

UNIT 2

INTRODUCTION TO CELLS AND TISSUES

2.1: CELL

The structural and functional unit of the living body is known as cell. The human body contains about 100 trillion cells.

STRUCTURE OF HUMAN CELL

A typical cell, as seen by the light microscope consists of three basic components:

1. Cell membrane
2. Cytoplasm
3. Nucleus

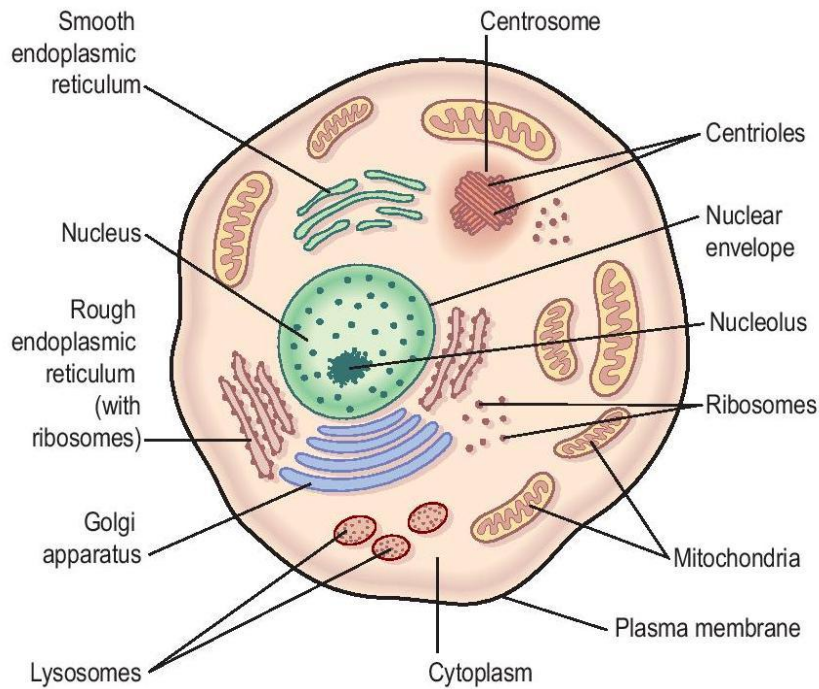


Fig. Structure of cell

1. Cell Membrane

Cell membrane is a protective sheath, enveloping the cell body. It is also known as plasma membrane or plasmalemma. This membrane separates the fluid outside the cell known as extracellular fluid (ECF) and the fluid inside the cell known as intracellular fluid (ICF). The cell membrane is a semipermeable membrane.

Functions of cell membrane

- a. It is responsible for the maintenance of shape and size of the cell.
- b. It gives mechanical support to the cell.
- c. It protects the cytoplasm and the organelles present in the cytoplasm.
- d. It excretes metabolites and other waste products from the cell.
- e. It enters oxygen in the cell and removes carbon dioxide out the cell.

2. Cytoplasm

Cytoplasm of the cell is the jelly like material formed by 80% of water. It contains a clear liquid portion known as cytosol and various particles of different shape and size. **Organelles in cytoplasm**

Organelles in cytoplasm are the cellular structures embedded in the cytoplasm. Each organelle is having a definite structure and functions.

- a. **Endoplasmic reticulum:** Endoplasmic reticulum is a network of tubular and microsomal vesicular structures which are interconnected with one another. The Endoplasmic reticulum is of two types:
 - **Rough endoplasmic reticulum:** The granular ribosomes which are attached to the outer surface of endoplasmic reticulum are known as rough endoplasmic reticulum. It is also known as granular endoplasmic reticulum. It synthesizes protein.

- **Smooth endoplasmic reticulum:** The granular ribosomes which are not attached to the outer surface of endoplasmic reticulum are known as smooth endoplasmic reticulum. It synthesizes fatty acid and steroids.
- b. **Golgi body:** Golgi body is also known as Golgi apparatus or Golgi complex. The Golgi body is closed to the nucleus. Its main functions are packing, labeling and delivery of proteins and other molecules like lipid to different parts of the cell.
- c. **Lysosomes:** Lysosomes are the small spherical or oval in shape membranous vesicular organelles found throughout the cytoplasm. It is formed by Golgi apparatus.
The lysosomes contain digestive hydrolytic enzymes that break down components of the cell such as cellular debris and foreign material. They also digest the cells in which they are present (autolysis) by their own enzymes. This results in cell death. Hence lysosomes are known as **suicide bags of the cell**.
- d. **Peroxisomes:** Peroxisomes are also known as microbodies. It is spherical structure enclosed by a single layer of unit membrane.
- e. **Mitochondria:** Mitochondria are the major sites for aerobic respiration. These are oval structures and more numerous in metabolically active cells. The mitochondria consist of two layers of the membrane and the matrix.
- f. **Ribosomes:** The minute particle consisting of RNA and associated proteins in large numbers in the cytoplasm of living cells is known as ribosomes.
- g. **Centrosome and Centrioles:** Centrosome is the membrane-bound cellular organelles situated almost in the center of cell, close to nucleus. It consists of two cylindrical structures known as centrioles which are made up of proteins. Centrioles are responsible for the movement of chromosomes during cell division.

3. Nucleus

Nucleus is the most prominent and the largest cellular organelle. It has a diameter of 10μ to 22μ and occupies about 10 % of total volume of the cell.

Nucleus is present in all the cells in the body except the red blood cells. The cells with nucleus are known as eukaryotes and those without nucleus are known as prokaryotes.

Functions of nucleus

- a. Control of all the cell activities that include metabolism, protein synthesis, growth and reproduction (cell division).
- b. Synthesis of RNA.
- c. Sending genetic instruction to the cytoplasm for protein synthesis through messenger RNA (mRNA).
- d. Storage of hereditary information (in genes) and transformation of this information from one generation of the species to the next.

FUNCTIONS OF CELL

The important functions of cell are:

- | | | |
|----------------------|-----------------------|--------------------------|
| 1. Energy production | 5. Protein synthesis | 9. Response to stimuli |
| 2. Nutrients uptake | 6. Communication | 10. Defense and immunity |
| 3. Waste removal | 7. Transports | |
| 4. Reproduction | 8. Structural support | |

CELL DIVISION/ CELL CYCLE

The cell division is a series of changes that a cell undergoes from the time it is formed until it has completed a division and reproduced itself. The cell division takes place by two methods.

