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Equine Infectious Anemia

Swamp Fever, Mountain Fever, Slow Fever, Equine Malarial Fever, Coggins Disease

Slide 2

Overview

- Organism
- History
- Epidemiology
- Transmission
- Disease in Humans
- Disease in Animals
- Prevention and Control

In today's presentation we will cover information regarding the organism that causes equine infectious anemia and its epidemiology. We will also talk about the history of the disease, how it is transmitted, species that it affects, and clinical and necropsy signs observed. Finally, we will address prevention and control measures, as well as actions to take if equine infectious anemia is suspected. [Photo: Horse. Source: Patricia Futoma/CFSPH]

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THE ORGANISM

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The Organism

- Equine infectious anemia virus
  - Family Retroviridae
  - Subfamily Orthoretrovirinae
  - Genus *Lentivirus*

Equine infectious anemia (EIA) is a retroviral disease of equids that is often carried asymptomatically. Equine infectious anemia is caused by equine infectious anemia virus (EIAV), a lentivirus in the family Retroviridae (subfamily Orthoretrovirinae). [Photo: Cross section of equine infectious anemia virus. Source: U.S. Department of Agriculture via Wikimedia Commons]

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HISTORY

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History

- EIA first detected in U.S in 1888
- EIA testing
  - Coggins test
  - Percent positive has decreased dramatically
    - 4% in 1972
    - <0.01% in 2004

Equine infectious anemia was first identified in the U.S. in 1888. EIAV testing in the United States utilizing the Coggins test began in 1972. Data exist from 1972 to 2005 on the number of tests performed by each State annually, and the percentage of those tests that were positive for EIAV. The percentage of test-positive samples in the United States decreased dramatically from nearly 4 percent in 1972 to less than 0.01 percent in 2005.

[Photo: Graph shows the reported numbers of equine infectious anemia tests (green x 100) and positive cases (blue) in the United States, 2000-2012. Source: U.S. Department of Agriculture, 2012 Summary of equine infectious anemia cases in the United States at http://www.aphis.usda.gov/vs/nahss/equine/eia/index.htm]

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EPIDEMIOLOGY

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Geographic Distribution

- Found nearly worldwide
  - May be absent from Iceland, Japan
- U.S.

Equine infectious anemia has been found nearly worldwide. This disease appears to be absent from a few countries including Iceland and Japan.

[Photo: Map depicting the annual total number of equine cases of equine infectious anemia and the number of affected premises in each state, 2001-2012. Source: U.S. Department of Agriculture at http://www.aphis.usda.gov/vs/nahss/equine/eia/eia_distribution_maps.htm]

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Morbidity and Mortality

- Infection rate varies
  - Geographic region (humid, swampy)
- Seroprevalence
  - Up to 70% on endemic farms
- Morbidity and mortality affected by:
  - Virus strain and dose
  - Health of the animal
- Infections often go unnoticed

The infection rate varies with the geographic region. Virus transmission is influenced by the number and species of flies, their habits, the density of the horse population, the level of viremia in the host and the quantity of blood transferred. Infections are particularly common in humid, swampy regions. Seroprevalence rates as high as 70% have been seen on farms where the disease has been endemic for many years. The morbidity rate and severity of the clinical signs are influenced by the strain and dose of the virus, and the health of the animal. The presence of EIAV in a herd often goes unnoticed until some horses develop the chronic form of the disease or routine testing is done. Epizootics with high morbidity and mortality rates have been reported, but deaths are otherwise uncommon in naturally infected horses. Experimental inoculation with a high viral dose can result in mortality rates as high as 80%.

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TRANSMISSION

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Transmission-Primary

- Mechanical transmission
  - Mouthparts of biting insects
    - Horse flies, stable flies, deer flies
- Fly behavior enhances transmission
  - Bites painful
  - Horses react
  - Fly feeding interrupted
  - Fly resumes feeding on same animal or nearby host
  - Infectious blood transferred to new host

Equine infectious anemia virus is transmitted mechanically on the mouthparts of biting insects. In horses, this virus persists in blood leukocytes for life, and also occurs in plasma during febrile episodes. Symptomatic horses are most likely to transmit the disease. Although other insects including stable flies (*Stomoxys calcitrans*) can transmit EIAV, the most effective vectors are biting flies in the family Tabanidae, especially horse flies *(Tabanus* spp. and *Hybomitra* spp.) and deer flies (*Chrysops* spp.). The bites of these flies are painful, and the animal's reaction interrupts feeding. The fly attempts to resume feeding immediately, either on the same animal or on another nearby host, resulting in the transfer of infectious blood. [Photo: Horse fly. Source: Dennis Ray/Wikimedia Commons]

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Transmission-Other

- Fomites
  - Needles
  - Surgical instruments
  - Floats
- *In utero*
- Via milk
- Venereal
- Aerosol

