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# Tissue

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## Human Anatomy & Physiology

### Chapter - 1

In this Notes we provide you Human Anatomy & Physiology Notes Chapter – 3 Tissue

# Tissue

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*Tissue* is defined as collection of cells which are similar in origin structure and function.

OR

A group of cells having the same origin, similar shape and specific common general function is known as Tissues.

Cell is the structural and functional unit of the body and group of cell which is similar in origin structure and function called tissue.

Group of Tissues which perform the special function is known as organ.

OR

Biological tissue is a collection of interconnected cells that perform a similar function within an organism.

OR

Tissues are the group of similar cell and perform a similar function and interconnected by the non-living intercellular material or matrix.

- Study of tissue is called Histology.
- The word Histology was given by Mayr (1891).
- Father of Histology is Marcello Malpighi.
- The term tissue was coined by the Bichat.

## Classification of Tissues

They are classified into four types:

1. **Epithelial Tissue**
2. **Connective Tissue**
3. **Muscular Tissue**
4. **Nervous Tissue**

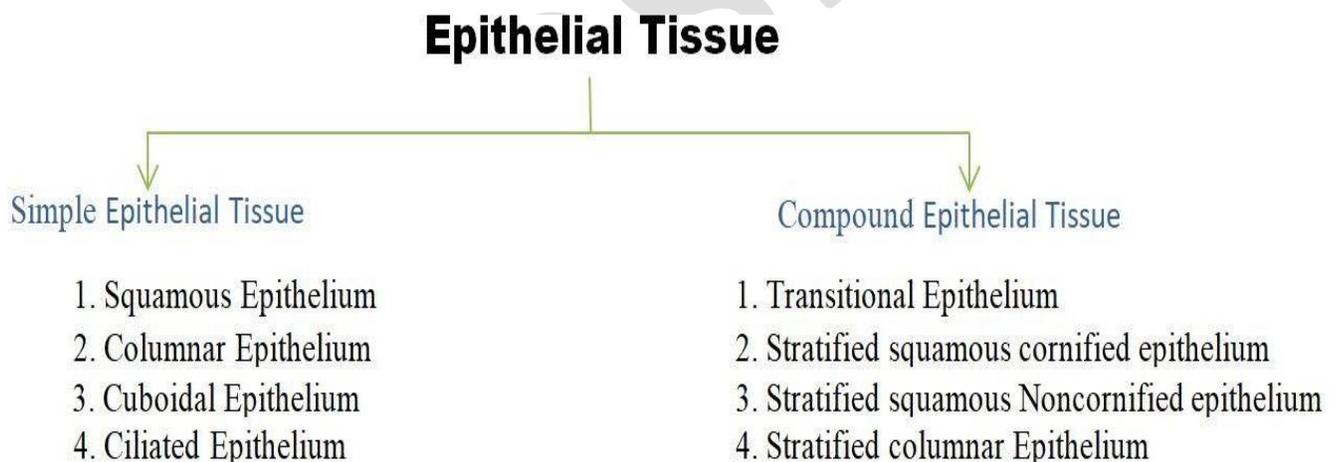
## A. Epithelial Tissue:

Epithelial tissue provides the protective covering to the other tissue. Basically all types of epithelium consist of the cells with minimum intercellular space and so help in protection absorption, excretion and secretion.

- Due to presence on outer surface it does not contain blood vessels or capillaries. It absorbs nutrients from the lymph vessels or connective tissue.
- Epithelial tissue is present on the basal membrane and lower the basal membrane connective tissue are present. Due to involvement of the junction cell communicate with each other.
- The word epithelial was introduced by the Ruysch.

It is developed by three primary germinal layers (ectoderm, mesoderm, endoderm)

**Epithelial tissue classified into two types.**



## Classification of Simple Epithelial tissue

### Simple Epithelial Tissue:

The *Simple Epithelium* a single layer of cell called Simple Epithelial Tissue. It divided into five.

