# Viruses

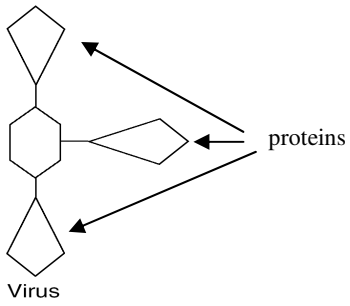
**Viruses** are made up of nucleic acids (DNA or RNA) surrounded by a protein coat. They are smaller than the smallest bacterium.

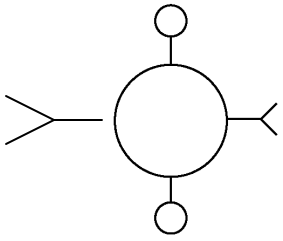
Viruses consist of **nucleic acid** (genetic material) surrounded by a **capsid** (protein coat).

Most scientists consider viruses to be nonliving because they can't carry out the most basic processes of life. Viruses can't metabolize (break down) food to release energy (carry out respiration) or grow.

The only thing that viruses can do is replicate (copy themselves), but to do that they need the help of a living cell. The living cell in which a virus replicates is called its **host cell**.

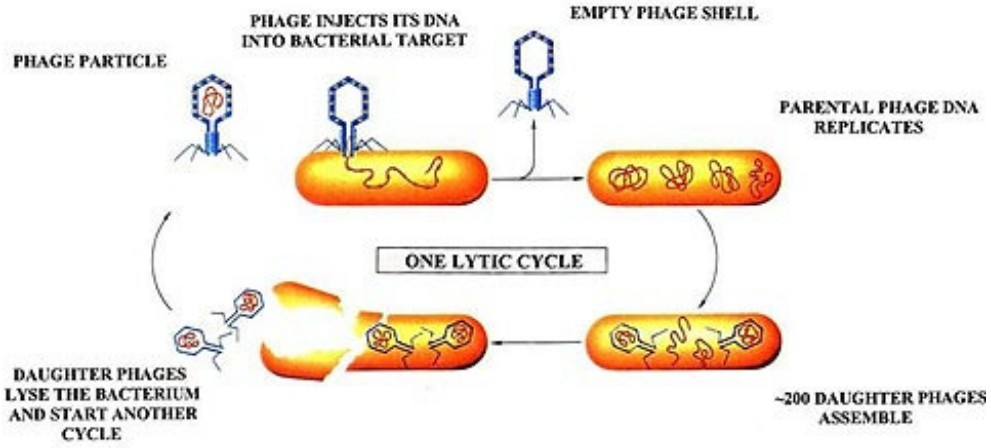
There are proteins on the surface of a virus that allow it to attach to a host cell. (The shape of the protein on the virus must fit the shape of the receptor on the host.) For example, the virus shown below could infect the cell pictured because their shapes would fit together.



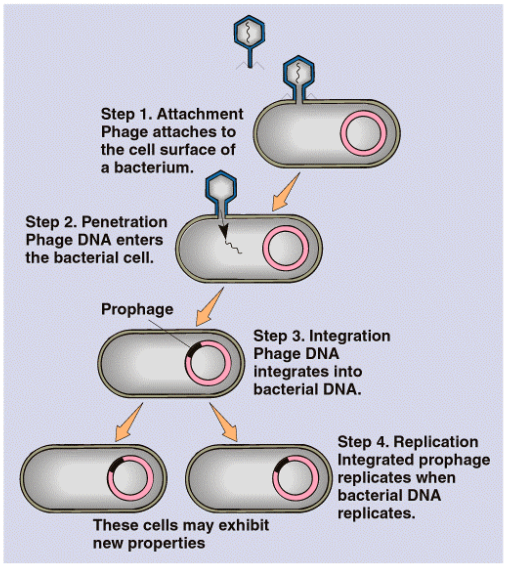


Host cell

When a virus infects a host cell, it injects its DNA or RNA into the host and takes control.

If the host cell makes many copies of the virus (replicates viral DNA), the new viruses explode from the cell and kill the host. The **lytic cycle** is characterized by viral infection, replication and cell destruction.



Sometimes, when a virus infects a host cell, it may stay inside the cell but not make new viruses. This is called the **lysogenic cycle**. The virus' DNA becomes a part of the host cell's DNA, and every time the host cell copies and divides, it also copies viral DNA. The viral DNA may remain inactive (a provirus) for a long time, but it can become active when it frees itself from the host's chromosome, which triggers the lytic cycle.

