Pakistan School
Kingdom of Bahrain

Pakistan School, Kingdom of Bahrain.

Welcome to new class

Grade 11

Rules of the class

1) Be on time for all your classes.
2) Respect all the participants of the class.
3) Do not create any disturbance.
4) Pay attention to your teacher.
5) Raise hand if you have a question.
6) Enter into the class with your actual name and CPR number.

Chapter 1

Cell Structure and Function

OBJECTIVES:

At the end of this lesson students will be able to:

- Analyze the structure of lysosomes, peroxisomes , glyoxysomes and vacuoles
- Explain their respective functions.

LYSOSOMES (lyso- splitting, soma- body)

1) Single membranous, spherical sacs.
2) Contain hydrolytic or digestive enzymes

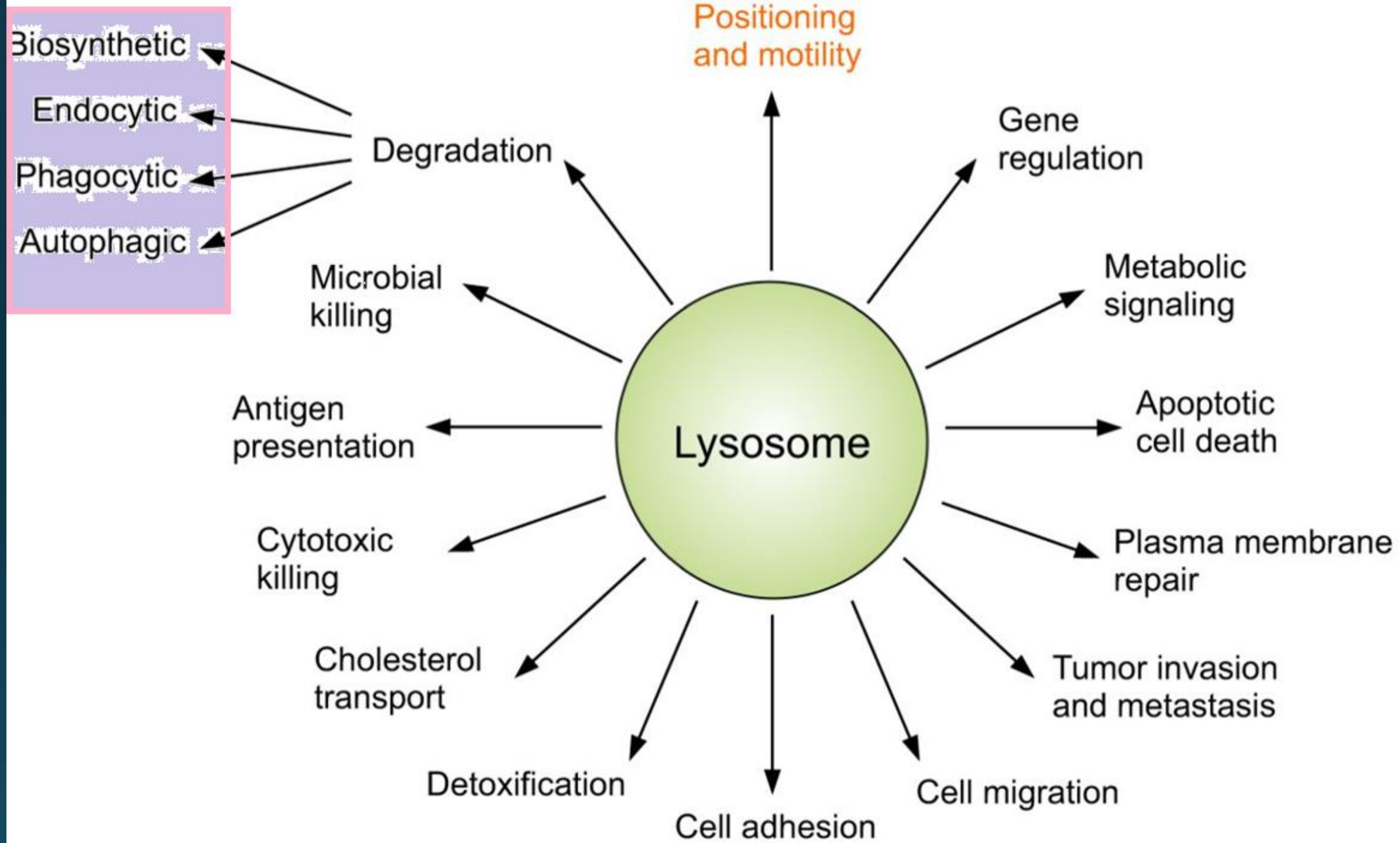
   RER → SER -→ Golgi complex → vesicles (lysosomes) primary lysosomes
3) Contain 40 different enzymes to break every major macromolecule
4) The p H of enzymes → 4 - 4.5
5) Major functions are

   a. intra cellular digestion

   b. Autophagy

   c. Autolysis

   d. release of extra cellular enzymes


Biosynthetic
Endocytic
Phagocytic
Autophagic
Degradation
Positioning and motility
Gene regulation
Microbial killing
Metabolic signaling
Antigen presentation
Lysosome
Apoptotic cell death
Cytotoxic killing
Plasma membrane repair
Cholesterol transport
Tumor invasion and metastasis
Detoxification
Cell adhesion
Cell migration

