Viruses

What are viruses? Non-cellular particles made up of genetic material (DNA or RNA) and a protein that can invade living cells

What is the general structure of a virus?

1. Core of nucleic acid (DNA or RNA) - genetic material
2. Protein coat - called a "capsid" surrounds nucleic acid

Viruses occur in a variety of Shapes **and** Sizes**. They range from 17nm to 300nm in length.**

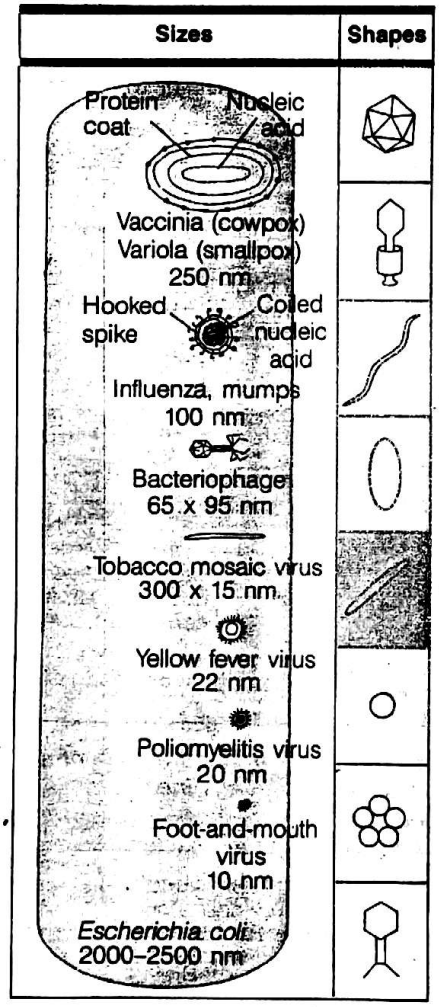
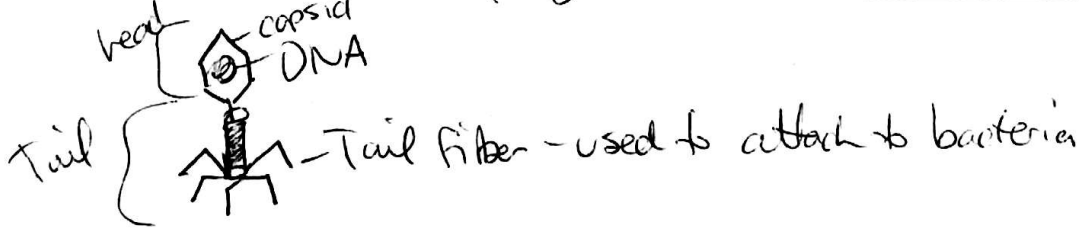


Figure 17–3 *Viruses come in a variety of sizes and shapes. Notice the size of the bacterium* E. coli *as compared to the sizes of the viruses.*

Representative Virus: Bacteriophage - virus that infects bacteria



Viruses DO NOT contain the Enzymes required to carry out the chemical reactions for life. The only Enzymes that they carry function to decode their Genetic instructions. Viruses cannot function on their own; they need to invade a host cell to reproduce.

This raises the following question.....ARE VIRUSES LIVING OR NON-LIVING?

Living Characteristics	Non-living Characteristics
- Infect living cells - grow - Reproduce - regulate gene expression - evolve	- depend on host for → respiration → nutrition → growth → reproduction - aren't made of cells (cells are the basis of life)

How do viral infections occur?

Viruses are activated when they contact the ***correct type*** of host cell, and they inject their genetic material into this cell.

What is meant by the ***correct type*** of host cell? Viral Specificity

Specific viruses infect Specific organisms. Some viruses are specific to specific species (e.g. humans), whereas other viruses are specific to a specific group of organisms (e.g. mammals).

The general life cycle of a virus is as follows:

1. A virus particle attaches to a host cell.
2. The particle releases it genetic instructions into the host cell.
3. The injected genetic material uses the host cell's enzymes.
4. The enzymes make parts for more new virus particles.
5. The new particles assemble the parts into new viruses.
6. The new viruses break free from the host cell. This can occur in two ways:
   - (i) The new viruses break the host cell open and destroy the host cell.
   - (ii) The new viruses pinch off from the host's cell membrane by breaking away with a piece of the membrane surrounding them. The host cell IS NOT destroyed. This is called budding.
7. The newly released viruses can infect other cells.

How does the human cold virus infect you?

1. An infected person sneezes on you.
2. You inhale the virus particle, and it attaches to the cells lining the sinuses in your nose.
3. The virus attacks the cells lining the sinuses and rapidly reproduces new viruses.
4. The host cells break and new viruses spread into your bloodstream and also into your lungs. Because the cells lining your sinuses have been destroyed (when the viruses break them open so that they can emerge), fluid can flow into your nasal passages, resulting in a runny nose.
5. Viruses in the fluid that drips down your throat attack the cells lining your throat and give you a sore throat.
6. Viruses in your bloodstream can attack muscle cells and cause you to have muscle aches.

Recall: A virus is a set of Genetic Instructions surrounded by a Protein coat (capsid).

Because viruses do not carry out any biochemical reactions of their own, they can "live" for years outside a host cell. Some viruses can insert their genetic material into the host cell's DNA (the inserted viral DNA is called a prophage). The viral DNA can remain in the host cell's DNA for years before reproducing.