# Practical Biology Lecture -4

## Kidney Dialysis Techniques Department

Prof . Dr. Younis A. Alkhafaj

## Cell, Cell Types and Functions

# Learning Objectives

1- Define cell and its importance
2- Know the basic structure of animal cell 2- ·
3- Distinguish between main cell types ·
4- Understand functions of cellular organelles ·
5 - Relate cell biology to dialysis technology

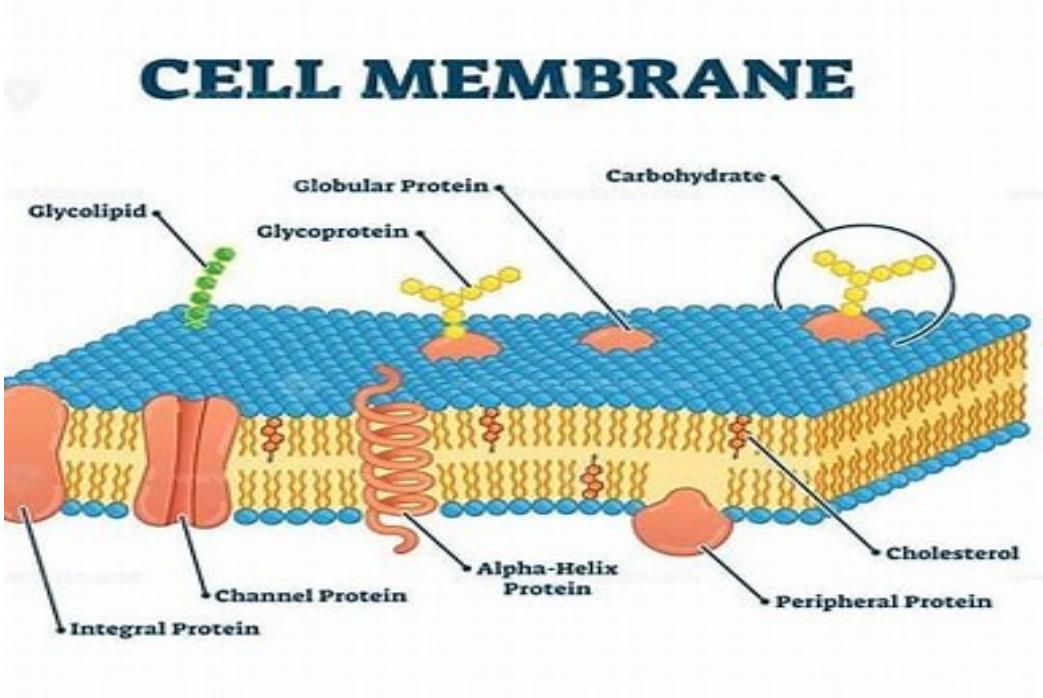
## What is a Cell

- Basic unit of life
- All living organisms are composed of cells.
- Cells perform all vital functions
- Cells divide to form new cells

# General Structure of Animal Cell

**The composed of the following components:**

- ♣ Cell membrane
- ♣ Cytoplasm
- ♣ Nucleus
- ♣ Mitochondria
- ♣ Endoplasmic reticulum
- ♣ Golgi apparatus
- ♣ Ribosomes
- ♣ Lysosomes




## Cell Membrane

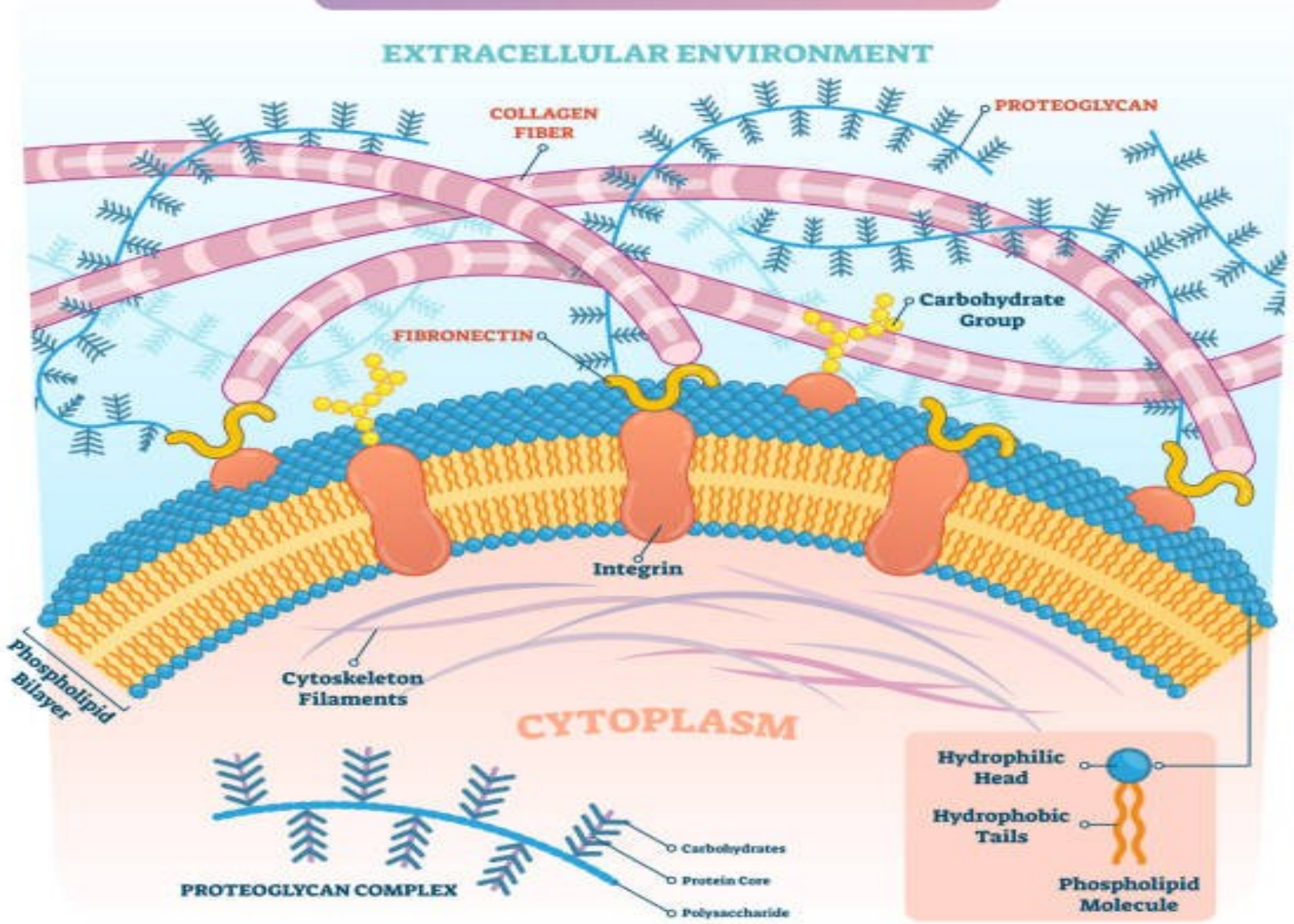
♠-Selective barrier separating cell from environment

