

# Lecture-16

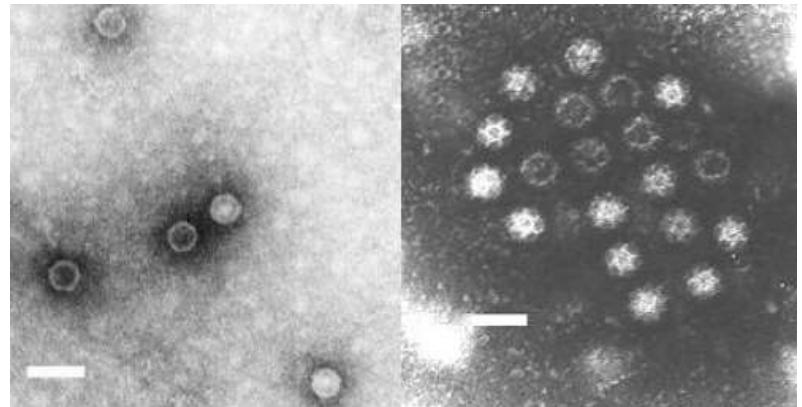
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## Viruses

# Viruses

## General properties

- ❖ Viruses are Infectious **agents**
- ❖ Obligate intracellular parasitic microorganisms which are smaller than bacteria and so could pass through bacterial filters.
- ❖ They form groups which infect other living systems such as humans, animals , insects , plants , bacteria and fishes .
- ❖ Viruses can be classified on the basis of the hosts they infect:
  - ❖ Bacterial viruses (bacteriophages)
  - ❖ Archaeal viruses
  - ❖ Animal viruses
  - ❖ Plant viruses
  - ❖ Other viruses

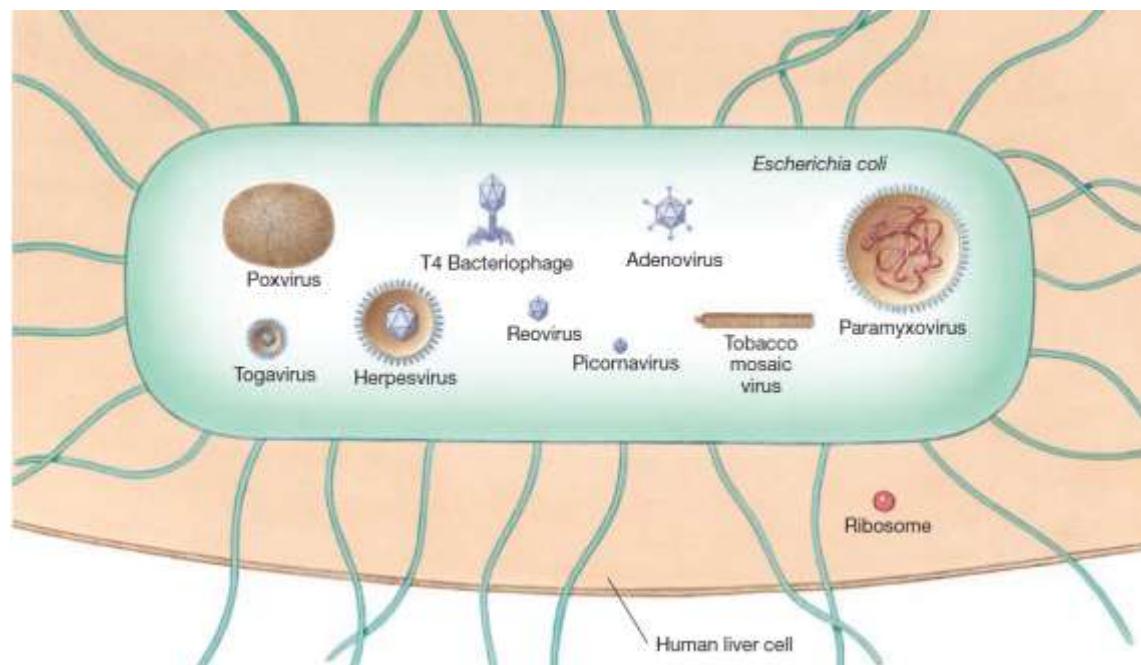


A transmission electron microscopy (TEM) images of the Polio virus (left), and the Calicivirus (right). Notice the identifiable differences in appearance between the two types of viruses. Bars = 50 nm (1)

# Viruses

## General properties

- ❖ The largest ones coming somewhat closer to the smallest bacterium .
- ❖ These viruses are highly selective and specific to their hosts.
- ❖ They are known to be responsible for several diseases of man, animal, plant, etc.



# Viruses

## General properties

❖ Viruses have both living and nonliving characteristics.

### 1. Living characteristics of viruses

- a. They **reproduce** at high rates, but only in living host cells.
- b. They **can mutate**.

