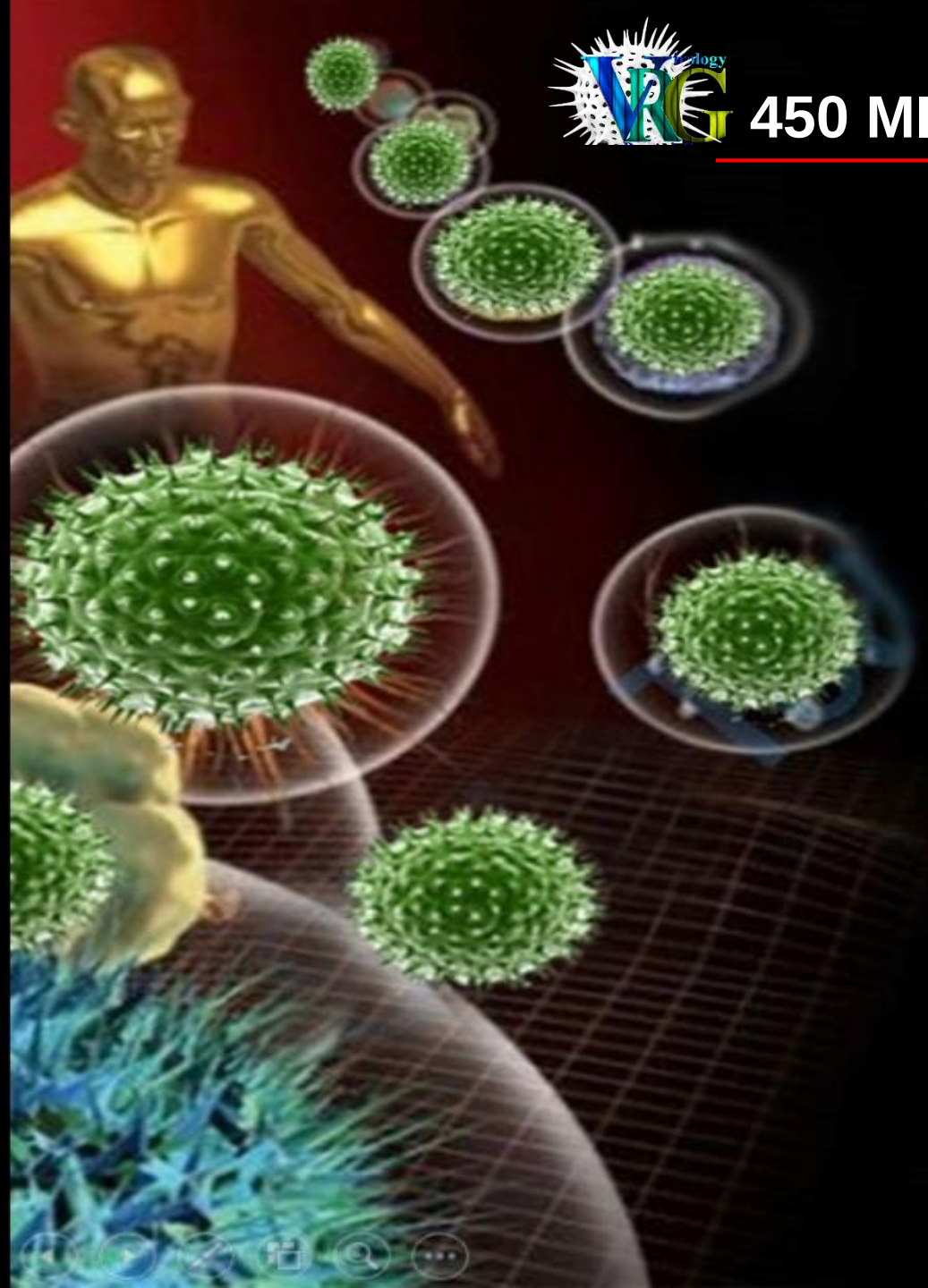

Lecture Two – *Part 1*

Virus Properties and Terminology

By

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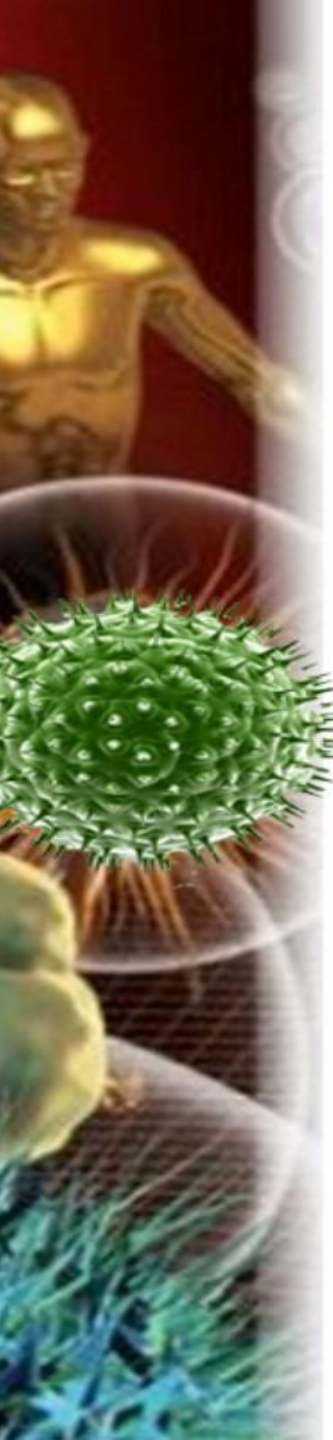
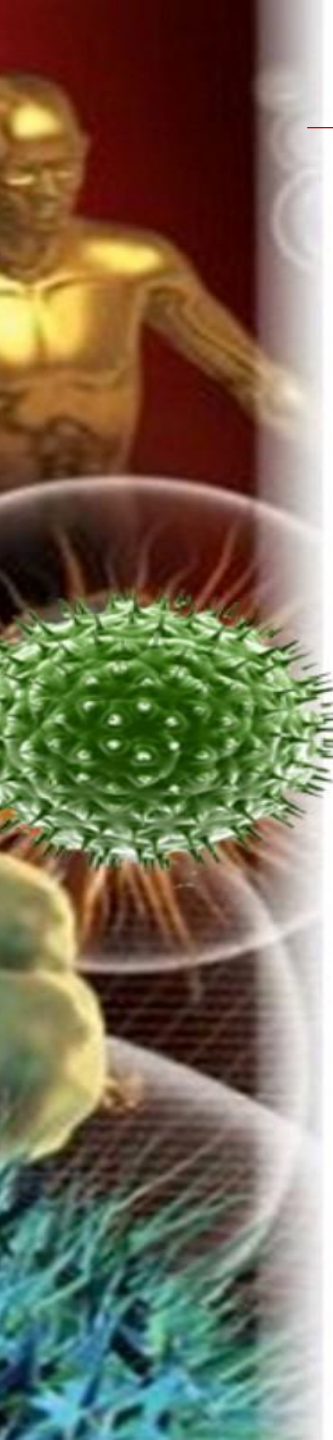


