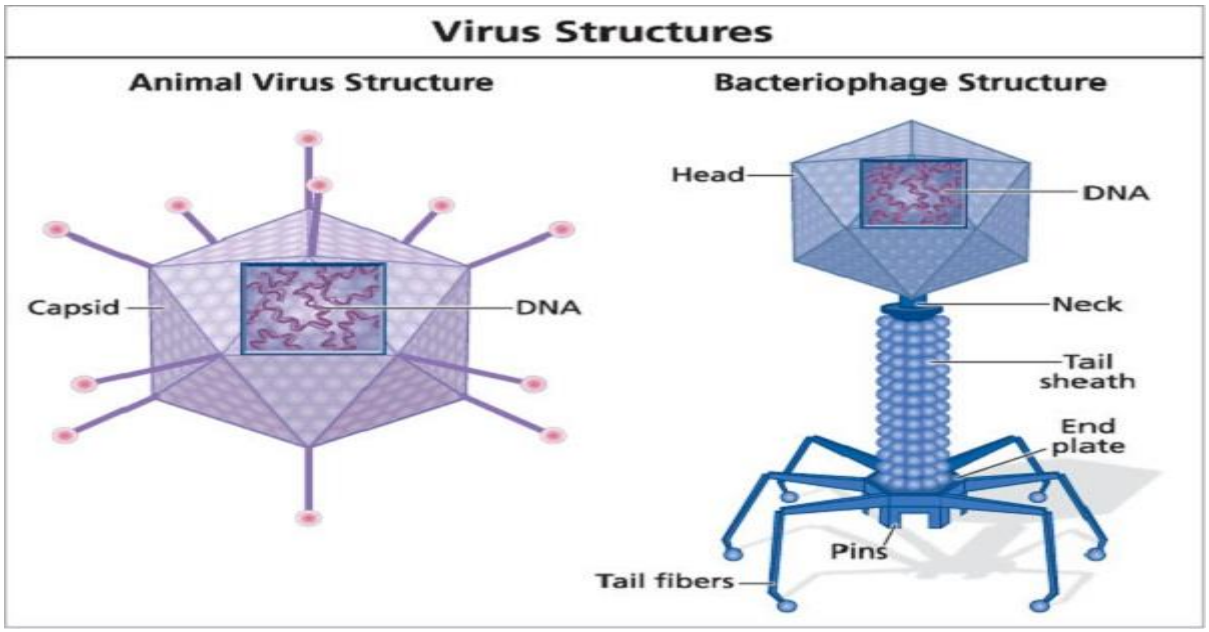
Viruses

A **virus** is a small infectious agent that replicates only inside the living cells of other organisms. Viruses can infect all of life forms, from animals and plants to microorganisms.

Since 1892 article describing a non-bacterial pathogen infecting tobacco plants, about 5,000 virus species have been described in detail, although there are millions of types. Viruses are found in almost every ecosystem on earth and are the most numerous type of biological entity. The study of viruses is known as virology, a sub-specialty of microbiology.



Viroid:

The first recognized viroid, the pathogenic agent of the potato spindle tuber disease, this viroid is now called Potato spindle tuber viroid. Viroids are plant pathogens.

Viroid is circular RNA particles that are much simpler than a virus. They do not have a capsid or outer envelope, but, as with

viruses, can reproduce only within a host cell. Viroids do not, however, manufacture any proteins. Viroid is infectious particle smaller than any of the known viruses, an agent of certain plant diseases. The particle consists only of an extremely small circular RNA molecule, lacking the protein coat of a virus. Whether viroids occur in animal cells is still uncertain.

Prions: are misfolded proteins, which characterize several fatal neurodegenerative diseases in animals and humans. The word *prion* derives from "proteinaceous infectious particle". Prions composed of the prion protein (PrP) are hypothesized as the cause of transmissible spongiform encephalopathies (TSEs), include, made cow disease and Jakob disease in humans.

All known prion diseases in mammals affect the structure of the brain or other neural tissue; all are progressive, have no known effective treatment and are always fatal.

Bacteriophages:

A bacteriophage is a type of virus that infects bacteria. The word "bacteriophage" literally means "bacteria eater". All bacteriophages are composed of a nucleic acid molecule that is surrounded by a protein structure.

Also known informally as a phage, is a virus that infects and replicates within bacteria and archaea. Bacteriophages are composed of proteins that encapsulate a DNA or RNA genome. Phages replicate within the bacterium following the injection of their genome into its cytoplasm. Bacteriophages are ubiquitous viruses, found wherever bacteria exist. Bacteriophages are viruses that infect bacteria but are harmless to humans. To reproduce, they get into a bacterium, where they multiply, and finally they break the bacterial cell to release the new viruses.

Virial life cycle:

Viruses cannot function or reproduce outside a cell, thereby being totally dependent on a host cell in order to survive.

When a virus infects a cell, the virus forces it to make thousands of viruses. It does this by making the cell copy the virus's DNA or RNA, making viral proteins, which all assemble to form new virus particles.

