionate protocol to attempt permanent organism clearance from the animal. Success rates for the treatment protocol have been high, but some cases may require additional treatment or may not respond to treatment at all. Equids undergoing treatment require pre-medication to reduce adverse clinical effects of imidocarb administration. Successfully treated horses are eligible for quarantine release when all antigen and serologic tests are confirmed to be negative. Assays detecting longer-lived EP antibodies, such as the cELISA test, may take up to 1-2 years or longer to reach test-negative levels, so extended quarantines post-treatment should be expected.
Environmental Persistence	Not applicable.
Specific Control Measures	● If EP is suspected, State or Federal Animal Health Officials should be notified before veterinarians collect any samples. ● Infected equids become life-long carriers and pose a risk of infection to other equids. As such, management options for an EP-positive equid include euthanasia, life-time isolation and quarantine, or long-term quarantine with enrollment in the USDA-APHIS-approved EP treatment program. ● Prevention is key to stopping the spread of EP. There is no approved vaccine for EP in the U.S. Most cases of EP in the US are the results of iatrogenic spread. To avoid this, do not engage in any practice that could transfer even a small amount of blood from one horse to another. ● Below are some ways to protect equids from contracting an EP pathogen: o Use a sterile needle, syringe, and IV set for all injections or treatments. o Disinfect dental, tattoo, and surgical equipment, lip chains, and bits thoroughly between horses. Remove debris and blood with soap and water before disinfection. o Only administer U.S.-approved and commercially licensed biologics and blood products. o Use sterile technique and a new needle and syringe when drawing up and administering medications. o Regularly test equine blood donors for potential blood-borne pathogens including EP.

	○ Institute vector (tick) control on equine premises including frequent examination of equids for ticks, use of approved acaricides, and facility and vegetation management practices aimed at reducing tick burden in paddocks, pastures, and throughout the premises.
Biosecurity Recommendations	To prevent iatrogenic spread, never reuse needles, syringes or IV sets, practice sterile technique with injectable medications, and use only commercially licensed and U.S.-approved biologics and blood products. Blood transfusions should be performed only by licensed veterinarians using donor horses tested negative for EP and other blood-borne infections, like EIA. Reduce tick exposure by keeping pastures mowed, removing brush and weeds and using topical acaricides labeled for use on equids such as pyrethroid or permethrin products. There are no vaccines available for EP prevention.
Zoonotic Potential	Human babesiosis is still incompletely understood, but *B. caballi and T. equi* are not thought to be significant human pathogens. Biosecurity, personal protective measures, and safe needle-handling technique should always be practiced to prevent zoonotic transmission of infectious pathogens.
Resources	https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/equine/ep/equine-piroplasmosis

Authors: Angela Pelzel-McCluskey, DVM, MS and Katie Flynn, BVMS, MRCV

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