- Mitosis
- Meiosis

1. MITOSIS

It occurs in four stages namely:

- Prophase
- Metaphase
- Anaphase
- Telophase

- a. **Prophase:** Initially, the centrosome divides into two. These two new centrosome moves away from each other to the ends of the nucleus forming two poles.

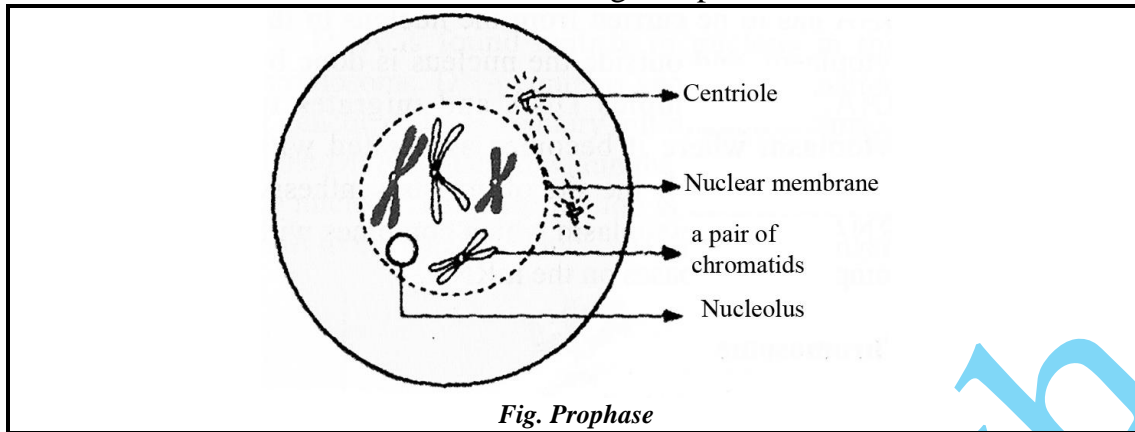


Fig. Prophase

- b. **Metaphase:** Now, the nuclear membrane disappears. The chromosomes arrange themselves around the centre of the cell. They get attached to thread like structures of the centrosome which are now at the two poles of the cell.

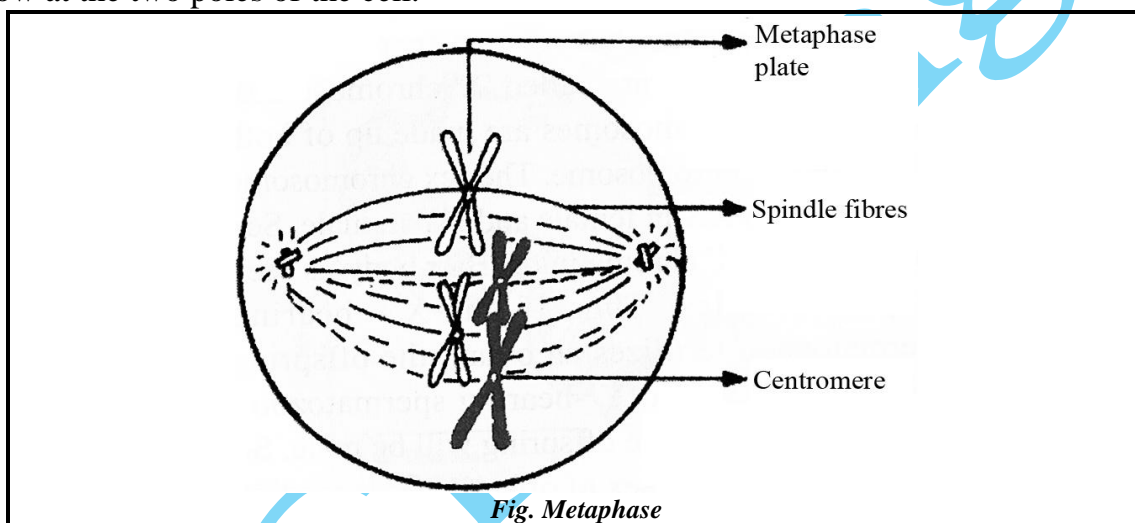


Fig. Metaphase

- c. **Anaphase:** The chromosomes now divide longitudinally into two equal parts. The two groups of chromosomes move away to the poles and get arranged around the centrosome.

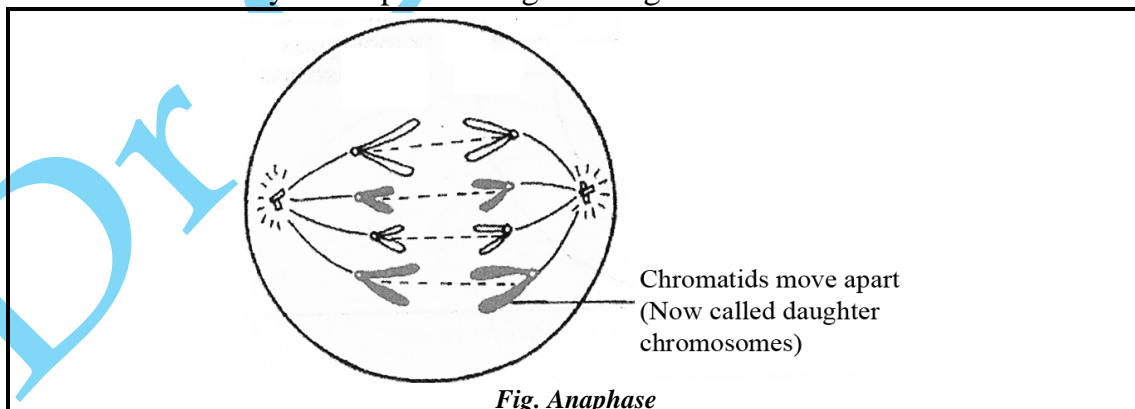


Fig. Anaphase

- d. **Telophase:** The cell becomes narrower at the centre to facilitate division. The thread like structures disappears. The nuclear membrane appears again.