There are six basic, overlapping stages in the life cycle of viruses in living cells:

- **Attachment**: is the binding of the virus to specific molecules on the surface of the cell. This specificity restricts the virus to a very limited type of cell. For example, the human immunodeficiency virus (HIV) infects only human T cells.
- **Penetration**: viruses penetrate the host cell by endocytosis or by fusion with the cell.
- **Uncoating**: happens inside the cell when the viral capsid is removed and destroyed by viral enzymes or host enzymes, thereby exposing the viral nucleic acid.
- **Replication**: is the stage where a cell uses viral messenger RNA in its protein synthesis systems to produce viral proteins.
- **Assembly**: takes place in the cell when the newly created viral proteins and nucleic acid combine to form hundreds of new virus particles.
- **Release**: occurs when the new viruses escape or are released from the cell. Most viruses achieve this by making the cells burst, a process called lysis. Other viruses such as HIV are released more gently by a process called budding.

Characterstics:

All viruses share some general structural characteristics. Though the details of virus infection and replication vary greatly with

host type, all viruses' share the above 6 basic steps in their replication cycles.

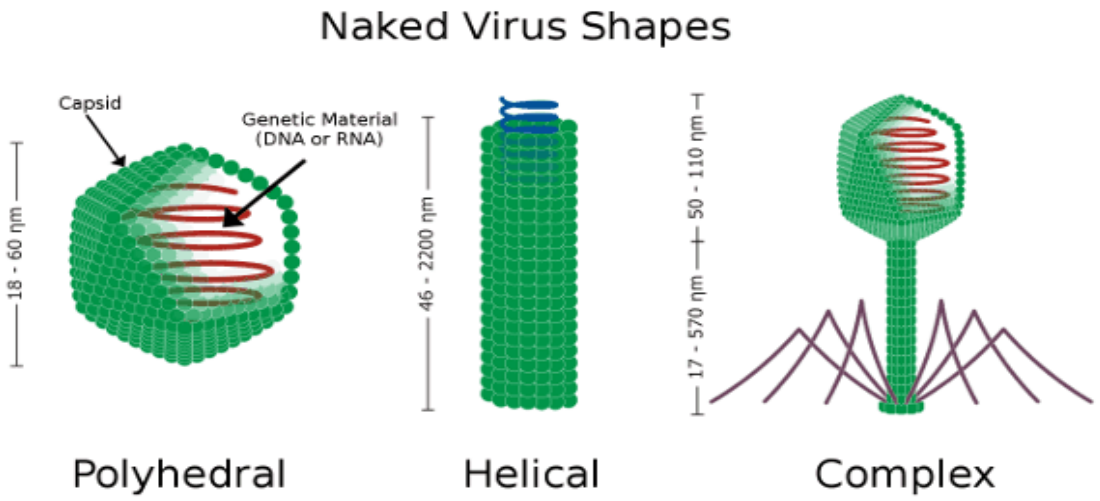
Below the main characteristics of viruses:

- Non living structures.
- Contain a protein coat called the capsid.
- Have a nucleic acid core containing DNA or RNA (not both).
- Capable of reproduce.
- Some viruses are enclosed in a protective envelope.
- Outside of host cells, viruses are inactive.
- Some viruses may cause many diseases and some cancers like leukemia.

Shapes of viral:

There are three basic types of viral shapes:

1. Helical viruses forming a tube-like structure.
2. Polyhedral viruses are roughly spherical, with shape similar to a dome.
3. Complex (a combination of helical and polyhedral) has many different shapes.



Viral Human Diseases:

There are several diseases classed based on the organs and the system of the human body. **Viral disease** occurs when an organism's body is invaded by pathogenic viruses, and infectious virus particles (virions) attach to and enter susceptible cells.

The body's first line of defence against viruses is the innate immune system. This is made up of cells and other mechanisms that defend the host from infection. This provides a temporary protection against the viral onslaught.

Two types of antibodies are important. The first called IgM is highly effective at neutralizing viruses but is only produced by the cells of the immune system for a few weeks. The one that lasts a life time is the IgG antibodies. The second line of defence is called cell-mediated immunity and involves immune cells known as T cells. T cell recognises a suspicious viral fragment. and the killer T cells destroy the virus. Below are some viral diseases:

- smallpox
- The common cold and different types of flu.
- measles, mumps, rubella and chicken pox.
- polio

- rabies
- HIV (Human immunodeficiency disease)
- dengue fever, And others.

Bacterial infections can be treated with antibiotics, but viral infections require either vaccinations to prevent them in the first place or antiviral drugs to treat them. These drugs do not destroy the pathogen, but they inhibit their development and slow down the progress of the disease.

Harmful of Viruses:

Viral infections can cause disease in humans, animals and even plants. However, they are usually eliminated by the immune system, conferring lifetime immunity to the host for that virus. Antibiotics have no effect on viruses, but antiviral drugs have been developed to treat life-threatening infections. Vaccines that produce lifelong immunity can prevent some viral infections.

Viruses are like hijackers. They invade living, normal cells and use those cells to multiply and produce other **viruses** like themselves. This **can** kill, damage, or change the cells and make you sick. Different **viruses** attack certain cells in your body such as the liver, respiratory system, or blood.

Some of the viruses infecting humans are capable of causing severe and often lethal diseases, but other viruses can be beneficial to human health. These viruses offer the potential to cure cancer, correct disorders, or fight pathogenic viral infections.