CELL ORGANELLE

LYSOSOME

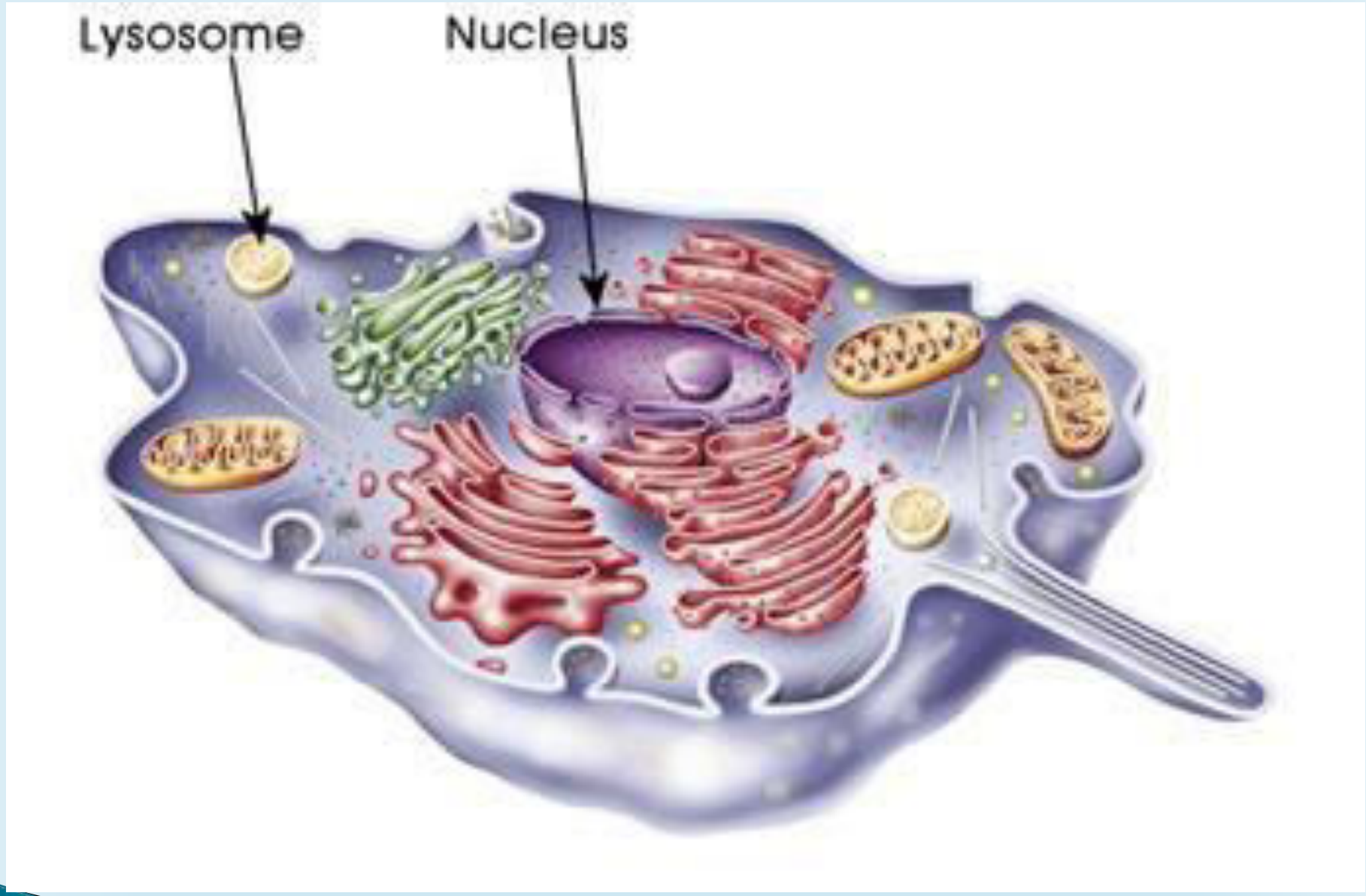
De Duve discovered membrane bound organelles "lysosomes in 1949.

