

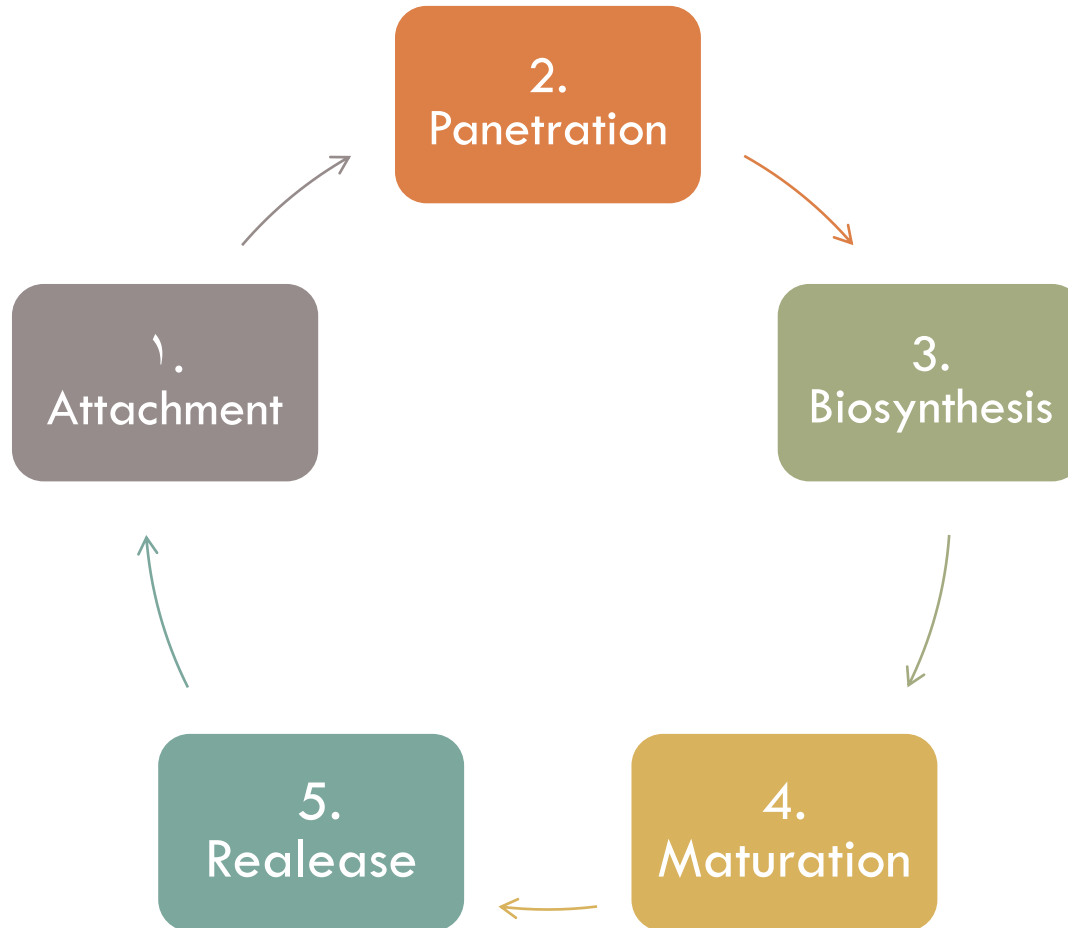
# VIRAL REPLICATION



# Viral Replication and Its Control

- The process of viral replication is one of the most remarkable events in nature.
- A virus invades a living host cell a thousand or more times its size.
- hijacks the metabolism of the cell to produce copies of itself.
- & often destroys the host cell when new virions are released.

# The Replication of virus is a Five-Step Process



# 1. Attachment

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- Animal viruses infect host cells by binding to receptors on the host cell's plasma membrane.

## 2. Penetration

- Some viruses, such as HIV and the adenoviruses, require a second receptor, called a **co-receptor**, for viral penetration into the cytoplasm.
- Animal viruses often are taken into the cytoplasm as intact nucleocapsids.
- For viruses like HIV, the viral envelope fuses with the plasma membrane and releases the nucleocapsid into the cytoplasm.

- For other animal viruses, such as the adenoviruses and influenza virus, the virion is taken into the cell by endocytosis.
- The capsid disassembles from the genome in a process called **uncoating** and the genome is transported to the site where transcription or replication will occur.


# 3. Biosynthesis

- The DNA of a DNA virus supplies the genetic codes for enzymes that synthesize viral parts from available building blocks.
- Most of the DNA viruses, DNA genomes are synthesized in the host cell nucleus.
- The capsid proteins are produced in the cytoplasm.