Learning outcomes

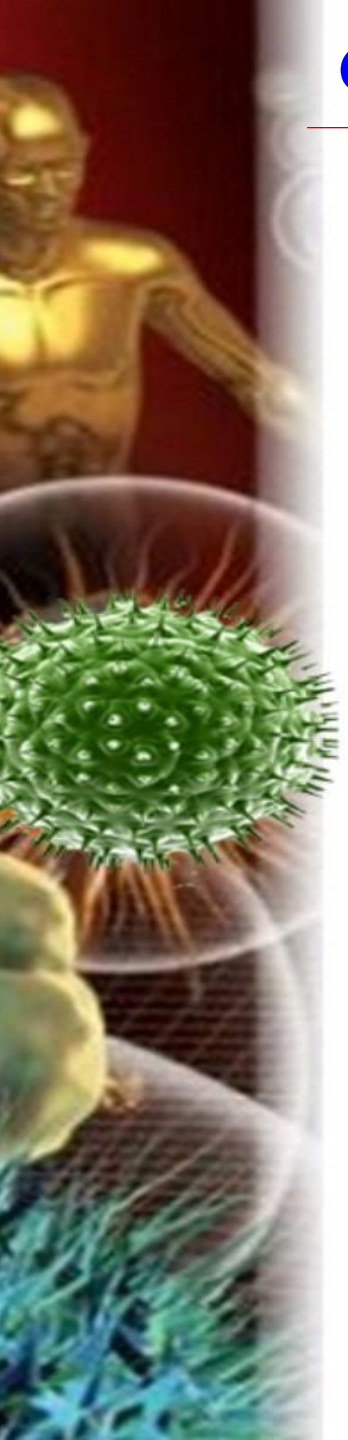
By the end of this lecture students should

- Have the knowledge of virus shapes and sizes.
- Define virus structure and the function of virus coatings.
- Recognize different types of virus nucleic acids.
- Recognize different types of virus capsid.
- Familiar with different terms related to virus structure and pathogenesis.



General Properties of Viruses

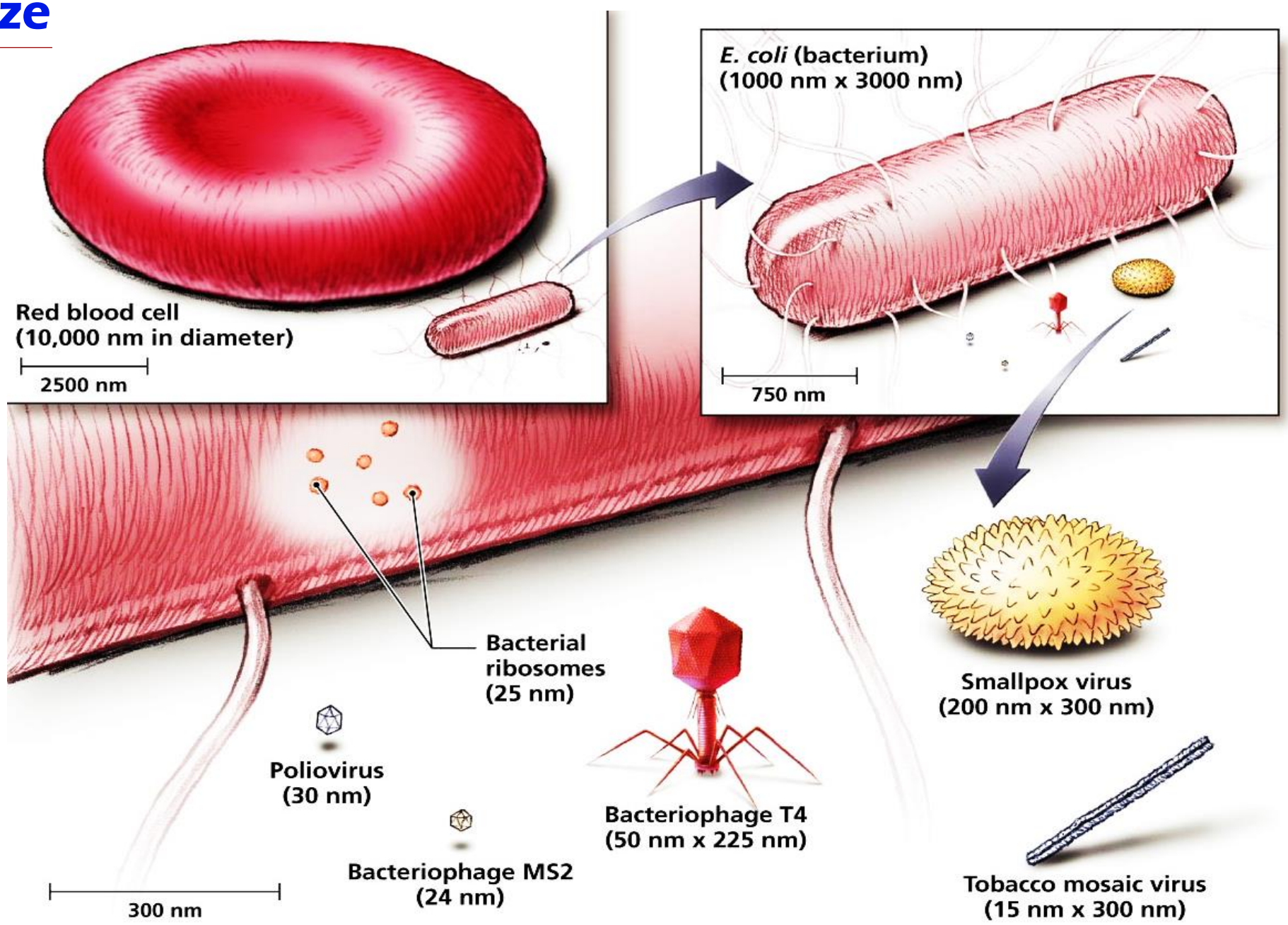
- Obligate intracellular parasites of bacteria, fungi, algae, plants and animals.
- Ultramicroscopic size, ranging from 20 nm up to 450 nm.
- Contain only one type of nucleic acid, either DNA or RNA
- Not cellular in nature.
- Do not independently fulfil the characteristics of life.
- Inactive macromolecules outside the host cell and active only inside host cells.
- Basic structure consists of protein shell and surrounding nucleic acid core.