1.Endocytosis

2. Phagocytosis

3. Autophagocytosis

Membrane bound vesicles

+

Primary lysosome

Secondary Lysosomes

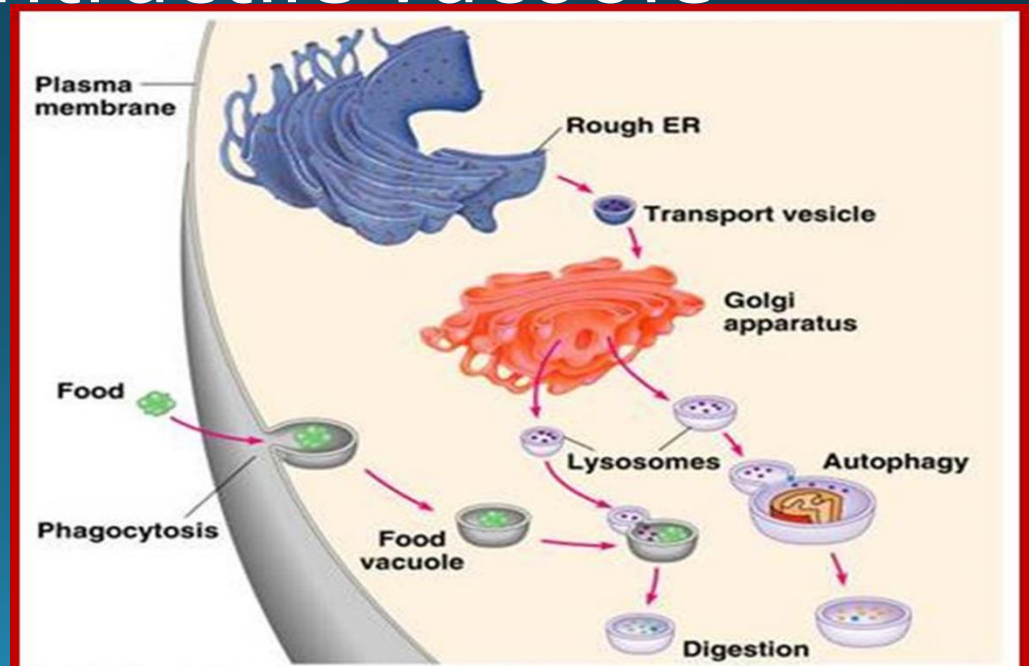
Intracellular digestion:

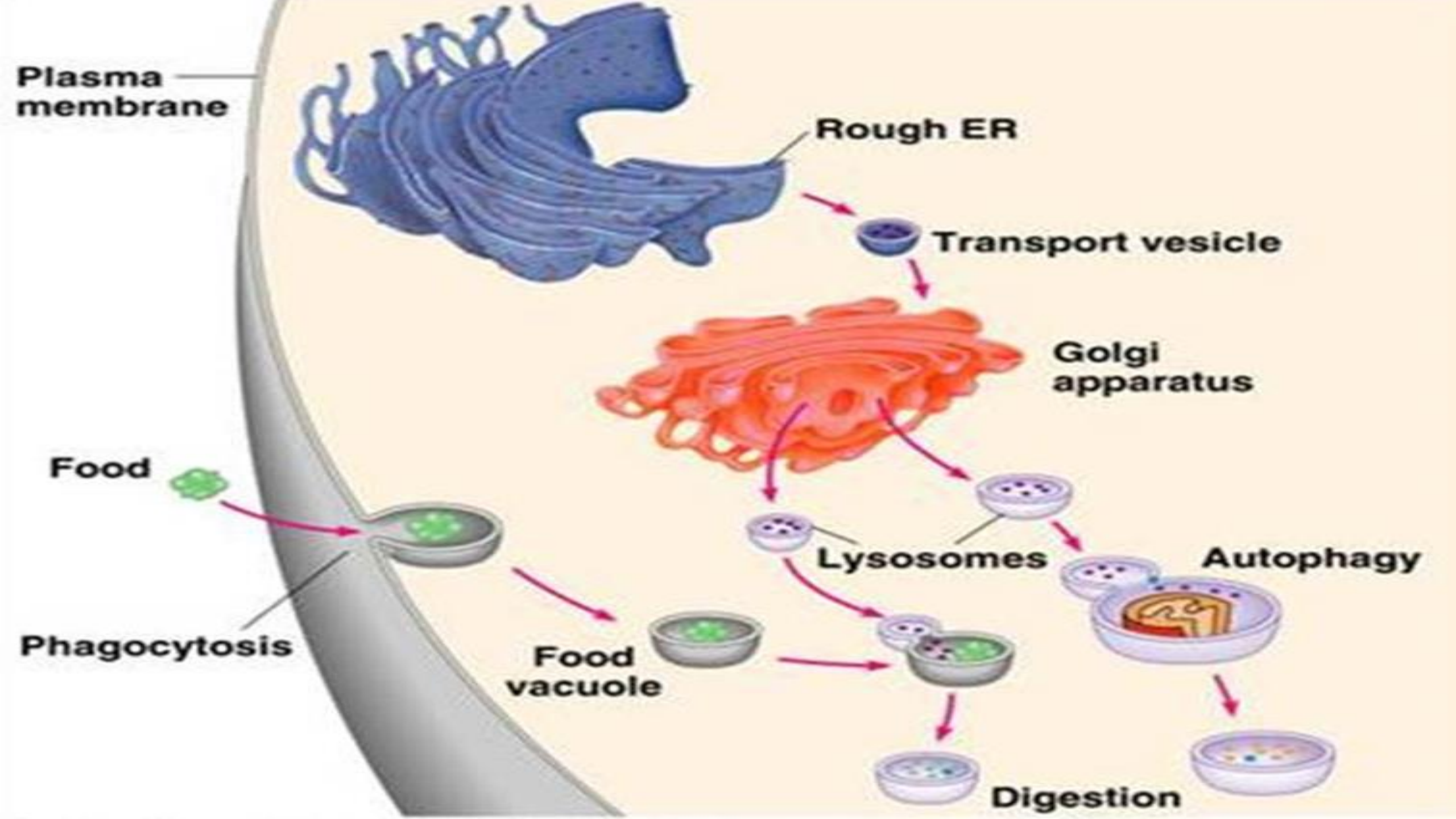
- Ingested food → food vacuole + Primary lysosome

