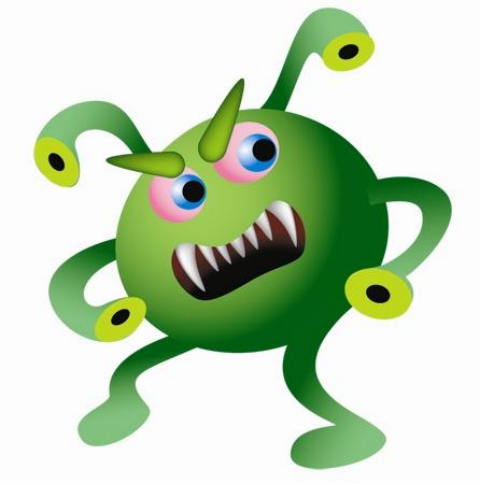
Microbiology Chapter 7 Viruses

7:1 Viral Structure and Classification



VIRUS: a biological particle composed of genetic material (DNA or RNA) encased in a protein coat

CAPSID: protein coat surrounding a virus

OBLIGATE INTRACELLULAR PARASITE: biological particle that requires a host cell to reproduce

VIRUSES ARE NOT CONSIDERED TO BE LIVING ORGANISMS BECAUSE:

1. They do not reproduce by mitosis or meiosis.
2. They cannot carry out cellular respiration.
3. They have no nucleus, cytoplasm, organelles, or cell membrane
4. They require a host cell to use organelles and enzymes to reproduce more viruses.
5. Outside a host cell a virus is a lifeless particle with no control over its own movement.

Viruses differ in their disease causing ability:

1. VIRULENT: virus that immediately causes a disease
2. TEMPERATE: virus that does not immediately cause a disease

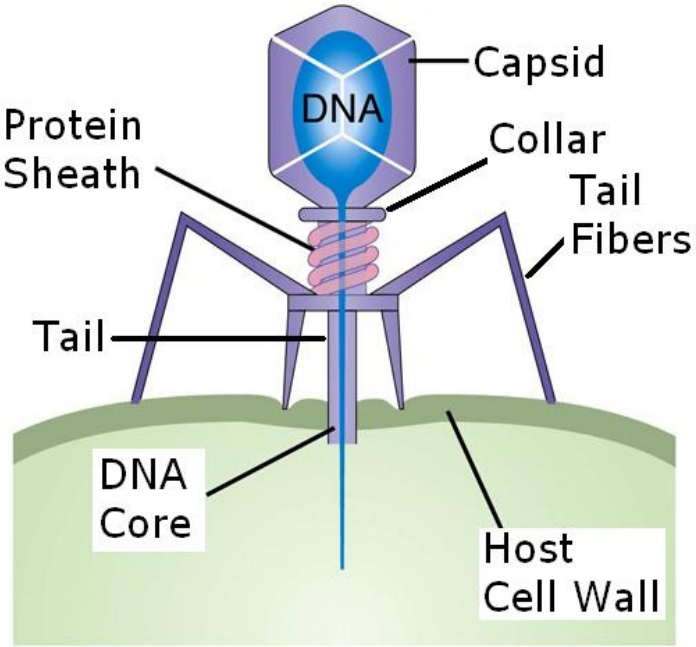
7:2 Viral Structures

Viral capsids may have different shapes.

ICOSAHEDRON: viral capsid shape that is a polyhedron with 20 triangular sides.

