

## ❖ retrovirus

A retrovirus is a single-stranded positive-sense RNA virus with a DNA intermediate and, as an obligate parasite, targets a host cell. Once inside the host cell cytoplasm, the virus uses its own reverse transcriptase enzyme to produce DNA from its RNA genome, the reverse of the usual pattern, thus retro (backwards). The new DNA is then incorporated into the host cell genome by an integrase enzyme, at which point the retroviral DNA is referred to as a provirus. The host cell then treats the viral DNA as part of its own genome, transcribing and translating the viral genes along with the cell's own genes, producing the proteins required to assemble new copies of the virus. It is difficult to detect the virus until it has infected the host. At that point, the infection will persist indefinitely.

Virions of retroviruses consist of enveloped particles about 100 nm in diameter. The virions also contain two identical single-stranded RNA molecules 7–10 kilobases in length. Although virions of different retroviruses do not have the same morphology or biology, all the virion components are very similar.

### Transmission

Cell-to-cell, Fluids, Airborne, like the Jaagsiekte sheep retrovirus.

### Disease

AIDS / Acquired Immune Deficiency Syndrome - human immunodeficiency virus, Bovine leukemia, Mouse mammary tumour

## ❖ Rhabdoviridae

### Structure

Rhabdoviruses are approximately 70 nm wide and 170 nm long. They consist of a lipid envelope with glycoprotein peplomers surrounding a helically nucleocapsid. It is the arrangement of the peplomers and the nucleocapsid that give the virus its distinct bullet-shaped morphology. The viruses contain a single linear molecule of minus sense ssRNA, 11-12 kb in size. The pathogen that humans should be most concerned with is the rabies virus which is capable of infecting all warm blooded animals. Rabies occurs in most geographic regions but has been successfully eradicated in Australia, Japan, Great Britain, Hawaii, and the islands of the Caribbean basin. Dog rabies is an important human concern as the virus in the saliva of infected dogs

### Replication

Viral replication is cytoplasmic. Entry into the host cell is achieved by attachment of the viral G glycoproteins to host receptors, which mediates clathrin-mediated endocytosis.

### Transmission & Disease

Rhabdoviruses are important pathogens of animals and plants. Rhabdoviruses are transmitted to hosts by arthropods, such as aphids, planthoppers, leafhoppers, black flies, sandflies, and mosquitoes and The most common transmission of rabies is via the bite of a rabid animal which usually results in the deposition of rabies infected saliva into the striated muscle. The infected individual may experience two forms of the virus depending on the location of neuronal infection.

## ❖ Paramyxoviridae

**Morphology:** Virions enveloped; pleomorphic and filamentous forms occur (frequently); spherical, or filamentous; 150-200(-300) nm in diameter; 1000-10000 nm long. Surface projections of envelope distinct; spikes (of haemagglutinin-neuraminidase (HN) and fusion (F) glycoproteins 8-20 nm long, spaced 6-10 nm apart). Capsids filamentous; nucleocapsids 600-800(-1000) nm long; nucleocapsids 13-18 nm in diameter. Symmetry helical. Pitch of helix 5.5-7 nm.

**Genome:** RNA. Single stranded. Linear; genomic nucleic acid mostly negative sense, or positive sense (template strands occur). Genome monopartite.

**Host:** Humans, vertebrates, and birds serve as natural hosts.

**Disease :** The human paramyxoviruses are important pathogens of humans and are a common cause of respiratory disease in children. Approximately half of the cases of infantile bronchiolitis, croup, and pneumonia are caused by parainfluenza and respiratory syncytial viruses. Although measles and mumps used to be a significant problem worldwide, their incidence has decreased greatly in developed nations due to the success of immunization campaigns. However, measles remains to be a major cause of death among malnourished infants in the developing world - it is estimated that over a million children die annually of this disease in Third World countries.

## ❖ Orthomyxoviridae

### Transmission

Orthomyxoviruses are transmitted through the aerosol-respiratory route. Virus particles called

**Taxonomy:** Taxonomic structure of the family.

Genus Influenzavirus A

Genus Influenzavirus B

Genus Influenzavirus C

Genus "Thogoto-like Viruses"

**Host:** Virus infects vertebrates.

**Genome:** Virions contain 7 segments of to 8 segments of linear negative-sense single stranded RNA.

**Morphology:** Virions enveloped; pleomorphic and filamentous forms occur; spherical, or filamentous; 50-120 nm in diameter, or 20 nm in diameter; 200-300(-3000) nm long. Surface projections of envelope distinct; about 500 spikes (projecting 10-14 nm from the surface); dispersed evenly over all the surface (i.e. haemagglutininesterase (HEF)), or dispersed equally over all the surface, but the various types are in clusters (i.e. **haemagglutinin (HA)** the major glycoprotein is interposed irregularly by clusters of **neuraminidase (NA)**, ratio of HA to NA about 4-5 to 1). Nucleocapsid(s) enclosed within lipoprotein membrane; nucleoproteins of different size classes with loop at each end; arrangement within virion uncertain. Nucleocapsids filamentous; with no clear modal length (of different size classes); 50-130 nm long; 9-15 nm in diameter. Symmetry helical.

virions bud from the membranes of epithelial surfaces of the the respiratory tract. They are then transferred through the air within liquid droplets as a person sneezes, coughs, and even talks. The envelopes help the virions survive outside of the host's body until they enter another host. The virions enter a host through the mucousal membranes of the respiratory tract.