♠- Composed of phospholipid bilayer

♠ -Contains transport proteins

♠ -Essential for maintaining homeostasis

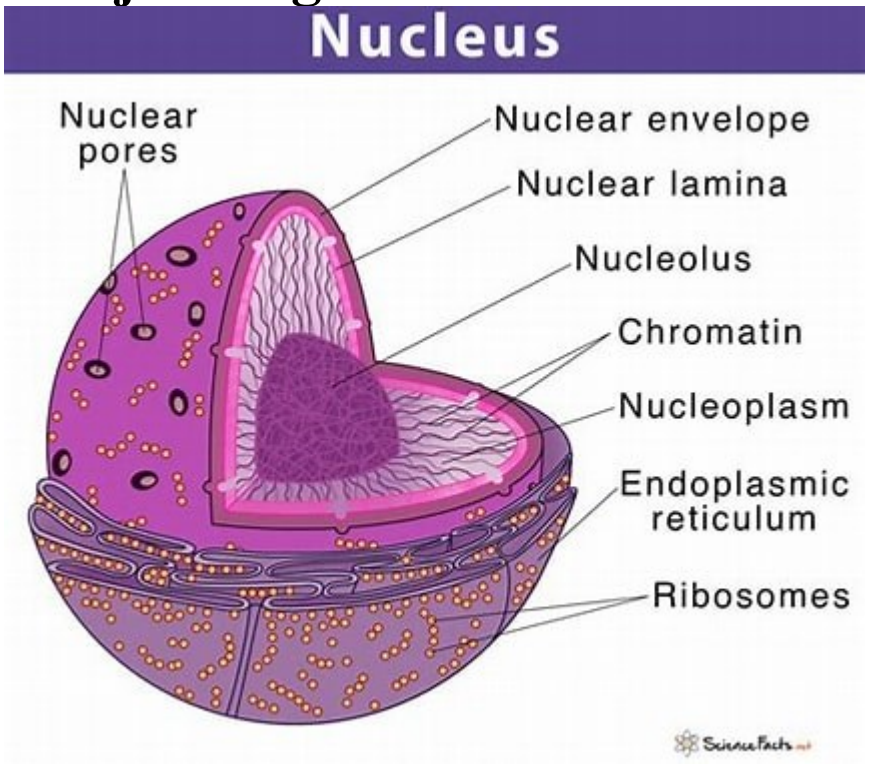
# Extracellular Matrix

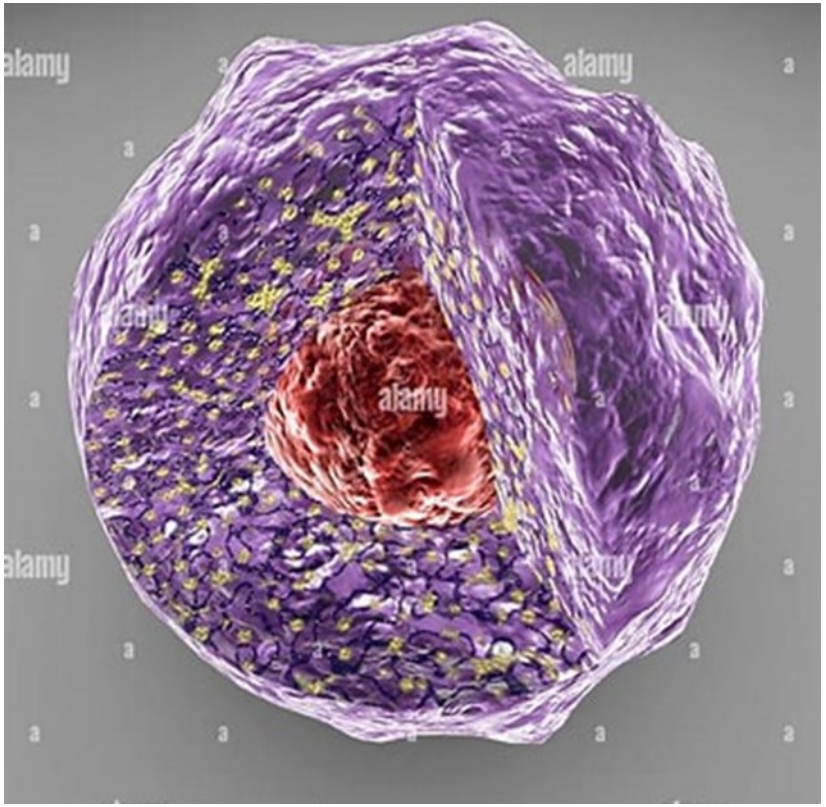


## Nucleus

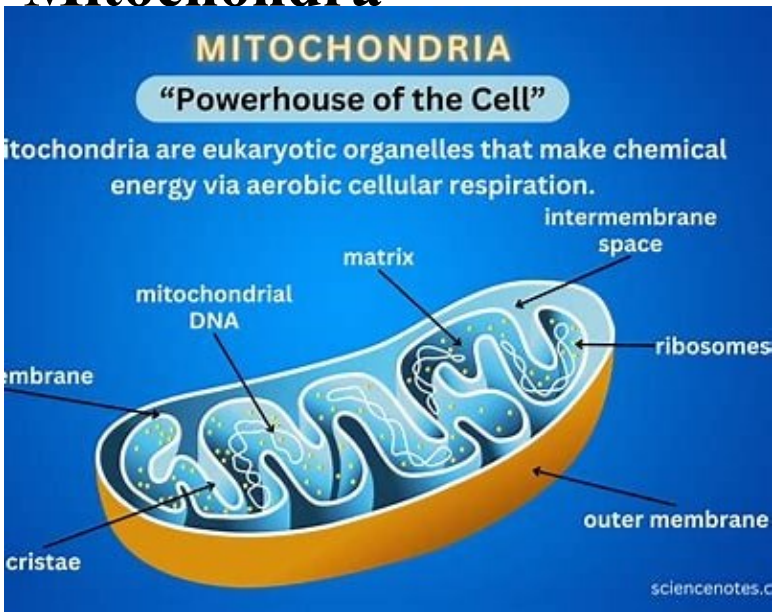
- Control center of the cell
- Contains genetic material (DNA)
- Regulates cellular activities
- Surrounded by nuclear envelope

