Al-Mustaqbal University
College of Science
Forensic Evidence Department

جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم
قسم الادلة الجنائية

Lecture (3)

عنوان المحاضرة

Cell: Structure, properties and classification (part 2)

المادة : بايلوجي

المرحلة : الاولى

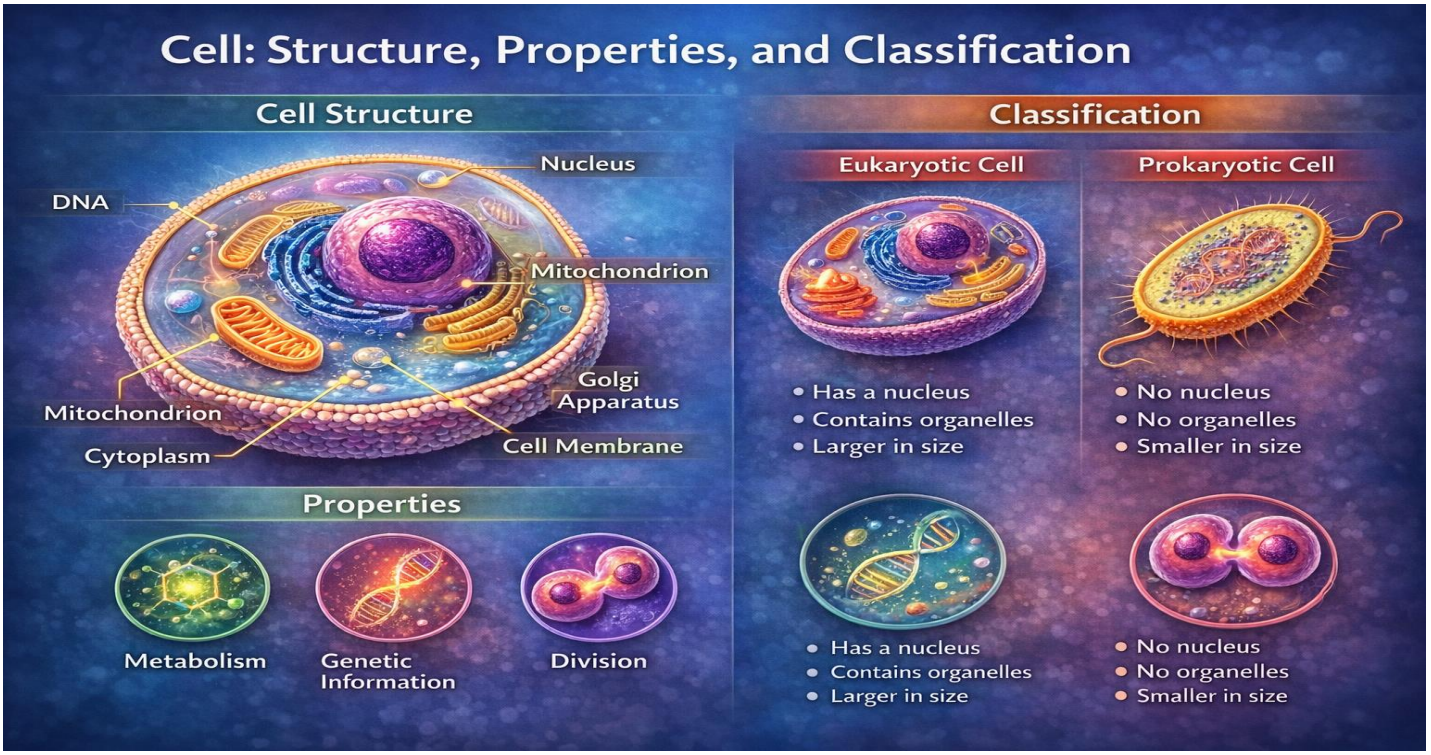
اسم الاستاذ: م.م هويدا نزال حسين

Cell: Structure, Properties, and Classification (Part 2)

Introduction

In Part 1, we studied the basic definition of the cell, its general structure, properties, and classification. In this part, we focus on **eukaryotic cells**, their internal structures (organelles), and the differences between **animal and plant cells**.

