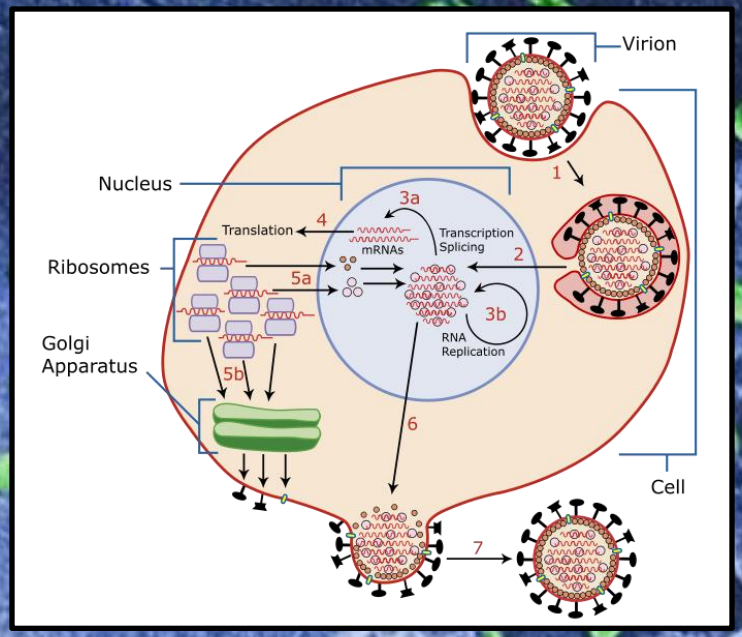
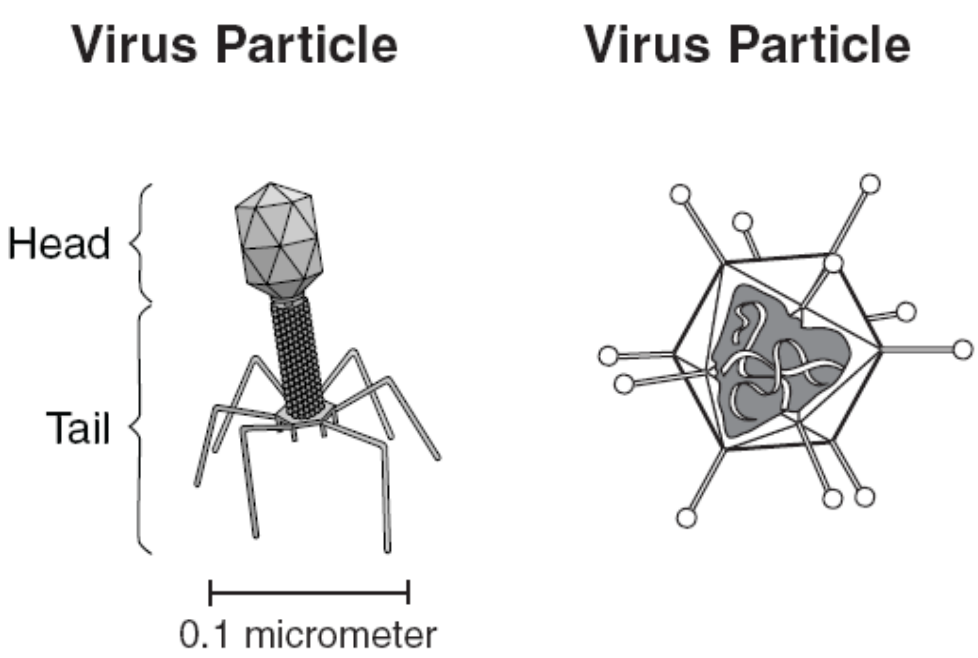
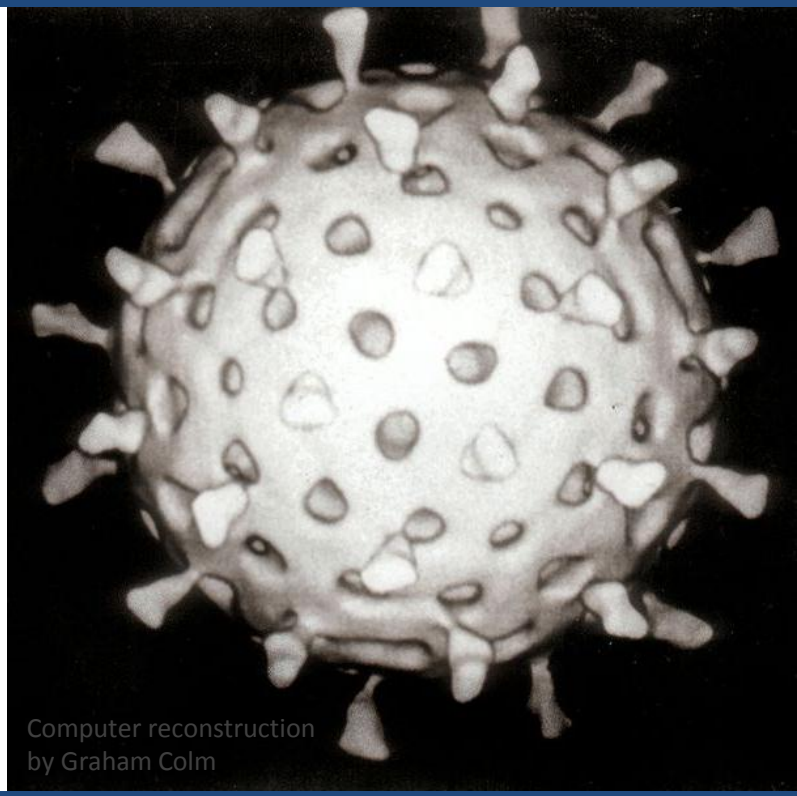


Viral Reproduction





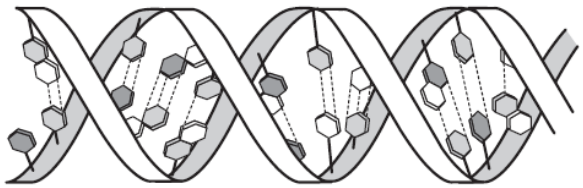
Viruses are **NOT** considered to be alive because they do not meet ALL of the requirements of life.

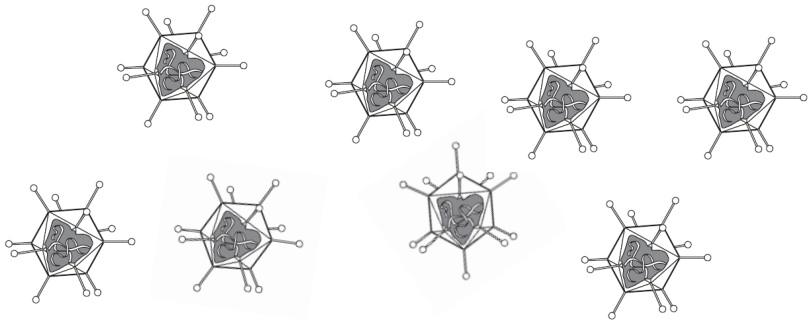
Viruses are ***NOT*** made of cells and viruses ***CANNOT*** metabolize nutrients.