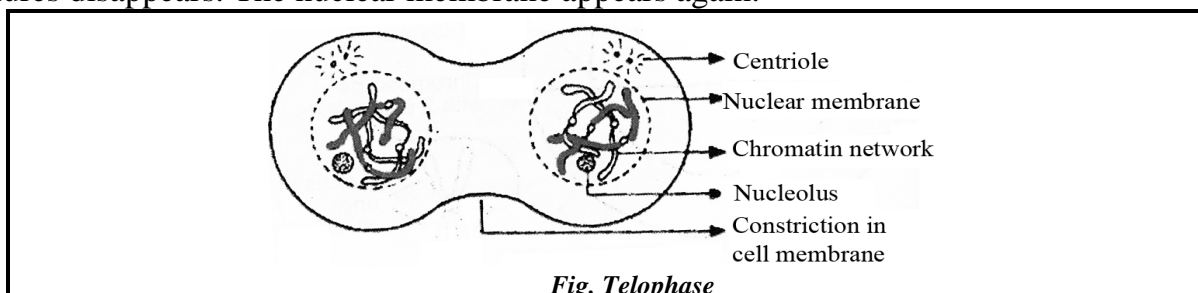


Fig. Telophase

At the end of telophase, the cell divides. The chromosomes disappear into the nucleus. The daughter cells grow and in turn reproduce by mitosis. During mitosis, each chromosome duplicates so, the daughter cell contains forty six (46) chromosomes.

2. MEIOSIS

It is a process of reproduction which occurs in higher animals including man. It involves the fusion of:

- The spermatogonium from the male (which contains 23 chromosomes).
- The ovum from the female (which also contains 23 chromosomes).

The spermatogonium and ovum are also known as gametes. The fusion of these two (male and female) gametes results in the formation of a zygote which has the normal number of 46 chromosomes (23 pairs). This leads to mixing of the hereditary determinants or genes from the male and female.

Differences between Mitosis and Meiosis

No	Mitosis	Meiosis
1.	It occurs in somatic cells.	It occurs in sex cells.
2.	Two daughter cells are produced.	Four daughter cells are produced.
3.	Each daughter cell contains diploid number of chromosomes.	Each daughter cell contains haploid number of chromosomes.
4.	Processes one complete phase of cell division.	Processes two different phases of cell division.
5.	Long interphase.	Short interphase.
6.	Prophase is short and no subdivisions.	Prophase is long and has subdivision.
7.	No pairing of homologous chromosomes.	Pairing of homologous chromosomes.
8.	No chiasmata or crossing over.	Chiasmata or crossing over.
9.	Helps in growth differentiation.	Helps in continuity of the species.

2.2. TISSUES

The group of cells having similar function is known as tissue.

Types of Tissue

According to the shape, size and functions, tissues are classified mainly in four types:

1. Epithelial tissue
2. Connective tissue
3. Muscular tissue
4. Nervous tissue

EPITHELIAL TISSUE

Epithelial tissue is a type of tissue composed of closely packed cells that form continuous layers, covering body surfaces, lining internal organs and cavities. It is also found in glands.

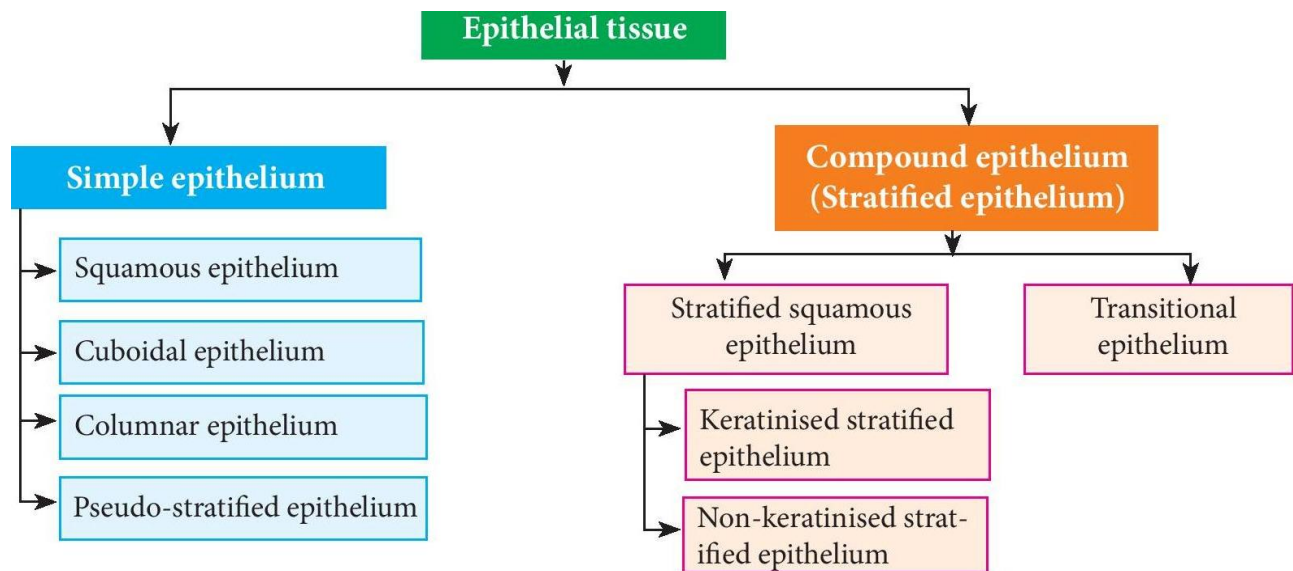
Functions of Epithelial Tissue

1. **Protection:** Epithelial tissue protects the body from mechanical injury, harmful chemicals, invading bacteria and from excessive loss of water.
2. **Sensation:** Epithelial tissue stimulates sensory organs like eye, ear, nose, tongue and skin.
3. **Secretion:** Epithelial tissue secretes specific chemical substances such as enzymes, hormones and lubricating fluids.
4. **Absorption:** Epithelial tissue absorbs nutrients from the digestion of food.
5. **Excretion:** Epithelial tissue excretes waste products from the body.
6. **Diffusion:** Epithelial tissue promotes diffusion of gases, liquids and nutrients.
7. **Cleaning:** Epithelial tissue assists in removing dust particles and foreign bodies which have entered the air passages.

