

Lec -1- The cell

Biology is the science that studies living organisms and how they interact with one another and their environment, including their physical and chemical structure, function, development and evolution.

The term *biology* is derived from the Greek word βίος, *bios*, "life" and the suffix -λογία, *-logia*, "study of."

The cell (from Latin *cella*, meaning "small room") is the basic structural, functional, and biological unit of all known living organisms. A cell is the smallest unit of life that can replicate independently, and cells are often called the "building blocks of life". The study of cells is called cell biology or cytology.

Cell biology or Cytology, (from the Greek, *kytos*, "vessel") is a branch of biology that studies the different structures and functions of the cell and focuses mainly on the idea of the cell as the basic unit of life.

Cell biology explains the structure, organization of the organelles they contain, their physiological properties, metabolic processes, Signaling pathways, life cycle, and interactions with their environment.

Organisms can be classified as

- **unicellular** (consisting of a single cell; including bacteria)
- and
- **multicellular** (including plants and animals). While the number of cells in plants and animals varies from species to species, humans contain more than 10 trillion (10^{12}) cells.

Cell theory

Robert Hooke in (1665) who described the cella (open spaces) of plant tissues discovered the cell.

The cell theory is a widely accepted explanation of the relationship between cells and living things. The cell theory states:

1. all organisms are composed of cells.
2. cell is the structural and functional unit of life.
3. cells arise from pre-existing cells.

The cells vary considerably, in shape and size. Nerve cells of animals have long extensions. They can be several feet in length. Muscle cells are elongated in shape. Egg of the ostrich is the largest cell (75 mm). Some plant cells have thick walls. There is also wide variation in the number of cells in different organisms.

Cell types

There are two distinctive types of cells

1. **Prokaryotic cells:** Prokaryotes lack a nucleus (though they do have circular DNA) and other membrane-bound organelles (though they do contain ribosomes). Bacteria and Archaea are two domains of prokaryotes.
2. **Eukaryotic cells:** Eukaryotes, have distinct nuclei bound by a nuclear membrane and membrane-bound organelles (mitochondria, chloroplasts, lysosomes, rough and smooth endoplasmic reticulum, vacuoles). In addition, they possess organized chromosomes which store genetic material. Protists, fungi, animals, and plants all consist of eukaryotic cells.
(“**Protist**” is an informal term referring to a group of mostly **unicellular** eukaryotes) .

Table 1: Comparison of features of prokaryotic and eukaryotic cells

	Prokaryotes	Eukaryotes
Typical organisms	bacteria, archaea	protists, fungi, plants, animals
Typical size	~ 1–5 $\mu\text{m}^{[12]}$	~ 10–100 $\mu\text{m}^{[12]}$
Type of nucleus	nucleoid region; no true nucleus	true nucleus with double membrane
DNA	circular (usually)	linear molecules (chromosomes) with histone proteins
RNA/protein synthesis	coupled in the cytoplasm	RNA synthesis in the nucleus protein synthesis in the cytoplasm
Ribosomes	50S and 30S	60S and 40S
Cytoplasmic structure	very few structures	highly structured by endomembranes and a cytoskeleton
Cell movement	flagella made of flagellin	Flagella and cilia containing microtubules; lamellipodia and filopodia a containing actin
Mitochondria	none	one to several thousand
Chloroplasts	none	in algae and plants
Organization	usually single cells	single cells, colonies, higher multicellular organisms with specialized cells
Cell division	binary fission (simple division)	mitosis (fission or budding) meiosis
Chromosomes	single chromosome	more than one chromosome
Membranes	cell membrane	Cell membrane and membrane-bound organelles

Table 2: Comparison between plant and animal cells

Plant cell	Animal cell
1. Cellulose cell wall present around cell membrane.	1. No cell wall.
2. Vacuoles are usually large.	2. Generally vacuoles are absent and if present, are usually small.
3. Plastids present.	3. Plastids absent.
4. Golgi body present in the form of units known as dictyosomes.	4. Golgi body well developed.
5. Centriole absent.	5. Centriole present.

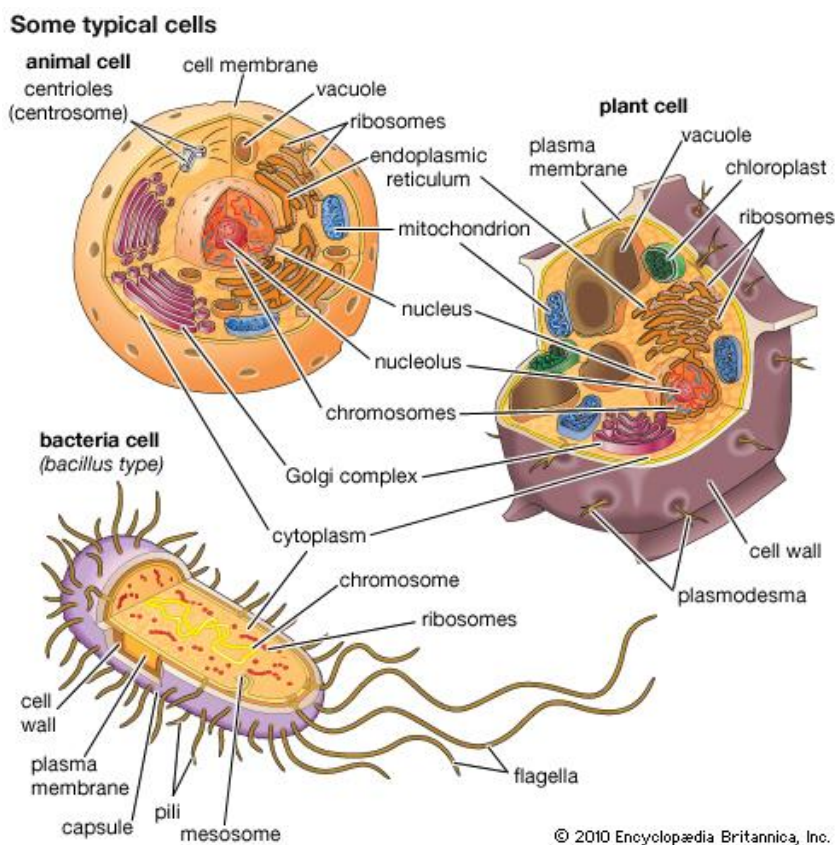


Figure 1: typical cells Animal, plant and plant cells contain membrane-bound organelles, including a distinct nucleus. In contrast, bacterial cells do not contain organelles.

Cell types in the human body

Skin cells	Keratinocytes Melanocytes Merkel cells Langerhans cells	
Bone cells	Osteoblasts Osteocytes	
Muscle cells	Skeletal Cardiac Smooth	
Blood cells	Red blood cells	Erythrocytes
	White blood cells	Granulocytes (neutrophils, eosinophils, basophils) A granulocytes (monocytes, lymphocytes)
	Platelets	
Sex cells	Sperm cell Ova	
Epithelial cells	Covering surface and Lining body cavities	
Endothelial	Lining blood vessels	