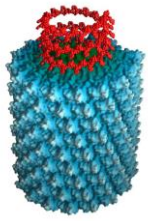
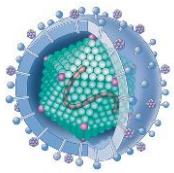
Life Science

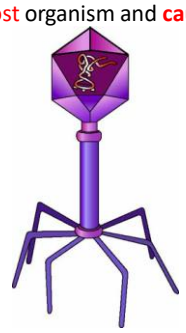
Chapter 8
Viruses & Bacteria

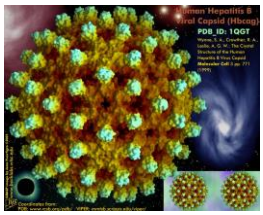
What is a virus?

- A very small (must use an electron microscope to see) nonliving particle that invades and then reproduces inside a living cell.
- Made up of a **protein coat** & **genetic material** **(some w/ DNA, some w/ RNA).**
- **Non living** because: Not made up of cells, Do not utilize energy, Do not respond to surroundings
- The only life function they perform is reproduction & they have the host cell do all the work!
- Viruses are **parasites**: lives on or in a host organism and **causes harm** to the host.





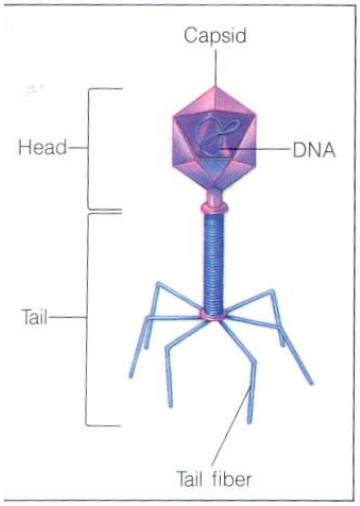




Virus Structure

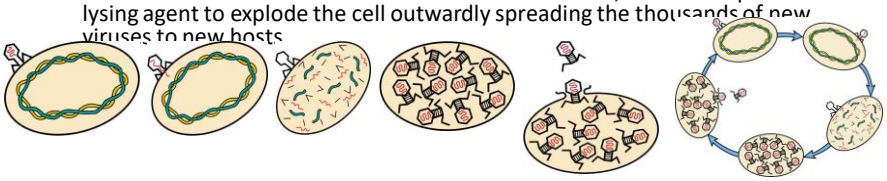
Over 5,000 different types of viruses have been identified, we will use the bacteriophage virus as an example

- Genetic material is DNA
- Everything else is made of Protein:
  - Head
  - Tail
  - Tail fiber
  - Capsid

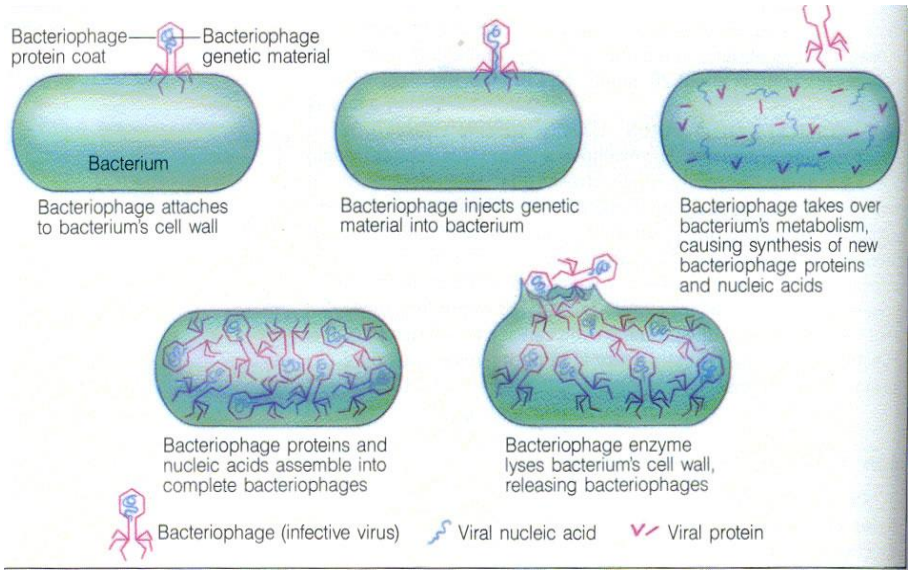


Virus "Life Cycle"