→ secondary lysosome → Digestion →

Digested products absorbed → Contractile vacuole

→exocytosis for waste elimination




Plasma membrane
Rough ER
Transport vesicle
Golgi apparatus
Food
Lysosomes
Autophagy
Phagocytosis
Food vacuole
Digestion

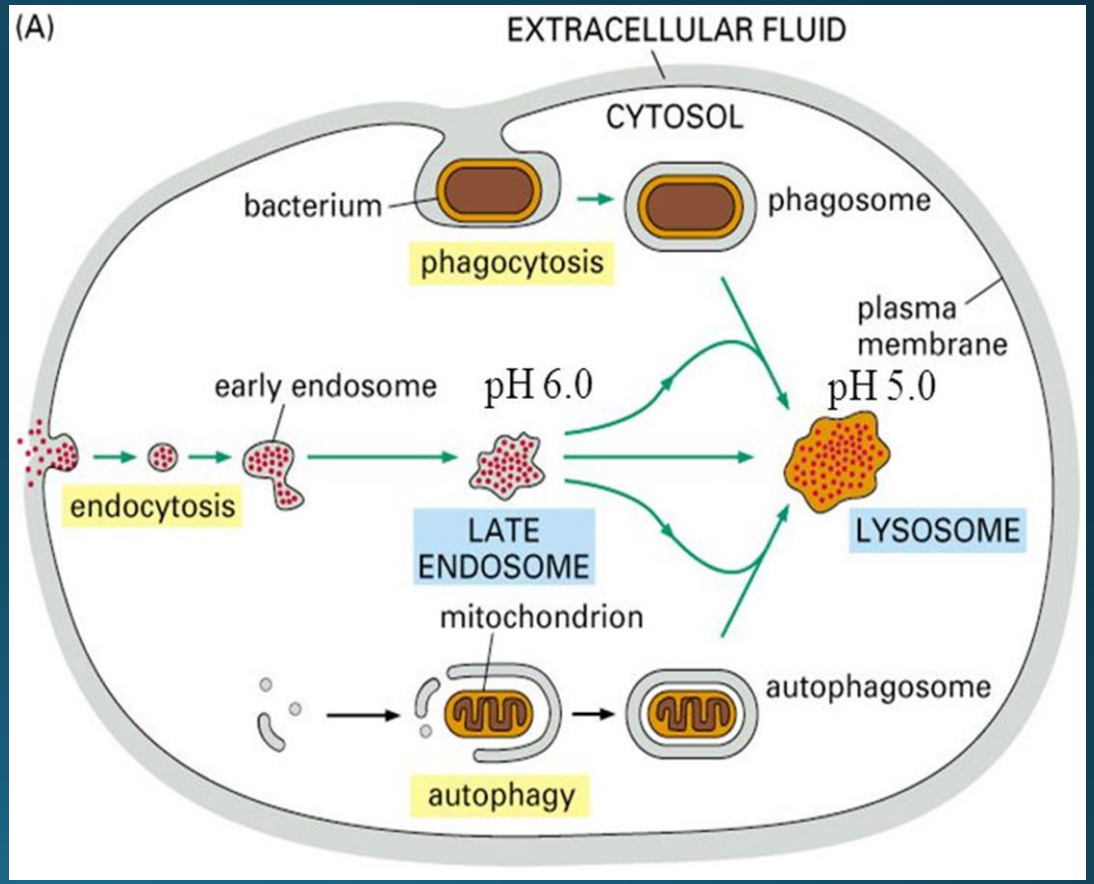
Autophagy:

Def: The process to engulf and digest the unwanted structures within the cell.