Types of Epithelial Tissue

According to the shape of cells and cell layers, the epithelial tissues can be classified into two types:

1. Simple epithelium tissues: The cells are arranged in single layer.
2. Stratified epithelium tissues: The cells are arranged in several layers.



1. SIMPLE EPITHELIUM

- Simple epithelium tissues consist of a single layer of identical cells.
- All the cells rest on a non-cellular basement membrane.
- Cells of these epithelium lack intercellular space.

(i). Squamous Epithelium

Characters/Structure

- It consists of a single layer of thin, flat, roughly polygonal or hexagonal cells.
- Each cell has a distinct, oval nucleus situated at the center.
- The intracellular spaces are absent between the cells.
- All the cells rest on a non-cellular basement membrane.
- It is also known as pavement epithelium because of tile-like appearance.

Location

- It is present in the lining of heart, alveoli of lungs, inner wall of blood vessels and lymph vessels, buccal cavity, Bowman's capsule of nephron etc.

Functions

- It helps in the protection, absorption, filtration, exchanges of gases (diffusion) etc.

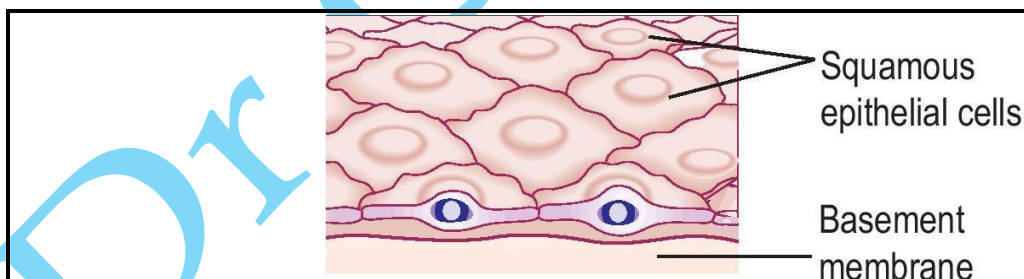


Fig. Squamous epithelium

(ii). Cuboidal Epithelium

Characters/structure

- It consists of single layer of cuboidal cells (cube-shaped cells) fitting closely together lying on a basement membrane.
- Each cell has large, spherical and centrally located nucleus.
- All the cell rest on a non-cellular basement membrane.

Location

- It is present in the surface of ovaries, lens of eye, inner surface of cornea, sweat glands, thyroid vesicles, lining of renal tubules, salivary glands, pancreatic duct etc.

Functions

- It involves in the protection, secretion (as gland), absorption and excretion.

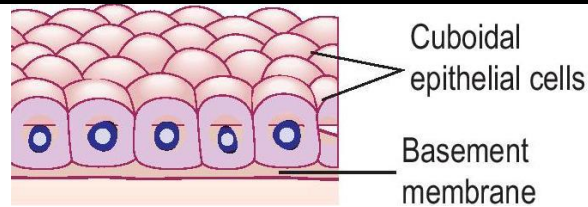


Fig. Cuboidal epithelium

(iii) Columnar Epithelium

Characters/Structure

- It consists of single layer of elongated pillar like cells which are arranged in column, perpendicular to the basement membrane.
- Each cell has an elongated oval shaped nucleus, generally lies towards the base.
- All the cells rest on the non-cellular basement membrane.

Location

- It is present in the gall bladder, alimentary canal, lining of stomach, small intestine, large intestine, uterus, fallopian tube, bile duct etc.

Functions

- It helps in the secretion, excretion, absorption etc.

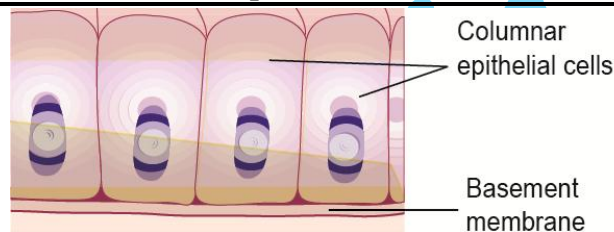


Fig. Columnar epithelium

(iv). Pseudo-Stratified Epithelium

Characters/Structure

- It consists of a single layer of columnar and ciliated cells but appears as two layers.
- The cells are unequal in size.
- The longer cells reach up to outer free surface where as shorter cells not reach up to the free surface.
- The nuclei lie at the different level.
- All the cells rest on a non-cellular basement membrane.

Location

- It is present in the lining of trachea and bronchi, part of the nasal epithelium, epididymis, vas deferens etc.

Functions

- It helps in the protection, secretion and removal of secretion.

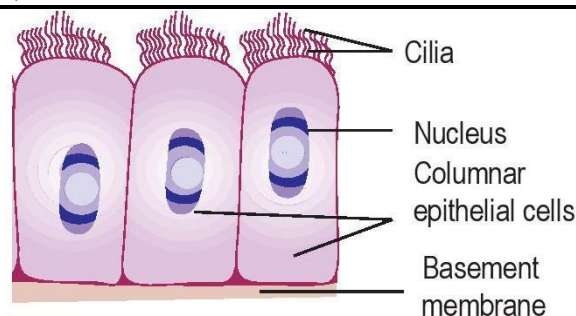


Fig. Pseudo stratified epithelium

2. COMPOUND EPITHELIUM/ STRATIFIED EPITHELIA

The compound epithelium consists of two or more layers (several layers) of cells having various shapes. The basement membranes are usually absent. The compound epithelium tissue is of two types:

(i) Stratified Squamous Epithelium

It consists of several layers of cells. In the deepest layers, the cells are mainly columnar and as they grow towards the surface, they become flattened and are then shed. It can be divided into two types:

a) Keratinised Stratified Epithelium

- It is present in the superficial dry surfaces of the body like skin, hair, claw, nails etc.
- The outer surface consists of dead cells.
- It contains keratin protein (highly insoluble protein with water proofing qualities).

Functions

- It prevents the resistance of friction.
- It protects the underlying tissue from heat, microbes, chemical etc.

b) Non- Keratinised Epithelium

- It consists of lower cuboidal cells.
- It is present in the lining of mouth, tongue, pharynx, oesophagus vagina etc.