General Properties of Viruses

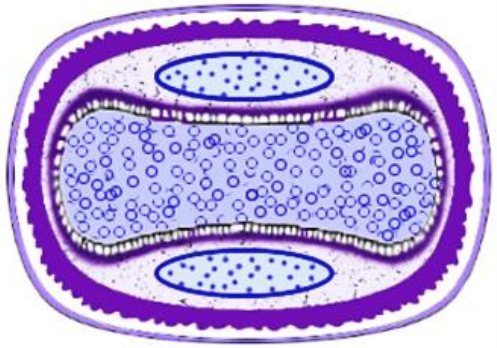
	Bacteria	Virus
Number of cells	Unicellular; one cell	No cells; not living
Living attributes	Living organism	At the edge of live (Not a true living organism)
Structures	**DNA and RNA** floating freely in cytoplasm. Has cell wall and cell membrane.	**DNA or RNA** enclosed inside a coat of protein.
Organelles and metabolism	Present	Absent
Treatment	Antibiotics	Vaccines and antiviral medications like interferon
Enzymes	Yes	Yes, in some
Reproduction	Binary Fission- a form of asexual reproduction	Replication cycle
Size	Larger (over 1000 nm)	Smaller (20 – 400) nm

Virus Size



Virus Size

Poxvirus
(e.g. smallpox)

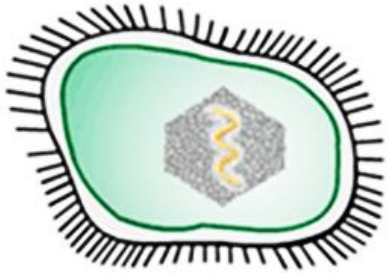


200–300 nm

Myxovirus
(e.g. measles)

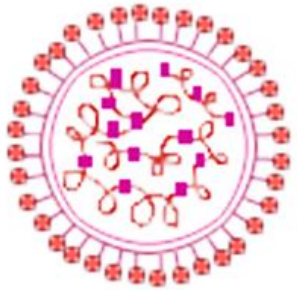
80–250 nm

Herpesvirus
(e.g. herpes)



150–160 nm

Coronavirus
(e.g. SARS)



80–160 nm

Adenovirus
(e.g. common cold)

70–80 nm

Hepadnavirus
(e.g. hepatitis B)

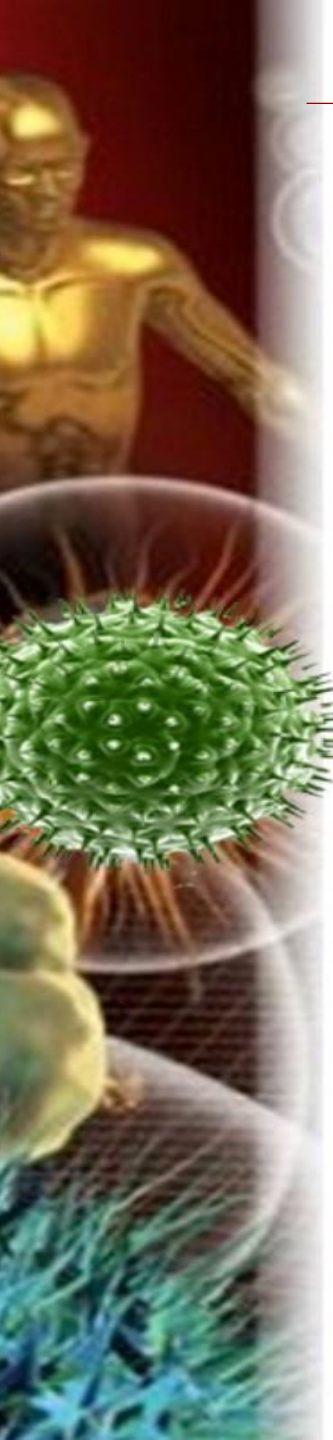
42 nm

Picornavirus
(e.g. polio)

20–30 nm

Parvovirus
(e.g. aplastic anaemia)

18–22 nm

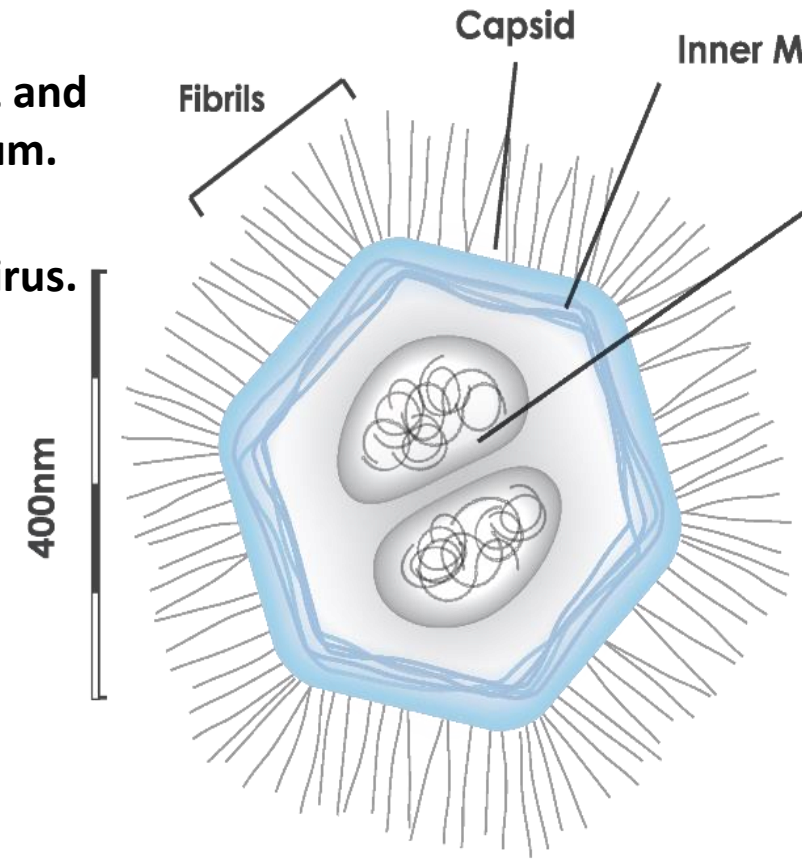


Virus Size

➢ **Giant viruses**

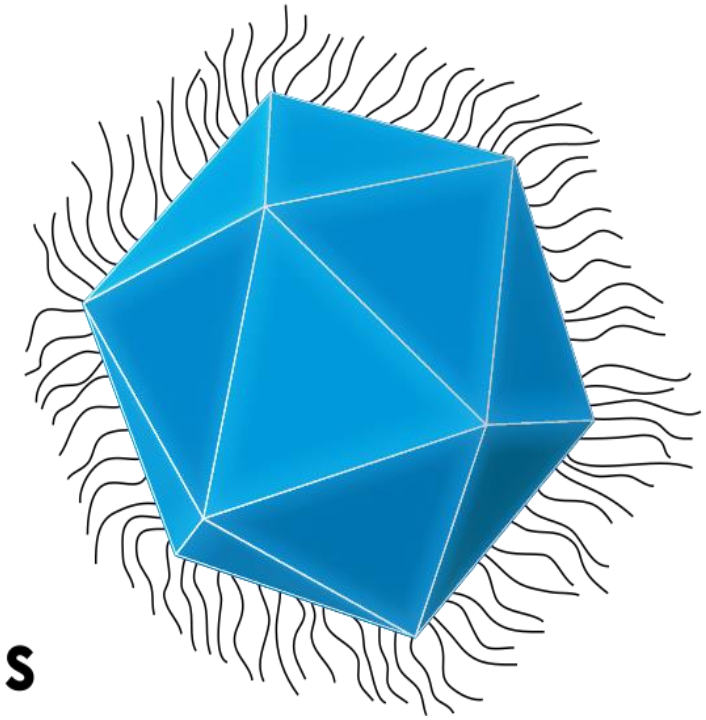
Discovered accidentally in 1992 and wrongly identified as a bacterium.

