VIRAL REPLICATION

Viral RNA or DNA molecules must be replicated efficiently within an infected cell to provide genomes for assembly into progeny virions.

Attachment/Adsorption
- Penetration
- - Uncoating
- - Biosynthesis
- - Assembly
- - Release
- - Maturation

1. ATTACHMENT / ADSORPTION

- Virus attachment consists of specific binding of a ***Viral Attachment Protein*** to a cellular receptor

- The existence or absence of receptors on the surface of cells determines the ***TROPISM***.

- Virus specific receptor is necessary but not sufficient for viruses to infect cells and complete replicative cycle

2. PENETRATION

- Penetration is an energy-dependent process
- Enveloped viruses penetrate cells through fusion of viral envelope with host cell membrane
- ***ENDOCYTOSIS*** of the virus into intracellular vacuoles; eventually into the cytoplasm. (Non enveloped and enveloped viruses)
- Translocation of the entire virion across the cell membrane

3. UNCOATING

- Occurs after penetration, in which the capsid is removed and the virus genome exposed, usually in the form of a nucleoprotein complex.

- A key step in uncoating is the acidification of the content of the endosome to a pH of about 5
- Makes viral nucleic acid available for transcription to permit multiplication to proceed

4.GENOME REPLICATION & GENE EXPRESSION

- The replication strategy of the virus depends on the nature of its genome.

I: Double-stranded DNA (Adenoviruses; Herpesviruses; Poxviruses, etc)

II: Single-stranded (+)sense DNA (Parvoviruses)

III: Double-stranded RNA (Reoviruses; Birnaviruses)

IV: Single-stranded (+)sense RNA (Picornaviruses; Togaviruses, etc)

V: Single-stranded (-)sense RNA (Orthomyxoviruses)

VI: Single-stranded (+)sense RNA with DNA intermediate in life-cycle (Retroviruses)

VII: Double-stranded DNA with RNA intermediate (Hepadnaviruses)

4.GENOME REPLICATION & GENE EXPRESSION

- (+) RNA toProteins
- (-) RNA to (+) RNA to Proteins
- RNA to DNA to RNA to Proteins
- DNA to RNA to Proteins

5. ASSEMBLY

- Assembly of all the components necessary for the formation of the mature virion
- Process involves bringing together newly formed genomic nucleic acid and structural proteins to form the nucleocapsid of the virus

6. MATURATION

- Maturation proceeds differently for naked, enveloped, and complex viruses.
- The stage of the life-cycle at which the virus becomes infectious
- Involves structural changes in the particle, cleavage of capsid proteins to form the mature products, which frequently leads to a conformational change in the capsid, or the condensation of nucleoproteins with the genome.

7. RELEASE

- lytic viruses (most ***non-enveloped*** viruses), breaks cell; open and releases the virus
- ***Enveloped*** viruses acquire the lipid membrane as the virus buds out through the cell membrane. (Budding)
- Budding viruses do not necessarily kill the cell. Thus, some budding viruses may be able to set up persistent infections.
- Some enveloped and uninfected viruses leave the cell through exocytosis.

ANTIVIRAL THERAPY

The use of antiviral drugs demands great care as an application that can bring many problems with systemic use. Prevention of virus replication is mainly based on targeting the following two periods.

Adsorption and penetration phase

During the Eklips period

Substances that block the adsorption of viruses

- Sulphated polysaccharides (Agar extract, mucopolysaccharide, polyvinylsulphate)

- Detergents

- Antibodies