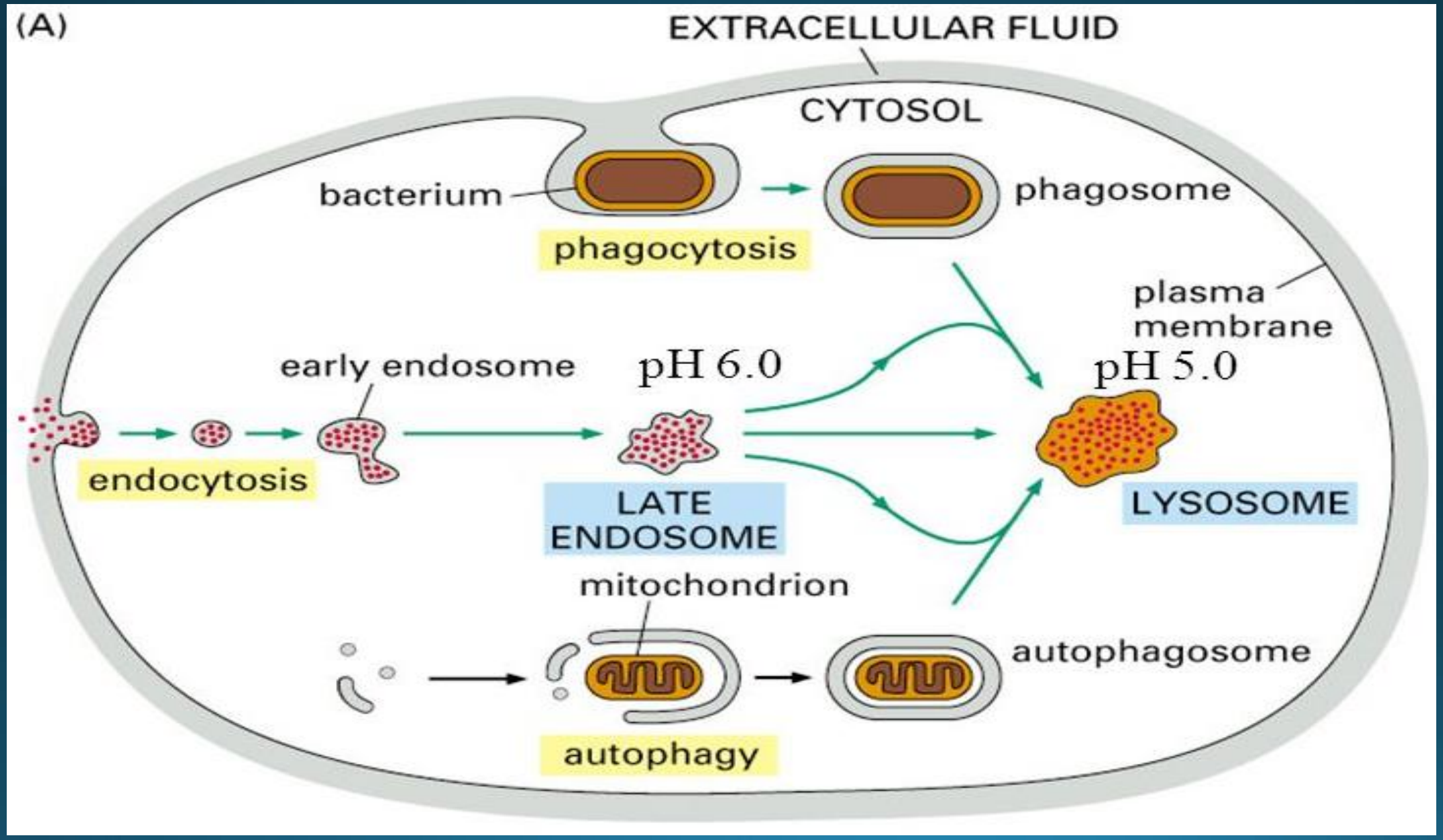
- The lysosomes → Auto phagosomes
- Occur in a. Starvation to obtain energy

  b. To control the number of organelles

e.g. during exercise more mitochondria but when leaves exercise less mitochondria



Functions of lysosomes:



