# Equine Viral Arteritis (EVA)



## Summary


Equine viral arteritis (EVA) is a contagious viral disease of equids. The etiologic agent for EVA is equine arteritis virus (EAV). The name equine viral arteritis comes from the characteristic vascular lesion that is produced by the causal agent equine arteritis virus (EAV). Serological evidence of exposure to EAV is present in equine populations in many countries. Clinical disease is non-specific and EVA is frequently confused with other illnesses that produce similar clinical signs. Documented outbreaks have been infrequent, but this may reflect underdiagnosis and be related to a lack of recognition as most acute EAV infections are subclinical or inapparent. Widespread vasculitis may occur in susceptible individuals leading to fever, peripheral edema, pneumonia, and abortion.

*Note: EVA is a reportable disease in some states; consult your State Animal Health Official when disease is suspected.*


### Causal Agent

Infection with EAV is highly species-specific and is limited to members of the family Equidae (includes horses, donkeys, mules, and zebras). The virus replicates primarily in equine macrophages and vascular endothelial cells resulting in the characteristic pathologies

## Clinical Signs

The majority of EAV infections are inapparent and mortality is rare, especially in healthy adult horses. Young foals, immunocompromised and debilitated horses are at greater risk for severe disease. Clinicopathologic abnormalities may include leukopenia.

Clinical signs are non-specific and may include:

- Fever (up to 106° F or 41.1° C)
- Depression
- Anorexia
- Edema: limbs, ventrum, peri- or supraorbital region, scrotum/prepuce (male), mammary glands (female)
- Conjunctivitis
- Epiphora

- Rhinitis
- Urticaria
- Abortion – EVA can be associated with 'abortion storms'
- Temporary subfertility in stallions
- Fatal respiratory or enteric disease related to vasculitis in neonatal/young foals

**Transmission**

**Respiratory** (most common)

- Droplet spread of respiratory secretions from acutely infected horses and congenitally infected newborn foals
- Contact with placental fluids and membranes, fetal fluids and tissues from cases of EAV abortion

**Venereal transmission**

- Acutely infected stallions or mares.
- Virus present in infective fresh, cooled, or frozen semen
- Carrier stallions act as a reservoir of EAV; long-term carriers maintain the virus in horse populations
- There is limited evidence of transmission by embryo transfer from a donor mare inseminated with EAV-infective semen

**Indirect transmission**

- Fomites such as twitches, head-collars, clothing, hands of animal care personnel and breeding shed equipment, e.g. phantoms, may be contaminated with infectious respiratory or ocular secretions, semen or vaginal secretions.
- Artificial insemination
- Semen
- Vaginal secretions
- Urine
- Feces

**Congenital**

- Infection in foals born to mares infected with EAV in late gestation

**Incubation Period**

The incubation period following respiratory spread is 2–3 days.

Post venereal spread the incubation period is usually 6–8 days but may be up to 14 days in some cases.

**Risk Factors**

Inapparent carrier stallions shed virus constantly in their semen. Fresh cooled or frozen semen is highly infectious. Acutely infected shedding mares and stallions may be subclinical but still infectious.

**Diagnostic Sampling, Testing and Handling**

Diagnosis cannot be based on clinical signs alone due to their non-specific nature, similarity of presentation to certain other diseases, and the frequency of subclinical infection and horses only mildly affected with the disease. Diagnostic testing for equine arteritis virus should be pursued in horses showing clinical signs consistent with EVA such as high fever, peripheral edema, signs of upper respiratory infection (oculonasal discharge) and abortion.

Differential diagnoses include EHV-1 & 4, equine influenza, equine rhinitis virus A & B infections, purpura hemorrhagica, equine infectious anemia, allergic reactions, and toxicosis from ingesting hoary alyssum (*Berteroa incana*).

| Sample | Test | Shipping | Handling |
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| Nasopharyngeal washings or swabs | RT-PCR and/or viral isolation | Leakproof container | Chilled overnight |
| EDTA or citrated whole blood (no heparin) | RT-PCR and/or viral isolation | Leakproof container | Chilled overnight |
| Semen | RT-PCR and/or viral isolation | Leakproof container | Chilled or frozen overnight |
| Fetal membranes or fetal tissues (lung, liver, kidney, spleen) | RT-PCR and/ or viral isolation; FA | Leakproof container | Chilled or frozen overnight |
| Sera(paired): Acute and convalescent | Virus neutralization or an ELISA meeting validation criteria prescribed by the World Organization for Animal | Red top tube or leak proof container | Chilled overnight |

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- Sampling for virus detection should be initiated as early as possible after onset of fever and/or other clinical signs.
- EAV is stable at refrigeration or lower temperatures. With exception of unclotted blood samples, specimens should be refrigerated or frozen and shipped on frozen freezer packs. Unclotted bloods should be kept cold but not frozen in transit to the laboratory.
- Paired (acute and convalescent) sera should be collected over an interval of 2–4 weeks. Previous vaccination history against EVA should be considered when interpreting positive titers. Vaccinated individuals may develop a serologic response or a rapid rise in titer in response to natural exposure to infection.

**Post-Mortem Findings**

EAV infection rarely results in a fatal outcome in adult horses; however, it can be associated with isolated cases or outbreaks of multiple cases of abortion. Evidence suggests lethal EAV infection of the fetus is the cause of abortion. Because the aborted fetus contains high levels of virus, all appropriate biosecurity precautions should be taken to limit the spread of the virus.

