CONCEPT: VIRUSES, VIROIDS, AND PRIONS

Viruses

● **Viruses** are small, parasitic particles that rely on other organisms for their _____

□ Viruses are extremely small containing a range of 4-200 proteins

□ A **capsid**, or protein coat, encloses their genetic material (DNA or RNA)

- An **envelope** made up of a phospholipid bilayer, surrounds some viral capsids

- Two main shapes, **Helical** and **Icosahedron,** can describe viral structure

- Does not contain any organelles or cytoplasm, and only a few proteins

□ Viruses cause many diseases in plants and animals, and are typically named after the disease they cause

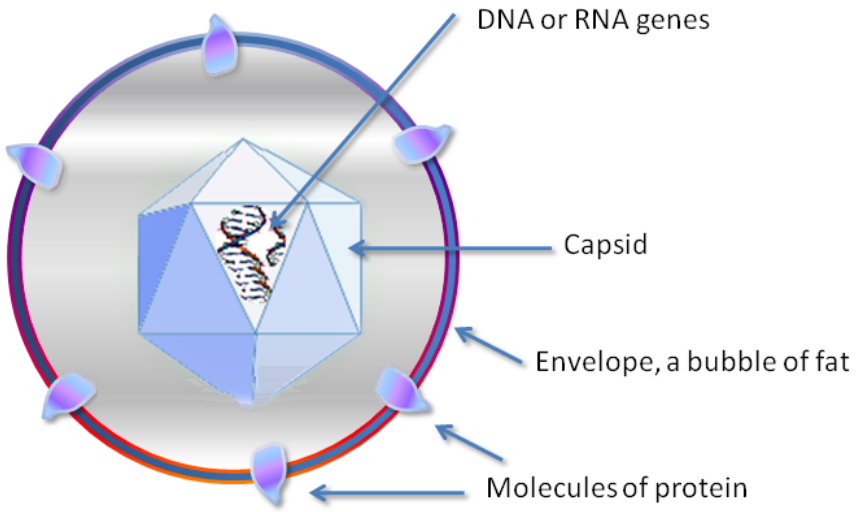
□ Viruses are not _____ as they cannot reproduce independently and do not have metabolic pathways

- Instead, viruses infect host cells and redirect the host's machinery for virus replication

□ Viruses evolved to infect very specific hosts

- **Bacteriophages** infect only bacteria hosts

EXAMPLE: Basic structure of a virus particle



● **Viruses** have two main life cycles

□ The **Lytic Cycle** is responsible for creating _____ viral particles

- Absorption: Virus binds with cell receptors; enveloped viruses are endocytosed

- Penetration: Viruses crosses the plasma membrane

- Replication: Viral genes are replicated

- Assembly: The capsid and genome form into a virus particle

- Release: Virus particles are released, lysing the cell; enveloped viruses **bud** from the cell

□ During the **Lysogenic Cycle** the virus integrates its _____ into the host genome

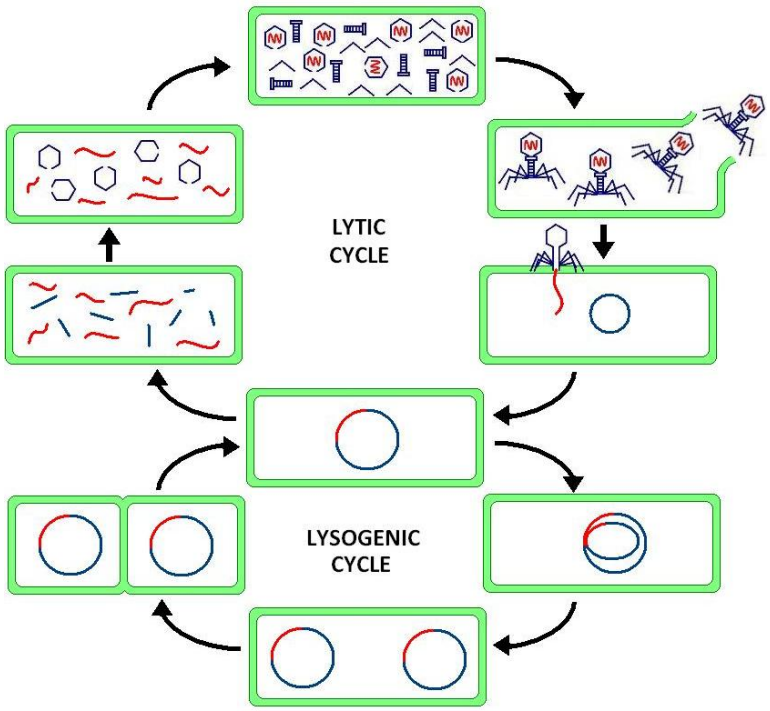
- A **prophage** (provirus) is the term for the integrated DNA

