Equine Granulocytic Anaplasmosis (EGA)

Definition

Equine Granulocytic Anaplasmosis (EGA) is caused by infection with the rickettsial organism *Anaplasma phagocytophilum* (formerly *Ehrlichia equi*). Anaplasmosis is a common, seasonal, non-contagious, tick-transmitted disease of equids observed where the *Ixodes* tick vector is found. *Ixodes scapularis* is found in the eastern half of the United States, while *Ixodes pacificus* is found along the entire west coast. Equine anaplasmosis has been reported in the United States, Canada, South America, Europe, Asia, and North Africa.

Clinical Signs

Acute infection is often characterized by lethargy, biphasic fever, and reduced appetite. This is followed in 3-5 days with more severe signs of icterus (common) limb edema, mucous membrane petechiation, and reluctance to move. Laminitis has not been associated with EGA.

Horses less than four years of age have milder clinical signs and may present with only fever and mild depression. Abortions are rare but can occur at any stage of gestation.

Detection of *A. phagocytophilum* via qPCR up to 129 days has been reported in experimentally infected horses but was not associated with clinical or pathological abnormalities. There is little evidence of chronic infection associated with EGA at the present time.

Mortality is rare, with most horses recovering over a 2–3-week period.

Infrequently reported syndromes associated with EGA include:

- **Severe myopathy** characterized by fever and severe rhabdomyolysis with firm and painful gluteal and epaxial musculature and markedly elevated serum creatine kinase (CK) and aspartate aminotransferase (AST).

- **Neurologic disease** characterized by ataxia, recumbency, depression, and additional non-specific neurological deficits.

- **Pleural and pericardial effusions** in horses with fever, weakness, and peripheral edema. Transudates contain granulocytes with intracellular morulae inclusion bodies and are PCR-positive for *A. phagocytophilum.*

- **Respiratory distress** secondary to upper airway edema, pharyngeal dysfunction, and dysphagia.

Incubation Period

6-12 days following tick exposure

Risk Factors

Exposure to *Ixodes* ticks harboring *A. phagocytophilum* is the primary risk factor for developing disease. Horses visiting or introduced into an endemic area are more likely to develop EGA than native horses, likely attributable to ongoing exposure and protective immune response.

Transmission

EGA is not naturally contagious between horses. Blood inoculation through sharing of needles or sharps can transmit the infection. Transplacental infection is possible and congenital anaplasmosis has been reported in a foal born to a mare with EGA in late gestation.

Diagnostic Sampling, Testing and Handling

- CBC and serum biochemistry typically reveal leukopenia (characterized by neutropenia and lymphopenia), thrombocytopenia (sometimes severe), anemia (usually mild), hyperbilirubinemia and elevated liver enzymes.

- PCR of EDTA whole blood is the most sensitive diagnostic for EGA and is most valuable in early stages of disease. False negatives can occur if the horse has received treatment with tetracycline antimicrobials.

- The organism can also often be identified in neutrophils as inclusion bodies (called morulae) in the cytoplasm, which stain blue-gray with Giemsa or Wright's-Leishman stains. The organisms have variable shapes ranging from small 0.2 um in diameter) single inclusions to circular clusters which resemble spoke wheels (Fig. 1). Organisms are very few in the early stages of infection and difficult to verify by light microscopy. After day 2-5 of infection, inclusions are more easily found by using high dry or oil immersion light microscopy. Buffy coat smears may aid finding the infected cells. Dohle bodies may occasionally be confused for inclusions. Unless classic morulae are observed, caution is advised in making a diagnosis solely via cytology alone.

