SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr.M.G.R Medical University, Chennai

DEPARTMENT OF OPERATION THEATRE AND ANESTHESIA TECHNOLOGY

COURSE NAME: 1131 – BASIC SCIENCES - PHYSIOLOGY

UNIT: 1 – THE CELL AND THE BLOOD

TOPIC: THE CELL AND IT'S ORGANELLES

SUBTOPIC: CYTOPLASM

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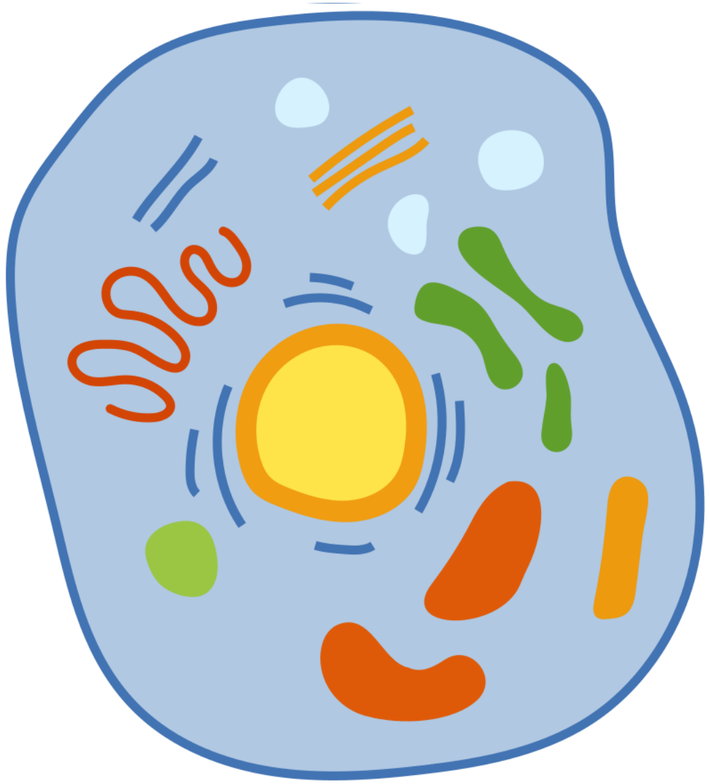
CYTOPLASM

Semi-liquid jelly like substance present in the cell that is between plasma membrane and nucleus