In 1955 enzyme hydrolyases found in these sac like structure.

- This organelle is spherical in shape. And composed of acid hydrolase enzyme.

- Easily digest because they break up food. Present in animal cells but also found in yeast and plants

- Hydrolytic enzymes in lysosomes required for intracellular digestion.
- Lysosomes are about 0.1 to 0.8um in size.
- While in WBCs they are about 0.8 to 2um in size.


Lysosome
Nucleus

LYSOSOMAL ENZYMES

- Phosphate esters
- Nuclease (DNase, RNase)
- Protein digesting enzymes (coilagenase , cathepsins and other proteases)
- Carbohydrates digesting enzymes (beta-glucosidase, hexoaminidase A etc)
- lipid digesting enzymes (sphingomyelinase, esterases)
- These hydrolytic enymes are synthesized in endoplasmic reticulum.

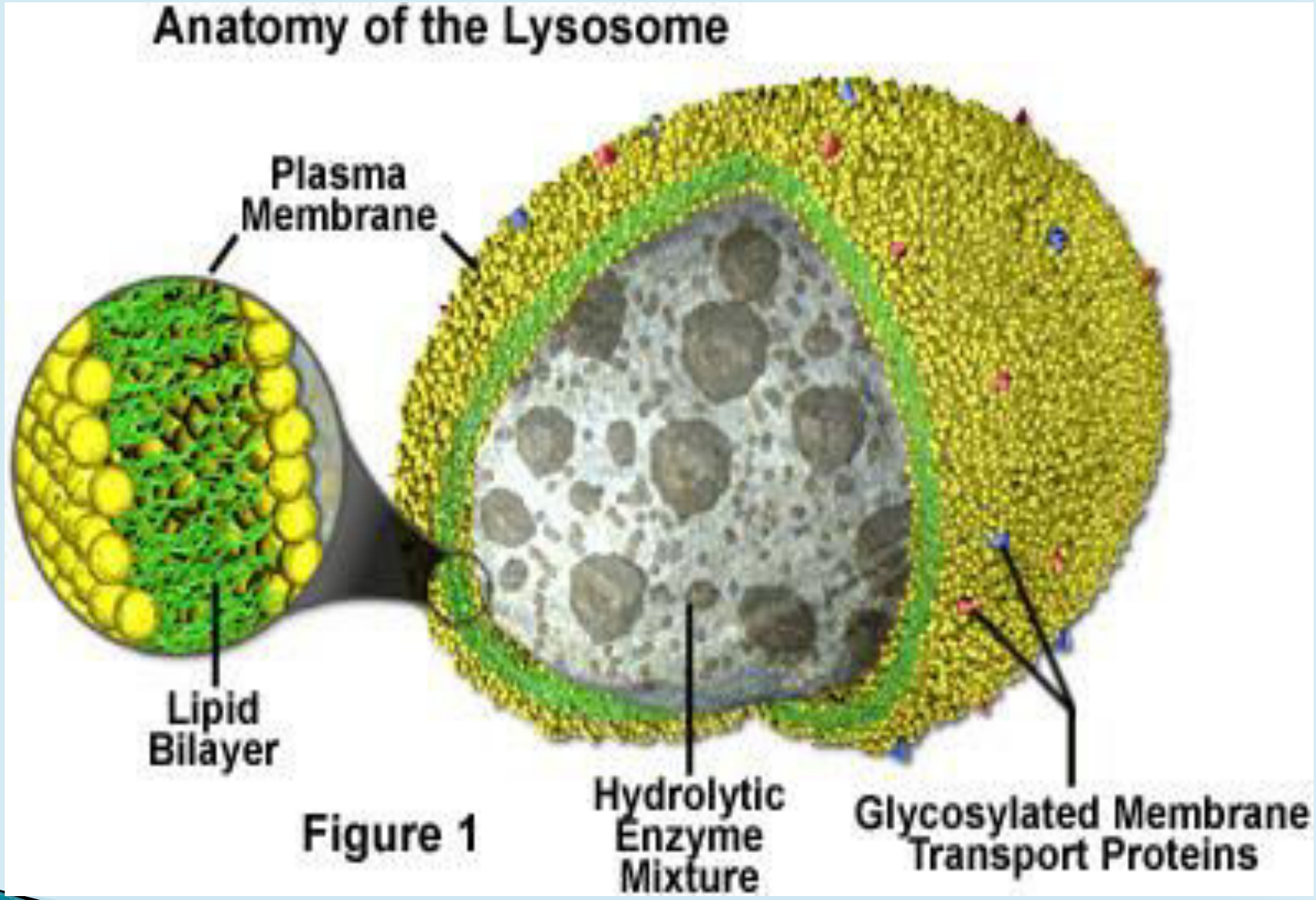
- They digest food, membrane of food vacuole and lysosome fuses together and pour the enzyme inside in food vacuole.

