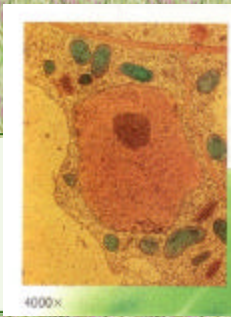


Cells

Chapter 4



4000x

Cells:

- Cytology: the study of cells
- Cytologists: scientists who study cells
- Cells are the basic unit of structure and function in a living organism.
- Smaller cells function more efficiently...why?


Cell Sizes:

- Cells vary in size, but most remain smaller rather than larger because they have more surface area/volume if they are smaller than larger.
- Most cells are so small that we need to use microscopes to see them and much smaller measurements than we normally use:
 - Micrometer (μm) = 1/1,000,000 of a meter = (10^{-6})
 - Nanometer (nm) = 1/1,000,000,000 of a meter = (10^{-9})

• Red blood cells: ~ 9 μm	Epithelial cell: ~ 50 μm
• Human egg cell: ~ 130 μm	Protein: ~ 6 nm
• Amino Acid: ~ 0.9 nm	<i>Some are larger-- Nerve Cells: ~ 90 cm</i>

Types of Cells:

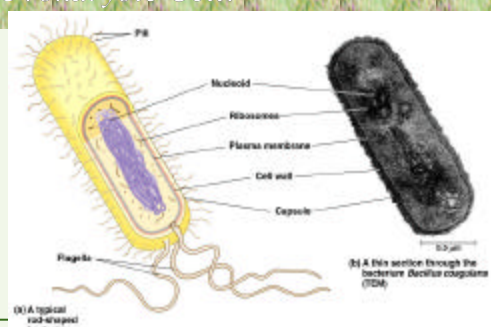
- There are two types of cells:
 - Prokaryotic
 - Eukaryotic



Types of Cells

- Prokaryotic - cells that lack membrane-bound internal structures; has no defined nucleus.
 - Most prokaryotes are unicellular.
 - Have DNA, but the DNA is not enclosed in a membrane-bound nucleus.
 - Usually ~ 1-10 μm in diameter.
 - Possess a peptidoglycan membrane which is a combination of protein and carbohydrate.
 - ie: bacteria, blue-green algae

Prokaryote Cell:



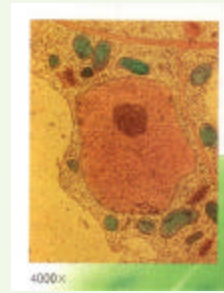
(A) Typical rod-shaped bacterium

(B) A thin section through the bacterium *Bacillus thuringiensis* (BTM)

Types of Cells

- Eukaryotic - cells that contain internal membrane-bound structures called organelles, have a true defined nucleus where different parts of the cell to specialize in different functions.
 - Can be unicellular or multicellular.
 - DNA is enclosed in a membrane-bound nucleus.
 - Usually about 10-100 μm in diameter (most between 10-30 μm .)
 - Derived from the Greek words:
 - eu- true/good
 - karyon - kernal/nucleus
 - ie: you, onion, protozoan

Eukaryotic Cells:



Main Parts of a Eukaryotic Cell

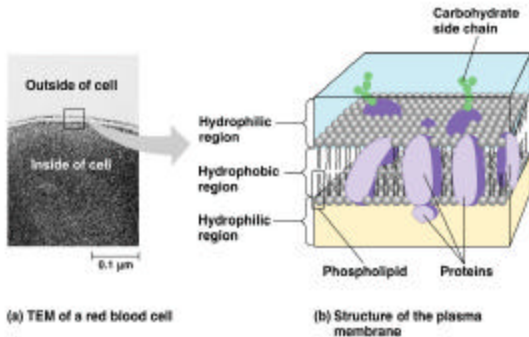
- Three Main Parts:
 - Cell Membrane
 - (AKA: Plasma Membrane)
 - Nucleus
 - Cytoplasm
- In plant and bacteria cells there is an “extra” part
 - Cell Wall



Cell (Plasma) Membrane

- Boundary between the cell and its external environment (complex double barrier of lipid and protein molecules.)
- Flexible, allows the cell to vary its shape when necessary.
- Maintains the chemical balance within the cell.
- Controls the movement of materials that enter and exit the cell by being selectively permeable. (O_2 , nutrients enter and excess H_2O , wastes exit.)

Plasma membrane:



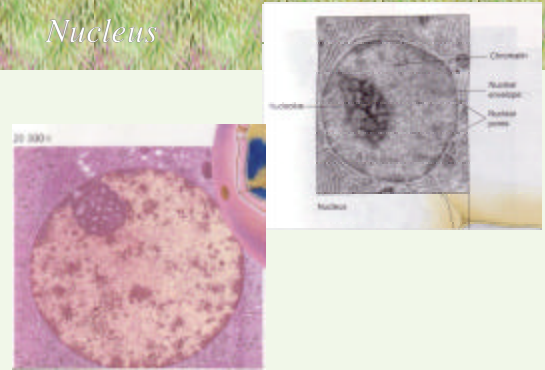
Nucleus

- Nickname: Control center
- Membrane-bound structure within the cell that directs cell activities.
- Contains and is responsible for transmission of the genetic material for the cell.
 - During most of the life cycle of the cell, the genetic material is in long tangled strands called chromatin, but when a cell prepares for replication, the chromatin condenses into short thick rods called chromosomes.

Nucleus Continued....

- It is the largest organelle.
- Surrounded by a porous double membrane and (each membrane is a double layer--making it 4 layers thick) called a nuclear envelope.
- The nucleus is ~ 5 μm in diameter.
- Contains a Nucleolus: region that produces ribosomes.
- Contains nucleoplasm: the cytoplasmic material inside the nucleus.

Nucleus



Cytoplasm:

- All of the material that lies inside the cell membrane except the nucleus.
- A thick, clear, aqueous salt solution that allows suspended materials to float freely within the cell.
- Jelly-like substance inside the cell and all the organelles.
- Cytoplasmic streaming: constant motion of the cytoplasm.

Cell Wall

- Rigid structure that surrounds a plant or bacteria cell.
- Inflexible structure that surrounds the plasma membrane.
- Thicker than the plasma membrane.
- Made of different substances in different organisms.
 - Cellulose in plants- form fibers to give the plant support.(fiber of our diets)
 - Chitin in fungi-nitrogen containing polysaccharide.

Cell Organelles:

- Membrane-bound structures that reside within a cell.
- Components of cells with specific functions.
- *organon*- tool, implement
- *ella*- small
- Or: Small organ

Cell Organelles:

- Chloroplasts
- Mitochondria
- Endoplasmic Reticulum (ER)
- Golgi Apparatus
- Vacuole
- Vesicle
- Ribosomes
- Lysosome
- Centrioles
- Plastid
- Cytoskeleton:
 - Microtubules
 - Microfilaments