Example - cold, polio

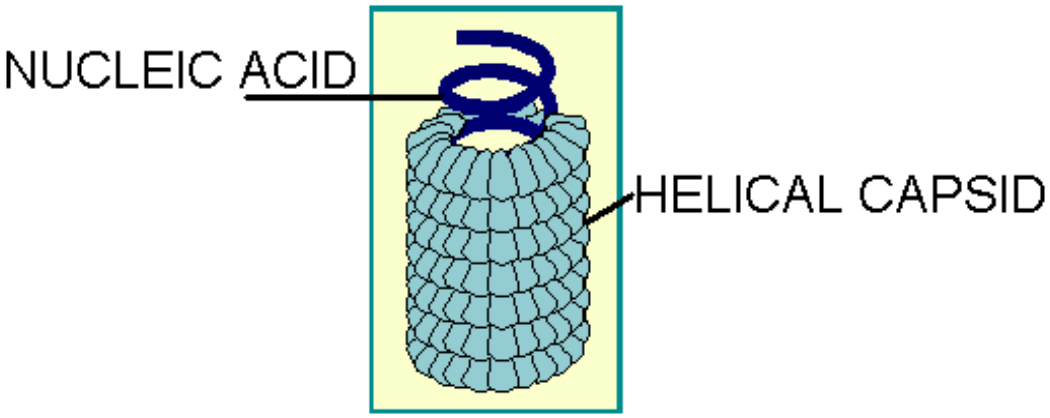
ICOSAHEDRAL VIRUS STRUCTURE



HELICAL: virus with a helically arranged capsid surrounding helical nucleic acid strand.

Example - rabies, mumps

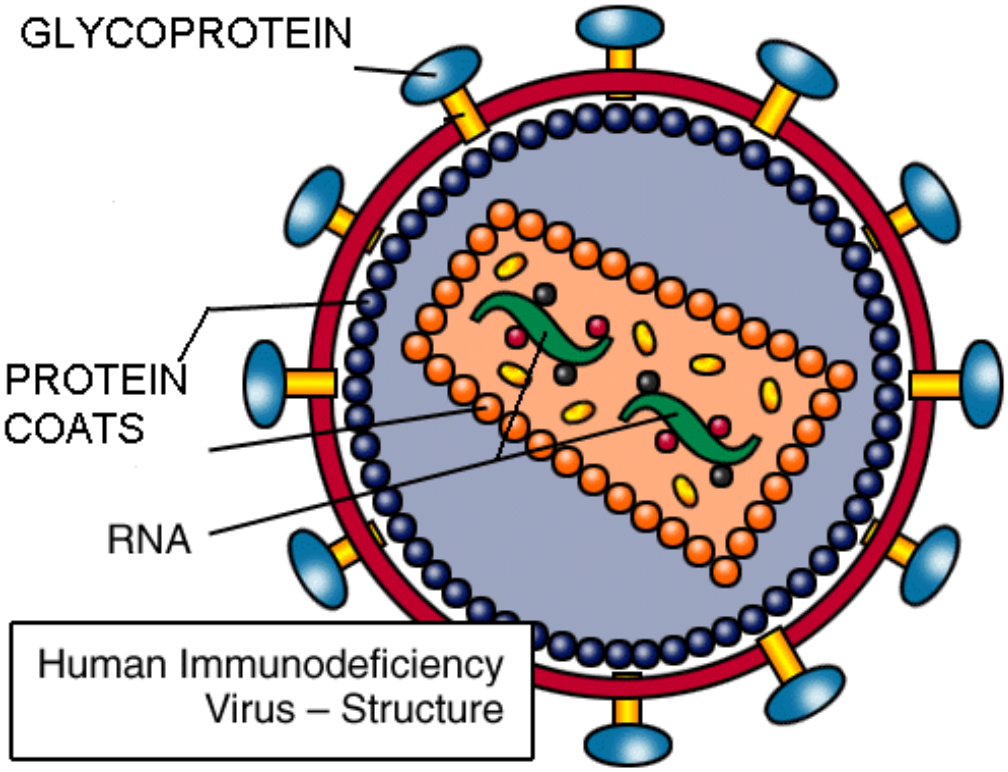
HELICAL VIRUS STRUCTURE



RETROVIRUS: RNA virus that have REVERSE TRANSCRIPTASE, an enzyme that makes DNA from RNA

Example – HIV, the virus that causes AIDS

RETROVIRUS STRUCTURE



This is the most complex viral structure, with two strands of RNA surrounded by two layers of protein surrounded by a layer of lipids with embedded glycoproteins.

