Tikrit University

College of Nursing

Basic Nursing Sciences

Second Year - 2023-2024

Microbiology

Virology

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Virology

Is the study of viruses and virus-like agents:

- Their structure
- Classification
- Evolution
- Their ways to infection and exploit cells for virus reproduction
- The diseases they cause
- The techniques to isolate and culture them, and their use in research and therapy.

Viruses

are obligatory intracellular parasite very small in size and have a simple, but effective structural organization. they usually consist of just two or three categories of components and use the components of the Host Cell to perform their "metabolism".

- Viral infections are the most common cause of human disease, it responsible for at least 60% of the illness
- Antibiotic have no effect on viruses, but antiviral drugs have been developed to treat life-threatening infections.
- Vaccine can produce lifelong immunity and prevent viral infection

- Viruses effect on all life forms, including human, animals,

plants, fungus and bacteria

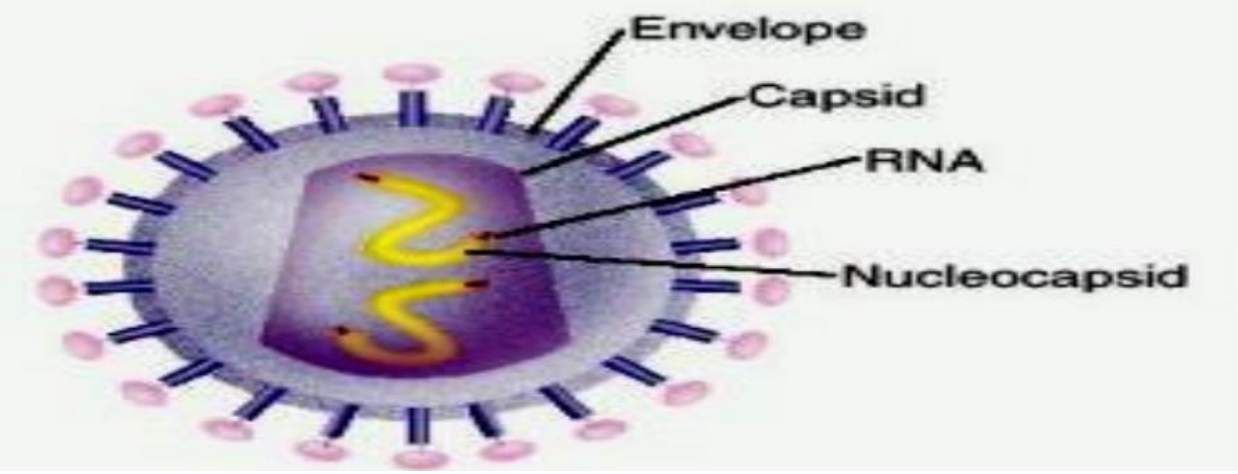
- They damage or kill the cells that they infect

- A few viruses can produced cancer

Virus components

1- Genome

The viral genome (either DNA or RNA but not both) codes for the few proteins necessary for replication. Some proteins are nonstructural, e.g.. Nucleic acid polymerases and some are structural, i.e. they become incorporated and form part of the virion.



2- Capsid (outer protein coat)

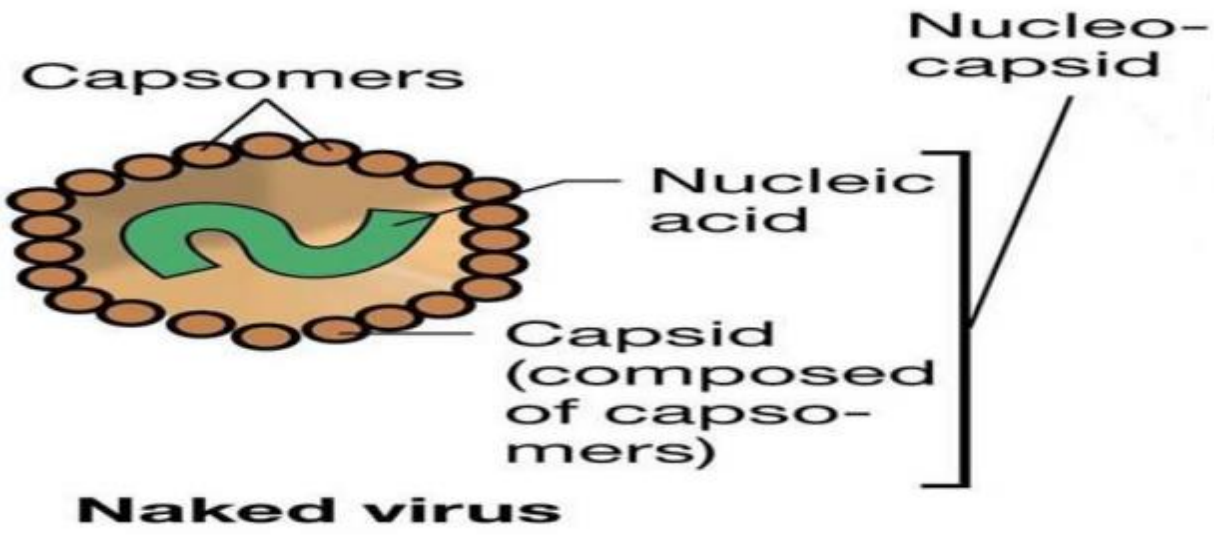
- many protein subunits are assembled to form a tight "shell" (capsid