In 2003, it was identified as a virus.



- dsDNA virus
- 90% coding capacity
- 10% Junk DNA

- 1.2 million base pairs
- ~911 protein coding genes
- additional genes (inc. aminoactyl tRNA synthetases; sugar, lipid, and amino acid metabolism)



acanthamoeba polyphaga mimivirus

Virus Size

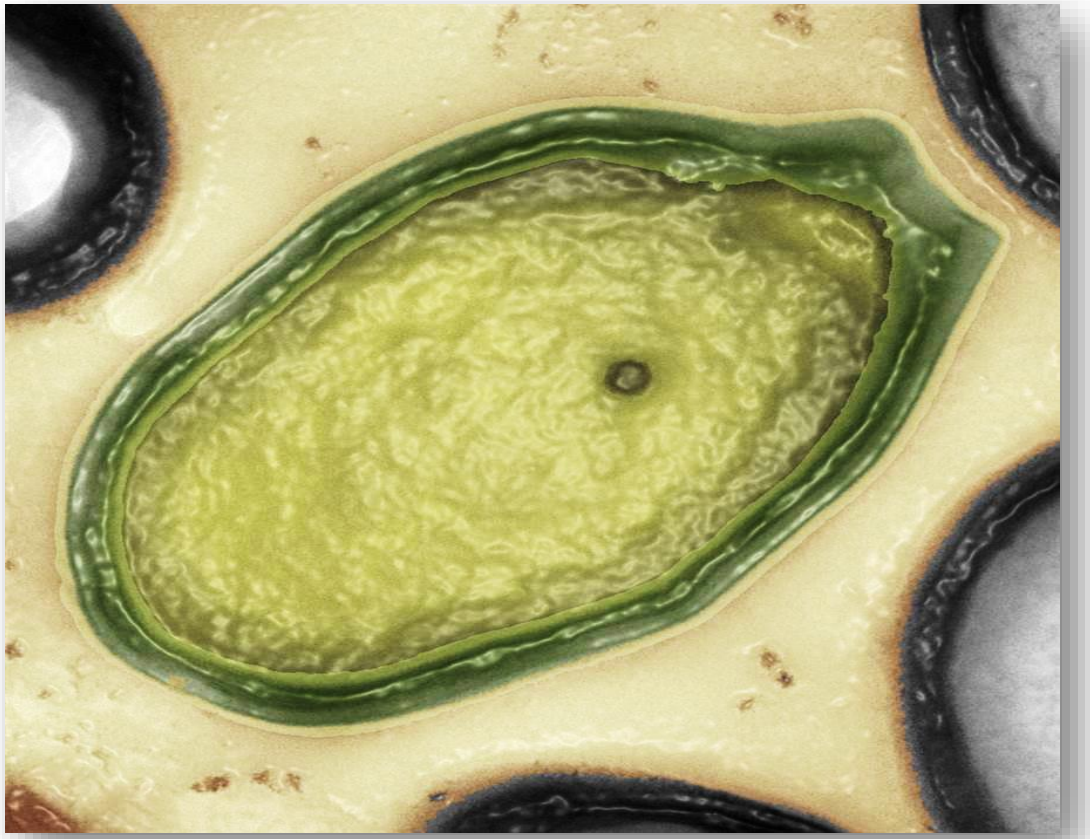
➢ **Giant viruses**

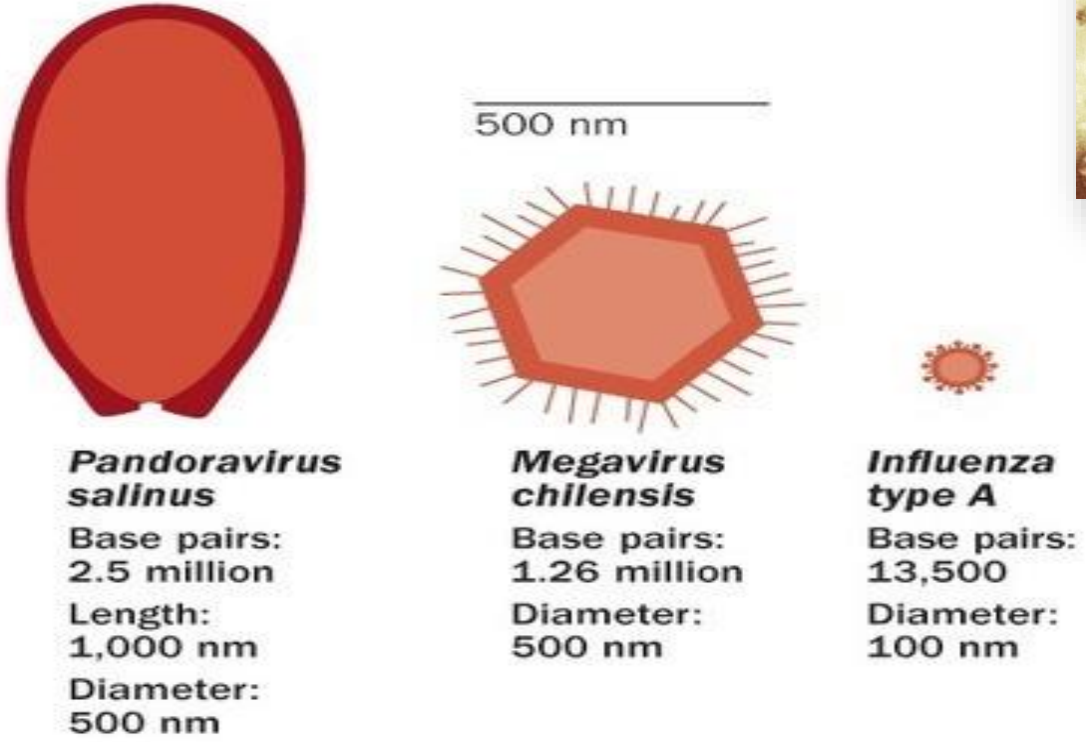
Pandoravirus

Discovered accidentally in 2013.