### characteristics of infleunza as a disease

These viruses can cause flu like symptoms but they aren't **influenza**.

## ❖ Reoviridae

**Taxonomy:** Taxonomic structure of the family. Species: Orthoreovirus; Orbivirus; **Rotavirus**;

**Host:** Virus infects invertebrates, plants, and vertebrates.

**Genome:** RNA. Double stranded. Linear. Genome monomeric. Genome in six parts. In 10-12 segments (depending on genus); total genome 18200-30500 nucleotides long.

**Morphology:** Virions not occluded, or occluded by protein bodies or crystals in thin sections (sometimes); not enveloped. Virions one type of particle only. Capsids isometric. Capsid shell of virion composed of two layers, or three layers; shell of virion all usually present, or outer often lost. Nucleocapsids with obvious regular surface structure; 60-80 nm in diameter. Symmetry icosahedral. Nucleocapsids appear to be round. Surface capsomer arrangement obvious. Surface projections of nucleocapsid not seen (surface apparently smooth), or not present, or distinct; spikes; restricted to (the 12 vertices). Incomplete virus particles often present; are empty capsids, or are incompletely assembled capsids. Virions only of one kind.

## ❖ Coronaviridae

Coronaviridae is a family of enveloped, positive-stranded RNA viruses. The viral genome is 26–32 kb in length. Virions are spherical, 120–160 nm across (Coronavirinae), bacilliform, 170–200 by 75–88 nm . The particles are typically decorated with large (~20 nm), club- or petal-shaped surface projections (the “peplomers” or “spikes”), which in electron micrographs of **spherical particles create an image reminiscent of the solar corona**.

### Transmission

**Coronaviruses are transmitted by faecal-oral route or by aerosols of respiratory secretions.**

## Pathogenesis

Coronaviruses infect a wide range of mammals and birds and occur worldwide. Although most diseases are mild, sometimes they can cause more severe situations in humans, such as, for example, the infection of the respiratory tract known as **Severe Acute Respiratory Syndrome (SARS)**. They can also cause **enteric infections in very young infants** and, in rare situations, neurological syndromes.

### ❖ Caliciviridae

**Taxonomy:** Comments: Viruses with typical calicivirus morphology have been identified in other animal species including humans, other primates, cattle, mink, swine, walrus, dolphins, dogs, rabbits, chickens, reptiles, amphibians and insects, but none of these have been fully characterised. **Those from humans and some other species cause gastroenteritis**, and are difficult to propagate in cell culture. Other viruses that cause **gastroenteritis in humans, generally designated "small round structured viruses"**, including Norwalk virus and Snow Mountain agent, lack typical calicivirus morphology, but have buoyant density and a single capsid polypeptide typical of caliciviruses.

**Host:** Virus infects vertebrates and invertebrates.

**Genome:** RNA. Single stranded. Linear; genomic nucleic acid positive sense. RNA which is non-segmented. Genome monopartite. Total genome 7900 nucleotides long.

**Morphology:** Distinct viral structures visible in thin sections of infected tissue; virions not enveloped. Capsids isometric. Nucleocapsid with 32 cup-shaped depressions. Nucleocapsids with obvious regular surface structure; 35-39 nm in diameter. Symmetry icosahedral. Nucleocapsids appear to be round to appear to be angular. Surface capsomer arrangement obvious.

**Human disease:** **Calicivirus infections commonly cause acute gastroenteritis, which is the inflammation of the stomach and intestines (e.g. the Norwalk Virus)**. Symptoms can include **vomiting and diarrhea**. These symptoms emerge after an incubation time of 2 days and the symptoms only generally last for 3 days. Most calicivirus infections do not call for medical attention, but those who are immunocompromised may need to be hospitalized for rehydration therapy.

### ❖ Arenaviridae

#### **Taxonomy:**

Taxonomic structure of the family.

Genus Arenavirus

Subgroup **LCM-LASV Complex (Old world arenaviruses)**

Subgroup Tacaribe Complex (New world arenaviruses)

#### **Host:**

Virus infects vertebrates.