made up of subunits called capsomers) inside which the nucleic acid

genome lodges for protection.

- The arrangement of capsomers give the virus structure its genomic symmetry

- The capsid together with its enclosed nucleic acid is called the nucleocapsid.

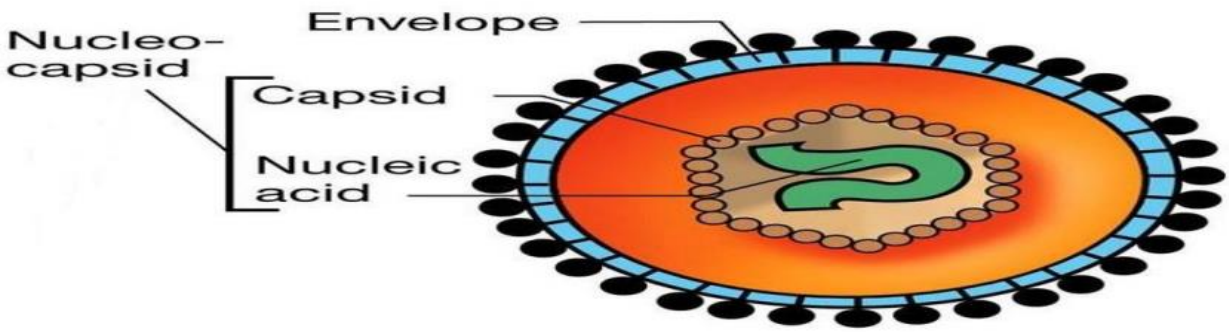


Viral envelop (not found on all viruses)

- Some viruses acquire an outer lipoprotein coat by "budding" through the host cell membranes and are thus called Enveloped viruses.

- The envelop is important for interaction with cellular components during the process of infection and replication.

- Enveloped viruses are more sensitive to heat, drying, detergent and lipid solvents such as alcohol and ether than non enveloped virus



Viruses are vary in size 20 – 300 nm in diameter

- The shape of viruses are determined by the arrangement of the repeating subunits that form the protein coat (capsid) of the virus.

- Most virus appear as spheres or rods in the electron microscope. In addition to these forms, bacterial viruses can have very complex shapes

- Viruses have no metabolic enzymes and cannot generate their own energy.

- Viruses cannot synthesize their own proteins. For this they utilize host cell ribosomes during replication.

- Unlike cells, viruses do not grow in size and mass leading to a division process. Rather viruses grow by separate synthesis and assembly of their components resulting in production of mature viruses.

A virus like particles (VLPs)

An assembly of virus structural proteins that mimics the configuration of a real virus, except that it contains no genetic material. If a person is vaccinated with VLPs then an immune response is generated as if the immune system has been presented with a real virus. Subviral particles

*Viroids

- Are infectious agents composed exclusively of a single piece of circular single stranded RNA which has some double-stranded regions. They do not contain a capsid.

-Viroids mainly cause plant diseases but have recently been reported to cause a human disease

*Prions

- An infectious particle that does not contain DNA or RNA. It is a protein particle. There are no genetic material.

- Diseases are caused by the conversion of a normal host glycoprotein into an infectious form (e.g. Mad Cow)

The different viruses are classified based the type of genomic nucleic acid, e.g. DNA or RNA, and then further by the number of strands of nucleic acid (e.g. double-stranded DNA, doublestranded RNA or single-stranded RNA. Their host range is also a viral classification consideration .

Viral Structure