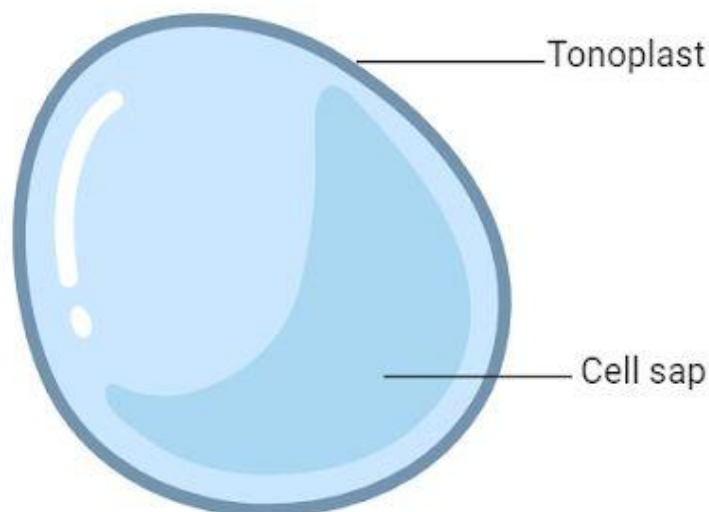


Vacuoles

- Vacuoles are membrane-bound cell organelles present in the cytoplasm and filled with a watery fluid containing various substances.”
- The term “vacuole” means “empty space”. They help in the storage and disposal of various substances. They can store food or other nutrients required by a cell to survive. They also store waste products and prevent the entire cell from contamination.
- The vacuoles in plant cells are larger than those in the animal cells. The plant vacuoles occupy more than 80% of the volume of the cell. The vacuoles may be one or more in number.

Structure of Vacuole



- A vacuole is a membrane bound structure found in the cytoplasmic matrix of a cell. The membrane surrounding the vacuole is known as **tonoplast**.
- The components of the vacuole, known as the **cell sap**, differ from that of the surrounding cytoplasm.
- The membranes are composed of **phospholipids**.
- The membranes are embedded with proteins that help in transporting molecules across the membrane. Different combinations of these proteins help the vacuoles to hold different materials.

Functions of Vacuole

Storage

A vacuole stores salts, minerals, pigments and proteins within the cell. The solution that fills a vacuole is known as the cell sap. The vacuole is also filled with protons from the cytosol that helps in maintaining an acidic environment within the cell. A large number of lipids are also stored within the vacuoles.

Turgor Pressure

The vacuoles are completely filled with water and exert force on the cell wall. This is known as turgor pressure. It provides shape to the cell and helps it to withstand extreme conditions.

Endocytosis and Exocytosis

The substances are taken in by a vacuole through endocytosis and excreted through exocytosis. These substances are stored in the cells, separated from the cytosol.

Lysosome

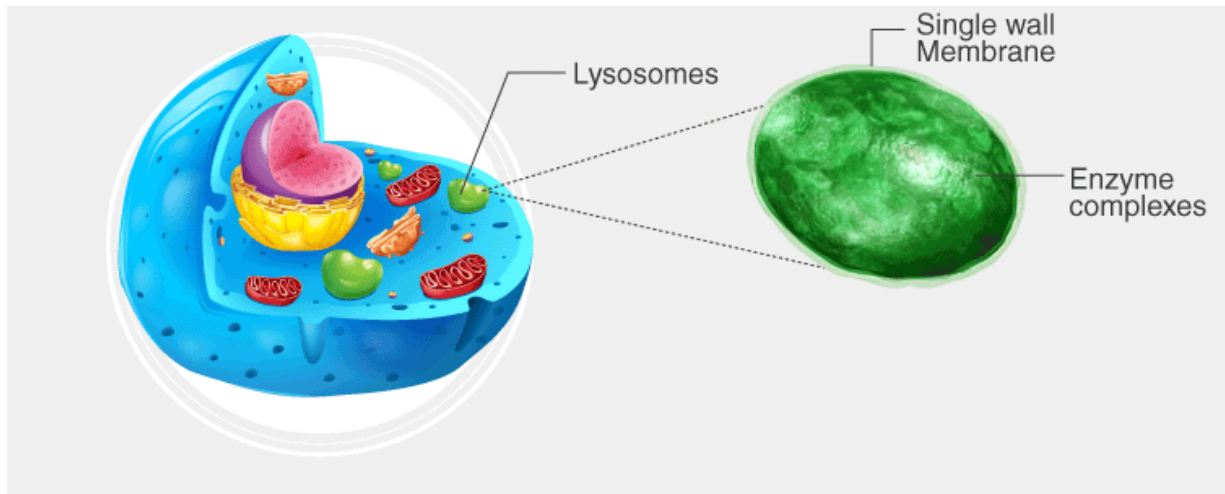
- Lysosomes are sphere-shaped sacs filled with **hydrolytic enzymes** that have the capability to break down many types of biomolecules.
- In other words, lysosomes are membranous organelles whose specific function is to breakdown cellular wastes and debris by engulfing it with hydrolytic enzymes.
- Lysosomes are an important cell organelle found within eukaryotic animal cells. Due to their peculiar function, they are also known as the “*suicide bags*” of the cell.
- The term was coined by Christian de Duve, a Belgian biologist, who discovered it and ultimately got a Nobel Prize in Medicine or Physiology in the year 1974.

Lysosome Structure

Lysosomes are membrane-bound organelles and the area within the membrane is called the lumen, which contains the hydrolytic enzymes and other cellular debris.

Lysosomes comprise of over 50 different enzymes. They are synthesized in the rough endoplasmic reticulum

The sizes of lysosomes vary, with the largest ones measuring in more at than 1.2 μm . But they typically range from 0.1 μm to 0.6 μm .



The pH level of the lumen lies between 4.5 and 5.0, which makes it quite acidic. It is almost comparable to the function of acids found in the stomach.

Besides breaking down biological polymers, lysosomes are also involved in various other cell processes such as counting discharged materials, energy metabolism, cell signalling, and restoration of the plasma membrane.

Why are Lysosomes known as Suicidal Bags?

As stated before, lysosomes work as the waste discarding structures of the cell by processing undesirable materials and degrading them, both from the exterior of the cell and waste constituents inside the cell.

But sometimes, the digestive enzymes may end up damaging the lysosomes themselves, and this can cause the cell to die. This is termed as **autolysis**, where “**auto**” means “*self*” and “**lysis**” means “*the disintegration of the cell by the destruction of its cell membrane*”.

Hence, lysosomes are known as “Suicidal Bags” of the cell.

Functions of lysosome

- Breakdown/digestion of macromolecules (carbohydrates, lipids, proteins, and nucleic acids) into small molecules that can be used by the rest of the cell.
- Cell membrane repairs
- Responses against foreign substances such as bacteria, viruses and other antigens.

How do the Lysosome function?

The key function of lysosomes is digestion and removal of waste. Cellular debris or foreign particles are pulled in to the cell through the process of **endocytosis**. The process of endocytosis happens when the cell membrane falls in on itself (invagination), creating a vacuole or a pouch around the external contents and then bringing those contents into the cell.

On the other hand, discarded wastes and other substances originating within the cell is digested by the process of **autophagocytosis or autophagy**. The process of autophagy involves disassembly or degradation of the cellular components through a natural, regulated mechanism.

Heterophagy- Digestion of external food/pathogens/molecules

Autolysis- Breakdown of lysosome itself by which entire cell is digested or destroyed

Autophagy- Digestion of internal material like cell organelles, molecules