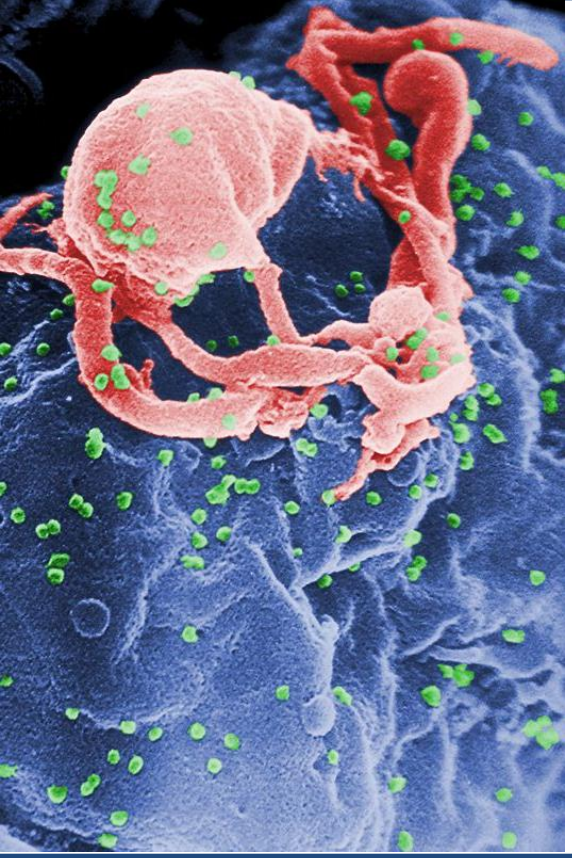
Comparing Viruses and Cells

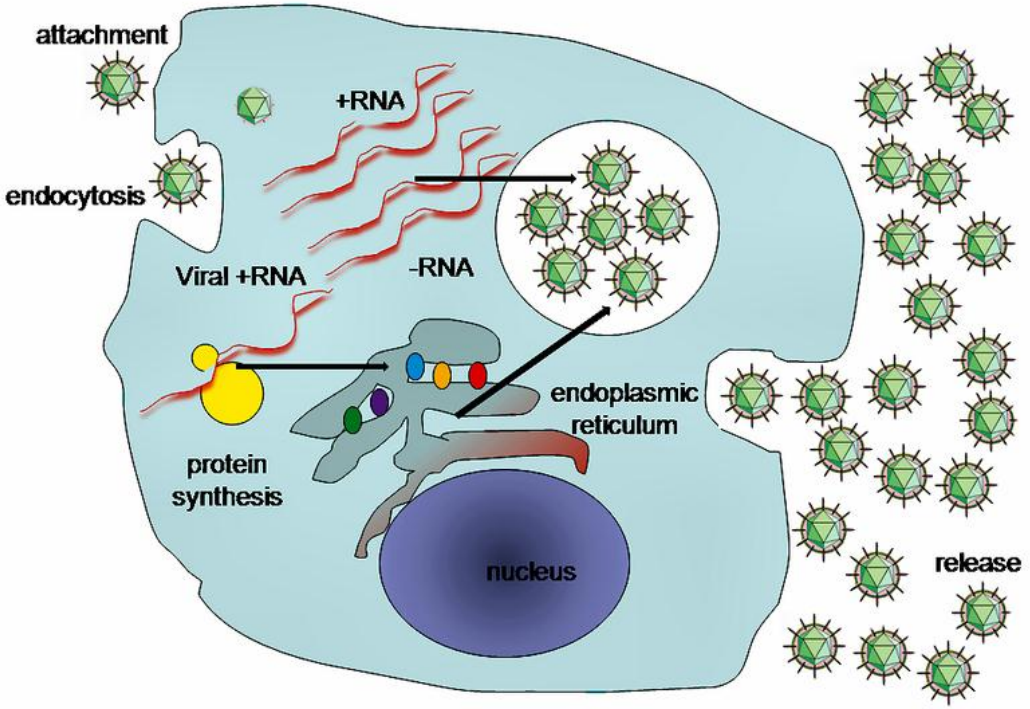
However, viruses do have 2 very important things in common with living cells.

They both have genetic material and they both reproduce themselves.





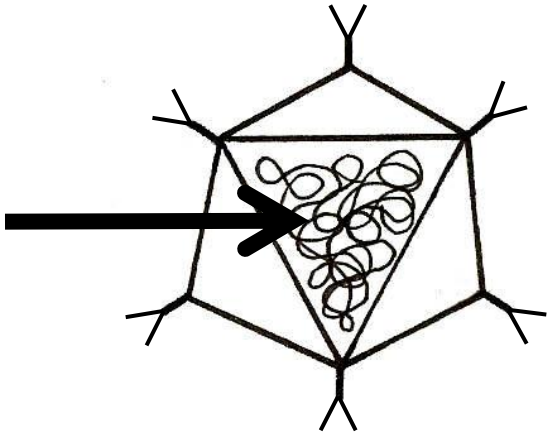




Important Fact: *Viruses can only reproduce themselves with the help of a* ***host cell****.*

Comparing Viruses and Cells

Genetic Material
(DNA or RNA)

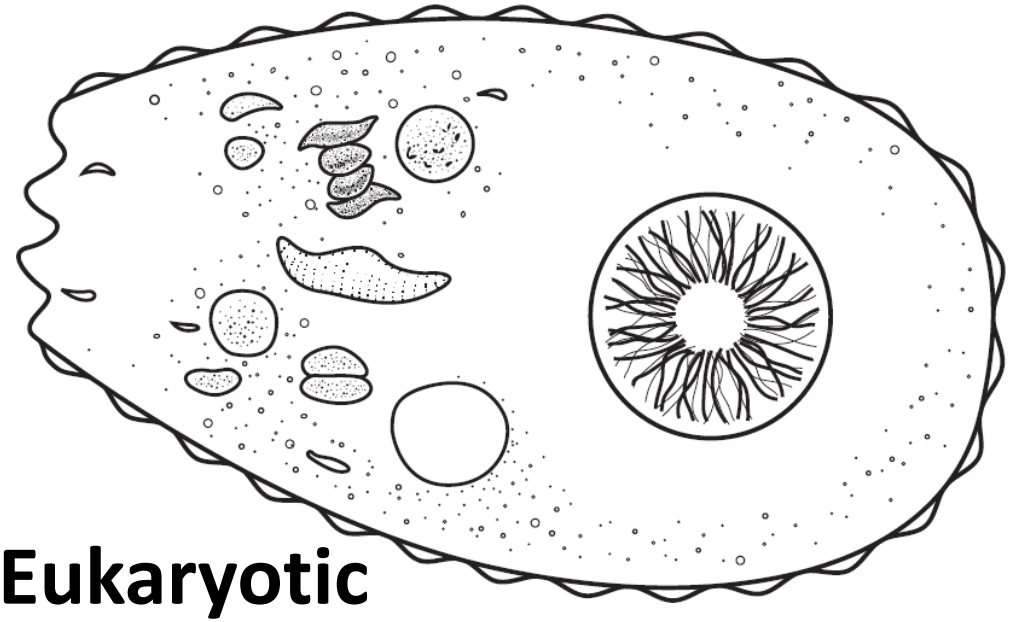


Viruses carry the instructions for making more viruses in the form of genetic material. This is either a strand of DNA or RNA.

The Size of Viruses

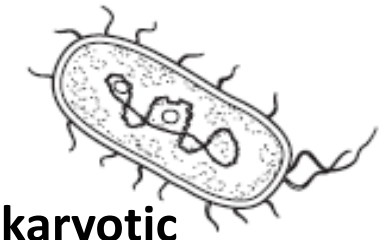
How do viruses compare to eukaryotic and prokaryotic cells in size?

Eukaryotes are bigger than prokaryotes; prokaryotes are bigger than viruses.



Eukaryotic Cell

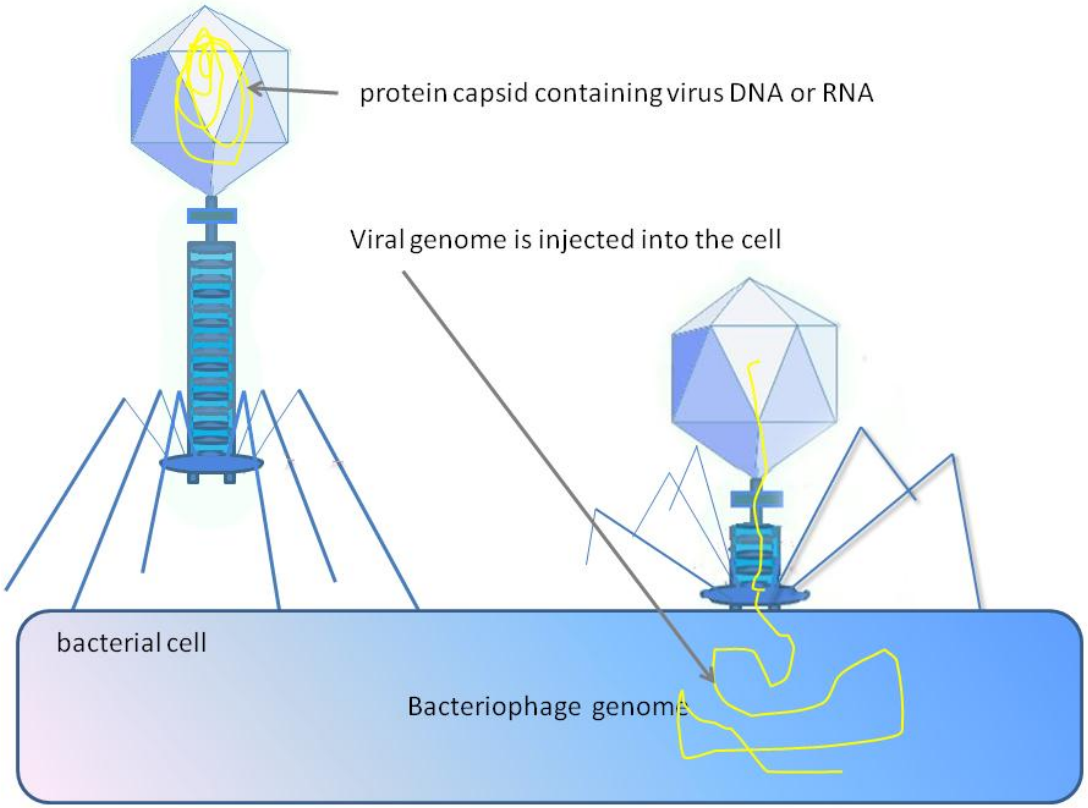
Virus

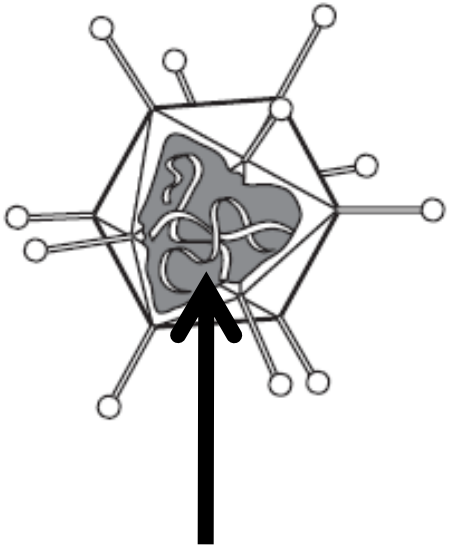


Prokaryotic Cell

The Structure of Viruses

All viruses contain genetic material in the form of DNA or RNA.

