

## Herpes viruses

Herpesviruses are morphologically similar, with a double stranded DNA core and an icosahedral capsid consisting of 162 capsomeres, surrounded by a granular zone composed of globular proteins (tegument) and encompassed by a lipid envelope.

The genome of herpesviruses is large, 125–290 kilobases (kb), and encodes many different proteins; functions of the proteins encoded by the viral genome include virus replication, virus structural proteins, and a variety of proteins that regulate cell growth and modulate the host's antiviral response.

Viral replication occur in the nucleus, and the envelope is obtained by budding through the inner layer of the nuclear envelope.

Infection with herpes viruses results in lifelong latent infection with subsequent intermittent or continuous shedding of virus. Herpesviruses do not survive well outside of the host.

**Transmission** usually requires close contact, but respiratory droplet spread is important in facilities with confined populations, such as cattle feedlots and animal shelters.

The virus may survive longer in cool, moist environments, but latently infected animals serve as the reservoir for transmission.

The family Herpesviridae consists of three major subfamilies,

(**alpha-,beta-, and gamma**) herpesvirinae, which were initially distinguished by: host range, duration of replication, reproductive cycle, cytopathology, and latent infection characteristics.

**The alpha herpesvirinae** are generally highly cytopathic in cell culture, have a relatively short replication cycle (24 h), and frequently cause latent viral infections in sensory ganglia. Most of these viruses are restricted in their host range.

**Beta herpesvirinae** have a variable host range and a long replication cycle; infected cells often become enlarged (cytomegaly), thus their designation as cytomegaloviruses. Latency can be established in numerous tissues, including secretory glands and lymphoreticular tissues.

**Gamma herpesvirinae**, with some exceptions, tend to be tropic for B or T lymphocytes (lymphotropic), replicate in lymphoblastoid cells, and may cause lytic infections in certain types of epithelial and fibroblastic cells. Latency is established frequently in lymphoid tissue. Host range is narrow.

### **Bovine Herpesviruses**

#### **Bovine Herpesvirus 1 (BHV-1)**

**Disease.** BHV-1 infection in cattle may present as ocular, genital, and respiratory disease. Respiratory disease typically presents as rhinotracheitis (IBR), which may lead to severe and often fatal bronchopneumonia. Conjunctivitis is common. BHV-1 can infect genitalia, resulting in vulvovaginitis. BHV-1 has been isolated from vesicular lesions on the udder and teats of a cow with mastitis.

#### **Culture Systems.**

BHV-1 virus can be grown in a wide variety of cells, including bovine, canine, feline, equine, ovine, rabbit, monkey, and human.

#### **Pathogenesis and Pathology.**

The virus induces injury to the respiratory mucosa, which becomes hyperemic and lesions within the nasal cavity progress from areas of focal epithelial necrosis to large areas of ulceration, covered by a pseudomembrane composed of fibrin and cellular debris that results from an intense inflammatory response to the virus. The injury predisposes the cattle to bacterial infection and subsequent bacterial bronchopneumonia (shipping fever complex). Virus can be recovered from nasal secretions for almost 2 weeks following infection.

Genital infections are most common in dairy cattle. Lesions consisting of pustules and later fibronectic plaques are usually limited to the vulva

and posterior vagina in the female. Similar lesions are seen on the prepuce of affected bulls. Lesions typically heal in 10–14 days, and many cases are subclinical.

**BHV-2 (Bovine Mammillitis Virus)**

BHV-2 has been isolated from cattle with generalized skin disease (pseudolumphy skin disease), mammillitis, and stomatitis. The diagnosis of pseudolumphy skin disease and mammillitis can be based on clinical signs and viral isolation in cell culture. Serology on paired samples will demonstrate an increase in antibody.

**Bovine Herpesvirus 5 (BHV-5)**

BHV-5 is an alphaherpesvirus responsible for nonsuppurative meningoencephalitis in young cattle and is closely antigenically and genetically related to BHV-1.

**Gallid Herpesvirus 1 (Infectious Laryngotracheitis Virus)**

**Disease.** Infectious laryngotracheitis virus (ILTV) usually occurs as an acute disease in chickens and represents a serious problem in areas of intense poultry husbandry. The virus produces signs of respiratory distress and coughing that often produce a bloody discharge. Mild enzootic forms of ILTV infection may result in reduced egg production, conjunctivitis, and persistent nasal discharge with swollen nasal and infraorbital sinuses. The mild enzootic form is the most common form in modern poultry operations.

**Gallid Herpesvirus 2 (Marek's Disease Virus)**

**Disease.** Marek's disease (MD) is a lymphoproliferative disease, lymphoma being most common, of chickens that may involve numerous tissues. Most frequently peripheral nerves are affected. Prior to vaccine development, MD was responsible for heavy losses, and increased losses to MD in vaccinated flocks have suggested an evolution toward greater virulence. Progressive paralysis of one or more extremities, incoordination, drooping wings, and lowered head position are the most common signs of MD. Mortality varies from 10% with mild MD to more than 50% in unvaccinated birds.