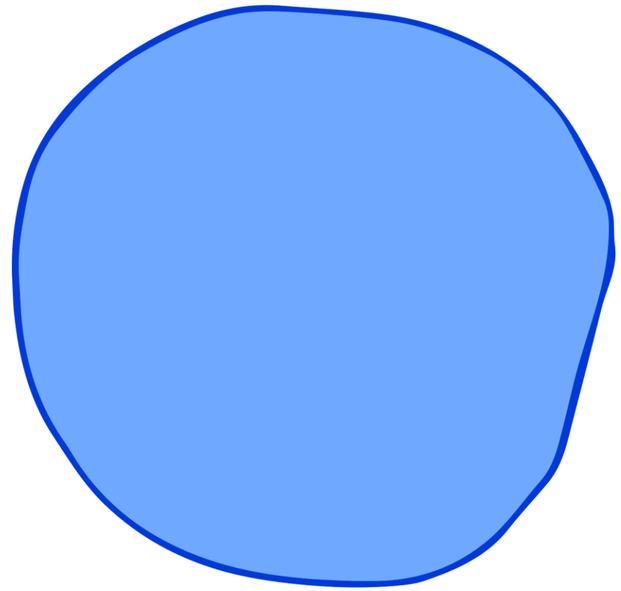
It consists of -

- Cystol
- Organells
- Inculsions



CYTOPLASM - CYSTOL

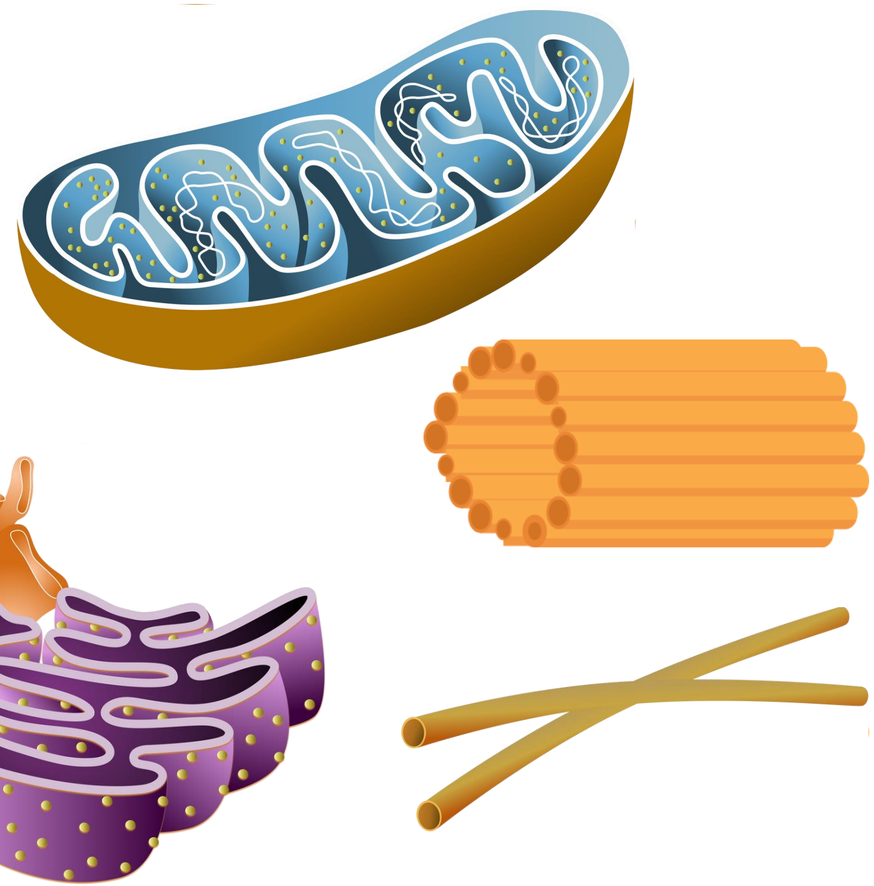
- Semifluid portion in which organells and inclusions are suspended
- Also called as intracellular fluid
- It contains 75-90 % of water and remaining are solids
- It is the medium in which metabolic reactions occurs



CYTOPLASM - ORGANELLES

- Specialized structures that have characteristics appearance and specific role in growth, maintenance, repair and control of cellular activity
- It is classified into 3 types-

1. Membranous organelles
2. Cytoplasmic ribonucleic acid
3. Centrosomes
4. Microtubules, microfilaments



CYTOPLASM - INCLUSIONS

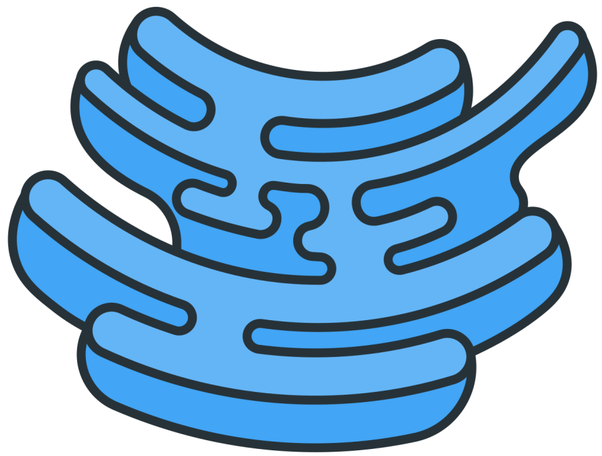
- Non- living substance present in the cytoplasm
- It is not bounded by any membrane
- There are 4 types -

