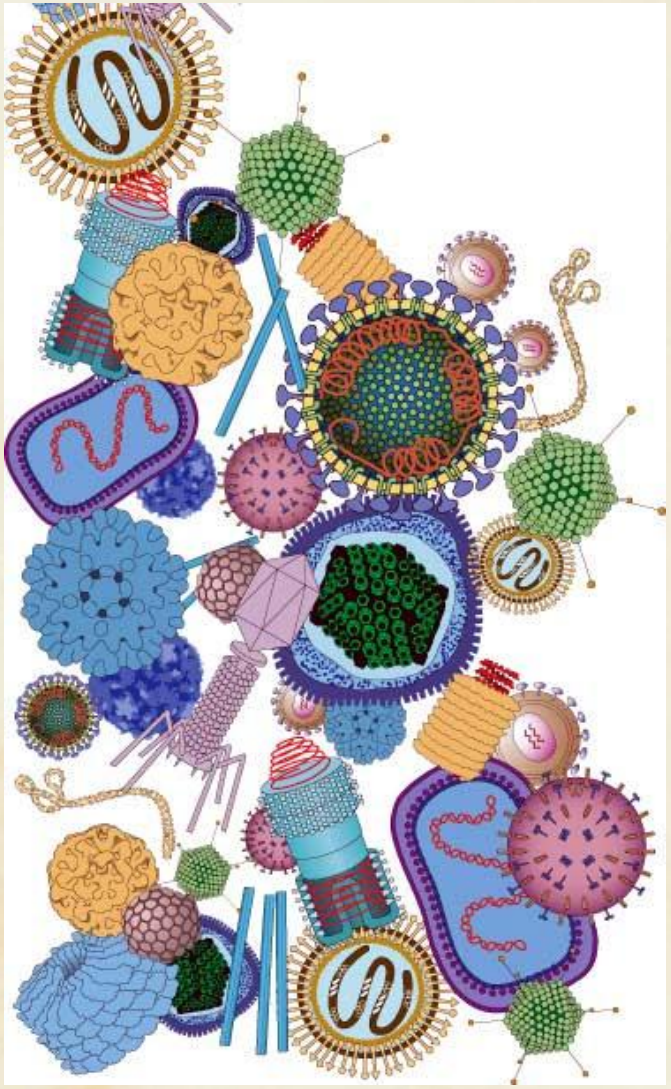
# Viruses

# What is a Virus?

- Segments of nucleic acids wrapped in a protein coat.
- They are not cells.
- Smaller than prokaryotic cells.
- Visible only with electron microscope.
- Are pathogens = disease causing
- Do not grow, have homeostasis, or metabolize.

# What is a Virus?

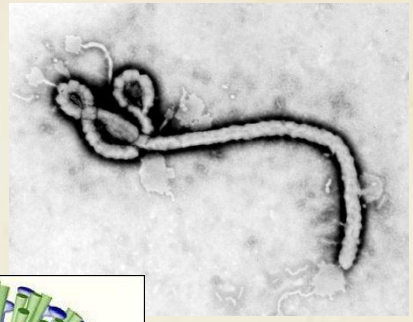
- They reproduce by infecting cells and using the cell to make more viruses.
- In Latin, virus means "poison".



# Viral Structure

- Protein coat = capsid
- Contains DNA or RNA, but not both.
- Surrounding membrane of the capsid = envelope
- RNA viruses
  - HIV, influenza, rabies
- DNA viruses
  - Warts, chicken pox, mononucleosis
- Glycoproteins = protein with carbohydrates and specific enzymes

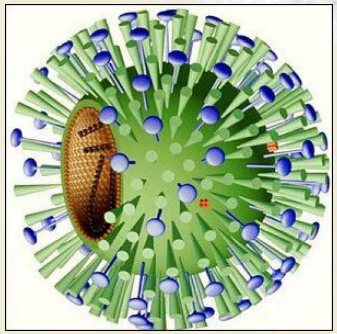
# Viral Structure

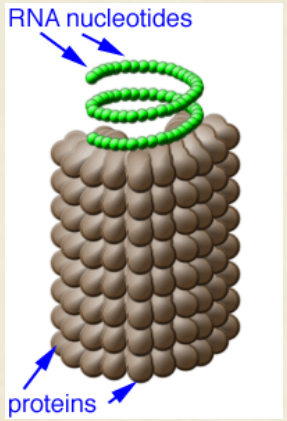


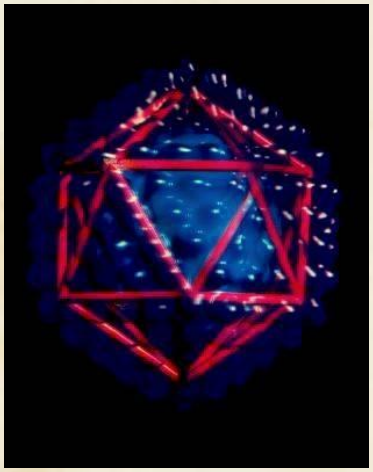
- Viruses come in many shapes.
  - Long rods (Ebola)
  - Spherical (influenza)
  - Helical (tobacco mosaic)
  - Polyhedral (many sided)

    adenoviruses

    (Respiratory illnesses)