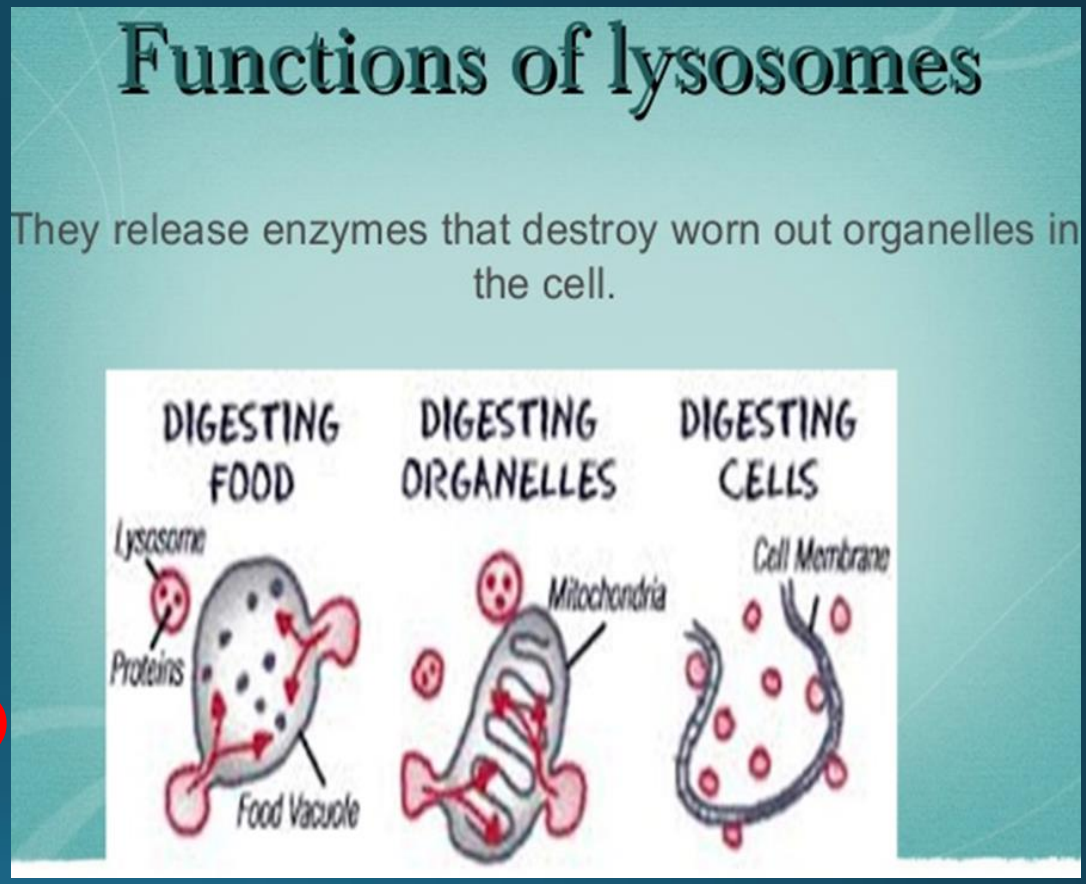
Autolysis (programmed cell death)

Def. Particular cells are disintegrated
(esp. during development)

Stages

1. Lysosomes burst
2. Enzymes dispersed in cell
3. Cell breaks in fragments
4. Fragments phagocytosed

Suicidal Bags?



Lysosomal storage diseases :

