**Cell Organelles**

An **Organelle** is special part inside [cell](https://en.wikipedia.org/wiki/Cell_(biology)) that has specific function. The organelles are enclosed within their own [lipid bilayers](https://en.wikipedia.org/wiki/Lipid_bilayer).

**Analogy**- As organs are to body, organelles are to cells!

Some biologists believe that when we say organelle, it should include only those that contain their own [deoxyribonucleic](https://en.wikipedia.org/wiki/Deoxyribonucleic_acid) acid (DNA). These organelles are thought at some point in history to be, independent living Prokaryotes.

Question: Prokaryotes are mostly unicellular organisms? How many cells are in unicellular?

We are talking about- **Mitochondria** (present in Eukaryotes) and **chloroplasts** (present in plants ONLY). Yes, both mitochondria and chloroplast **contain their own DNA**! They at some point in history by **mutualistic symbiosis** were engulfed inside body cells of living beings. This is **Endosymbiosis Theory**. Another example: Rhizobium living inside root nodules of legume plants. Remember them from the Nitrogen cycle!

There are many organelles in Eukaryotes that are not present in Prokaryotes.

Most organelles are membrane bound. Remember Ribosomes are not Organelle nor membrane bound! Ribosomes are part of cell like Plasma membrane, cytoplasm, DNA. Common in both Prokaryotes and Eukaryotes.

**Plasma Membrane:** It is also known as Cell Membrane or boundary of cell. The membrane protects the cell contents from its environment. The membrane is **semi permeable**. **It allows some substances like molecules or ions to pass freely but not all**.

Remember Plasma membrane from the cheek cell lab.

**Cell Wall**: Cell Wall is only present in **Plant cells** and Prokaryotes like bacteria. The Plasma Membrane is surrounded by Cell Wall. Remember the cell wall from Anacharis water plant cell and onion cells. The cell wall protects the cell from its environment. It is an additional layer of protection to the cell membrane. Plant cell walls are made up of cellulose.

**Ribosomes**: Ribosomes help in protein synthesis (manufacturing). Ribosomes are abundant inside cell because proteins are vital to living, growing. Ribosomes can be either free floating or attached to the Rough Endoplasmic Reticulum.

**Major Eukaryotic Organelles:**

**Nucleus**: All Eukaryotes have nucleus. The function is DNA maintenance, controls all activities of the cell. The nucleus is protected by ‘nuclear’ membrane. The membrane has pores (like windows) that allow transport of molecules. We saw nucleus in cheek cells during cell lab. If unwanted materials like antibodies happen to enter nucleus under certain conditions, it can lead to diseases.

Example: lupus.

**Endoplasmic Reticulum (ER)**: All Eukaryotes have Endoplasmic Reticulum. It can either be **rough** endoplasmic reticulum (RER) or **smooth** endoplasmic reticulum (SER).

Example: The liver cells have large number of ER. An abnormality in functioning of ER can lead to Insulin resistance.

The function of ER is making or ‘synthesizing’ of new proteins in **rough endoplasmic reticulum** and then transport those proteins to the Golgi Apparatus. It is covered with Ribosomes, hence rough and is located outside the nucleus. Cells that produce more proteins have more RER.

**SER** do not have ribosomes attached, hence smooth. They help in synthesis of lipids, phospholipids and storage of proteins. They are found in abundance in testes, ovaries, skin glands.

**Golgi Apparatus:** All Eukaryotes have Golgi. Its function is to sort and package the newly synthesized proteins by the ER and ship them to destinations in transport **vesicles (sounds like vehicles!)** It can be thought to be like a Post Office and located close to ER. It is large and one of first organelles to be discovered by an Italian scientist Mr Golgi!

Question: What does the Golgi do? Think Vehicles.

**Mitochondrion:** As singular it is Mitochondrion and plural is Mitochondria. Its function is energy production by adding Oxygen to glucose to produce ATP aka energy. The energy keeps cells alive. Why? Because we can now do our daily activities like breathing, growing etc. A cell can sometimes have hundreds of mitochondria.

Example: The kidney, muscle and liver cells have more mitochondria than other cells. Mitochondria have two membranes- outer and inner. Good to know that mitochondrion has its own ribosomes and small amount of DNA. They resemble the prokaryotic bacteria in size and chemistry. Any disorder of the mitochondria can cause heart failure, autism to name a few.

Question: What process takes place in Mitochondria? **Cellular Respiration** or storage of proteins.

**Chloroplast (plastid):** These are organelles found in **the plant cells (NOT animal cells)**. The main function of chloroplast is to perform [photosynthesis](https://en.wikipedia.org/wiki/Photosynthesis). Chloroplast has high concentration of the green pigment, chlorophyll that traps the sunlight. Chloroplasts are dynamic, they circulate around plant cell. Like mitochondria, chloroplast have their own DNA. Chloroplasts cannot be made by plants and must be inherited by each daughter cell.

Question: What is important pigment that helps in photosynthesis and is found in Chloroplast? **chlorophyll.**

**Vacuole**: These are membrane bound organelles. Their function of vacuole is storage of water and other waste products. They isolate and store products that might be harmful to cell, they export unwanted material from the cell, they help maintain turgor within the cell. Turgor is pressure maintained by cell to keep cell rigid. Healthy plant cells are turgid. Vacuoles are filled with water and molecules, enzymes and sometimes solids that they have engulfed. They have no basic structure and varies according to the needs of cell. They are vital to plant cell and present in small size in animals.

Question: List any TWO functions of vacuole.