Rhabdoviridae

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Enveloped RNA viruses with helical symmetry and

- r od-shaped morphology Rabies virus and related lyssaviruses

-present in saliva; transmitted by biting carnivores
and bats
--cause encephalitis in mammals which is invariably fatal

- Vesicular stomatitis viruses

-transmitted by direct contact and environmental contamination or by arthropod vectors-cause febrile disease with

vesicular lesions especially in cattle, horses and pigs

Bovine ephemeral fever virus
-transmitted by biting arthropods
--causes febrile transient illness with ill-defined
clinical signs

Members of the family *Rhabdoviridae* (Greek *rhabdos*, rod) have characteristic rod shapes

Rhabdoviruses have a non-segmented, linear, negative-polarity RNA genome contained in a ribonucleoprotein complex .

Viruses from vertebrates, invertebrates, and plants make up this large family. Rhabdoviruses in vertebrates are shaped like bullets or cylinders.

The family *Rhabdoviridae* comprises 11 genera. The genera *Vesiculovirus*, *Lyssavirus* and *Ephemerovirus* contain viruses of veterinary significance.

With the exception of plant nucleorhabdoviruses, replication takes place in the cytoplasm. As virions bud from the cell, newly produced nucleocapsids gain envelopes from the plasma membrane.

In the pH range of 5 to 10, virions (100 to 430 nm 45 to 100 nm) are stable. Heating them to 56°C, treating them with lipid solvents, and exposing them to UV radiation inactivates them quickly.