Eukaryotic cells are complex and highly organized. Each organelle inside the cell performs a specific function. All organelles work together to keep the cell alive, growing, and functioning properly.



1. Eukaryotic Cells

Eukaryotic cells are cells that contain a **true nucleus** and **membrane-bound organelles**. These cells are found in animals, plants, fungi, and protists.

Characteristics of Eukaryotic Cells

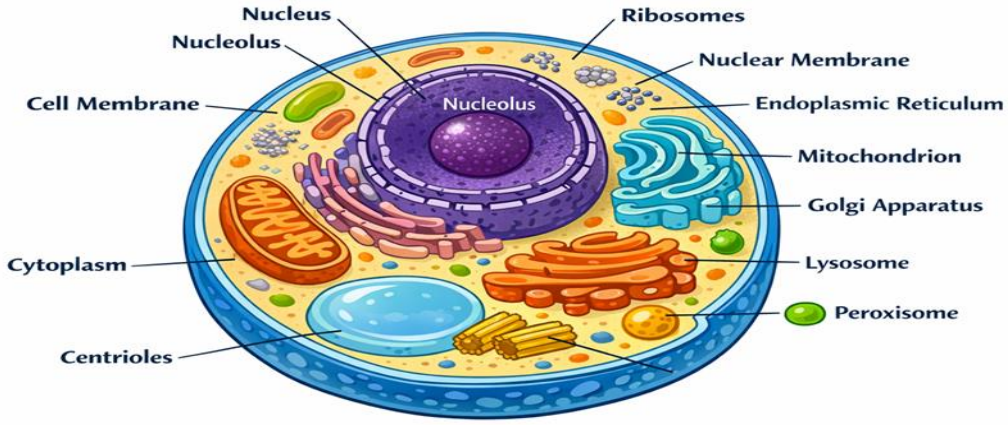
- True nucleus surrounded by a nuclear membrane
- Presence of specialized organelles
- Larger in size than prokaryotic cells

- Highly organized internal structure

2. Animal Cells

Animal cells are eukaryotic cells found in humans and animals. They lack a cell wall and chloroplasts but contain many organelles.

Figure 3: Animal Cell



2.1 Nucleus

The nucleus is the control center of the cell.

Structure:

- Double membrane (nuclear envelope)
- Nuclear pores
- Chromatin (DNA + proteins)
- Nucleolus

Functions:

- Controls cell activities
- Stores genetic information
- Regulates cell division
- Controls protein synthesis

2.2 Mitochondria

Mitochondria are called the powerhouse of the cell.

Structure:

- Double membrane
- Inner membrane folded into cristae

Functions:

- Produce energy (ATP)
- Cellular respiration
- Regulation of metabolism

2.3 Ribosomes

Ribosomes are small, non-membrane-bound structures.

Location:

- Free in cytoplasm
- Attached to rough ER

Function:

- Protein synthesis

2.4 Endoplasmic Reticulum (ER)

The ER is a network of membranes.

A. Rough Endoplasmic Reticulum (RER)

- Covered with ribosomes
- Synthesizes and transports proteins

B. Smooth Endoplasmic Reticulum (SER)

- No ribosomes
- Synthesizes lipids
- Detoxifies harmful substances
- Stores calcium ions

2.5 Golgi Apparatus

The Golgi apparatus is a stack of flattened sacs.

Functions:

- Modifies proteins and lipids
- Packages substances
- Forms vesicles for transport

2.6 Lysosomes

Lysosomes contain digestive enzymes.

Functions:

- Breakdown of waste materials
- Destruction of damaged organelles
- Cell cleaning

2.7 Peroxisomes

Peroxisomes are small membrane-bound organelles.