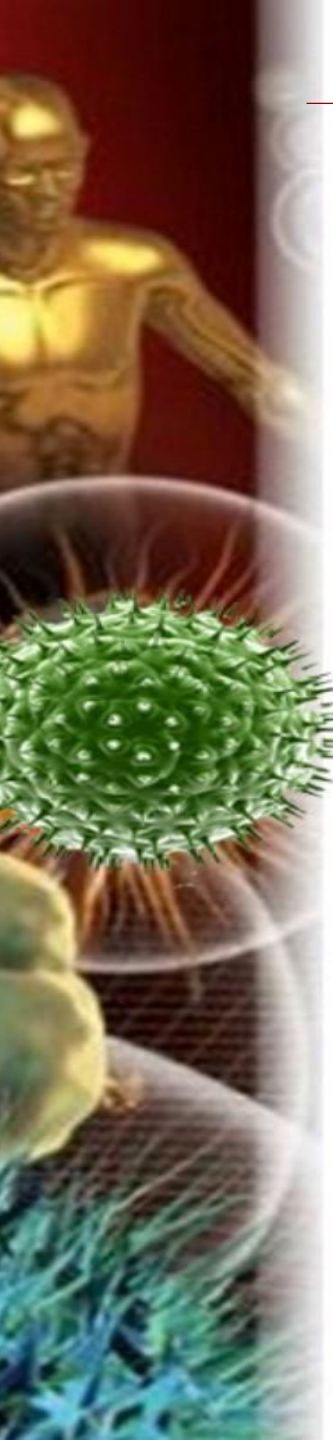
Have a large genome made up of 2,500 genes.

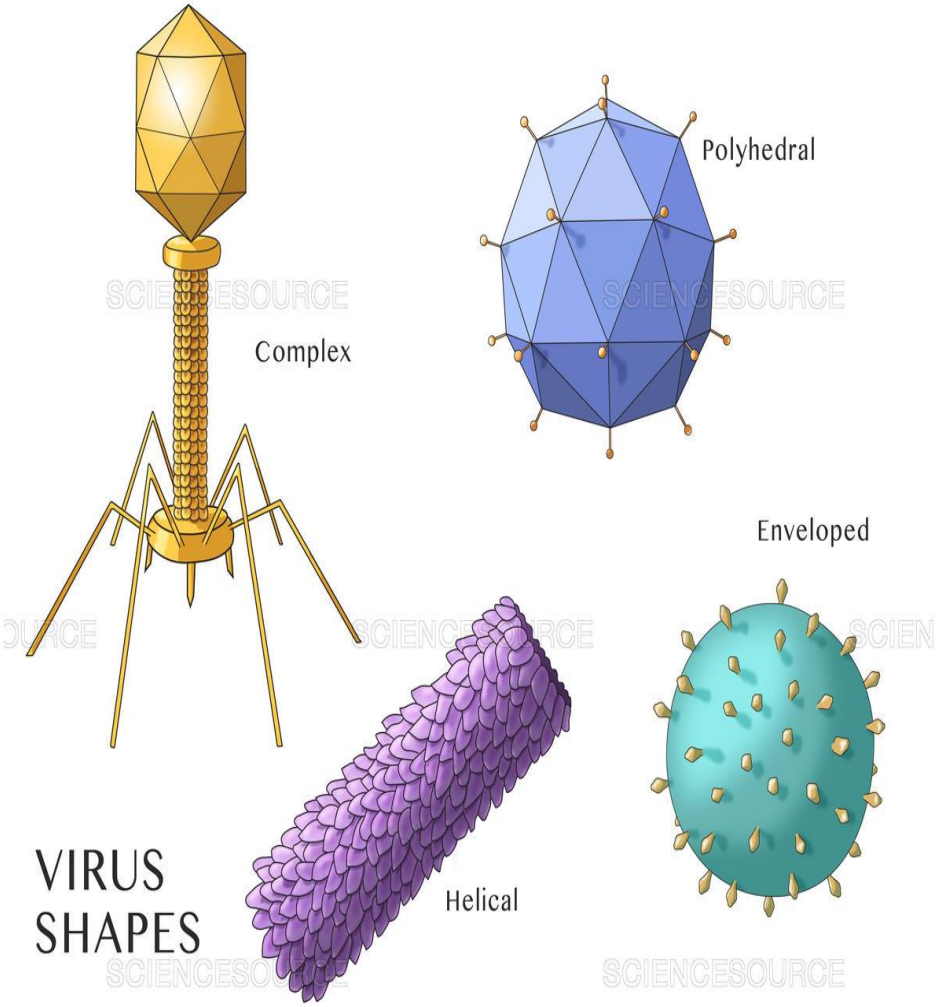
About 1 micrometer (1000 nanometers) in length



