






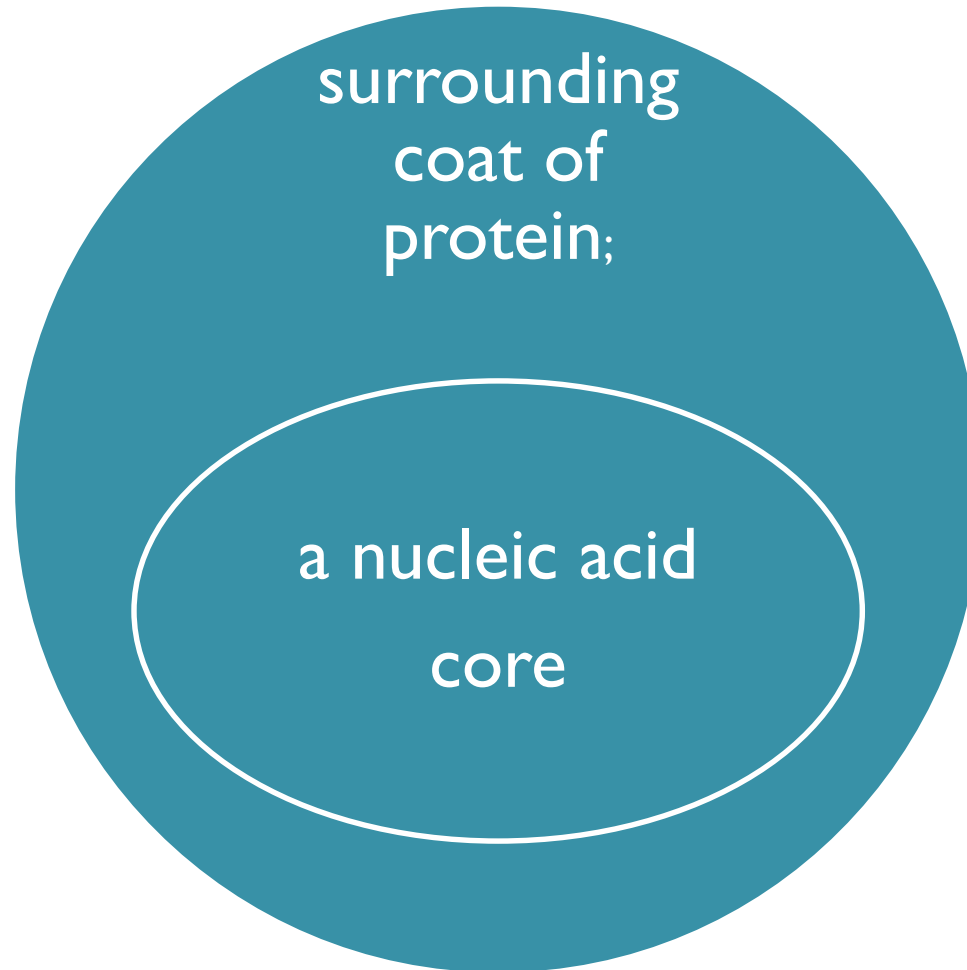
Virology

- 
- Viruses are small, obligate, intracellular particles.
 - Viral size ranges from 20 to 300 nm
 - Therefore most can be seen only with the electron microscope .

- 
- They must infect and take over a host cell in order to replicate.
 - This is because they lack the chemical machinery for generating energy and synthesizing large molecules.
 - Therefore, are difficult to combat medically.

- 
- Viruses have some unique features not seen with the living microorganisms.
 - They have no organelles, no cytoplasm, and no cell nucleus or nucleoid
 - Instead, they are comprised of two basic components:

