

Difference Between Cell Organelles and Cell Inclusions

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Key Difference - Cell Organelles vs Cell Inclusions

The cell is the basic structural and functional unit of living organisms. It is the basic building block of life that has the self-replicating ability. The cell was first discovered by an English Scientist Robert Hooke in 1665. The cell theory was proposed in 1839 for the first time by Matthias Schleiden and Theodor Schwann. The organisms can be classified based on the number of cells; [unicellular or multicellular](#). [Bacteria](#) are unicellular organisms. On the other hand, fungi, plants and animals are multicellular organisms. The cell has a [cytoplasm](#) enclosed within a membrane known as [plasma membrane](#). It also contains cell [organelles](#) such as [Golgi bodies](#), [mitochondria](#), endoplasmic reticulum, [lysosomes](#), peroxisomes, microtubules, filaments, [chloroplast](#) etc. and cell inclusions such as pigment granules, fat droplets, secretory products, [glycogen](#), [lipids](#) and crystalline inclusions. The **key difference** between Cell Organelles and Cell Inclusions is, **the cell organelles are living components and subcomponents of the cell that perform specific functions and act as cellular machines whereas cell inclusions are non living chemical compounds and by-products of cellular metabolism which present in the cytoplasm.** The cell inclusions contain reserved materials which are necessary for future use of the cells.

What are Cell Organelles?

The cell organelles can be defined as the membrane-bound internal structures that perform specific functions in the cell. They are also known as internal machines which are highly important for cellular activities. They are mini-organs that have single or double layered [phospholipid](#) membrane. There is a number of cell organelles present in the cell as indicated below.

Cell organelles	Function
Nucleus	It stores genetic material (DNA or RNA) of the cell.
Mitochondrion	It involves in energy production.
Golgi apparatus	It involves in protein modification and export.
Endoplasmic Reticulum (ER) and detoxification.	It involves in lipid production, protein production,

Lysosomes
(security).

It contains various hydrolytic enzymes (recycling and

Chloroplast

It involves in photosynthesis (glucose production).

Cytoskeleton

It provides cell stability and helps in movement.

Microtubules

It helps in cell movement.

Intermediate Filaments
envelope.

It provides structural stability to the nuclear

Microfilaments

It helps in cell movement.

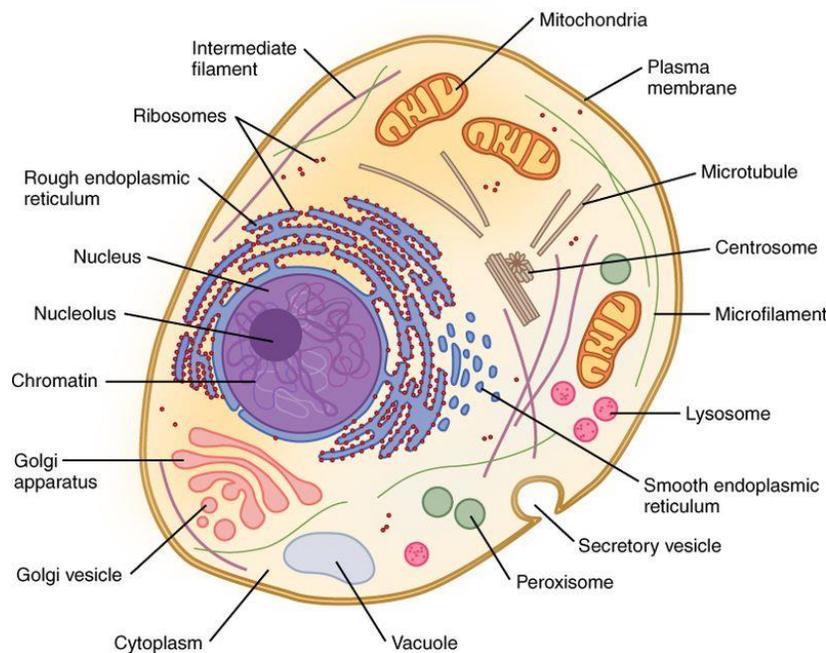


Figure 01: The Cell Organelles

It is highly important to know that membrane-bound organelles are only found in the [eukaryotic](#) organisms. They are absent in the prokaryotic organisms like [bacteria](#) and [archaea](#).

What are Cell Inclusions?

The cell inclusions or cytoplasmic inclusions can be defined as non-living substances that are not able to carry out any metabolic activity. And they are not bound by any membrane. These inclusions include; stored nutrients, secretory products and pigment granules etc. They are present in both prokaryotic cells as well as in eukaryotic cells.

