

▮ Comparing Prokaryotic and Eukaryotic Cells: An Overview**• Prokaryotes**

- DNA is not enclosed within a membrane in a circularly arranged chromosome
- DNA is not associated with histones
- Lack membrane enclosed organelles
- Cell walls contain peptidoglycan
- Divide by binary fission (asexual)

• Eukaryote

- DNA is found in the cells nucleus
- Associated with histones
- Membrane enclosed organelles
- Cell walls are chemically simple
- Cell division involving mitosis (mitotic spindle)

▮ The Prokaryotic Cell

- Small unicellular organisms
- Bacteria (majority) and archaea
- **The Size, Shape and Arrangement of Bacterial Cells**
 - .2 - 2 μm in diameter and 2-8 μm in length
 - Basic Shapes
 - Spherical - coccus

- Round, oval, or flattened on one side
 - Diplococcic, **streptococci** (remain in chain like pattern), **tetrads** (divide in two planes and remain in groups of thirds) **sarcinae** (divide in three planes and remain in cube-like groups of 8), & **staphylococci** (divide in multiple planes and form grapelike clusters)
- Rod shaped - bacillus
 - Only divide along their short axis
 - Fewer groupings
 - Single bacilli, **diplobacilli** (appear in pairs after division), & **streptobacilli** (appear in chains)
 - **Coccobacilli** look oval and appear so much like cocci
- Spiral
 - Have one or more twists, NEVER straight
 - Curved rod shaped are **vibrios**
 - **Spirilla**: have a helical, corkscrew shape and rigid bodies
 - Use flagella to move
 - **Spirochetes**: helical and flexible
- Most bacteria are **monomorphic** (stay the same shape their whole lives)
- **Pleomorphic** have many different shapes throughout their lives
- **Structures External to the Cell Wall**
 - **Glycocalyx**: general term for substances that surround cells
 - **Capsule**: substance that is organized and firmly attached to the cell wall
 - Protect the cell from phagocytosis by host cells
 - **Slime layer**: substance that is unorganized and loosely attached to the cell wall
 - **Extracellular polymeric substance (EPS)**: helps cells in a biofilm attach to their target environment and to each other

- Bacteria can grow on various surfaces
- **Flagella:** long filamentous appendages that propel bacteria
 - **Atrichous:** bacteria that lack flagella
 - **Peritrichous:** flagella distributed over the entire cell
 - **Polar:** at one or both ends of the cells
 - **Monotrichous:** flagellum at one end of the cell
 - **Lophotrichous:** a tuft of flagella coming from one end of the cell
 - **Amphitrichous:** flagella at one end of the cell
 - 3 Basic Parts
 - Filament: long outer portion and contains flagellin arranged in chains that intertwine and form a helix around a hollow core
 - Hook: filament attached to this slightly wider part with a different protein
 - Basal body: anchors the flagellum to the cell wall and plasma membrane
 - Small central rod inserted into a series of rings
 - **Gram-negative** bacteria contain two pairs of rings
 - The outer pair of rings is attached to various portions of the cell wall
 - The inner pair of rings are attached to plasma membrane
 - **Gram-positive** bacteria only contain an inner pair of rings that are attached to the plasma membrane
 - Prokaryotic flagellum rotate at the basal membrane to move the cell
 - Clockwise or counterclockwise
 - **Motility:** the ability to be able to move itself
 - Can alter the speed and direction of rotation