Viral structure

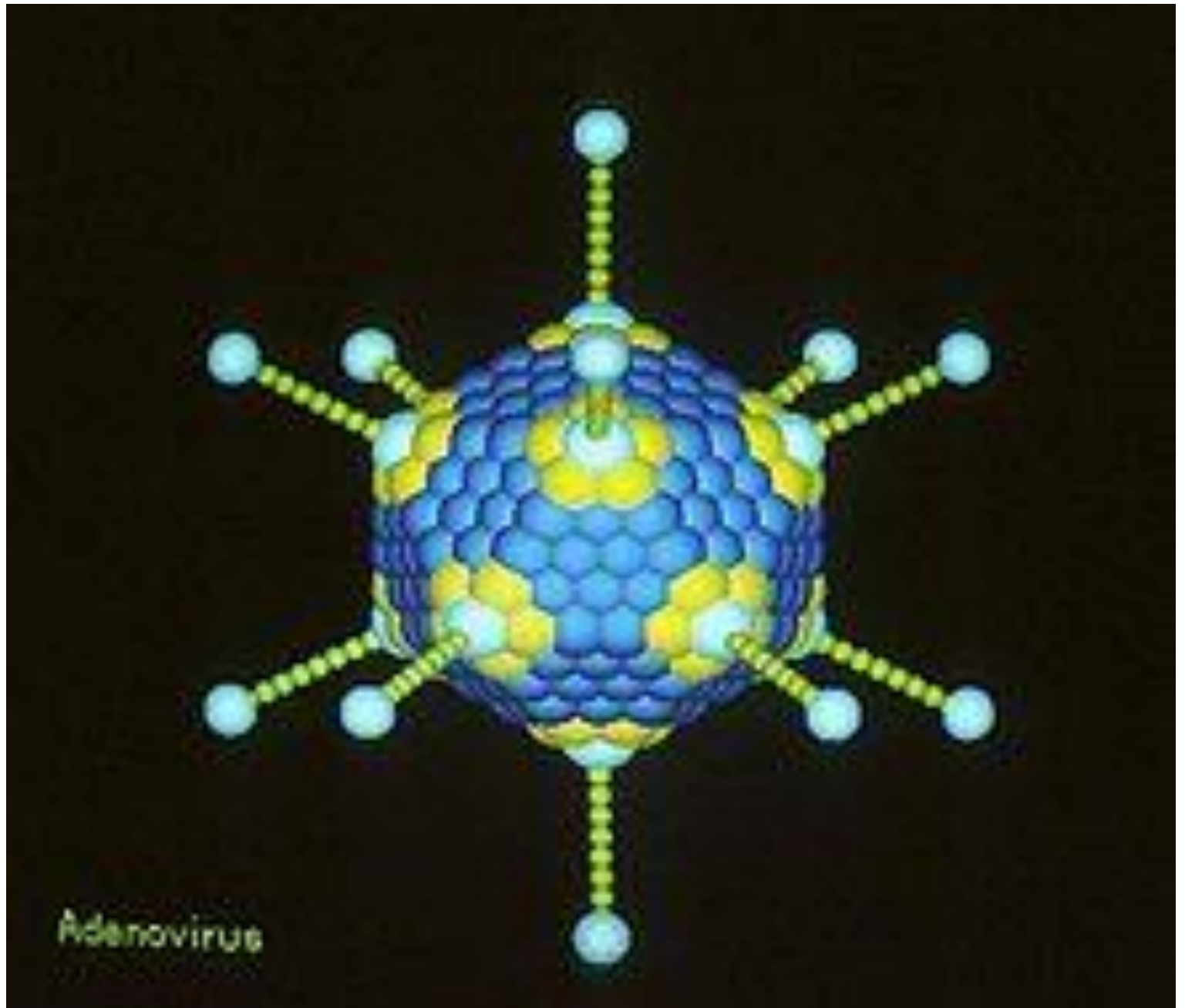


I. The viral genome

- The viral genome of almost all viruses contains either DNA or RNA, but not both.
- The nucleic acid occurs in either a double-stranded or a single-stranded form.

2. Protein coat

- The protein coat of a virus particle, called a **capsid**.
- It gives shape or symmetry to the virus
- Generally, the capsid is subdivided into individual protein subunits called **capsomeres**
- (the organization of capsomeres yields the viral symmetry)
- the capsid with its enclosed genome is referred to as a **nucleocapsid**.



Adenovirus

2. Protein coat

- Functions of capsid:

Protective covering:


Compose of amino acids resists temperature, pH, and other environmental fluctuations.

Envelope

- It is a flexible membrane surrounding the nucleocapsids of many “**enveloped viruses**”
- The envelope is composed of lipids and protein, similar to the host cell membrane.
- In fact, it is acquired from the host cell during replication and is unique to each type of virus.

Spikes

- Many enveloped viruses also contain spikes projecting from the envelope.
- These spikes help attach the virus to the host cell & facilitate penetration of the cell.

- 
- Viruses composed solely of a nucleocapsid are sometimes referred to as “naked” viruses.

Virus-Like Agents

- **Viroids** :

Are infectious circular RNA molecules that lack protein shells; they are responsible for a variety of plant diseases.

Virus-Like Agents

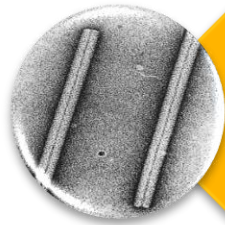
- **Prions:**

Prions is apparently lack any genes and are composed only of protein,

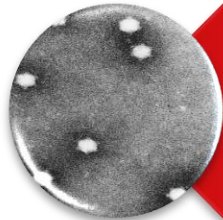
It is responsible for some transmissible and inherited spongiform encephalopathies such as; bovine spongiform encephalopathy in cattle.