Functions

- It protects the moist surfaces subjected to wear and tear & prevents them from drying out.

Differences between Keratinised and Non-Keratinised Epithelium

No	Keratinised Epithelium	Non-Keratinised Epithelium
1.	Keratin protein is present.	Keratin protein is absent.
2.	The cells of superficial layers are dead.	The cells of superficial layers are living.
3.	It is water impermeable.	It is water permeable.
4.	It forms well protective covering against abrasion.	It forms moderately protective covering against abrasion.
5.	It is present in the dry surface of the body like skin, hair, claw, nail etc.	It is present in the moist surface of the body like mouth, tongue, pharynx, oesophagus, vagina etc.

(ii) Transitional Epithelium**Characters/Structure**

- It consists of several layers (4-6 layers) of stretchable cells.
- The cells having basal layer are columnar or cuboidal, middle layer are polyhedral or pear shaped and upper layer are globular.

Location

- It is present in the urinary bladder, ureter and upper parts urethra.

Functions: It helps in the stretching or distension of the organs.

Differences between Simple and Compound Epithelium Tissue

No	Simple Epithelium Tissue	Compound Epithelium Tissue
1.	It consists of a single layer of cells.	It consists of several layers of cells.
2.	All the cells rest on basement membrane.	Only lower layer rest on basement membrane.
3.	Cells are similar.	Cells in different layers are different.
4.	It involves secretory and absorptive functions.	It involves in protective functions.
5.	It is present in the intestine, alveoli etc.	It is present in the vagina, skin, hair, nails etc.
6.	Examples: squamous epithelium, cuboidal epithelium, columnar epithelium and ciliated epithelium.	Examples: Stratified epithelium, transitional epithelium.

SPECIALIZED EPITHELIAL TISSUE**GLANDULAR EPITHELIUM (GLANDS)**

Glandular epithelium is the group of epithelial cells (columnar or cuboidal cells) which produce specialized secretions such as hormones enzymes, mucus or other essential fluids. All the glandular epithelium has a rich blood supply. The glandular epithelium selects the necessary materials from blood stream. These materials are utilized for making the secretions.

Classifications of Glands

The glands are classified on different bases. They are as follows:

1. On the Basis of Number of Cells

On the basis of number of cells, the glands are classified into two different types:

- Unicellular gland:** It is formed by single glandular cell, scattered in the columnar cells. Examples: goblet cells or mucus secreting cells.
- Multicellular glands:** It is formed by many cuboidal glandular cells. Examples: sweat glands, gastric glands and mammary glands.

2. On the Basis of Present of Ducts

On the basis of present of ducts, the glands are classified into three different types:

- Exocrine glands:** These glands have ducts and pour their secretions through the ducts. The secretions of exocrine glands are known as enzymes. Examples: Salivary glands, gastric glands etc.
- Endocrine glands:** These are ductless glands and pour their secretions directly into the blood. The secretions of endocrine glands are known as hormones. Examples: Pituitary glands, thyroid gland, parathyroid gland etc.
- Heterocrine glands:** It is a mixture of both exocrine and endocrine gland; hence it has both functions (exocrine and endocrine functions). Examples: Pancreas.

Differences between Exocrine and Endocrine glands

No.	Exocrine glands	Endocrine glands
1.	Exocrine glands have duct.	Endocrine glands have ductless.
2.	They secrete enzymes.	They secrete hormones.
3.	They discharge their secretions into the ducts.	They discharge their secretions directly into the blood.
4.	The glands are present near the site of action.	The glands may be present at a far away site than action.
5.	Exocrine glands are simple.	Endocrine glands are complex.
6.	Secretions are produced large quantities.	Secretions are produced small quantities.
7.	Examples. Salivary gland, gastric gland, liver etc.	Examples: Pituitary gland, thyroid gland, parathyroid gland etc.

Differences between Hormones and Enzymes

No	Hormones	Enzymes
1.	The secretion of endocrine glands is known as hormones.	The secretion of exocrine glands is known as enzymes.
2.	They may act slowly or quickly.	They act slowly.
3.	They have low molecular weight.	They have very high molecular weight.
4.	It may be steroids, peptides, proteins or amino acid derivates.	They are simple proteins.
5.	The chemical controlled reactions are not reversible.	The chemical controlled reactions are reversible.
6.	Excess or deficiency of hormones may cause disorders.	Excess or deficiency of enzymes which catalyzed the chemical reactions.

3. On the Basis of Nature of Secretion

On the basis of nature of secretion, the glands are classified into three different types:

- Mucous glands:** These glands secrete viscous fluid known as mucous. These glands are also known as mucous cells or mucocytes. It is present in wall of palate, colon, uterus, cervix etc. Examples: Goblet cells in the intestine.
- Serous glands:** These glands secrete watery fluid knows as serous fluid. These glands are also known as serocytes. It is found in the parotid salivary glands, intestinal glands and sweat glands.
- Sero-mucous (mixed) glands:** These glands are made up of both mucous and serous glands and hence produce both kinds of secretion (mucous and serous fluids). Examples: gastric glands, pancreatic glands etc.

CONNECTIVE TISSUE

Tissue that connects or binds together or supports the various tissues and organs of the body is known as connective tissue.