### 2. Nonliving characteristics of viruses

- a. They do not contain cytoplasm or cellular organelles.
- b. They do not carry out metabolic reactions on their own. They **don't grow and divide**
- c. They must replicate using the host cell's metabolic machinery. New viral components are synthesized and assembled within the infected host cell.
- d. The majority of viruses possess either **DNA or RNA but not both**.

# طبيعة الفيروسات

## Nature of viruses

Viruses **cannot** be grown on artificial media.

They can only grow in living organisms or tissue cells which are kept alive in suitable medium.

# Morphology of Virus

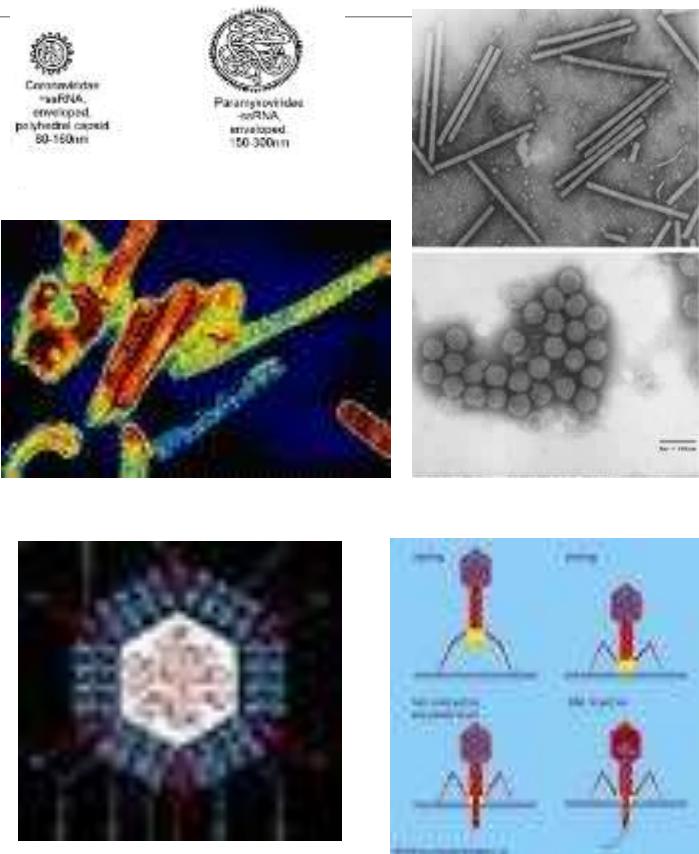
According to the shape, viruses can be classified into the following groups :

**Spherical.** With a size ranging from 18 to 150  $\mu\text{m}$  This includes , as example , the viruses of influenza.

**Rod-shaped.** They are 300  $\mu\text{m}$  in length and 15  $\mu\text{m}$  in width. It is represented by the tobacco mosaic virus.

**Cuboid.** With a size ranging from 210 to 305  $\mu\text{m}$ .This form is found in cowpox and canary pox viruses.

**Complex-shaped.** The size varies from 10 to 225 $\mu\text{m}$ . This form is characteristic of phages.



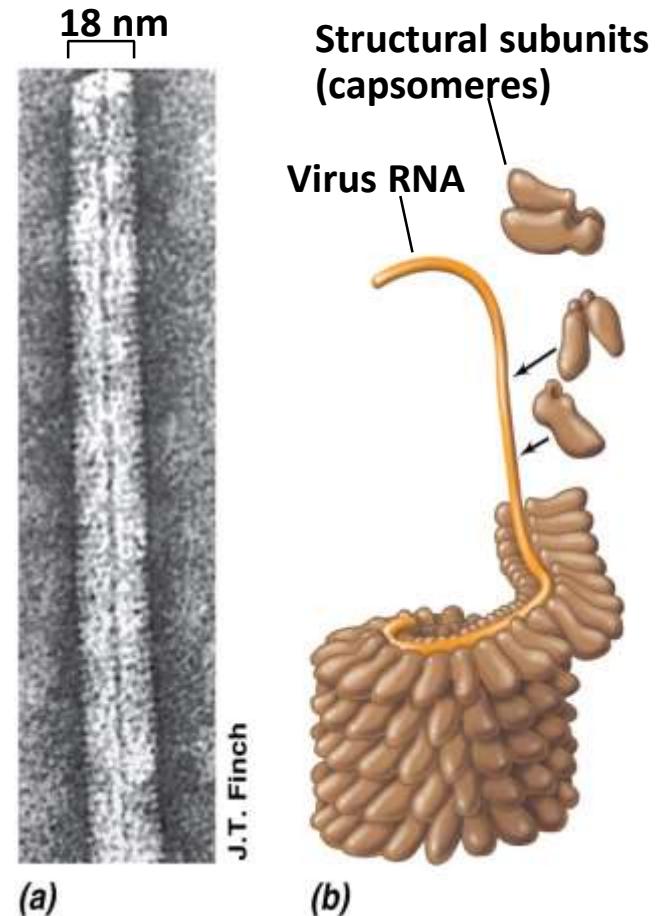
# Viruses Structure

Capsid: the protein shell that surrounds the genome of a virus particle Composed of a number of protein molecules arranged in a precise and highly repetitive pattern around the nucleic acid