- **4 part "Life Cycle"**
- **1. Invade/Infect**
  - a. Chance contact w/ host cell
  - b. Protein coat attaches to cell and injects its genetic material
- **2. Growth**
  - a. Viral DNA takes over the cells functions,
  - b. Shuts down the cellular DNA,
  - c. Causes the cell to make viral mRNA and then viral proteins
- **3. Replication**
  - a. Viral DNA cause the cell to replicate the viral protein coat and copies of the viral DNA thousands of times
- **4. Release**
  - a. Once the virus has utilized the host cellular material, the viruses produce a lysing agent to explode the cell outwardly spreading the thousands of new viruses to new hosts

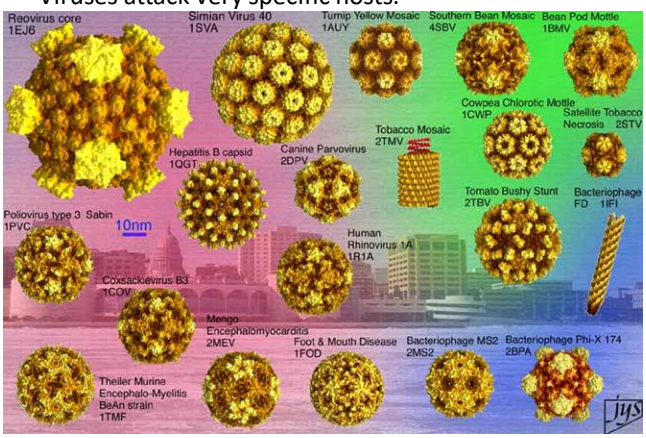


Virus Life Cycle



Virus Types

- Since they are not living they are not given Scientific names, instead they are named after the disease they cause.
- **Measles, Mumps, Hepatitis, Rabies, AIDS, Colds** and the **Flu** to name only a few
- Viruses attack very specific hosts.



Natural defenses your body uses to protect itself from viruses:

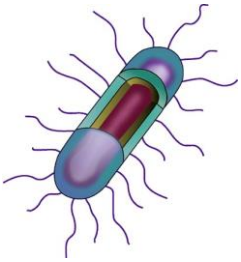
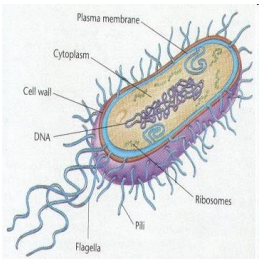
a. **Skin** acts as a barrier

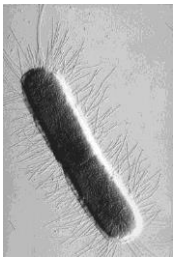
b. **Immune system**
   i. **Antibodies**
   ii. **Interferon**

Vaccines (a dead or weakened form of the virus)

Bacteria

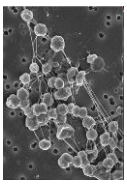

- **Lumper** Kingdom **Monera**
- **Splitter** Kingdoms **Archaebacteria & Eubacteria**
- All are single celled Prokaryotes- no nucleus **(but still reproduce)**, no mitochondria **(but still respire)** or chloroplasts
- **Nucleoid**- a single chromosome formed into a closed circle of double-stranded DNA -

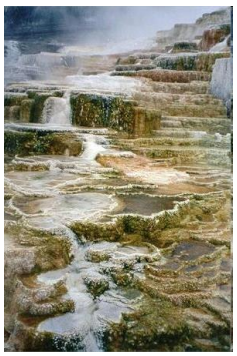





Kingdom Archaebacteria

- Example – **methanogens** (waste product is methane gas)
- Some of the oldest known organisms
- Very different from other bacteria
  - **Missing an important carbohydrate** found in other prokaryotes
  - Have **different type of lipid** in their membranes
  - Very **different gene sequences**
- Live in very harsh environments **anaerobic** in nature (environments without oxygen)
  - a. Inside your digestive tract
  - b. Ocean floor in hot vents, geysers, very salty
    Great Salt Lake