1. Stored food (Eg- Glycogen)
2. Secretion granules
3. Crystals (Eg- Proteins)
4. Pigments (Eg- Melanin, Bile)

ENDOPLASMIC RETICULUM

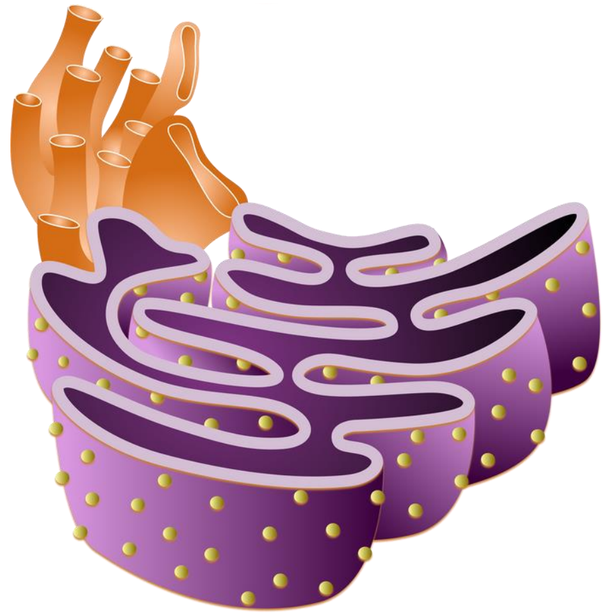
- Network of intracellular membranes
- It can be present in the form of hollow tubes, flattened sheets or round chambers called Cisternae
- It is connected to nuclear membrane on one side and to the plasma membrane on the other side
- 2 types - based on presence or absence of ribosomes on its surface -

1. Rough Endoplasmic Reticulum
2. Smooth Endoplasmic Reticulum



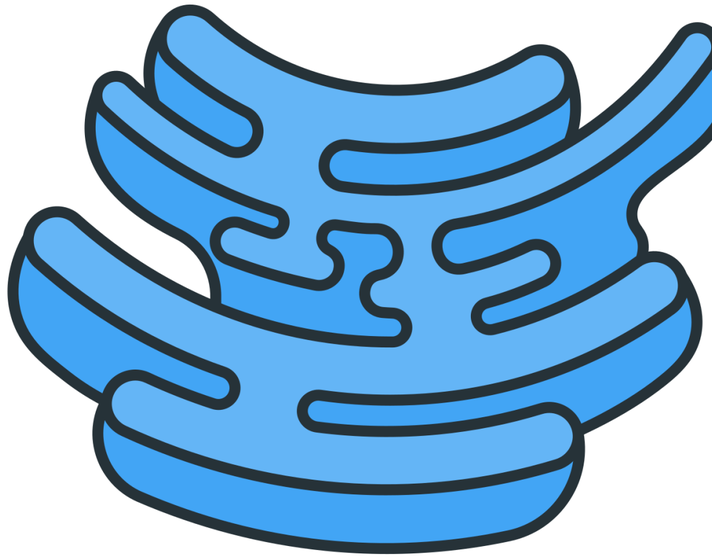
ROUGH ENDOPLASMIC RETICULUM

- The membranes of these Endoplasmic Reticulum are associated with minute particles of RNA called Ribosomes
- Presence of ribosomes gives the membrane a rough appearance
- Synthesis proteins
- It also serves as temporary storage area for newly synthesized molecules



SMOOTH ENDOPLASMIC RETICULUM

- Which are not having ribosomes
- It is site for fatty acid, phospholipids, steroid synthesis
- It is involved in lipid cholestrol and carbohydrate metabolism



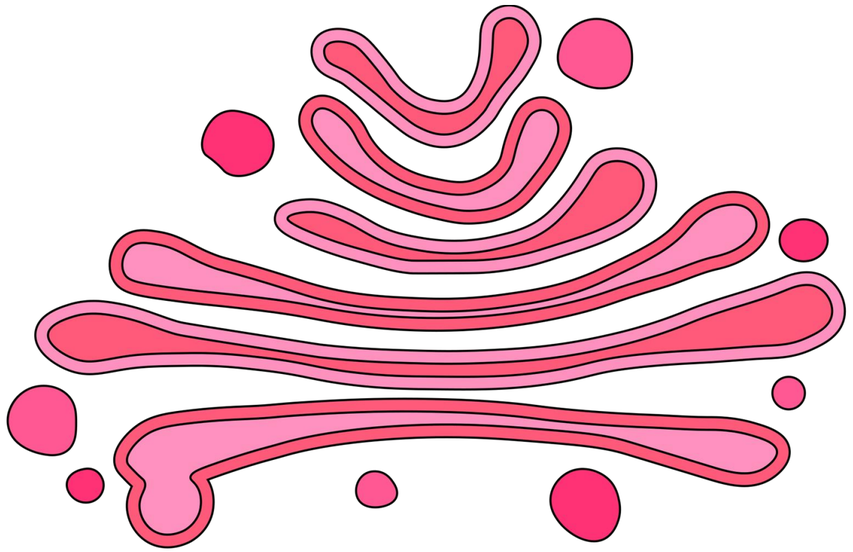
ENDOPLASMIC RETICULUM

FUNCTIONS

- It provides surface area for various chemical reactions that takes place in cell
- It helps in protein, fatty acid, phospholipid, steroid synthesis
- Various products are transported from one part to another part of the cell