Functions of Connective Tissues

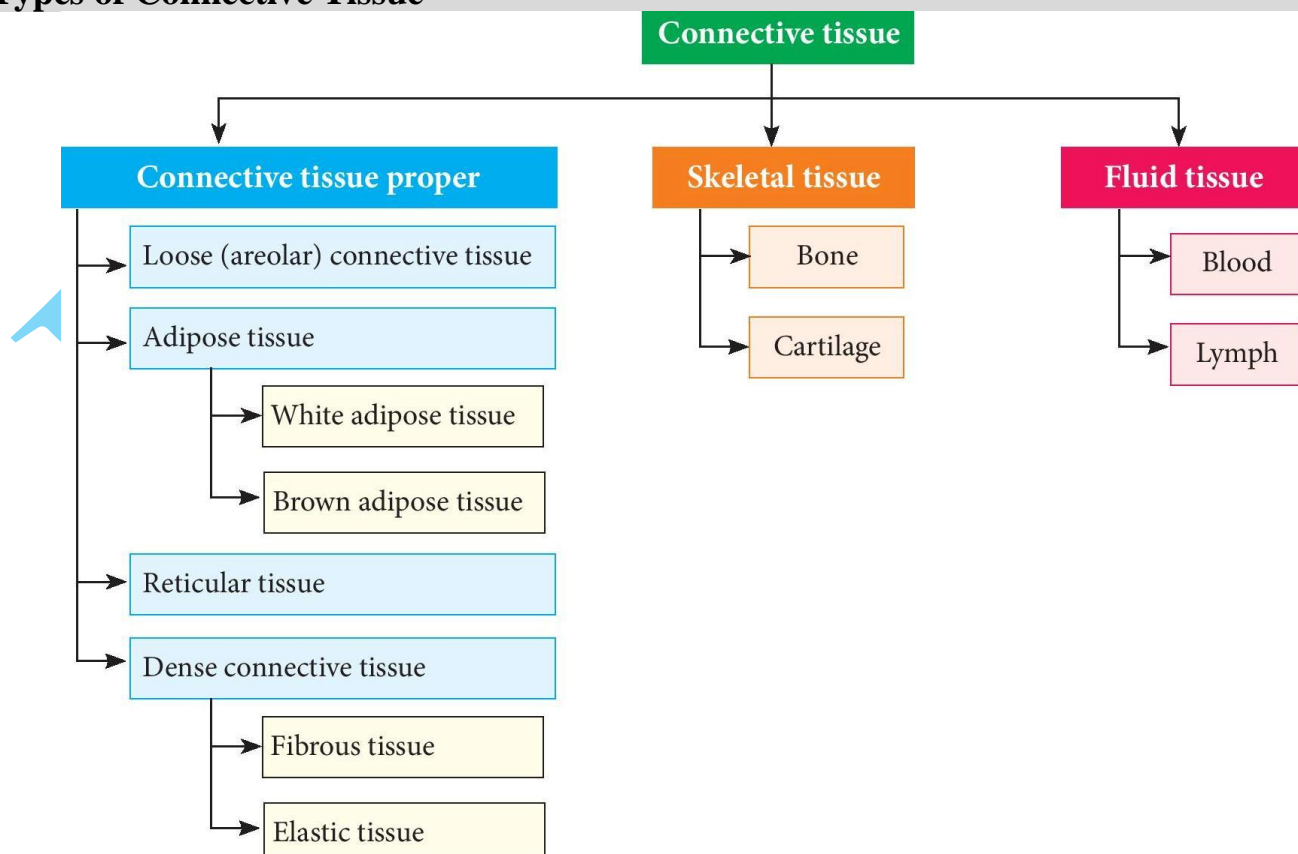
1. It provides structural support to organs and the body.
2. It connects different tissues and organs, such as tendons linking muscles to bones and ligaments connecting bones to joints.
3. It facilitates the transport of nutrients, gases, hormones, and waste products through blood.
4. It stores energy in adipose tissue and minerals like calcium in bones.
5. It maintains body temperature by insulating against heat loss (e.g., adipose tissue).
6. It protects against infections and diseases through specialized cells like macrophages and lymphocytes.

Components of Connective Tissues

Basically, a connective tissue is composed of three components:

- Cell of connective tissues
 - Fibers of connective tissues
 - Matrix
1. **Cells of connective tissues:** Cells of the connective tissue are the living components which are widely distributed in the matrix. The cells of connective tissue are of following types:
 - a. Fibroblast
 - b. Macrophages or Histocytes
 - c. Adipocytes
 - d. Leukocytes
 - e. Mast cells
 2. **Fibers of connective tissues:** Fibers of connective tissues are non-living products of the cells which are distributed in the matrix. The fibers of connective tissue are of following types:
 - a. **Collagen or white fibers:** They contain collagen protein.
 - b. **Elastic or yellow fibers:** They contain elastin protein.
 - c. **Reticular fibers:** They contain reticulin protein.
 3. **Matrix:** Connective tissues consist of a large amount of non-living, transparent fluid or semisolid intercellular substance known as matrix. It contains various organic and inorganic substances.

Types of Connective Tissue



1. CONNECTIVE TISSUE PROPER

The connective tissue proper is made up of soft matrix which is of various types of different tissues. The connective tissue proper is divided into four types:

i. Loose (Areolar) Connective Tissue

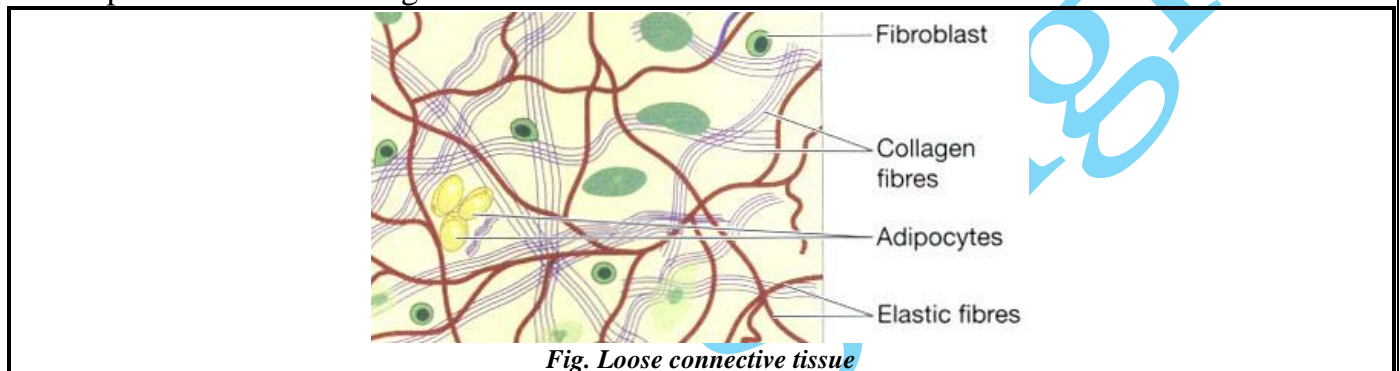
It is made up of semisolid matrix with many fibroblasts and some fat cells (adipocytes), mast cells, macrophages, elastic and collagen fibers.

