
Cells
and
Viruses

8 Characteristics of Life

- GROWTH AND DEVELOPMENT
- REPRODUCE
- CHANGE OVER TIME
- OBTAIN AND USE ENERGY
- MAINTAIN HOMEOSTASIS
- COMPOSED OF CELLS
- RESPOND TO THE ENVIRONMENT
- CONTAIN GENETIC MATERIAL

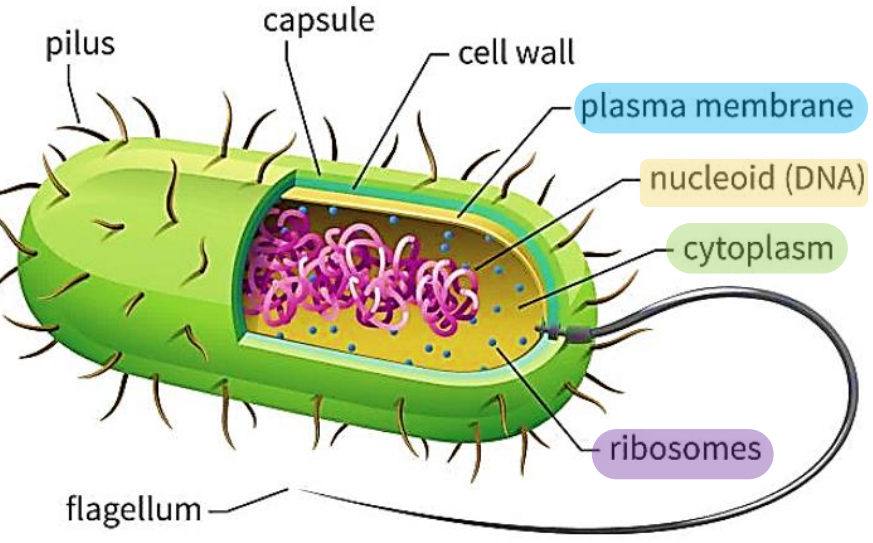
The Cell Theory

1. ALL LIVING THINGS ARE MADE UP OF CELLS
2. CELLS ARE THE BASIC UNITS OF STRUCTURE AND ORGANIZATION IN ALL LIVING THINGS
3. NEW CELLS ARE PRODUCED FROM EXISTING CELLS

What do each of these structures have in common?

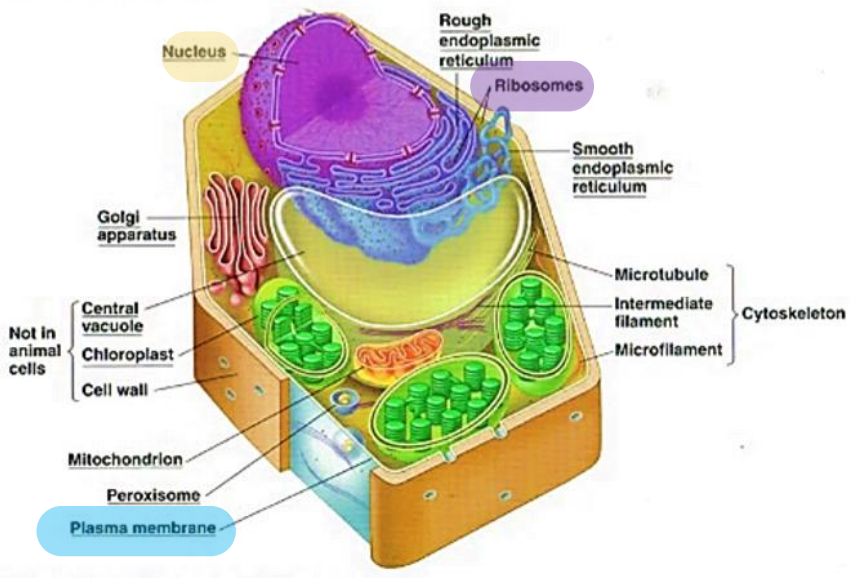
Prokaryotic Cells

Bacterium

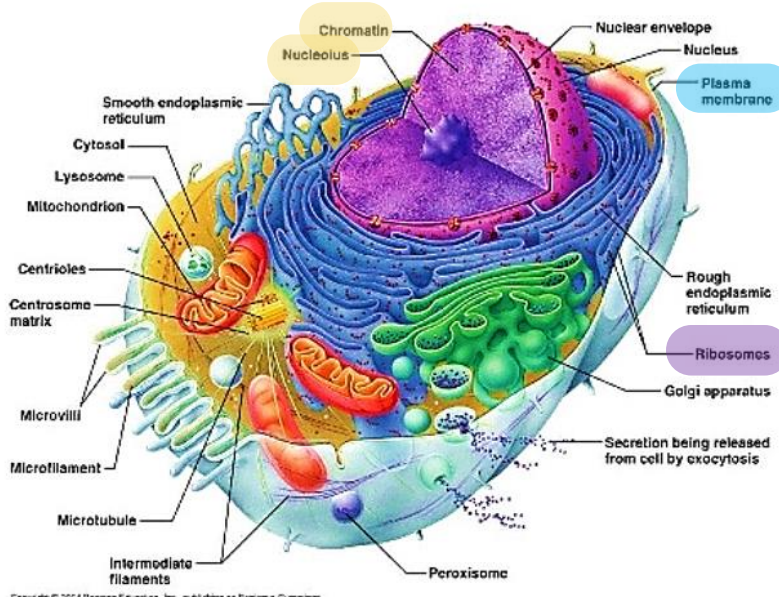


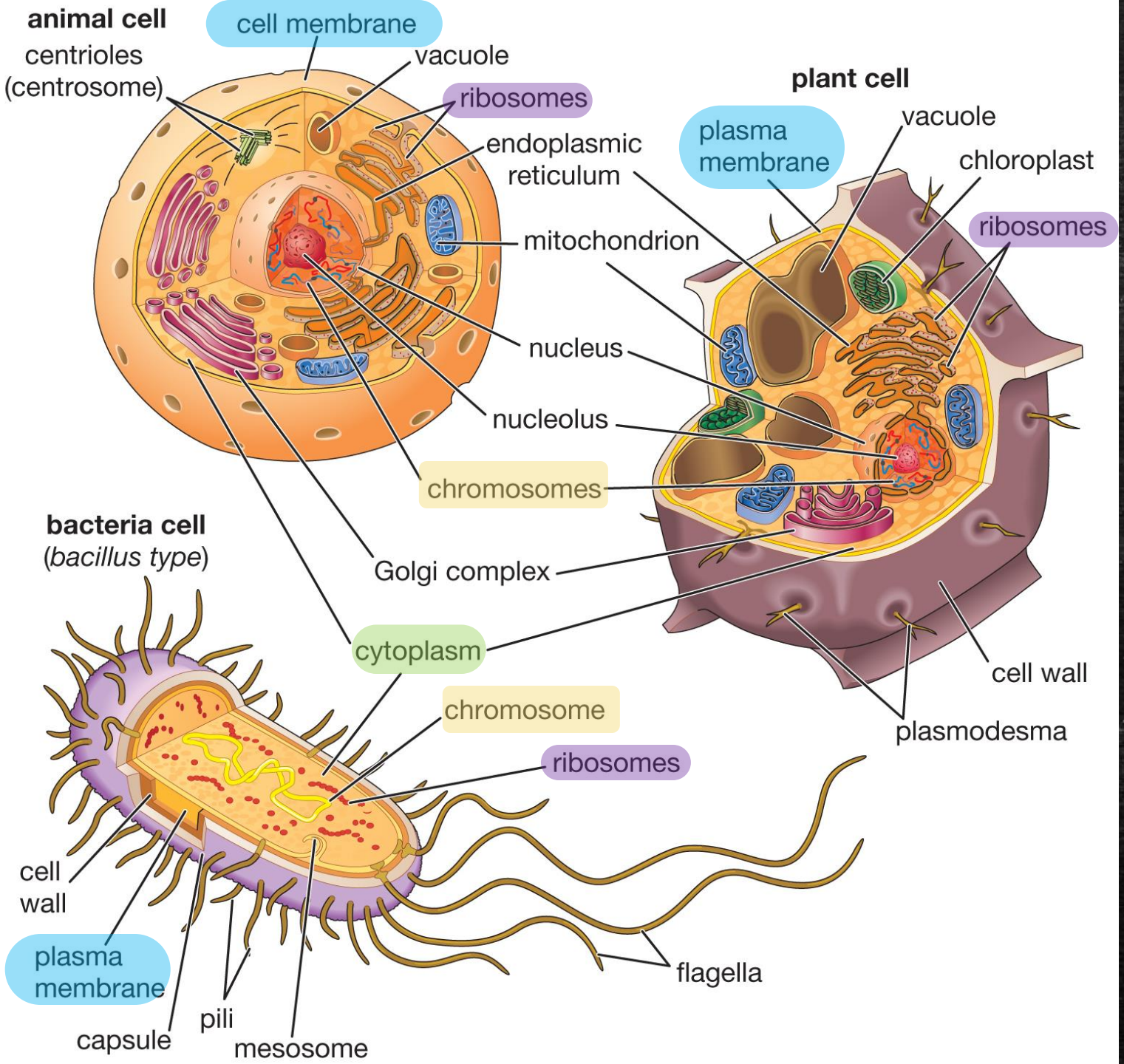
Eukaryotic Cells

Plant



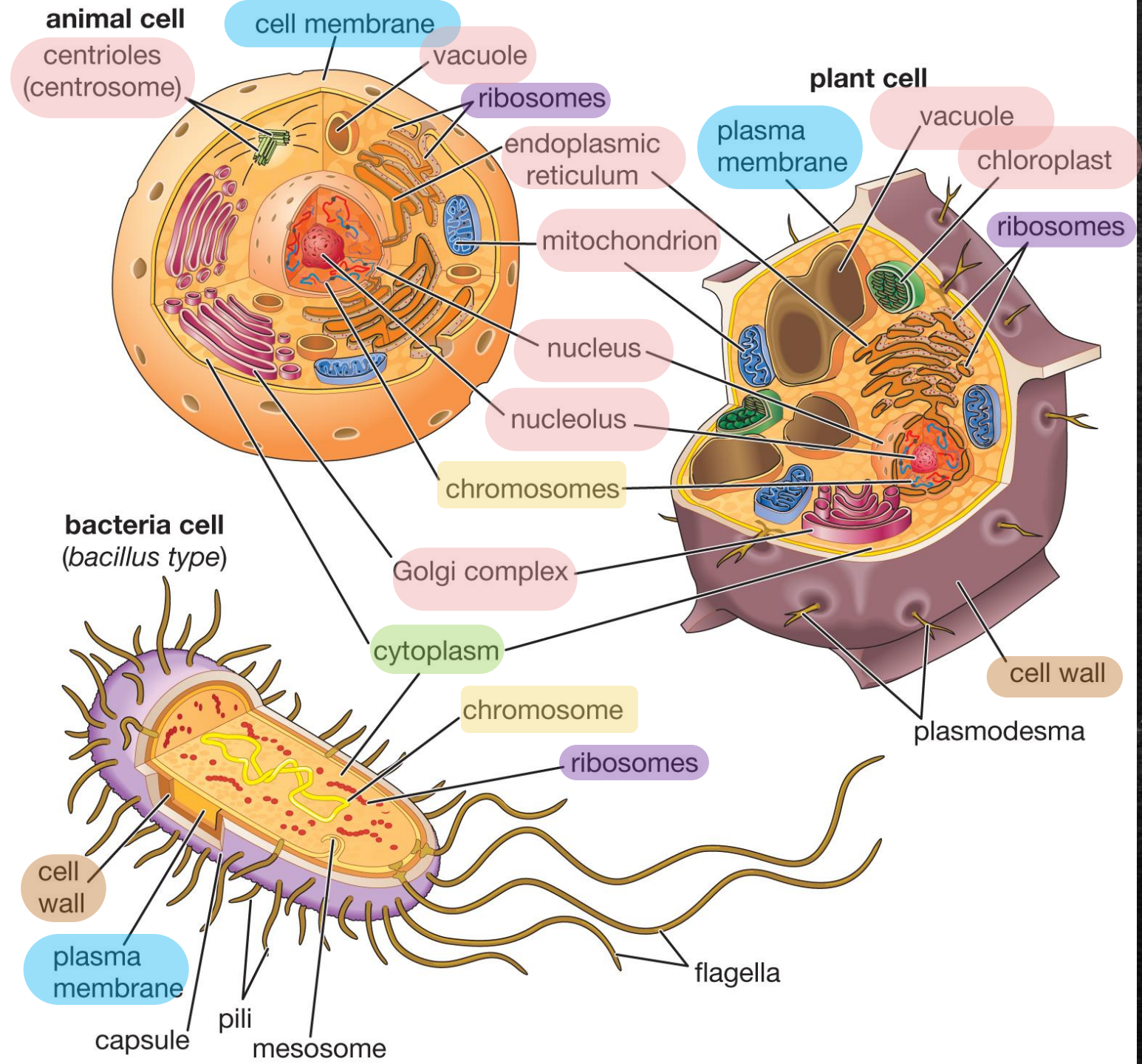
Animal





All cells contain...

