Viral Classification Schemes (continued)

2. Classified based upon host range or host specificity. TMV (tobacco mosaic virus) will only infect tobacco plants. The T-even phage will only replicate in *E. coli*.

3. Classified based upon tissue affinities.

   A. dermotropic
      - Herpes simplex 1(oral) and 2(genital) viruses
      - Varicella virus (chickenpox) Another name is varicella-zoster virus
      - Rubeola virus (measles)
      - Rubella virus (German measles)

   B. pneumotropic
      - common cold viruses (several viruses including rhinovirus, coronavirus and adenovirus)
      - pneumonia virus

   C. neurotropic
      - Herpes zoster virus (shingles) Also called varicella-zoster virus
      - rabies virus
      - encephalitis virus
      - polio virus

   D. viscerotropic
      - hepatitis virus

   E. oncogenic
      - viruses found in cancerous tissue

Note that the varicella-zoster virus is dermotropic when it causes chickenpox and neurotropic when it causes shingles. The virus has remained within the body in a quiet or latent form and re-emerges later in life in another tissue (nervous).

4. Classified based upon morphological characteristics
   - type of nucleic acid (DNA or RNA, single or double stranded)
   - enveloped vs. naked
   - capsid size and number of capsomeres
   - helical or polyhedral or complex

5. Classified based upon physical and chemical properties- are the viruses susceptible to certain forms of radiation or chemical agents such as lipid solvents which might include ether or formaldehyde.

6. Classified based upon the location of the replication site within a host cell-DNA viruses are typically assembled within the nucleus of the host cell, while RNA viruses are typically assembled within the cytoplasm of the host cell.

7. Classified based upon the method of transmission-arboviruses for example are transmitted by the bite of blood-sucking arthropods (insects and arachnids).
8. Classified based upon immunological properties—the influenza viruses are categorized based upon the antigenic H and N spikes. Other antigenic markers located on the external surfaces of viruses are used in this fashion.

The Herpes family of viruses (Herpesviridae)
All of the viruses in this family are double stranded DNA viruses that display an icosahedral symmetry and are enveloped. They are medium sized viruses that can cause an array of diseases in all stages of life.

A fetus can suffer from CMV or cytomegalovirus. This can cause certain congenital defects including mental retardation and hearing loss. Note, that CMV causes a severe eye infection in AIDS patients.

A child can suffer from the varicella-zoster virus in the form of chickenpox.

An adolescent can suffer from the Epstein-Barr (EB) virus in the form of infectious mononucleosis

Adults can suffer from an array of Herpes viruses. Herpes simplex 1 can cause oral herpes (fever blisters, cold sores). Herpes simplex 2 causes genital lesions. Varicella-zoster can cause shingles in adults. Shingles is a painful condition characterized by the formation of vesicles distributed about the waist, face, upper chest or back. The virus invades cutaneous sensory nerves and is usually limited to one side of the body at a time. The EB virus is associated with chronic fatigue syndrome.

The EB virus is implicated in causing two cancerous diseases. They are Burkitt’s lymphoma and nasopharyngeal carcinoma.

Isolation and purification of viruses

1. Filtration—use a membrane (Millipore filter with a grid of 0.2 µm) filter to hold back bacteria.
2. Centrifugation—use standard differential centrifugation to remove cells, cell debris and nuclei. Increase the RPM to remove mitochondria and bacteria. Follow this with ultracentrifugation to pellet out the viral particles.

Cultivation of viruses

1. Grow virus in whole animals and then recover.
2. Use chicken embryos (fertile, embryonated eggs) for cultivation. Inoculate a viral suspension onto the appropriate membrane. Viruses will replicate in these undifferentiated embryonic tissues. This is commonly used in vaccine preparation. Look for pocks which are areas of cell destruction on the membrane to signal viral replication (more on pocks later).
3. Tissue (cell) culture using animal cells. Tissue can be used from a fetal animal (undifferentiated) to facilitate replication. Liver or lung tissue is commonly used. Tissue culture cells can be used as a suspension of cells or in a monolayer (single layer). Use of monolayer allows for visualization of tissue deterioration by the viruses (CPE).