Location

- It is found in almost every part of the body and connects and supports other tissues. Examples: under the skin, between the muscles, supporting blood vessels and nerves, in the alimentary canal, in glands supporting secretory cells.

Functions

- It gives support to the structure.
- It provides tensile strength.



ii. Adipose Tissue

Adipose tissue is a specialized loose connective tissue. It consists of fibroblast, macrophages, collagen fibres and elastic fibres. It is of two types:

- a. **White Adipose Tissue:** It is made up of 20 to 25% of body weight in adults with a normal body mass index; more is present in obesity and less in those who are underweight. The white adipose tissue secretes hormone known as leptin.

Location

It is present in the kidneys, eyes, between the muscle fibres, under the skin etc.

Functions

- It supports, protects and insulates the organs.
- It prevents the heat loss. Thus, it helps in maintaining the body temperature.

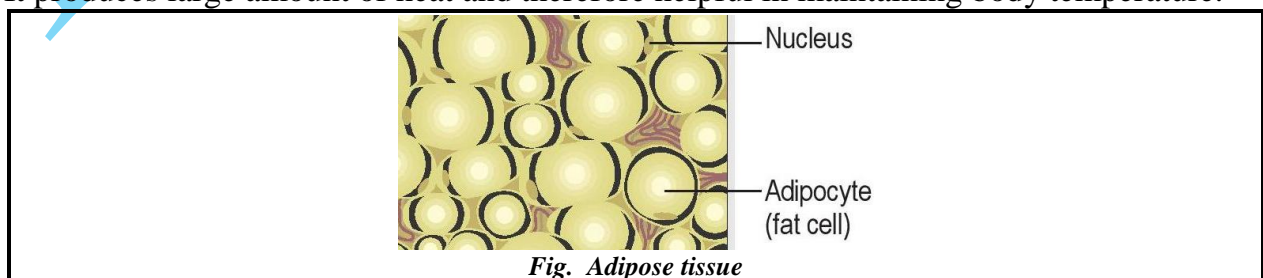
- b. **Brown adipose tissue:** It is present in the newborn. It has a more extensive capillary network than white adipose tissue. It is dark in colour with rich blood supply.

Location

- It lies between the scapula, neck and in the walls of the large blood vessels of the trunk.

Function

- It produces large amount of heat and therefore helpful in maintaining body temperature.



iii. Reticular Tissue

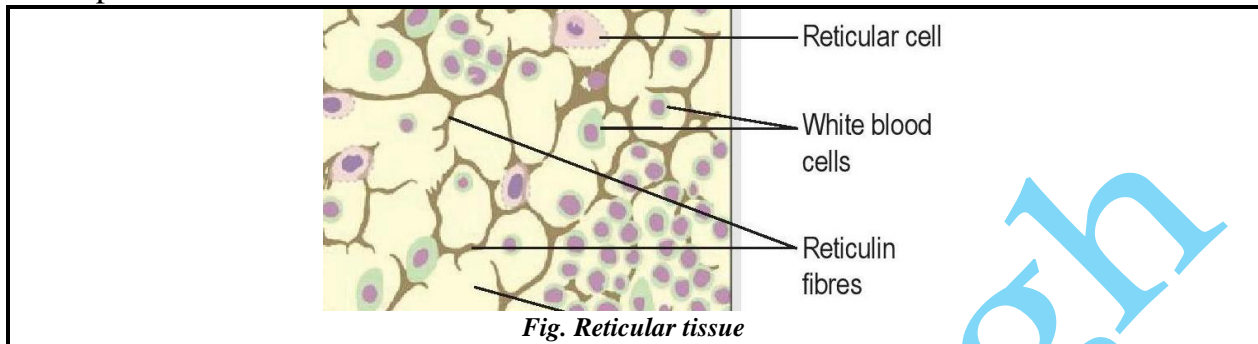
Reticular tissue has a semisolid matrix with fine branching reticulin fibers (reticulin protein). It contains reticular cells and white blood cells (monocytes and lymphocytes). The reticular tissue is also known as lymphoid tissue.

Location

- It is present in the liver, spleen, lymph nodes and all organs of the lymphatic system (lymphatic organs).

Functions

- It helps to form the framework of many organs including the liver, spleen and lymph nodes.
- It helps to bind the cells of stomach muscle tissue.

**iv. Dense Connective Tissue**

The dense connective tissue contains more fibers and fewer cells than loose connective tissue. It is divided into two types:

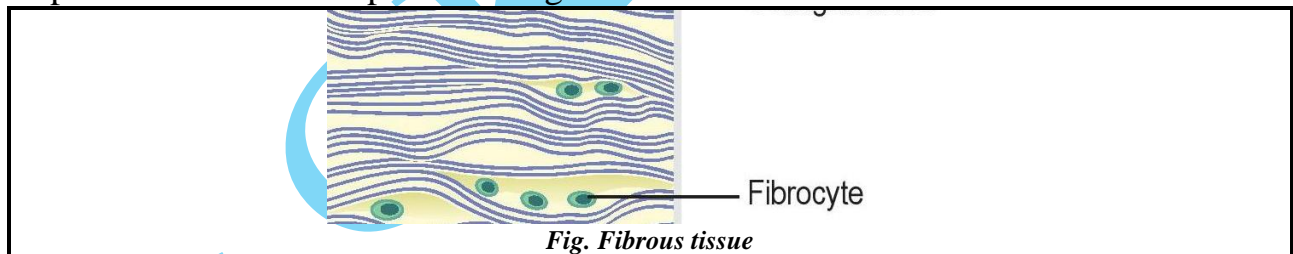
- Fibrous tissue:** The fibrous tissue consist of bundles of collagen fibers with very little matrix. Fibrocytes (old and inactive fibroblasts) are few in number and lie in rows between the bundles of fibers.

Location

- It is present in the pericardium of heart, dura mater of brain, renal capsule, ligaments, covering of bone (periosteum), covering of lymph nodes etc.

Functions

- It provides mechanical protection against stretch.