- Also play role as a cell garbage disposal system and involve in digestion of macromolecules from phagocytosis endocytosis and autophagy.

STRUCTURE OF LYSOSOMES

- Lysosomes are spherical in shape that consists of outer membrane and inner matrix.
- The outer membrane is composed of phospholipids while inner membrane consists of several enzyme.

- outer membrane separates inside of lysosomes from membrane external environment.
- The entire cell membrane of cell are composed of phospholipids molecules.
- Structurally, lysosomes are just like floating garbage bag that consists of many enzymes which help in digestion.
- The outer membrane works like gateway that moves molecules inside the lysosomes without escaping into cell.

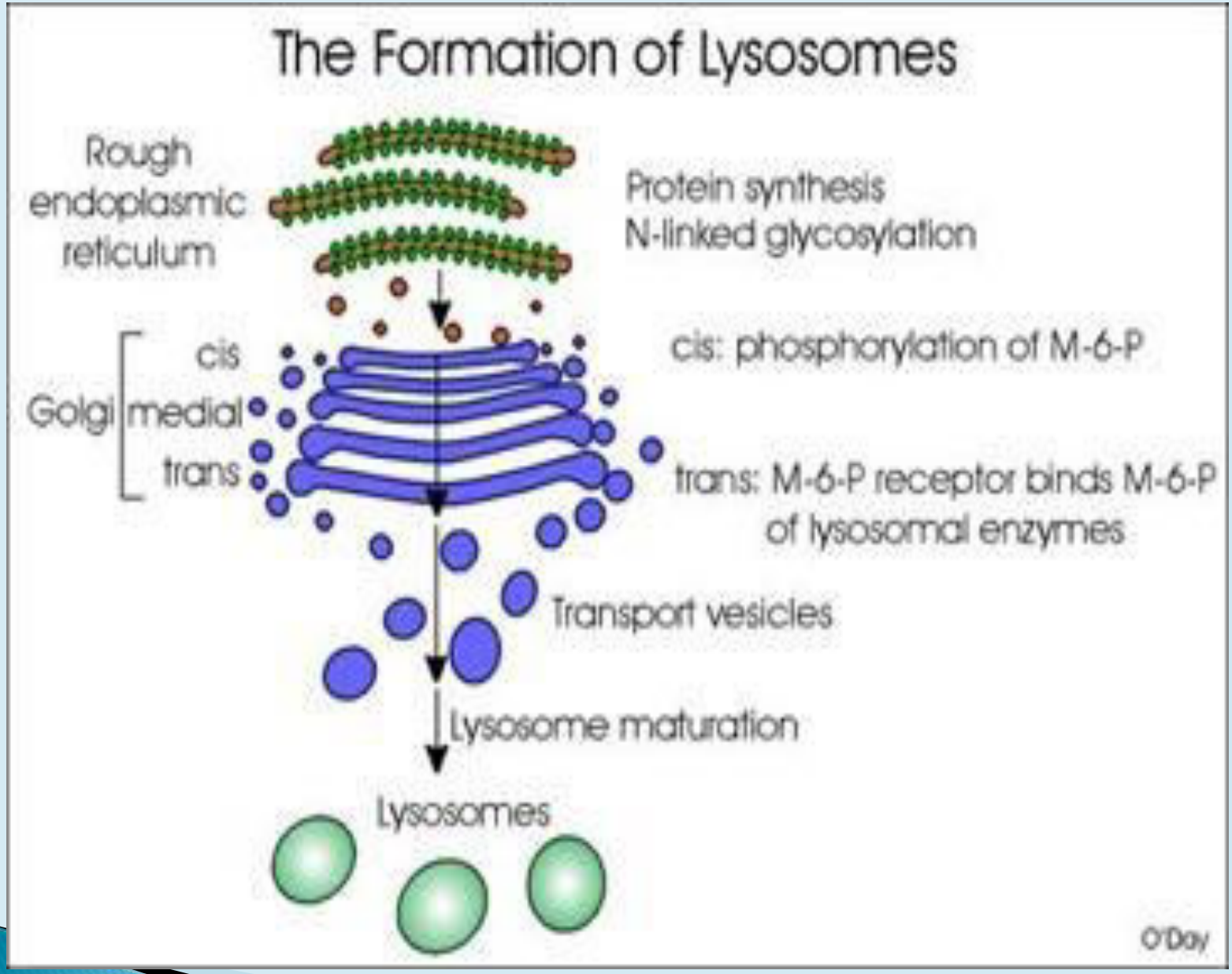

Anatomy of the Lysosome
Plasma Membrane
Lipid Bilayer
Hydrolytic Enzyme Mixture
Glycosylated Membrane Transport Proteins
Figure 1

pH of lysosomes:

- At pH 4.5-5 the lysosomes are acidic as compared to slighty basic cytosol(pH 7.2).
- Enzymes are pH sensitive and don't perform function at basic pH of cytosol.
- This ensure cytosolic molecules are not destroyed in case there is leakage of hydrolytic enzymes from lysosomes.

Formation of lysosome:

- A tiny vesicle separates from gogli apparatus .vesicle then begin formation of two lysosomes
- Primary lysosome.
- They contain enzymes synthesized by rough endoplasmic reticulum.
- They are small sac like structure.
- They are storage granules so they store enzymes.
- Secondary lysosome.
- They are formed by fusion of primary lysosome with phagosome.


The Formation of Lysosomes
Rough endoplasmic reticulum
Protein synthesis
N-linked glycosylation
Golgi
cis
medial
trans
cis: phosphorylation of M-6-P
trans: M-6-P receptor binds M-6-P of lysosomal enzymes
Transport vesicles
Lysosome maturation
Lysosomes
O'Day

Lysosome storage diseases:

- They are inherited metabolic diseases.
- They are result of enzyme deficiencies.
- There are 50 of disorders they may affect.
- heart ,brain,skin,central nervous system.

Fabry disease:

It affects both male and female known as x linked genetic disease.Affect kidney heart ,pulmunary problems and typical skin types.