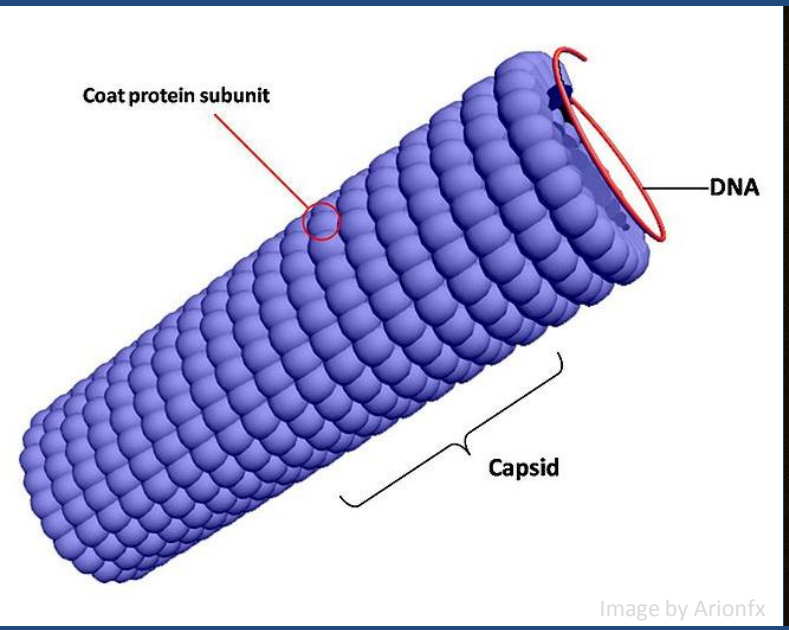


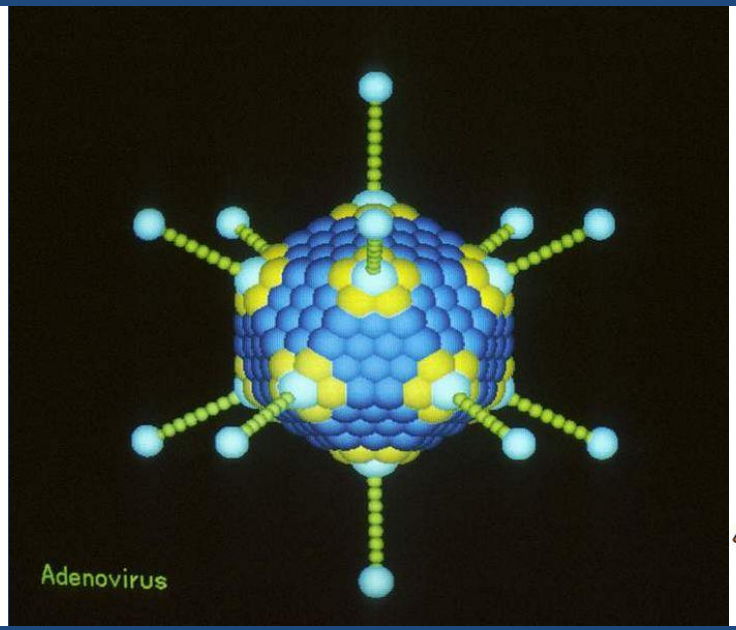


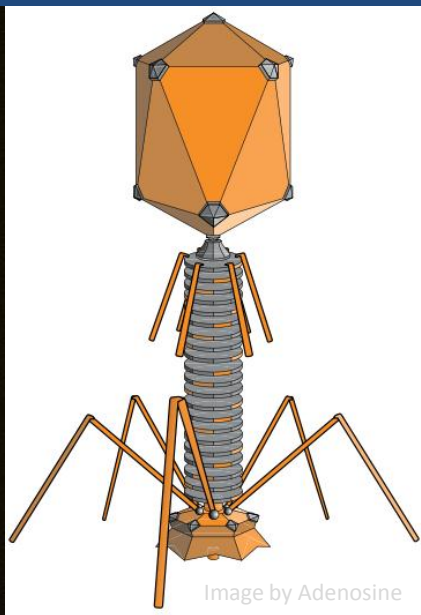
Genetic Material (DNA or RNA)

The Structure of Viruses

This genetic material is stored inside of a **protein shell**. This protein shell is known as the **capsid**.

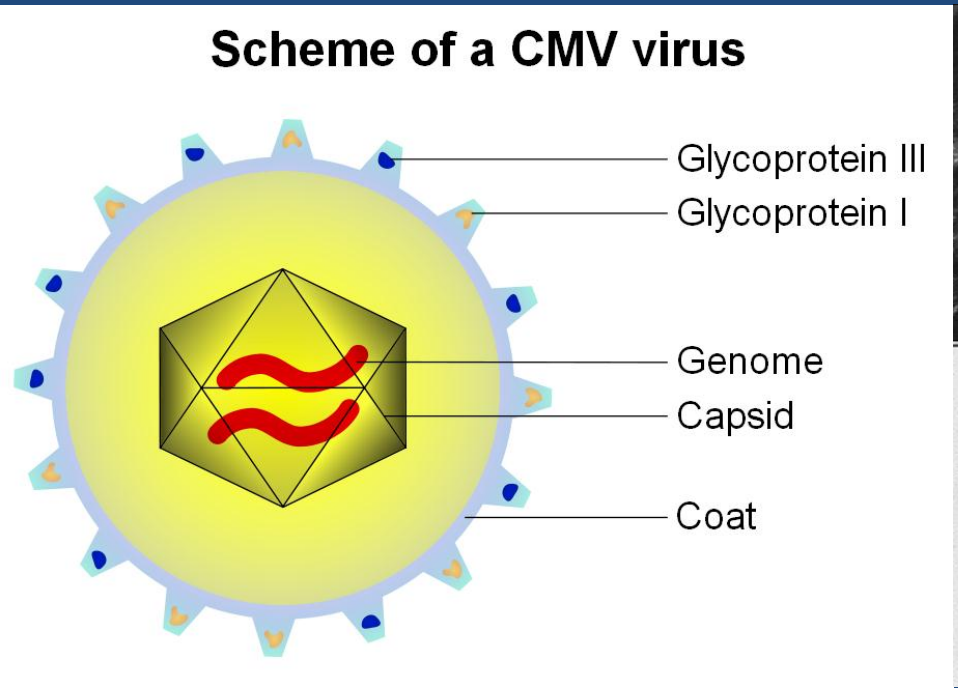


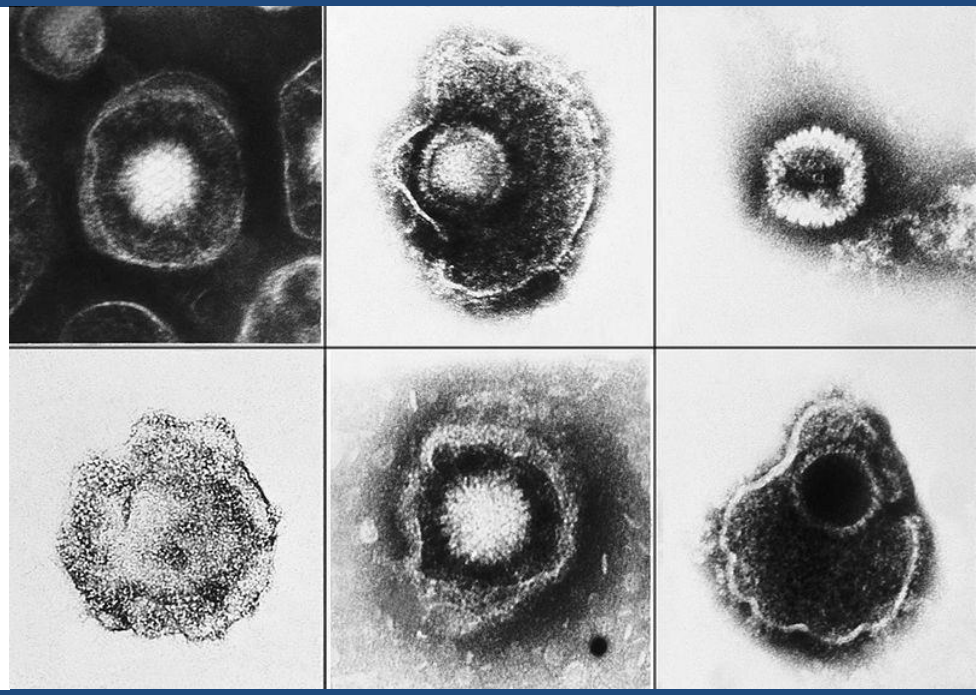




The Structure of Viruses

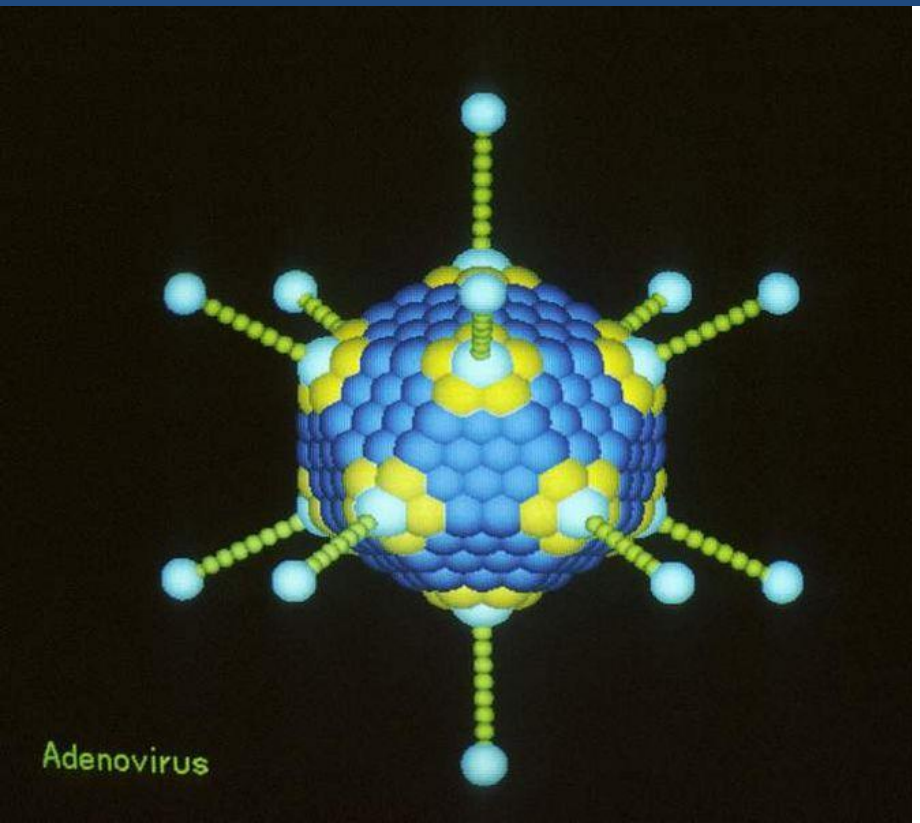
Some viruses contain a layer of ***cell membrane*** known as the **envelope**. This piece of cell membrane was taken from the **host cell** that was forced to make the virus.