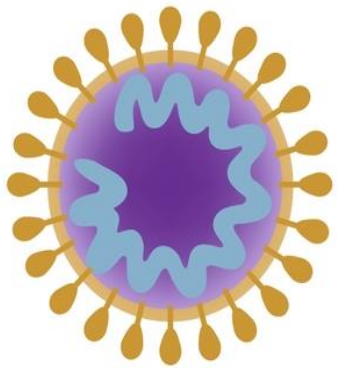


Virus Shape



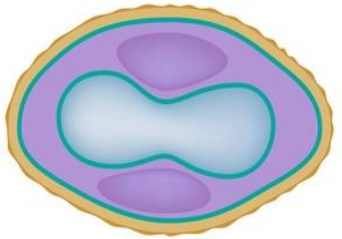


Papillomavirus
Enterovirus
Rhinovirus
Rotavirus



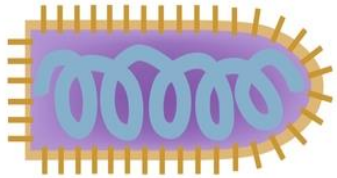
Coronavirus

Herpesvirus
Hepatitis B virus

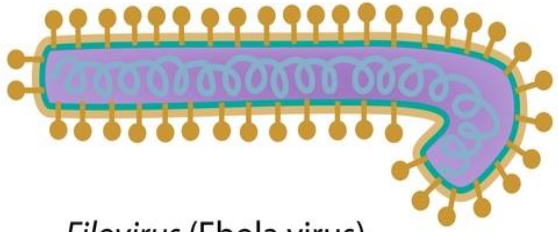


Smallpox virus

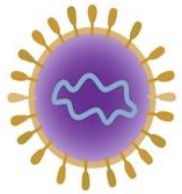
Mastadenovirus



Rabies virus



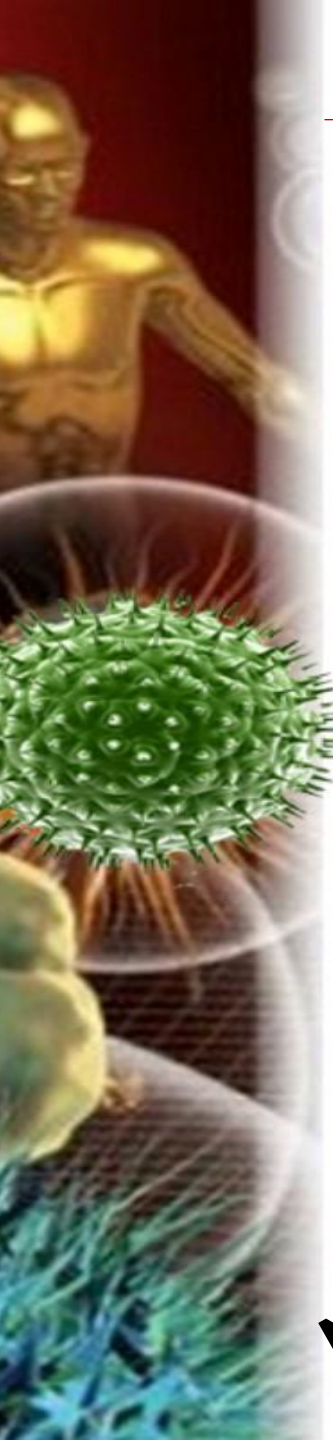
Filovirus (Ebola virus)