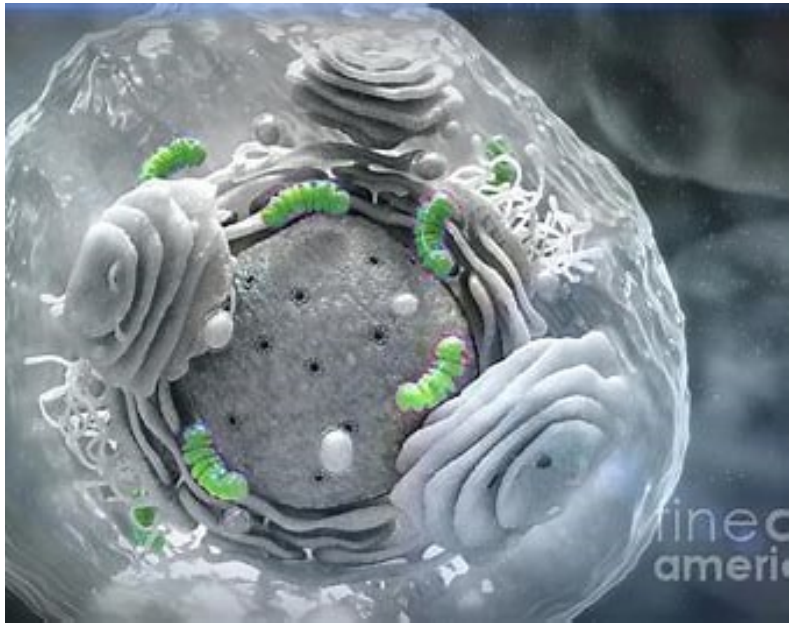
## Major Organelles and Functions



# Mitochondra



## Mitochondria

**Structure: Double-membrane organelle, inner membrane folded (cristae).**

## Function:

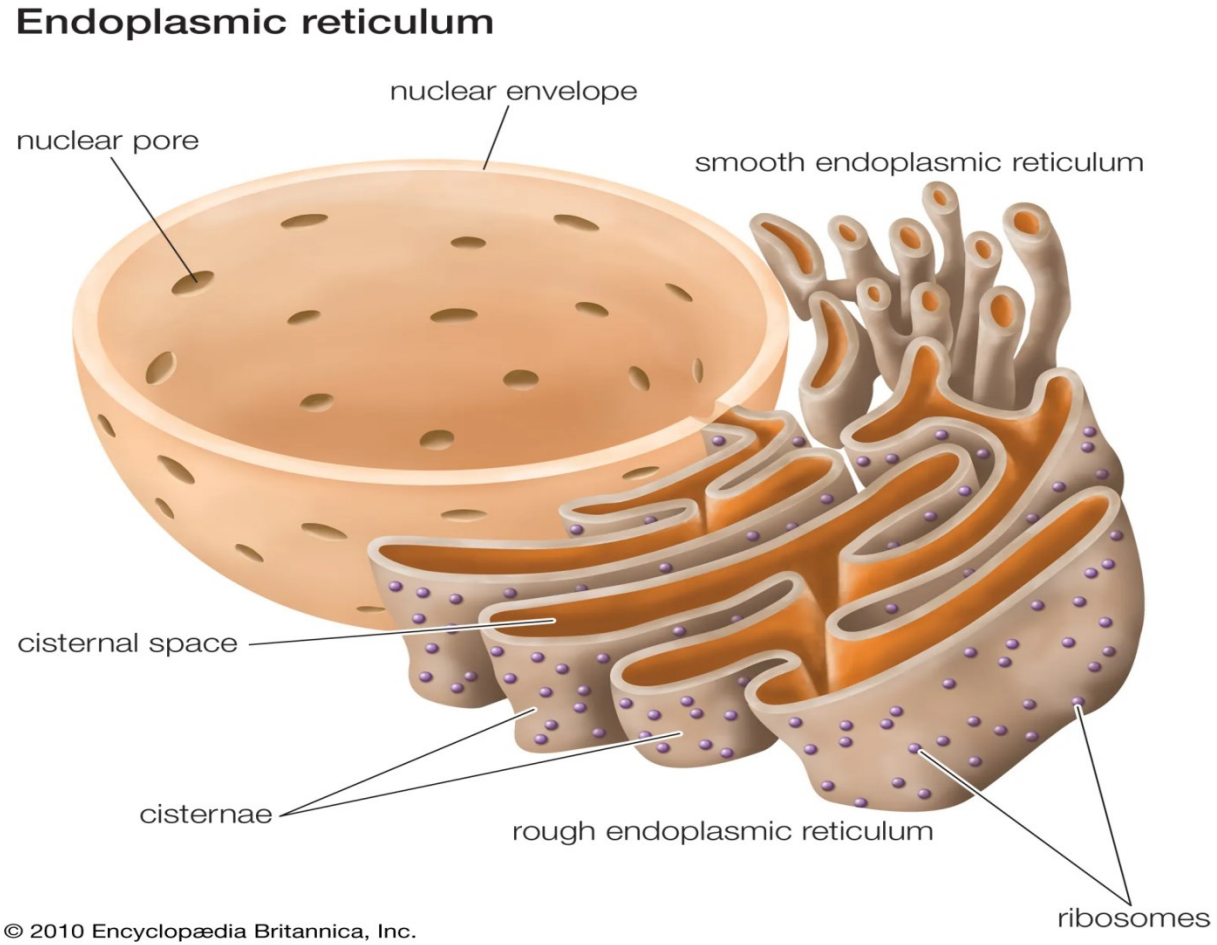
