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Arteriviridae

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This family of enveloped, positive-sense, single-stranded RNA viruses, established in 1996, was classified formerly in the Togaviridae family. It has only one genus, *Arterivirus*, whose virus species are antigenically distinct from each other.

Viral Characteristics

- These positive sense, single-stranded RNA viruses are medium in size (50 - 70 nm) have a spherical appearance due to the envelope, but the nucleocapsid is icosahedral in shape (see Fig. 25.1).
- They possess a lipoprotein envelope with ring-like structures on the surface, but no gross surface spikes.
- They replicate in the cytoplasm of macrophages and endothelial cells.
- The genome is 13K nucleotides in length, has a 5'-methylguanosine cap and a 3' poly A tail of approximately 50 nucleotides. The genome alone is infectious.
- Individual viruses are antigenically distinct and host specific; they establish persistent infections.



Figure 25-1. Arteriviridae (50 - 70 nm in diameter). Positive sense, single-stranded RNA viruses that have a spherical appearance due to the envelope, but the nucleocapsid is icosahedral in shape. - To view this image in full size go to the IVIS website at www.ivis.org . -

Classification

There is only one genus:

Arterivirus

Equine viral arteritis virus

Porcine respiratory and reproduction syndrome virus

Lactate dehydrogenase-elevating virus of mice

Simian hemorrhagic fever virus: Causes hemorrhagic fever in several species of African monkeys.

Arterivirus

Equine Viral Arteritis

Cause

Equine arteritis virus.

Occurrence

Hosts are horses, donkeys and mules. Equine viral arteritis (EVA) is an important contagious disease occurring worldwide. Outbreaks have frequently been associated with racetracks. The virus is said to be endemic in standard-breds.

Transmission

The virus is shed in excretions/secretions and transmission occurs by direct and indirect contact, including by breeding. The most common route of infection in young animals is thought to be respiratory. Aerosol spread and transmission occurs mainly when horses are congregated at sales, racetracks and shows. The virus is shed in the semen of carrier stallions and is thus perpetuated in horse populations.

Pathogenesis

Following infection by the respiratory route the virus replicates in pulmonary macrophages and then in bronchial lymph nodes. There is a viremia with infection of endothelial cells leading to a general necrotic arteritis.

Clinical & Pathologic Features

Horses infected with EVA virus may have no overt signs of disease or may display a variety of clinical signs, including fever, depression, anorexia, and nasal and ocular discharge. Affected horses often have hind limb and scrotal edema and some develop a skin rash over various parts of the body. Fatal cases with pulmonary edema and interstitial pneumonia have been described in foals. Mares are likely to abort. Aborted fetuses may only show autolysis. Infected stallions recover clinically, but often remain persistently infected and spread the virus during natural breeding or artificial insemination. Gross lesions include edema, congestion and hemorrhages particularly in the subcutaneous tissues of the abdomen and limbs and widespread necrotic arteritis.

Diagnosis

- Clinical specimens: Nasal swabs, ocular swabs, whole blood, serum, fetal tissues, and semen from suspect stallions.
- Diagnosis is usually made on the basis of virus isolation or by the demonstration of a significant increase in specific antibody between acute and convalescent sera.
- The virus can be propagated in a variety of cell cultures, including those derived from horses and rabbits.
- The serologic test most often used to measure antibody response is virus neutralization, performed in the presence of 10% guinea pig complement. Other serological procedures are used but they are thought to be less reliable.

Prevention

- A modified live vaccine given at 6 - 12 months is effective but it is not used in pregnant mares.
- Prevention is best accomplished by isolation and quarantine of new additions and horses returning from race tracks and shows.
- Serologically positive stallions should be evaluated as to carrier status through virus isolation attempts on the sperm-rich fraction of semen or by a program of test breeding of seronegative mares.
- Pregnant mares should be isolated from other horses.

Porcine Reproductive and Respiratory Syndrome

Cause

An arterivirus. Antigenic differences have been noted among different isolates. Three different genotypes have been identified recently.

Occurrence

The virus of porcine reproductive and respiratory syndrome (PRRS) has been reported widely from North America and Europe. It is estimated that 60 - 80% of herds in the US are infected. The disease is responsible for enormous economic losses in the swine industry.

Transmission

By aerosol, direct contact, and fomites. Infected boars shed virus in their semen.

Clinical & Pathologic Features

Most infections occur by the respiratory route with initial viral replication in alveolar macrophages.

The incubation period is typically 2 - 7 days. Clinical signs in adult swine are usually nonexistent to mild, consisting of a slight febrile response and anorexia of short duration. A bluish discoloration of the ears due to erythematous plaques has been associated with PRRS.

Pregnant sows may abort late in gestation or deliver prematurely. There may be early embryonic death, mummified fetuses, stillbirths and premature, weak piglets. Abortions may reach epidemic proportions in fully susceptible herds.

A reproductive form may persist resulting in irregular return to estrus and a decrease in farrowing. Young pigs infected with PRRS virus frequently exhibit depression, anorexia, and rapid respiration with some coughing and sneezing. Mortality may be as high as 50% in nursing pigs, but is generally low in older pigs. Secondary bacterial infections may result in poor growth and performance. The virus may be present in the respiratory tract and lymphoid tissues for months after infection. Gross necropsy lesions are minimal in the uncomplicated respiratory form of PRRS, but interstitial pneumonitis is a consistent histopathologic finding. There are no gross or histopathologic lesions noted in aborted or stillborn fetuses.

Diagnosis

- Clinical specimens: Nasal swabs, blood, serum, lung tissue, and aborted fetuses.
- The PRRS virus can be cultivated in porcine alveolar macrophages and in a continuous cell line derived from African green monkey kidney cells. Identification is most easily accomplished by indirect fluorescent antibody (IFA) examination of infected cultures. IFA and ELISA are used to detect specific anti-PRRSV antibody.
- Infection can also be diagnosed by using the IFA test on frozen sections of lung and fetal tissues.
- Demonstration of seroconversion (ELISA) in affected pigs or in sows that have aborted is also employed. ELISA is also used in herd surveys.

Treatment

Appropriate antimicrobial therapy may be indicated to cope with secondary bacteria.

Prevention

- This is best accomplished by good management practices, including quarantine (about two months) and serologic testing of replacement stock and show animals.
- The possibility that previously infected boars might shed virus in their semen for extended periods of time should be considered.
- Modified live and killed vaccines are given to sows prior to breeding and to pigs 3 - 20 weeks of age. They help control outbreaks and reduce economic losses.

Lactate Dehydrogenase-Elevating Virus of Mice

Although of little veterinary significance, this agent illustrates the remarkable capacity some viruses have for adaptation and survival.

Wild and laboratory mice infected with this virus remain persistently infected for life. The virus infects macrophages and there is a life-long viremia. They have no overt signs of illness but plasma lactic dehydrogenase levels are elevated, not as a result of increased production but as a consequence of impaired clearance.

Mice are most often infected during fighting and experimental procedures, such as the use of common needles, transplantation studies, etc. Natural transmission appears to require close contact with contaminated blood or tissue, and is more common in males that fight.

Glossary

Genotype: A virus genotype is based on partial or complete nucleotide sequence analysis.

Seroconversion: The development of demonstrable antibody in response to a disease or a vaccine.

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