#### 1. Squamous Epithelium:

- It consists of one layer of flat cell, nucleus usually placed in the center of the cells.
- It is generally situated on basement membrane.
- These are present in the alveoli of the lungs.
- Henle's loop of the nephron, the inner lining of the heart and inner wall of blood vessels etc.
- These cell help in the filtrations, exchange of gases from blood and protect the internal organs.

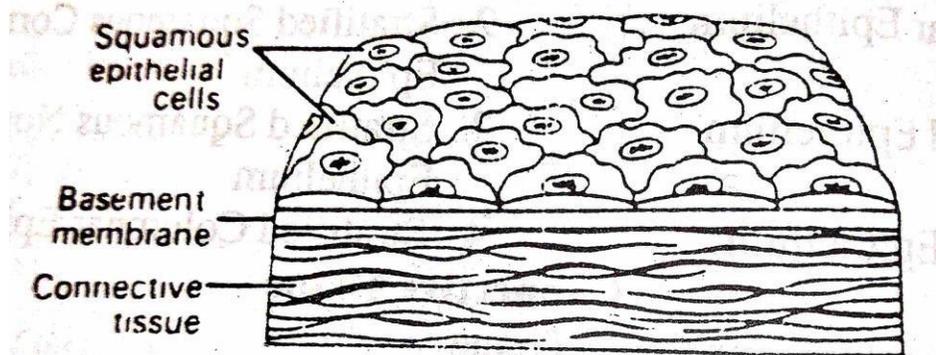
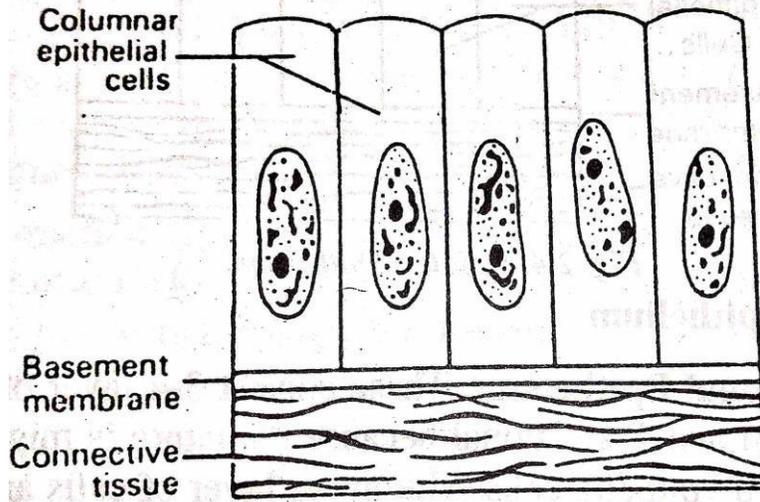


Fig: Squamous Epithelium

#### 2. Columnar Epithelium:

- They are composed of single layer of tall and slender cells and height is more than its breadth.
- Their nuclei are located at the base. Free surface may have microvilli.
- It is found in lungs and duct of glands.
- It also found in the lining of stomach and intestine and help in secretion and absorption.



### 3. Cuboidal epithelium.

- These cells protect the organ and help in the secretion.
- It is formed of one layer of cubical cells which has the same dimension from each side. This is commonly found in ducts of glands and tubular parts of nephron in kidneys and its main functions are secretion and absorption it also found in bronchioles, salivary glands, thyroid etc.
- The proximal convoluted tubule (PCT) of nephron in the kidney has microvilli.

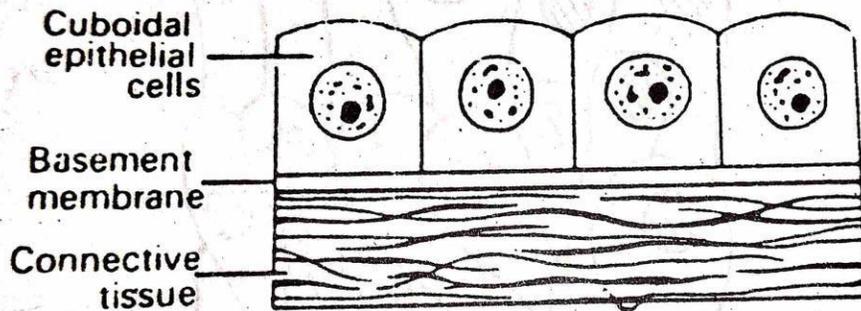


Fig: Cuboidal Epithelium

### 4. Ciliated epithelium.

- These cells consist of 12-15 hairy structure called cilia. These are usually present in respiratory tract, fallopian tubes, etc.
- Their function is to move particles or mucus in specific directions over the epithelium.
- These help in the flow of mucous, and prevent the entry of bacteria, particles etc.