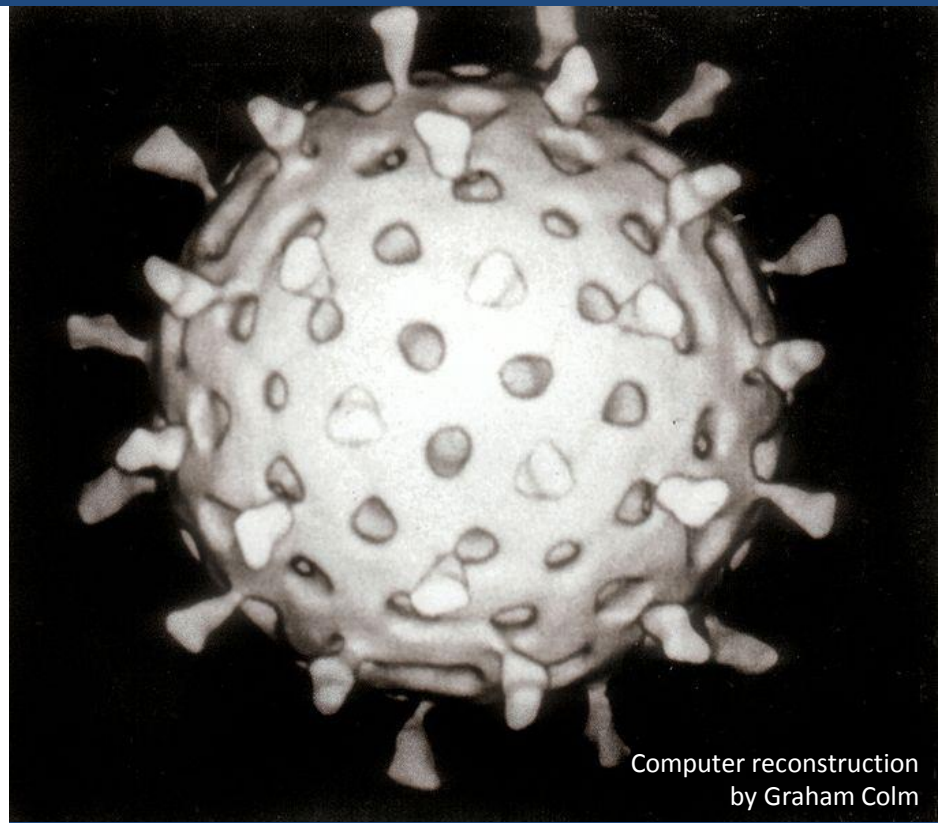




The Structure of Viruses

Viruses often have protein surface markers surrounding their capsid. These proteins are critical to how the virus *attaches to its host cell* before an infection.

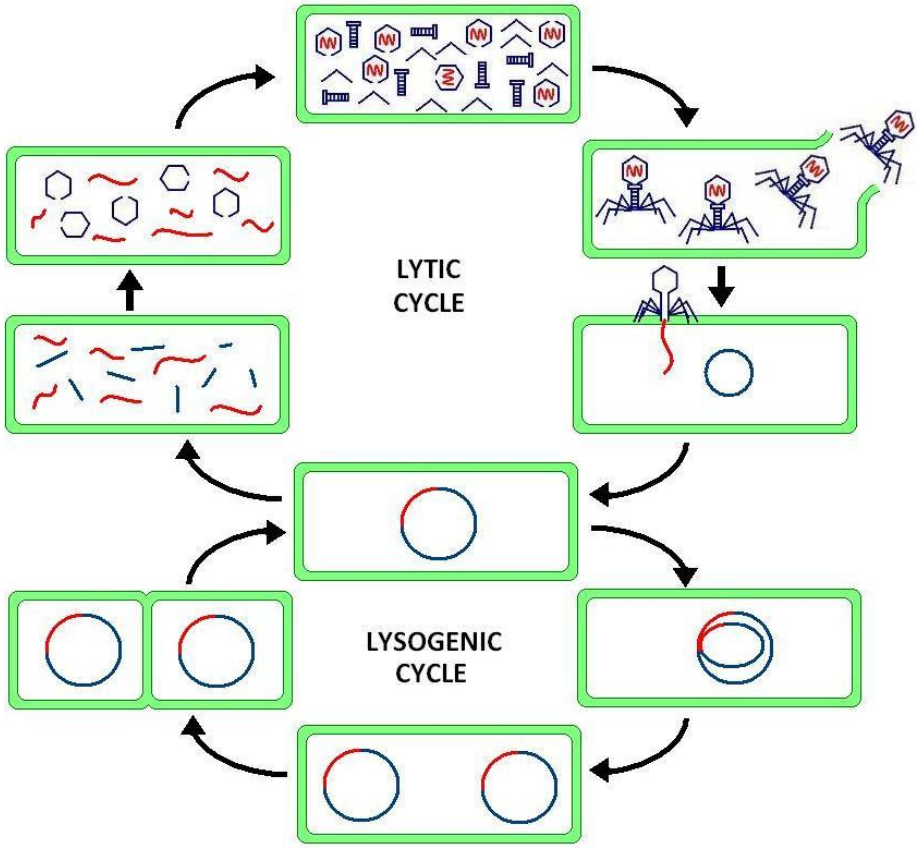




Viral Reproduction

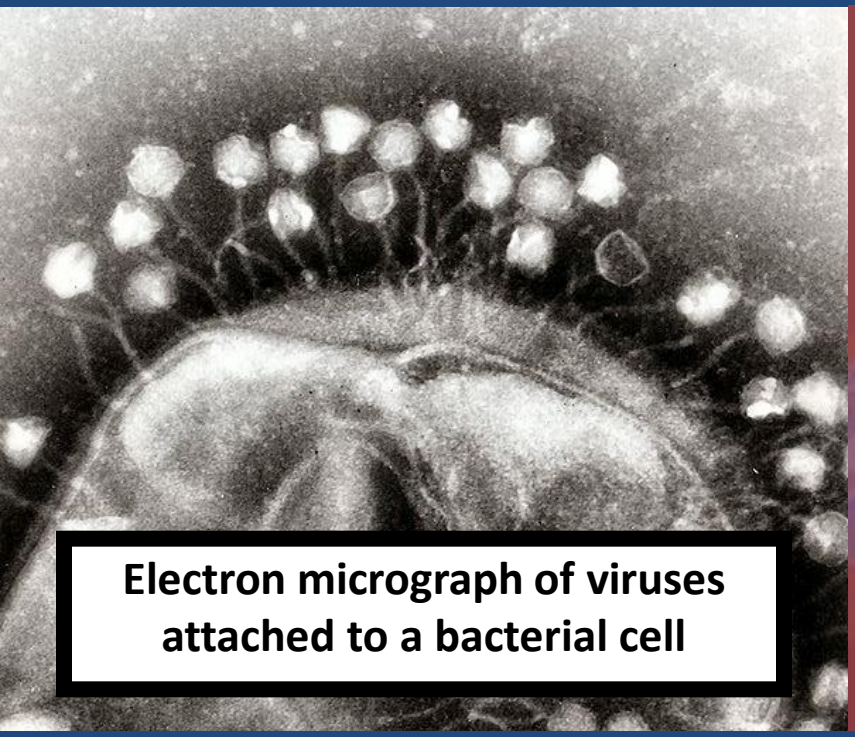
There are two methods of viral reproduction. These are the **lytic cycle** and the **lysogenic cycle**.

*First, we will discuss the **lytic cycle**.*



Viral Reproduction: Lytic Cycle

Step 1: The virus attaches to the host cell.



