

Cytoplasm

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Last reviewed: June 15, 2022

Reading time: 7 minutes

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The **cytoplasm** is the part of a [cell](#) which is contained within a cell membrane.

Cells of animals, plants and fungi are known as **eukaryotic cells**. Eukaryotes contain a well defined [nucleus](#) surrounded by a nuclear membrane.

Prokaryotic cells are found in bacteria. Instead of a well-defined nucleus, the prokaryotic cells contain a nucleoid, which is a single loop of DNA that lies free within the cytoplasm of the cell.

The cytoplasm of eukaryotic cell is located between the cell membrane and nuclear membrane, while in prokaryotic cells the cytoplasm fills the whole space bounded by the cell membrane.

The cytoplasm of both eukaryote and prokaryote cells consists of a gelatinous liquid known as **cytosol**. The cytosol is made up of a mixture of colloidal proteins which include: enzymes, carbohydrates, small protein molecules, ribosomes and ribonucleic acid (RNA).

This article will discuss the [anatomy](#) and function of the cytoplasm.

Key facts about the cytoplasm Table quiz

Definition	Part of the cell contained within the cell membrane.
Location	Eukaryotes: External to the nuclear membrane and internal to the cellular membrane.
	Prokaryotes: Internal to the cellular membrane.
Structure of cytoplasm	Eukaryotes (contains nucleus):
	Animals: Consists of a cell membrane, cytoskeleton and organelles (mitochondrion, endoplasmic reticulum, golgi apparatus, centrioles, lysosomes, peroxisomes) which lie suspended in cytosol (a gelatinous liquid which fills the cytoplasm of a cell)
	Plants: Consists of a cell wall; cytoskeleton, organelles (mitochondrion, endoplasmic reticulum, golgi apparatus), vacuole and chlorophyll which lie suspended in cytosol

Prokaryotes (no nucleus): Consists of nucleoid and plasmid suspended in cytosol
Function Protein synthesis, energy production, signal transduction, transportation of metabolites and molecules from organelles across the cell, provision of structural support to organelles of the cell, regulation of cell signaling and structural support for the cell itself

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Cytoplasm structure

Smooth endoplasmic reticulum
Reticulum endoplasmicum non granulosum
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Synonyms: Smooth ER, SER

Every cell contains a cytoplasm which is filled with **cytosol**. Cytosol forms 70% of a cells volume and provides a medium or platform in which [organelles](#) and other cellular structures can operate in.

Cytoplasm of eukaryotic cells

The cytoplasm of a eukaryotic cell is defined as the component of the cell internal to the cell/plasma membrane and external to the nuclear membrane. The cytoplasm of both plant and animal eukaryotic cells are composed of numerous membrane- and non-membrane bound **organelles** suspended in cytosol.

Take a closer look at the structures of a eukaryotic cell with the study unit below.



[Eukaryotic cell Explore study unit](#)

Forming a major component of the cytoplasm of eukaryotic cells is the **endoplasmic reticulum** which can be divided into smooth and rough components. The endoplasmic reticulum is a system of interconnected membrane lined channels which function in lipid and protein synthesis. The rough and smooth endoplasmic reticulum surrounds the nuclear membrane of the eukaryotic cells, suspended within cytosol.

Another important organelle of the cytoplasm of the eukaryotic cell is the **Golgi apparatus**. The Golgi apparatus lies adjacent to the nucleus and centriole, suspended in cytosol and functions to modify, sort and pack proteins in preparation for their transport to cellular destinations.

Dispersed throughout the cytosol of eukaryotic cells are small sacs of digestive enzymes known as the **lysosomes** and **peroxisomes** which function in intracellular digestion. Located freely within the cytoplasm are numerous non-membrane bound organelles known as **ribosomes**. Ribosomes function to produce proteins within the cell.

Giving the cytoplasm its shape and structure is the [cytoskeleton](#) which is composed of a dynamic network of protein filaments embedded throughout the cytoplasm.

Recommended video: Eukaryotic cell
Overview of the cell and its contents.

Animal vs plant cell

While the cytoplasm of all eukaryotic cells maintain many similarities there are some major differences between the cytoplasm of animal and plant eukaryotic cells.

Unique to animal eukaryotic cells are the paired **centrioles**. Centrioles are barrel-shaped non-membrane bound organelles which function to organize the cytoskeleton of the animal cytoplasm and also help to determine the location of other organelles of the cytoplasm.

Contributing further to the structure and stability of the plant cell is a rigid **cell wall**. The cell wall gives the plant eukaryotic cell its rigidity and maintains the shape of the cytoplasm.

Also, unique to the cytoplasm of a plant cell are **chloroplasts** which function as the site of photosynthesis. Forming the bulk of the cytoplasm of a plant cell is the permanent **vacuole** which aids in maintaining water balance. The cytoplasm of animal cells may also contain vacuoles but they are much smaller in comparison and are only present temporarily.

Differences between cytoplasm of plant and animal cells Table quiz

Plant	Cell wall, cell membrane, cytosol, cytoskeleton, mitochondria, endoplasmic reticulum (rough and smooth), golgi apparatus, digestive enzymes (lysosomes, peroxisomes), ribosomes, chloroplasts, permanent vacuole
Animal	Cell membrane, cytosol, cytoskeleton, mitochondria, endoplasmic reticulum (rough and smooth), golgi apparatus, digestive enzymes (lysosomes, peroxisomes), ribosomes, centrioles

Cytoplasm of prokaryotic cells

As prokaryotic cells do not contain a nuclear membrane or nucleus, the cytoplasm of a prokaryote encompasses the total structure of a cell internal to the plasma membrane. Similar to the eukaryotic cell, prokaryotic cells are filled with cytosol. However, unlike the eukaryotic cell, prokaryotic cells do not contain membrane bound organelles.

Located within the cytoplasm of a prokaryotic cell is a single loop of DNA known as a **nucleoid**. The nucleoid is not membrane bound and suspends freely within the cytosol. Accompanying the nucleoid material of the prokaryotic cell is a small ring of extrachromosomal DNA known as **plasmid**.

Within the cytosol of both eukaryotic and prokaryotic cells are **ribosomes**. Ribosomes are non-membrane bound organelles which function in the synthesis of proteins. Ribosomes of prokaryotic cells are typically smaller when compared to eukaryotic cells.

Now that you have finished learning about the anatomical structure of the cytoplasm of eukaryotic and prokaryotic cells, use our **diagrams and cell quizzes** to consolidate your knowledge!

Function of cytoplasm

The cytoplasm is an integral part of both prokaryotic and eukaryotic cells and functions to house and maintain an optimal environment for the cellular organelles.

Organelles of cytoplasm carry out complex metabolic reactions which include **protein synthesis** and **energy production**. Facilitating and contributing to the function of the organelles of the cytoplasm is the cytosol.

Cytosol of the cytoplasm has numerous functions, some of which include signal transduction, transportation of metabolites and molecules across the cell, provision of structural support for the whole cell.

Sources

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Cytoplasm: want to learn more about it?