1. GENETIC MATERIAL - *deoxyribonucleic acid*
2. CYTOPLASM
3. RIBOSOMES
4. CELL MEMBRANE *plasma membrane or phospholipid bilayer*



Some cells contain...

1. CELL WALLS
   - Plant cells
   - Bacterial cells
2. MEMBRANE BOUND ORGANELLES
   - Animal cells
   - Plant cells

Are CELLS alive?

- GROWTH AND DEVELOPMENT
- REPRODUCE
- CHANGE OVER TIME
- OBTAIN AND USE ENERGY
- MAINTAIN HOMEOSTASIS
- COMPOSED OF CELLS
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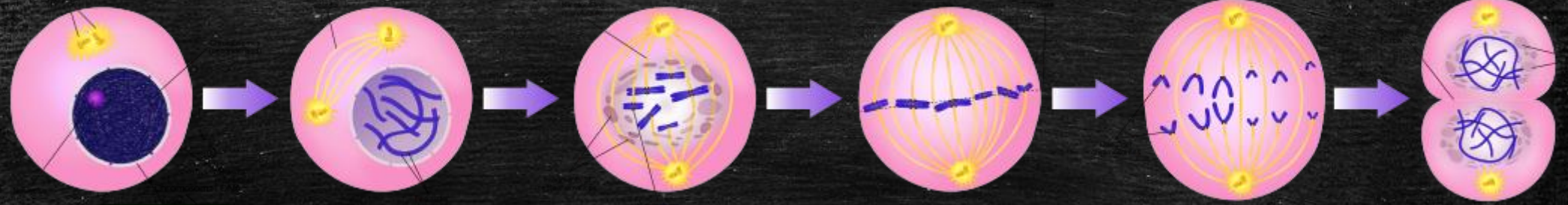
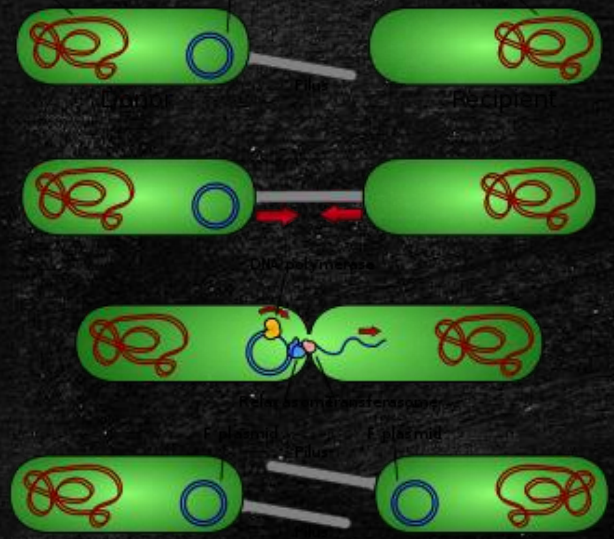
All cells can...