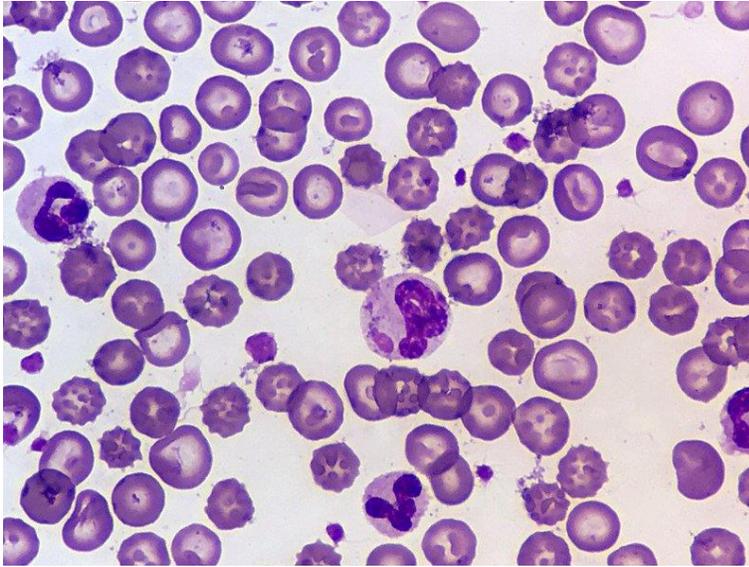


Figure 02: Cell Inclusions

Examples of Cell Inclusions include,

- Glycogen granules in liver muscle cells,
- Lipid droplets in fat cells (lipids in adipocytes and hepatocytes),
- Pigment granules of skin and hair cells ([melanin](#) in melanocytes),
- Water containing [vacuoles](#),
- Crystals of various types of cells in human testis ([Sertoli cells and Leydig cells](#)),
- Secretory products such as [hormones](#), [mucus](#), digestive [enzymes](#), [neurotransmitters](#) etc.

They are normally termed as reserved materials or cellular fuels. The bacteria are having cell inclusions such as polyphosphates, poly-beta-hydroxy-butyrate, glycogen, gas vacuoles, sulfur globules, ribosomes and carboxysomes.

What are the Similarities Between Cell Organelles and Cell Inclusions?

- Both are present in the interior of the cell.
- Both are important for living cell on various occasions.
- Both are present in the cytoplasm.
- The cell membrane is known as “plasma membrane” protects both of them.

What is the Difference Between Cell Organelles and Cell Inclusions?

Cell Organelles vs Cell Inclusions	
Cell organelles are the membrane-bound	Cell inclusions are the non-living substances

internal structures that perform specific functions in the cell.	that are not able to carry out any metabolic activity.
Function	
The cell organelles perform specific functions in the cell.	The cell inclusions do not carry out any specific metabolic functions.
Presence in Eukaryotic and Prokaryotic Cells	
The cell organelles are present only in the Eukaryotic organisms' cells.	The cell inclusions are present in both prokaryotic and eukaryotic cells.
As Cellular Machine and Fuel	
The cell organelles are described as cellular machines.	The cell inclusions are described as cellular fuels.
Living or Non Living Structures	
The cell organelles are known as living structures.	The cell inclusions are known as non-living structures.
Activity	
The cell organelles perform metabolic activities.	The cell inclusions are used for storage, as excretory and secretory materials.
Growth Capability	
The cell organelles are capable of growth.	The cell inclusions are not capable of growth.
Exporting Nature	
The cell organelles are always inside the cell and not exported out of the cell.	The cell inclusions may be exported out of the cell.

Summary - Cell Organelles vs Cell Inclusions

The cell is the basic unit of living organisms. It is composed of a cytoplasm enclosed within a membrane called as plasma membrane. It also contains cell organelles such as; Golgi bodies, endoplasmic reticulum, lysosomes, peroxisomes, microtubules, filaments, chloroplast. And also cell contains cell inclusions such as pigment granules, fat droplets, secretory products, glycogen, lipids and crystalline inclusions. The cell organelles

perform specific metabolic functions in the cell. On the other hand, the cell inclusions are not able to carry out any metabolic activity but help in cell organelles. Cell organelles are the cellular machines of the cell while cell inclusions play a role in fueling the cell organelles with different compounds and chemicals. This is the difference between cell organelles and cell inclusions.

Reference:

1. Benditt, MD Earl P. "The Cell: Its Organelles and Inclusions." JAMA, American Medical Association, 3 Oct. 1966. [Available here](#)
2. "Cell (Biology)." Wikipedia, Wikimedia Foundation, 25 Dec. 2017. [Available here](#)
3. "Cytoplasmic inclusion." Wikipedia, Wikimedia Foundation, 19 Nov. 2017. [Available here](#)

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2. 'Canine Distemper Virus Cytoplasmic Inclusion Body (Blood smear, Wright's stain)' By Lance Wheeler - Own work, [\(CC BY 4.0\)](#) via [Commons Wikimedia](#)

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