Cell Biology
Cell Structure & Function

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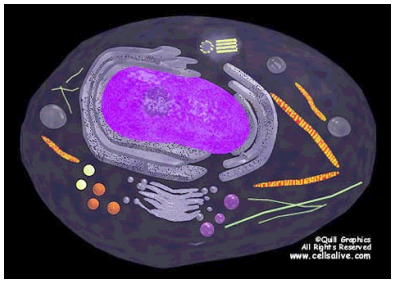
Since cells are the building blocks of life, understanding the different structures and functions of a cell is critical to your understanding of biology. Our biology unit is going to begin by exploring the anatomy of both plant and animal cells. The website *Cells Alive,* http://www.cellsalive.com/cells/3dcell.htm does an outstanding job modeling both plant and animal cells. You are about to enter a virtual cell where you can see the structure of the different organnelles and learn about their function. This web guide will take you through a tour of the cell, and provide you with your notes on the structure and function of the cell. Start Internet Explorer and type in the address given above. Click on "Take Me to the Animation" or the image of the cell in middle of page. Now select the animal option located under the image. Notice that as you move the cursor around the cell, the different organelles of the cell are highlighted. By clicking on the organelle you will be directed to an information page regarding that organelle. Explain the function of the different parts of the cell.



Animal Cell

Animal Cell

Nucleus & Nucleolus

Enclosed in double membrane and communicates with the surrounding cytosol through pores in membrane. DNA is held within the nucleus.

The Nucleolus produces ribosomes. Ribosomes move out of the nucleus after being produced and migrate to the rough endoplasmic reticulum.

Smooth Endoplasmic Reticulum & Rough Endoplasmic Reticulum

Smooth ER (ER): Vast network of membrane-bound vesicles and tubules. The ER is actually the continuation of the outer nuclear membrane. Appears smooth under the electron microscope. Functions depend on the type of cell and may include: lipid and steroid hormone synthesis, breakdown of lipid-soluble toxins in liver cells, and may control release of calcium during muscle cell contraction.

Rough ER (RER); Has numerous ribosomes attached/embedded in membrane so it appears "rough". The ribosomes on the RER produce proteins that are collected by the ER and transported throughout cell.

Centrosomes & Centrioles

Centrosomes: Produces microtubules. These microtubules are used during mitosis to separate and pull apart replicated chromosomes. In ANIMAL CELLS the centrosome is actually a pair of small organelles called Centrioles.

Centrioles: During Animal cell division these replicate and the centrosome divides. Each centrosome moves to opposite ends of the nucleus. While at the end of the nucleus, each centriole grows microtubules that form a "spindle" which is responsible for separating the replicated chromosomes.

Golgi Body

Also know as the Golgi Apparatus. A membrane-bound structure with a single membrane (remember, the Nucleus has a double membrane). A Golgi Body is actually a stack of membrane-bound vesicles. This structure is important in packaging macromolecules for transport elsewhere in cell. The stack of larger vesicles is surrounded by smaller vesicles. These smaller vesicles contain the packaged macromolecules mentioned above. At the periphery of the Golgi Body the vesicles contain the enzymatic or hormonal contents of lysosomes, peroxisomes, and secretory vesicles.

Cytoskeleton

Helps the cell maintain shape. Primary function is cell motility or movement. Allows for internal movement of organelles, cell locomotion, and muscle fiber contraction. Composed of three primary protein filaments:

- microtubules
- actin filaments (microfilaments)
- intermediate fibers

Cytosol

Most cellular metabolism occurs here in. The "liquidy" watery matrix in which the organelles reside. Although mostly water many proteins that control cell functions are found here. These proteins control cellular functions such as signal transduction pathways, glycolysis, intracellular receptors, and transcription factors. Cytoplasm is the collective term for the cytosol and all the organelles that are suspended in the cytosol.

Mitochondria

About the size of bacteria, these organelles provide the energy for the cell to move, replicate, contract, etc. These organelles have a double membrane (just like the nucleus) with the outer membrane being smooth and the inner membrane having a lot of convoluted folds (cristae). The purpose of the cristae is to increase surface area and is the site for part of cellular respiration that combine oxygen with sugar to make ATP.

Lysosomes

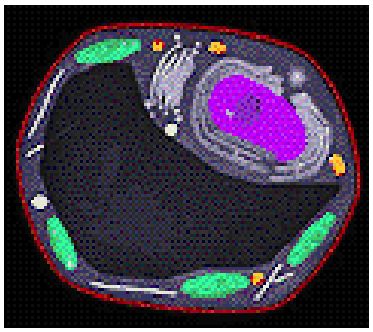
Common in ANIMAL CELLS. Contain hydrolytic enzymes that are used for intracellular digestion (cell eating). In white bloods that eat bacteria the lysosome contents are slowly released into the vacuole around the bacteria and then kill and digest the bacteria. An uncontrolled release of lysosome contents results in cell death (necrosis).

Are RARE in Plants. Hydrolytic enzymes in plants are found in the vacuole.

Vacuole
Membrane-bound sac that plays a role in intracellular digestion and release of cell wastes/toxins. In animals they are generally small. Vacuoles are much larger in plants and are use in:

- storing nutrients
- storing waste products
- increasing cell size during growth
- acting like lysosomes
- regulates Turgor Pressure (keeps plant from wilting)

Cell Membrane
Double layer of phospholipids (Phospholipid bilyar). The phospholipids contain hydrophilic and hydrophobic portions. Embedded within the membranes are proteins that serve important roles including moving materials in and out the cell, cell recognition, receptors for hormones, odors, tastes, etc.



Plant Cell
Plant Cell

What organelles are found in both plant and animal cells?

Everything except chloroplasts, centrioles, cell wall,

What organelles are unique in the plant cells?

Chloroplasts, cell wall

How do the centrosomes and centrioles differ between plants and animals?

In plants the centrosomes are simpler and do not include centrioles.

How do vacuoles differ between plant and animal cells?

In plants the vacuoles are large and are used to store nutrients, waste products , and is important in maintaining turgor pressure (keeps plant from wilting).

Explain the function of the Cell Wall.

Helps plant cells maintain shape and serves as a protective barrier.

Explain the difference between prokaryotic and eukaryotic cells.

Prokaryotic Cells: Primitive cells that lack membrane-bound organelles. Has outer cell wall that give them shape with a plasma membrane next to the cell wall. An example is a bacterium.

Eukaryotic Cells: Larger (bigger than bacteria) highly developed cells that have membrane-bound organelles. These cells have specialized packaging and transport mechanisms needed to support their larger size. Examples: Protozoa, higher plants and animals, YOU!