Functions:

- Breakdown of fatty acids
- Detoxification
- Regulation of hydrogen peroxide

2.8 Cytoskeleton

The cytoskeleton is a network of protein fibers.

Functions:

- Maintains cell shape
- Cell movement
- Transport of materials

2.9 Centrosome and Centrioles

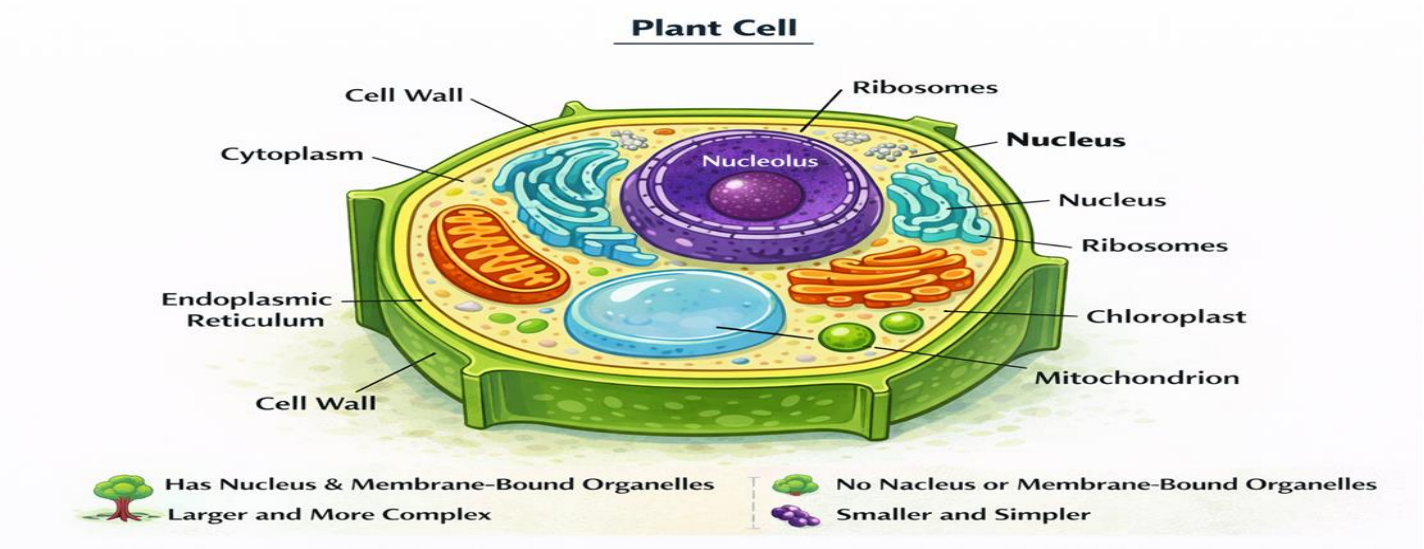
Found mainly in animal cells.

Functions:

- Organization of microtubules
- Important in cell division

3. Plant Cells

Plant cells are eukaryotic cells with additional structures not found in animal cells.

