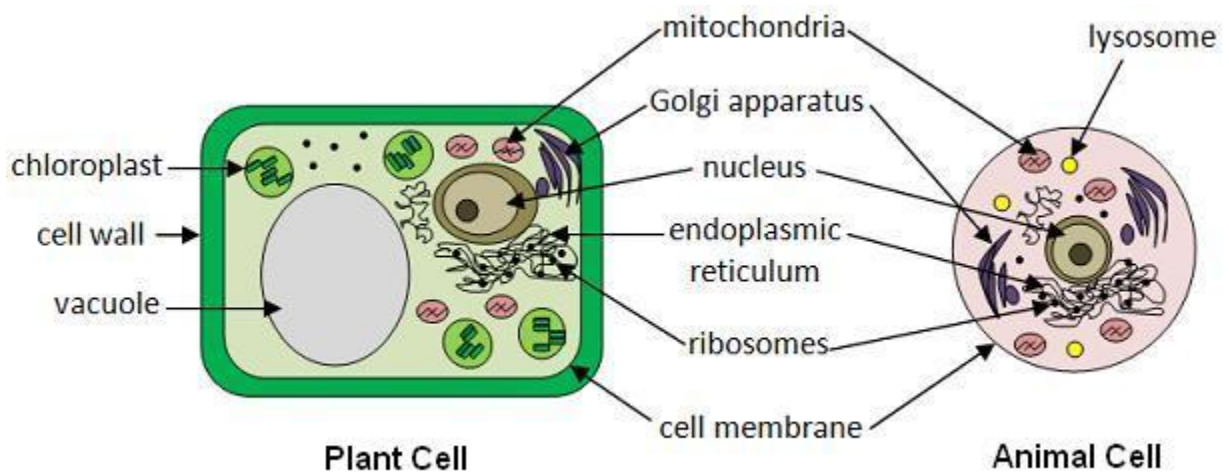


# Cells

All living organisms on Earth are made up of microscopic structures called **cells**. Cells are the building blocks of all organisms. Some organisms are unicellular, while other organisms, including humans, are multicellular. Although there are many types of cells, cells generally share a similar structure.

## CELL STRUCTURE

Cells consist of smaller pieces, called **organelles**. Organelles are like the “organs” of a cell; they are groups of complex molecules that help cells survive. Cell membrane, cell wall, cytoplasm, vacuole, mitochondrion, endoplasmic reticulum, nucleus and chloroplast are examples of organelles.



**Cytoplasm** is a suspension fluid that houses the other organelles. The **cell membrane** (or plasma membrane) acts as a boundary layer around the cytoplasm and is selectively permeable to chemicals. Nutrients first enter the cell through the cell membrane. The **cell wall** is a secretion of the cell membrane; it provides protection from physical injury, and with the vacuole it provides structural support.

A **vacuole** stores water and ingested food in a fluid sack; it removes waste from a cell; and it produces turgor pressure against the cell wall for cellular support. The **nucleus** is like the “brain” of the cell; it contains chromosomal information on chromatin. The **chromatin** is composed of long, thin strands of DNA; it contains “instructions” that control cell metabolism and heredity.

**Mitochondria** act like a stomach for the cell; they take in nutrients, break them down and create energy for the cell. **Chloroplasts**, which contain chlorophyll, are the food producers in a plant cell. The **endoplasmic reticulum** transports chemicals between and within cells. It is important to note that all cells do not always have all the organelles.

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## PLANT CELLS VS. ANIMAL CELLS

There are many types of cells, but for our purposes, we will focus on plant cells and animal cells. Plant cells have chloroplasts, while animal cells do not. Instead, animal cells have **centrioles, lysosomes, cilia** and **flagella**. Centrioles help organize microtubules in the cytoplasm and assist with the spatial arrangement of cellular organelles. Lysosomes contain enzymes which digest food particles, excess or old organelles and engulfed foreign particles, such as viruses or bacteria. Cilia and flagella are cellular projections which allow organisms to move.

All cells are surrounded by some type of membrane. Plant cells have a cell membrane and a cell wall, while animal cells only have a cell membrane. It is the lack of a cell wall in animal cells that allowed animals to develop greater diversity of cell types, tissues and organs.

### CELL PURPOSE

The main purpose of a cell is to survive and organize; cells hold all of the biological equipment necessary for life. Cells have a variety of pieces and each cell has a different set of functions. They may be part of a **multi-cellular** organism, in which case they are dependent on other cells for their survival. Alternatively, a cell may be a **single-celled** organism, and contain all the components necessary for its own survival.

Humans are multi-cellular and may have hundreds of types of cells. While each cell type has a specialized function, they all work together in a system to help the organism (human) survive. In the human body, cells of similar function group together into tissues, which group together with other tissues to form organs. Some cells are used to carry oxygen through the blood, while other cells of similar function group together to transmit nerve impulses.

### CELL THEORY

Cell theory is a scientific theory that is one of the foundations of biology. This theory puts forth the following:

- the cell is the basic building block in all living things
- all organisms are made up of one or more cells
- cells arise from other cells through cellular division called mitosis
- cells carry genetic material passed to "daughter" cells during mitosis
- all cells are essentially the same in chemical composition
- energy flow (metabolism) occurs within cells

Cell theory was developed in 1838 by a botanist and a physiologist who discovered that plant cells and animal cells both have nuclei. Originally, these two scientists thought that cells form by spontaneous generation. With this modification, cell theory became widely accepted and has changed only slightly from the original theory.

Cells are complex "basic building blocks" of living organisms and they all share one purpose – to organize and survive.