7:3 Viral Classifications

→ Viruses contain either DNA or RNA, never both.

→ DNA and RNA viruses differ in the manner in which they alter the machinery of the host cell.

Activities of DNA Viruses

1. DNA produces viral RNA that directs host cell to make viral proteins
2. Viral DNA joins with host DNA then directs host cell to make new viruses.

Activities of RNA Viruses

1. Viral RNA goes directly to cytoplasm of host cell and uses host ribosomes to make viral proteins.
2. May be retroviruses.

How does a Retrovirus act on a host cell?

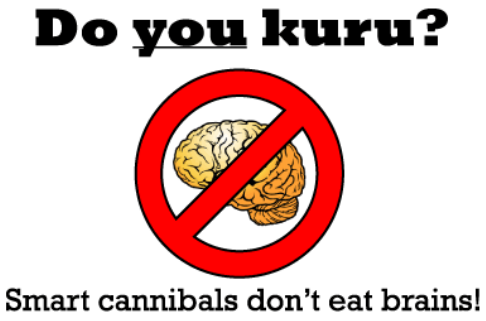
1. Reverse transcriptase allows viral RNA to make viral DNA (opposite of usual).
2. Viral DNA makes new viral RNA.
3. New RNA directs host ribosomes to make viral proteins to construct new viruses.

There are some disease-causing particles that are smaller and simpler than viruses.

VIROID: short single strand of RNA with no surrounding capsid.

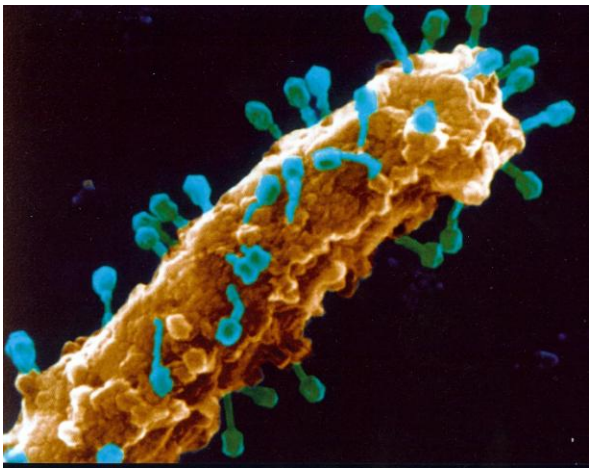
PRION: glycoproteins particle containing a polypeptide of about 250 amino acids.

KURU: degenerative nerve disease caused by a prion; transmitted touching the brains of dead individuals.



7:4 Viral Reproduction

BACTERIOPHAGES: viruses that infect bacteria



Bacteriophages are used to study viral reproduction because their bacterial hosts multiply quickly in culture

T-GROUP PHAGES: most commonly studied bacteriophages, infect E. coli

e.g. T-1, T-2, T-3 (most virulent are even numbers T-2, T-4, T-6)

Structure of a Bacteriophage

1. DNA in viral core is surrounded by a polyhedral capsid.
2. Below the capsid is a protein collar and tail surrounded by a protein sheath.
3. Tail fibers emerge from the tail.