Detailed instructions on collecting and submitting samples associated with equine abortion can be found on the websites of laboratories that are USDA approved to perform EVA diagnostics.
https://www.aphis.usda.gov/animal_health/lab_info_services/downloads/ApprovedLabs_EVA.pdf

**Shedding of Virus Following Resolution of Clinical Signs**

Carrier stallions shed EAV constantly in semen, but not via the respiratory tract, urine or blood. Only stallions and sexually mature colts can develop the carrier state.

**Treatment**

- No specific antiviral treatment for EVA is currently available
- Supportive therapies are indicated in moderate to severe cases of the disease, and is especially important in clinically affected stallions
- Elimination of a carrier state is problematic. Because the virus is shed in semen, castration is the only reliable method for elimination of carrier state.

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| | • Non-surgical strategies, such as the use of GnRH antagonist or anti-GnRH vaccines, may facilitate clearance in some stallions, but these methods are not fully validated and may have deleterious effects on libido and sperm production. |
| | **Vaccination**<br>The vaccine has been used successfully to curtail the spread of EVA in large outbreaks of the disease. In the face of an outbreak, vaccination of exposed but clinically normal horses can be implemented as part of a control program. See AAEP EVA Vaccination Guidelines<br><br>Considerations for vaccination:<br>• Primary vaccination provides protection from clinical disease for at least 1–3 years. First time vaccination may not prevent re-infection or potential replication of challenge virus.<br>• Revaccination results in an enhanced serologic response<br>• It is recommended that at-risk stallions be re-vaccinated annually<br>• Stallions must be screened serologically before primary vaccination<br>• Implications regarding export must be considered when vaccinating at- risk horses<br>• Currently, it is not possible to differentiate a vaccinated horse from one naturally infected via serology<br>• All teaser stallions and nurse mares should be vaccinated<br>• 'Pony' horses/outriders' horses/catch horses (or those with close contact to multiple horses) should be vaccinated or withdrawn from use until vaccinated<br><br>*Note*: Approximately 50% of vaccinated horses may experience a brief period of viremia during the week following vaccination and some may shed low levels of virus into the respiratory tract for a few days. The risk of respiratory transmission of vaccine virus is minimal. |
| **Environmental Persistence** | The virus is heat sensitive but can persist at freezing temperatures for extended periods of time. |
| **Specific Control Measures and Biosecurity Recommendations** | Biosecurity Guidelines<br><br>Control measures are primarily directed at restricting viral spread in breeding populations to, a) minimize risk of virus-related abortions, deaths in young foals and b) prevent establishment of the carrier state in stallions and sexually mature colts. |

Specific measures to prevent/control EVA on breeding farms include:

- Identify any carrier stallions
- Separately manage any carrier stallions
- Vaccinate non-carrier stallions annually
- Restrict breeding carrier stallions to EVA vaccinated mares or mares naturally seropositive for antibodies to EAV
- Isolate mares bred with infective semen for the first time from EAV seronegative horses for 3 weeks
- Screen semen intended for artificial insemination (AI) use for virus, particularly if imported
- Observe sound management practices, especially of pregnant mares
- Vaccinate colt (male) foals between 6 and 12 months of age to prevent possible development of carrier state later in life
- Under circumstances of intensive management and limited facilities, it is advisable to consider vaccination of all at-risk animals

**In the Event of an Outbreak at a Performance Event**

Although there have been a number of extensive occurrences of EVA at racetracks, shows, etc., these have been so infrequent that no control programs have been developed specifically to prevent the introduction and spread of EAV in such situations.

Biosecurity Tool Kit Recommendations for Equine Events

Where outbreaks occur at performance events, clinically normal horses housed within the primary perimeter may be permitted segregated exercise periods outside the perimeter.

Precautions should be taken, and may include:

- Exercise scheduled after general population's exercise period to avoid
  potential virus transfer to unaffected horses/barns by riders
- Access to starting gate or similar equipment denied
- Restricted use of ponies/out-riders' horses- horses housed within the primary perimeter may only be escorted by horses housed within the same facility
- Direct horse-to-horse contact is to be avoided
- Prompt post-contact use of hand sanitizer or hand washing with soap by any individual who has had contact with horses during exercise

**Release of Animals from Isolation**

Release of animals from isolation can be considered four weeks after the last case of EVA or confirmed case of EAV infection. Animals can be released if virus detection tests (nasal/pharyngeal swab and blood) are negative. This should also include testing of semen in the case of stallions and post-pubertal colts. After all animals have been released from isolation, thorough disinfection of the area holding facility should be undertaken.

**Biosecurity Issues for Receiving Animals**

**For horses having been housed within the primary perimeter:**

- Certificate of Veterinary Inspection w/ affidavit indicating that within the previous 21 days the horse has not exhibited signs of EVA, has not been exposed to nor housed with horses that exhibited signs of the disease, or were suspected or confirmed as being infected with EAV.

**For other horses:**

- Require health certificate w/disease specific disclaimer and proof of vaccination.

**Breeding farms:**

- Mares or fillies shipping from a premise of exposure should follow the requirements as listed for exposed and unexposed individuals as above.
- Colts and stallions should also follow these restrictions (in addition to any state veterinary restrictions) if these animals are to enter the breeding population.

**Zoonotic Potential** None known.

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