#### **Morphology:**

Virions enveloped; slightly **pleomorphic; spherical**. Virions contain probably 2 nucleocapsid(s) per envelope. Virions (50-)110-130(-300) nm in diameter. Surface projections of envelope distinct; club-shaped (about 10 nm long); in small numbers dispersed evenly over all the surface. Host ribosomes seen inside the envelope (in varying numbers). Nucleocapsids filamentous (. Isolated nucleocapsids, free of contaminating host ribosomes, are organised in closed circles and display a linear array of nucleosomal subunits); (450-)1000-1300 nm long; 9-15 nm in diameter. **Symmetry helical**.

#### **Genome:**

Virions contain 2 % nucleic acid. Virions **contain two segments** of (RNA L and S) linear negative-sense single stranded RNA.

## Disease

The diseases derived from arenaviruses range in severity. Aseptic meningitis, a severe human disease that causes inflammation covering the brain and spinal cord, can arise from the Lymphocytic choriomeningitis virus (LCMV) infection. Hemorrhagic fever syndromes, Lassa fever

## ❖ Bunyaviridae

### Structure

Bunyavirus morphology is somewhat similar to that of the Paramyxoviridae family; Bunyavirales form enveloped, spherical virions with diameters of 90–100 nm. These viruses contain no matrix proteins.

Genome[edit]

Bunyaviridae have tripartite genomes consisting of a large (L), medium (M), and small (S) RNA segment. These RNA segments are single-stranded, and exist in a helical formation within the virion. Besides, they exhibit a pseudo-circular structure due to each segment's complementary ends.

### Replication

Bunyavirus RNA replicates in the cytoplasm, while the viral proteins transit through the ER and Golgi apparatus. Mature virions bud from the Golgi apparatus into vesicles which are transported to the cell surface.

### Diseases in humans

Bunyaviruses that cause disease in humans include:

- California encephalitis virus vector: mosquitoes
- Hantavirus reservoir small mammals or rodents, vector:
- Crimean–Congo hemorrhagic fever reservoir and vector: ticks, amplifying hosts and vector: small mammals, domestic mammals,
- Rift Valley fever reservoir: bats, vector: mosquitoes, amplifying hosts: small mammals, domestic mammals,
- Bwamba Fever env. reservoir: monkeys vector: mosquitoes, amplifying hosts: donkeys
- Severe fever with thrombocytopenia syndrome

## ❖ Picornaviridae

The picorna virus family is a diverse family comprising many different viruses. A small RNA virus, it includes enteroviruses like polio and coxsackie, hepatoviruses, like Hepatitis A, and rhinoviruses, the most frequent cause of the common cold. It has a long history dating back to ancient Egypt where cases of polio have been depicted on the stella for Ruma.

### Structure

Picornaviruses are non-enveloped, with an icosahedral capsid. The capsid is an arrangement of 60 protomers in a tightly packed icosahedral structure.

### Genome

Picornaviruses are classed under Baltimore's viral classification system as group IV viruses as they contain a single stranded, positive sense RNA genome

### Transmission

#### Enteroviruses

fecal-oral transmission - (including polio) This can take place by direct contact with feces to the hands then eating utensils to the mouth. This is especially prevalent in crowded conditions. Water supplies can also be contaminated by sewage.

direct contact - acute hemorrhagic conjunctivitis

respiratory - some coxsackie viruses can spread by aerosol routes to cause upper respiratory infection; polio can also be spread this way by way of the pharynx.

#### Rhinovirus

respiratory transmission - virus particles are shed in nasal secretions, coughing and sneezing aerosols

direct contact - Transmission can also occur by fomites where particles from tissues or hands touch the eyes or nose.

## Hepatitis A

**fecal-oral transmission** - The virus can survive in water for months. This poses an especially large risk for potential outbreaks when the water supply becomes contaminated by HAV. Developing countries with poor sanitation and hygiene and overcrowding have higher rates of infection. Other risks posed are in food and water contamination.

## Common Disease

### Enteroviruses

#### Virus

#### Common Disease Associations

**Polioviruses 1,2,3**

**Poliomyelitis**

**Coxsackieviruses A1-A24(no 23) ,B1-B6**

**Hand Foot and Mouth Disease, some colds**

Less Common: paralysis, myocarditis, pleurodynia, Herpangina, Acute hemorrhagic conjunctivitis(ocular), neonatal carditis, encephalitis, and hepatitis

Echoviruses 1-34(no 10 or 28)

chronic meningoencephalitis/dermatomyositis, maculopapular exanthema (rash), colds, neonatal carditis, encephalitis, and hepatitis

Enteroviruses 68-71

paralysis, Hand Foot and Mouth Disease, Maculopapular exanthema, Acute hemorrhagic conjunctivitis (ocular)

### Rhinoviruses

**Rhinovirus 1-100**

**Common Cold** (respiratory)

### Hepatovirus

Hepatitis A

infectious Hepatitis (as opposed to HBV - serum hepatitis)