Introduction

Lysosomes are membrane-bound, dense granular structures containing hydrolytic enzymes.
Origen of lysosome is from SER and from golgi.
Size varies from 0.2-0.8 micrometer.
The word "**lysosome" is made up of two words** "**lysis" meaning breakdown** and "soma" meaning **body.**
Lysosomes occur **freely in the cytoplasm** and Found in eukaryotic animal cells & Plant cell, except mature mammalian RBC.

Lysosomes were **discovered by De Duve** a Belgian Cytologist in 1955 who designated them as **suicide bags.**
They are also known as the "*suicide bags*" of the cell. when cell gets damaged, **lysosome** may burst and the enzymes digest their own cell. they posses different kind of hydrolases on release of these enzymes that cause death of cell.

. ***"Lysosomes are sphere-shaped sacs filled with hydrolytic enzymes that have the capability to break down many types of biomolecules."***

Lysosomal Enzymes-

lysosomes contains **acidic hydrolytic enzymes,** about 50 of enzymes have been identify far. All this enzyme have been classify in to 6 categories-

Proteases, which digest **proteins**

Lipases, which digests **lipids**

Amylase, which digests **carbohydrates**

Nucleases, which digest **nucleic acids**

Phosphoric acid monoesters

Sulphatases

Collectively the group of enzymes is called hydrolases which cause cleavage of substrates by the addition of water molecules. **Most of the lysosomal enzymes function in the acidic medium.**

Lysosome Structure

The outer surface is formed by a **single membrane**, a phospholipid bilayer that can fuse with some other membrane-bound organelles .

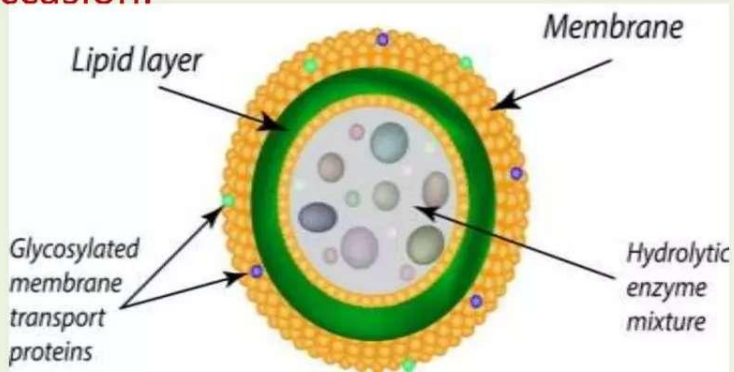
Lysosomes are formed by budding off of the Golgi apparatus, and the hydrolytic enzymes within them are formed in the endoplasmic reticulum.

lysosomes are membrane-delimited organelles.

They also have a high concentration of protons, which results in **pH value of less than 5.**

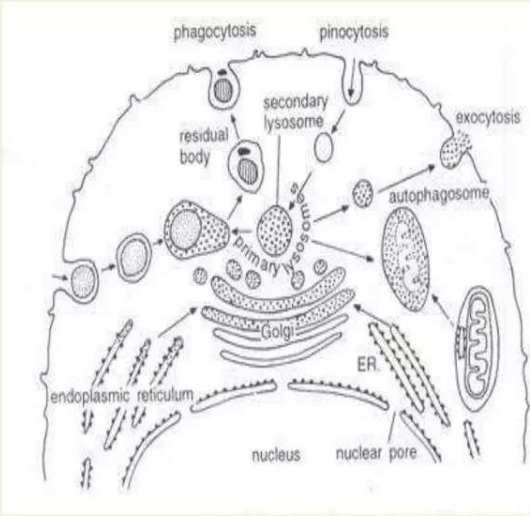
The surrounding membrane is composed of integral proteins as well as a vacuolar-type H+ ATPase, **highly glycosylated proteins and a number of transporters**. Depending on the type of lysosome and their function, they also greatly vary in size (between 1 micrometer and several microns) and general shape.

They are less defined compared to other types of organelles. they appear as cytoplasmic dense bodies that may be ovoid, spheric or tubular on occasion.



Types of lysosomes

Lysosomes are of four types.so they are called Polymorphic organelle.

