

## **Cytology**

- Cytology is the branch of biology that focuses on the study of cells, their structure, function, and composition.
- It is a fundamental field within biology, as cells are the basic building blocks of all living organisms, and understanding their properties is essential for understanding life processes and functions.

### **Cell Structure:-**

- Cytology involves the examination and description of the structure of cells.
- This includes the study of cellular organelles (e.g., nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus) Cell Wall, Cytoplasm and their functions.

### **Cell wall**

- The cell wall is a rigid, protective layer that surrounds the cell membrane of most prokaryotic and eukaryotic cells.
- It is primarily composed of complex carbohydrates, such as cellulose, chitin, or peptidoglycan, depending on the organism.
- The main function of the cell wall is to provide structural support and protection to the cell.
- It helps maintain the cell's shape and prevents it from bursting or collapsing under osmotic pressure.
- The cell wall also serves as a barrier, regulating the exchange of substances between the cell and its environment.

### **Cellular organelles:-**

<b>Organelles with limiting membrane</b>	<b>Organelles without limiting membrane</b>
<b>1. Endoplasmic reticulum</b>	<b>1. Ribosomes</b>
<b>2. Golgi apparatus</b>	<b>2. Cytoskeleton</b>
<b>3. Lysosome</b>	
<b>4. Peroxisome</b>	
<b>5. Centrosome and centrioles</b>	
<b>6. Secretory vesicles</b>	
<b>7. Mitochondria</b>	
<b>8. Nucleus</b>	

## **Functions of cytoplasmic organelles**

Organelles	Functions
Rough endoplasmic reticulum	1. Synthesis of proteins
Smooth endoplasmic reticulum	1. Synthesis of lipids and steroids 2. Role in cellular metabolism 3. Storage and metabolism of calcium 4. Catabolism and detoxification of toxic substance
Golgi apparatus	1. Processing, packing, labeling and delivery of protein and lipids
Lysosome	1. Degradation of macromolecule 2. Degradation of worn organelles 3. Removal of excess of secretory products
Peroxisomes	1. Breakdown of excess fatty acids 2. Oxygen utilization 3. Acceleration of gluconeogenesis 4. Degradation of purine to uric acid 5. Role in formation of myelin 6. Role in the formation of bile acids
Centrosome	1. Movement of chromosomes during cell division
Mitochondria	1. Production of energy 2. Synthesis of ATP
Ribosomes	1. Synthesis of protein
Cytoskeleton	1. Determine shape of cell 2. Stability of cell shape 3. Cellular movements
Nucleus	1. Control of all activities of the cell 2. Synthesis of RNA 3. Sending genetic instruction to cytoplasm for protein synthesis 4. Formation of subunits of ribosomes 5. Control of cell division 6. Storage of hereditary information in genes (DNA)

#### Cytoplasm:-

- The cytoplasm is a semifluid substance that fills the interior of a cell, excluding the nucleus.

#### Composition:-

- The cytoplasm is composed of a mixture of water, ions, salts, and various organic molecules, including proteins, lipids, carbohydrates, and small molecules.

#### Structure:-

- The cytoplasm has a gel-like consistency, which allows for the suspension and movement of organelles and other cellular structures within it.
- It provides mechanical support to the cell and helps maintain its shape.

### **Cytoskeleton:-**

- The cytoplasm contains a network of protein filaments known as the cytoskeleton, which includes microfilaments, microtubules, and intermediate filaments.
- The cytoskeleton provides structural support to the cell, helps maintain cell shape, and plays a crucial role in intracellular transport and cell division.

### **Protection:-**

- The cytoplasm helps protect cellular components from damage.
- It acts as a barrier that surrounds the nucleus, mitochondria, and other organelles, shielding them from potential threats.

## **TISSUE**

- Tissues are groups of similar cells that work together to perform a specific function within an organism. They are one of the fundamental levels of biological organization, sitting between individual cells and organs in terms of structural complexity.
- The study of tissues and their functions is known as histology
- Tissues are found in all multicellular organisms and are essential for the proper functioning of the body.
- There are four primary types of tissues in animals

### **1. Epithelial Tissue:-**

- Location: Found covering body surfaces (skin), lining body cavities (digestive tract, respiratory tract), and forming glands.
- Functions: Epithelial tissue serves as a protective barrier, helps with absorption and secretion, and plays a role in sensation (e.g., skin).

### **2. Connective Tissue:-**

- Location: Found throughout the body, including in tendons, ligaments, bones, cartilage, blood, and adipose (fat) tissue.
- Functions: Connective tissue provides structural support, connects and anchors organs and tissues, stores energy, and transports substances (e.g., blood).

### **3. Muscle Tissue:-**

- Location: Found in muscles throughout the body, including skeletal muscles (attached to bones), cardiac muscle (in the heart), and smooth muscle (in various organs).
- Functions: Muscle tissue is responsible for body movement, maintaining posture, and generating heat through contraction.

### **4. Nervous Tissue:-**

- Location: Found in the brain, spinal cord, and nerves throughout the body.
- Functions: Nervous tissue is specialized for transmitting and processing electrical signals (nerve impulses) that allow for communication and coordination within the body.

- In addition to these primary tissue types, there are also transitional tissues that have properties of more than one primary type.

For example, blood is considered a connective tissue because it has cells suspended in an extracellular matrix, but it also plays a role in immune response and transport.

- Tissues can further combine to form organs, which have more specialized functions within the body. Organs, in turn, work together in organ systems to carry out complex bodily functions.