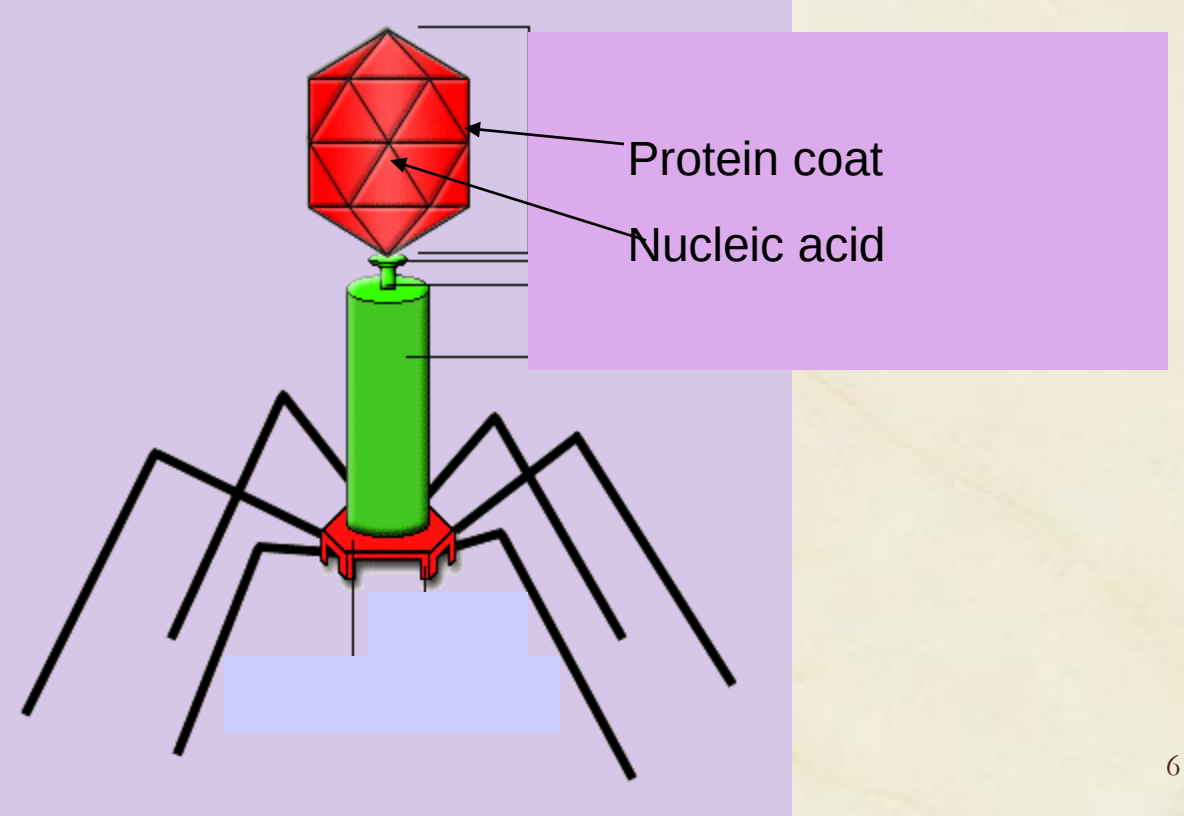




# Bacteriophage

- Virus that infects bacteria cells
- Most common bacteriophage is the $T_4$



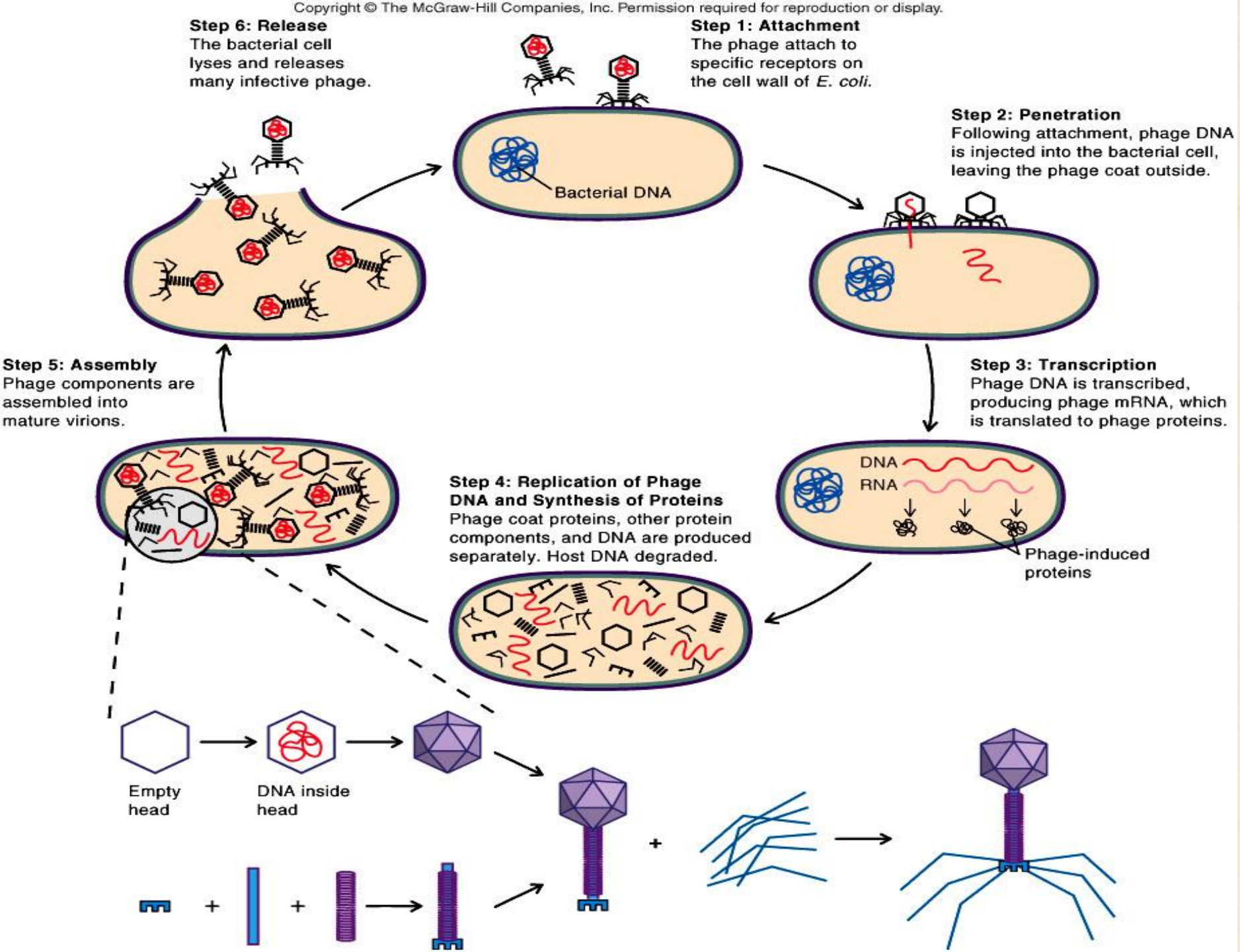
# Viral Reproduction

- Most viruses reproduce inside bacteria cells. What makes this an ideal place?
  - Bacteria reproduce rapidly
  - (every 20 minutes)

- Two types of reproductive life cycles are known.

# 1. Lytic Cycle

- Virus attaches to bacteria cell and injects its DNA into the bacteria
- Uses the host bacteria cell to replicate the nucleic acid and protein coat (capsid).
- Virus destroys the bacteria cell by rupturing the cell and releasing new viruses.

