

## **RHABDOVIRIDAE (*RHABDO* = *ROD*)**

Order: Mononegavirale

Family: Rhabdoviridae

Genera:

- Cytorhabdovirus
- Ephemerovirus
- Lyssavirus
- Nucleorhabdovirus
- Vesiculovirus
- Novirhabdovirus: example include Infectious haematopoietic necrosis virus of fish

General properties:

- Members have characteristic rod shapes
- Rhabdoviruses of vertebrates are 'bullet-shaped' or cone-shaped
- Enveloped viruses
- Helical symmetry
- About 100 to 430nm x 45 to 100nm
- Possess a linear, non-segmented RNA genome of negative polarity/sense and about 10 – 12 kilobase in size
- Genome encased in a ribonucleoprotein complex
- Contain five major proteins:
  - large RNA-dependent RNA polymerase (L)
  - surface glycoprotein (G): forms the surface spikes for interaction with host cell receptor. Also induces virus-neutralising antibodies and cell mediated immunity
  - nucleoprotein (N)
  - protein component of the viral polymerase (P)
  - matrix protein (M)
- Replication takes place within the cytoplasm with the exception of nucleorhabdovirus
- Virion released by budding from host cell plasma membrane
- Stable at pH 5 to 10

- Inactivated by heating at 56°C, treatment with lipid solvents and exposure to UV light

Genera of Veterinary importance: Lyssavirus, Vesiculovirus and Ephemerovirus

### **LYSSAVIRUS (*Lyssa = rage/fury*)**

Viruses:

- Rabies virus (Lyssavirus genotype 1)
- Lagos bat virus (Lyssavirus genotype 2)
- Mokola virus
- Duvenhage virus
- European bat lyssavirus 1
- European bat lyssavirus 2
- Australian bat lyssavirus

### **RABIES:**

- caused by Rabies virus (Lyssavirus genotype 1).
- Viral infection of the central nervous system of most mammals and man.
- Carnivores (Dogs, foxes, wolves, coyotes, jackal) highly susceptible
- Urban rabies: maintained in dogs
- Sylvatic rabies: maintained in wildlife
- Important reservoirs: skunks, racoon, foxes, bats

**Transmission:** bite of infected animals. Transmission through scratching, licking, open wound and conjunctiva is also possible. Saliva is rich in the virus. Infected animals may excrete the virus in saliva before clinical manifestation

**Clinical sign:** Prodromal, furious (excitative) and dumb (paralytic) phases.

Prodromal: Confusion and disorientation

Furious/Excitative: increased aggressiveness, hyperexcitability, bite of inanimate objects

Dumb/paralytic: muscle weakness, difficult swallowing, profuse salivation, dropping of jaw.  
Difficulty in swallowing water (hydrophobia) due to pharyngeal paralysis

**Other lyssaviruses:** similar to rabies.

### **DIAGNOSIS:**

- Clinical signs
- Samples for isolation: brain tissue, saliva, CSF, urine
- Histology: non-suppurative encephalitis characterised by perivascular lymphocytic cuffing and intracytoplasmic inclusion bodies (Negri bodies)
- Direct fluorescent antibody test (FAT) with fluorescein labelled specific antiserum
- Virus isolation in neuroblastoma cells or in baby hamster kidney cells. Rabies virus is non-cytopathic and can be detected by FAT
- Virus can also be isolated in newborn mice inoculated intracerebrally with suspected brain tissue. The animal is observed for signs of disease. Rabies virus is detected by FAT
- Reverse transcriptase polymerase chain reaction (RT-PCR) distinguishes rabies from other lyssaviruses.

### **CONTROL:**

- Quarantine
- Isolation of suspected dog for 10 days
- Movement restriction
- Elimination of stray dogs and cat
- Vaccination of susceptible animals (High egg passage and Low egg passage live attenuated rabies vaccine)
- Vaccination of wildlife reservoirs (live oral vaccines, vaccinia-rabies virus glycoprotein, recombinant rabies vaccine)
- Hyperimmune serum

### **VESICULOVIRUS**



### Viruses:

- Vesicular stomatitis Indiana virus (type species, most common): three subtypes, Indiana-1, Indiana-2, and Indiana-3
- Vesicular stomatitis New Jersey virus (most severe)
- Vesicular stomatitis Alagoas virus
- Cocal virus

### Vesicular stomatitis

- Caused by members of the genus Vesiculovirus
- Clinical similar to Foot-and-Mouth-Disease
- A reportable zoonotic disease
- Affects horses, swine, cattle, llamas, sheep, goats, deer, bobcats, raccoons, monkeys and humans.

Transmission: by contact and insect vectors

- Virus is shed in saliva
- Virus has been isolated from blackflies, mosquitoes, sandflies and houseflies
- Virus can be acquired through skin abrasions and mucous membranes

Clinical signs:

- Subclinical infection is common
- Occur more in animals over one year old
- Fever
- Vesicular lesions typically develop on the tongue and oral mucosa
- Vesicles rupture and may progress to ulcers and erosions
- There may be secondary bacterial infections.
- Swine usually exhibit lameness
- Vesicular lesions in swine are generally located on the coronary band and snout.

- Cattle may additionally develop lesions around the coronary band, interdigital spaces, and teats (mastitis)
- Humans commonly develop flu-like symptoms including fever, chills, headache, muscle pain and runny nose.
- Humans occasionally develop oral vesicles
- Rarely causes death, but may be fatal due to secondary bacterial infections

## **DIAGNOSIS**

- Differential diagnosis: foot-and-mouth disease, swine vesicular disease, vesicular exanthema of swine, infectious bovine rhinotracheitis, and bluetongue.
- Vesicular lesions in horses
- Suitable samples: Vesicular fluid, epithelium of lesions
- Detection of viral antigen by Enzyme Linked Immunosorbent Assay and Complement Fixation Test
- Virus isolation in suitable cell lines, embryonated eggs or in suckling mice by intracerebral inoculation. Virus produces cytopathic effects.
- ELISA, CFT or virus neutralisation can be used for identification of growing virus
- Electron microscopy of vesicular fluids or fresh lesions

## **CONTROL:**

- Notifiable disease
- Movement restriction
- Control of insect vectors
- Vaccines not commercially available
- Zoonotic

## **EPHEMEROVIRUS**

Virus: Bovine ephemeral fever virus

Disease: Bovine ephemeral fever

Host: Cattle, water buffalo

Transmission: Arthropod-borne (*Culicoides spp*)

Clinical signs:

- More severe in well-fed animals
- Diphasic fever
- Lethargy, anorexia, lameness, constipation
- Muscle stiffness, ruminal stasis
- Abortion
- Recumbency, salivation, nasal and ocular discharges
- Hypocalcaemia
- Short duration and recovery within few days

DIAGNOSIS

- Based on clinical signs
- Demonstration of rising virus specific antibody by virus neutralisation test or ELISA on paired serum sample

CONTROL:

- Attenuated and inactivated vaccines
- Subunit vaccine based on envelope glycoprotein
- Vector control