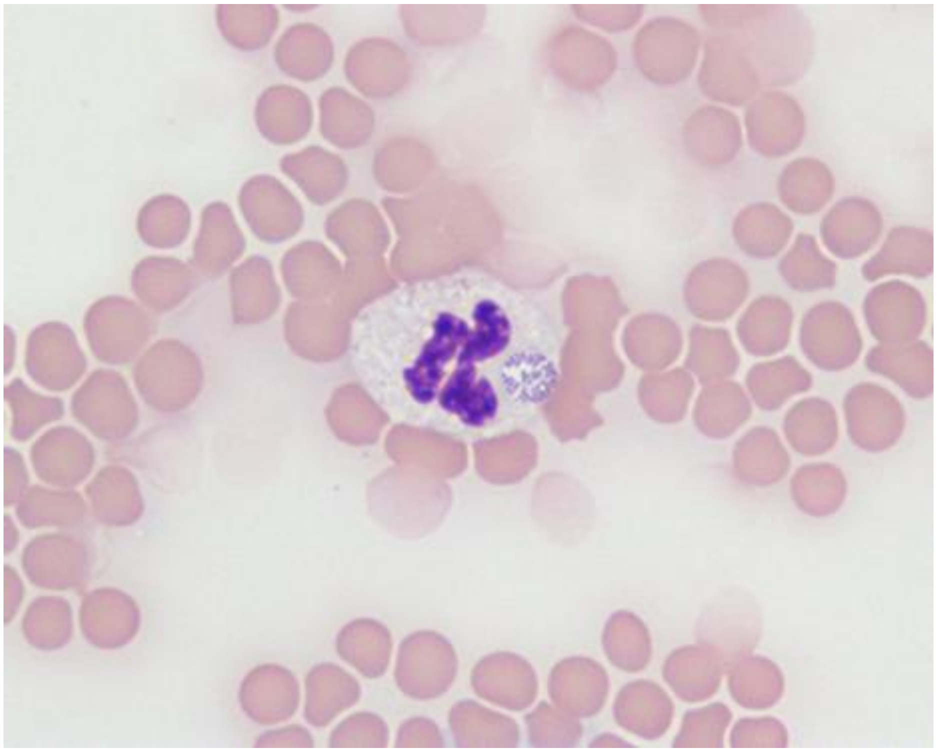

Figure 1: An *Anaplasma phagocytophilum* morula (arrow) observed within a neutrophil on a blood smear from a horse with Anaplasmosis. Image credit: Tracy Stokol, Cornell University.

- Serology demonstrating a four-fold increase in paired titers collected 2-4 weeks apart is confirmatory of acute infection. Single time point serology (including the canine 4DX SNAP test) is not recommended for diagnosing acute infection, as a single positive result could indicate prior infection. Results may be negative early in the course of infection. Seroprevalence rate is high among healthy horses residing in endemic areas. Serum antibodies against *A. phagocytophilum* can persist for at least two years.

Post-Mortem Findings

In the rare fatal case, lesions include gross petechiation, ecchymoses, and edema in the subcutis and fascia. The primary lesion in horses is extensive vasculitis of distal limbs, with additional sites of vasculitis often including the CNS, testis, myocardium, ovaries, and muscle.

Prognosis

Mortality is rare with most horses recovering over a 2–3-week period. Recovery from EGA results in protective immunity that may persist for years. Chronic carrier states have not been reported.

Environmental Persistence

The organism is an obligate intracellular organism and does not persist in the environment.

Specific Control Measures

Tick control through environmental avoidance and diligent removal from horses remains the mainstay of EGA prevention.

- Tick repellants: Multiple spray and spot-on tick repellent products are available. These products may contain a combination of cypermethrin, permethrin, pyrethrins, or piperonyl butoxide, and demonstrate variable efficacies and durations of action.
- “Tickscaping”: Environmental tick populations can be reduced by removal of leaves and woody debris, pasture mowing, and maintaining dry, well-lit paddocks whenever possible.

Treatment

A. phagocytophilum is highly susceptible to tetracycline antimicrobials, and rapid (24-36 hours) improvement in clinical signs can be expected in most cases. While no standard treatment protocol exists, intravenous administration of oxytetracycline at 7 mg/kg body weight once daily for 5 to 7 days is commonly used in practice. Dilution of tetracycline in saline (not LRS) and slow administration IV is recommended. Collecting blood for PCR and blood smear assessment before initiating treatment is recommended. Relapse may occur in treated or untreated cases. Alternate treatment options include oral doxycycline (10 mg/kg BID) or minocycline (4 mg/kg orally BID). While the dose of 10 mg/kg BID IV tetracycline has been described for chronic or severely affected cases, assessment of hydration status and renal values (BUN and creatinine) are indicated when oxytetracycline is used at this dose or for prolonged duration. Persistent or severe ataxia may warrant treatment with dexamethasone for 24-48 hrs. Supportive measures are recommended in severe cases, including fluid and electrolyte therapy, supportive limb wrap, and stall confinement of severely ataxic horses to prevent secondary injury.

Untreated horses generally experience a self-limiting disease course lasting 2 to 3 weeks. While some horses recover uneventfully, others experience significant weight loss with persistent limb edema and incoordination.

Biosecurity Considerations

EGA is not contagious, and therefore, isolation and biosecurity measures are not necessary in infected horses.

Disinfection

None. The organism does not survive outside mammalian hosts.

Zoonotic Potential

No known zoonotic potential from horses to humans. Humans participating in outdoor activities in endemic regions are at risk for A. phagocytophilum if bitten by Ixodes spp. ticks.

Further Reading

- Franze´n, F. Aspan, A., Egenvall, A., Gunnarsson, A., Adberg, L., and Pringle, J. (2005) Acute Clinical, Hematologic, Serologic, and Polymerase Chain Reaction Findings in Horses Experimentally Infected with a European Strain of Anaplasma phagocytophilum. Journal of Veterinary Internal Medicine 2005;19:232–239. https://doi.org/10.1111/j.1939-1676.2005.tb02687.x

- Madigan, J. (2021), *Anaplasma phagocytophilum (Ehrlichia equi)* 50 years later. Equine Vet Educ, 33: 126-128. https://doi.org/10.1111/eve.13153

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