

# Classification and nomenclature of viruses

# History of virus classification

- Type of host
- Type of disease
- Transmission by an arthropod vector
- Nucleic acid type
- SS or DS
- Segmented
- Size of the virion
- Capsid symmetry
- Envelope

# Nomenclature

- Small, icosahedral, single-stranded DNA viruses of animals were called parvoviruses (Latin parvus = small)
- Nematode-transmitted polyhedral (icosahedral) viruses of plants were called nepoviruses
- Phages T2, T4 and T6 were called T even phages
- Serological relationships between viruses were investigated
- Distinct strains (serotypes) could be distinguished in serological tests
- Antisera against purified virions
- Serotypes reflect differences in virus proteins

# International Committee on Taxonomy of Viruses

- Order had to be brought
- ICTV was formed in 1966
- Many working groups and is advised by virologists around the world
- Rules for the nomenclature and classification of viruses
- Considers proposals for new taxonomic groups and virus names
- Approved are published in book form and on the web

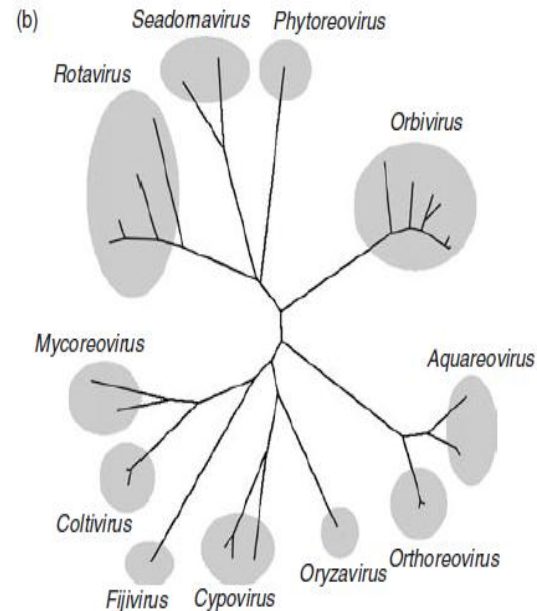
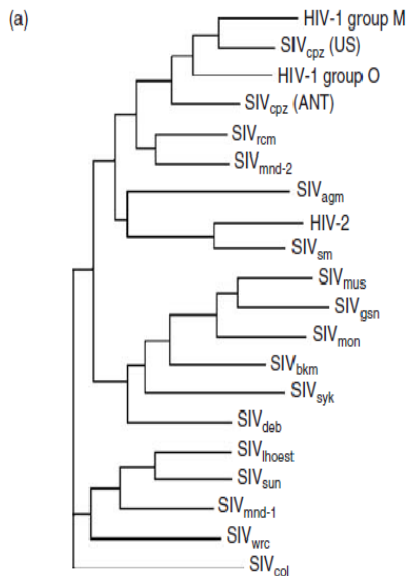
# Modern virus classification and nomenclature

- Each order, family, subfamily and genus is defined by viral characteristics that are necessary for membership of that group.

Taxonomic group	Suffix	Example 1	Example 2	Example 3
Order	<i>-virales</i>	<i>Caudovirales</i>	<i>Mononegavirales</i>	<i>Nidovirales</i>
Family	<i>-viridae</i>	<i>Myoviridae</i>	<i>Paramyxoviridae</i>	<i>Coronaviridae</i>
Subfamily	<i>-virinae</i>	–	<i>Paramyxovirinae</i>	–
Genus	<i>-virus</i>	<i>T4-like viruses</i>	<i>Morbillivirus</i>	<i>Coronavirus</i>
Species	–	<i>Enterobacteria phage T4</i>	<i>Measles virus</i>	<i>Severe acute respiratory syndrome virus</i>

# Classification based on genome sequences

- Similarity is represented in diagrams known as phylogenetic trees.
- Rooted- the tree begins at a root which is assumed to be the ancestor of the viruses in the tree.
- Unrooted- no assumption is made about the ancestor of the viruses in the tree.