**b. Elastic tissue**

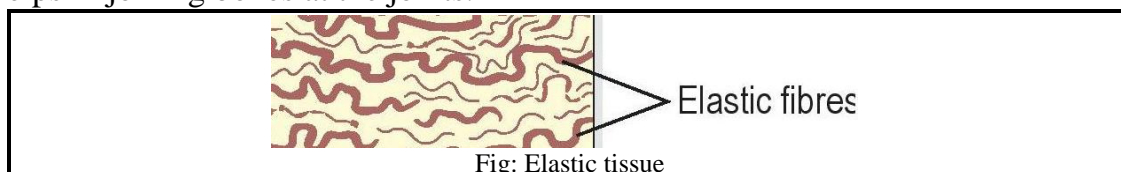
The elastic tissue consists of yellow elastic fibers. These fibers are thick, branched and capable of considerable extension and recoil. There are few cells and the matrix consists mainly of masses of elastic fibers secreted by fibroblasts.

Location

- It is present in organs where stretching or alteration of shape is required. Examples: in large blood vessel walls, trachea, bronchi, and the lungs.

Functions

- It gives elasticity and strength.
- It helps in joining bones at the joints.

**2. SKELETAL TISSUE**

Skeletal tissues are the framework of the body, consisting of bones and cartilages, which protects and supports the body and internal organs.

Types of Skeletal Tissue

The skeletal tissue is of two types:

- i. **Bone Tissue:** *See the Unit 7, Skeletal System (Bone).*
- ii. **Cartilage:** Cartilage is a connective tissue composed of cells (chondrocytes) and fibres (collagen or yellow elastic), embedded in a firm gel like matrix. The study of cartilage is known as chondrology.

Types of Cartilage

The cartilage is of three types:

- a. **Hyaline Cartilage:** It is the most abundant kind of cartilage. Most of the embryonic skeleton consists of hyaline cartilage. It is semi-transparent and appears bluish-white in colour.

Location

- Articular surfaces at joints of long bones hence, known as articular cartilage.
- It is present in the trachea, larynx, tip of the nose, in the connection between the ribs, breastbone etc.

Functions

- It reduces friction at joints.
- It helps in body movements.
- It helps in longitudinal growth of bone.

- b. **Fibro Cartilage:** Fibro cartilage is composed of thick, dense bundles of collagen fibres in matrix.

Location

- Discs between the vertebrae (intervertebral disc), symphysis pubis, around the edges of the articular cavities such as the glenoid cavity in the shoulder joint.

Functions

- It helps in the shock absorbers.
- It provides sturdiness without impeding movement.

- c. **Elastic Cartilage:** Elastic cartilage is composed of network of yellow elastic fibres, which is highly elasticity and flexible in nature.

Location

- It is present in the pinna, external auditory meatus, eustachian tubes, epiglottis, tip of nose, larynx etc.

Functions

- It maintains the shape: Example: In the ear.
- It helps in strengthens and supports the body.

Differences between Bone and Cartilage

No	Bone	Cartilage
1.	The study of bone is known as osteology.	The study of cartilage is known as chondrology.
2.	It is hard and rigid.	It is soft and flexible.
3.	It contains ossein protein.	It contains chondrin protein.
4.	Lamellae are present.	Lamellae are absent.
5.	Canaculi are present,	Canaculi are absent.
6.	Each lacula contains only one osteocyte.	Each lacula contains one or more chondrocytes.
7.	Haversian system is present.	Haversian system is absent.
8.	Bone marrow is present.	Bone marrow is absent.
9.	It has Its own blood supply.	It is without blood supply.
10.	The outer layer is known as periosteum.	The outer layer is known as perichondrium.

3. FLUID TISSUE

The fluid connective tissue is mainly blood and lymph.

- a. **Blood:** See the Unit: 4(circulatory System: Blood).
- b. **Lymph:** See the Unit: 5, Lymphatic System (Lymph)

Differences between Blood and Lymph

No	Blood	Lymph
1.	It is red vascular fluid connective tissue.	It is milky white vascular fluid connective tissue.
2.	It occurs in blood vessels.	It occurs in lymph vessels.
3.	It consists of plasma, red blood cells, white blood cells and platelets.	It consists of plasma and white blood cells (lymphocytes most abundant).
4.	Presence of haemoglobin in red blood cells.	Absent of haemoglobin.
5.	It transports materials within the body.	It transports materials between blood and body cells (middleman).

MUSCULAR TISSUE

The muscular tissue is of three types:

- Skeletal muscle
- Smooth muscle
- Cardiac muscle

Describe in detail in Unit 6 (Muscular System)

NERVOUS TISSUE

The two types of nervous tissues are found in the nervous system:

1. **Neurons:** It is also known as excitable cells. They initiate, receive, conduct and transmit information.
2. **Neuroglia (Glial cells):** It is also known as non-excitabile cells. They support the neurons.

Describe in detail in Unit 11 (Nervous System)

MEMBRANES

The thin, soft layer of the tissue that covers an organ or structures, lines a tube or cavity, divides a space or organ or structure or separates one part from another is known as membranes.

Types of Membranes

The body membranes are of two types:

1. Epithelial Membranes

Epithelial membranes consist of epithelial tissue and the connective tissue which are attached together. The epithelial membranes are of three types.

- a. **Cutaneous membrane (skin):** Skin consists of a layer of stratified squamous epithelium (epidermis) firmly attached to a thick layer of dense connective tissue (dermis). It differs from other membranes because it is exposed to air and is dry.
- b. **Mucus membrane:** The mucus membranes are lining of the alimentary tract, respiratory tract and genitourinary tracts. These membranes are sometimes known as mucosa. The mucus membranes secrete mucus. The mucus protects the lining membrane from drying and from mechanical and chemical injury.
- c. **Serous Membranes:** serous membrane lines the closed cavities as peritoneal, pleural and pericardial cavities of the body. It secretes a thin fluid which keeps the surface moist.

2. Connective Tissue Membranes

Connective tissue membranes consist of only connective tissue. The connective membranes are of two types.

- a. **Synovial membranes:** Synovial membranes line the cavities of the synovial joints (freely movable joints) such as the shoulder, elbow, knee etc. Synovial membranes secrete clear, sticky, oily fluid known as synovial fluid. The synovial fluid lubricates the cartilage on the ends of the bones so that they can move freely and without friction.
- b. **Meninges:** Meninges covering the brain and spinal cord. Meninges protect and support to the brain and spinal cord.