**"Powerhouse" of the cell.**

**Produces ATP molecules via cellular respiration.**

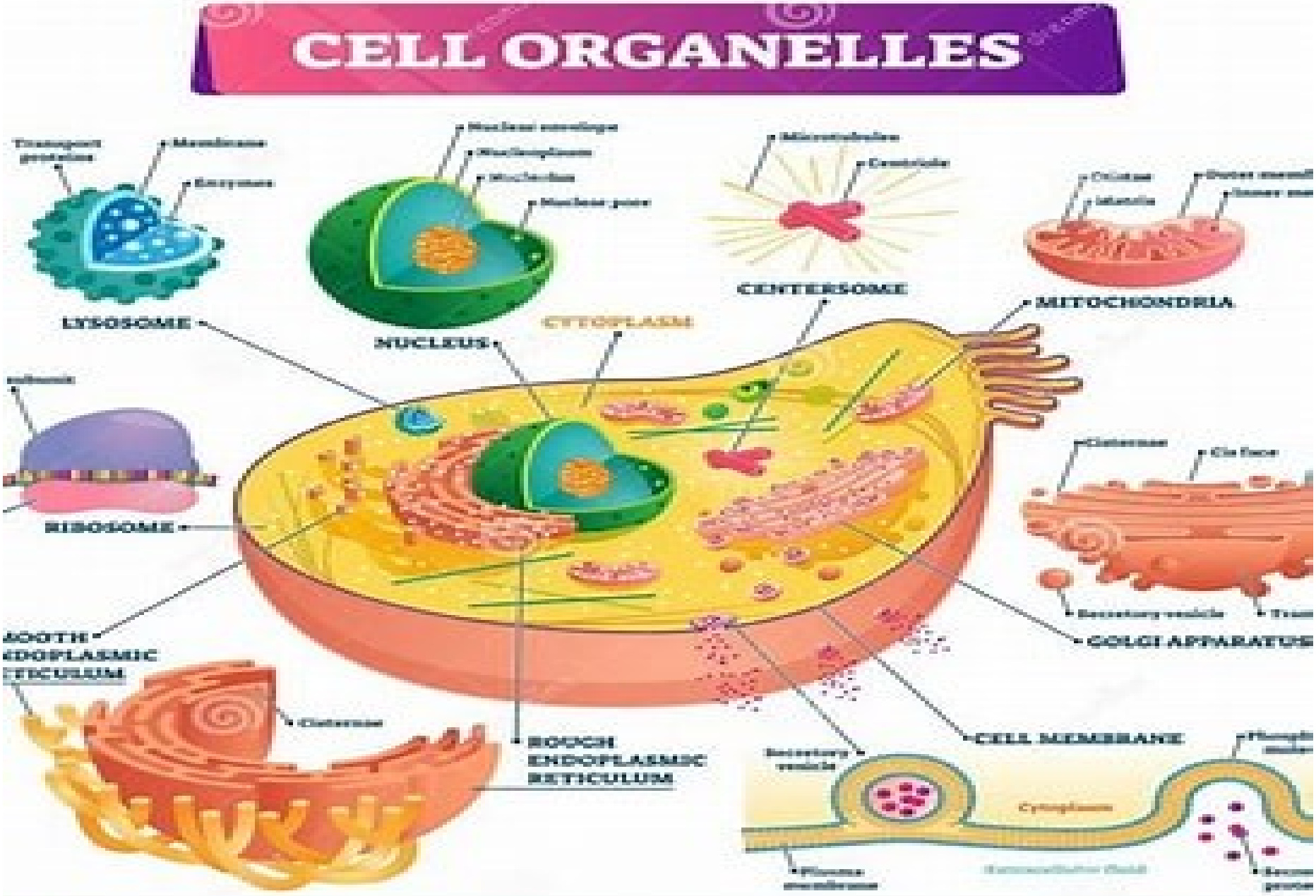
**Has its own DNA and ribosomes .**

# Endoplasmic reticulum

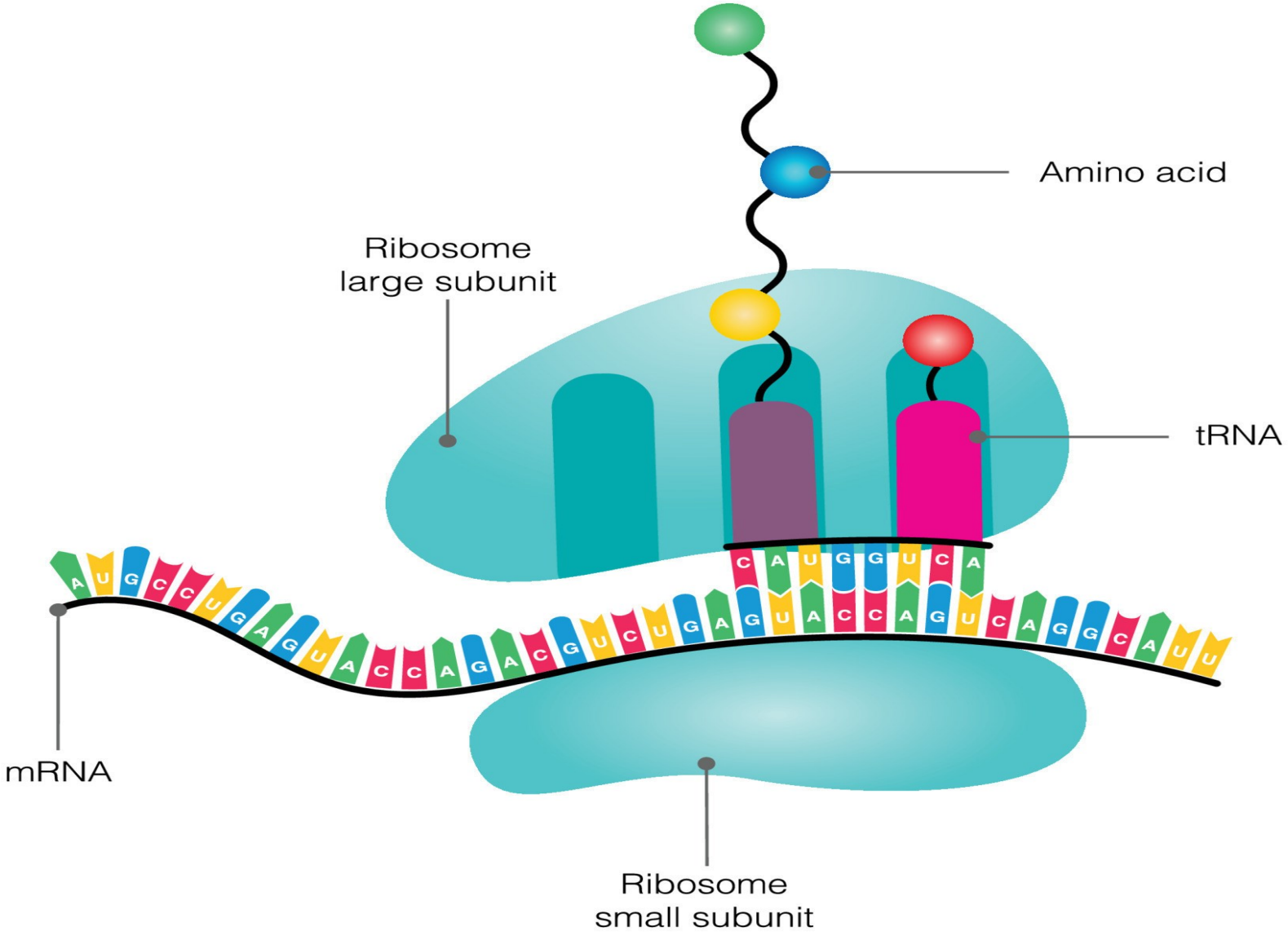
**Structure: is a complex network of membranous tubules and sacs, called cisternae, found