Equine Viral Arteritis

Agent: Equine viral arteritis (EVA) is a contagious viral disease of equids caused by equine arteritis virus (EAV), an RNA virus that is classified in the family Arteriviridae of the genus Arterivirus. The virus can be found throughout the world and sporadically in the United States.

Brief Description: Most cases of EAV infection are subclinical; however, the EAV virus can cause disease of varying severity. Following the 1984 epidemic on several Thoroughbred breeding farms in Kentucky, EVA has significantly impacted international movement of horses and semen. Previously, EAV was noted at a higher incidence in Standardbreds and Warmbloods; however, in June 2006, EVA was diagnosed in a Quarter Horse stallion in New Mexico. Of particular concern to horse breeders, EVA can cause abortion in mares, death in young foals, and has the potential to cause a permanent carrier state in stallions. Export markets may deny entry to carrier stallions, virus infective semen, and even any horse that is seropositive for EAV. Both vaccination and natural exposure are responsible for seropositive results.

Illness associated with EVA may include clinical signs of depression, fever, conjunctivitis, epiphora, photophobia, supraorbital or periorbital edema, abortions, nasal discharge, a local or generalized urticarial skin reaction, and dependent edema of the limbs, and/or mammary gland, scrotum, and prepuce. Mares may abort anytime from 2 months of gestation to term in the acute phase or early in the convalescent stage of the infection. Abortion occurs within 1-3 weeks of respiratory transmission and not as a result of being bred to a carrier stallion. In natural outbreaks, abortion rates can vary from <10% to as high as 70%. Mortality is rare with the exception of congenitally infected foals which may develop a fulminating pneumonia or pneumo-enteritis with death within 48-96 hours of birth. Deaths have been reported in foals a few weeks to months of age that develop a progressive pneumo-enteritis. Affected horses almost invariably make complete clinical recoveries.

A carrier state develops in stallions that were sexually mature at the time of initial EAV exposure that may result in persistent shedding of the EAV in semen. Stallions may remain carriers for weeks, months, years, or indefinitely. Intermittent shedding does not occur; however, some stallions exposed to the EAV virus will undergo serological conversion, but not be responsible for shedding the virus or may initially shed EAV and later become non-shedders. Carrier stallions and their semen are denied import into most countries other than the United States and Canada. Carrier stallions shed virus in their semen, but not in their urine or respiratory secretions.

Differential Diagnoses:

- Equine Influenza
- Equine Herpesvirus 1 and 4 Infections
- Purpura Hemorrhagica
- Equine Infectious Anemia (EIA)
- Toxicosis due to hoary alyssum (*Bertoroa incana*)
- Leptospirosis
- Contagious Equine Metritis
- Getah Virus Infection

- African Horse Sickness
- Dourine

Reservoir/Host species: Equids appear to be the only hosts of this virus.

Mode of Transmission: Spread of EAV occurs primarily as the result of direct contact with infected animals. The respiratory route is the most common form of transmission via the acutely infected horse with shedding lasting up to 16 days. Aerosol transmission is the principal means of spread of infection among horses closely congregated such as at racetracks, shows, breeding farms, and sales. Venereal transmission via the acute or chronically infected stallion is responsible for dissemination of the virus both from natural breeding and artificial insemination. Transmission rates can be as high as 85-100 percent. Indirect spread may occur following contact with fomites contaminated with infective secretions. Vertical transmission from mare to foal is possible but has been infrequently recorded.

Incubation Period: The incubation period is 2-14 days.

Diagnosis: Clinical diagnosis can be difficult due to variability of clinical signs or even lack of clinical signs. Diagnosis of EAV infection is based on virus isolation, detection of viral antigen or viral nucleic acid, or demonstration of a specific antibody response by testing paired sera. Appropriate specimens for diagnosis in acutely infected horses include nasopharyngeal and conjunctival swabs and EDTA or citrated blood samples for virus isolation or detection by polymerase chain reaction. Swabs should be transported refrigerated in a viral transport media by overnight delivery (best handling) to the diagnostic laboratory or frozen if delivery will be delayed. Virus isolation requires 5-15 days at the laboratory and tests are set up at least twice a week. The most common method of diagnosis is testing blood for the EAV neutralizing antibodies utilizing a complement enhanced virus neutralization test (SN). The SN test is set up each Friday at Georgia's Diagnostic Laboratories in Athens and Tifton and read on the following Monday. Additionally, the Tifton Laboratory also sets up the SN test on Tuesday and reads the test on Friday. Acute and convalescent serum should be collected for serological exam using a red top tube with the clot removed or serum separator tube that is centrifuged prior to being sent refrigerated to the laboratory. Very high levels of antibodies on a single sample or a rising antibody titer (four–fold or greater) from paired blood samples collected 14-28 days apart indicate active infection. Previous exposure to EAV can be verified by testing a refrigerated serological sample as described above. A titer of 1:4 or greater without appropriately certified vaccination history against EAV is considered to be seropositive. The first EAV positive by virus isolation diagnosed by the UGA Diagnostic Laboratory will be confirmatory tested at the National Veterinary Diagnostic Laboratory in Ames, Iowa.

If a stallion is seropositive and vaccination verification for his status is not available, confirmation of his shedding status should be tested. The carrier state in the stallion can be confirmed by virus isolation from the sperm rich fraction of the semen which is the required test for exporting semen. The virus is not present in the pre-sperm portion; therefore, the sperm-rich portion should be collected. Virus isolation should be attempted on 2 samples taken same day to several weeks apart. Collect the entire ejaculate using an AV or condom and a teaser mare or phantom. No antiseptic or disinfectants should be used on the external genitalia of the stallion prior to collection. Refrigerate the sample immediately and send overnight refrigerated to the

laboratory or freeze the sample and send frozen to the laboratory. A reliable alternative is to breed a suspect carrier to 2 mares which are monitored clinically and serologically; however, this is not a valid test for import/ export.

