Difference Between Cytoplasm and Nucleoplasm

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Key Difference - Cytoplasm vs Nucleoplasm

In the context of cell theory, the cell is the basic structural and functional unit of all organisms. Therefore, the components of the cell become an important aspect. Cytoplasm and nucleoplasm are considered to be universal features with respect to eukaryotic cells. Even though the cytoplasm is common to both eukaryotes and prokaryotes, the nucleoplasm is only found in eukaryotes. The cytoplasm contains cellular organelles embedded within it and is enclosed by the cell membrane whilst the nucleoplasm contains the nucleolus and chromatin which is enclosed by the nuclear membrane. **Cytoplasm is the protoplasm inside the cell membrane while nucleoplasm is the protoplasm inside the nuclear membrane.** This is the **key difference** between cytoplasm and nucleoplasm.

What is Cytoplasm?

In living cells, cytoplasm is considered as an important component that provides different functions to the embedded cell organelles of the cell. It is enclosed by a cell membrane and consists of a liquid mass which contains water salts and different proteins. It is a gel-like structure which is highly organized. Different proteins present in the cytoplasm possess a scaffolding function that leads to the formation of the cytoskeleton. The cytoskeleton helps the cytoplasm to maintain its shape and also assist with cyclosis. Cyclosis is the constant movement of the cytoplasm in the desired direction. Cytoplasm is considered as the cytosol and embedded cell organelles except for the nucleus. In Eukaryotes, all cell organelles are membrane-bound which includes mitochondria, cytoplasm, endoplasmic reticulum, lysosomes, Golgi apparatus etc.

With respect to its physical nature, the cytoplasm is mainly composed of 80 % of water. It appears colorless and has two main sections namely; ectoplasm and endoplasm. The endoplasm is the concentrated inner region of the cytoplasm whilst the ectoplasm is the outermost layer of the cytoplasm. In other terms, the ectoplasm is referred to as the cell cortex. It is the most important region of the cytoplasm where different cell organelles are embedded. Once the smaller cell organelles and other particles are excluded, the remaining portion of the cytoplasm is referred to as the **groundplasm**. Groundplasm is an important aspect since it contains larger organelles such as mitochondria and cytoplasm.

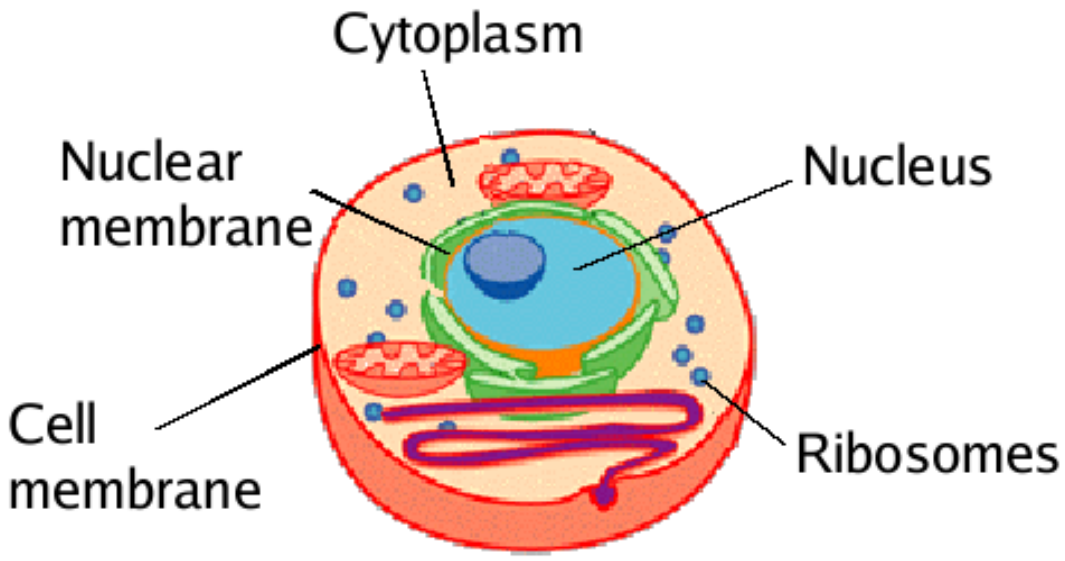

Figure 01: Cytoplasm

Cytoplasm provides the location for many important cellular metabolic pathways which include glycolysis, mRNA translation, cell division. The permeability of the cytoplasm is considered to be an important aspect since it is mainly required by different cell processes which include cell signaling. Due to the permeability of the cytoplasm, the flow of different important components within the cell is maintained. For example, calcium ions are allowed to move in and out from the cytoplasm which involves in cell signaling and different metabolic processes.

What is Nucleosome?

Nucleoplasm is the fluid matrix in which nucleolus and chromatic are embedded. In other terms, the nucleoplasm is referred to as the karyoplasm or nucleus sap. The nucleoplasm is enclosed by a double membranous structure which is known as the nuclear envelope. The main constituent of the nucleoplasm is water along with other molecules and ions dissolved within it. The soluble liquid portion present within the nucleoplasm that supports the nucleolus and the chromatin are referred to as **nucleosol**. It is a gelatinous sticky liquid. Nucleosol is also termed as the **nuclear hyaloplasm**. The nucleoplasm gives rise to the chromatin body and contains important enzymes required for different important cell processes.