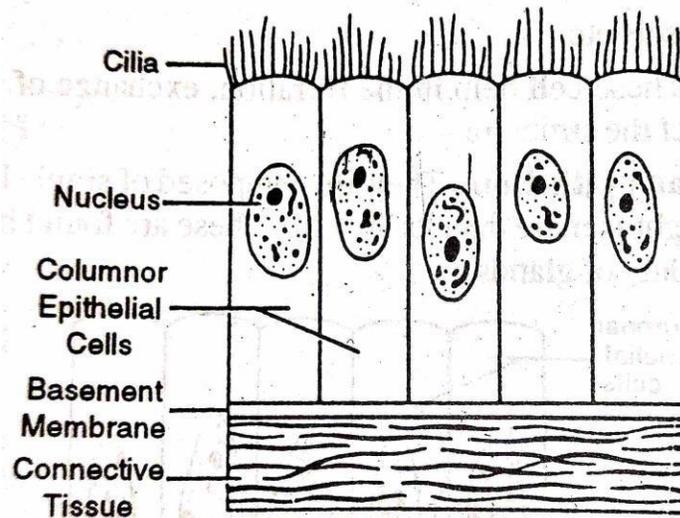


Fig: Ciliated Epithelium  
**Compound epithelium.**

## 1. Transitional Epithelium.

- It consist 3-4 layer of cells. These are known transitional because its nature is migrating from simple to stratified epithelia cells.
- They are found in the pelvis of kidney, ureters, urinary bladder, urethrae.
- These are helpful in protection of the organ. These also prevent reabsorption of excreted material back to the system.

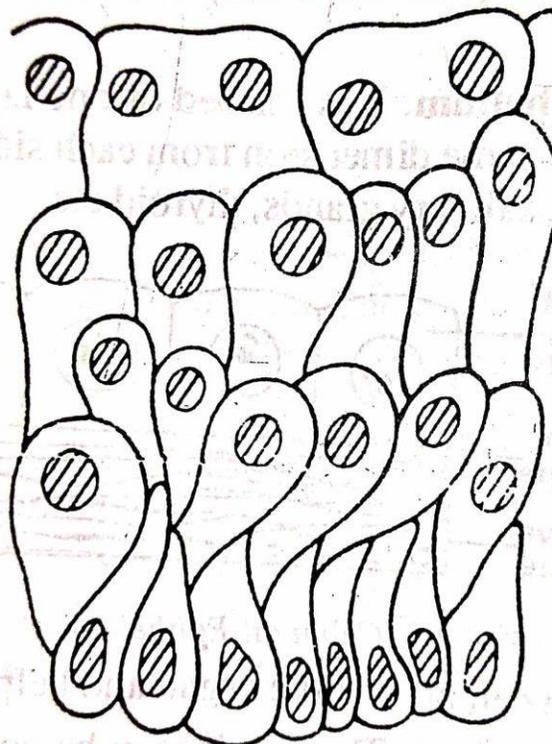


Fig: Transitional Epithelium

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## 2. Stratified squamous cornfield epithelium.

- It consists of many layers of squamous epithelial cells modified into keratinized cells due to deposition of keratin.
- They are found in the skin, nails, and palms.
- These provide protection against atmospheric and mechanical pressure and injury etc.

## 3. Stratified squamous non- cornfield epithelium.

- They are similar in the structure as Stratified squamous cornfield epithelium except they do not contain the keratinized cells.
- These are found in various mucous membranes. e.g. mouth, pharynx, esophagus, and vaginal mucosa.
- These cells also provide protection and helpful in secretion of mucus etc.

