

Difference Between Cytoplasm and Cytoskeleton

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Key Difference - Cytoplasm vs Cytoskeleton

The [cell](#) is the basic structural and functional unit of all biological living organisms. The cell biology explains all the basic structures of cell components and their functions in the living cell. The cell has the self-replicating ability. An English scientist called Robert Hooke first discovered this phenomenon in 1665. Matthias Schleiden and, Theodor Schwann did a detailed explanation about the cell for the first time in 1839 using the cell theory. The cell has a cytoplasm enclosed within a membrane known as [plasma membrane](#). The cytoplasm contains [cytosol](#), cell [organelles](#) such as; [Golgi bodies](#), [endoplasmic reticulum](#), [lysosomes](#), peroxisomes, microtubules, filaments, [mitochondria](#), [chloroplast](#) and cell inclusions like; pigment granules, fat droplets, secretory products, [glycogen](#), [lipids](#), crystalline inclusions. The cytosol is the major part of cytoplasm which is not contained within the membrane-bound organelles. Cytosol has cytoskeleton composed of interlinking filaments and tubules and also with dissolved molecules and water. The **key difference** between Cytoplasm and Cytoskeleton is, **cytoplasm is the jelly-like material enclosed within the cell membrane while the cytoskeleton is protein filaments and tubules that are found within the cytoplasm of the cell which provides structural support to the cell.**

What is Cytoplasm?

The cytoplasm is defined as the jelly-like semi-fluid presents in-between the nuclear envelope and cell membrane in [eukaryotes](#). But in case of [prokaryotic cells](#), it is defined as the jelly-like semi-fluid finds inside the plasma membrane. The cytoplasm consists of three main elements; cytosol (70 %), organelles and cell inclusions. The cytosol is the aqueous component of the cytoplasm. The cytosol contains water, ions, small molecules and macromolecules. The eukaryotic cell also has the membrane-bound organelles in the cytosol.

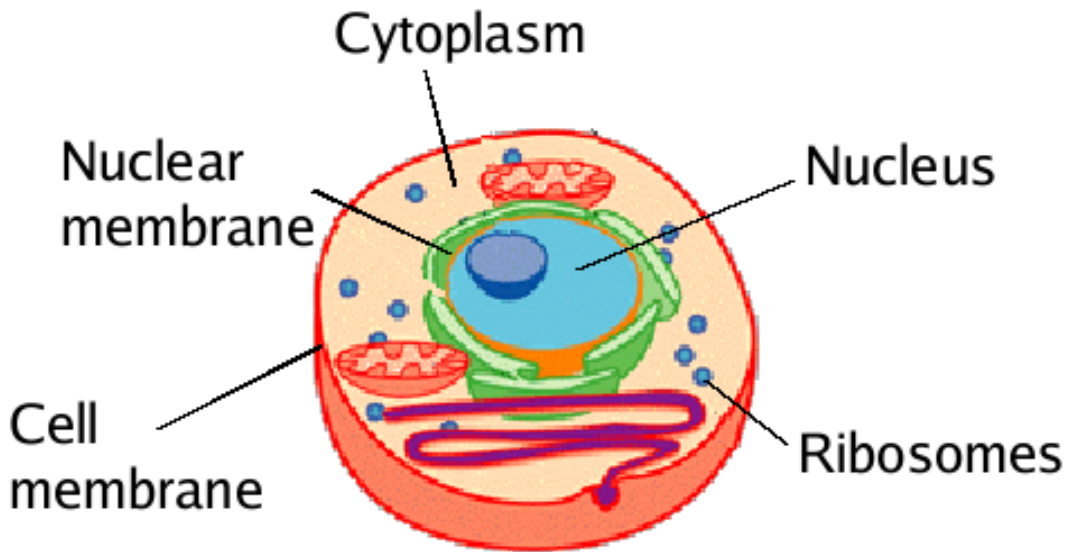


Figure 01: Cytoplasm

The cytoskeleton is a complex network of [protein](#) fibres that finds in the cytosol. Eukaryotic cells have cell organelles in the cytoplasm such as; Golgi bodies, endoplasmic reticulum, lysosomes, peroxisomes, microtubules, filaments, mitochondria, chloroplast. Cytoplasm also contains cell inclusions like stored nutrients, secretory products and pigment granules. Many proteins are suspended in the cytoplasm. It also contained other dissolved molecules like sugars, [carbohydrates](#), lipids and ions (sodium, potassium, calcium). The all metabolic reactions are taken place in the cytoplasm. It works as a reaction media.

What is Cytoskeleton?

The cytoskeleton is defined as the skeleton of the cell that is made up of protein filaments like microfilaments, intermediate filaments and microtubules. The cytoskeleton is responsible for giving structure and support to the cell. A Russian scientist named Nikolai K Koltsov first coined the term in 1903. The cytoskeleton is an important component of the cytosol of the cytoplasm. In humans and animal cells, the cytoskeleton is made up of three main proteins: microfilaments (actin), microtubules (tubulin) and intermediate filaments.