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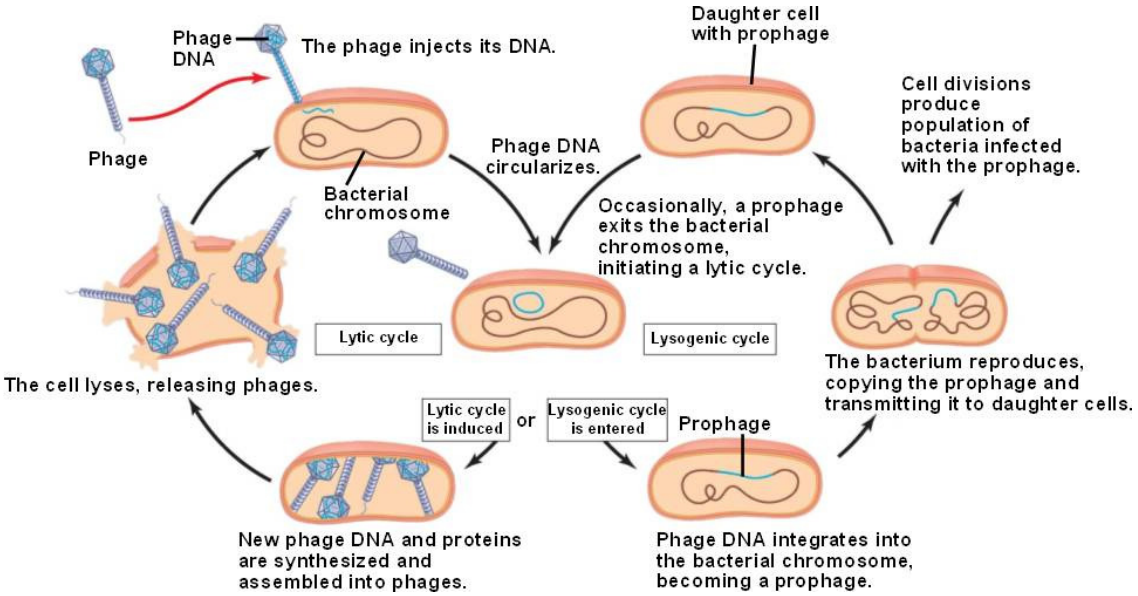
**Relationship Between Lytic and Lysogenic Replication Cycles**




Viruses cause human diseases, many of them serious. Some examples of diseases caused by viruses are AIDS, the common cold, rabies, influenza (flu), hepatitis, chicken pox, and warts. Doctors cannot use antibiotics to treat viruses; antibiotics are used to treat bacterial diseases. Antibiotics attack certain life processes that nonliving viruses do not carry out.

Doctors can prevent some viruses using **vaccines**. Vaccines are harmless viruses that stimulate your immune system to fight off harmful viruses. Remember that viruses have proteins on their surfaces that allow them to infect their host cells. Some viruses do not change very often, so the vaccines for these viruses remain effective- smallpox, polio, and measles are all easily prevented using vaccines. However, some viruses have surface proteins that mutate (change) often, and the immune system can't recognize constantly

changing surface proteins. You may be vaccinated today against the flu, but after the virus mutates and forms a new strain, you could become infected again.

**HIV**, the virus that causes **AIDS**, is one of the most rapidly changing viruses, which is why it is not possible at this time to develop a vaccine against it. AIDS (Acquired Immune Deficiency Syndrome) attacks the body's **helper T cells**, a part of the immune system- the body is unable to defend itself against infections. Most people infected with HIV only develop symptoms years after that have been infected, so an HIV infected person can feel healthy but still spread the disease to others

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## PRACTICE

1. Viruses can reproduce only under which of the following conditions?
   A. When they are outside a living organism
   B. When they carry out respiration
   C. When they grow or move
   D. When they are inside a host cell

2. What is the main function of the projections on the surface of a virus?
   A. They aid in respiration
   B. They help the virus grow
   C. They help the virus invade its host
   D. They help the virus digest food molecules

3. Which of the following cannot metabolize nutrients?
   A. Viruses
   B. Fungi
   C. Animals
   D. Bacteria

4. What do viruses have in common with living cells? They both…
   A. store genetic information in DNA and RNA
   B. have chloroplasts
   C. use glucose for cellular respiration
   D. have endoplasmic reticulum

5. Which of the following statements is true?
   A. Viruses have no DNA or RNA
   B. Viruses use host cells to reproduce
   C. Viruses contain no proteins
   D. Viruses can be killed by antibiotics

6. Which of the following happens as part of both the yltic cycle and the lysogenic cycle?
   A. New viruses are made
   B. The host cell dies
   C. The entire virus infects the cell
   D. The virus injects its nucleic acid into the host cell

7. The lytic cycle involves several steps. Which of the following is the final step of the lytic cycle.

A. the host cell bursts
B. the virus injects its nucleic acid
C. new viruses begin to be made
D. the viral DNA becomes part of the host cell's DNA

8. What type of cell does HIV attack?

9. Why don't antibiotics work against the flu?

10. Why do scientists consider viruses to be nonliving?