within the cells of all eukaryotic organisms.**



# CELL ORGANELLES



# Ribosome


Amino acid
Ribosome
large subunit
tRNA
mRNA
Ribosome
small subunit

**Golgi Apparatus**

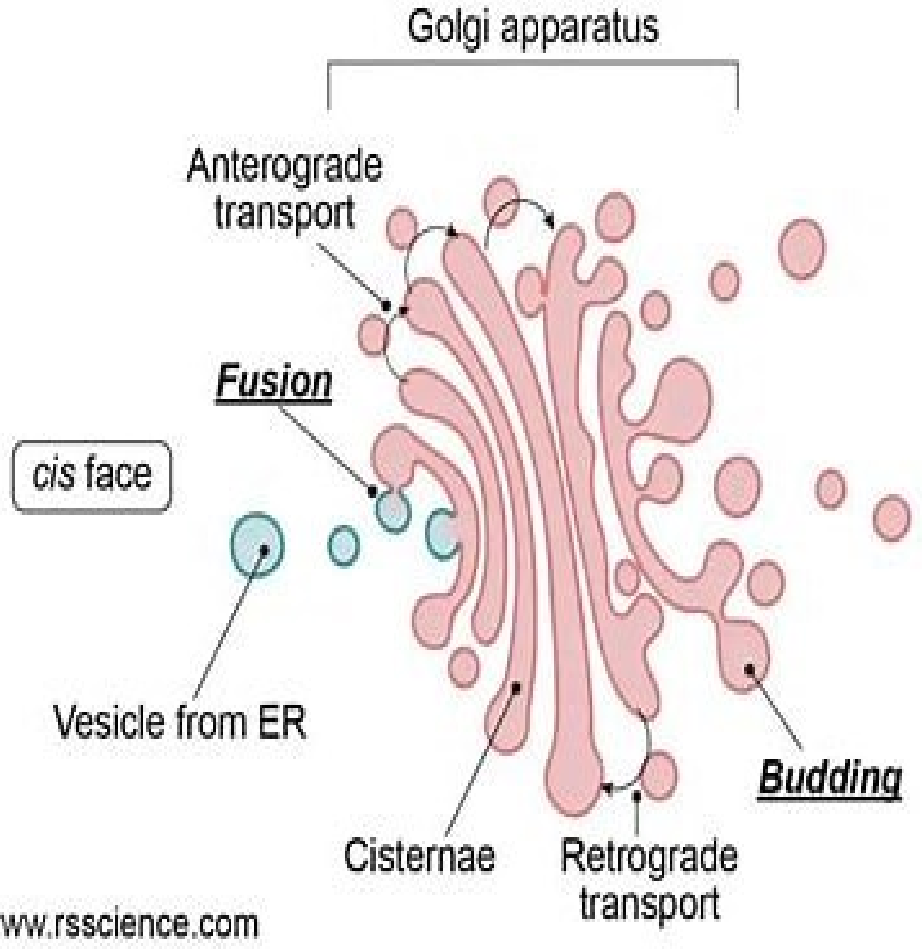
**Structure: Stack of flattened membranous sacs (cisternae.)**