This virus can also be transmitted in blood transfusions or on contaminated needles, surgical instruments and teeth floats. EIAV may also be passed from a mare to her foal *in utero*. Other, minor routes of transmission might be possible. EIAV does not appear to be shed in saliva or urine. However, it can be found in milk and semen, and horses can be infected by inoculating these secretions subcutaneously. Possible transmission through milk has been reported in some nursing foals. Although venereal transmission does not seem to be a major route of spread, one stallion appears to have transmitted the virus to a mare with a vaginal tear during breeding. The possibility of aerosol transmission by infectious material during close contact was raised during the 2006 outbreak in Ireland. [Photo: Mare and foal. Source: Pixabay.com/public-domain]

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DISEASE IN HUMANS

Equine infectious anemia is not a risk for people

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DISEASE IN ANIMALS

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Species Affected

- All members of Equidae affected
  - Clinical disease occurs in horses and ponies
  - Donkeys may be asymptomatic

Equine infectious anemia virus is reported to infect all members of the Equidae. Clinical cases occur in horses and ponies (*Equus caballus*), and have also been reported in mules. Some horse-adapted viral isolates replicate to low levels without clinical signs in donkeys (*E. asinus*); however, unpublished evidence suggests that serially-passaged, donkey-adapted isolates may be pathogenic for this species. [Photo: (Top) Horse and pony. Source: www.geograph.org.uk; (Bottom) Donkey. Source: Wikimedia Commons]

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Disease in Horses

- Clinical signs often nonspecific
  - Fever, weakness, depression
  - Jaundice, tachypnea, tachycardia
  - Ventral pitting edema
  - Petechiae, epistaxis
  - Anemia (chronically infected animals)
- Most recover and become carriers
  - Infections may become symptomatic again during times of stress

Equine infectious anemia virus is reported to infect all members of the Equidae. The incubation period is a week to 45 days or longer. The clinical signs of acute EIA are often nonspecific. In some cases in horses, the only sign is a fever. More severely affected horses can become weak, depressed and inappetent, with additional signs that may include jaundice, tachypnea, tachycardia, ventral pitting edema, thrombocytopenia, petechiae on the mucus membranes, epistaxis or blood–stained feces. Anemia can occur, although it is more likely to be severe in chronically infected animals. Occasionally, horses die during the acute stage. After the initial bout, most horses become asymptomatic carriers; however, some animals develop recurring clinical signs. Inapparent infections may become symptomatic during concurrent illnesses, severe stress or hard work. Death is possible during these febrile episodes. Ophthalmic lesions, characterized by depigmentation with prominent choroidal vessels, have been reported in chronically infected horses.

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Disease in Donkeys and Mules

- Less likely to develop clinical signs
  - Can be infected (experimentally) with horse-adapted strains
- May develop clinical signs if infected with a donkey-adapted strain

Donkeys and mules are less likely to develop severe clinical signs. Mules can be infected asymptomatically, but typical EIA signs have been reported in some naturally or experimentally infected animals. In a recent experiment, donkeys inoculated with two horse-adapted strains became infected but remained asymptomatic. Donkeys inoculated with a serially-passaged, donkey-adapted strain in China are reported to have developed clinical signs.

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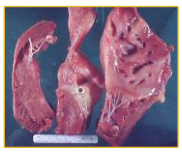
Post Mortem Lesions

- Enlarged spleen, liver, lymph nodes
- Pale mucous membranes
- Emaciation
- Edema
- Petechiae
- Usually no lesions in chronic carriers



The spleen, liver and abdominal lymph nodes may be enlarged, and the mucous membranes can be pale. In chronic cases, emaciation may also be noted. Edema is often found in the limbs and along the ventral abdominal wall. Petechiae may be observed on internal organs, including the spleen and kidney. Mucosal and visceral hemorrhages and blood vessel thrombosis have also been reported. Chronically infected horses that die between clinical episodes usually have no gross lesions, but some animals may have proliferative glomerulonephritis or ocular lesions.

[Photo: Pale cardiac muscle, focal white areas of myocardial degeneration, and reddened hemorrhagic areas (possible hypoxia during death) of a horse heart. Iowa State University, College of Veterinary Medicine/CFSPH]

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Differential Diagnosis

- Equine viral arteritis
- Purpura hemorrhagica
- Leptospirosis
- Babesiosis
- Severe strongyliasis or fascioliasis
- Phenothiazine toxicity
- Autoimmune hemolytic anemia
- Other causes of fever/edema/anemia

Equine infectious anemia should be among the differentials in individual horses with weight loss, edema and intermittent fever. It should also be considered when several horses experience fever, anemia, edema, progressive weakness or weight loss, particularly when new animals have been introduced into the herd or a member of the herd has died. The differential diagnosis includes other febrile illnesses including equine viral arteritis, purpura hemorrhagica, leptospirosis, babesiosis, severe strongyliasis or fascioliasis, phenothiazine toxicity, autoimmune hemolytic anemia and other diseases that cause fever, edema and/or anemia.

