

Classification of medically important viruses

It is based on chemical and morphologic criteria:-

1- Two main components of the virus are used in classification

a) **Nucleic acid** including type of it either DNA or RNA, size of genome in kilobase (kb), whether single or double, linear or circular, positive or negative sense.

b) **The capsid** it's size and symmetry & whether it is enveloped ie: viron morphology.

2- Susceptibility to physical and chemical agents especially ether and chloroform.

3- Antigenic properties.

4- Biological properties

Including natural host range, mode of transmission, vector relationship, pathogenicity and tissue tropism.

Universal system of virus taxonomy:

Viruses are separated into major groupings called families on the basis of viron morphology, genome structure and strategies of replication. Within each family subdivisions called genera are based on physicochemical or serologic differences.

Viruses are either DNA or RNA single or double stranded:

DNA viruses:

Poxviruses, herpesviruses and hepadna viruses are DNA viruses with an envelope whereas adenovirus, papovaviruses and parvoviruses are DNA viruses without an envelope i.e: they are naked nucleocapsid viruses. Parvoviruses have single stranded DNA while all other families have double stranded DNA.

RNA viruses:

There are 14 families of RNA viruses. The 3 naked icosahedral families are picornaviruses, caliciviruses and reoviruses whereas all the other families have an envelope.

All families have single stranded RNA except reoviruses have double stranded RNA. Orthomyxo, reoviruses, arena and bunyaviridea have segmented RNA. Picornaviruses, caliciviruses, flaviviruses, togaviruses, retroviruses and coronaviruses have positive polarity RNA while other families have negative polarity RNA.

SYSTEMATIC VIROLOGY

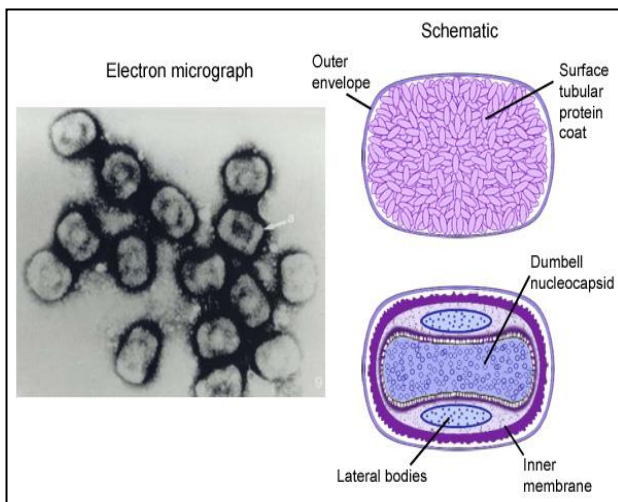
DNA ENVELOPED VIRUSES

Poxvirus

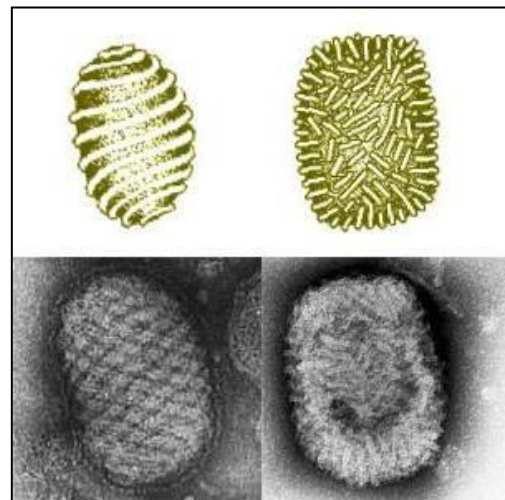
Pox comes from the Latin word pock which means pustule.

Common characteristic:

1. Poxviruses are the **largest** and most complex viruses of vertebrates; they could be seen by light microscope.
2. By electron microscope they appear to be **brick-shaped** or **ovoid particles** measuring about 400×230 nm.
3. The viral genome is linear, double stranded DNA.
4. Poxviruses have an **envelope** that encloses a core and 2 lateral bodies.
5. Poxviruses replicate in the **cytoplasm** and produces **intracytoplasmic** inclusion bodies.
6. They include variola virus (the cause of small pox), vaccinia virus, molluscum contagiosum, orf, monkey pox, and cow pox.



Poxviruses have an envelope that encloses a core and 2 lateral bodies



Electron micrograph of pox virus (400nm)

Smallpox

Smallpox is a serious, contagious, and sometimes fatal infectious disease. There is no specific treatment for smallpox disease, and the only prevention is vaccination.

The pox part of smallpox is derived from the Latin word for “**spotted**” and refers to the raised bumps that appear on the face and body of an infected person.

There are two clinical forms of smallpox

- Variola major is the severe and most common form of smallpox, with a more extensive rash and higher fever.
- Variola minor is a less common presentation of smallpox, and a much less severe disease.

Transmission

- Prolonged face-to-face contact with someone who has smallpox
- Direct contact with infected bodily fluids or an object (infected bedding or clothing)
- Exposure to an aerosol release of smallpox
- Smallpox is not known to be spread by insects or animals

Signs and Symptoms

- After 7-17 days, the first symptoms of smallpox appear (fever, tiredness, head and body aches, and sometimes vomiting). This stage may last for 2 to 4 days.
- Next, a rash appears first as small red spots on the tongue and in the mouth. A rash then appears on the skin, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours.
- The rash becomes raised bumps and the bumps become “pustules”,
- The pustules begin to form a crust and then scab.
- The scabs begin to fall off, leaving scars. Most scabs will have fallen off three weeks after the rash first appears.
- A person with smallpox is sometimes contagious when they get a fever, but the person becomes most contagious when they get a rash. The infected person is contagious until their last scab falls off. In the past, most people recovered from smallpox, but three out of every ten smallpox patients died.

NB:

- ✓ **Incubation Period** (Duration: 7 to 17 days) → Not contagious
- ✓ **Initial Symptoms** (Prodrome) (Duration: 2 to 4 days) → Sometimes contagious

- ✓ **Early Rash** (Duration: about 4 days)→ Most contagious
- ✓ **Pustular Rash** (Duration: about 5 days)→ Contagious
- ✓ **Pustules and Scabs** (Duration: about 5 days)→ Contagious
- ✓ **Resolving Scabs** (Duration: about 6 days)→ Contagious
- ✓ **Scabs resolved** → Not contagious

Smallpox Vaccine:

- The vaccinia virus is the "live virus" used in the vaccine.
- It is a "pox"-type virus related to smallpox.
- When given to humans as a vaccine, it helps the body to develop immunity to smallpox.