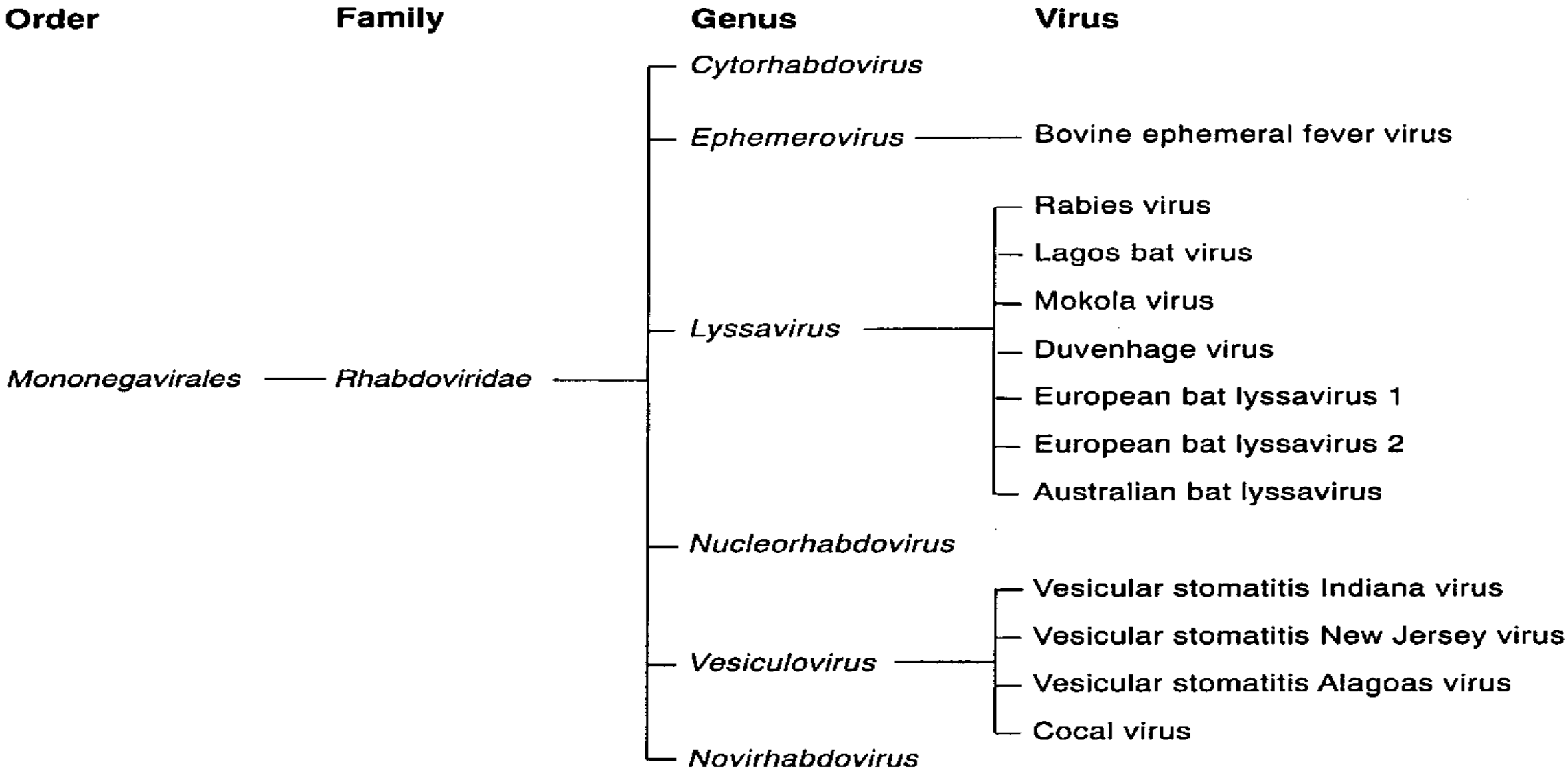


Figure 66.2 A classification of rhabdoviruses with emphasis on those of veterinary importance

Rhabdoviruses usually contain five major proteins: a large RNA-dependent RNA polymerase (L), a surface glycoprotein (G), a nucleoprotein (N), a protein component of the viral polymerase (P) and a matrix protein (M).

The G protein forms the surface peplomers which interact with host cell receptors, facilitating endocytosis of the virion. In addition, the G protein induces virus-neutralising antibodies and cell-mediated immunity.

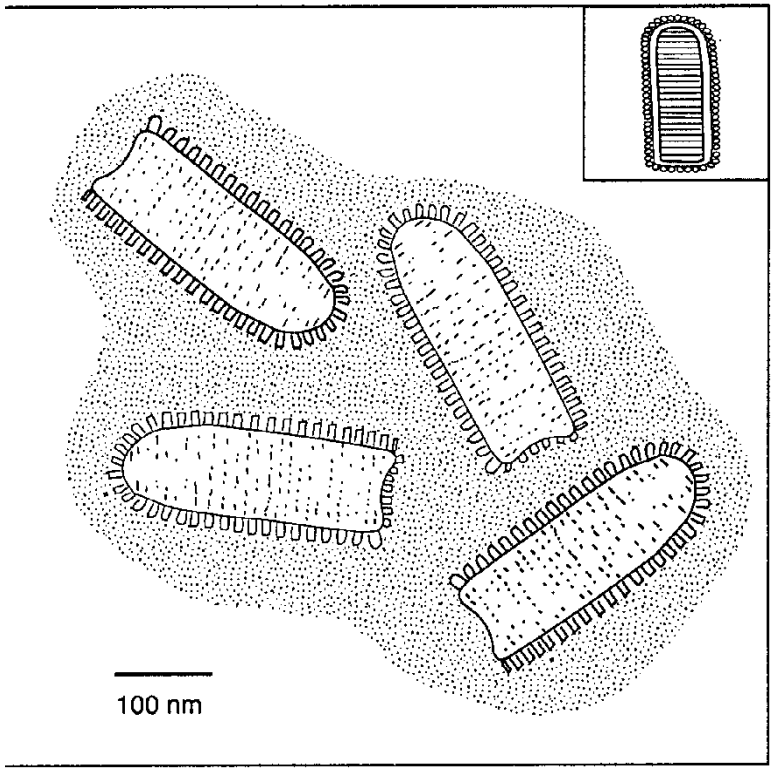


Figure 66.1 Rhabdovirus particles as they appear in an electron

Clinical infections

Veterinary important rhabdoviruses can be spread through bites of mammalian, arthropod vectors, or direct contact. Contamination of the environment can also lead to infection.

The rabies virus, a Lyssavirus, is the most well-known and significant member of the Rhabdoviridae family (Greek lyssa, rage or fury).

A variety of different lyssaviruses, many of which have been discovered from bats, exhibit clinical indications that are similar to rabies. New lyssaviruses are still being isolated from wildlife.
The vesicular stomatitis Indiana virus and the vesicular stomatitis New Jersey virus are the two most common vesiculoviruses that infect domestic animals.