**Function:**

**Modifies, sorts, and packages proteins and lipids from the ER.**

**Forms secretory vesicles.**

**Helps form lysosomes.**



# Major Organelles and Functions

- **Mitochondria: Powerhouse (ATP production)**
- **Endoplasmic reticulum: Protein and lipid synthesis**
- **Golgi apparatus: Protein modification and packaging**
- **Ribosomes: Protein synthesis**
- **Lysosomes: Cellular digestion**

## Cell Types

1. **Prokaryotic cells: No true nucleus (Bacteria)**
2. **Eukaryotic cells: Have true nucleus and organelles**

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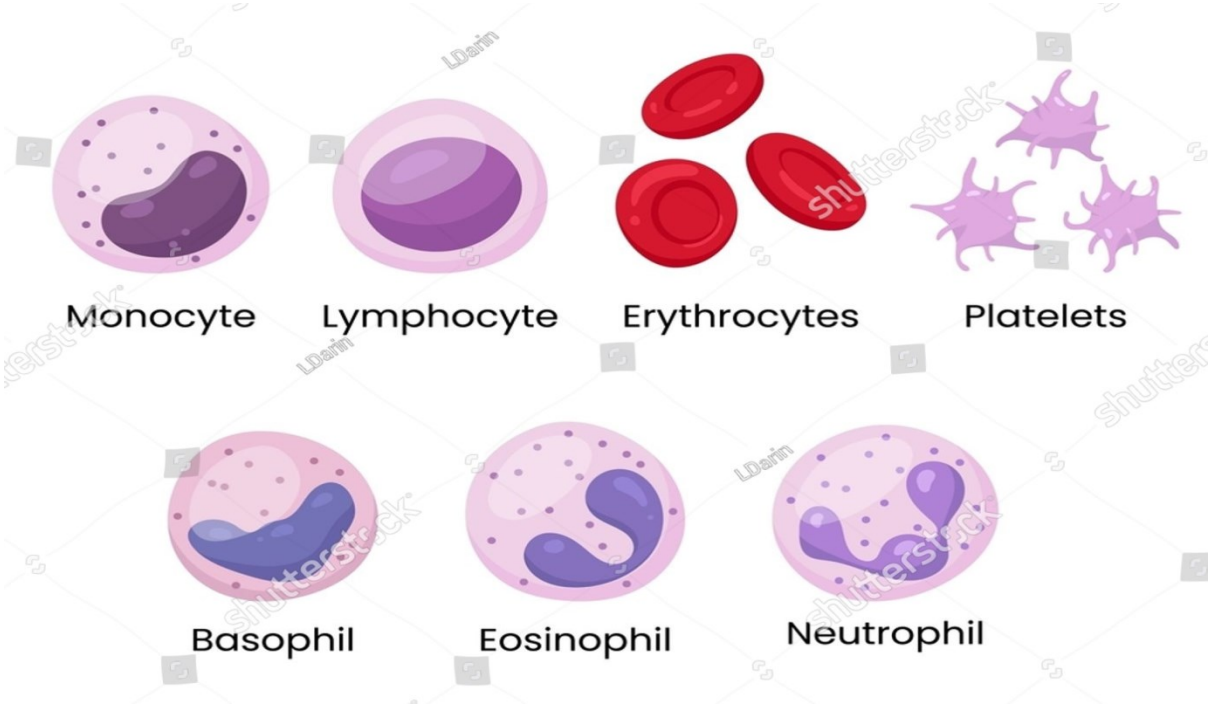
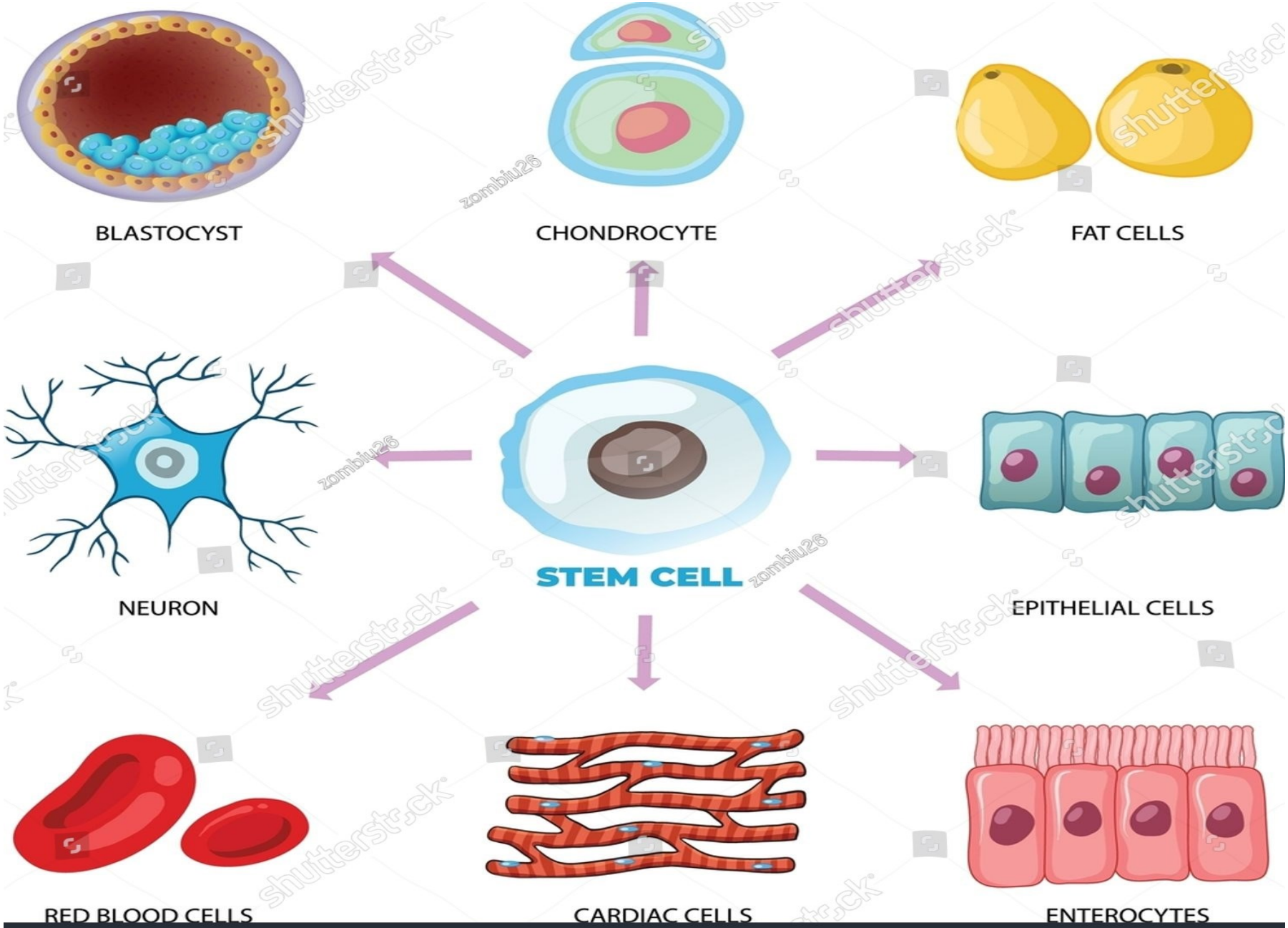
## Human Cell Types

