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Caliciviridae

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This family is composed of small, non-enveloped, positive-sense single-stranded RNA viruses with distinctive morphological features. The viruses infect a wide variety of animals and two are important pathogens of domestic animals.

Viral Characteristics

- Non-enveloped, positive sense, ssRNA viruses, 35 - 40 nm in diameter with icosahedral symmetry (Fig. 23.1).
- The 32 cup-shaped depressions on the spherical capsid surface give caliciviruses a distinctive morphology.
- The genome is a single molecule of linear single-stranded RNA (7400 to 8300 nucleotides in length) with positive polarity. It contains a 5' protein (VPg) or a methylated nucleotide (for hepatitis E) and a 3' polyA tail.
- The genome alone is infectious.
- Replication takes place in the cytoplasm and virions are released with cell lysis.
- The virions are stable in the environment and resistant to some disinfectants; sodium hypochlorite is effective.

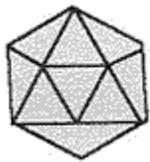


Figure 23-1. Caliciviridae (35 - 40 nm). Small, non-enveloped, positive-sense single-stranded RNA viruses with icosahedral symmetry and distinctive morphological features. - To view this image in full size go to the IVIS website at www.ivis.org . -

Classification

The Caliciviridae consists of four genera, Vesivirus, Lagovirus, "Norwalk-like viruses" and "Supporto-like viruses". The last two categories contain viruses that infect humans. The first two categories contain viruses of veterinary significance as follows:

Vesivirus

- Vesicular exanthema virus
- Feline calicivirus
- Canine calicivirus: Not considered of pathogenic significance; recovered from dogs with diarrhea.

Lagovirus

- Rabbit hemorrhagic disease virus
- European brown hare syndrome virus

"Norwalk-like viruses"

- Norwalk virus: A major cause of acute gastroenteritis in humans.

"Sapporo-like viruses"

Many non-pathogenic strains recovered from humans.

Vesivirus

Vesicular Exanthema

(San Miguel sea lion virus disease)

Cause

Vesicular exanthema of swine (VES) virus. Thirteen serotypes of the virus designated A, B, C, etc, have been identified to date. A number of serotypes have been implicated in San Miguel sea lion disease.

Occurrence

The virus naturally infects swine; horses and dogs. Hamsters can be infected experimentally. The disease, with the exception of isolated outbreaks in Hawaii and Iceland, has only been seen in the continental United States. It has not been reported since 1956. A virus closely related or identical to VES virus was isolated from San Miguel sea lions along the California coast. It was capable of producing vesicular lesions in pigs experimentally inoculated. Several serotypes of this virus affect other marine mammals, including northern fur seals, and antibodies to these viruses have been detected in a variety of terrestrial mammals. It has been suggested that marine animals are the reservoir of VES virus.

Transmission

Vesicular exanthema virus is transmitted by direct and indirect contact and by fomites. The virus is present in the saliva and feces of infected pigs. It has been conjectured that pigs may have been infected by eating food containing portions of sea lion carcasses.

Clinical & Pathologic Features

The disease in swine clinically resembles foot-and-mouth disease but is milder. There is fever and vesicles appear on the snout, the mucous membranes of the mouth, the feet, and the udder of nursing sows about 48 hours after viremia. The vesicles break in 24 - 48 hours leaving erosions that rapidly are covered with new epithelium. The disease is usually benign and runs a course of about two weeks.

Diagnosis

VES is an important disease because of its similarity to foot-and-mouth disease, vesicular stomatitis and swine vesicular disease.

- Clinical specimens: Vesicular fluid, affected mucous membranes, blood with anticoagulant, and serum.
- Vesicular fluid contains virus that can be identified by complement fixation and ELISA and detected by electron microscopy.
- The virus can be cultivated in swine embryonic kidney cells in which cytopathic changes are observed. In cell cultures, the virus can be identified by neutralization tests and viral antigens can be detected by immunofluorescence.