The type species of the genus Ephemerovirus is bovine ephemeral fever virus, which is found in the tropics and subtropics of Africa, Asia, and Australia.

Rabies

This viral infection affects the central nervous system of most mammals, including humans. However, the susceptibility of mammalian species varies greatly. The majority of clinical cases are caused by rabies virus (genotype 1). Domestic animals and man are considered to be moderately susceptible to the virus,whereas foxes and wolvesare considered to be highly susceptible.

Although virus may be transmitted through scratching and licking, transmission usually occurs through bites. Infected animals may excrete virus in their saliva for some time before the onset of clinical signs.

Other neurotropic lyssaviruses that are closely related to the rabies virus exhibit clinical symptoms that are similar to rabies.

The rabies virus has been described as having several species-adapted genotypes or strains. Strains that affect a certain species are more likely to be transferred to members of that species than to members of other animal species.

Pathogenesis

Following introduction into the tissues, virus enters peripheral nerve endings. There may be limited replication locally in myocytes or other tissue cells.

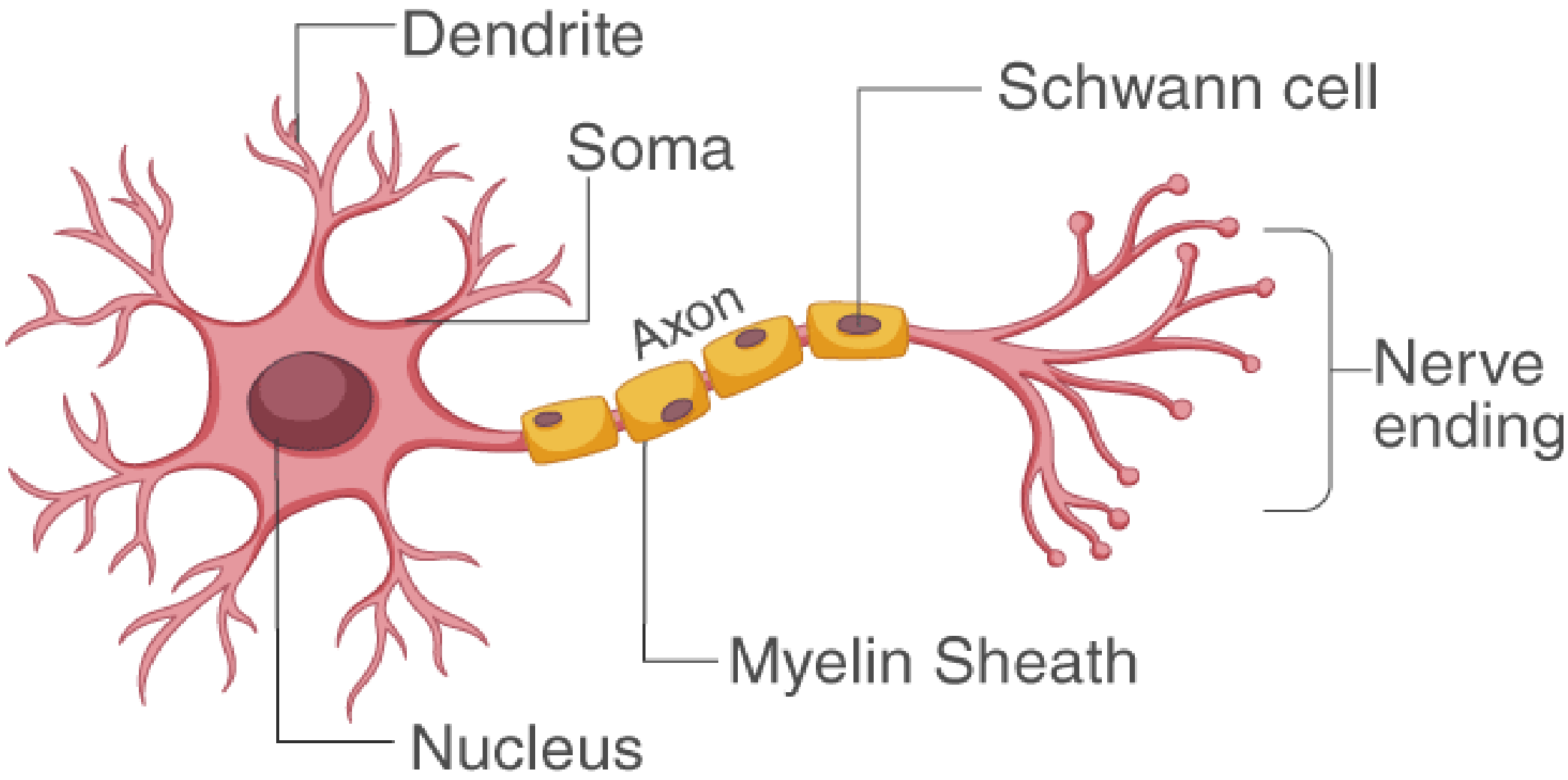
The virus is transported to the central nervous system by retrograde axoplasmic flow and becomes widely disseminated in nervous tissue by intra-axonal spread.