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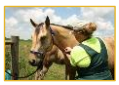
Laboratory Diagnosis

- Serology
  - Agar gel immunodiffusion/Coggins test
    - Horses may be seronegative for first 2-3 weeks post-infection
  - ELISA
    - Can detect antibodies earlier
    - More false positive occur
    - Must be confirmed with AGID or immunoblot



Equine infectious anemia is often confirmed by serology. Once an animal is infected, it becomes a carrier for life. The two most commonly used serological tests are the agar gel immunodiffusion (AGID or Coggins) test and enzyme-linked immunosorbent assays (ELISAs). Horses are usually seronegative in the AGID test during the first 2-3 weeks after infection; in rare cases, they may not develop antibodies until 60 days. ELISAs can detect antibodies earlier than the AGID test and are more sensitive, but false positives are more likely to occur. For this reason, positive results on ELISA are confirmed with the AGID test or immunoblotting (Western blotting). Limited experimental evidence suggests that antibody production may be delayed in donkeys and mules. [Photo: Blood sampling. Source: Jessica Kennicker/CFSPH]

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Laboratory Diagnosis

- RT-PCR
  - Good for foals with maternal antibodies (up to 6-8 months of age)
  - Used to confirm serological tests
- Virus isolation
  - Not required for diagnosis
  - May not be available

Reverse-transcriptase polymerase chain reaction (RT-PCR) assays can also be used to detect infected horses. These tests are valuable in determining the infection status of foals born to infected mares, because young animals may have maternal antibodies up to the age of 6-8 months. PCR tests can also be used to supplement or confirm serological tests. In addition, this technique can ensure that blood donors and horses used for vaccine or antiserum production are uninfected. Virus isolation is not usually required for a diagnosis, but it can be done. Virus isolation is performed in horse leukocyte cultures; because these cells are difficult to grow, this test may not be available in all laboratories. The identity of the virus can be confirmed with antigen-specific ELISAs, immunofluorescence tests or PCR.

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PREVENTION AND CONTROL

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Recommended Actions

- IMMEDIATELY notify authorities
- Federal
  - Area Veterinarian in Charge (AVIC)
    http://www.aphis.usda.gov/animal_health/area_offices/
- State
  - State veterinarian
    http://www.usaha.org/stateanimalhealthofficials.aspx

If you suspect a case of equine infectious anemia, state or federal authorities should be notified immediately.

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Prevention and Control

- Control programs
  - State regulations vary
  - Most require testing
    - Before entry of horses into the state
    - Before participation in organized activities
    - Before sale of horse
- Voluntary testing can help maintain an EIA-free herd
- No vaccine available

Many countries have control programs requiring equids to be tested for equine infectious anemia. State regulations in the U.S. vary, but most states require one or more tests, particularly before entry of the horse into the state, participation in organized activities and/or sale of the horse. Regular voluntary testing of the equids on a farm, as well as testing of new animals before introduction, is helpful in maintaining an EIA-free herd. No vaccine is available.

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Prevention and Control

- Lifelong carriers
  - Must be permanently isolated or euthanized
  - Reactors must be marked
  - Transport limited
- Asymptomatic mares
  - Foals usually not infected

Infected equids become lifelong carriers, and must be permanently isolated from other susceptible animals or euthanized. In the U.S., a reactor must be marked with a brand, freezemarking or a lip tattoo before it is moved between states. Reactors can only be transported between states if they are going to their home farms, a slaughterhouse, or a diagnostic or research facility, and they must move under quarantine conditions. Most states also require that reactors be marked if they remain within the state. The risk of transmission from carriers varies, but because it is impossible to quantify this risk, all infected horses are treated alike. Asymptomatic carriers often give birth to uninfected foals. The risk of congenital infection is higher if the mare has clinical signs before she gives birth. Foals born to infected mares should be isolated from other equids until the foal is determined to be free of infection. [Photo: Mare and foal. Source: Megan Smith/CFSPH]

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Prevention and Control

- Vector control
  - Spray
  - Insect repellent
  - Insect-proofing stables
- Separate herds of susceptible animals
- Clean and disinfect

During an outbreak, spraying to control insect vectors, as well as the use of insect repellents and insect-proof stabling, may aid in interrupting transmission. Placing animals in small groups separated by at least 200 yards might be beneficial when the virus is being transmitted within a farm. Care should be taken to prevent iatrogenic transmission. In countries where equine infectious anemia is not present, outbreaks are contained with quarantines and movement controls, tracing of cases and surveillance. Enveloped viruses such as EIAV are readily destroyed by most common disinfectants. This virus does not persist in insects, which are mechanical vectors.

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Additional Resources

- Center for Food Security and Public Health
  - www.cfsph.iastate.edu
- USDA: Equine Infectious Anemia
  - www.aphis.usda.gov/animal_health/animal_diseases/eia/

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Acknowledgments

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