Electron micrograph of viruses attached to a bacterial cell

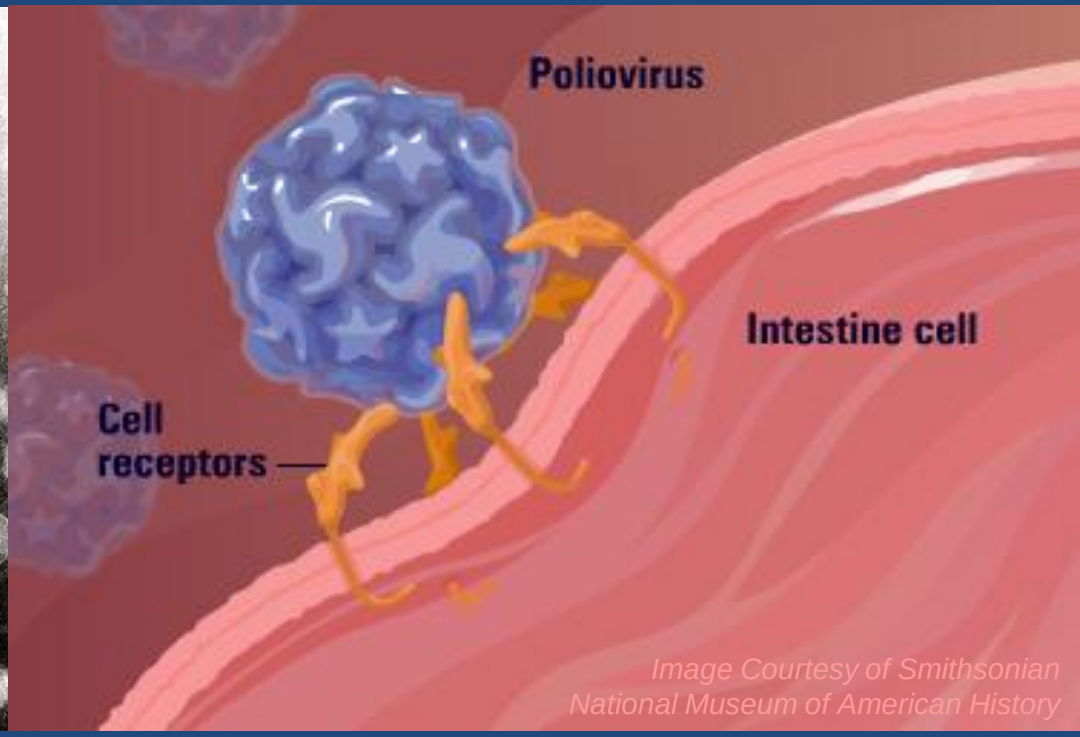
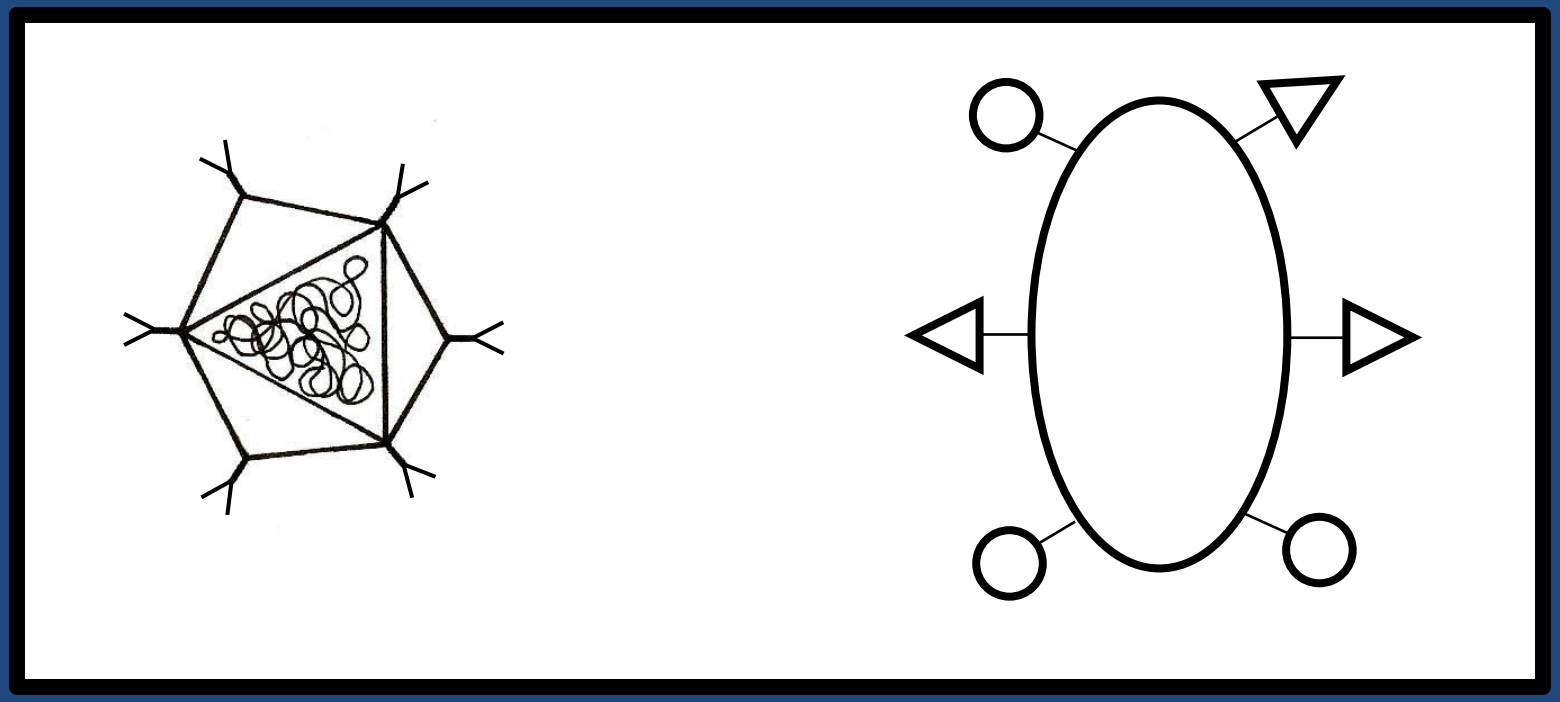


Image Courtesy of Smithsonian National Museum of American History

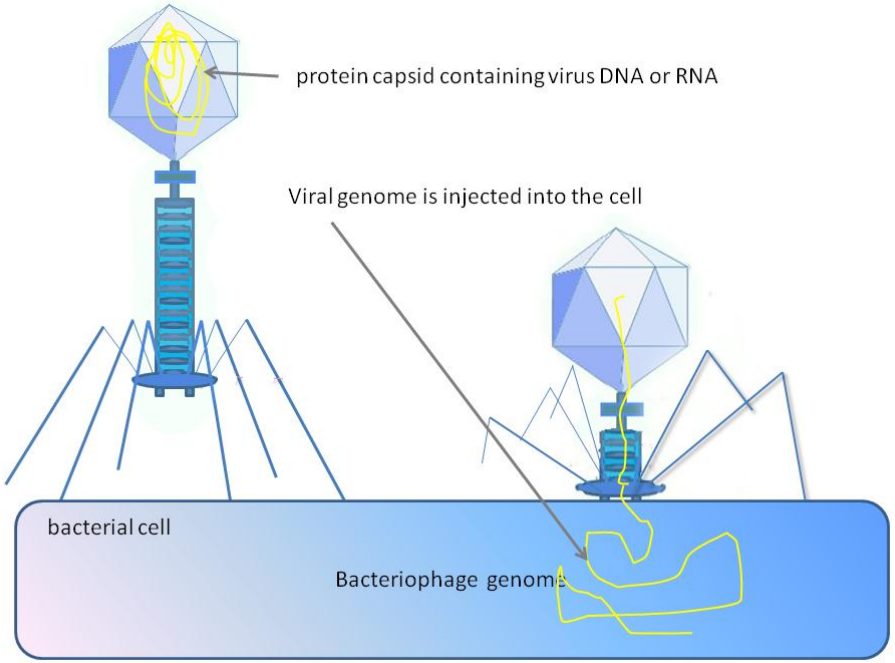
Viral Reproduction: Lytic Cycle

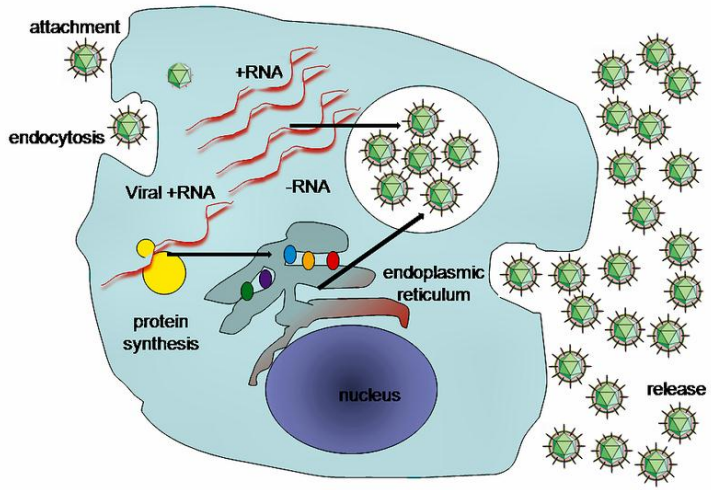
The surface markers on the virus attach to *receptors* on the host cell like a key fitting into a lock. Viruses can only infect cells that have receptors that match their surface markers.



Viral Reproduction: Lytic Cycle

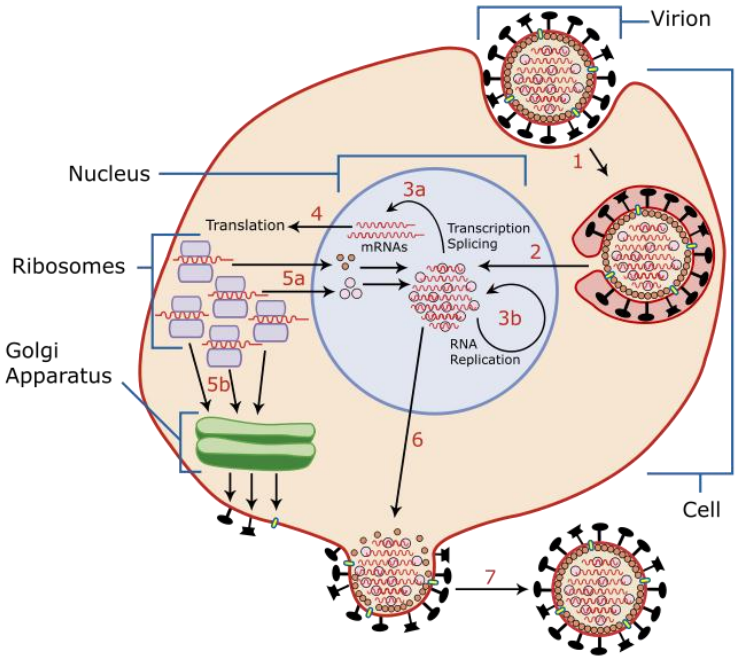
Step 2: The virus inserts its genetic material into the host cell. Once the genetic material is in the cell, it becomes a part of the cell's genome.