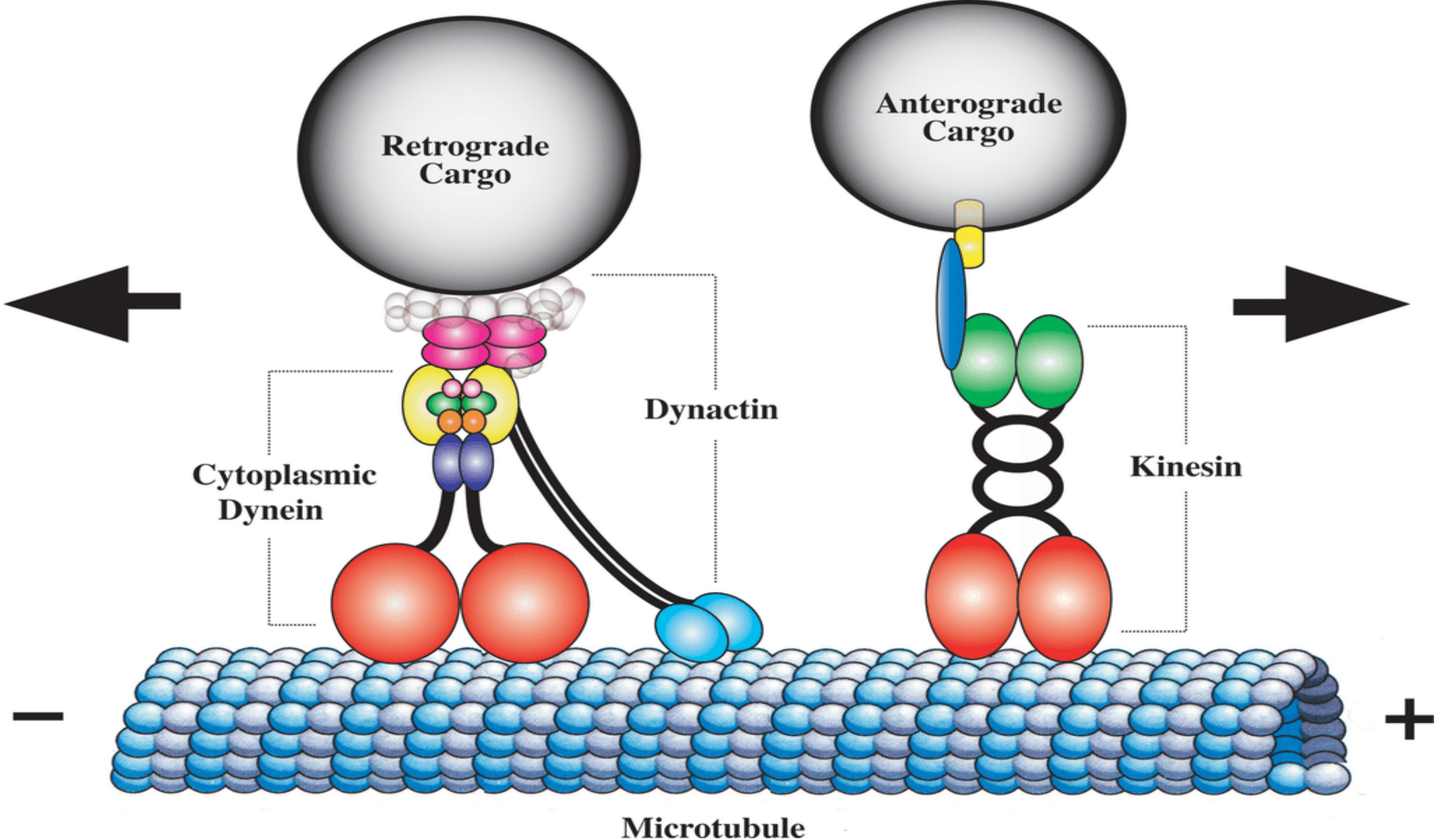
Clinical signs develop following neuronal damage caused by viral replication. ~ir;s spreads centrifugally within nerve cell processes and is released at axon terminals where it infects many non-nervous tissues including the salivary glands.