Lysosomes contain various digestive enzymes

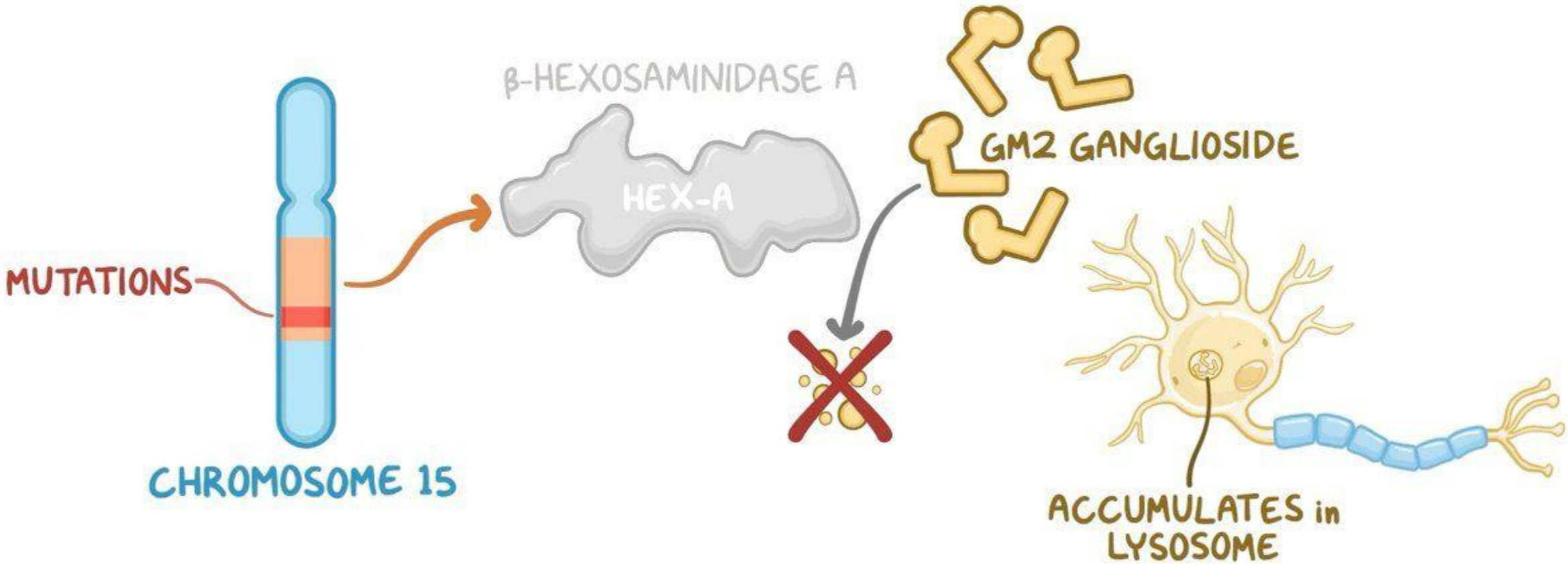
If a particular lysosome is missing,

GUESS WHAT WOULD HAPPEN?

Why would a particular lysosome be missing?

TAY-SACHS DISEASE (TSD)

* LYSOSOMAL STORAGE DISORDER



PEROXISOMES & GLYOXYSOMES:

- They are collectively called **microbodies** .
- Similar to lysosomes, due to:

1. Single membrane.
2. Vesicular.
3. Contain enzymes (different from lysosomes).
4. Originate from Golgi complex.
5. Smaller than lysosomes.

PEROXISOMES:

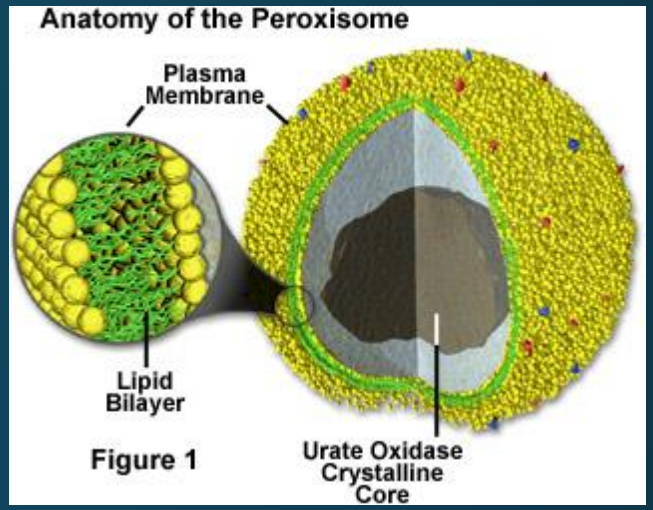


Figure 1

- Contain oxidative enzymes:

