

The Parts of the Cell and Their Functions

I. Organelles

- A. Cells are made up of small parts that each have a specific job to do for the cell to function.
 - 1. **organelles** = the small structures that make up a cell; each organelle performs a special function to help the cell do its job for the organism.
 - 2. Some of the most important jobs in the cell include making and transporting proteins, releasing energy from food, controlling what enters and leaves the cell, and getting rid of wastes.
- B. While plant and animal cells have several of the same organelles, there are some structures that are found only in plants and not in animals.
- C. Many of the organelles found in cells are made up of or are surrounded by membrane and, therefore, would not be found in prokaryotic cells.

II. Organelles Found in Typical Eukaryotic Cells

A. **cell membrane**

Type of cell: both plant and animal

Location: forms outer boundary of cell; surrounds cytoplasm; separates the cell from its environment

Description: made up of a double layer of fats (called lipids) with some proteins scattered throughout; the proteins form tiny openings or passageways in the membrane called pores

Function: 1. controls what moves into and out of the cell (only certain materials can get in or out; ex. food, oxygen, and materials go in and wastes and cell products move out)

2. provides protection and support for the cell

Other: it is flexible so it can change shape under pressure; by allowing things to move in and out, it helps maintain homeostasis

B. **nucleus**

Type of cell: both plant and animal (only in eukaryotic cells)

Location: found within the cytoplasm; separated from the cytoplasm by the nuclear membrane

Description: largest organelle; made up of 3 parts:

1. nuclear membrane = thin layer that surrounds the nucleus; contains pores to let materials in and out

2. chromosomes = thin threadlike structures made up of DNA (controls cell activities and provides the information or “recipe” the ribosomes need to make proteins)

3. nucleolus = makes ribosomes (which make proteins)

Function: controls all of the cells activities; controls which proteins are made

Other: chromosomes contain genes that control the characteristics of an organism and pass on the traits

C. **cytoplasm**

Type of cell: both plant and animal

Location: found inside the cell membrane but outside the nucleus

Description: clear, thick, jellylike material; contains a large amount of water (about 70%) and chemicals; may sometimes appear to be grainy (this grainy appearance comes from the organelles floating in it)

Function: contains all the organelles outside of the nucleus

Other: the cytoplasm is constantly moving or “streaming” through the cell

D. **cytoskeleton**

Type of cell: both plant and animal

Location: found throughout the cytoplasm

Description: a web of long tubes and fibers made of protein

Function: supports the cell and helps the cell keep its shape; also helps certain cells move

E. **endoplasmic reticulum (ER)**

Type of cell: both plant and animal

Location: extends from the nuclear membrane to the cell membrane; found winding throughout the cytoplasm; rough ER is usually found near the nucleus

Description: folded, tubelike membrane; rough ER has ribosomes on it; smooth ER lacks ribosomes

Function: moves materials (especially proteins) around the cell; acts like a conveyor belt or passageway; is the cell’s transportation system

F. **ribosomes**

Type of cell: both plant and animal

Location: most are attached to the ER (making rough ER); some float freely in cytoplasm

Description: small grainlike bodies (ribosomes are NOT covered in a membrane)

Function: to make protein; gets instructions for protein production from the DNA in nucleus; the DNA gives the ribosomes the codes for which amino acids to put together to make a specific kind of protein

Other: ribosomes drop proteins directly into the ER for transport; free-floating ones make proteins for that particular spot in the cell

G. **Golgi bodies**

Type of cell: both plant and animal

Location: found in cytoplasm

Description: stacks of flat, membrane-covered sacs; looks a lot like smooth ER

Function: sort and modify proteins from the ER to do different jobs; these are then packaged in sacs (called vesicles) that break off the end of the stack; vesicles go to either the cell membrane for export outside the cell (to be secreted or “given off” by the cell) or to other places within the cell

Other: also called “Golgi apparatus” or “Golgi complex”

H. **mitochondria**

Type of cell: both plant and animal

Location: scattered throughout cytoplasm

Description: rod-shaped structures that have a folded inner membrane within an outer membrane

Function: release energy from the sugar (glucose) in food by combining it with oxygen (cell respiration); it stores this energy in special energy-rich molecules (called ATP) that the cell uses to do its work

Other: called the “powerhouse” of the cell; cells that are more active will have more mitochondria (ex. muscle cells)

I. **lysosomes**

Type of cell: common in animal cells; rare in plant cells

Location: found in cytoplasm

Description: small, round structures filled with digestive chemicals called enzymes

Function: 1. break down large food (sugar) molecules into small ones so they can enter the mitochondria; 2. digest waste products, worn out organelles, and dead or injured cells to make room for new cells (the cell’s materials can be reused by other cells); 3. protect the cell from foreign invaders

Other: sometime act like a “self-destruct” device for the cell

J. **vacuole**

Type of cell: both plant and animal

Location: found in cytoplasm

Description: large, round, fluid-filled sac; plants have one very large vacuole; animals have a few small ones

Function: storage area for food, water, wastes, and other materials

Other: when plant vacuoles are completely filled of water, the cells are plump and the plant is firm; if it loses water, the plants wilt

K. **cell wall**

Type of cell: only in plant cells

Location: found outside the cell membrane

Description: strong and stiff; made of bundles of nonliving cellulose fibers

Function: protects and supports plant cells; allows materials to pass through

Other: often remains after the rest of the cell dies (ex. wood)

L. **chloroplasts**

Type of cell: only in plant cells

Location: found in cytoplasm

Description: large, oval-shaped structures that contain a green pigment called chlorophyll

Function: food-making sites in plant cells; they trap the sun’s energy and use it to combine water and carbon dioxide to make sugar (glucose) for the plant—this process is called photosynthesis

Other: these are the reason that plants are green