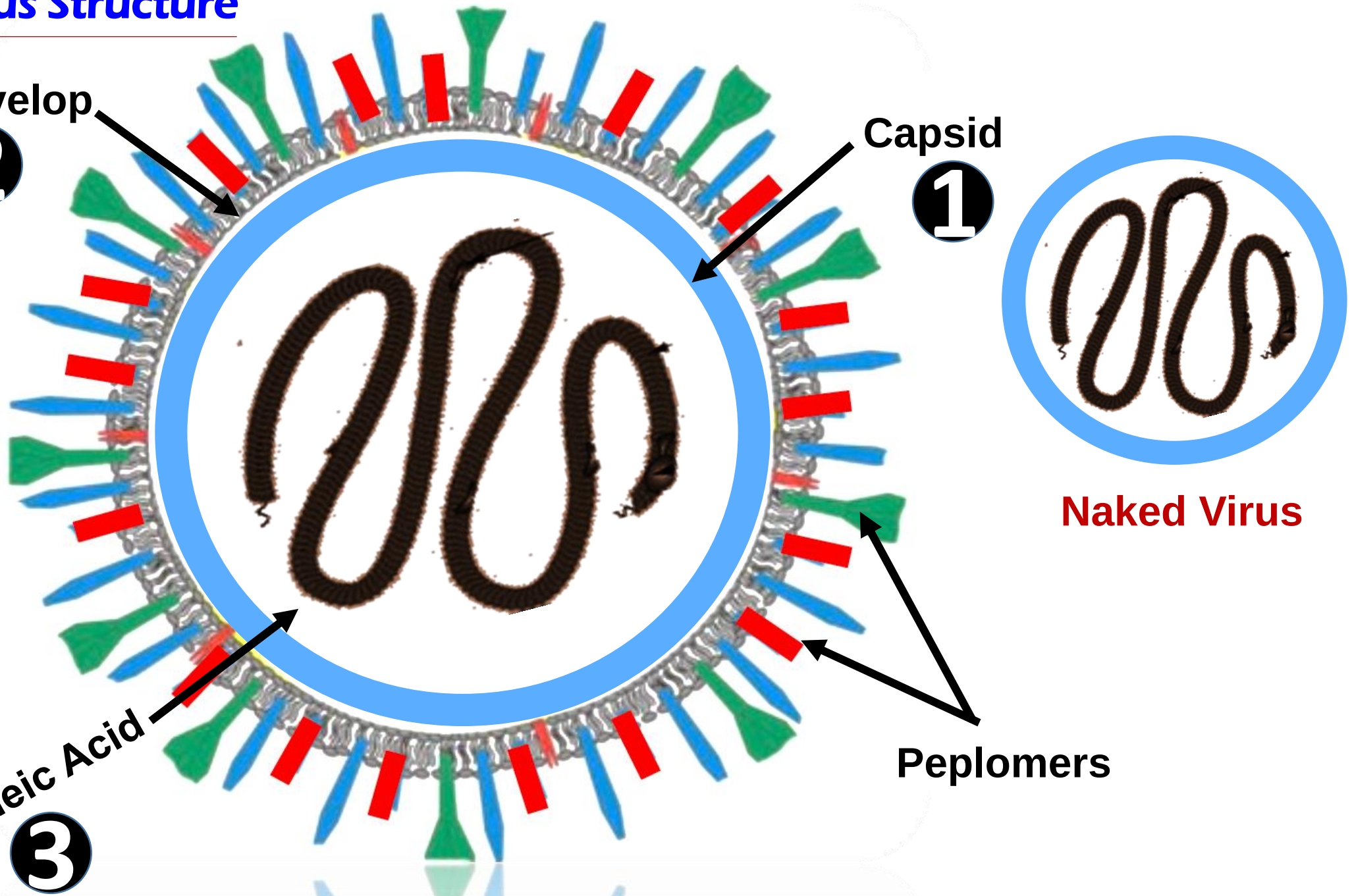


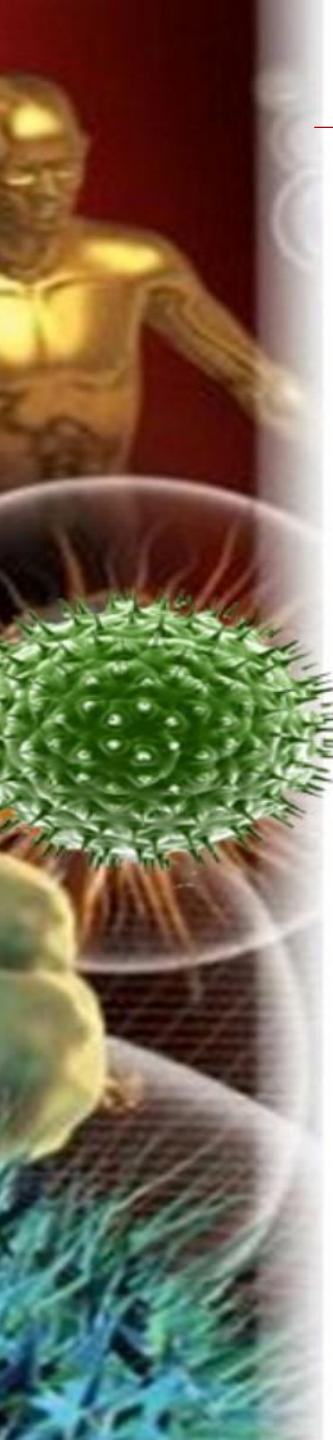
Hepatitis D virus

Hantavirus

Virus Structure

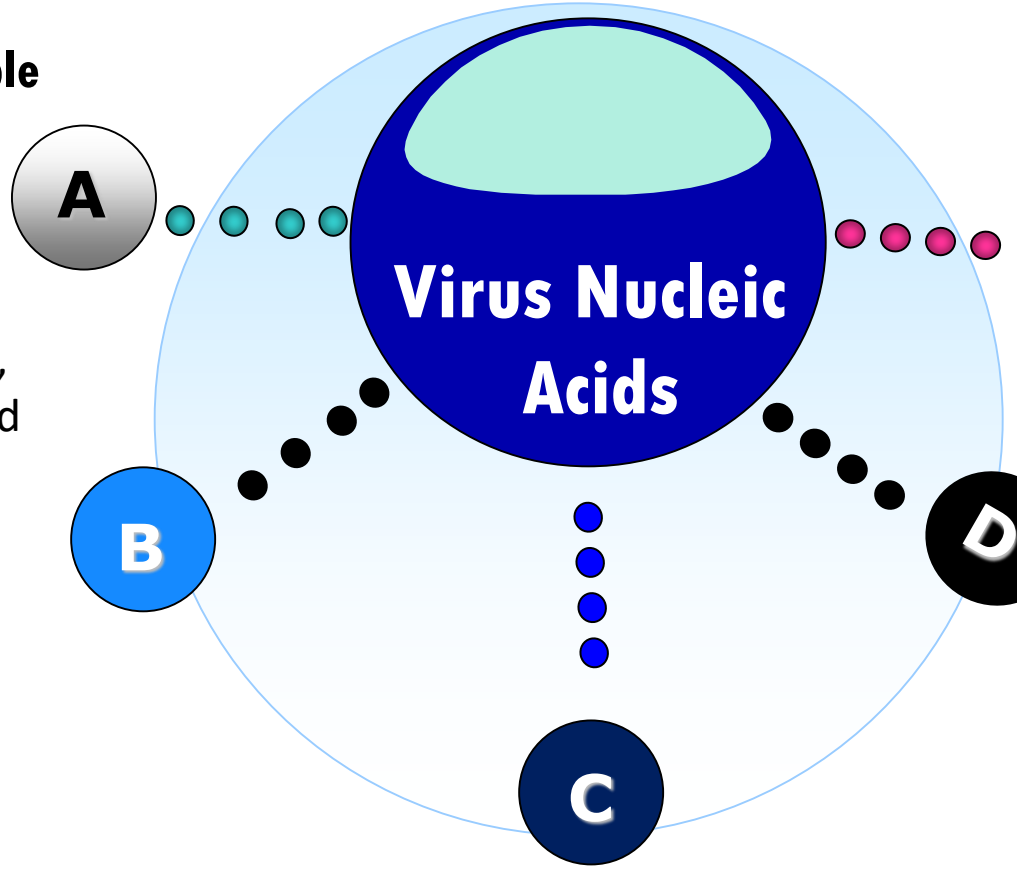






Virus Nucleic Acids

➢ DNA or RNA BUT never both



Single stranded or double stranded DNA.

Ex.
ssDNA: Circoviridae, Parvoviridae
dsDNA: Adenoviridae, Poxviridae, and Adenoviridae