Prevention

- The disease is now considered eradicated from the United States. The last occurrence was in 1956. However, the possibility of infection from marine mammals must be kept in mind.
- It is a reportable disease and is dealt with by the same strict measures used to control other vesicular diseases.

Feline Calicivirus Infection

Cause

Feline calicivirus of which there are several serotypes.

Occurrence

Feline calicivirus infection is highly contagious, occurs worldwide, and rivals feline viral rhinotracheitis (FVR) in frequency of occurrence.

Transmission

Spread is by direct and indirect contact and the mode of infection is mainly by inhalation of aerosols.

Clinical & Pathologic Features

Infection begins in the oropharynx with extension to the upper respiratory tract and eye. The incubation period (2 - 5 days), course, and clinical manifestations resemble FVR. Clinical signs include fever, mild rhinitis, sneezing, nasal discharge, conjunctivitis, palatine or glossal ulcerations, and, in some instances bronchopneumonia. There is a great variation in the severity of the disease, probably owing to variability in the virulence of different strains of the virus and host factors.

Kittens 2 - 6 months of age are most severely affected. The fatality rate can be substantial in kittens and older cats. Infected

cats become carriers and the virus is shed continuously from the pharynx and tonsils for months and sometimes for years. Abortion may occur in queens.

Diagnosis

- Clinical specimens: Nasal, oropharyngeal, and ocular swabs; lung and trachea from necropsied cats.
- Isolation and identification of the virus are required for a definitive diagnosis. The virus can be easily propagated in cell cultures of feline origin, in which a rapid and well evidenced cytopathic effect is produced. Upon production of characteristic CPE, the virus can be identified by virus neutralization with specific antiserum.

Prevention

Feline calicivirus is strongly immunogenic, and killed and modified-live vaccines of cell culture origin are available, often in combination with other viruses. They are administered intranasally or intramuscularly.

Lagovirus Rabbit Hemorrhagic Disease

Cause

Rabbit hemorrhagic disease virus.

Occurrence

Rabbit hemorrhagic disease (RHD) affects domestic and wild rabbits and hares. Destructive outbreaks have been reported worldwide. Although not endemic in the USA outbreaks have occurred, most recently in 2001 and 2005.

Transmission

Spread by is by direct and indirect contact and mechanically by mosquitoes and other insects. The virus is present in secretions and excretions.

Clinical & Pathologic Features

Infection is by the oral/fecal route and the principal target cells are mononuclear phagocytes. The disease is highly contagious and infections are characterized by acute onset and frequently death without premonitory clinical signs. Some affected rabbits may have signs of respiratory distress, such as dyspnea, abdominal respiration, and mild nosebleed. Swollen, congested and hemorrhagic viscera are noted at necropsy. Histologically, the most characteristic lesion is a coagulative hepatic necrosis. There are hemorrhages in the lung and focal areas of necrosis in the spleen and heart. Severe crypt necrosis may be occasionally noted in the small intestine.

Diagnosis

- Clinical specimens: Liver, spleen and lung.
- A presumptive diagnosis is made on the basis of the peracute nature of the disease, liver necrosis and other characteristic gross lesions.
- Virus in tissues can be detected by electron microscopy and antigen identified by ELISA and immunofluorescence.
- The virus in tissue preparations will agglutinate human type O erythrocytes.
- The virus has not been propagated in cell cultures.

Prevention

- Where the disease is endemic inactivated vaccines are used.
- Outbreaks in North America are dealt with by strict quarantine and slaughter.
- The disease is of such severity that it has been used to reduce rabbit populations.

European Brown Hare Syndrome

The disease caused by this lagovirus is similar to rabbit hemorrhagic disease (RHD) and has been reported in wild and domestic hares in many European countries. The European brown hare syndrome virus is antigenically similar to the virus that causes RHD. This hemorrhagic disease with liver necrosis has a high mortality rate in adult hares.

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