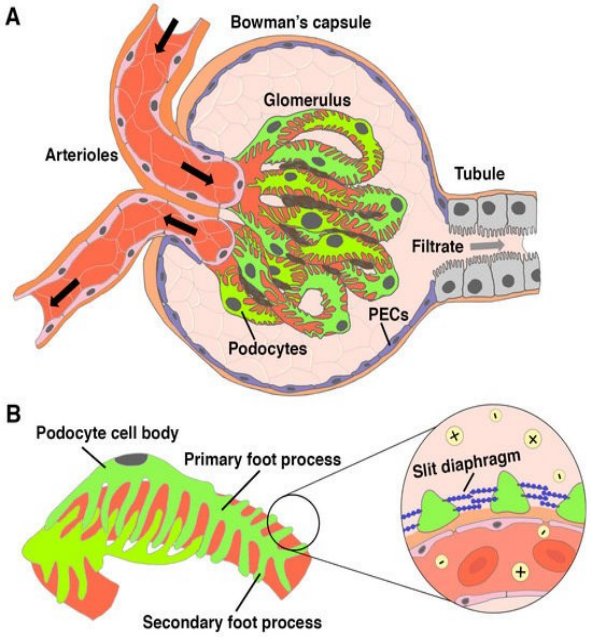
- **Epithelial cells**
- **Neurons**
- **Muscle cells**
- **Macrophages**
- **Blood cells**
- **Reproductive cells**





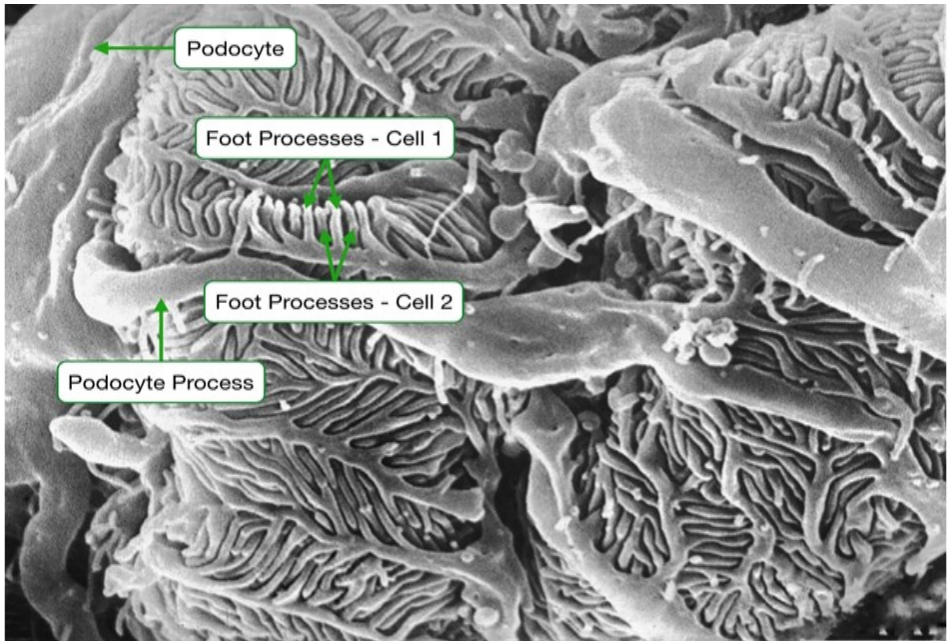
## Epithelial Cells (Kidney-related)