# RNA viruses follow a slightly different pattern

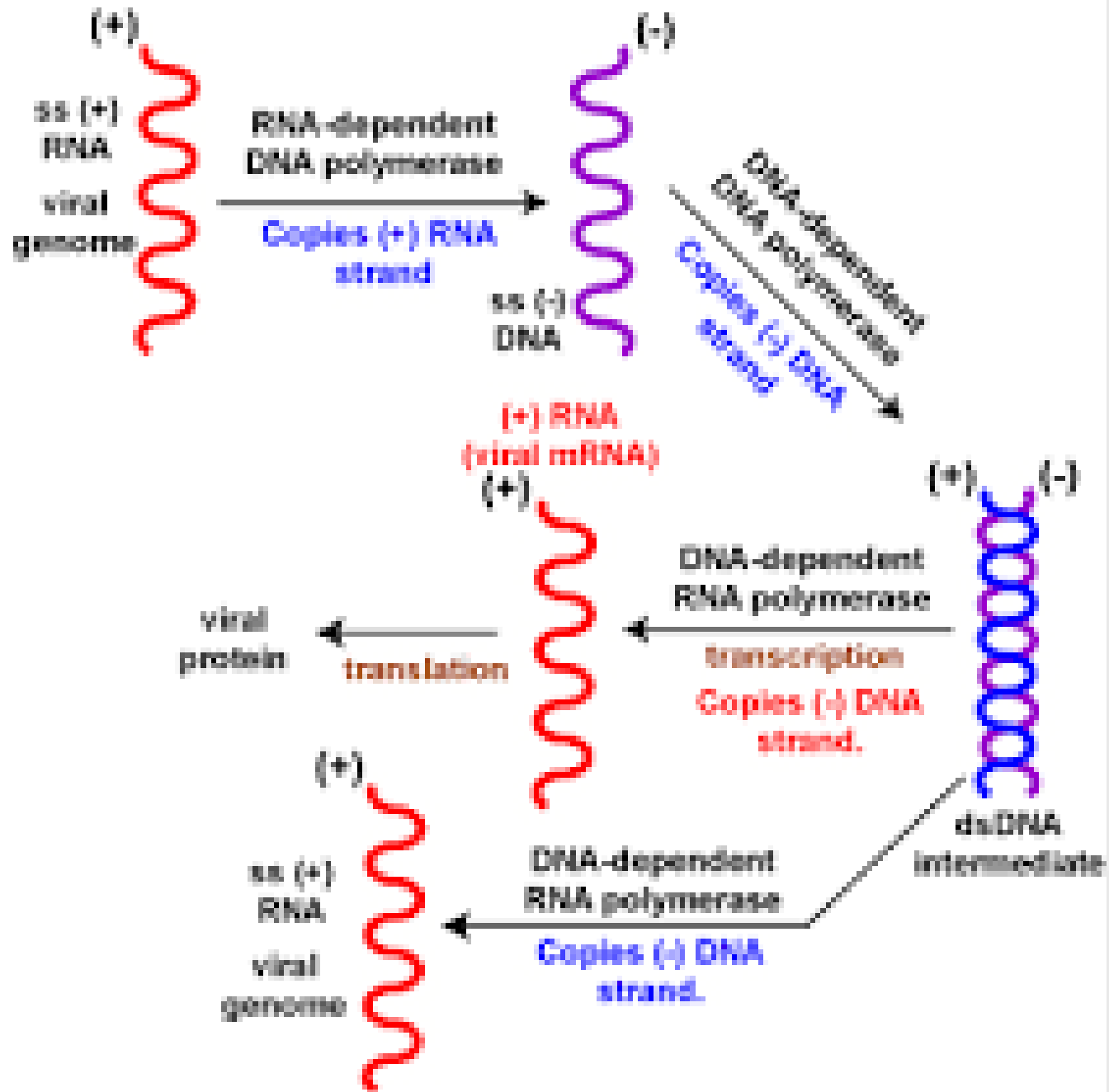
- +ssRNA viruses act as a messenger RNA.
- following uncoating, the RNA immediately begins supplying the codes for protein synthesis as genome replication occurs.
- Other –ssRNA viruses use their RNA as a template to synthesize a complementary(+) strand of RNA.




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- An RNA-dependent RNA polymerase is present in the virus to synthesize the (+) strand.
  - The synthesized +ssRNA then is used as a messenger RNA molecule for protein synthesis as well as the template to form the -ssRNA genome.

# Retroviruses

- In this group of viruses, the virus carries an enzyme, called reverse transcriptase, which is used to reverse +ssRNA into dsDNA.
- The dsDNA then enters the host cell nucleus and DNA inserted into DNA of one chromosome(provirus).
- It is a unique and stable association between the viral DNA and the host genome.



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- The advantage for the virus is that the provirus will be replicated along with the host genome and be present in all progeny cells.
  - In addition, as a provirus, it is protected from attack by antiretroviral drugs
  - However, at any time, the provirus can be reactivated and a productive infection involving biosynthesis and maturation of new virions will occur.

# 4. Maturation.

- For maturation, the proteins are then transported to the nucleus and join with the nucleic acid molecules.
- The final steps of maturation may include the acquisition of an envelope.
- In this step, envelope proteins (spikes) are synthesized and, depending on the virus, incorporated into a nuclear or cytoplasmic membrane.

# 5. Release

- In the final stage, enveloped viruses either:
  - (1) push through the plasma membrane, forcing a portion of the membrane ahead of and around the virion, resulting in an envelope;

# 5. Release

2) As with the herpesvirus, a membrane-enclosed virus fuses with the plasma membrane, releasing the virion.

- This process, called **budding**, need not necessarily kill the cell during release.

It's really nice to wake up in the morning realizing that  
God has given you another day to live.

Unknown quotes



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