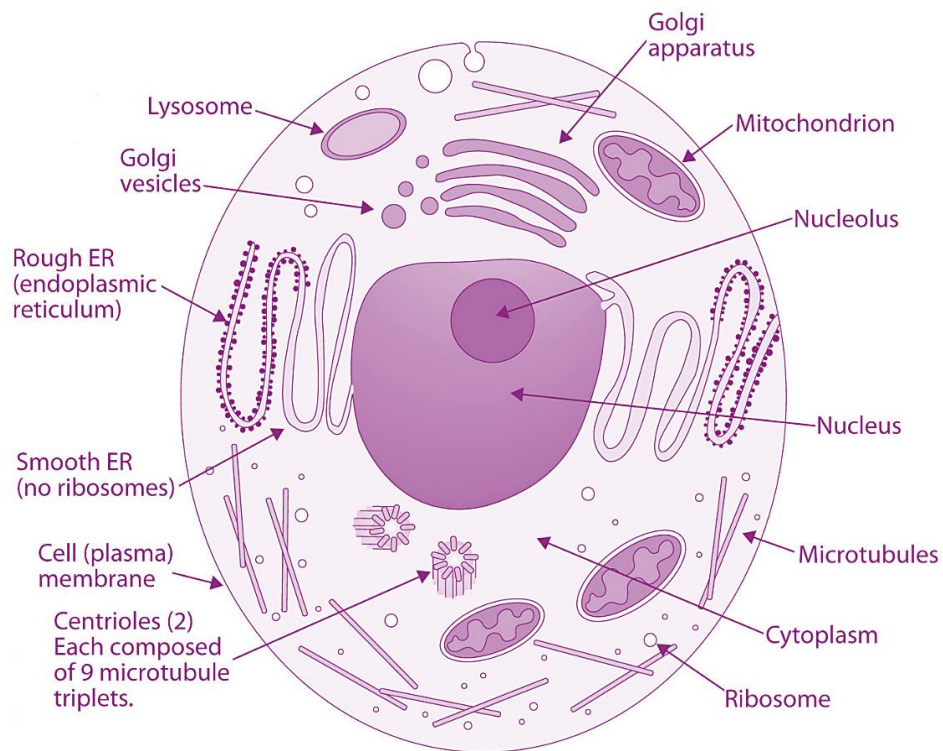


Structure of Cell

Structure and Functions of a Cell

- Cells are the basic structural and functional units of life.
- They can be categorized into two major types:
 - **Prokaryotic cells** – Found in bacteria and archaea; generally smaller and simpler.
 - **Eukaryotic cells** – Found in plants, animals, fungi, and protists; larger and more complex.
- Despite differences, both cell types share some fundamental features such as a cell membrane, cytoplasm, and ribosomes.



Main Structures (Organelles) and Their Functions in a Typical Eukaryotic Cell

1. Cell Membrane (Plasma Membrane)

- **Structure:** Composed of a **phospholipid bilayer** with embedded proteins.
- **Functions:**
 - Acts as a **selectively permeable barrier**, controlling the movement of substances in and out of the cell.
 - Maintains **homeostasis** by balancing ions, nutrients, and waste.

- Facilitates **cell communication and recognition**.

2. **Cytoplasm**

- **Structure:** A **gel-like substance** that fills the cell and surrounds the organelles.
- **Functions:**
 - Provides a **medium** for cellular processes.
 - Suspends organelles and helps in the **transport** of molecules within the cell.

3. **Nucleus**

- **Structure:** Surrounded by a **double-layered nuclear envelope**, contains **chromosomes (DNA)** and a **nucleolus**.
- **Functions:**
 - Serves as the **control center** of the cell.
 - Regulates **gene expression** and **protein synthesis**.
 - The **nucleolus** produces **ribosomes**.

4. **Endoplasmic Reticulum (ER)**

- **Structure:** A network of **membranous tubules and sacs**.
- **Types & Functions:**
 - **Rough ER:** Studded with ribosomes; synthesizes **proteins** for secretion or membrane use.
 - **Smooth ER:** Lacks ribosomes; involved in **lipid synthesis** and **detoxification** of harmful substances.

5. **Ribosomes**

- **Structure:** Made of **RNA and protein**; can be **free-floating** or attached to rough ER.
- **Function:**
 - Site of **protein synthesis**, translating genetic information into proteins.

6. **Golgi Apparatus**

- **Structure:** Stacks of **flattened membrane-bound sacs**.
- **Function:**
 - Modifies, **packages**, and **sorts proteins and lipids** for delivery to their destinations (inside or outside the cell).

7. Mitochondria

- **Structure:** Double-membraned with **own DNA**; inner membrane folded into cristae.
- **Function:**
 - Known as the "**powerhouse**" of the cell.
 - Produces **ATP** through **cellular respiration**.
 - Believed to have evolved via **endosymbiosis**.

8. Lysosomes

- **Structure:** Small, membrane-bound sacs containing **hydrolytic enzymes**.
- **Function:**
 - Break down **waste materials**, **cell debris**, and **foreign substances**.

9. Peroxisomes

- **Structure:** Membrane-bound organelles with **oxidative enzymes**.
- **Function:**
 - Involved in **fatty acid breakdown** and **detoxification** (e.g., hydrogen peroxide degradation).

10. Cytoskeleton

- **Structure:** A network of **protein filaments: microtubules, microfilaments, and intermediate filaments**.
- **Function:**
 - Provides **structural support** and maintains **cell shape**.
 - Aids in **cell movement, intracellular transport, and cell division**.



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