

# Viral Multiplication

Varies greatly depending on viral structure and genome

Steps are similar

## 1. Attachment/Adsorption to Host Cell

- Relies on interactions between ligands (specific molecules on the virion), and receptors (specific molecules on the host cell)
  - **Receptor-ligand specificity** is partially responsible for the preference viruses have for particular hosts (if they can't interact, the virus can't infect)
    - Preference may be for: specific tissue, more than one host, more than one receptor, etc

## 2. Entry and Uncoating of Genome

- Entry of the genome, or entire nucleocapsid, may enter the host
  - Uncoating of the genome (removal of the capsid) may occur during entry (leaving the capsid outside the cell), or just after entry.
- Mechanisms for penetration and uncoating vary with type of virus, and between naked and enveloped viruses
- Three main methods for entry and uncoating
  - 1. Fusion of viral envelope with host membrane
  - 2. Endocytosis of the virus in a vesicle. (The endosome then aids in genome uncoating)
  - 3. Injection of nucleic acid

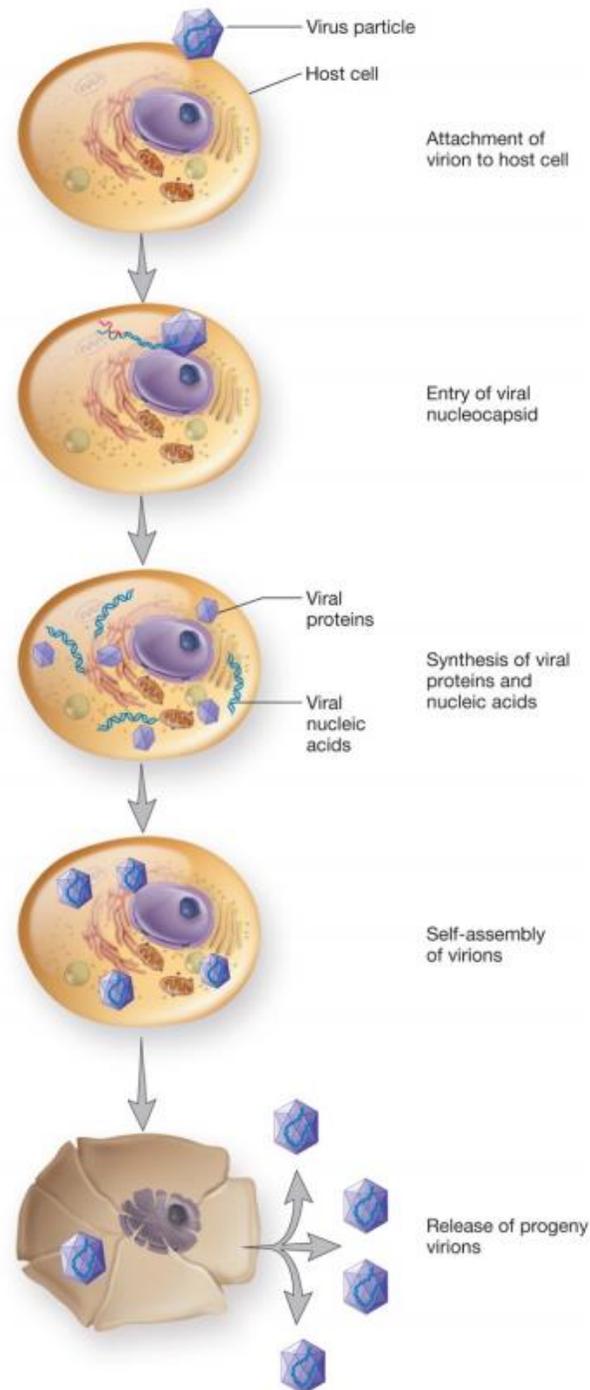
## 3. Synthesis

Differs depending on genome

- dsDNA
  - Similar to normal protein synthesis and DNA replication- transcription, translation, etc
  - Just hijacks the host cell's protein synthesis and DNA replication machinery
- RNA
  - Viruses must carry in, or synthesise the proteins needed to complete synthesis (e.g. RNA polymerase)
- Different genes are expressed at different, tightly regulated, times – only when required, not all at once!
  - Proteins may be “early” (synthesised early) or “late” (synthesised late)

## 4. Assembly

Involves multiple subassembly lines which function independently and converge in later steps to complete nucleocapsid construction



- Varies with different viruses

Late proteins (synthesised late) are important to assembly

- Some are not incorporated in the nucleocapsid, but participate in assembly or virion release

## 5. Release

Two methods

- **Lysing the Host Cell**
  - Common for bacterial viruses and non-enveloped animal viruses
  - Viral proteins attack peptidoglycan or the membrane
  - E.g. Lysis of *E.coli* by T4 bacteriophage – lysozyme attacks peptidoglycan in host's cell wall, holing creates holes in the plasma membrane
- **Budding**
  - Common for enveloped viruses
  - Host cell may survive and continue releasing virions for some time
  - 1. Virus proteins are incorporated into the membrane
  - 2. Nucleocapsid is released and envelope is formed from the host cell membrane (or the golgi, ER, or other internal membranes).
    - The virus may use host actin tails to propel through the host membrane, or a matrix protein may attach to the plasma membrane and aid in budding.