Aborted fetuses may only show autolysis on gross examination. Body cavity fluids, lung tissue, liver tissue, spleen tissue, and lymph nodes associated with the respiratory tract and gastrointestinal tract should be taken for virus isolation or RT-PCR (Reverse-Transcription Polymerase Chain Reaction) testing and histopathology. Swabs should be transported refrigerated (preferred) or frozen in a viral transport media by overnight delivery to the diagnostic laboratory. The placenta, placental fluids, and fetus are plentiful sources of virus. Tissue samples should be refrigerated or frozen and sent overnight delivery to the laboratory.

Prevention measures: Prevention and control programs are aimed at curtailing dissemination of the infection in breeding populations to minimize the risk of virus-related abortions, but also to prevent development of the carrier state in stallions. EVA can be prevented and controlled by sound management practices and selective use of a commercial modified live virus vaccine. Blood samples for EAV testing should be collected before breeding and virus isolation should be performed on semen from seropositive stallions before use. Strict hygiene and disinfection of instruments and equipment are essential to minimize spread of the virus. EAV-negative mares should be bred only to EAV-negative, non-carrier stallions. If serological test results are positive in a stallion, but there is no official documentation of negative EAV status prior to vaccination, then the stallion must be tested for the presence of a carrier state. Mare owners should be notified of a stallion's carrier status at booking in order to perform risk assessment. Mares bred to carrier stallions should be vaccinated as recommended below and isolated from nonvaccinates for 24 hours after breeding and all contact surfaces cleaned and disinfected prior to introducing nonvaccinates. Cleaning and disinfecting of contact materials and composting of bedding is necessary during an outbreak. EAV is not very resistant outside of the body and is readily inactivated by sunlight, heat, low humidity, or exposure to common disinfectants. EAV can remain infective for long periods in low temperature inclusive of frozen semen.

Period of Communicability: Acutely infected horses shed EAV for a limited period of time in various body secretions and excretions. The greatest concentration of virus is usually shed via the respiratory tract and shedding can last for up to 16 days. A major factor in the epidemiology of EVA is that a significant percentage of stallions become carriers after exposure to the virus. The stallion can remain in the carrier state after infection and shed the virus for several weeks, months, years, or indefinitely. There is no known medical means of eliminating the carrier state in the stallion. The virus is shed in the semen which can be transmitted to mares upon mating or artificial insemination whether from fresh, cooled, or frozen semen. The carrier state has only been found in the stallion, not in the mare, gelding, or sexually immature colt. Mares, geldings, and foals that are vaccinated should be isolated from nonvaccinates for 21 days following first vaccination. Stallions should be isolated from nonvaccinates for 28 days following first vaccination. Mares bred to carrier stallions should be isolated from nonvaccinates for 24 hours following breeding due to the potential of expelled infectious semen.

Vaccine: Arvac®, a modified live virus is available from Fort Dodge Animal Health. Vaccination may have international trade consequences; therefore, the decision to vaccinate must

be carefully weighed with other risk factors. Veterinary consultation is necessary to determine and document appropriate serological monitoring and an isolation and vaccination program if recommended. Before vaccination, negative serological status for EAV must be recorded and subsequent annual vaccination records should be maintained. Isolation from nonvaccinates should occur for at least 21-28 days following vaccination (dependent upon the horse's sex) due to the possibility of limited shedding of the virus.

Vaccination is essential prior to breeding to a carrier stallion. It is recommended that serological negative mares only be bred to negative stallions or those designated as serologic positive via vaccination. If breeding to a seropositive stallion due to natural exposure, the stallions should be validated as non-shedders.

Arvac® is not approved for use in pregnant mares and mares should not be vaccinated in the last 2 months of gestation regardless of the threat of natural exposure. Vaccination of pregnant mares at other stages of pregnancy should be based upon a specific veterinary risk assessment. Mares with foals at side should not be vaccinated until foals are at least 2 weeks of age. Mares should be vaccinated no sooner than 3 weeks prior to breeding to a carrier stallion. Isolation from nonvaccinates is necessary following primary vaccination, but not subsequent vaccinations provided that annual booster vaccinations have occurred.

Foals born of seropositive dams are passively protected for the first 2-5 months of age. Foals that are seropositive through passive transfer are seronegative by 8 months of age. If EVA vaccination is considered in foals, the primary vaccination should begin at 8-10 months of age. Vaccination of foals at high risk requires veterinary consultation as different schedules may be recommended. Since properly vaccinated EAV-negative stallions do not become carriers, all EAV-negative colts less than 270 days old should be vaccinated dependent upon a veterinary risk assessment.

Zoonotic Potential: None

Potential as Biothreat Agent in Humans/Animals: EVA can have a significant economic effect on both breeding and performance sectors of the horse industry. Sources of economic losses attributable to this infection are as follows:

- Abortion and/or death loss in young foals
- Decreased commercial value of carrier stallions and the demand to breed to these animals
- Denied export markets for carrier stallions, virus infective semen and in the case of some countries, any horse seropositive for antibodies to EAV
- Disruption of training schedules and reduced race entries or race cancellations in racetrack outbreaks of EVA

Reporting Requirements:

- **Any person who makes a laboratory confirmation of Equine Viral Arteritis shall report it by the close of the next business day** to the State Veterinarian's office at (404) 656-3667 or (404) 656-3671 in Atlanta, or 1-800-282-5852 outside of Atlanta, or to the USDA Area Veterinarian in Charge at (770) 922-7860.

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