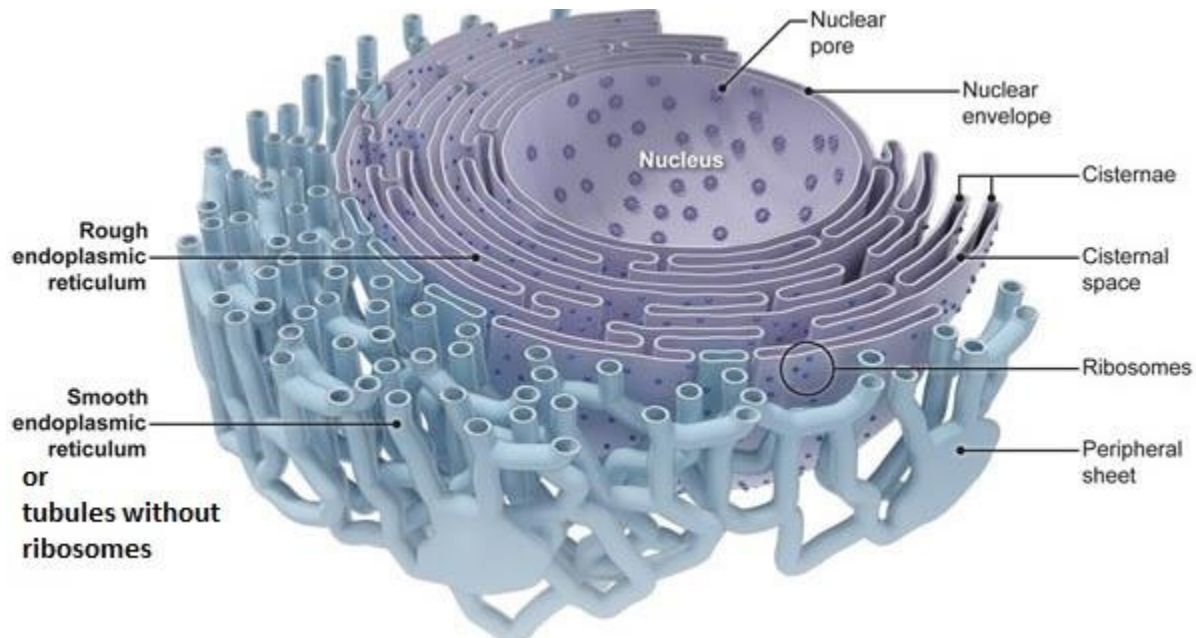


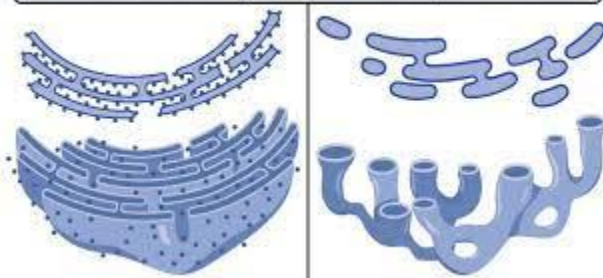
# CELL BIOLOGY

## Endoplasmic Reticulum (ER)



- ER is a vast network of membrane bound , branching and inter- connecting tubules, vesicles and flattened sac ,irregularly distributed in the cytoplasmic matrix
- Known as the **Endoskeleton of cell**
- First observed by **Garnier in 1897**
- Also known as **Ergastoplasm**
- Discovered by **Porter in 1945**
- Ultra structure described by **Keith Porter,Albert Claude and Ernest Fullum in 1945**
- Term Endoplasmic reticulum coined by **KR Porter**

Differences Between Rough and Smooth Endoplasmic Reticulum



- There are two types of ER

- i. **Rough ER** (RER) / Granular ER – attached with ribosome, have rough walls, major location of synthesis of secretory proteins
  - ii. **Smooth ER** (SER) / Agranular ER –not attached with ribosome, have smooth walls, manly concerned with synthesis of non-protein substances
- ER exists in 3 morphologically different forms