- In bacteria the prophage is released upon DNA damage and can be replicated to create viral particles

- **Virions,** or new viral particles, are continually created by the provirus in some eukaryotic cells

- In some eukaryotic cells the provirus can cause cancer by restricting control over cell division/growth

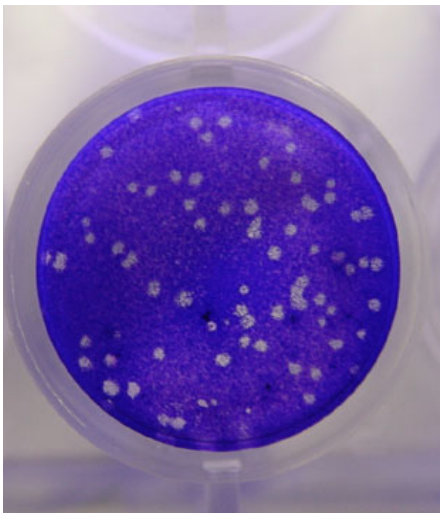
EXAMPLE: Arrow diagram showing the steps of the lytic and lysogenic cycles



Viruses and Research

- **Viruses** are used by scientists to study cell biology and cancer
    - □ **Plaque assays** are used to calculate the amount of virus in a sample

EXAMPLE: A plaque assay output

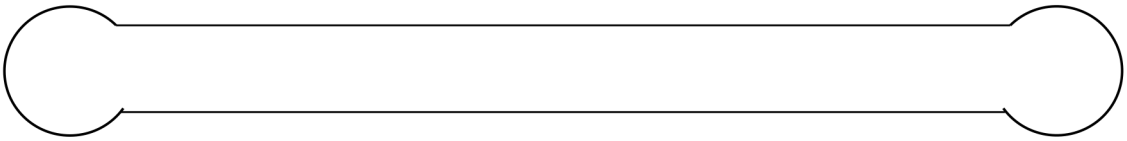


- □ **Retroviruses** are enveloped _____ viruses that incorporate their genome into the host cell chromosomes
    - The RNA undergoes **reverse transcription** to create two identical DNA strands
    - This DNA is integrated into the host chromosome (provirus)
    - The viral gene is expressed through host cell transcription and translation
    - Scientists use retroviruses to express genes of interest into cells

Viroids and Prions

- **Viroids** and **Prions** are two other types of nonliving infectious particles
    - □ **Viroids** are small circular infectious _____ molecules found in plant cells
        - They can be transferred between damaged plant cells
        - They interfere with proper plant gene expression
    - □ **Prions** are infectious particles made from abnormally folded cellular _____
        - Mainly cause neurological diseases (ex. Mad Cow Disease)
        - Not destroyed by cooking

EXAMPLE: Basic viroid structure



PRACTICE:

1. Which of the following is true?
    a. Viruses, viroids, and prions are all living infectious agents
    b. Viroids have two main life cycles: the lytic and lysogenic cycle
    c. Viruses have two main shapes: icosahedron and circular
    d. Viruses, viroids, and prions are all non-living infectious agents

2. During which life cycle is the virus making more copies of itself?
    a. Lytic Cycle
    b. Lysogenic Cycle

3. True or False: Retroviruses are able to integrate their genome into the host cell?
    a. True
    b. False