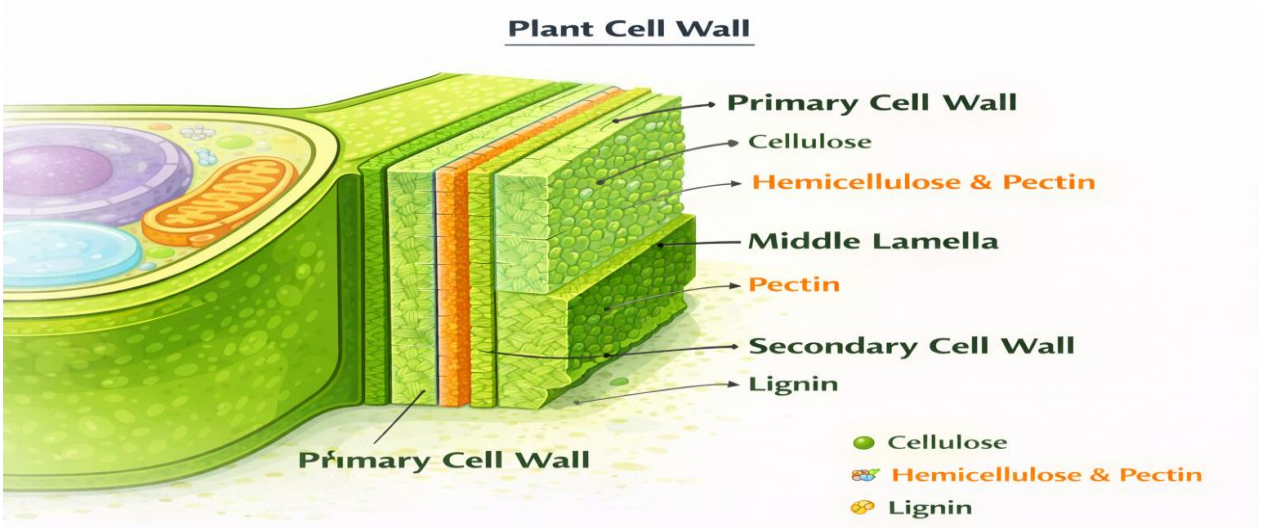


3.1 Cell Wall

A rigid layer outside the cell membrane.

Functions:

- Protection
- Support
- Maintains shape



3.2 Chloroplasts

Chloroplasts are the site of photosynthesis.

Functions:

- Capture light energy
- Produce glucose
- Contain chlorophyll

3.3 Vacuole

A large fluid-filled sac.

Functions:

- Storage of water and nutrients
- Maintains cell pressure
- Supports cell shape

4. Comparison Between Animal and Plant Cells

Feature	Animal Cell	Plant Cell
Cell wall	Absent	Present
Chloroplasts	Absent	Present
Vacuole	Small/Absent	Large
Shape	Irregular	Regular

5. Cell Cycle

The cell cycle is the process of cell growth and division.

5.1 Interphase

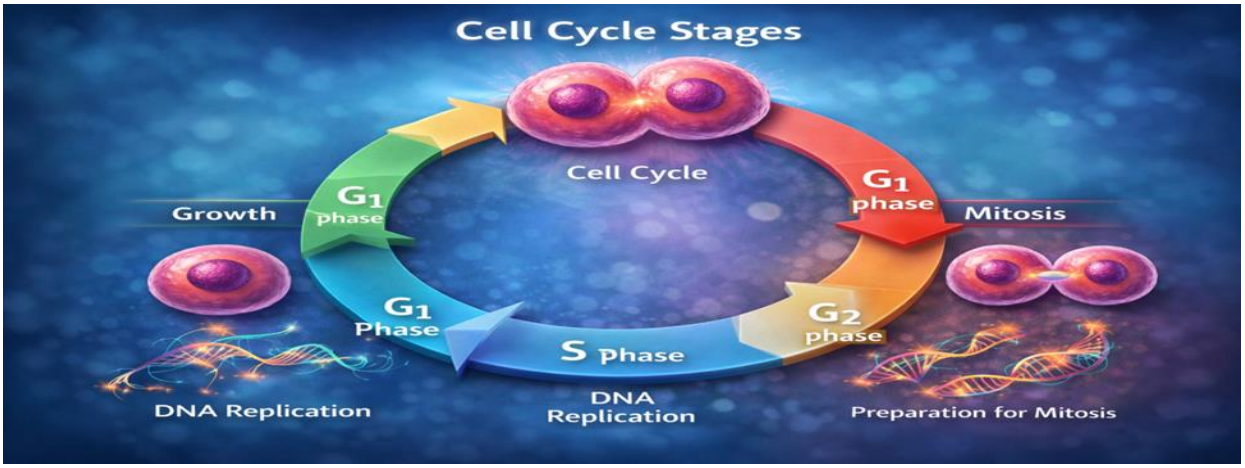
- Cell growth
- DNA replication
- Organelle duplication