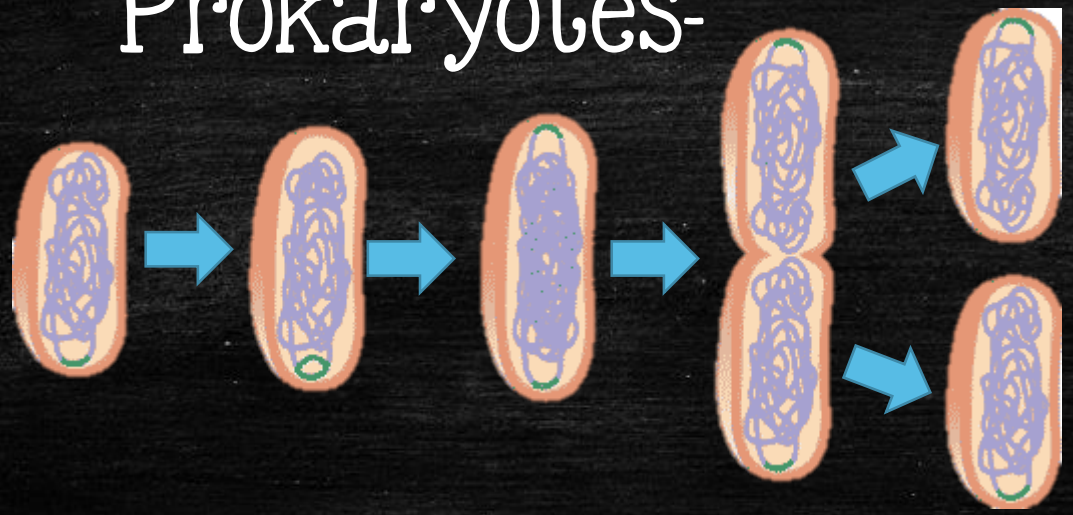
REPRODUCE

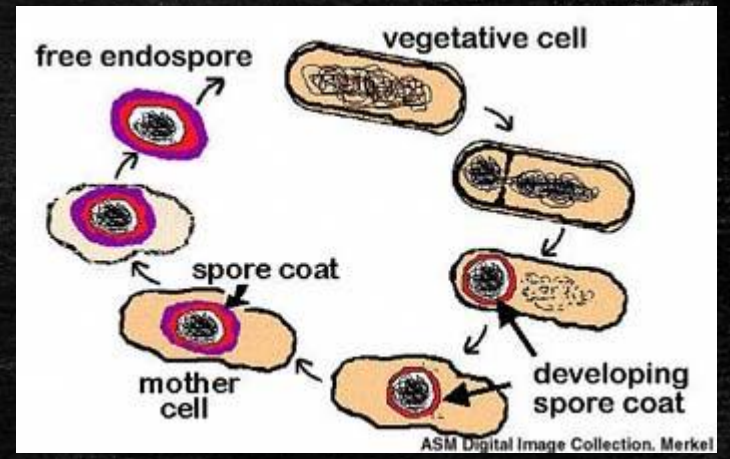
Eukaryotes-



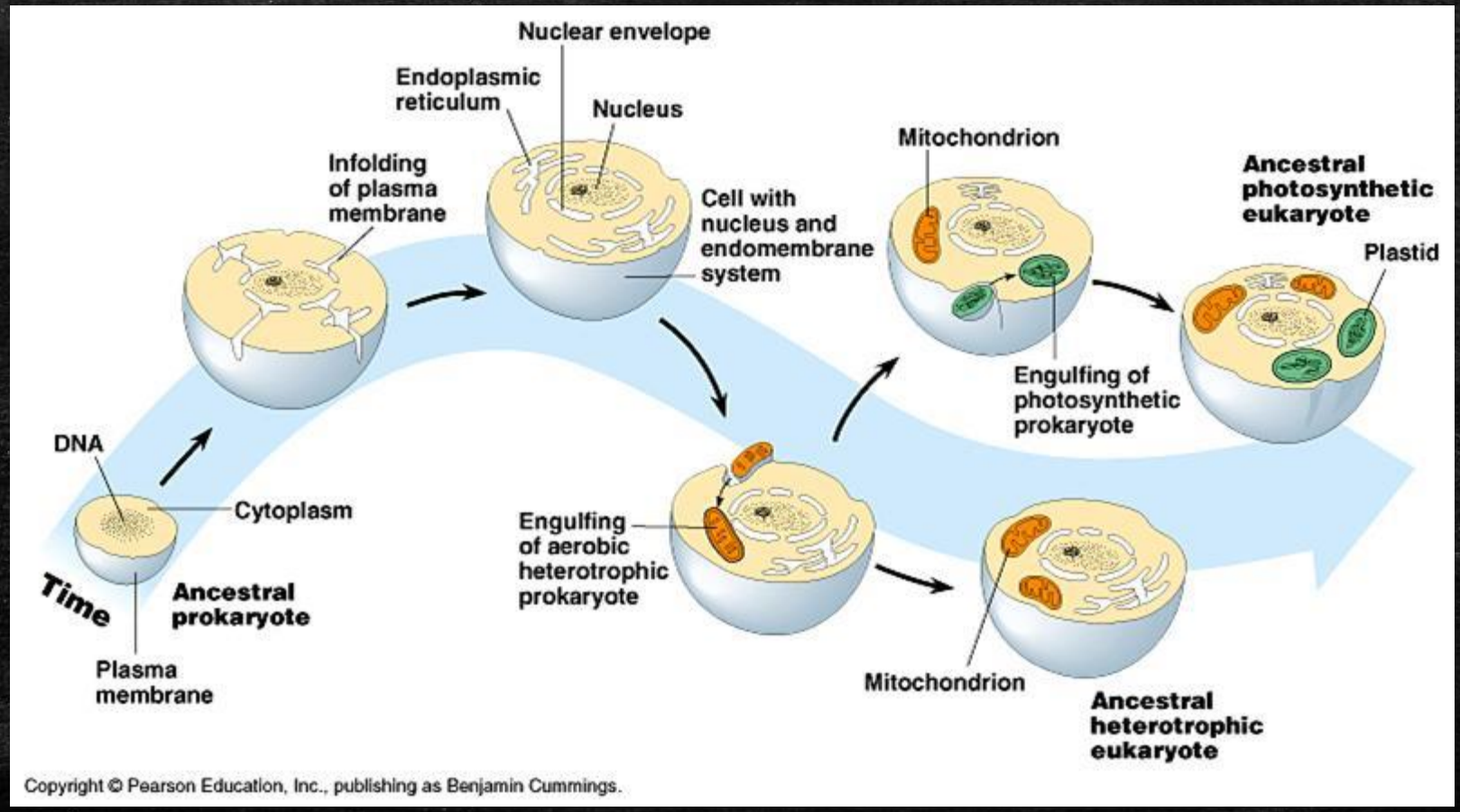
Prokaryotes-







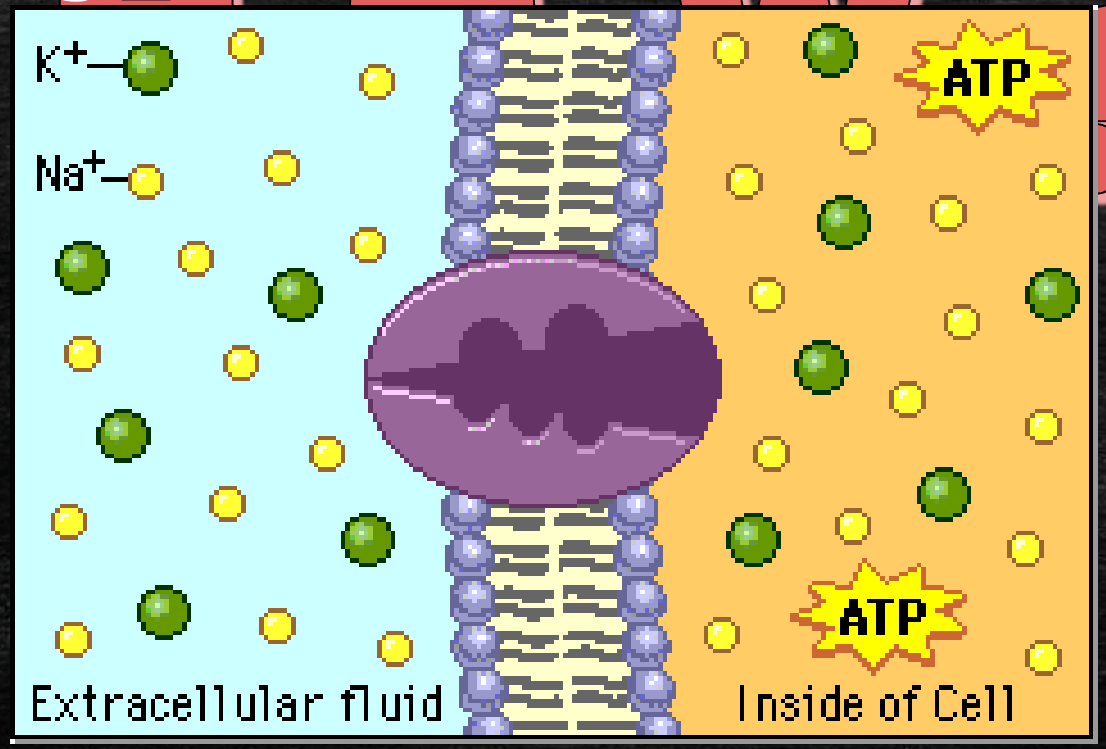
All cells can...
ADAPT & EVOLVE



All cells can...

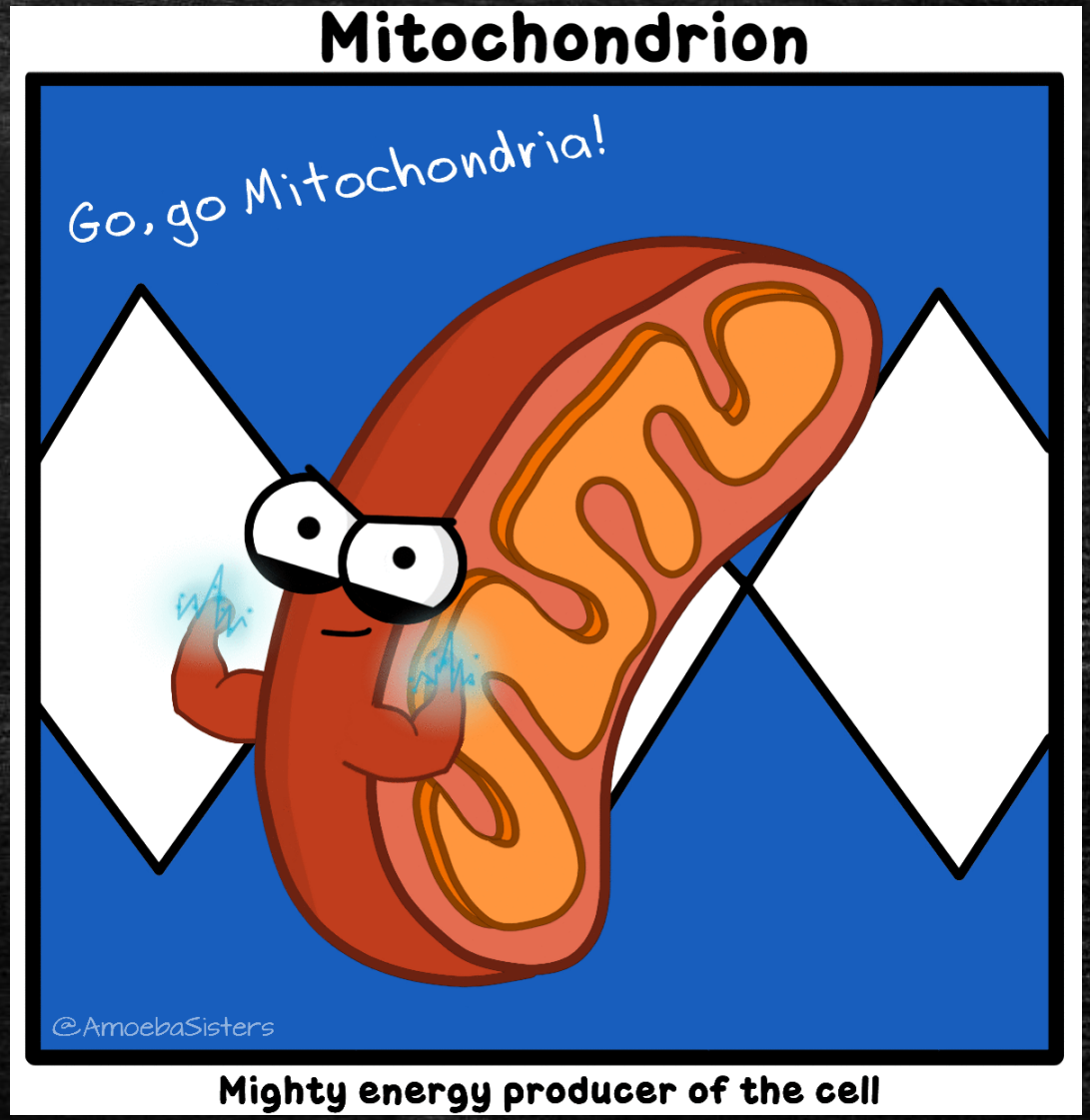
MAINTAIN HOMEOSTASIS

by regulating what enters and exits the cell



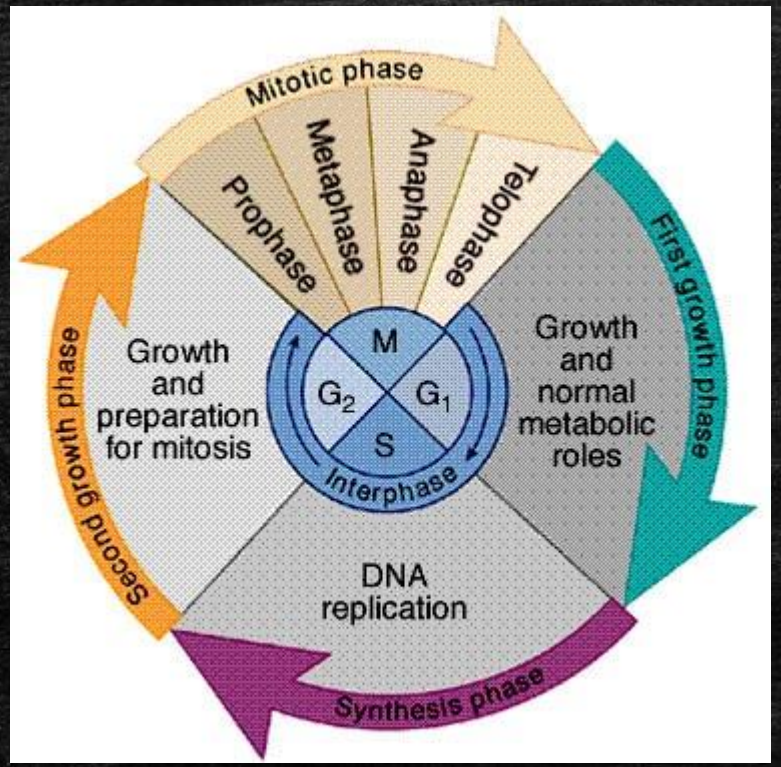
All cells can...