Single stranded or double stranded RNA

Ex.
ssRNA:
+ve sence: Coronaviridae
-ve sense: Mononegavirales
dsRNA: Reoviridae

Circular or linear

Ex.
Circular: Circoviridae
Linear: Orthopneumoviridae

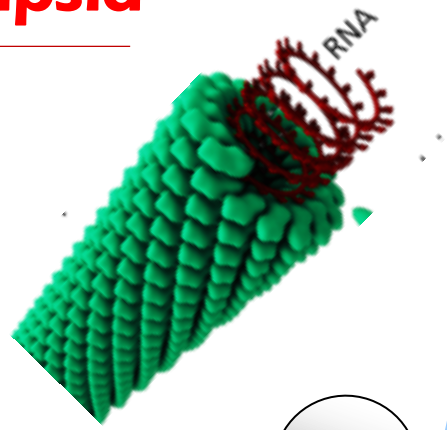
Segmented or non-segmented

Ex.
Segmented: Orthomyxoviridae
Non- Segmented: Adenoviridae

Diploid or haploid

Ex.
Diploid: HIV
Haploid: Herpesviridae

The Capsid



Helical Symmetry

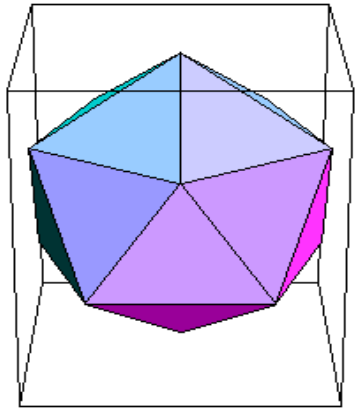
Capsid Symmetry

A

B

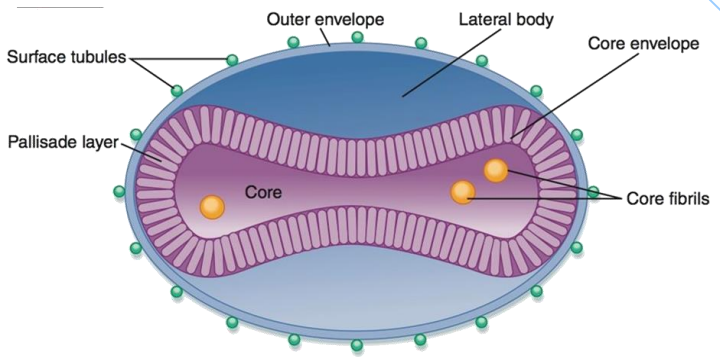
C

Complex



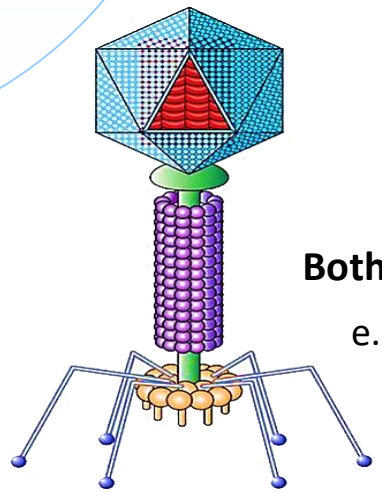
Icosahedral Symmetry

20 faces (equilateral triangle) 30 borders - 12 angles



Neither icosahedral nor helical

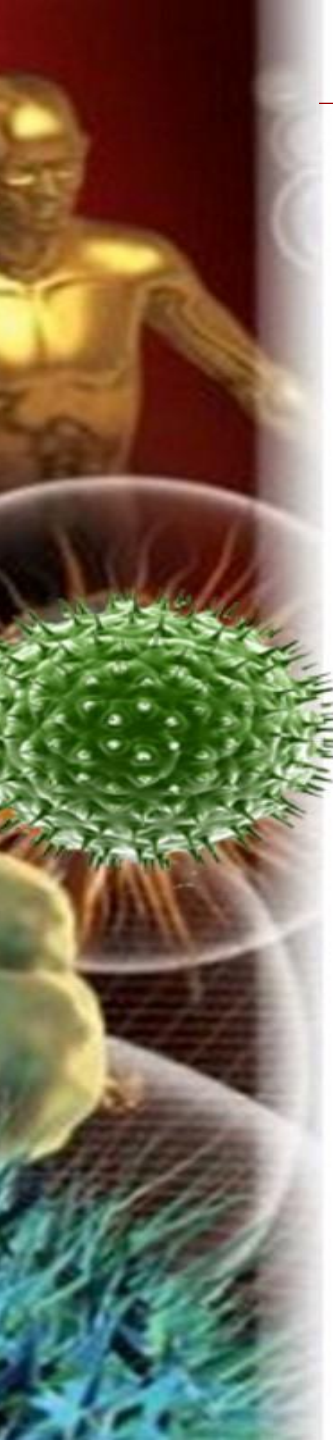
e.g. small pox virus

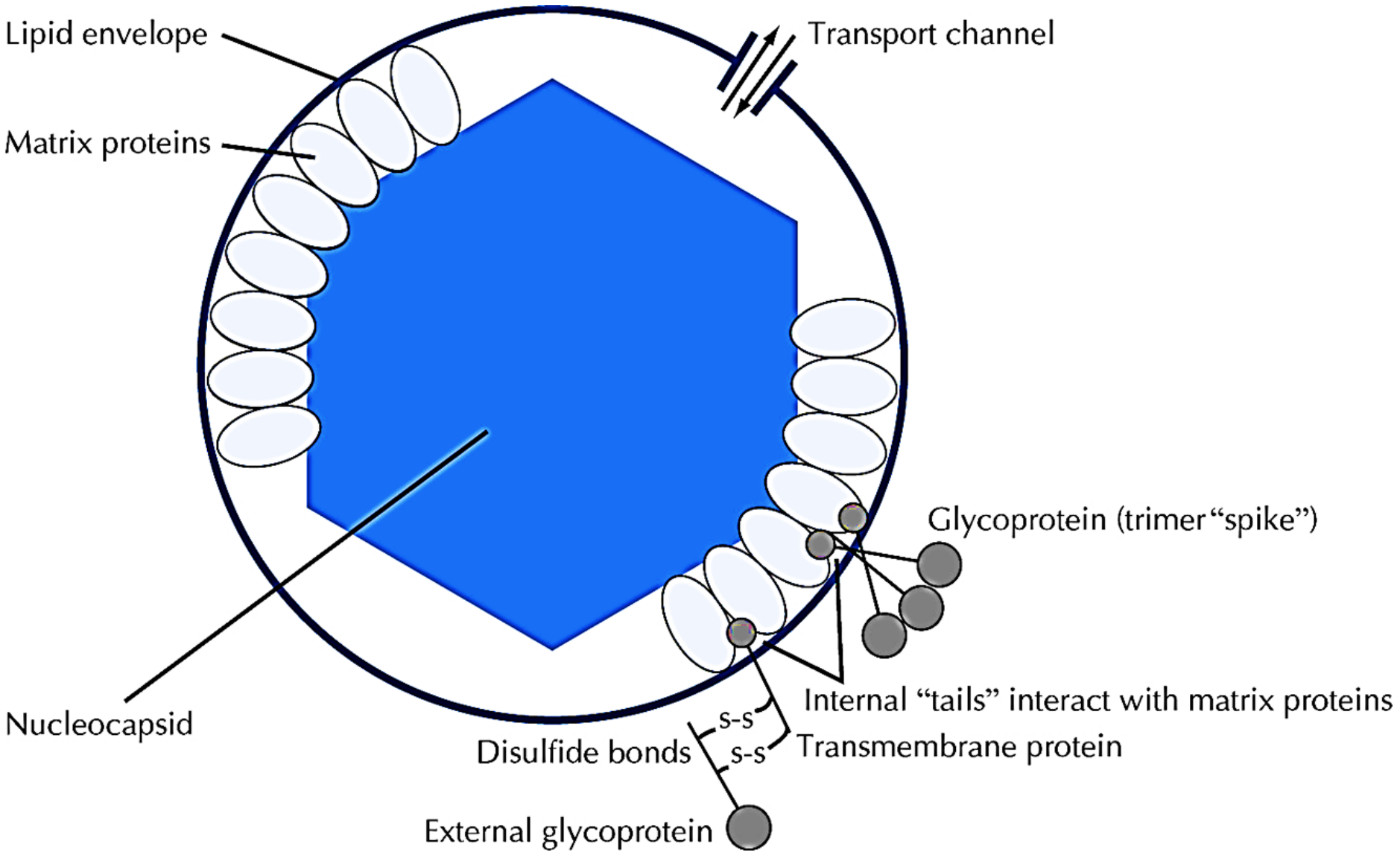


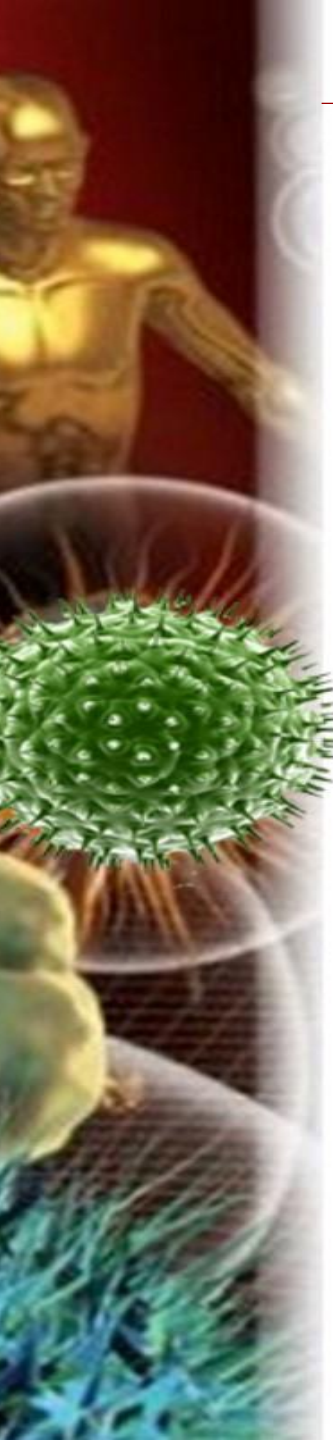
Both icosahedral nor helical (Binal)

e.g. Bacteriophage

Virus Envelop







Functions of Virus Coatings

- Protects the fragile genome from physical, chemical or enzymatic damage.
- Recognition and attachment of virus to host cell.
- Initiation of infection by delivering the viral genome in the host cell.
- Assembly and release of new viruses from host cell.
- Principle targets of host immunity.


Thank
You