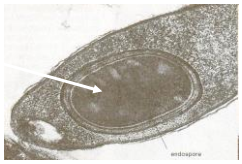



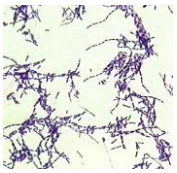
Kingdom Eubacteria

- **Bacteria** (aka Schizophytes)& **blue-green algae** (aka cyanobacteria)
- **Unicellular**
- Both **autotrophs** and **heterotrophs**
- Require both proper temperature & amounts of moisture; however, during harsh environmental conditions the often form an **endospore –** a thick protective internal wall
- Both Aerobic & Anaerobic
- Saprophyte
- Identified by their **SHAPE**
  - **a.** Round: **Coccus**
  - b. Rod-like: **Bacillus**
  - c. Spiral: **Spirillum**

Coccus Bacillus Spirillum

endospore



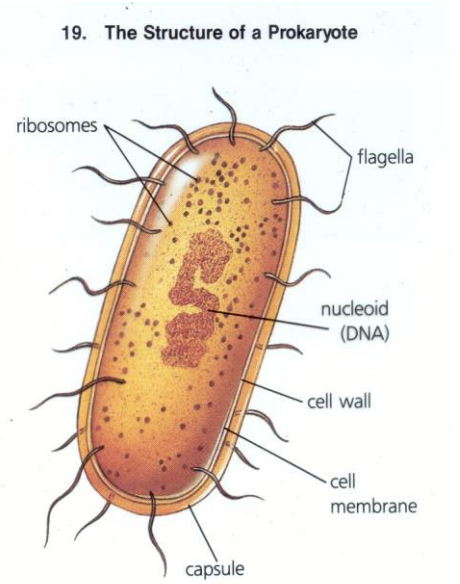


Misc. Info (that might help w/ the worksheets)

- Bacterial growth can be controlled by canning, refrigeration, freezing and even radiation
- Mutation is the greatest source of variability
- Multiple living environments include:
  - Living on Dead or decaying matter – Saprophytes
  - Some live on and are dependent on various chemicals like methane, ammonia, etc. for an energy source – chemosynthetic bacteria
  - Some bacteria live in the gut of ticks & cause Lyme disease in humans – spirochetes
  - Actinomycetes are used to produce multiple types of antibiotics
  - Legumes (Peas and beans) have nodules in their roots that take atmospheric Nitrogen and "fix" it so it can be used by other plants
    - Results in a mutualistic relationship where both the bacteria and plant benefit

Bacterial Structure

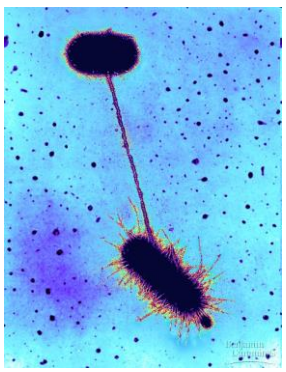
- **Cell Wall-** tough outside layer that protects and gives the bacteria its shape
- **Cell membrane-** located just inside of the cell wall.
- **Capsule**: slime coating for protection surrounding the cell wall
- **Flagella**; whip-like hairs used for locomotion
- **Nucleoid**: since no cell membrane, region the genetic material is concentrated
- **Ribosomes** used during protein synthesis are located throughout cytoplasm



Bacterial Reproduction

- **Binary Fission** – asexual reproduction, genetically identical to parent cell.
- **Conjugation -** Sexual:
  - Two cells connect by a **cytoplasmic bridge**
  - Part of genetic material from **donor** is transferred to the **recipient** cell
  - Results in **genetic diversity** and increased survival possibilities.

Follow the link to YouTube



Completo – no mas!!