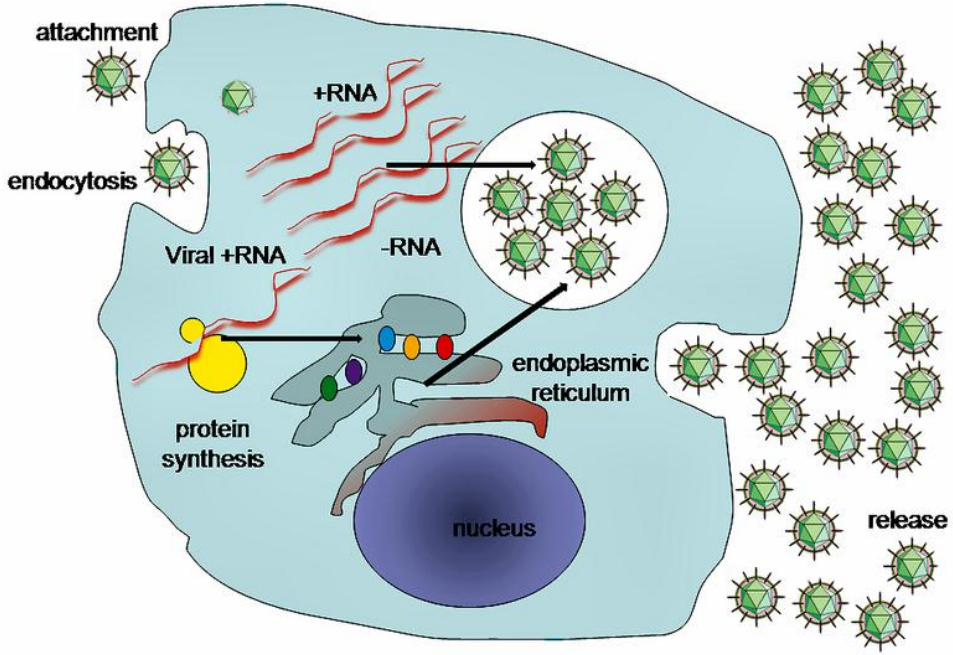




Viral Reproduction: Lytic Cycle

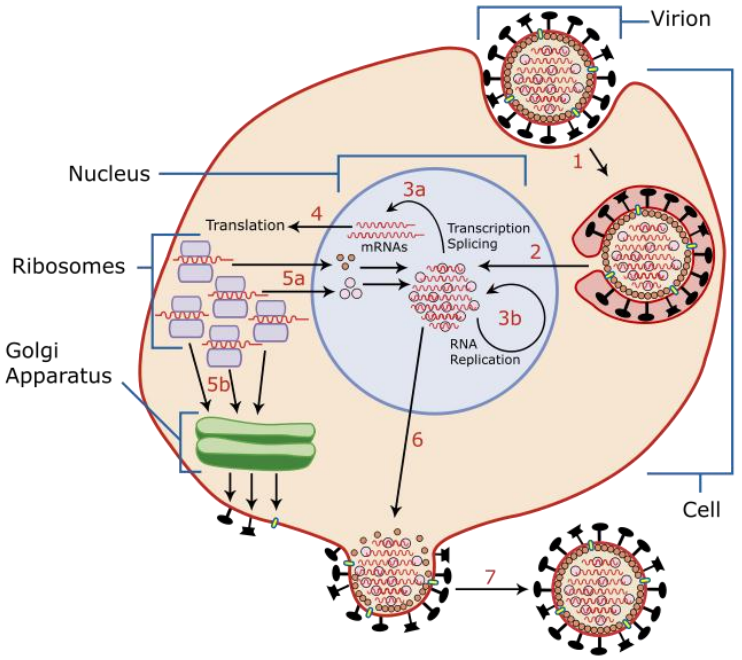
Step 3: The host cell *replicates* the virus. This means that the cell copies its genetic material and makes more capsids.

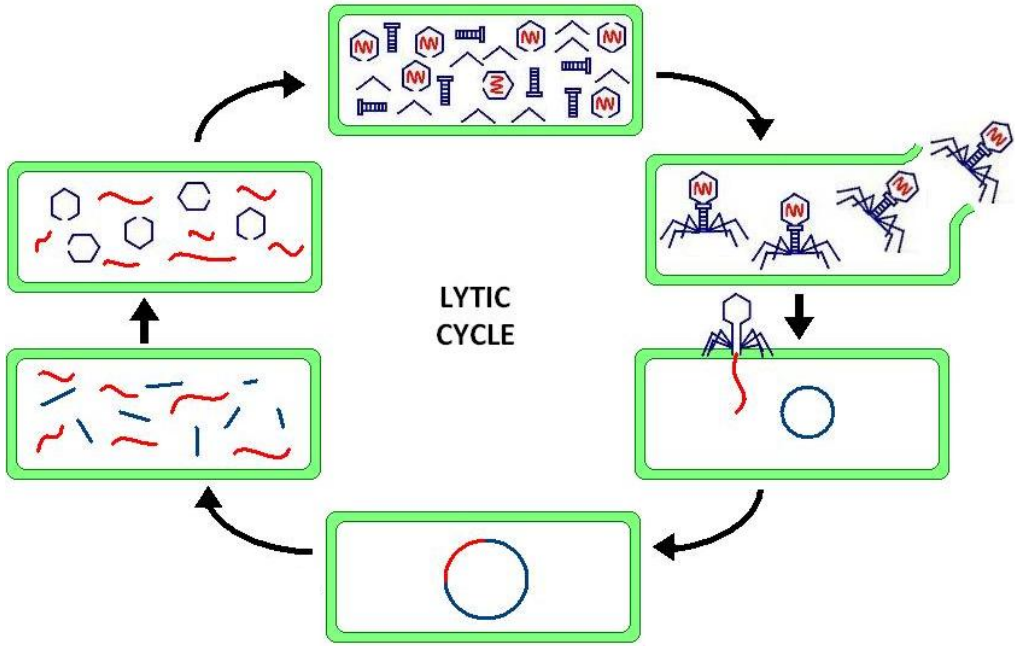




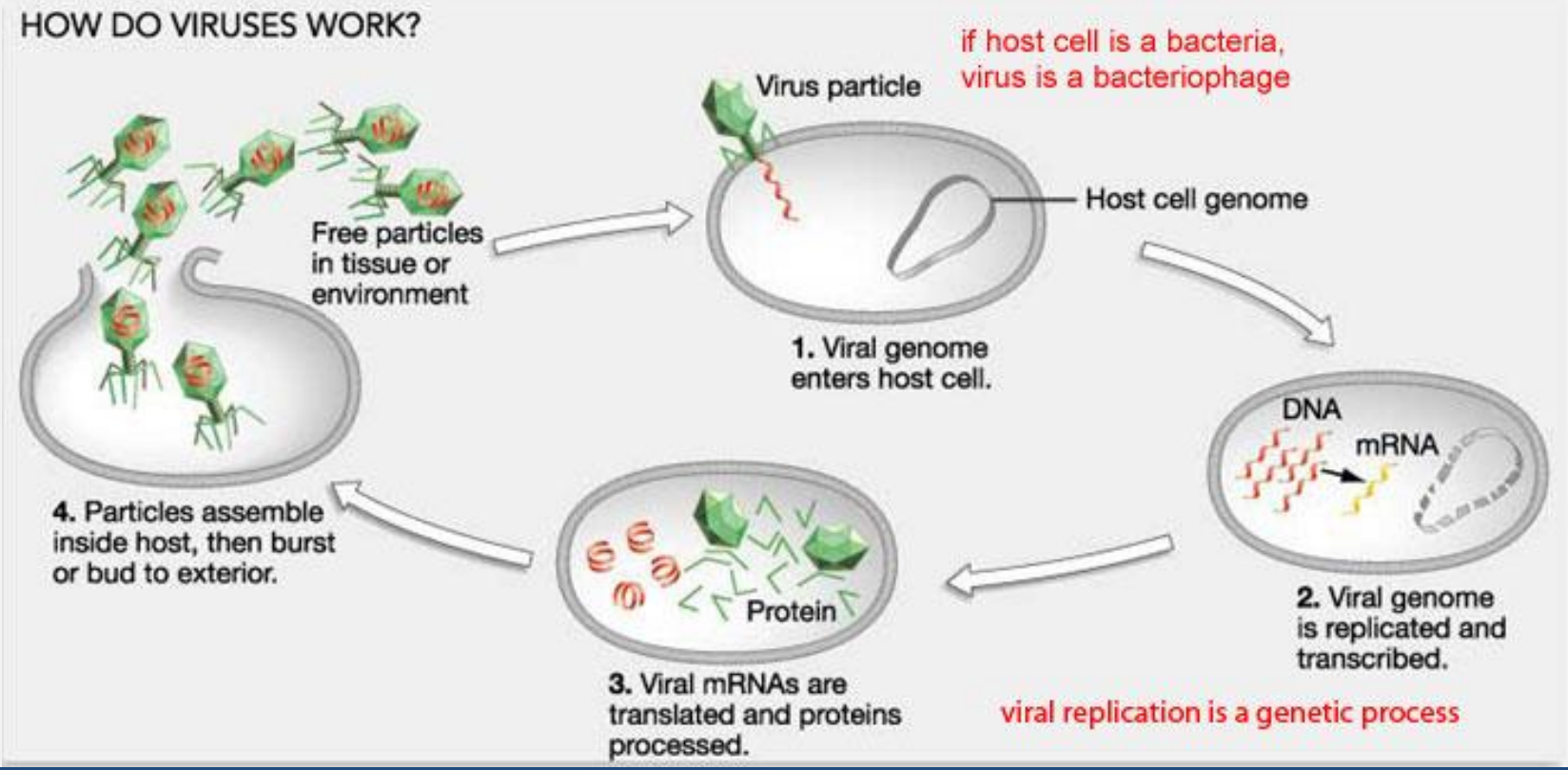
Viral Reproduction: Lytic Cycle

Step 4: The viruses *assemble themselves* inside of the host cell. The capsids wrap around strands of viral DNA.