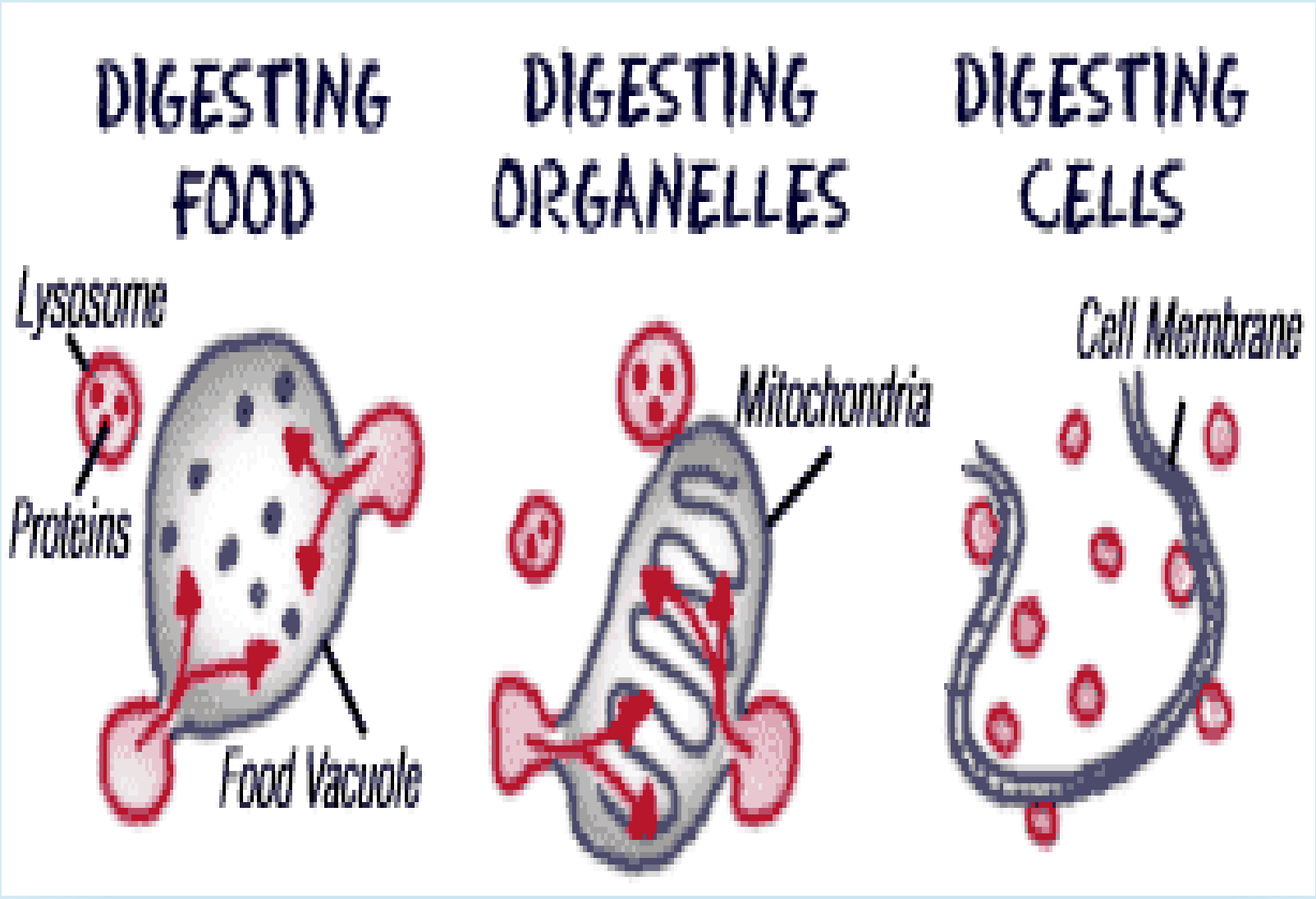
Gaucher disease:

It causes enlargement of liver spleen,bone .some lead to neurological problems affecting brain.

Mucopolysaccaridiosis:

- It damage multiple organs eyes heart bones eyes.
- Results from accumulation of mucopolysaccaride.
- Signs and symptoms appear with age.
- Disease may not be apparent at birth.

DIGESTION


DIGESTING FOOD
DIGESTING ORGANELLES
DIGESTING CELLS
Lysosome
Proteins
Food Vacuole
Mitochondria
Cell Membrane

Function

- Found only in animal cells
- Filled with enzymes for intercellular digestion
- Waste Disposal System that is inside of cell
- Essential to all eukaryotic cells
- If it is not functioning properly, there would be an accumulation of unwanted materials, which would lead to the death of the cell