5.2 Mitosis

- Division of nucleus
- Two identical cells formed

5.3 Cytokinesis

- Division of cytoplasm
- Formation of two separate cells

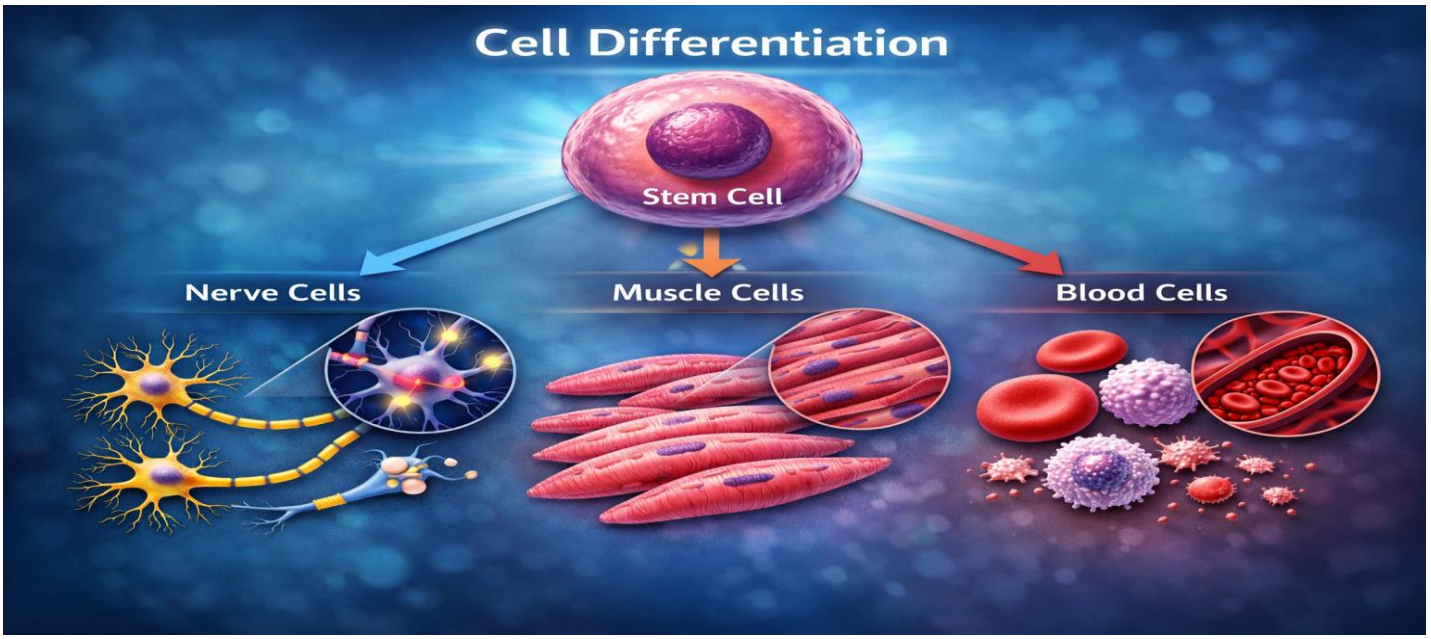


6. Cell Differentiation

Cell differentiation is the process by which cells become specialized.

Examples:

- Muscle cells
- Nerve cells
- Blood cells



7. Importance of Studying Cells

Studying cell structure and function helps in understanding:

- Growth and development
- Tissue and organ formation
- Basic processes of life

Conclusion

Eukaryotic cells are complex and well-organized. Each organelle has a specific structure and function. Understanding these structures provides a strong foundation in biology and helps explain how living organisms survive and function.