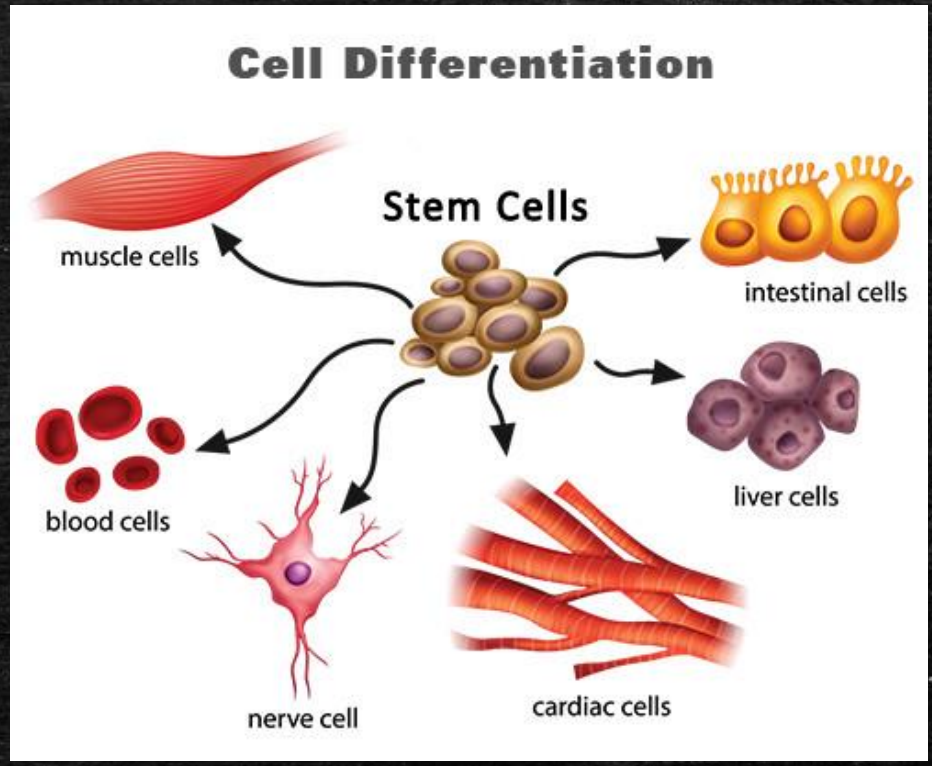
OBTAIN & USE ENERGY



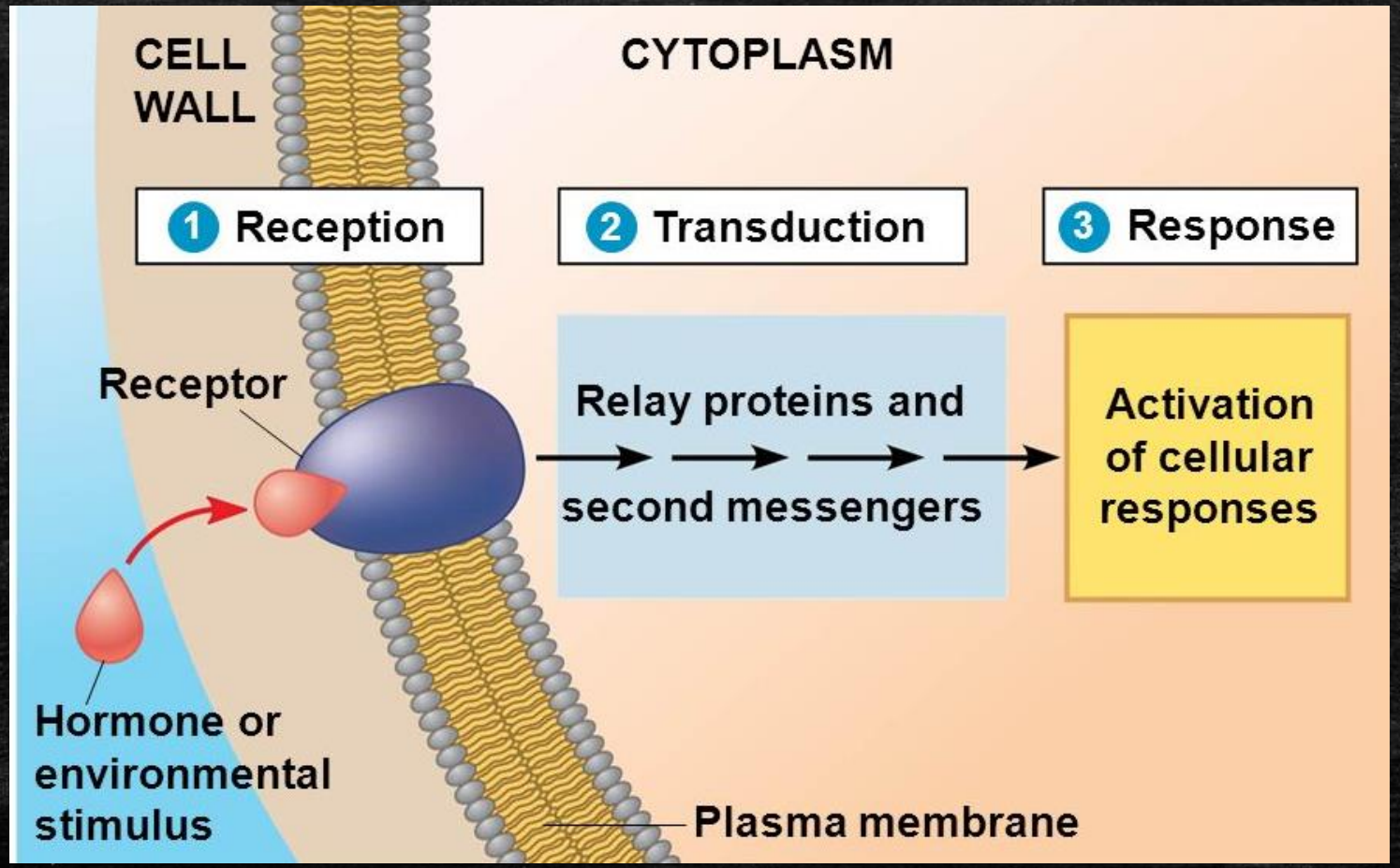
All cells can...

GROW & DEVELOP





All cells can...
RESPOND TO STIMULI

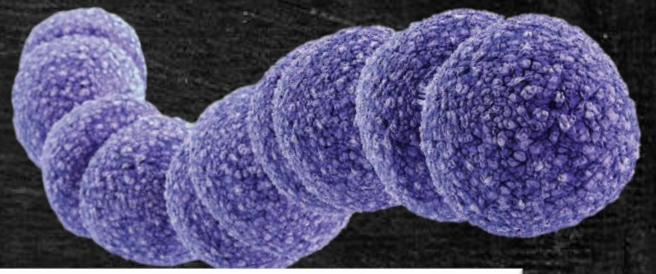


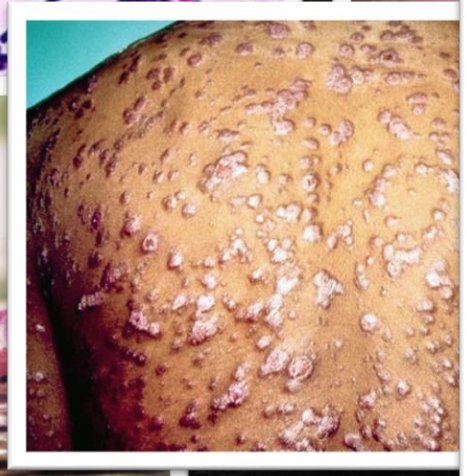
Cells can be **PATHOGENS** that cause diseases.

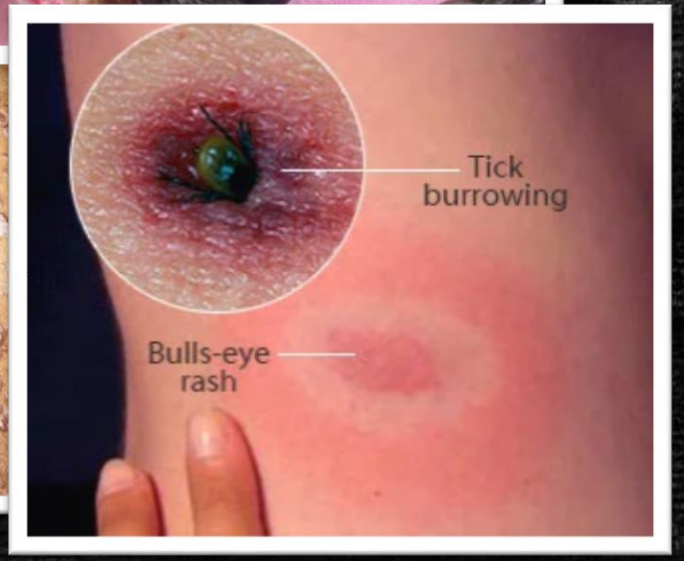
Bacterial Diseases

SHAPE OF BACTERIA

- **COCCUS**
  - Streptococcus pharyngitis (**Strep Throat**)
  - Necrotizing fasciitis (Flesh-eating Bacteria)
    - Some of the most common found in cultures of necrotizing fasciitis patients are:
      - S. pyogenes
      - Group A Streptococci
      - Group A Staphylococci
      - Peptostreptococcus
      - E. Coli
- **BACCILUS**
  - Bacillus anthracis (**Anthrax**)
  - Yersinia Pestis (Bubonic Plague)
- **SPIRILLUM**
  - Treponema pallidum (**Syphilis**)
  - Borellia burgdorferia (Lyme disease)







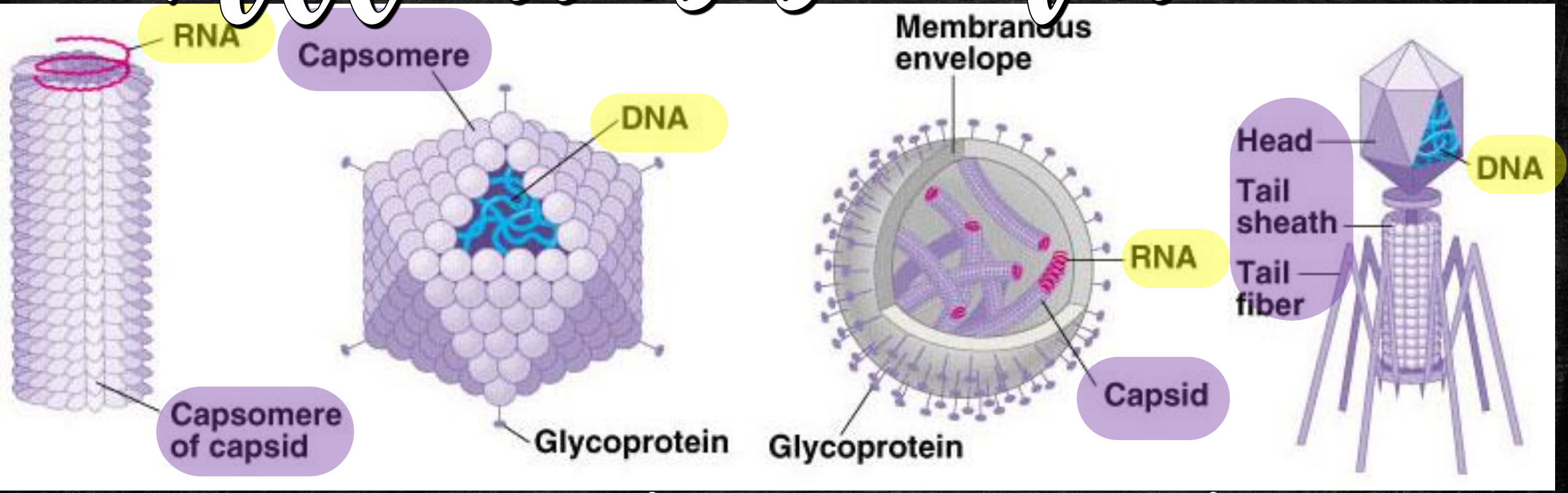
Fungal Diseases

- OROPHARYNGEA CANDIDIASIS - thrush
- TRICHOPHYTON, MICROSPORUM, AND EPIDERMOPHYTON - Ringworm or dermatophytosis
- SPOROTHRIX - Rose gardener's disease

Protozoal Diseases

- MALARIA
- GIARDIA LAMBLIA- giardiasis or beaver fever

All viruses contain...

