

### VIRUSES

Viruses are non-cellular, non-living infectious agents that are composed of nucleoproteins which can multiply inside animals and plants or bacterial cells. It consists of both living and non-living properties

#### LIVING PROPERTIES OF VIRUSES

1) They are obligate intracellular parasites,

i.e., cannot exist outside.

2) They can multiply inside the living organisms

3) They contain a genetic material namely DNA or RNA

#### NON-LIVING PROPERTIES OF VIRUSES

1) They can be crystallized and stored in bottles

2) They cannot multiply outside the host

3) They don't have cells

**SIZE:-** Viruses range in size from 300 nanometers as in TMV to 20nm as in parvoviruses.

Viruses approximate the sizes of the smallest bacterial cells as mycoplasmas.

Largest virus is **vaccinia virus and pox virus**,

smallest virus is **foot and mouth disease virus, polio virus**

### SHAPE

|                |   |
|----------------|---|
| Spherical      | <b>polio virus</b>                            |
| rod shaped     | <b>TMV virus, influenza virus</b>             |
| rectangular    | <b>vaccinia virus</b>                         |
| polyhedral     | <b>adeno virus, herpes virus, polio virus</b> |
| tadpole shaped | <b>bacteriophages</b>                         |
| Helical        | <b>Rabies virus, TMV</b>                      |

#### classification of viruses

**phytophages** viruses that infect plants

**zoophages** viruses that infect animals

**bacteriophages** viruses that infect bacteria

**cyanophages** viruses that infect blue green algae

**zymophages** viruses that infect yeast cells

**mycophages** viruses that infect fungi

### NUCLEIC ACID

Generally plant virus consists of **RNA** but in **cauliflower mosaic virus** and **dahlia mosaic virus** the genetic material is **double stranded DNA**

Generally animal virus consists of **DNA** but in **polio virus, flu virus** it is single stranded **RNA**

A single stranded DNA is present in bacteriophage **M14** and coliphage **S13**

A double stranded RNA is present in **Wound tumor virus, Rice dwarf virus, Maize dwarf virus, Reo virus**

## CAPSID

1) Chemically viruses contain a protein coat called **capsid**. The capsid consists of many protein subunits called **capsomere**. The number of capsomere varies from one virus to another virus

eg:- **TMV** capsid contains **2130** capsomeres.

**Adeno virus** contains **252** capsomeres.

2) Some animal viruses like **influenza virus** and **AIDS** contain a lipid-protein complex external to capsid. This is called **peplos or envelope**.

The capsomeres in capsid may be arranged in helically (eg:-**TMV**) polyhedral (eg:- **adeno virus**) and binal symmetry (eg:- **TMV**)

## DIFFERENT TYPES OF VIRUSES

| TMV VIRUS   | BACTERIOPHAGE  | POX VIRUS   | AIDS VIRUS  |
|---|--|---|---|
| <p><b>TMV</b> is most extensively studied plant virus.</p>  | <p>They are pathogenic virus infecting bacteria</p>  | <p><b>POX</b> virus is a casual agent of small pox.</p>   | <p>Acquired immune deficiency syndrome(<b>AIDS</b>) is an infectious disease is caused by a virus known as human immunodeficiency virus (<b>HIV</b>)</p>                                  |
| <p>It is elongated rod-like, 3000A<sup>0</sup> long, 180A<sup>0</sup> in diameter, molecular weight being 39.4*10<sup>6</sup>, 95% protein and 5% RNA by weight intertwined to form helical, grooved, cylindrical rods.</p> | <p><b>Twort</b> discovered the bacteriophages. The structure of T4 bacteriophage contains head and tail regions.</p>   | <p>pox virus are among the largest of animal virus, have complex structure and rectangular shaped</p>   | <p>This virus also called as Human T lymphotropic virus 3 or AIDS related retrovirus (ARV)</p>  |
| <p>The walls of the cylinder are 70A<sup>0</sup> thick. 2130 capsomeres are arranged helically to form a capsid.</p>  | <p>Head is folded <b>double standard DNA</b> is packed in head. Head is hexagonal with around 2000 capsomeres.</p>   | <p>This is rectangular shaped (300*2-30mU) in size, 6% double standard DNA, 89% protein, 5% lipids.</p> | <p>AIDS virus consists of <b>single standard RNA</b> surrounded by protein coat (core shell) the entire structure is wrapped around in an envelope.</p>                                   |
| <p>49 capsomeres are present in 3 turns and 130 turns in complete virus capsid. Each capsomere has a molecular weight of 17,400 and is formed by condensation of <b>158 aminoacids</b></p>                                  | <p>Tail is helically symmetrical with a core tube surrounded by a protein tail sheath consists of 144 capsomeres arranged in 24 rings of 6 subunits. The sheath is connected to collar at its upper end and base plate at lower end.</p> | <p>Genome is dumb bell shaped; central core has dsDNA.</p>  | <p>After entering the blood, AIDS virus infects the helper T-LYMPHOCYTES (not the suppressor T-cells) and destroy them. Helper T cell plays an essential role in antibody production.</p> |



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### DIFFERENT TYPES OF VIRUSES (cont)

|  |  |  |   |
|--|--|--|---|
| RNA strand is embedded in furrow and therefore, it is helical; ssRNA consists of 6400 nucleotides. Thus, the approximate ratio of <b>nucleotides and capsomers</b> is <b>3:1</b> | basal plate is hexagonal with single pin or spike at each corner. A thin tail fibre is also given out of the corner. A enzyme <b>lysozyme</b> is responsible for dissolving the bacterial cell wall is present in tail fibers. | The core contains two enzymes - <b>RNA polymerase</b> and <b>ATP-phosphohydrolase</b> . On both sides of the core lie lateral bodies one on each side. | Thus, AIDS virus destroy an important link in immune defence rendering the individuals prone to infectious diseases and tumour formation. |
|--|--|--|---|

### VIRIIDS

★ **DIENER** discovered the viroids. They are small, circular, single standard RNA molecules without protein coat. they cause many plant diseases.

Eg:- **Citrus exocortosis viroid**, **potato spindle tuber viroid**

★ Although the viroid RNA (300 to 400) nucleotides is single standard circle but can exhibit considerable secondary structure and resembles the short standard molecules with close ends.

★ viroids enter the plant through wound or by insects. It replicates in the host cell nucleus with the help of one plant of RNA polymerases.

### PRIONS

★ **PRUSINER** discovered the prions. The infectious proteins are called **prions**. Nucleic acid is absent. Protein coat is infectious and cause variety of diseases. The **mad cow disease** causing prion may reach man through beef cause **Creutzfeldt-Jakob disease** in him. eg:- **MAD COW disease (Bovine spongiform encephalitis)** and **Scrapie** disease in sheep.



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