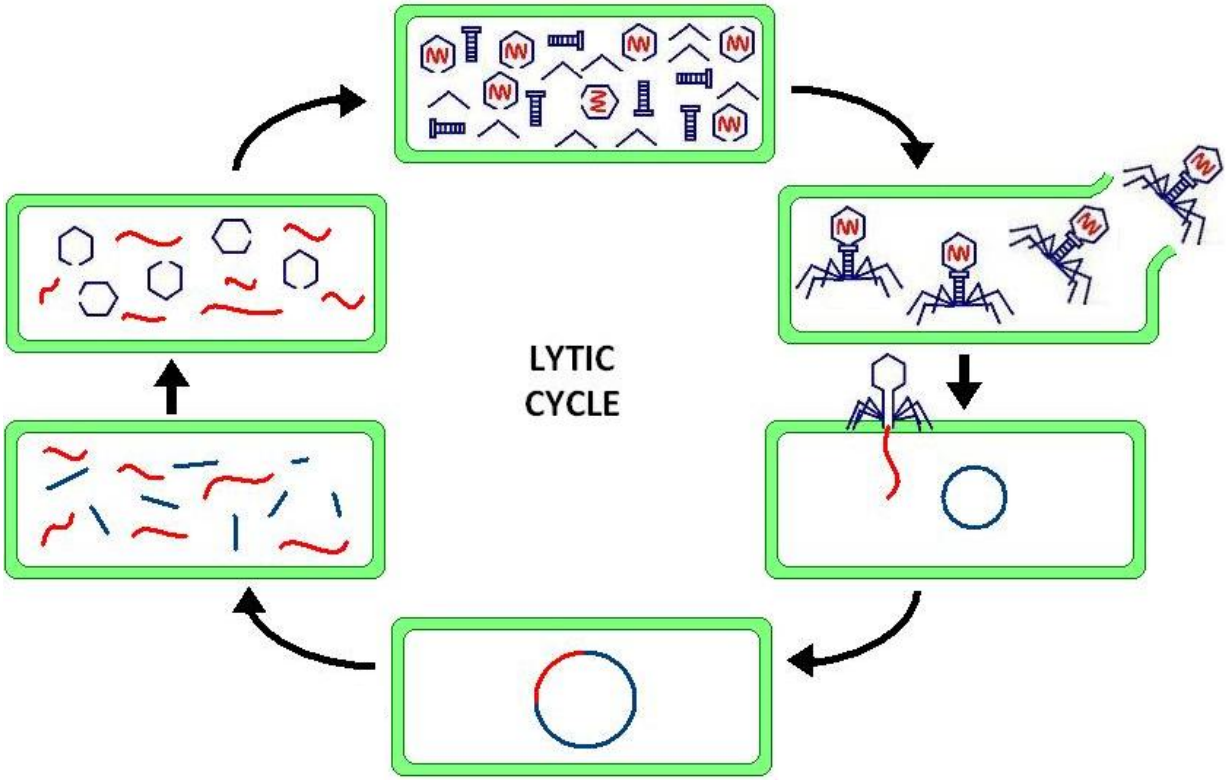
Viral Reproduction: Lytic Cycle



Step 5: The host cell's membrane is broken apart and the viruses are released. This can ***damage*** and ***destroy*** host cells.

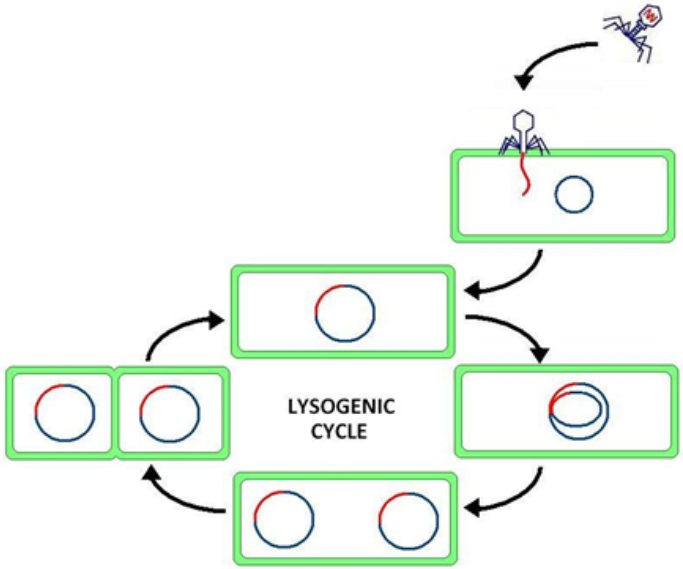
Viral Reproduction: Lytic Cycle

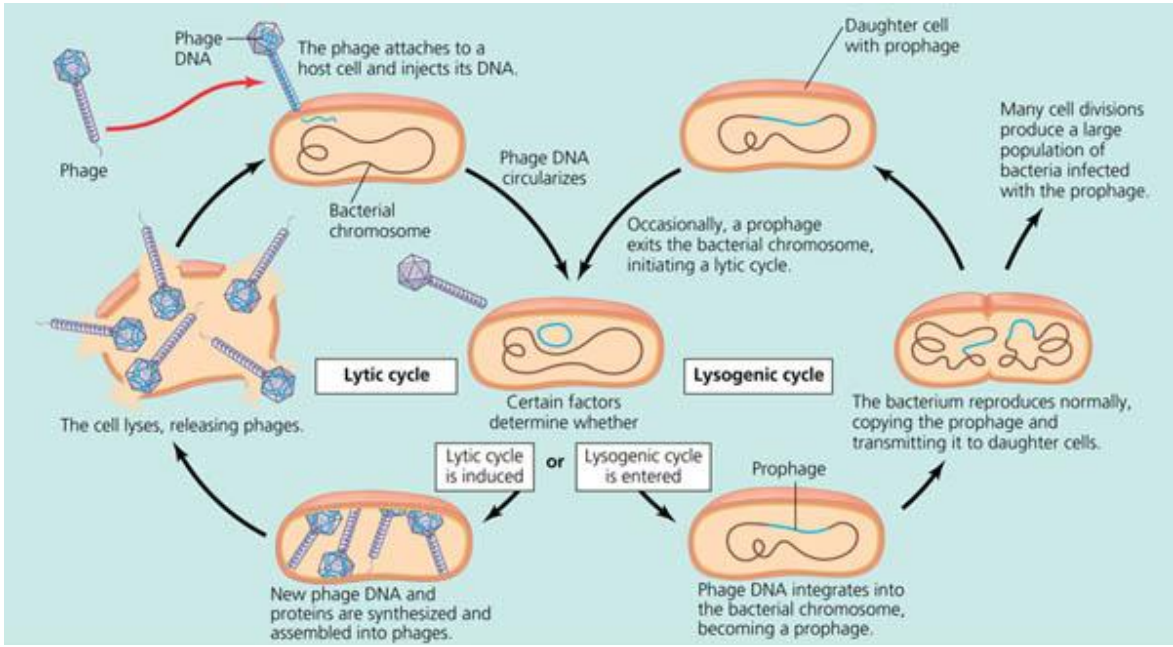
During the lytic cycle, new virus particles are quickly produced and host cells begin to be damaged and destroyed causing symptoms to appear quickly, within just a few of days of infection.



Viral Reproduction: Lysogenic Cycle

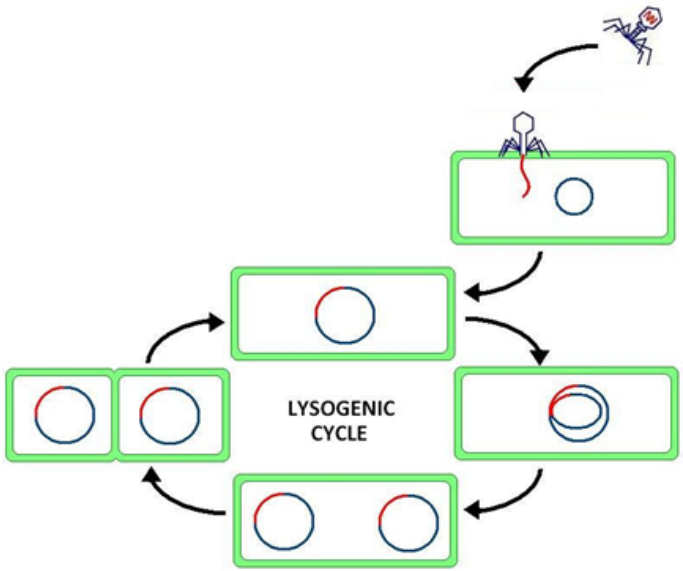
The lysogenic cycle starts the same way, with a virus attaching to the host cell and inserting its genetic material into the host cell's genome. But after this, the virus begins to be reproduced in a different way.