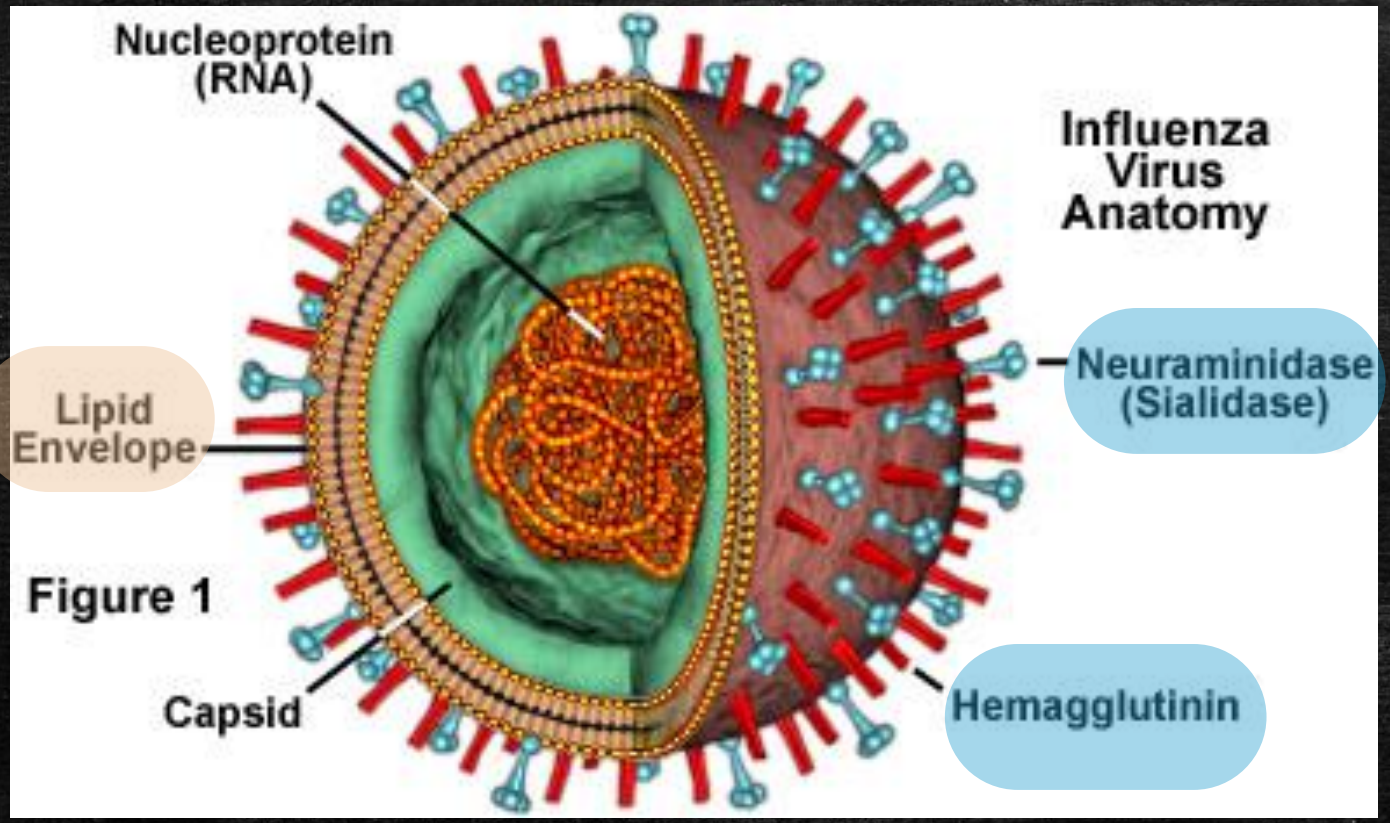


1. **GENETIC MATERIAL** -*deoxyribonucleic acid* **OR** *ribonucleic acid*
2. **PROTEIN -** A **capsid** is a protein shell or covering that protects the genetic material of a virus. The **capsomere** is a subunit of the capsid that self-assemble to form the complete covering.

All viruses can...

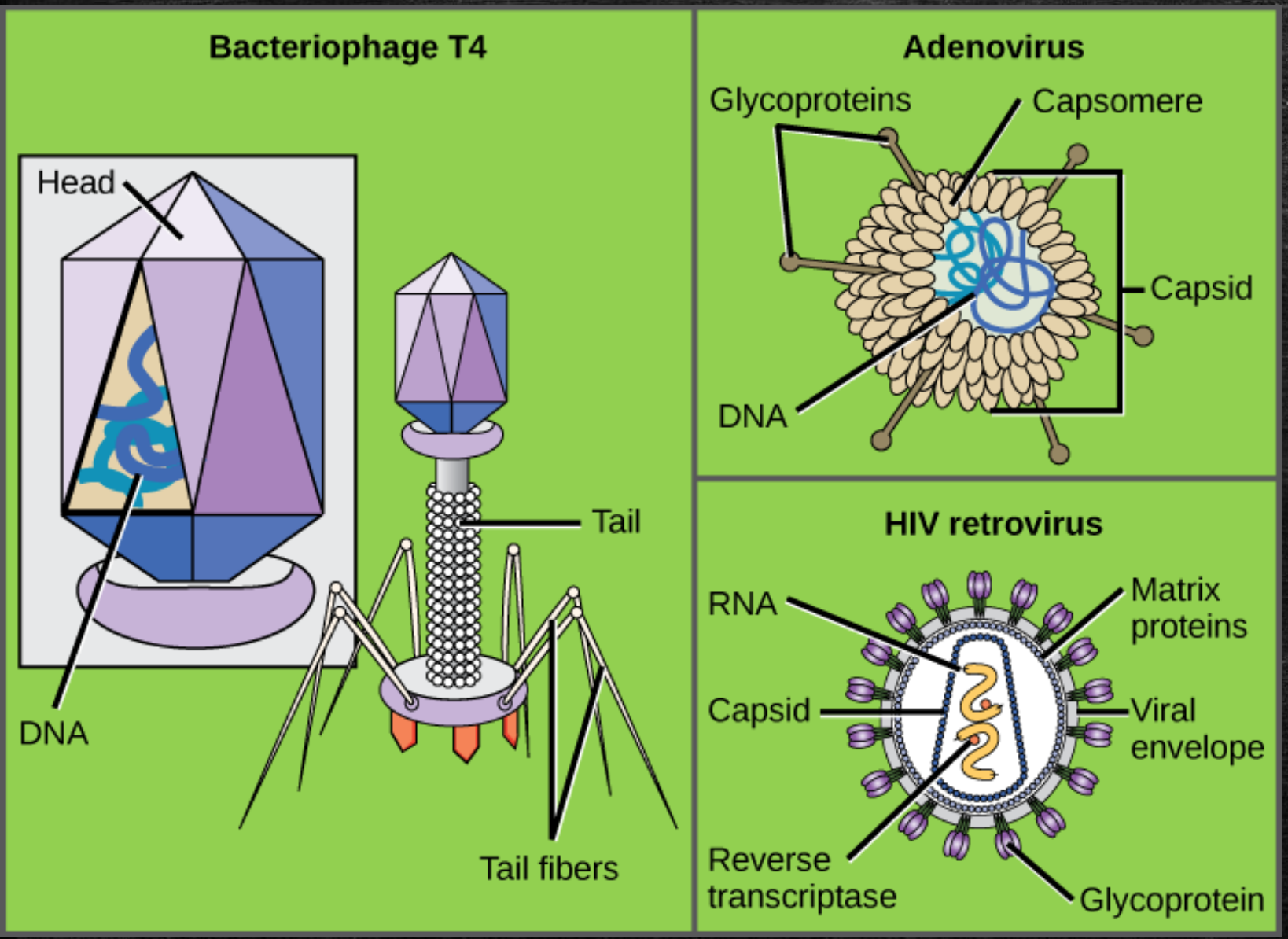
3. EVOLVE OR ADAPT

Some viruses contain...



- **GLYCOPROTEINS:** protein and carbohydrate projections that allow for viral attachment and entry into host cells

- **MEMBRANE ENVELOPE:** lipid bilayer from host cell membrane

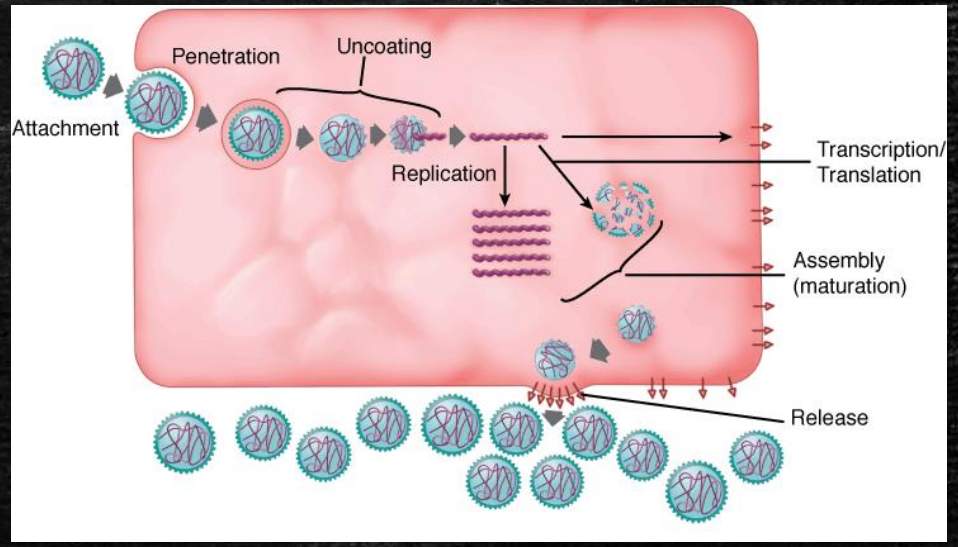


NAKED VIRUS - only nucleic acid and capsid; sometimes glycoproteins

ENVELOPED VIRUS- naked virus wrapped in host membrane

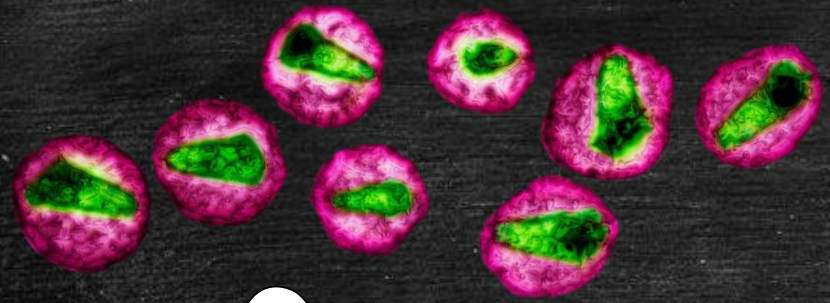
All viruses DO NOT...

- CONTAIN CELL MEMBRANES, ORGANELLES, RIBOSOMES, OR CYTOPLASM
- REPRODUCE OUTSIDE OF A HOST CELL
- GROW OR DEVELOP (ASSEMBLED BY HOST)
- OBTAIN OR USE ENERGY
- RESPOND TO STIMULI
- MAINTAIN HOMEOSTASIS

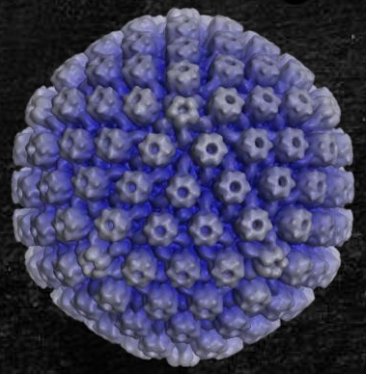


Are VIRUSES alive?

- ~~GROWTH AND DEVELOPMENT~~
- ~~REPRODUCE~~
-  CHANGE OVER TIME
- ~~OBTAIN AND USE ENERGY~~
- ~~MAINTAIN HOMEOSTASIS~~
- ~~COMPOSED OF CELLS~~
- ~~RESPOND TO THE ENVIRONMENT~~
-  CONTAIN GENETIC MATERIAL



Viruses are NOT cells! they are smaller than the smallest cell!