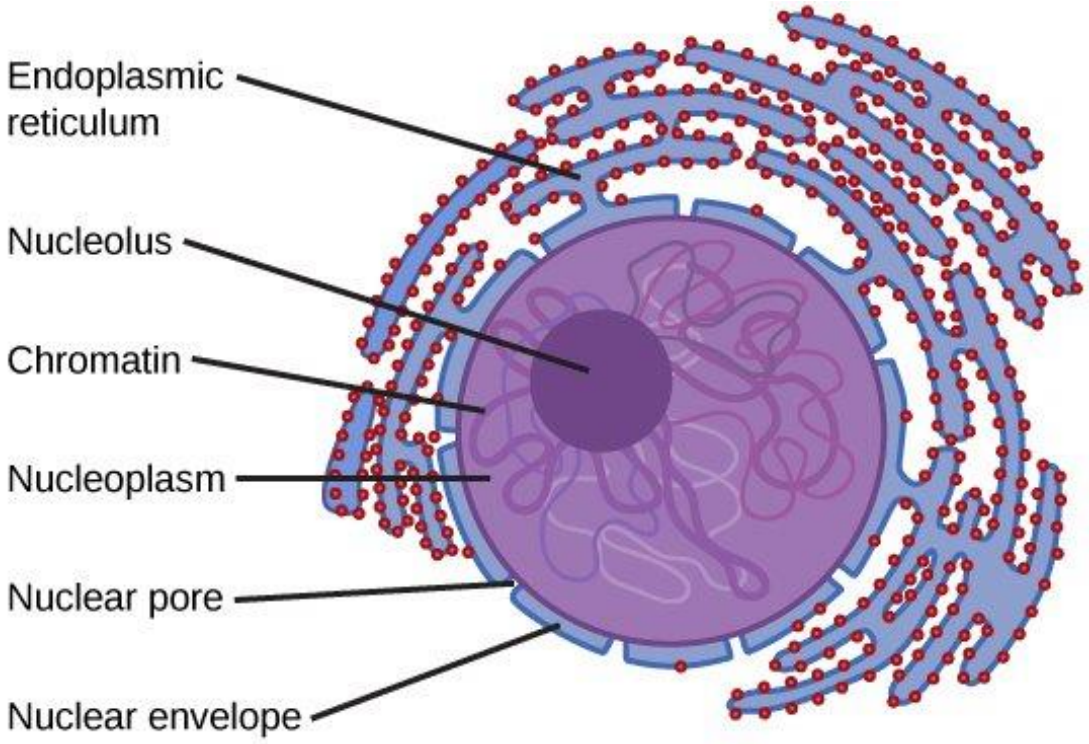

Figure 02: Nucleoplasm

As a whole, the nucleoplasm involves in many different cellular functions. It provides a shape to the nucleus and involves in the maintenance of its structure and the shape. Nucleoplasm contains different nucleotide precursors and enzymes which are required for the different functions of the nucleus. The needed enzymes for DNA replication and transcription are present within the nucleoplasm. Different cellular processes such as post-transcriptional modification of mRNA and synthesis of ribosomes occur within the nucleoplasm. It also regulates the mobility of different molecules and materials that are needed the efficient cell functioning and metabolism.

What are the Similarities Between Cytoplasm and Nucleoplasm?

- Cytoplasm and nucleoplasm are two important components of the cell.
- Both regulate different metabolic functions occurring in the cell.

What is the Difference Between Cytoplasm and Nucleoplasm?

Cytoplasm vs Nucleoplasm	
Cytoplasm is the protoplasm of the cell in which cell organelles are embedded and	Nucleoplasm is the protoplasm of the nucleolus covered by the nuclear membrane.

facilitates the environment for metabolic processes.	
Location	
Cytoplasm is present inside the cell.	Nucleoplasm is present inside the nucleus.
Enclosed By	
Cytoplasm is enclosed by the cell membrane.	Nucleoplasm is enclosed by the nuclear membrane.
Suspended Constituents	
Cell organelles are embedded in the cytoplasm.	Nucleolus and chromatin are present in the nucleus.
Cell Division	
Divided into two cells during cytokinesis.	During nuclear division, the nucleoplasm is released but once the nuclear envelope is formed, it gets filled again.

Summary - Cytoplasm vs Nucleoplasm

Cytoplasm and nucleoplasm are two important aspects of the cell. Even though the cytoplasm is common to both eukaryotes and prokaryotes, the nucleoplasm is only found in eukaryotes. The cytoplasm is a gel-like structure which is enclosed by the cell membrane. It appears colorless and composes of two main sections namely; ectoplasms and endoplasm. Cytoplasm provides the location for many important cellular metabolic pathways which includes glycolysis, mRNA translation, and cell division. Nucleoplasm is the fluid matrix in which nucleolus and chromatic are embedded It is enclosed by the nuclear membrane. Nucleoplasm involves many different cellular functions such as post-transcriptional modification of the mRNA and synthesis of the ribosome. This is the difference between cytoplasm and nucleoplasm.

Reference

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