Classification of viruses

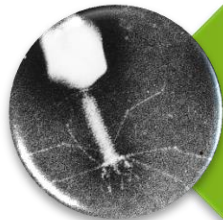
- Viruses can be classified according to their **shape** into:



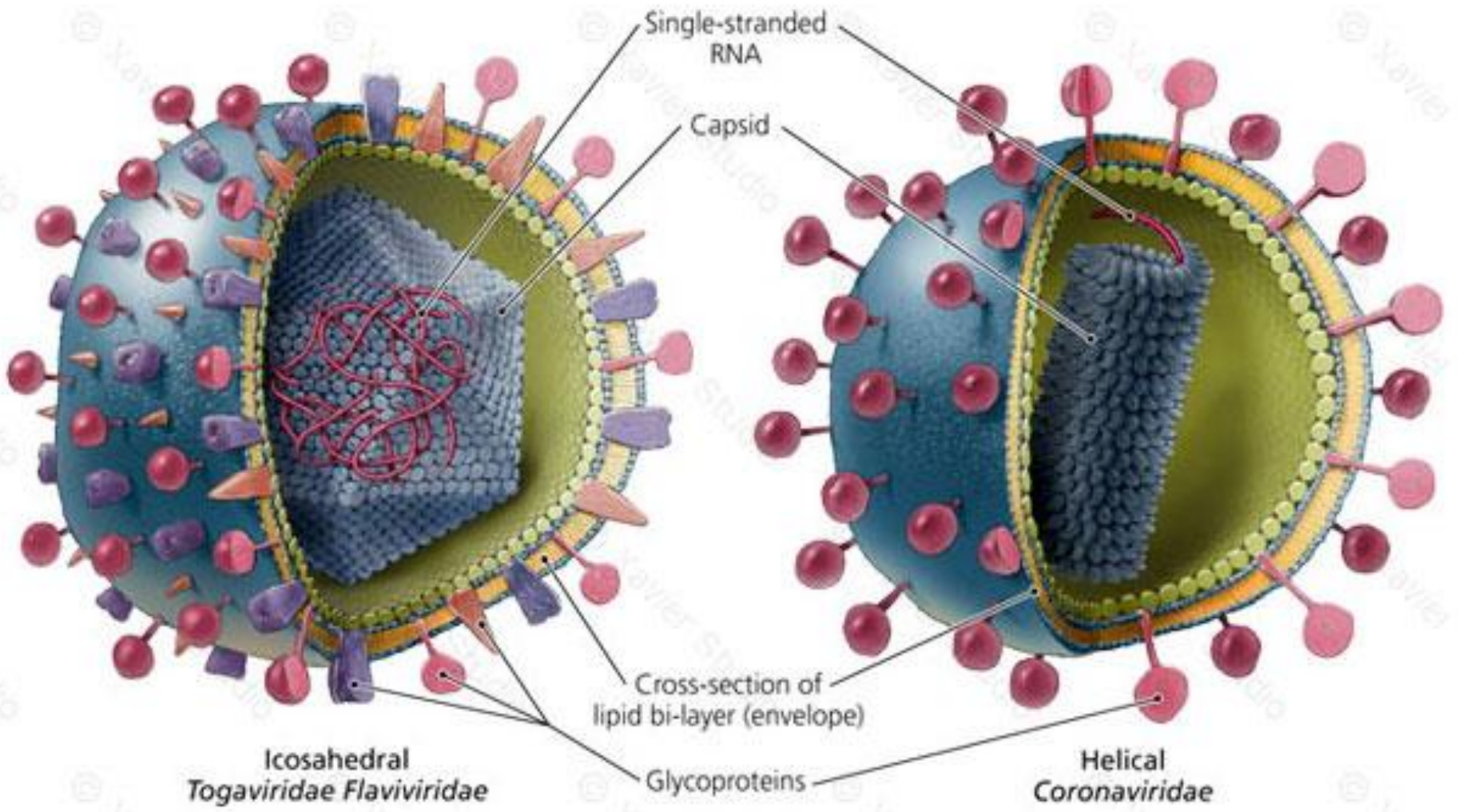
1. Helical viruses

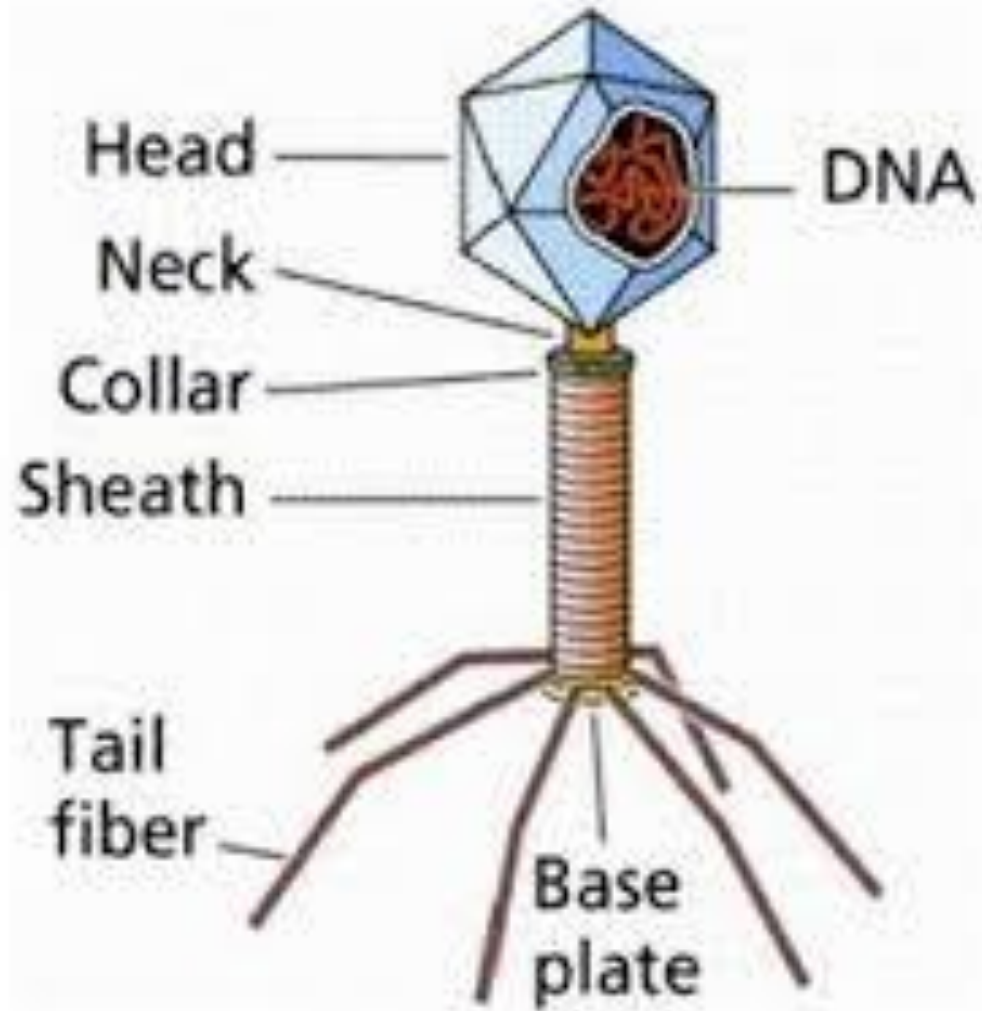


2. Icosahedral viruses



3. Complex viruses





Classification of viruses

- Viruses can be classified according to their **genome** into:

DNA Viruses

- single-stranded (ss) or double-stranded (ds)
- DNA genomes that are linear or segmented.

RNA Viruses

- ssRNA or dsRNA genomes,
- linear or segmented.

Viruses Have a Host Range & Tissue Specificity

- As a group, viruses can infect almost any cellular organism.
- There are specific viruses able to infect bacterial cells, while others infect protozoa, fungi, plants or animals.
- A virus' **host range** refers to what organisms (hosts) the virus can infect and it is based on a virus' capsid structure.

Tissue Specificity

- Even within its host range, many viruses only infect certain cell types or tissues.
- This limitation is called tissue **tropism** (tissue attraction).
- Because the envelope has protein spikes for binding to receptor molecules on these cells.
- e.g.: **HIV binds CD4 receptors in T helper cells.**

Nomenclature

- **Do Not Use Conventional Taxonomic Groups**
- The measles virus and poxviruses, for example, are named after the disease they cause.
- The Ebola virus after the location from which they were originally isolated;
- the Epstein-Barr virus after the researchers who studied it
- Others are named after morphologic factors—the coronaviruses (*corona* = “crown”) have a crown-like capsid

Nomenclature

- In 2008, five orders were recognized that comprised 20 families, each ending with -viridae (e.g., Herpesviridae; Coronaviridae).
- Viruses have been categorized into hundreds of genera; each genus name ends with the suffix -virus (e.g., Herpesvirus; Coronavirus).
- Names (binomial nomenclature) have not yet been agreed upon for species.