## 4. Stratified columnar Epithelium.

- It consists of multiple layers of cells which has more height than the breath. These are present in conjunctiva, pharynx and mucosa.
- These are helpful protection and secretion of various substances.

## B. Connective tissue.

- Connective tissue is the type of primary tissues which provide the binding and supportive function and provide the framework of the body.
- Connective tissues are most abundant and widely distributed in the body of multicellular organisms.
- It is stored the fat and mainly present beneath the skin.
- In all connective tissue except blood, the cells secrete fibers provide strength, elasticity and flexibility to the tissue.
- These cells also secrete modified polysaccharides, which accumulate between cells and fibers and act as matrix (ground substances).
- On the basis of fibers arrangement it divided into two parts.

Loose connective tissue: - Cells and fibers loosely arrangement in a semi-fluid ground substances. It contains the fibroblasts (fibers producing cells), microphages and mast cells.

Dense connective tissue: -Cells and fibers are compactly packed in this tissue.

Example—Tendons (join bone to muscle).

- **Connective tissue can be divided into following groups:**

1. *Areolar tissue*
2. *Adipose tissue*
3. *Fibrous tissue*
4. *Elastic tissue*
5. *Lymphoid tissue*
6. *Reticular tissue*
7. *Cartilages*

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8. *Bone*

9. *Blood*

10. *Lymph*

**Areolar tissue :-**

- It consist loosely arranged tissue and usually present throughout the body. These are present in subcutaneous sub mucous between muscle and nerves.

**Adipose tissue:-**

- They are also known as dosing tissue and present in subcutaneous tissue. They usually contain cells containing free fat inside the cell. The excess of nutrients which are not used immediately are converted into fats and are stored in this tissue. The cells are generally large rounded or oval in shape.
- Adipose tissues present the organs from injury and gives shapes to limbs, store the energy and regulate the body temperature.

**Fibrous tissue:-**

- Fibrous tissue is also known as white 'Fibrous' tissue as they are composed of mainly white Fiber of collagen cells like fibroblast, histiocytic, basophils, mast cells.
- Deprived the strong to the tissue and from the ligaments and tendons, diameter and neural canal.
- It function is to connect the different tissues and the different part of the body to provide mechanical protection against stretch and pressure.

**Elastic tissue:-**

- They are mainly consist elastic fibers and present in the walls of arteries and in the air tubes of respiratory track and some ligament.
- They provide supportive muscular strength and help in the maintaining the erect position of the spine.

**Lymphoid tissue:-**

- Lymphoid tissue contains lymph, lymph gland, lymphatic vessels and present in small intestine, pharyngeal tonsils etc.
- They supply lymphocytes to the blood and provide the protection against bacterial infections.

**Reticular tissue:-**

They are similar to the areolar tissue except lymphocyte cells presents in a very large number and forms the bulk of tissue. They are present in spleen, liver, lymph gland, bone etc.

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## **Cartilages:-**

- Cartilage is a connective tissue and elastic in nature. It contains large quantity of matrix. They are usually found at the joints between the bones. These are covered by a membrane perichondrium.
- Cartilage is present in the tip of nose, outer ear joints, between adjacent bones of the vertebral column, limbs and hands in adults.

*The Cartilage are three types.*

**1- Hyaline cartilage**

**2- Fibrocartilage**

**3- Elastic cartilage**

## **Bone:-**

- Bones are the hardest connective tissue which constitute the skeleton. It contains ground substance and bone cells. Calcium salts are present in the ground substance.

- **Bone cells are three types.**

**1. Osteoblast**

**2. Osteoclasts**

**3. Osteocyte**

- **Bone can also be divided into two types:**

**1. Compact bone** (e.g. Long bones)

**2. Cancellous bone** (Spongy bones)

- **Compact bones** consist of Haversian canals running longitudinally. It contains blood and lymph capillaries and nerves. Surrounding this canal is a layer of bone deposited in concentric circles and space between two layers called lacunae contain lymph and bone cells (Osteocytes).

- Canaliculi is present between lacunae and Haversian lymph carrying the nourishing material through this canaliculi.