1. Peroxidases.
2. Catalases.
3. Glycolic acid oxidases.

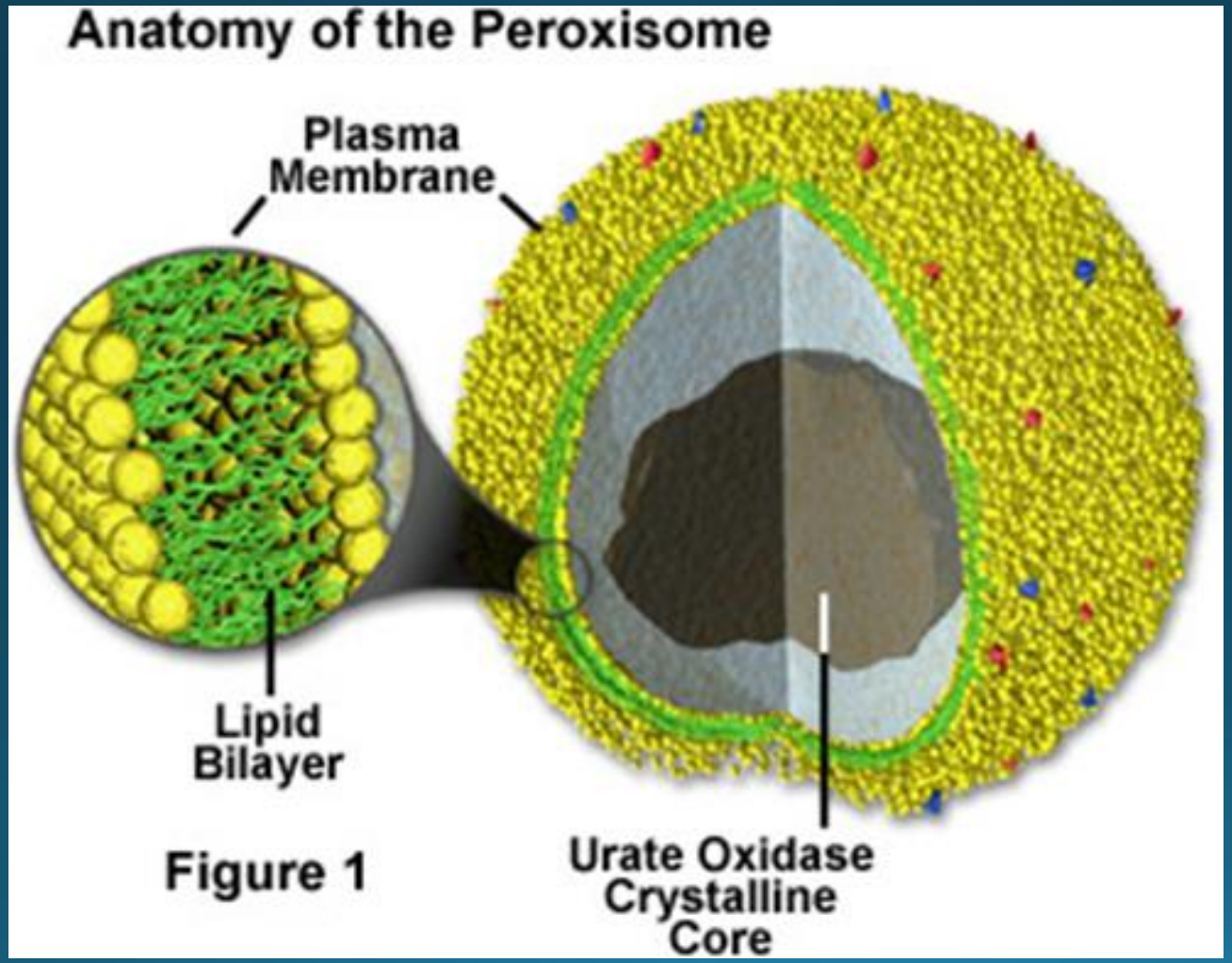
In ANIMALS

- Abundant in liver cells, which are involved in formation and decomposition of hydrogen peroxide.
- Main concern: detoxification of alcohol.
- Alcohol $\xrightarrow[\text{oxidizes}]{\text{peroxisomes}}$ hydrogen peroxide (H_2O_2).
- Hydrogen peroxide (toxic) $\xrightarrow[\text{immediate}]{\text{Catalase.}}$ $H_2O + O_2$.

In PLANTS

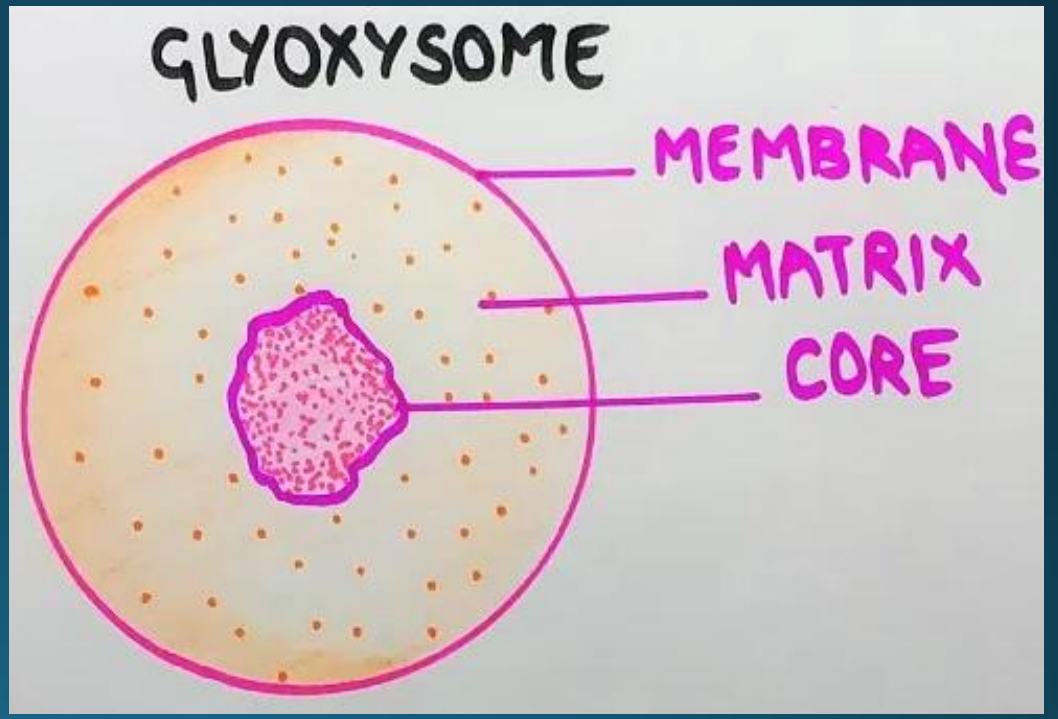
- Involved in photorespiration.
- Step of photorespiration occurs in peroxisomes.
- In this step glycolate is converted into glycine (enzyme used : glycolic acid oxidase).

