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Viruses - 1

Order of Topics Covered:

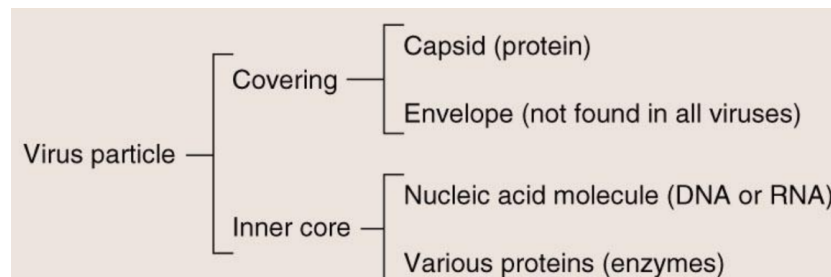
1. What is a Virus?
2. Structure of a Virus
 - a. Virus Shapes
 - b. Bacteriophage
3. Virus Reproduction
 - a. Lytic cycle
 - b. Lysogenic cycle
4. Retroviruses
5. Effects of Viruses On Human Health
6. Viruses - Living or Non-Living

What is a Virus?

- A **virus** is a **non cellular** particle made up of **genetic material** and **protein** that can invade living cells.
- The name “virus” comes from the Latin word meaning **poison**.
- At the end of the 19th century, the **first** virus discovered was called the **tobacco mosaic virus**.

Structure of a Virus

- A typical virus is made up of outer **protein capsid** and inner **nucleic acid core**.
 1. Core - either **DNA** or **RNA** but never both.
 2. **Capsid** - protects the nucleic acid core.
- Some viruses steal a portion of the cell’s membrane as an outer layer called an **envelope**.