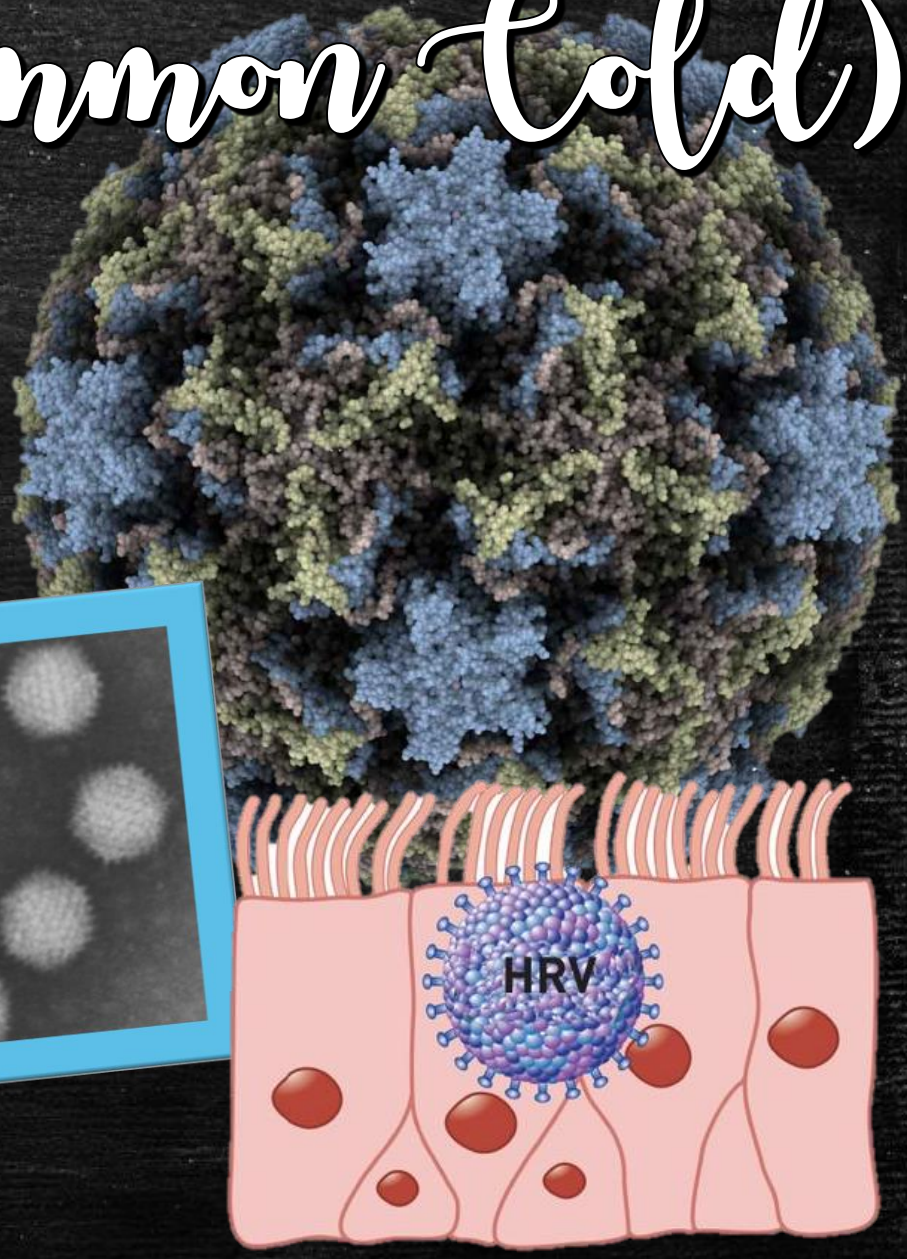
- http://learn.genetics.utah.edu/content/cells/scale/

CHECK IT!

Most viruses cause
DISEASE & INFECTION.

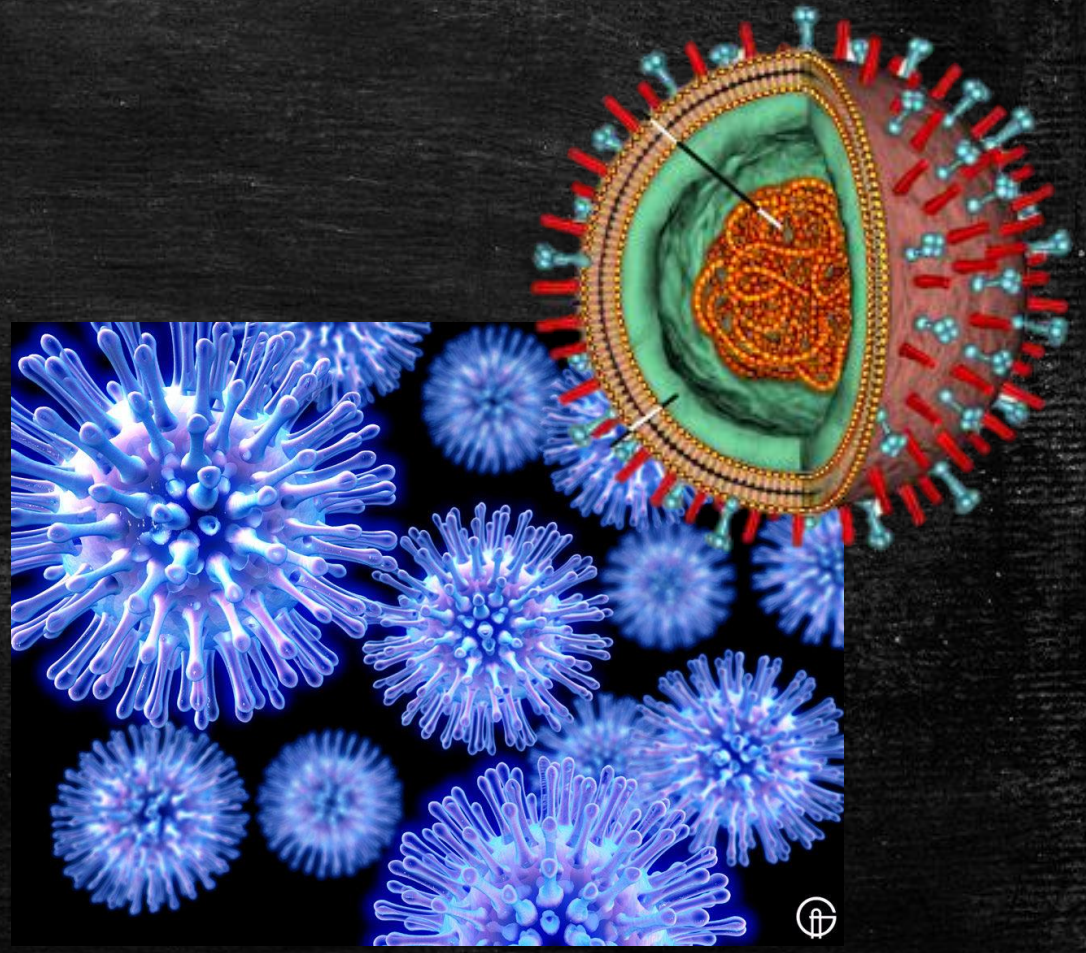
Rhinovirus (Common Cold)

- **WHAT IS THE HOST CELL?**
  - Respiratory epithelial cells
- **HOW DO WE CATCH IT?**
  - Contact with contaminated objects; droplet inhalation
- **WHAT ARE THE SYMPTOMS?**
  - Sneezing, Sore Throat, Fever, Headache, Muscle Aches

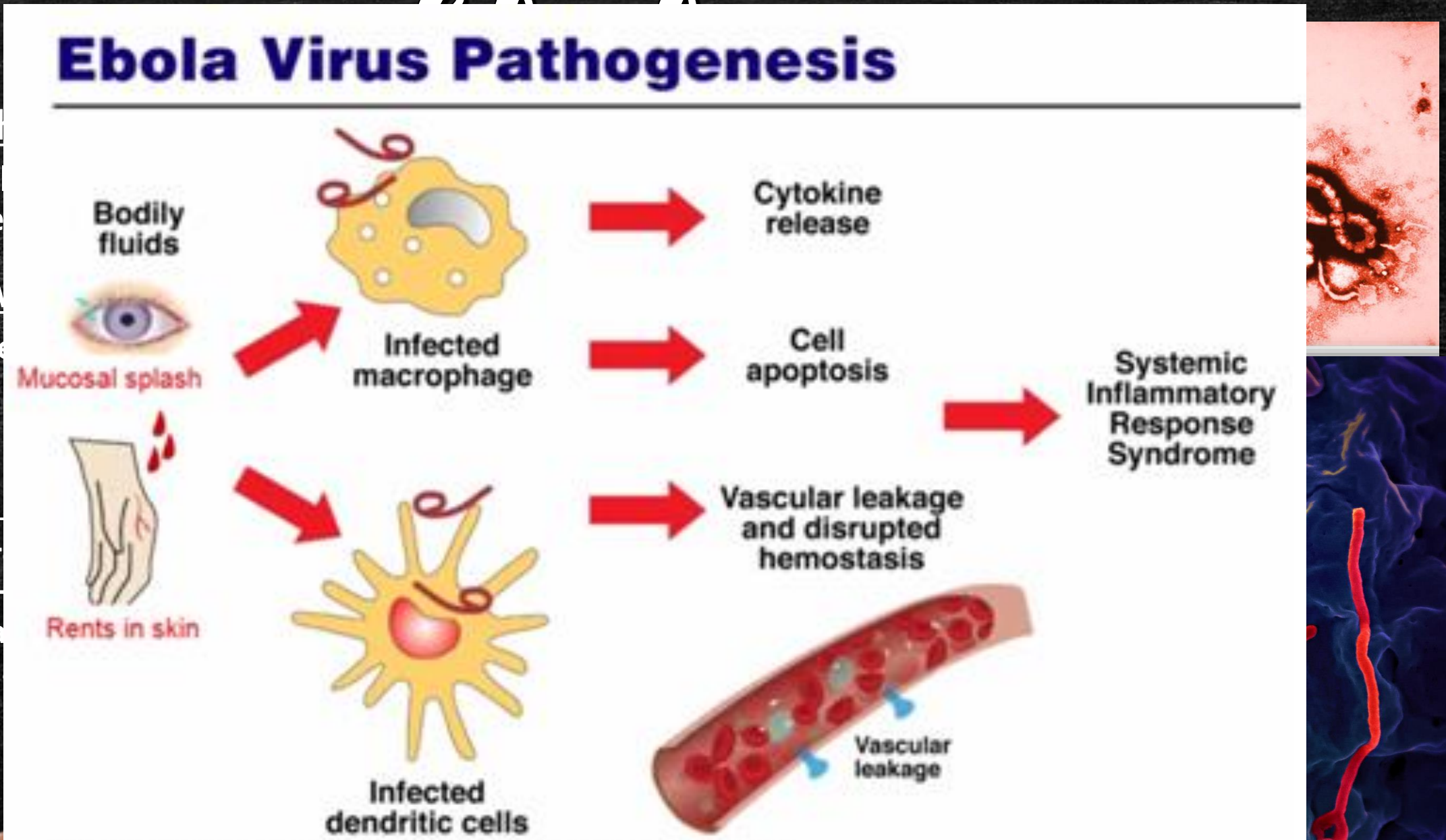


Influenza (flu)

- What is the host cell?
  - Respiratory tract cell
- How do we catch it?
  - Contact with contaminated objects, droplet inhalation.
- What are the symptoms?
  - Body Aches, Fever, Sore Throat, Nasal Congestion, Headache, Dry Cough, Fatigue.