7:5 The Lytic Cycle

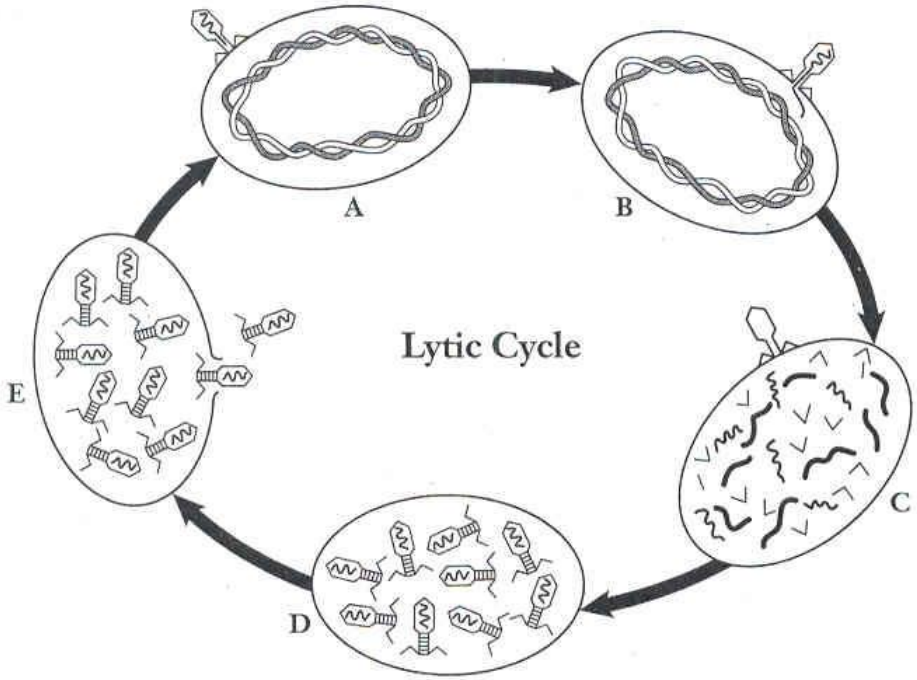
LYSE: to break open
LYTIC CYCLE: fundamental reproduction process in viruses

During the LYTIC CYCLE viruses:

- Enter the cell
- Use its components to make new viruses
- Destroy the cell

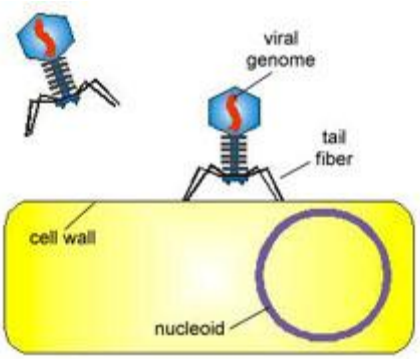
Stages Of Lytic Cycle

A. Adsorption
B. Entry
C. Replication
D. Assembly
E. Release

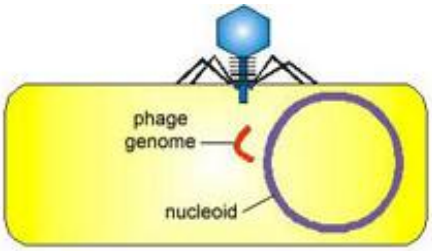


Stages of the Lytic Cycle

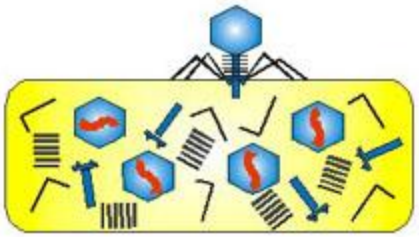
1. ADSORPTION: virus attaches to wall of bacterium with its tail down



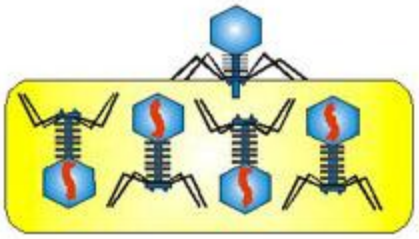
2. ENTRY: DNA core of virus is injected into the bacterium and empty capsid remains



3. REPLICATION: virus DNA is produced instead of bacterial DNA, producing viral proteins



4. ASSEMBLY: virus particles are organized within the bacterium



5. RELEASE: bacterial cell lyses and releases the phage particles