GOLGI COMPLEX

- It is present near nucleus
- The cells with more secretory activity are having more number of Golgi complex



STRUCTURE

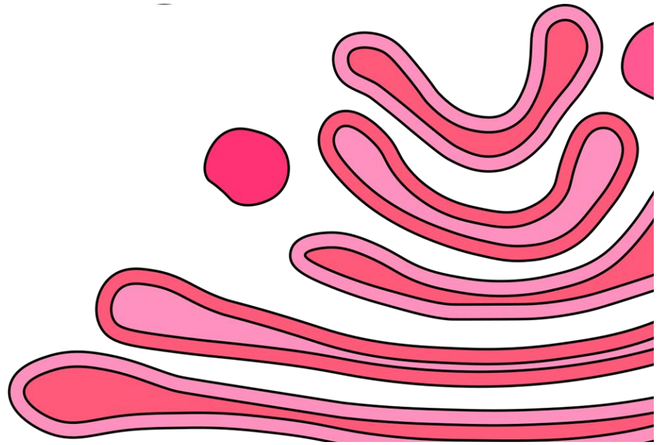
4 main structures -

1. Flattened vesicle
2. Golgi vesicle
3. Secretory vesicle
4. Micro vesicle

GOLGI COMPLEX

FLATTENED VESICLE

- 3 - 6 in numbers stocked upon each other



GOLGI VESICLE

- Bulged ends of flattened vesicle

SECRETORY VESICLE

- Golgi vesicles bulge much and they get detached from flattened vesicle

MICRO VESICLE

- Small in size (Transport vesicle). They carry the material from Endoplasmic reticulum to flattened vesicle

