

Prokaryotic and eukaryotic cells differ in size and complexity

- **All cells** are surrounded by a *plasma membrane*.
- The semifluid substance within the membrane is the **cytosol**, containing the organelles.
 - Forms most of cell mass
 - 70% water
- All cells contain chromosomes which have genes in the form of DNA.
- All cells also have *ribosomes*, tiny organelles that make proteins using the instructions contained in genes.
- A major difference between prokaryotic and eukaryotic cells is the location of chromosomes.
- In an eukaryotic cell, chromosomes are contained in a membrane-enclosed organelle, the *nucleus*.
- In a prokaryotic cell, the DNA is concentrated in the **nucleoid** without a membrane separating it from the rest of the cell.
- In eukaryote cells, the chromosomes (DNA) are contained within a membrane bound nucleus.
- The region between the nucleus and the plasma or cell membrane is the **cytoplasm**.
 - **All** the material within the plasma membrane of a prokaryotic cell is cytoplasm (no organelles except ribosomes).
- Within the cytoplasm of a eukaryotic cell is a variety of membrane-bounded organelles of specialized form and function. (*Can you name some???*)
 - These membrane-bounded organelles are **absent** in prokaryotes.
- Eukaryotic cells are generally much bigger than prokaryotic cells.
- Speaking of size.....the logistics of carrying out metabolism set limits on cell size.
 - At the lower limit, the smallest bacteria, mycoplasmas, are between 0.1 to 1.0 micron.
 - Most bacteria are 1-10 microns in diameter.
 - Eukaryotic cells are typically 10-100 microns in diameter. (*Remember, a micron is 1/1000 of a millimeter*)

Review of differences between prokaryotic and eukaryotic cells

- Prokaryotes (before nucleus)
 - DNA not membrane-bound

- No membrane-bound organelles (except ribosomes)
 - DNA is a loop without proteins
 - Small – about 1 to 10 μm
 - Only bacterial cells are prokaryotic
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- Eukaryotes (true nucleus)
 - DNA enclosed in nuclear envelope
 - Many complex organelles
 - DNA/Protein make up chromosomes
 - Larger – 10 to 100 μm
 - Cytoskeleton –lattice of protein filaments
 - All cells are eukaryotic, except bacteria
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- Metabolic requirements also set an upper limit to the size of a single cell.
 - As a cell increases in size its volume increases faster than its surface area.
 - Smaller objects have a greater ratio of surface area to volume. (*Why is surface area so important????*)
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- The **plasma membrane** functions as a selective barrier that allows passage of oxygen, nutrients, and wastes for the *whole volume of the cell* (it's the cell's bouncer!)
 - **Internal membranes compartmentalize the functions of a eukaryotic cell**
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- A eukaryotic cell has extensive and elaborate internal membranes, which partition the cell into compartments-each compartment being distinct from the others
 - These membranes also participate in metabolism as many enzymes are built into membranes.
 - The barriers created by membranes provide different local environments that facilitate specific metabolic functions.
 - The general structure of a biological membrane is a double layer of phospholipids with other lipids and diverse proteins.
 - Each type of membrane has a unique combination of lipids and proteins for its specific functions.
 - For example, those in the membranes of mitochondria function in cellular respiration.