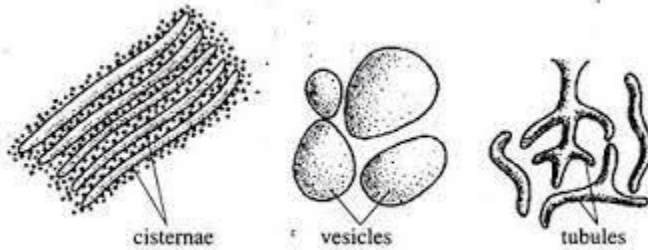


Fig. 3.9 : Various components of the endoplasmic reticulum.

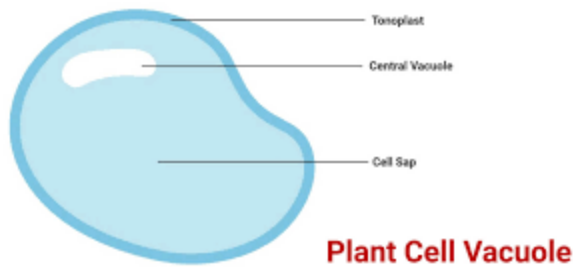
- i. **Cisternae** – un-branched and flattened sacs arranged in parallel stacks
- ii. **Vesicles** – oval or rounded vacuolar space
- iii. **Tubules** – tubular elements

### ***Functions***

1. Gives mechanical support and structural framework to cell
2. Serve as an intercellular transport system
3. Secretory, packing and storage of proteins
4. Involved in carbohydrate metabolism
5. Synthesis of phospholipids, lipoproteins, glycerides, sterols, steroid hormones, bile acids by SER
6. Metabolism of vitamin A

### **Vacuole**

- Membrane bound structure found in cytoplasm of a cell
- Found in protoplasts, plants and animals
- **Membrane of vacuole is Tonoplast**
- Components of vacuole is **cell sap**



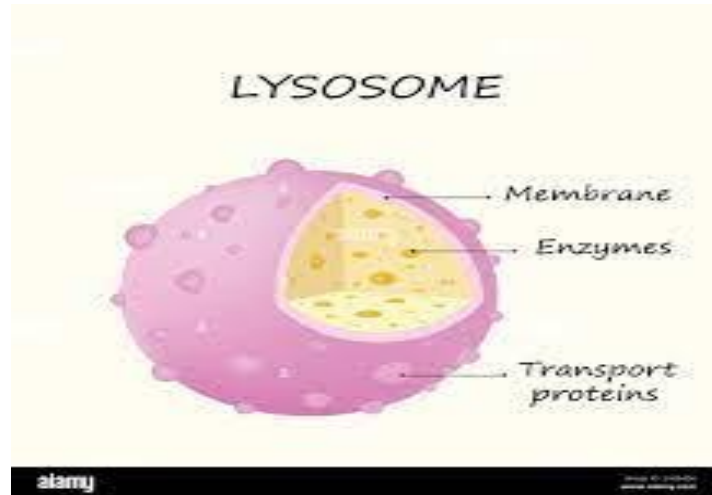
- **Functions** - storage of salts, minerals, pigments and proteins within a cell maintains a turgor pressure and shape of cell
- There are 4 types of vacuoles
  - I. **Sap Vacuole** - store and concentrate mineral salts, nutrients
  - II. **Contractile vacuole** – helps in osmoregulation and excretion
  - III. **Food vacuole** - contains digestive enzymes which helps in digestion
  - IV. **Air vacuole** - helps in buoyancy of cells