PEROXISOME:


Anatomy of the Peroxisome
Plasma Membrane
Lipid Bilayer
Urate Oxidase Crystalline Core
Figure 1

GLYOXISOMES:

- Found only at seedling stage in oil plants.
- Enzymes specific for plant lipid metabolism.
- Not found in animal cells.
- Germinating seedlings convert stored fatty acids to carbohydrates (metabolic pathway: glyoxylate cycle) .
- The enzymes for the above cycle are present in the glyoxysomes.

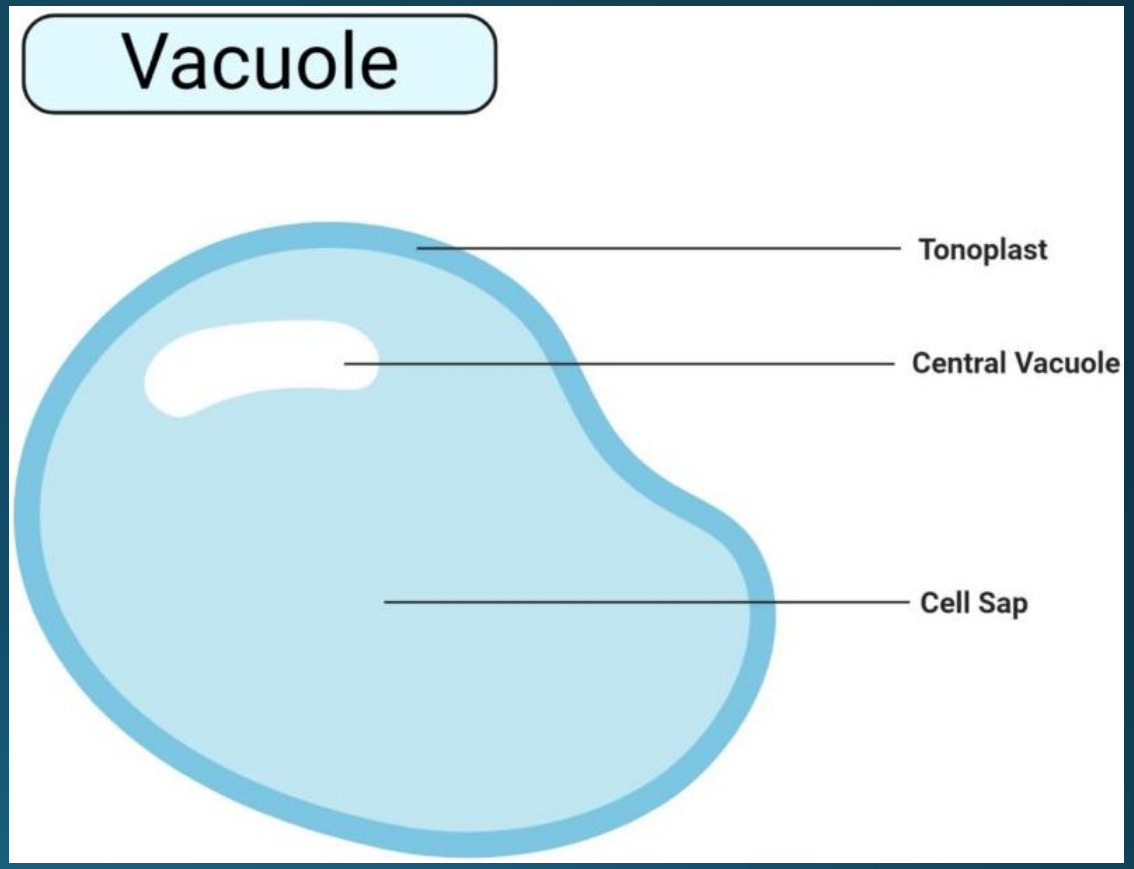


VACUOLES:

- Large vesicles .
- Originate from ER & Golgi complex & plasma membrane.
- Variety of functions in different cells.

ANIMAL CELLS:

- Food vacuoles formed by phagocytosis.
- Contractile vacuoles in many freshwater protists pump excess water out of cell, maintaining suitable concentration of ions and molecules inside cell.



PLANT CELLS:

- Many small vacuoles are present which hold organic compounds.
- Help in defending against herbivores by storing poisonous and unpleasant compounds to animals.
- Mature plant cells → large central vacuole formed due to coalescence of smaller vacuoles.
- **Cell sap** is the fluid inside the central vacuole.

✓main reservoir of inorganic ions including potassium and chloride.

- **Central vacuole** importance:

✓Cell sap.

✓Mechanical support.

✓Maintain turgor.

✓Storehouse.

- The membrane separating vacuole and cytoplasm → **TONOPLAST.**

PLENARY:

1. What is autophagy?
2. Why do we call lysosomes as suicidal bags?
3. How is tonoplast different from other membranes?


STAY
HOME
STAY SAFE

Allah Hafiz