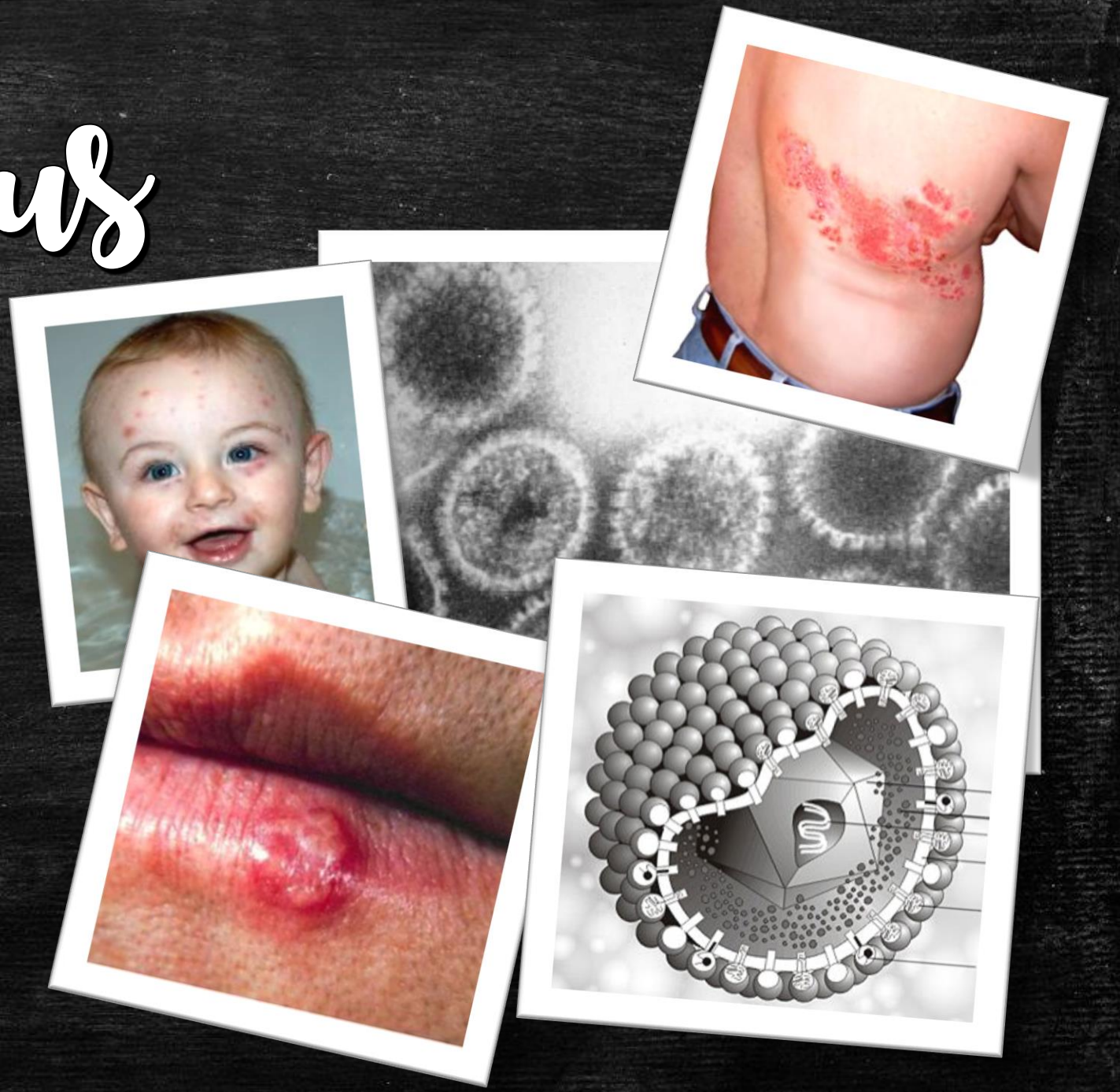


- What is th
  - Liver cell
    blood ve
- How do w
  - exposure
    infected
    person.
- What are
  - Sore Thr
    Severe H
    Diarrhea
    Internal



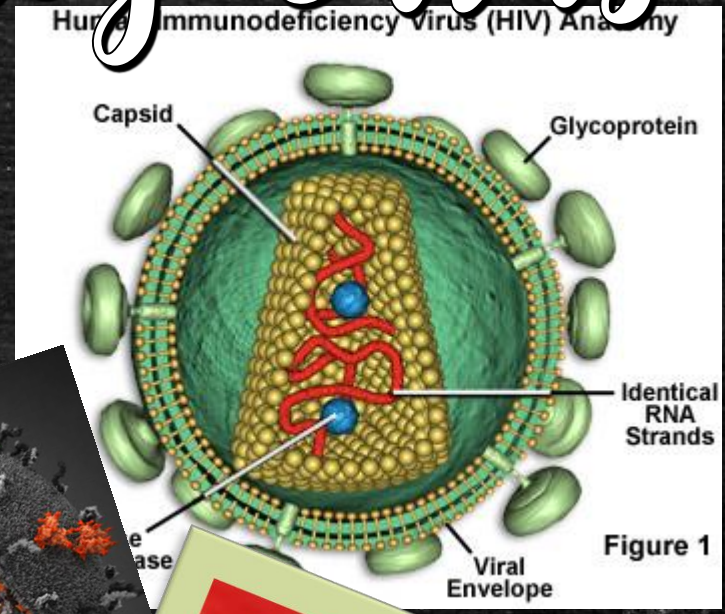
Herpes virus

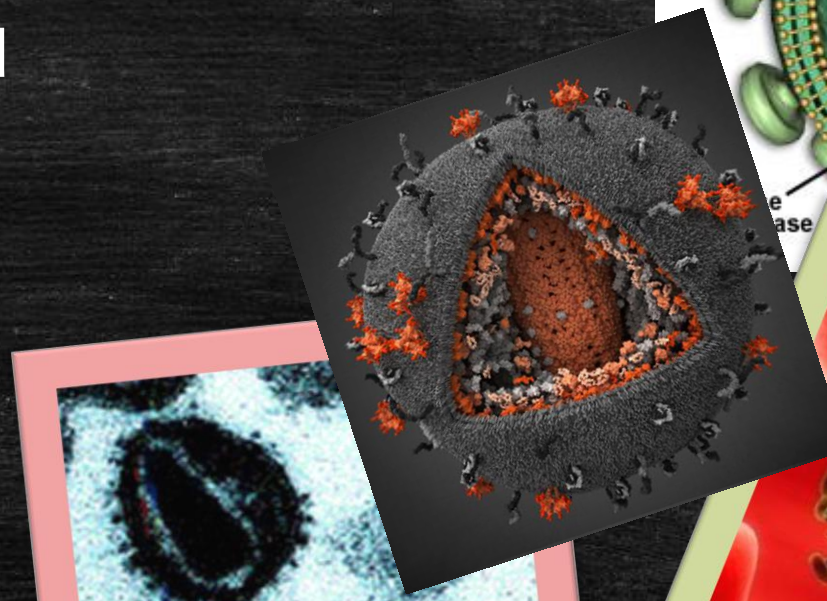
- Once a person is infected with a herpes virus they are infected for life.
- Examples:
  - Chicken Pox can reappear later in life as Shingles
  - HSV-1 (oral herpes) and HSV-2 (genital herpes)

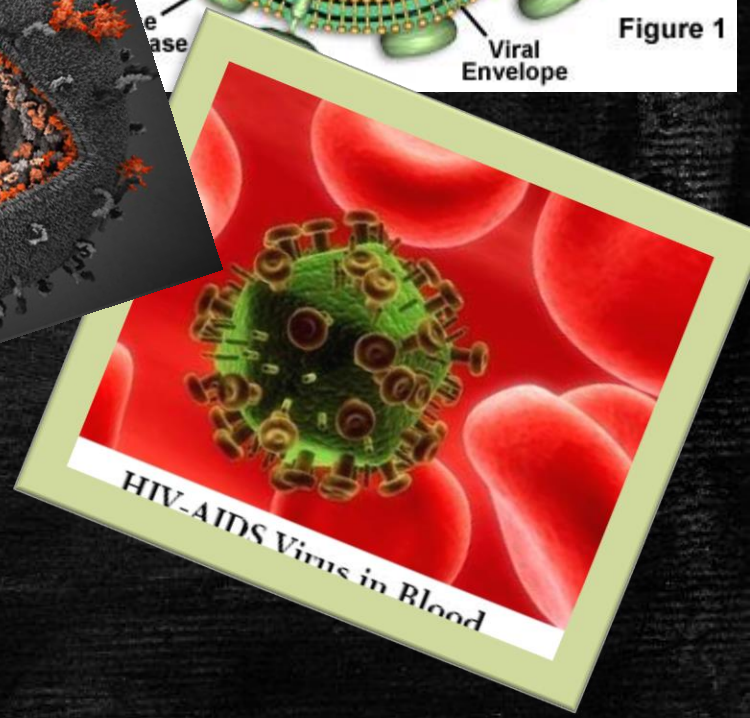


Human Immunodeficiency Virus

- What are the target cells?
  - immune cells such as helper T cells (specifically CD4+ T cells), macrophages, and dendritic cells
- How do we catch it?
  - Contact with contaminated blood or bodily fluids
- What are the symptoms?
  - Within a few weeks of HIV infection, flu-like symptoms such as fever, sore throat, and fatigue can occur. Then the disease is usually asymptomatic until it progresses to AIDS. AIDS symptoms include weight loss, fever or night sweats, fatigue, and recurrent infections.