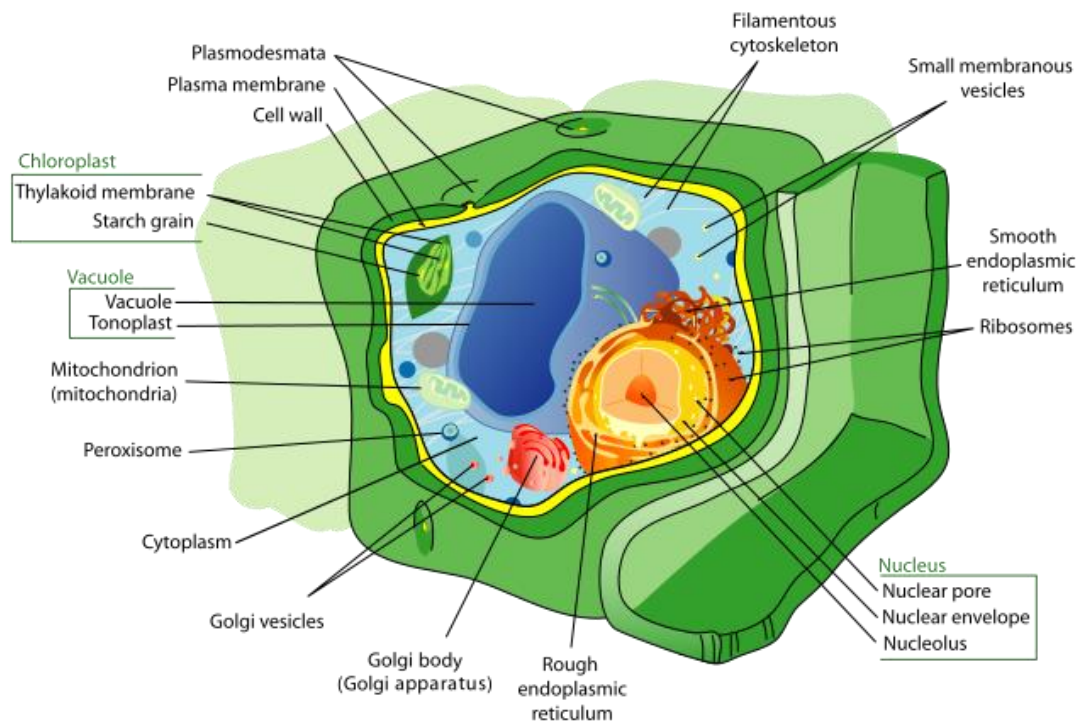


Figure 02: Cytoskeleton

The cytoskeleton gives mechanical resistance which prevents the cell from collapsing. The contracting and relaxing nature of cytoskeleton helps in cell migration. The cytoskeleton also helps in intracellular molecular movement. And the cytoskeleton plays a pivotal role in signal transduction between cells, and in chromosomal segregation in [cell division](#) and [cytokinesis](#). Cytoskeleton acts as a template to form the cell wall and it also forms cellular structures such as [flagella](#), [cilia](#), lamellipodia and podosomes. The muscle cell construction is the well-known example of cytoskeletons' function.

What are the Similarities Between Cytoplasm and Cytoskeleton?

- Both are present inside the cell.
- Both are extremely important for cell survival.
- Both have protein molecules.
- Plasma membrane protects both.
- Both are part of [protoplasm](#).

What is the Difference Between Cytoplasm and Cytoskeleton?

Cytoplasm vs Cytoskeleton	
The cytoplasm is defined as the jelly-like semi-fluid presents inside the plasma membrane.	The cytoskeleton is defined as the skeleton of the cell that is made up of protein filaments like microfilaments, intermediate filaments and microtubules.
Constituents	
The cytoplasm has three basic constituents: cytosol, cell organelles (eukaryotes) and cell inclusions like; pigments, granules, glycogens.	The cytoskeleton is made up of three constituents; protein filaments like microfilaments (actin), intermediate filaments and microtubules (tubulin)
Function	
Cytoplasm holds the cell organelles and acts as a reaction media for the cells' metabolic reactions.	The cytoskeleton is responsible for giving structure and supports for the cell.
Cell Organelles and Cell Inclusions	
Cytoplasm has cell organelles and cell inclusions as major constituents.	The cytoskeleton does not have cell organelles and cell inclusions as major constituents.
Energy Released or Stored	
The energy is released and stored in the cytoplasm.	The energy is not released and stored in the cytoskeleton.
Cell Wall Synthesis in Plants	
Cytoplasm is not involved in the cell wall synthesis in plants.	The cytoskeleton is involved in the cell wall synthesis in plants.

Summary - Cytoplasm vs Cytoskeleton

The cell is the basic unit and building block of the biology. An English scientist Robert Hooke for the first in 1665 discovered the cell. The cell has main components such as cell membrane, cytoplasm, cell organelles (eukaryotes) and genetic material stored in a compartment called nucleus. The cytoplasm and nucleus together form the living part of the cell called as protoplasm. Cytoplasm is considered as the jelly-like semi-fluid presents between the nuclear envelope and cell membrane in eukaryotes. The basic function of the cytoplasm is to provide a reaction media for metabolic reactions occurring in the cell. The cytoskeleton is the part of the

cytosol of the cytoplasm. Its main function is to provide structure and supports for the cell. This is the difference between cytoplasm and cytoskeleton.

Reference:

1. Wilkin, Ph.D. Douglas, and Ph.D. Jean Brainard. "Cytoplasm and Cytoskelton." CK-12 Foundation, CK-12 Foundation, 4 Sept. 2016. [Available here](#)
2. "Cytoplasm." Wikipedia, Wikimedia Foundation, 25 Dec. 2017. [Available here](#)

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