

Components of Prokaryotic and Eukaryotic Cells (Animal and Plant Cells) and Their Functions

Cell Component	Function	Present in Prokaryotes?	Present in Animal Cells?	Present in Plant Cells?
Endoplasmic reticulum	Modifies proteins and synthesizes lipids	No	Yes	Yes
Golgi apparatus	Modifies, sorts, tags, packages, and distributes lipids and proteins	No	Yes	Yes
Cytoskeleton	Maintains cell's shape, secures organelles in specific positions, allows cytoplasm and vesicles to move within the cell, and enables unicellular organisms to move independently	Yes	Yes	Yes
Flagella	Cellular locomotion	Some	Some	No, except for some plant sperm.
Cilia	Cellular locomotion, movement of particles along the extracellular surface of the plasma membrane, and filtration	No	Some	No

Table 4.1 This table provides the components of prokaryotic and eukaryotic cells and their respective functions. (credit: Fowler et al. / [Concepts of Biology OpenStax](#))

Check your knowledge

Which of the following are only found in plant cells?

- a. chloroplasts
- b. mitochondria
- c. nucleus
- d. rough endoplasmic reticulum

Cardiac muscle that makes up the heart must contract as a unit. What type of intracellular junction is important in holding contractile muscle cells together?

Answer: (a) and desmosomes

Section Summary

Plant cells have a cell wall, chloroplasts, and a central vacuole. The plant cell wall, whose primary component is cellulose, protects the cell, provides structural support, and gives shape to the cell. Photosynthesis takes place in chloroplasts. The central vacuole expands, enlarging the cell without the need to produce more cytoplasm. Plant cells also have various plastids for storage.

Animal cells have a centrosome and lysosomes. The centrosome has two bodies, the centrioles, with an unknown role in cell division. Lysosomes are the digestive organelles of animal cells.

Plant cells are connected and communicate with each other by plasmodesmata. Animal cells communicate through their extracellular matrices and are connected by tight junctions, desmosomes, and gap junctions.

Exercises

1. What structures does a plant cell have that an animal cell does not have? What structures does an animal cell have that a plant cell does not have?
2. Which two organelles are thought to have once been free-living bacteria?
3. In plant cells, the cell wall has a large abundance of what polysaccharide?
 - a. chitin
 - b. cellulose
 - c. starch
 - d. glycogen
4. Which of the following is not a junction used by animal cells?
 - a. tight junction
 - b. gap junction
 - c. desmosomes
 - d. plasmodesmata
5. Provide two pieces of evidence that support the endosymbiotic theory.

Answers

1. Plant cells have plasmodesmata, a cell wall, a large central vacuole, chloroplasts, and plastids. Animal cells have lysosomes and centrosomes.
2. Mitochondria and Chloroplast
3. (b)
4. (d)
5. They have their own DNA, ribosomes and are enclosed within two membranes.

Glossary

autotroph: an organism that can make its own food from materials in its environment

cell wall: a rigid cell covering made of cellulose in plants, peptidoglycan in bacteria, non-peptidoglycan compounds in Archaea, and chitin in fungi that protects the cell, provides structural support and gives shape to the cell

central vacuole: a large plant cell organelle that acts as a storage compartment, water reservoir, and site of macromolecule degradation

chloroplast: a plant cell organelle that carries out photosynthesis

cilium: (plural: cilia) a short, hair-like structure that extends from the plasma membrane in large numbers and is used to move an entire cell or move substances along the outer surface of the cell

desmosome: a linkage between adjacent epithelial cells that forms when cadherins in the plasma membrane attach to intermediate filaments

endosymbiosis: a relationship in which one organism lives inside the other

endosymbiotic theory: a theory that explains how mitochondria and chloroplasts originated

extracellular matrix: the material, primarily collagen, glycoproteins, and proteoglycans, secreted from animal cells that hold cells together as a tissue, allows cells to communicate with each other, and provides mechanical protection and anchoring for cells in the tissue

gap junction: a channel between two adjacent animal cells that allows ions, nutrients, and other low-molecular-weight substances to pass between the cells, enabling the cells to communicate

heterotroph: an organism that cannot make its own food and must consume other organisms to obtain its energy

plasmodesma: (plural: plasmodesmata) a channel that passes between the cell walls of adjacent plant cells, connects their cytoplasm and allows materials to be transported from cell to cell

tight junction: a firm seal between two adjacent animal cells created by protein adherence