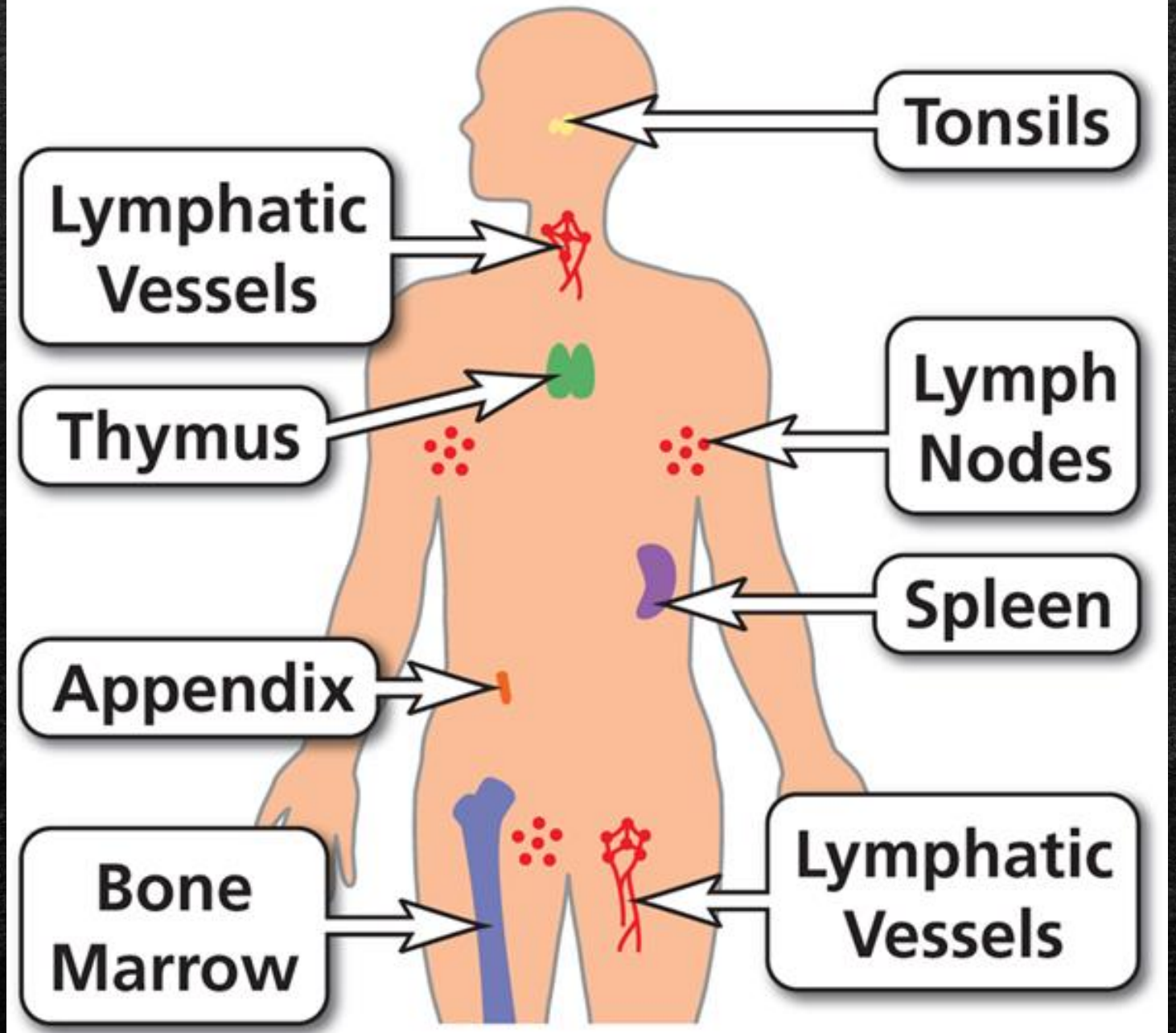






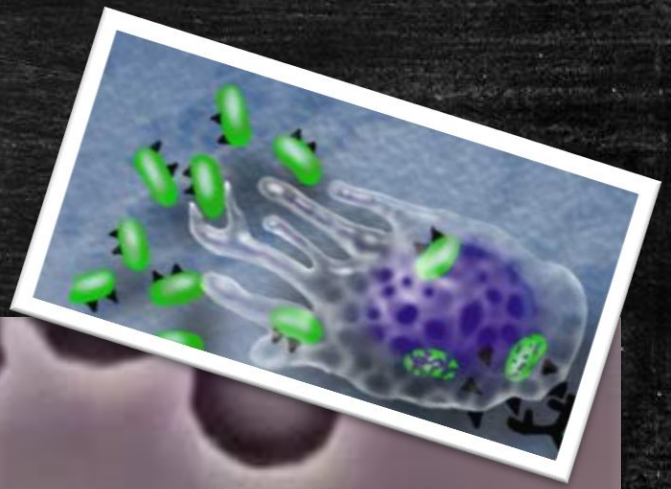
What happens when these pathogens (both microorganisms and viruses) enter our bodies?

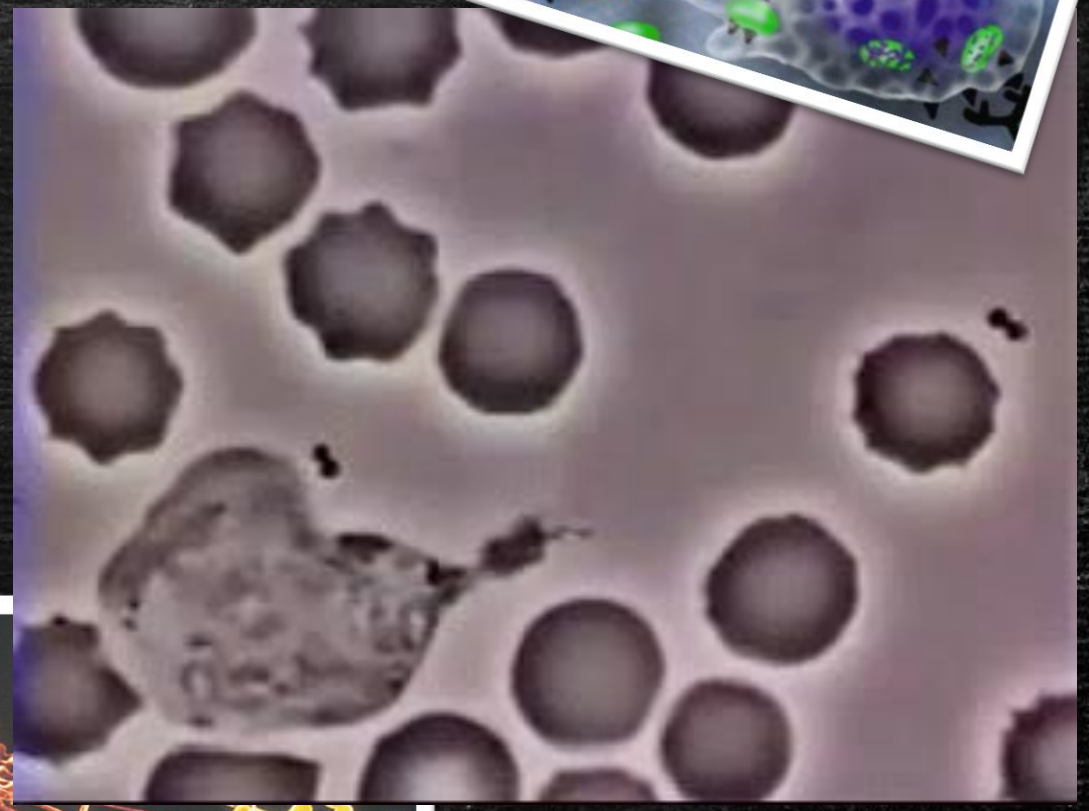
Immune System

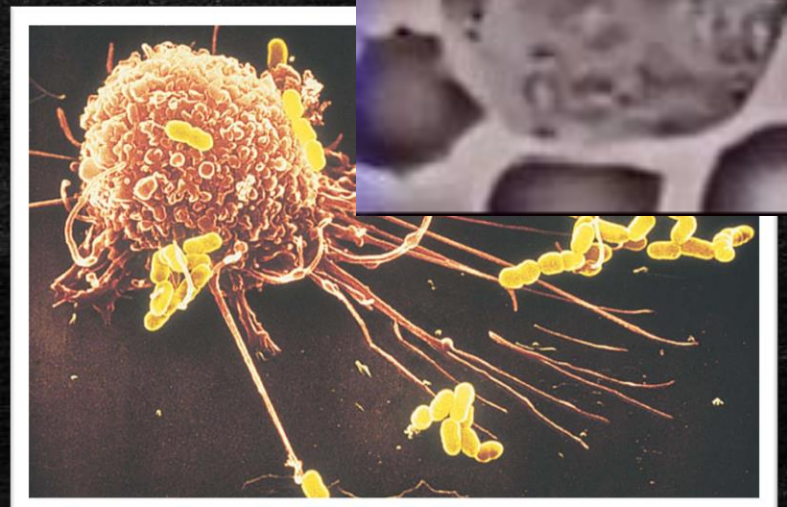


Immune cells

- *Macrophages* are large white blood cells that get rid of debris by eating it.
- When they eat too much, they die. These dead cells and the cell debris are "puss"

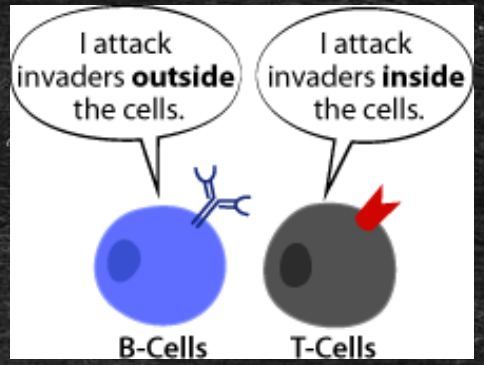


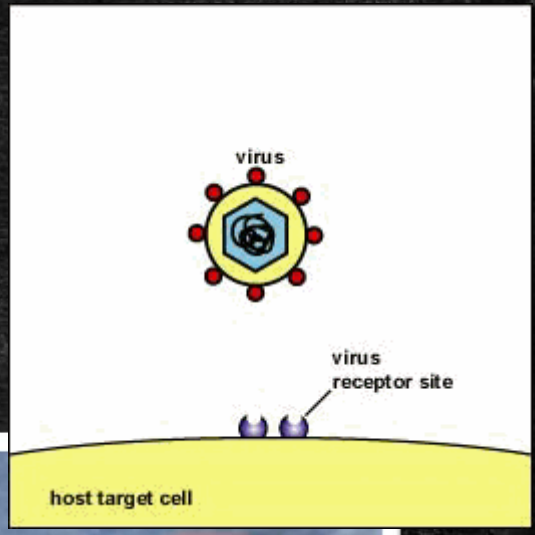


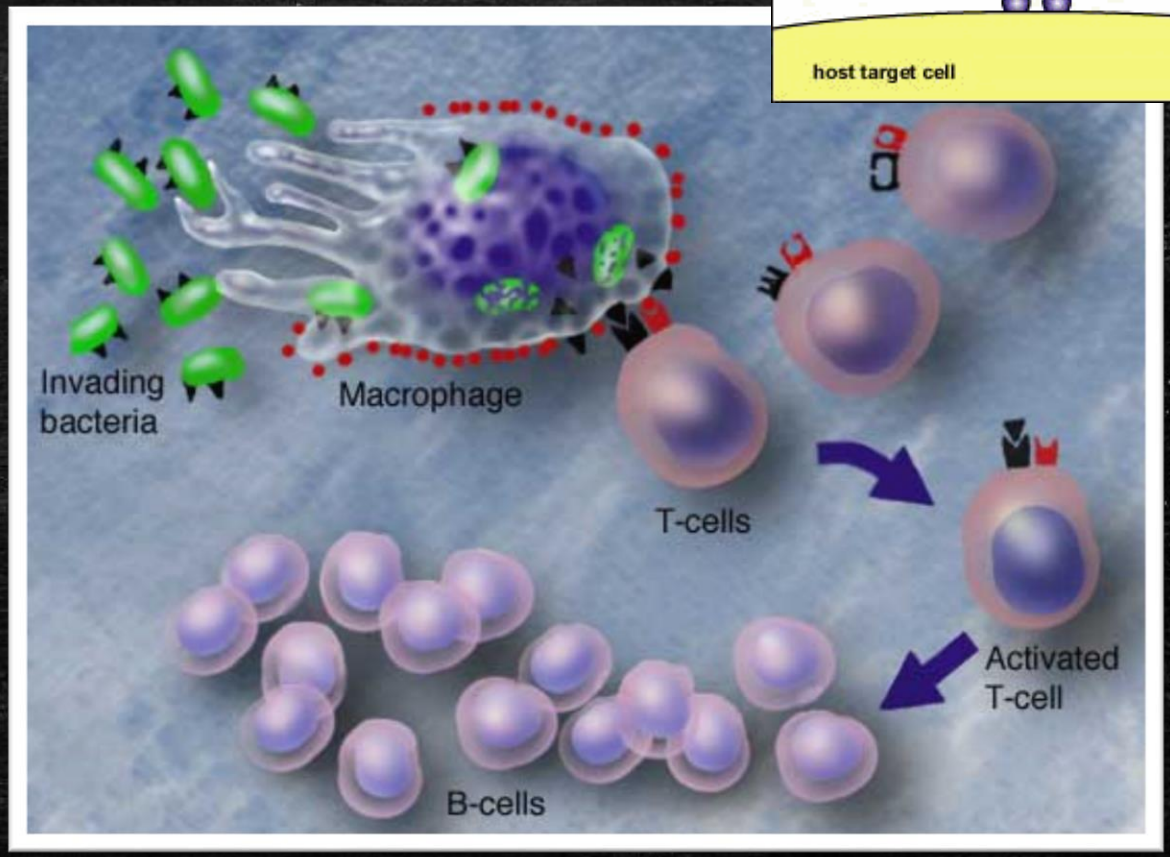


Immune cells

- Other white blood cells pick up viral particles from the battle and carry it to Lymph nodes.
- In the lymph nodes, they look for cells to fight this type of virus.
- T- cells (thymus cells) are called upon and go to the site of the infection to kill specific infected cells
- B-cells (bone marrow cells) make antibodies that go to the site and kill free viruses







Sometimes our immune system needs help

MICROORGANISM PATHOGENS CAN BE *treated* WITH *antibiotics, antifungals, & antiprotozoan.*

VIRAL PATHOGENS CAN BE *prevented* WITH *vaccines.*