## Lysosome

- Vesicular , membrane bound and enzyme filled cell organelles
- First observed in liver cells and termed as pericanalicular dense bodies
- Isolated and named as lysosome by **Christian de Duve in 1955**
- Performs autolysis during infection or cell death ,thus known as the **suicidal bag of cell**
- Absent in mature mammalian RBC and in prokaryotic cells
- **Functions**
  - i. Helps in the digestion of extracellular particles such as bacteria
  - ii. Helps in digestion of intracellular substances or autophagy during starvation
  - iii. Acrosomal reaction
  - iv. Helps intercellular digestion or autolysis during infection or when cells die
  - v. Helps to enable the cells to adapt metabolically to the changing conditions of nutrient supply, O<sub>2</sub> concentration etc
- Terms related to lysosome  
**Phagocytosis** = cell eating – when the cell takes up solid particles like food materials or bacteria or the injection of food

## E ▶ ENTRI

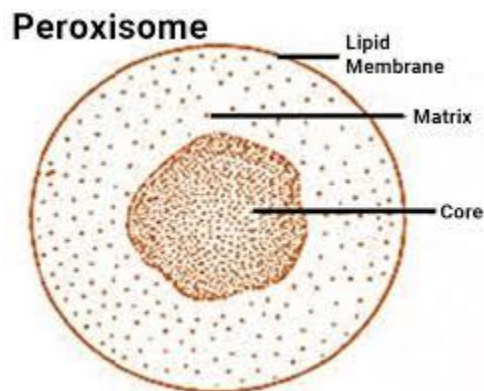
**Pinocytosis** = cell drinking – taking in of fluid particles



- There are two types of lysosomes based on contents
  - I. **Primary Lysosome** – contains enzymes alone
  - II. **Secondary Lysosomes** - contains enzymes and the materials to be digested

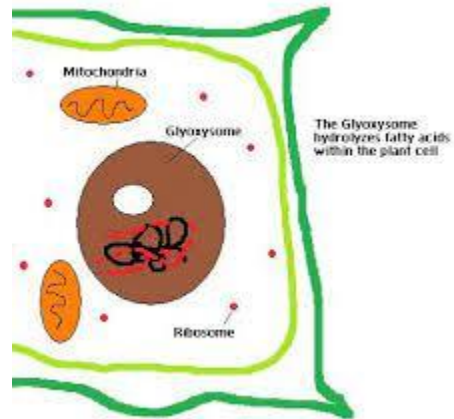
## Microbodies

- Microbodies are small ovoid spherical membrane bound, enzyme filled lysosome like cell organelles
- Discovered and named **by Rhodin in 1954**
- There are 2 types of microbodies
  - I. **Peroxisomes**
    - ovoid microbodies rich in peroxidase catalase and involved in formation and decomposition of hydrogen peroxide
    - Found in protists, yeast cells, some type of plant cells and liver and kidney cells of animals
    - Two types – animal peroxisomes and plant peroxisomes

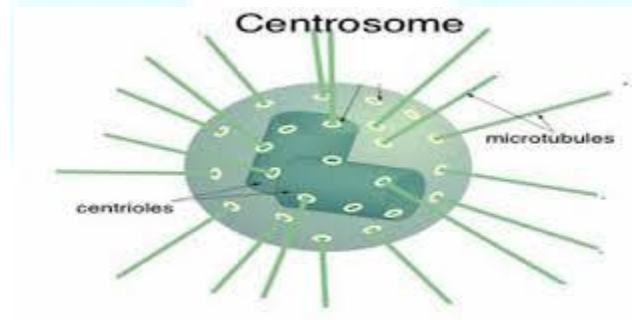


## II. Glyoxysomes

- Seen in plant cells in germinating seeds and are associated with triglyceride metabolism
- Contains enzymes of glyoxylate cycle
- Absent in animal cells



## Centrosome



- Cell organelles found near to nucleus
- Described and named by **Theodar Boveri in 1888**
- Major role in division of cell
- During cell division centrosome divides and migrate to opposite poles of cells
- **MTOC = Microtubule Organizing Centre**
- Centrosome have 2 centrioles placed right angle to each other
- **Functions**
  - Formation of mitotic spindle
  - Assembly of microtubules
  - Regulation of cell cycle progression

