

Paramyxoviridae

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Paramyxoviridae

- ❖ The family *Paramyxoviridae* consists of large enveloped RNA viruses infecting mammals, birds, reptiles and fish
- Includes pathogens that cause some of the most devastating human and veterinary diseases
- *Paramyxoviridae* includes many viruses that are of global concern
- Paramyxoviruses and orthomyxoviruses were formerly grouped together as 'myxoviruses' (Greek *myxa*, mucus), describes their affinity for mucous membranes

Taxonomy

Order: *Mononegavirales*

Family *Paramyxoviridae*

Subfamily: *Avulavirinae*- 03 genera

Subfamily: *Metaparamyxovirinae*- 01 genus

Subfamily: *Orthoparamyxovirinae*- 08 genera

Subfamily: *Rubulavirinae*- 02 genera

The family members continue to expand rapidly as new viruses are discovered in wild animal populations

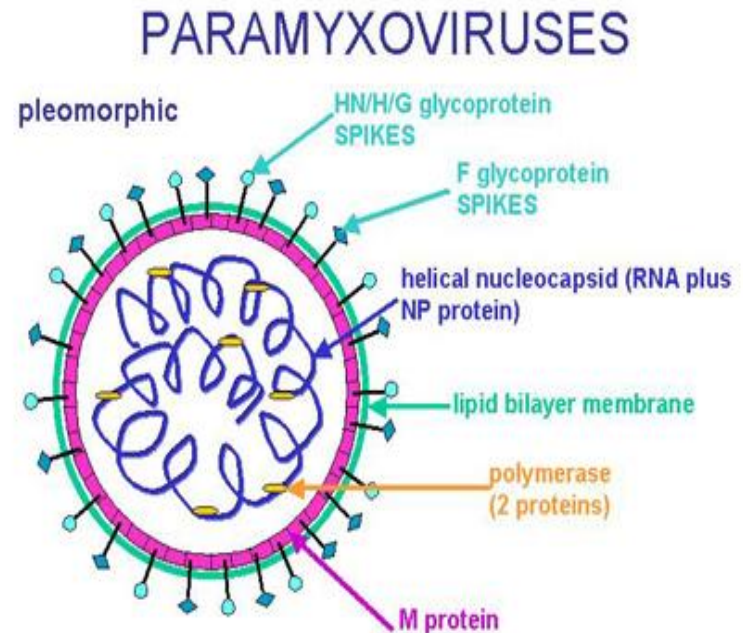
Subfamily	Genus
<i>Avulavirinae</i>	<i>Metaavulavirus</i>
	<i>Orthoavulavirus</i>
	<i>Paraavulavirus</i>
<i>Metaparamyxovirinae</i>	<i>Synodonavirus</i>
<i>Orthoparamyxovirinae</i>	<i>Aquaparamyxovirus, Ferlavirus</i> <i>Henipavirus, Jeilongvirus</i> <i>Morbillivirus, Narmovirus</i> <i>Respirovirus, Salemvirus</i>
<i>Rubulavirinae</i>	<i>Orthorubulavirus, Pararubulavirus</i>

➤ Many viruses have been named according to their:

- Species of origin
(eg, porcine rubulavirus, avian paramyxoviruses)
- Geographic sites of discovery
(eg: Sendai, Hendra, and Newcastle disease viruses)
- Antigenic relationships
(eg, human parainfluenza viruses)
- Diseases produced in affected animals or humans
(eg, canine distemper, rinderpest, measles, mumps viruses)

Virion properties

- Pleomorphic, 150-350 nm in diameter
- Spherical or filamentous particles
- Virions are enveloped, covered with large glycoprotein spikes
- Contain a “herring bone-shaped” helically symmetrical nucleocapsid
- The genome consists of a single linear molecule of negative-sense, single-stranded RNA



- Most of the gene products are present in virions either associated with lipid envelope or complexed with virion RNA
- Ribonucleoprotein (RNP) complex is surrounded by the viral envelope consisting of an unglycosylated matrix protein (M), and two glycosylated envelope proteins—a fusion protein (F) and an attachment protein
- Envelope spikes of paramyxoviruses are composed of two glycoproteins: Fusion protein (F) and attachment protein (H, HN, G)

Hemagglutinin-neuraminidase (HN)- Aquaparamyxovirus, Avulavirus, Ferlavirus, Respirovirus, Rubulavirus

Hemagglutinin (H)- Morbillivirus

Glycoprotein (G) -Henipavirus

- Both envelope proteins have key roles in pathogenesis of all paramyxovirus infections
- The HN, H, or G proteins are responsible for attachment to the cellular receptor(s)
- F protein mediates the fusion of viral envelope with plasma membrane of host cell
- The fusion protein is synthesized as an inactive precursor(F₀), activated by proteolytic cleavage

- Paramyxoviruses can be crudely divided into two groups:
 - with a single basic amino acid at cleavage site
 - with multiple basic amino acids at cleavage site
- The cleavage of F0 is essential for infectivity, and is an important virulence determinant for certain viruses
 - e.g. virulent strains of avian paramyxovirus 1 (Newcastle disease virus) have multiple basic residues at the cleavage site
 - avirulent strains of avian paramyxovirus 1 have a single basic residue at the cleavage site

- Paramyxoviruses replicate in cytoplasm of infected cells
- Virions released by budding from the plasma membrane
- Acidophilic **cytoplasmic inclusions** composed of RNP structures are characteristic of paramyxovirus infections
- Morbilliviruses also produce characteristic acidophilic **intranuclear inclusions** that are complexes of nuclear elements and N protein
- Hemadsorption is a distinctive feature of paramyxoviruses that carry an HN protein as well as of some morbilliviruses

- HN binds to sialic acid residues attached to glycolipids or glycoproteins at the cellular membrane
- The neuraminidase activity of these proteins is assumed to assist release of the nascent viral particles from infected cells
- Formation of syncytia are features of infection with these viruses
- Virions are sensitive to heat, desiccation, lipid solvents, non-ionic detergents and disinfectant

S.No.	Genus	Virus
1	Aquaparamyxovirus	Salmon paramyxoviruses
2	Avulavirus	Newcastle disease virus Avian paramyxoviruses 1-12
3	Ferlavirus	Fer-de-Lance virus
4	Henipavirus	Hendra virus, Nipah virus
5	Morbillivirus	Rinderpest virus Peste des petits ruminants virus (PPR virus) Canine distemper virus Feline morbillivirus, Measles virus
6	Respirovirus	Human parainfluenza viruses 1 and 3 Bovine parainfluenza virus 3, Sendai viruses
7	Rubulavirus	Mumps virus, human parainfluenza viruses 2, 4 Canine parainfluenza virus 5

Diseases

- Transmission through close contact or by aerosols
- Replication occurs primarily in respiratory tract in host
- Infection is generally cytolytic

Important Diseases

- Newcastle disease
- Hendra virus infection- Horses, Humans
- Nipah virus infections- Humans, Pigs (Barking pig syndrome)
- Rinderpest
- PPR
- Canine distemper

RINDERPEST VIRUS

- Described as “the most dreaded bovine plague
- Caused by Rinderpest virus of genus *Morbillivirus*
- Since 2011- Rinderpest second infectious disease, after smallpox, to be officially eradicated globally

Eradication of Rinderpest :

- Involved active surveillance, animal culling, movement restrictions, and an intense vaccination program
- The 1920 outbreak in Europe led to the founding of the OIE—the World Organization for Animal Health