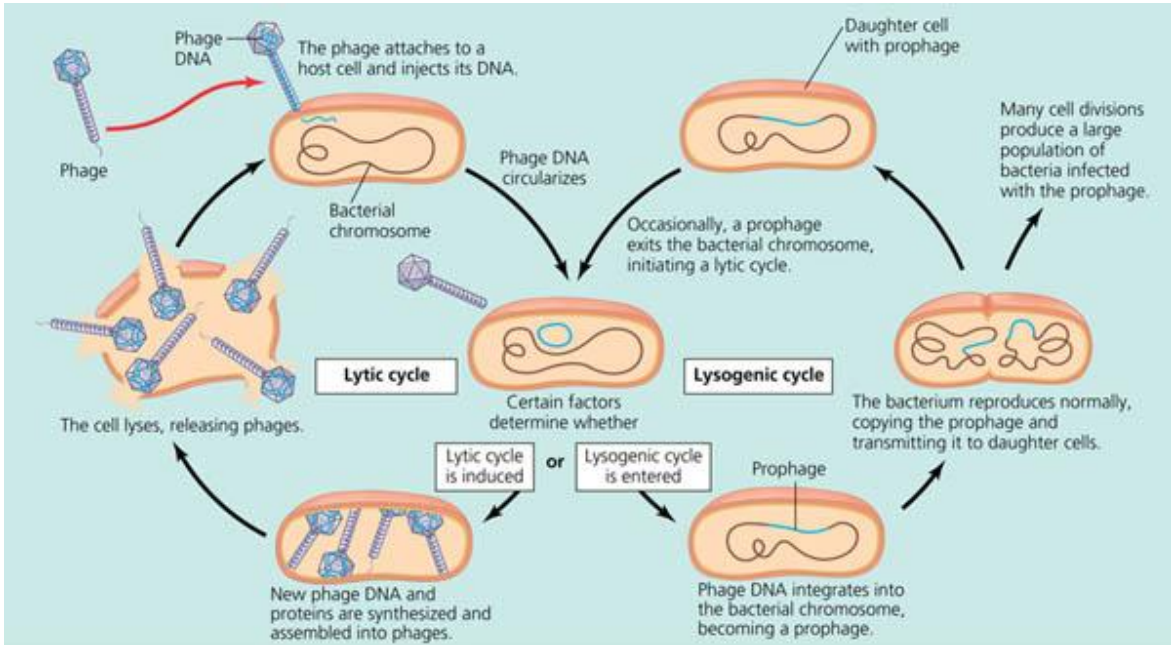




Viral Reproduction: Lysogenic Cycle

The viral DNA remains *dormant, or <u>doesn't become active</u>,* inside the host cell's genome, and <u>it is copied along with the cell's DNA during cell division</u>. Each new cell then contains a copy of the viral DNA (prophage).

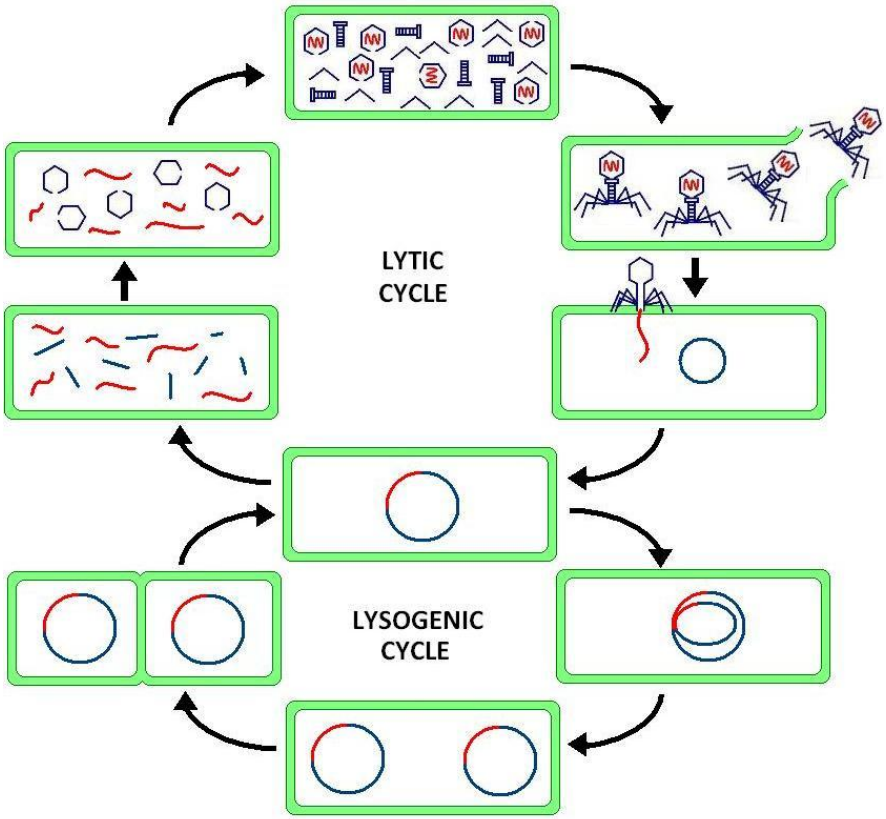


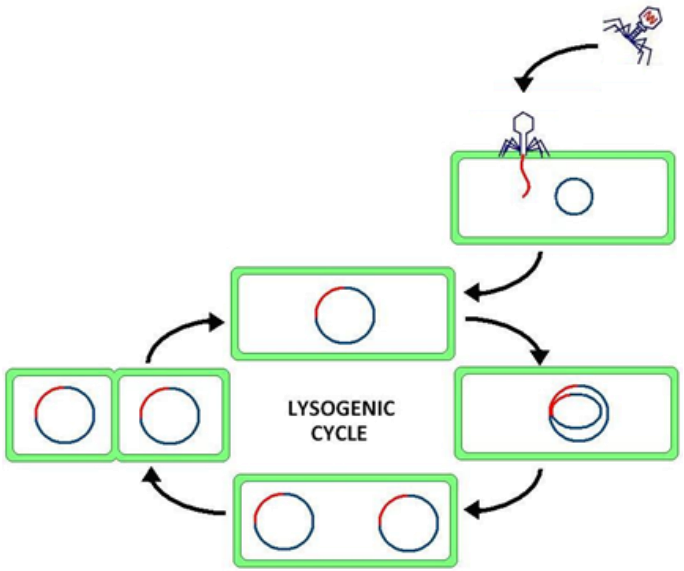
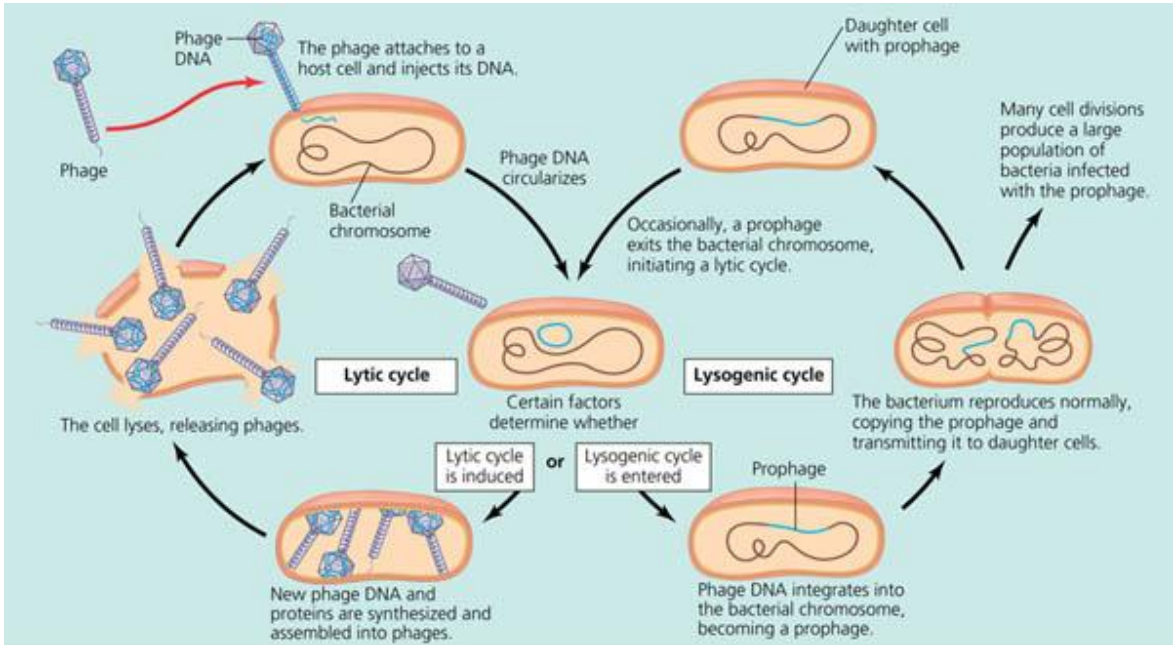


Viral Reproduction: Lysogenic Cycle

Eventually, some of viral DNA will become active causing the host cell to produce more virus particles.

At this point, the virus enters back into the lytic cycle and the host cell gets *damaged* or *destroyed* as new viruses are made.



Viral Reproduction: Lysogenic Cycle

Because the viral DNA remains dormant in the host cell's genome for a long period of time, viruses that reproduce through the lysogenic cycle do not start damaging cells and causing symptoms for long periods of time.