- Bones provide the framework of the body and help in protection and locomotion.

## **Blood:-**

- Blood is a fluid connective tissue distributed in blood vessels and pumped by heart.
- The ground substance of blood is watery fluid called plasma and various types of cells are suspended in it. These are:-

**A) Erythrocytes (Red Blood Cells)**

**B) Leucocytes (White Blood Cells)**

**C) Blood platelets.**

- Leucocytes are various types e.g. Neutrophils, acidophilus, monocytes and lymphocyte etc.
- Blood is helpful in.
- Transportation of gases e.g. O<sub>2</sub>, CO<sub>2</sub>
- Transportation of nutritive substance and hormones etc.

## **Lymph:-**

- Lymph is modified tissue containing 94% water and 6% solids and only lymphocytes are present in the form of cells.
- Lymph provides the protection against infection.

## C. Muscle tissue

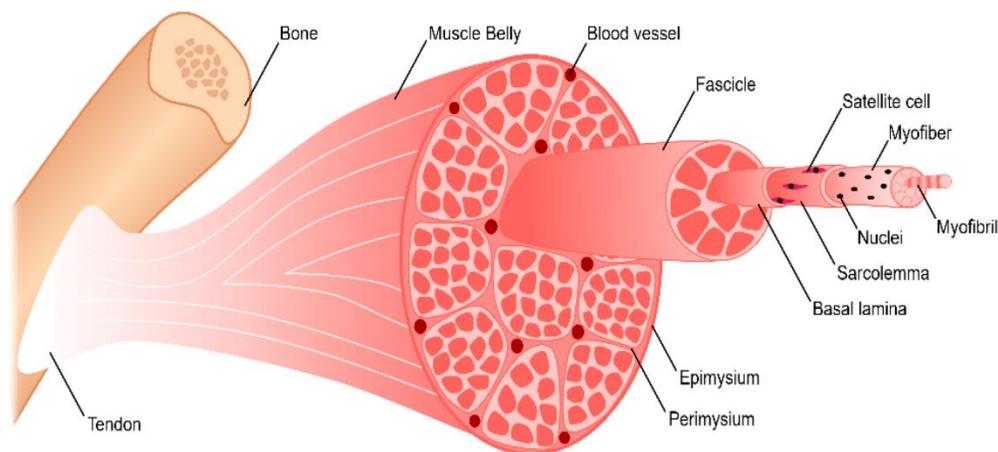
Each muscle is made of many long, cylindrical fibres arranged in parallel manners. These fibres are composed of numerous fine fibrils, called myofibrils.

- Muscle fibres contract (shorten) in response to stimulation, then relax (lengthen) and return to their uncontracted state in a coordinated fashion
- Muscle tissue plays an active role in the movement of the body.

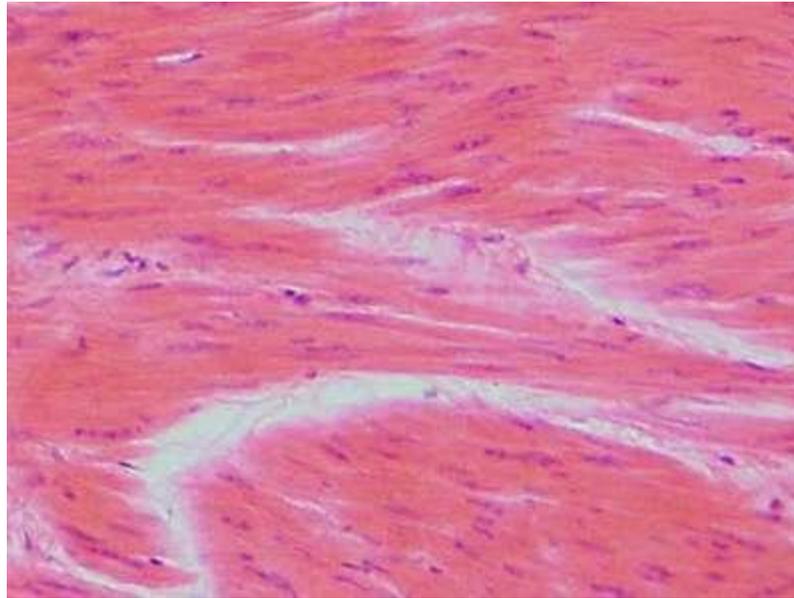
### Muscle tissue divided into three types.