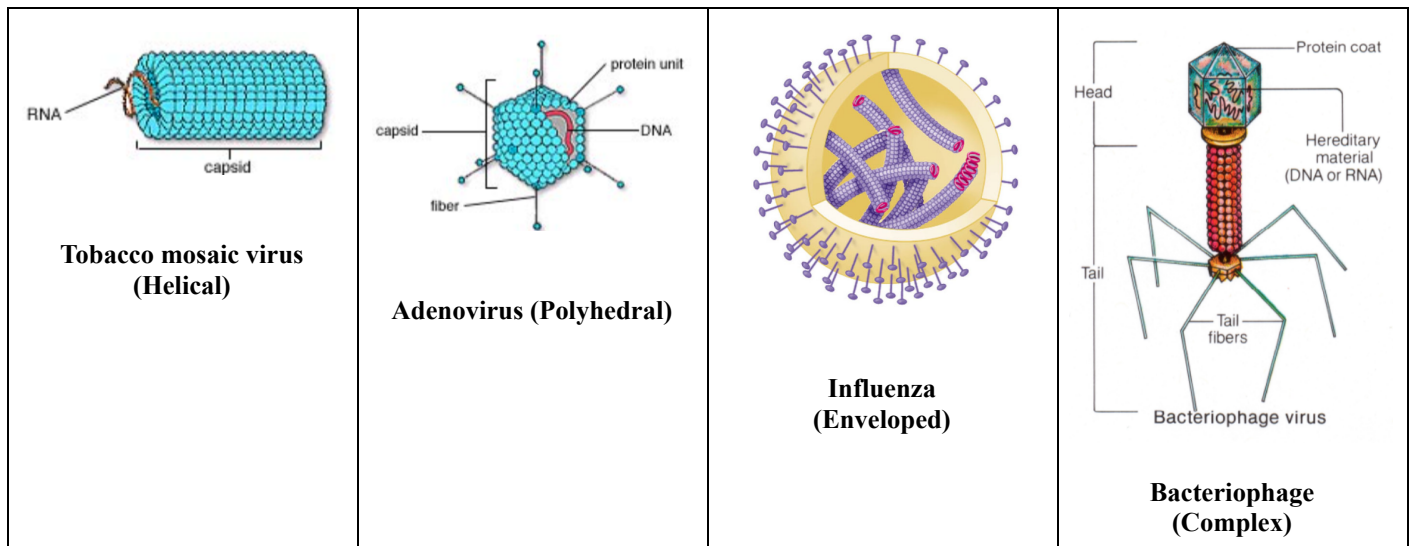
Structure of a Bacteriophage

- A **bacteriophage** is a virus that ONLY infects **bacteria**.
 - A bacteriophage has a **head** region (composed of a capsid), a nucleic acid core and a **tail**.
 - The **tail fibers** are used by the virus to attach to the bacteria.

Virus have many shapes:

- **Irregular** or **tadpole** – Example: T4 bacteriophage.
- **Rod shaped** - Example: Tobacco mosaic virus.
- **Spherical** - Example: Adenovirus and Influenza.

Examples of a few different viruses:

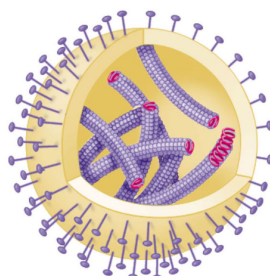


*See some creative Virus artwork at the Met:

<http://www.mymodernmet.com/profiles/blogs/luke-jerram-glass-microbiology>

The diagram below is of a typical influenza virus. It belongs to a type of viruses that are surrounded by a membrane envelope.

- Label: RNA, protein coat, membranous envelope and glycoprotein spike.



Virus Reproduction

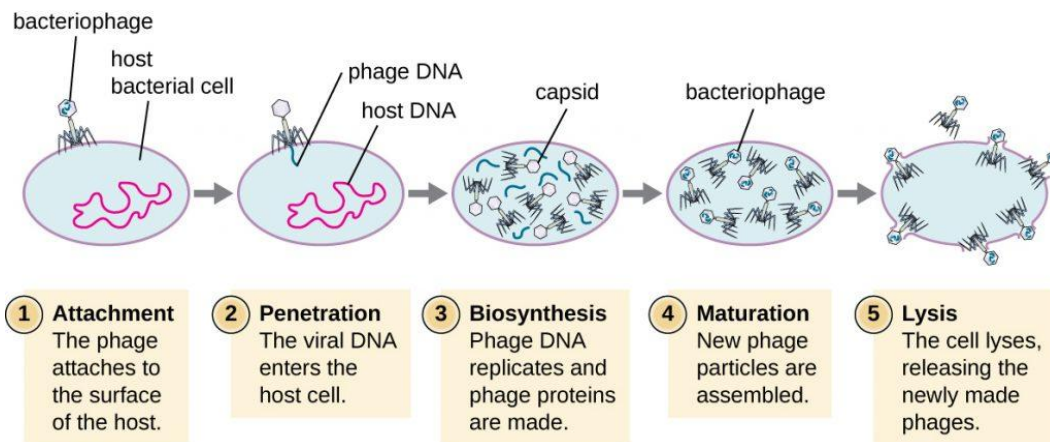
- There are 4 MAIN STEPS to viral reproduction:
 - 1) Virus attaches to cell and nucleic acid enters cell – either injects DNA/RNA or whole virus enters cell.
 - 2) Replicate parts – nucleic acid, capsid, envelope...= Synthesis
 - 3) Assemble new viruses from parts.
 - 4) Cell lysis or viral release from infected cell.
- Viruses infect bacteria by the **lytic** cycle or **lysogenic** cycle

