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Birnaviridae

G.R. Carter¹ and D.J. Wise²

¹Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, Virginia, USA. ²Department of Biology, Concord University, Athens, West Virginia, USA.

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This family was created to accommodate those double-stranded RNA viruses that did not fit in Reoviridae because their genome contained only two segments of linear double-stranded RNA rather than the ten to twelve segments of the reoviruses. Birnaviridae includes viruses that infect chickens, insects, rotifers and fish. Infectious bursal disease (IBD) virus is the only significant veterinary pathogen.

Viral Characteristics

- Non-enveloped, double stranded RNA viruses with icosahedral symmetry approximately 60 nm in diameter (see Fig. 17.1).
- The capsid consists of five major polypeptides (VP1-5) and contains a genome consisting of two segments of double-stranded RNA.
- Replication takes place in the cytoplasm. The dsRNA serves as a template for the production of mRNA (+) and progeny genomes.
- Viruses are stable, resisting heat and a wide pH range.



Figure 17-1. Birnaviridae (approximately 60 nm). Nonenveloped, icosahedral capsid that consists of five major polypeptides. - To view this image in full size go to the IVIS website at www.ivis.org . -

Classification

The family Birnaviridae contains three genera:

Aquabirnavirus includes viruses that infect fish, crustaceans and mollusks. Included is the virus that causes infectious pancreatic necrosis of salmonoid fish.

Entombirnaviruses includes viruses that infect insects.

Avibirnavirus infects birds. Only one species, the virus causing infectious bursal disease (IBD), is recognized. There are two serotypes of IBD virus: Type 1 strains cause IBD; type 2 strains are not pathogenic.

Avibirnavirus

Infectious Bursal Disease

(Gumboro disease)

Cause

Infectious bursal disease virus, Avibirnavirus, serotype 1.

Occurrence

Infectious bursal disease is a frequently occurring, worldwide infection of chickens.

Transmission

The virus is shed in the feces and transmission is by direct contact and indirectly by fomites.

Pathogenesis

The route of infection is mainly oral, but also via the conjunctiva and respiratory tract. Shortly after initial infection, the virus is found in Kupffer cells of the liver; and in macrophages and lymphoid cells of the jejunum, duodenum and cecum. Within 12 hours, cells of the bursa of Fabricius are infected. The principal target cells are B lymphocytes. Following viremia the thymus, the Harderian gland and spleen are infected. Depletion of the bursa leads to an impaired immune response.

Clinical & Pathologic Features

The disease is highly contagious for young chickens (usually 3 - 14 weeks), and is characterized by swelling and edema of the bursa of Fabricius.

Clinical signs include diarrhea, anorexia, depression, vent picking, and prostration. Mortality ranges from none to about 20%. The principal loss is mainly due to poor weight gains of broilers. Although clinical signs are not usually present in very young birds, the immune system may be permanently impaired.

Lesions in lymphoid tissues are characterized by degeneration of lymphocytes in medullary areas.

Diagnosis

- Clinical specimens: Bursa of Fabricius, liver, spleen, kidney, lungs and blood.
- IBD is suspected in cases of swollen and hemorrhagic bursa of Fabricius in young chickens.
- Confirmation of a diagnosis can be made by detecting viral antigen in macerated bursa by an ELISA or agar gel immunodiffusion procedure. Immunofluorescence can be used to detect viral antigen in frozen sections of the bursa.
- The virus can be propagated on the chorioallantoic membrane of chicken embryos obtained from flocks free of IBD. Death of embryos usually occurs in 3 - 5 days. Identification is made by virus neutralization.

Prevention

- Exposure can be reduced by thorough cleaning and disinfection of poultry houses.
- Killed virus vaccines are used in breeders.
- Attenuated live virus vaccines of chicken embryo origin are administered by eye instillation or drinking water to chicks during the first 1 - 2 weeks of age, but vaccination may not be effective if passively acquired immunity is high.
- Commercial ELISA kits are available for monitoring the immune status of flocks.

Glossary

bursa of Fabricius: This sac-like lympho-epithelial structure, unique to birds, is associated with the cloaca. Maturation of B lymphocytes takes place in this organ.

Harderian gland: An accessory lacrimal gland located on the inner side of the orbit in reptiles and birds.

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