

Unit 8: Biodiversity

Content Outline: Viruses (8.2)

- I. Wendell Stanley (1935)
 - A. First person to isolate a virus. The virus was **Tobacco Mosaic Virus - TMV**
- II. Viral Structure
 - A. **Viral Genome**
 1. Viruses possess either a *double or single strand of DNA or RNA*. (This is how viruses are classified.)
 2. Viruses contain very small amounts of DNA or RNA— most are 4 to 500 genes total.
 - B. **Viral Protein Coat** (Referred to as the **Capsid**.)
 1. The Capsid serves two purposes:
 - a. *Protection* of the DNA or RNA strands inside.
 - b. *Attachment* of the virus to a host cell.
 2. It is built from protein units called **capsomeres**. (means “capsid unit”)
 3. Some viruses can also have a **viral envelope**.
 - a. This is a *cloak derived from the previous host cell plasma membrane*. (It is an example of mimicry. It looks like a normal cell, but it is actually like a Trojan horse. The danger is inside.)
 - b. The AIDS/HIV virus has a viral envelope derived from the T-helper white blood cells.
 - C. **Bacteriophages** (A.K.A. **Phages**) – These are viruses that attack bacteria.
 1. These are some of the largest and most complex viruses.
 - D. Viruses are not living organisms. They cannot be “killed”. They can be broken apart using chemicals though. **Please review the characteristics of living things here while discussing if viruses fit all the conditions of life.**
- III. Viral Reproduction
 - A. Viruses must have a host cell in order to reproduce. (They are considered **Obligate Intracellular Parasites**. As the name indicates, viruses *must get inside the host cell* in order to reproduce.)
 - B. Viruses *need* to use the host cells ribosomes and enzymes to make new DNA or RNA strands and new capsomeres to form new viruses.
 - C. **Host Range** – Refers to what organisms a virus can attack. It is determined by recognition of certain glycoproteins or glycolipids on the host cell membrane.
Howard Hughes Medical Institute (HHMI) has some great videos about viral functions.
 - D. **Restriction enzymes** – These enzymes, *found in bacteria*, act as primitive *defense* against viruses. These enzymes *cut up the viral genome* and thus inactivate the genes from being transcribed. They are called *restriction* enzymes because they *only* cut at *certain nucleotide sequences*. In other words, they are *restricted* in where they can cut.
Please remind students that they talked about, and worked with these perhaps, during the genetics unit and DNA electrophoresis and DNA transformation.
- IV. **Retroviruses**
 - A. Retroviruses are a unique type of viruses. (“retro” means “reverse or backward”)
 1. They use **reverse transcriptase**, an enzyme, to *turn RNA into DNA*. (It does transcription *backwards*. It turns “mRNA” into double stranded DNA, so that it can incorporate into the host DNA.
 - B. AIDS/HIV and the common cold virus are both retroviruses.
- V. Major viruses
 - A. HIV/AIDS, Ebola, Influenza, SARS
 - B. **Epidemic** – Big Outbreak in one area ; **Pandemic** – Global Outbreak
 - C. Plant Viruses (Over 2,000 are known to exist.) (Big financial loss for farmers because of destroyed crops.)
- VI. **Viroids** (These are naked, infectious *RNA molecules*.) They attack plants only. (“oid” means “like”... they are “like” viruses as they are infectious.)
- VII. **Prions** (These are infectious *proteins*) Mad Cow – Kruetzfeldt-Jacob Disease is one example. The destroy brain cells thus driving the cow “mad” until it dies. The human version is KJD above.