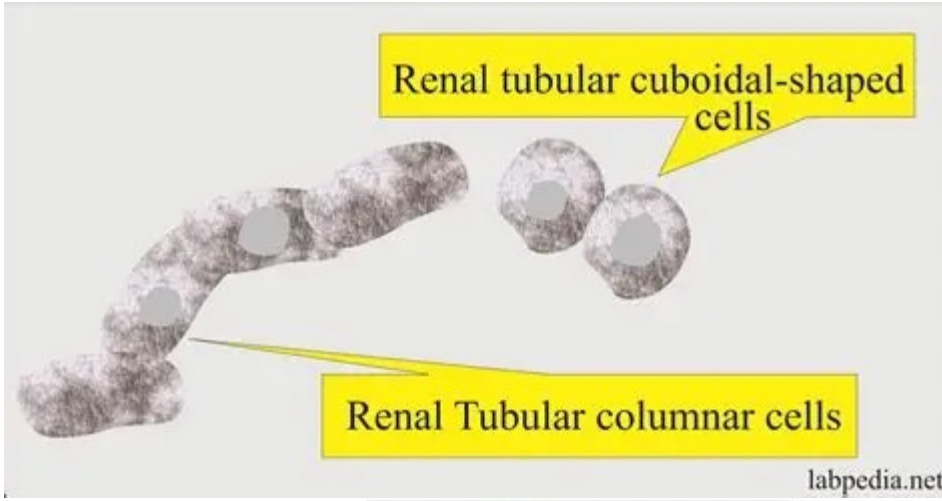
- ▶ Line internal and external body surfaces
- ▶ In kidney: Line renal tubules
- ▶ Functions: Absorption and secretion
- ▶ Essential for renal filtration

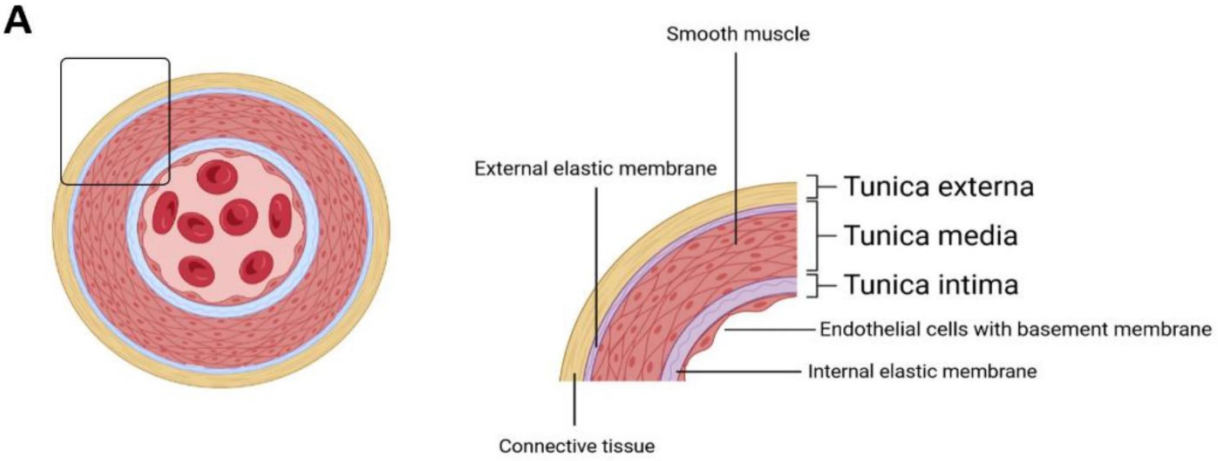


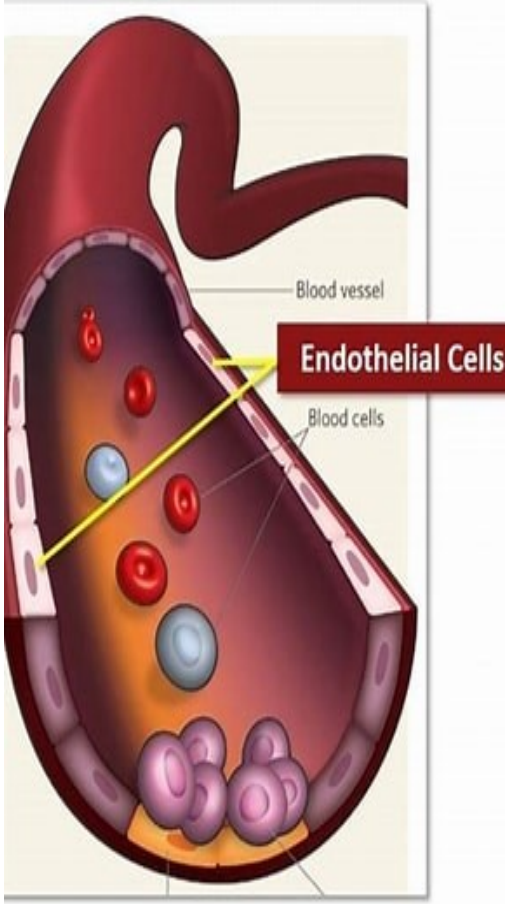

## ♥ Specialized Kidney Cells

- Podocytes: Blood filtration in glomeruli
- Tubular cells: Reabsorption and secretion
- Endothelial cells: Form renal blood vessels


Podocyte
Foot Processes - Cell 1
Foot Processes - Cell 2
Podocyte Process


Renal tubular cuboidal-shaped cells
Renal Tubular columnar cells
labpedia.net


A
Smooth muscle
External elastic membrane
Tunica externa
Tunica media
Tunica intima
Endothelial cells with basement membrane
Internal elastic membrane
Connective tissue
B
Pericyte
Endothelial cell
Basal lamina


Blood vessel
Endothelial Cells
Blood cells

## Cell and Dialysis Connection

- Renal failure results from damage to kidney cells
- Dialysis compensates for functions of damaged cells:
- Waste filtration
- Electrolyte balance
- Blood pressure regulation
- Excess fluid removal

## Observing cells under microscope:

- Prepare slide of human cells
- Use appropriate staining
- Identify major organelles

## References

1. General Biology textbook
2. Human Cell Atlas
3. Renal Cell Biology research
4. Approved electronic resource

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