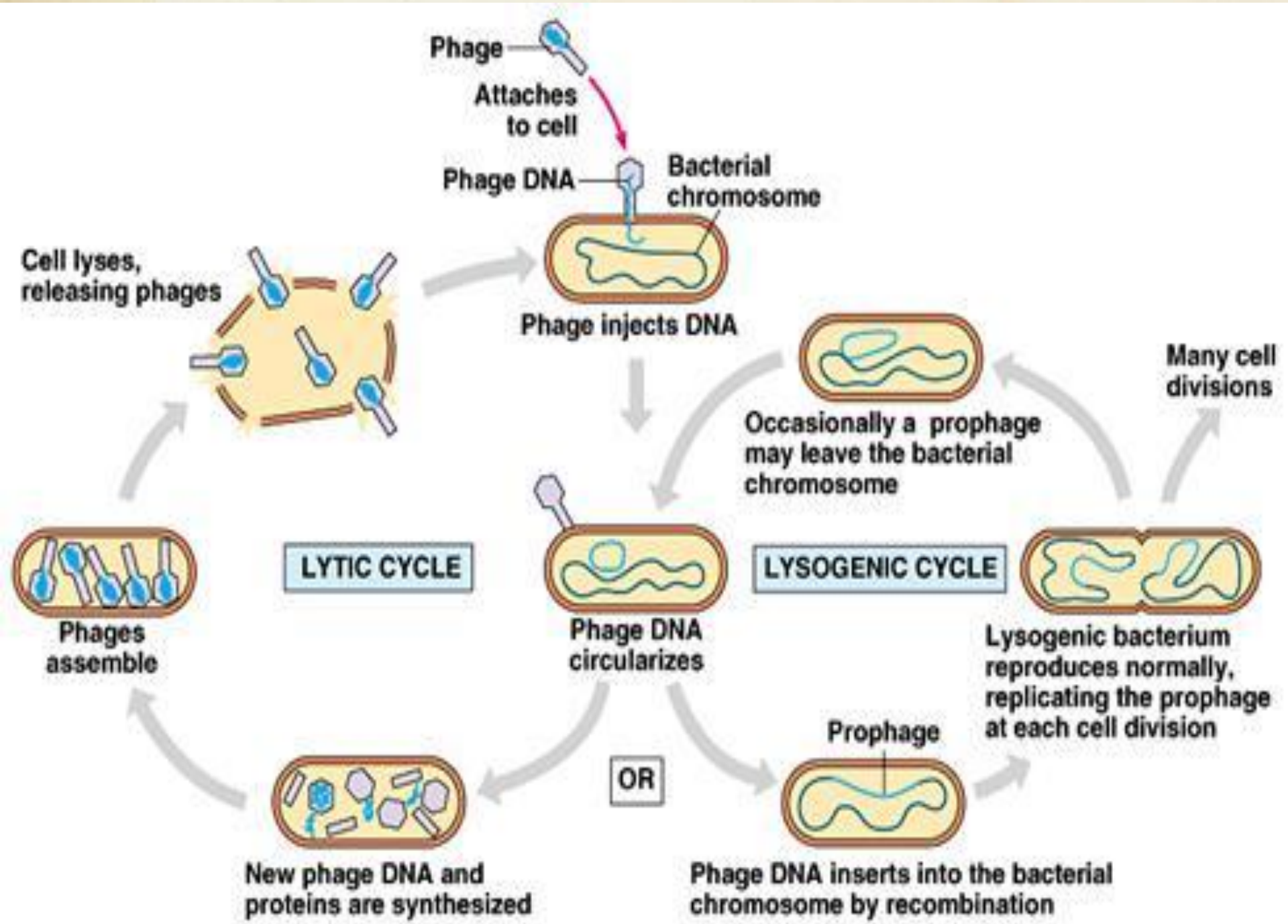


# 2. Lysogenic Cycle

- Virus attaches to bacteria cell and injects its DNA into bacterium and joins with the bacteria's DNA
  - It is now called a provirus
- Host cell divides normally—along with the viral DNA (Virus remains dormant inside bacteria)
- If environment of bacteria cell changes, the virus will enter the lytic cycle and destroy the bacteria cell to release new viruses

# 2. Lysogenic Cycle

- Fever Blisters (cold sores)
  - Virus hides deep in nerve cells
  - When conditions become favorable (such as stress) the virus ruptures cells and causes tissue damage, which is a fever blister or cold sore.



# Viral Diseases

- AIDS
- Common cold
- Ebola
- Hepatitis A
- Hepatitis B
- Influenza
- Mumps
- Polio
- Rabies
- SARS (severe acute respiratory syndrome)
- Smallpox
- Yellow fever

# Viral Diseases

- Some viruses cause cancer
  - Hepatitis B → liver cancer (vaccine available)
  - Epstein-Barr virus → Burkitt's Lymphoma
  - HPV (Human papilloma virus)→cervical cancer (vaccine available)

# Emerging Viruses

- Newly arrived at a location or a new mutated virus form
- 1999- West Nile virus arrives in US
  - Came to US on an infected bird
  - Mild flu-like symptoms
  - Causes brain inflammation in elderly or infirm → death

# Emerging Viruses

- Hanta virus
  - Southwestern US - 1993
  - Found in rodent droppings
  - Virus is lethal to 38% of its victims

# Prions

- Stanley Prusiner found a new class of pathogens called prions.
  - They contain protein but no nucleic acids.
  - Cause diseases such as scrapie (brain disease in sheep), mad cow disease (brain disease), Creutzfeldt-Jakob disease (human version of mad cow disease).

# Viroids

- Single stranded RNA with no protein coat (capsid)
- Usually affect crop plants such as cucumbers, potatoes, avocados, oranges

# Vaccines

- Vaccines prevent a person from contracting a disease.
- Weakened or dead form of the virus injected into body
- Body destroys virus and builds antibodies against the disease.
- Antibodies recognize and destroy the virus immediately if it enters the body again
- Smallpox and polio have been eliminated from earth due to vaccinations
- Jonas Salk –polio vaccine