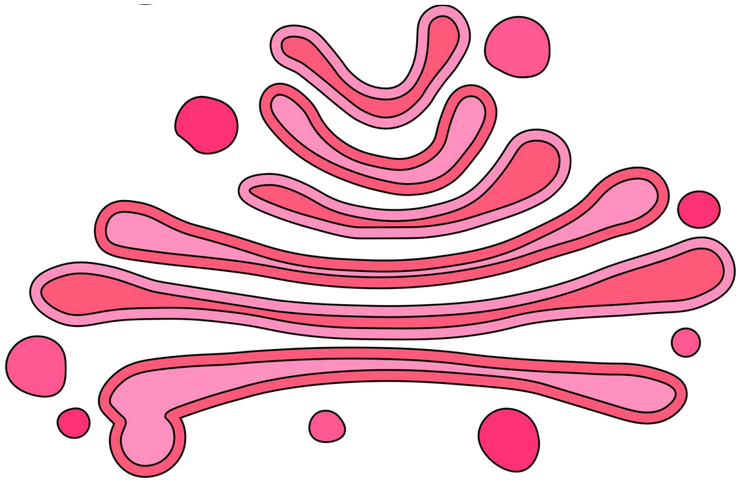
GOLGI COMPLEX

FUNCTIONS

In Golgi Complex

1. Processing
2. Sorting
3. Packing
4. Dispatching of substance takes place

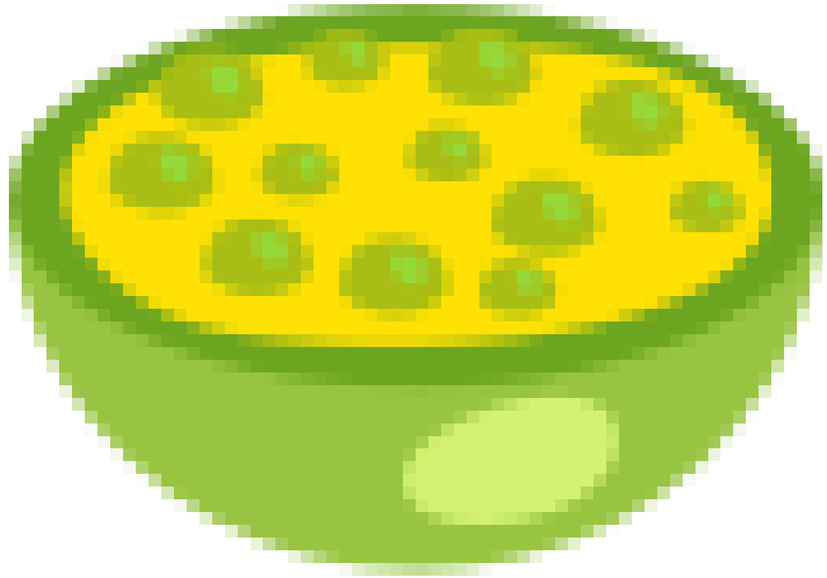
It also secretes polysaccharides



LYSOSOMES

STRUCTURE

- Membrane enclosed vesicle containing powerful digestive enzymes
- Orginating from Golgi complex
- Size : 0.25 - 0.8 microns
- Present in all animal cell except RBC

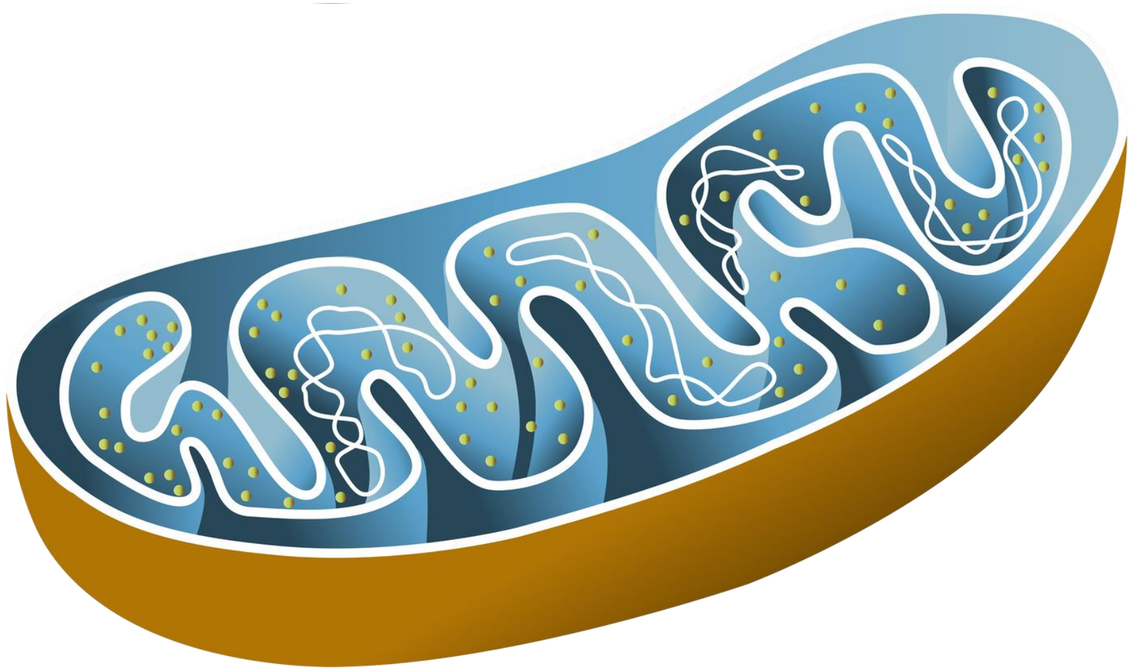


LYSOSOMES

FUNCTIONS

- It will help for intracellular digestion
- It helps for effective repair of an injured area
- It is called as Suicidal bags (Autolysis of cell)
- It will kill foreign substances by phagocytosis
- Sometimes rupture of lysosomes will stimulate the process of cell division
- It is also useful for extracellular digestion
- Acrosome of sperm is made up of lysosome which makes the penetration of sperm into ovum easy