10.2.2

## Nomenclature of viruses and taxonomic groups

➤ Bacterial viruses → such as T1, T2 and φX174.

➤ Viruses of humans and other vertebrates  
→ diseases that they cause

*Examples: measles virus, smallpox virus, foot and mouth disease virus*

➤ Some viruses → city, town or river

*Examples: Newcastle disease virus, Norwalk virus, Ebola virus*



**Table 10.2** Names of virus families and genera derived from place names

Place name	Family/genus name
Bunyamwera (Uganda)	Family <i>Bunyaviridae</i>
Ebola (river in Zaire)	Genus <i>Ebolavirus</i>
Hantaan (river in South Korea)	Genus <i>Hantavirus</i>
Hendra (Australia) and Nipah (Malaysia)	Genus <i>Henipavirus</i>
Norwalk (United States)	Genus <i>Norovirus</i>

# Insect viruses



- Many insect viruses were named after the insect, with an indication of the effect of infection on the host.
- A virus was isolated from *Tipula paludosa* larvae that were iridescent as a result of the large quantities of virions in their tissues. *Tipula iridescent virus*
- A virus was isolated from *Autographa californica* larvae that had large polyhedral structures in the nuclei of infected cells. *Autographa californica nuclear polyhedrosis virus*.

# Plant viruses



**Table 10.3** Names of families and genera of plant viruses based on the host and signs of disease

Host and disease signs	Family/genus name
Brome mosaic	Family <i>Bromoviridae</i>
Cauliflower mosaic	Family <i>Caulimoviridae</i>
Cowpea mosaic	Family <i>Comoviridae</i>
Tobacco mosaic	Genus <i>Tobamovirus</i>
Tobacco rattle	Genus <i>Tobravirus</i>
Tomato bushy stunt	Family <i>Tombusviridae</i>

# Many names of virus taxonomic groups are based on Latin words, while some have Greek origins

**Table 10.4** Names of virus families and genera based on Latin and Greek words. Note that there are two Latin words meaning yellow. One was used to name the flaviviruses (animal viruses) and the other was used to name the luteoviruses (plant viruses)

		Translation	Reason for name	Family/genus name
Latin	<i>Arena</i>	Sand	Ribosomes in virions resemble sand grains in thin section	Family <i>Arenaviridae</i>
	<i>Baculum</i>	Stick	Capsid shape	Family <i>Baculoviridae</i>
	<i>Filum</i>	Thread	Virion shape	Family <i>Filoviridae</i>
	<i>Flavus</i>	Yellow	Yellow fever virus	Family <i>Flaviviridae</i>
	<i>Luteus</i>	Yellow	Barley yellow dwarf virus	Family <i>Luteoviridae</i>
	<i>Parvus</i>	Small	Virion size	Family <i>Parvoviridae</i>
	<i>Tenuis</i>	Thin, fine	Virion shape	Genus <i>Tenuivirus</i>
	<i>Toga</i>	Cloak	Virion is enveloped	Family <i>Togaviridae</i>
Greek	<i>Kloster</i>	Thread	Virion shape	Family <i>Closteroviridae</i>
	<i>Kystis</i>	Bladder, sack	Virion is enveloped	Family <i>Cystoviridae</i>
	<i>Mikros</i>	Small	Virion size	Family <i>Microviridae</i>
	<i>Pous</i>	Foot	Phages with short tails	Family <i>Podoviridae</i>

# Baltimore classification of viruses

- Classification system that places viruses into one of seven groups depending on a combination of their:
  - Nucleic acids (DNA/RNA)
  - Strandedness (single/double-stranded)
  - Method of replication
- It was first suggested by David Baltimore, after whom the scheme is named.
- **Advantage:** Differentiation between **plus-strand RNA** viruses that do and do not carry out reverse transcription AND between **dsDNA viruses** that do and do not carry out reverse transcription.
- \*A **reverse transcriptase** (RT) is an enzyme used to generate complementary DNA (cDNA) from an RNA template, a **process** termed **reverse transcription**. ... In retroviruses and retrotransposons, this cDNA can then integrate into the host genome, from which new RNA copies can be made via host-cell **transcription**