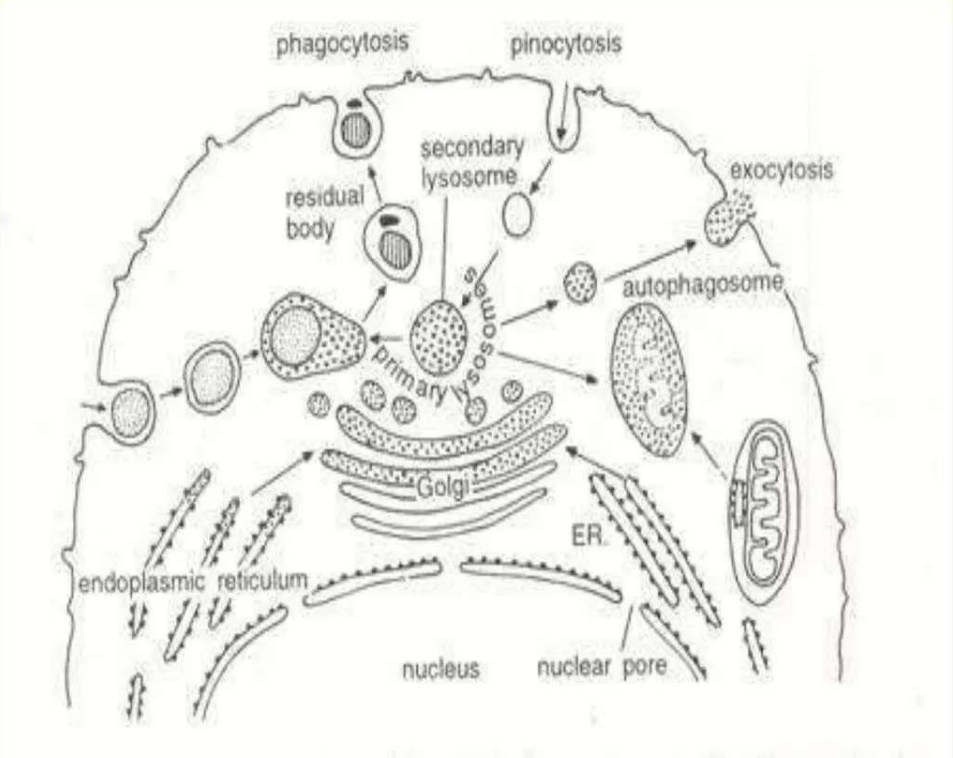


1. Primary lysosomes -

- They are formed from golgi body appearing as **small vesicles**.
- primary lysosomes are popular on Golgi apparatus, they also occur as granulocytes and monocytes.
- These lysosomes are surrounded by a single phospholipid layer and contain acid hydrolases.
- Small sac-like structures enclosing enzymes synthesized by the rough endoplasmic reticulum.
- Simply called as storage granules storing enzymes.

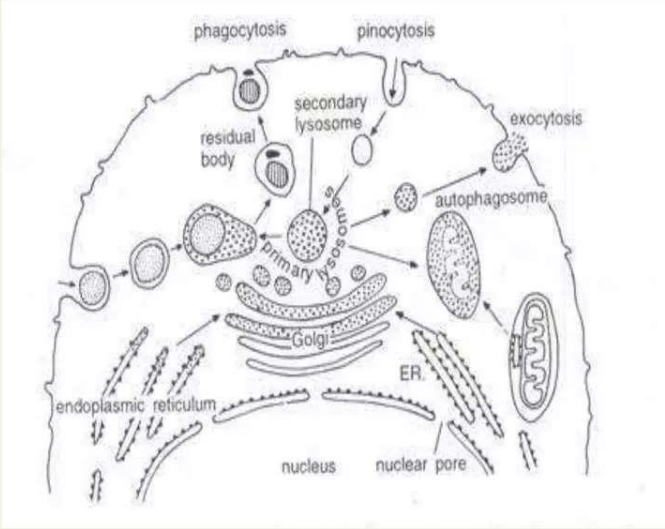
2. Secondary lysosomes -

- Secondary lysosomes are formed by the fusion of primary lysosomes with phagosomes /pinosome / endosomes.
- Compared to primary lysosomes, **secondary are larger in size** and capable of releasing their content (enzymes) outside the cells where they degrade foreign material.
- Contain active enzymes.
- Materials are progressively digested.



3. Tertiary lysosomes -

- Tertiary lysosome also known as Telosome or **residual body** .
- **Contain undigested food which is expelled by exocytosis.**



4. Auto lysosome-

- Auto lysosome also known as **autophagosome.**
- Formed by fusion of primary lysosome with cell organelles(which is old or damage and need to be digested).
- Auto lysosome also function during deficiency of food (by digesting the reserved food).
- They are called suicidal bag when they rapture to release all the enzyme to digest and old or worn- out cell.

Functions of Lysosomes

Primary function of lysosome is intracellular and extracellular digestion at acidic pH.

- **Intracellular Digestion**
- To digest food, the lysosome membrane fuses with the membrane of food vacuole and squirts the enzymes inside.
- The digested food then diffuses through the vacuole membrane and enters the cell to be used for energy and growth.

- **Extracellular Digestion**
- Primary lysosomes secrete hydrolases outside by exocytosis resulting in degradation of extracellular materials.
  eg. Saprophytic fungi

- **Heterophagy**
- The taking into the cell of exogenous material by phagocytosis or pinocytosis and the digestion of the ingested material after fusion of the newly formed vacuole with a lysosome.

Autophagy

A normal physiological process that deals with the destruction of cells in the body. It is essential for maintaining homeostasis, for normal functioning by protein degradation, turn over of destroyed cell organelles for new cell formation.

Autolysis

It refers to the self killing of an entire set of cells by the breakdown of the lysosome membrane. It occurs during amphibian and insect metamorphosis.

Fertilization

The acrosome of the sperm head is a giant lysosome that ruptures and releases lytic enzymes **like hyaluronidase**, on the **surface of the egg.** This provides the way for sperm entry into the egg by digesting the egg membrane.

As Janitors of the Cell

Lysosomes remove 'junk' that may accumulate in the cell helping to prevent diseases.