- (1) Skeletal muscle tissue.
- (2) Smooth muscle tissue.
- (3) Cardiac muscle tissue

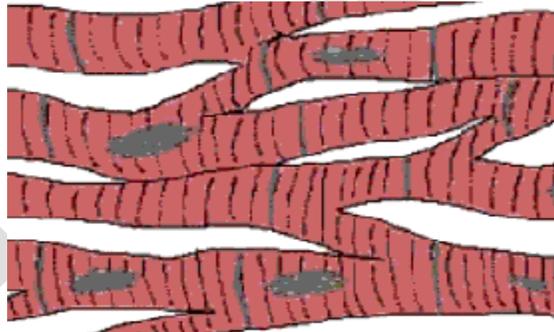
- (1) **Skeletal muscle tissue:** - These tissues are closely attached to skeletal bones. In a typical muscle such as the biceps, striated (striped) skeletal muscle fibres are bundled together in a parallel fashion.



- (2) **Smooth muscle tissue:** — Smooth fibres taper at both ends and do not show striations. Smooth muscle as involuntary as their functioning cannot be directly controlled.
  - The wall of internal organs such as blood vessels, stomach, and intestine contains this type of muscle tissue.



- (3) **Cardiac muscle tissue:** —It is only present in the heart. It is also an involuntary tissue and it is self-regulated. Cell junctions fuse the plasma membrane of cardiac muscle cell and appear like striped muscle.



## D. Nervous Tissue

- They are specialized tissue for reception discharge of stimuli and transmission. Nerve Tissue consists the nerve cells and nervefibres.
- Neurons, the unit of neural system are excitable cells. The neuroglial cell which constitute the rest of the neural system protect and support neurons.
- cell body -----The cell body contains cytoplasm with typical cell organelles and nucleus and also certain granular bodies called Nissls granules which are helps in the stimulus conduction.

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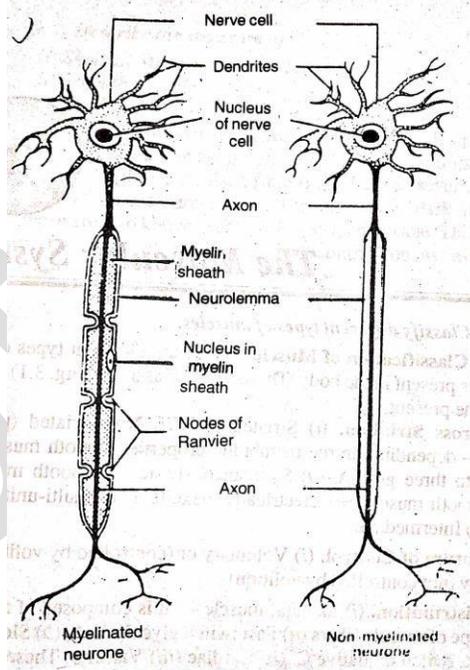
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- Neurons, the unit of neural system are excitable cells. The neuroglial cell which constitute the rest of the neural system protect and support neurons.
- cell body -----The cell body contains cytoplasm with typical cell organelles and nucleus and also certain granular bodies called Nissls granules which are helps in the stimulus conduction.
- Nerves system is composed three type.

Nerve cell- Each nerve cell has a nucleus highly specialized protoplasm. The body of the nerve cell gives rise to nervefibres.

- **Axon** – It is the main fiber when arises from the body of each nerve cell. Impulses pass through the axon in one direction only.
- **Dendrites** – These are short fibres arising from the body of the nerve cell. They conduct impulses towards the cell body synapses is the junction between axon of one nuroneand dendrites of another called dendrites.
- **Cell body**— The cell body contains cytoplasm with typical cell organelles, nucleus, and certain granular bodies called Nissls granules

## Fig; Structure of neuron



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