The presence of virus in saliva, especially in carnivores, is an important factor in rabies transmission.

Although rabies viral antigens are highly immunogenic, immune detection is delayed because intracellular transport prevents contact with the cells of the immune system in the early stages of infection.

STRUCTURE OF NEURON




Retrograde Cargo
Anterograde Cargo
Dynactin
Cytoplasmic Dynein
Kinesin
−
+
Microtubule

Diagnosis

Ante-mortem diagnostic tests for rabies are not generally used. In endemic areas, suspect domestic carnivores which have bitten humans should be isolated and observed for up to 14 days.

The brains of animals which develop clinical signs should be examined for the presence of virus.

Rapid laboratory confirmation is essential for the appropriate treatment of human patients.

Non-suppurative encephalitis characterized by perivascular lymphoid cuffing and intracytoplasmic inclusions (Negri bodies) may be demonstrable histologically.

The direct fluorescent antibody test (FAT), which provides a rapid and specific diagnosis, may yield false negative results with autolysed brain specimens.

The conjugated antisera usually used for diagnosis are specific for rabies virus (serotype 1).

Rabies virus can be cultured in neuroblastoma cells or in baby hamster kidney cells. Culture of the virus is of value when results of the FAT are uncertain. Rabies virus, which is non-cytopathic, can be detected in tissue culture using conjugated antisera

Suckling mice, inoculated intracerebrally with brain tissue from suspect rabies cases, should be observed over several days for the development of disease. The FAT is used to confirm the presence of rabies virus in infected mice.

Reverse transcriptase polymerase chain reaction (RTPCR) has been used to detect viral RNA in brain samples. This test can distinguish rabies virus (genotype 1) from rabies-related lyssaviruses. The sensitivity of RTPCR can be enhanced by combining the technique with ELISA which aids detection of amplified product

Vesicular stomatitis

This febrile disease affects mainly horses, cattle and pigs. Other susceptible species include camels, several wildlife species and humans. Vesicular stomatitis is clinically similar to foot-and-mouth disease

Pathogenesis

Virus probably enters the body through abrasions on the skin or mucous membranes or following an insect bite. Vesicles which develop at the site of infection may coalesce.

Spread may occur locally by extension from primary lesions. Although secondary lesions at distant sites may develop, it is unclear how transfer of the virus occurs and if these lesions result from viraemia or following environmental contamination.

Diagnosis

Prompt laboratory confirmation is required because of similarities between vesicular stomatitis, foot-and-mouth
disease and swine vesicular disease. If horses present with vesicular lesions, infection with vesicular stomatitis virus should be considered.

Suitable specimens for isolation of virus or the detection of viral antigen include epithelium from lesions and vesicular fluid. Viral antigen can be detected by CFT or ELISA.

Virus may be isolated in suitable cell lines, in embryonated eggs or in suckling mice by intracerebral inoculation. The virus is cytopathic. The fluorescentantibody test, ELISA, CFT or the virus neutralization test are suitable procedures for identification of isolates.

Electron microscopy can be used to identify virus in specimens or tissue culture.

Antibody levels in recovered animals may be assayed by CFT, the virus neutralization test, competitive ELISA or IgM-specific capture ELISA. Because levels of complement-fixing and IgM antibodies persist for only short periods, assays based on procedures involving these antibodies can be used to confirm recent infections in endemic areas.