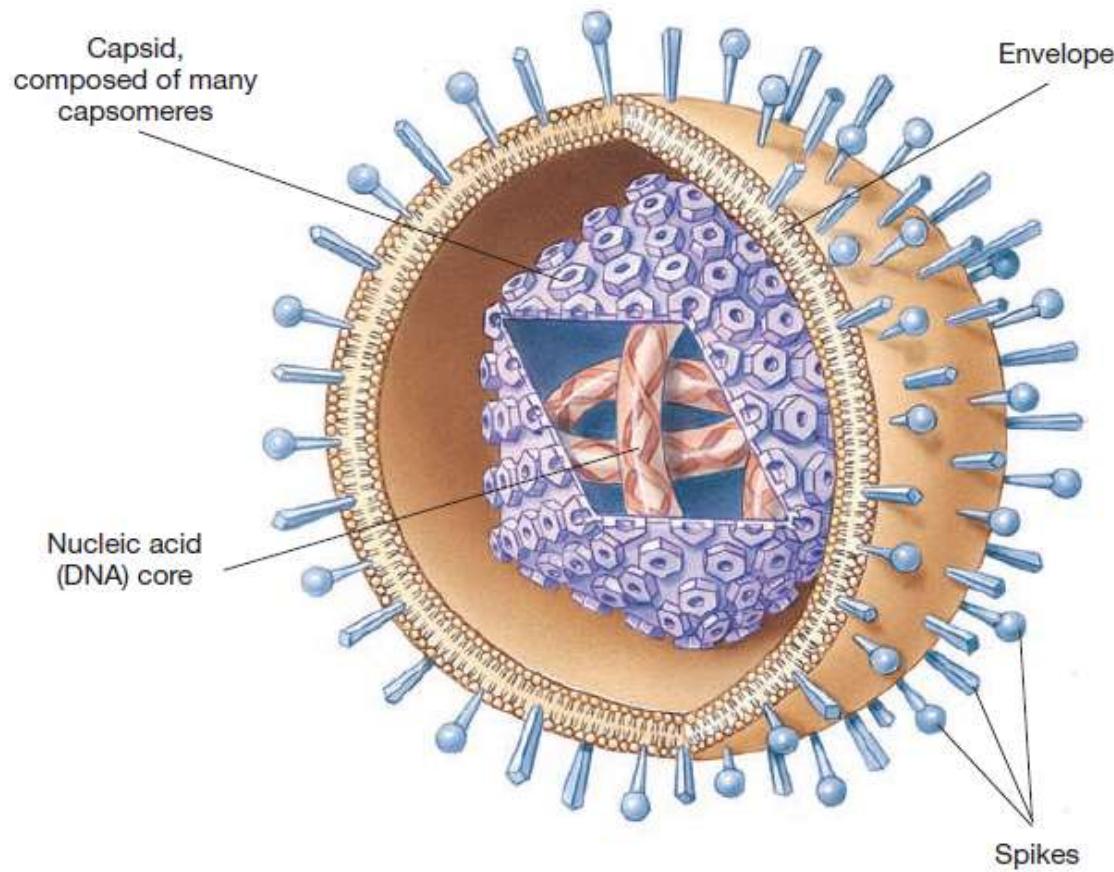
- Capsomere: subunit of the capsid
  - Smallest morphological unit visible with an electron microscope

Nucleocapsid : complete complex of nucleic acid and protein packaged in the virion

Enveloped virus: virus that contains additional layers around the nucleocapsid



# Viruses Structure



# Mechanism of virus infection ( Reproduction )

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1. **Adsorption of the virus** : The infective virus has to be bound at first to certain receptors on the outer surface of the host cell.
2. **Penetration:** There are two views concerning this phase :
  - The **whole virus** contain nucleic acid and protein penetrates into the cell , although the protein part has no role on the further steps of infection.
  - Only the **nucleic acid** part penetrates into the cell,

# Mechanism of virus infection ( Reproduction )

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3. **Blocking of cell information** :The introduction of viral nucleic acid in the host cell inhibits and blocks the original genetic information in the DNA of the chromosomes, and the nucleus has no longer any control on the cell activity.
4. **Synthesis of virus components.** the viral nucleic acid forces the cell to replicate the virus components ( nucleic acid and protein ) . This new synthesis is completed in few hours.
5. **Release of the virus** : the release in some virus by **lysis** of the cell, while in others by **exocytosis** .