MITOCHONDRIA



- Power house of the cell
- It is rod shaped organelle present in cytoplasm

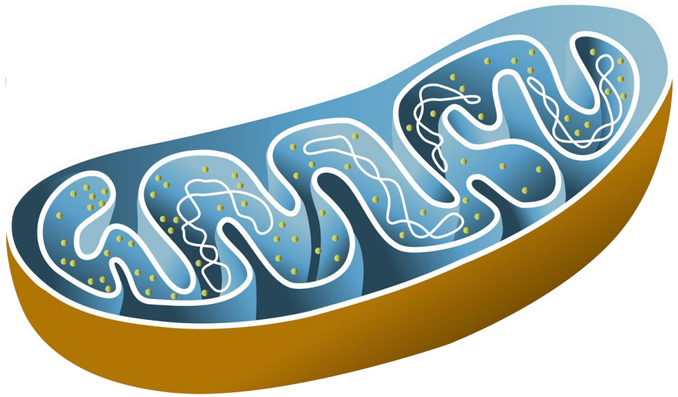
MITOCHONDRIA

STRUCTURE

- It has 2 membranes

1. OUTER - Smooth; Forms outer covering of mitochondria
2. INNER - Arranged in series of folds called Cristrae

- Cristrae provides enumerous surface area for group of chemical reactions known as cellular respiration
- Enzymes that catalyze these reactions are located in cristrae
- Central cavity enclosed by cristrae is called as matrix



MITOCHONDRIA

FUNCTIONS

- Acts as production centre for energy that is in the form of ATP (Adenosine Triphosphate)
- Dehydrogenase enzymes present in them is responsible from Krebes Citric Acid, Protein and Lipid synthesis

IN-CLASS ASSESSMENT

QUESTION 1:

What is the primary composition of cytoplasm's cytosol?

a) Equal parts water and solids

b) Mostly lipids and proteins

c) 75-90% water and remaining solids

d) 75-90% solids and remaining water

IN-CLASS ASSESSMENT

QUESTION 2:

Which type of endoplasmic reticulum is responsible for synthesizing proteins due to the presence of ribosomes?

a) Golgi Complex

b) Smooth Endoplasmic Reticulum

c) Lysosomes

d) Rough Endoplasmic Reticulum

IN-CLASS ASSESSMENT

QUESTION 3:

What is the main function of the Golgi Complex?

a) Cellular respiration

b) Storage of genetic material

c) Processing, sorting, packing, and dispatching of substances

d) Intracellular digestion

IN-CLASS ASSESSMENT

QUESTION 4:

Lysosomes are often called "suicidal bags" because they can perform:

a) Lipid metabolism

b) Autolysis of the cell

c) Protein synthesis

d) Cellular respiration

IN-CLASS ASSESSMENT

QUESTION 5:

What role do mitochondria play in the cell?

a) They synthesize steroids and lipids

b) They act as the powerhouse, producing ATP

c) They store inclusions like pigments

d) They form the nuclear membrane

IN-CLASS ASSESSMENT

ANSWERS:

1. c
2. d
3. c
4. b
5. b

SUMMARY

- The cytoplasm is a semi-liquid, jelly-like substance between the plasma membrane and nucleus, consisting of cytosol (75-90% water, serving as a medium for metabolic reactions), organelles (specialized structures like endoplasmic reticulum for synthesis and transport, Golgi complex for processing and secretion, lysosomes for digestion, and mitochondria for energy production), and inclusions (non-living substances like stored food and pigments).
- These components support cellular growth, maintenance, repair, and metabolic activities.

REFERENCE

- Guyton, A.C., & Hall, J.E. (2020). *Textbook of Medical Physiology* (14th ed.). Elsevier.
- Alberts, B., et al. (2014). *Molecular Biology of the Cell* (6th ed.). Garland Science.
- Cooper, G.M. (2000). The Endoplasmic Reticulum. *The Cell: A Molecular Approach*, 2nd ed. *Journal of Cell Science*, 113(Pt 12), 2113–2121.
- Farquhar, M.G., & Palade, G.E. (1981). The Golgi Apparatus (Complex). *Journal of Cell Biology*, 91(3), 77s–103s.
- National Center for Biotechnology Information (NCBI). "Mitochondria and Energy Production." https://www.ncbi.nlm.nih.gov/books/NBK9896/
- Khan Academy. "Cytoplasm and Organelles." https://www.khanacademy.org/science/biology/structure-of-a-cell

THANK YOU