Flu Attack! How A Virus Invades Your Body

https://www.youtube.com/watch?v=Rpj0emEGShQ&ab_channel=NPR

A) LYTIC CYCLE

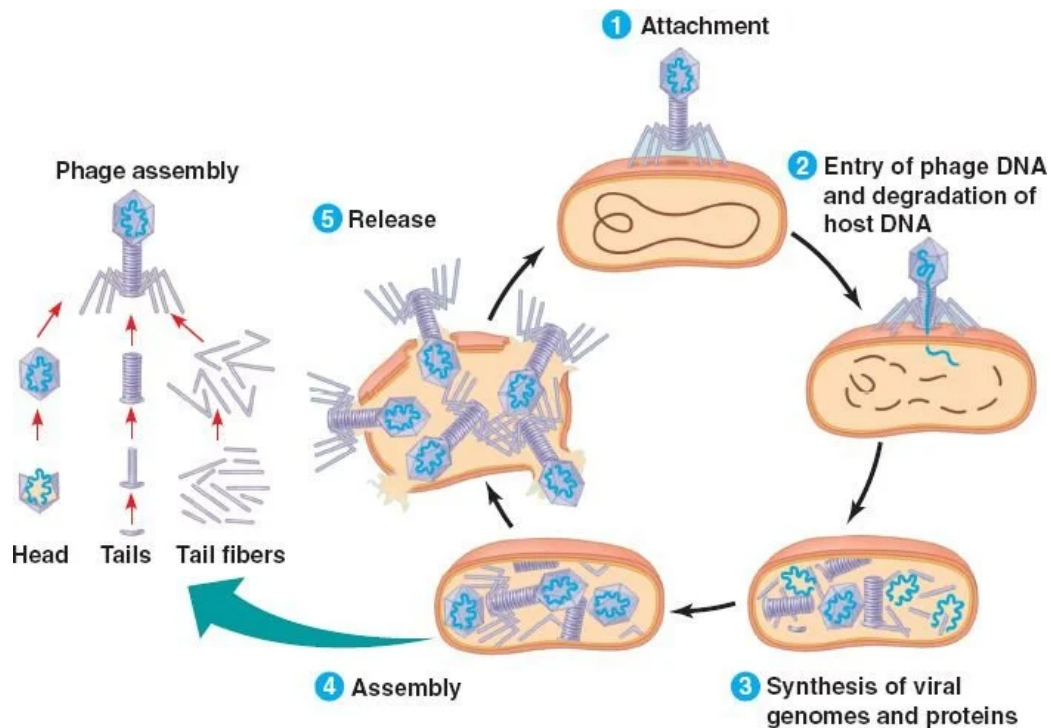
- Causes the disease **right away**.
- Steps of the lytic cycle:
 - 1) Bacteriophage tail fibers **attach** to the surface of a bacterium.
 - 2) Virus inserts its DNA into the **bacterium cell**.
 - a. Bacterium cell cannot tell the **difference** between its own DNA and the DNA of the virus.
 - 3) Virus uses materials of the bacterium cell to **make copies** of its own protein coat and DNA
 - 4) New viruses **assemble**.
 - 5) **Infected cell explodes (lyses)**, releasing them new viruses that may infect other cells.
- Examples of lytic viruses: **Common cold, Influenza, Ebola**



B) LYSOGENIC CYCLE

- Lysogenic cycle: sometimes a virus doesn't kill host cell right away or immediately cause the disease – it may **coexist** with the host for a period of time.
- Steps of the lysogenic cycle:
 - 1) Virus inserts its DNA into the **DNA** of the bacterium cell.
 - 2) Genetic material is inserted **into the host cell's DNA**
 - 3) Viral genes go **dormant** for an undetermined length of time, but are copied with the host cell's DNA without warning
 - 4) The cell will **switch** into the lytic cycle, releasing many viruses.
 - a. Factors that can activate the virus:
 - i. a. Sudden changes in **temperature**
 - ii. b. Availability of **nutrients**
- Examples of lysogenic viruses: **Herpes, Hepatitis, HIV**

Life Cycle Summary



Lytic cycle

<http://www.youtube.com/watch?v=41aqxcxsX2w&feature=related>

Flu

<http://www.youtube.com/watch?v=Rpj0emEGShQ&feature=related>

Retroviruses

- Have **RNA** as nucleic acid.
- Which modern, devastating disease is caused by a retrovirus? **AIDS**
- What is the virus called? **human immunodeficiency virus (HIV)**