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Diploma in Pharmacy 1st Year
Human Anatomy and Physiology
Chapter 3 : Tissues of Human Body

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Chapter 3

Tissues of Human Body

- Tissues are a group of cells having similar structure & function.
- The study of tissue is known as Histology.
- The body is composed of four major tissue , Which differ from each other in shape, size, type of matrix present in extracellular space
- Each tissue perform different function to maintain homeostasis & its survival

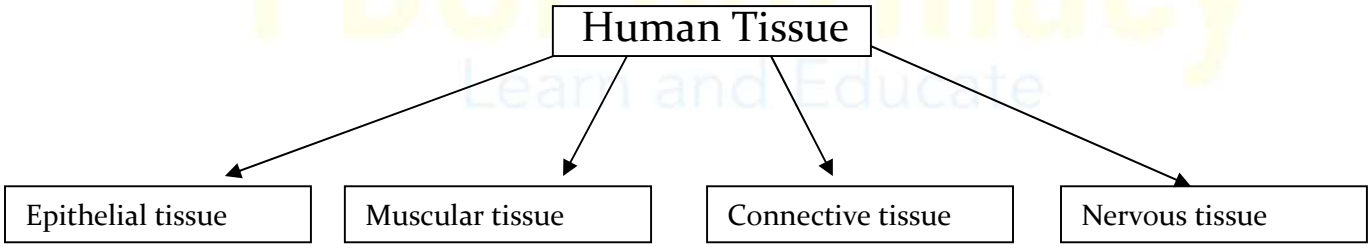
four type of tissue

- **Epithelial tissue** :- It perform the function of covering & protection.
- **Muscular tissue** :- It is responsible for the movement of body.
- **Connective tissue** :- It provides structural framework to the body.
- **Nervous tissue** :- It controls different function of the body.

❖ They together perform all the function required to support the body's system

Classification

Tissue can be divided on the basis of their cell type, amount & type of matrix in extracellular space, function they perform, and their location in body



Function

Secreation of chemical :- Substance specialised & specific substance like enzyme, harmones, & lubricating fluid are secreted from the glandular tissue in the body.

Reduction of friction :- Human ciculatory system is lined with smooth & tightly interlocked tissue which help in the friction between the walls of blood vessels & blood flow

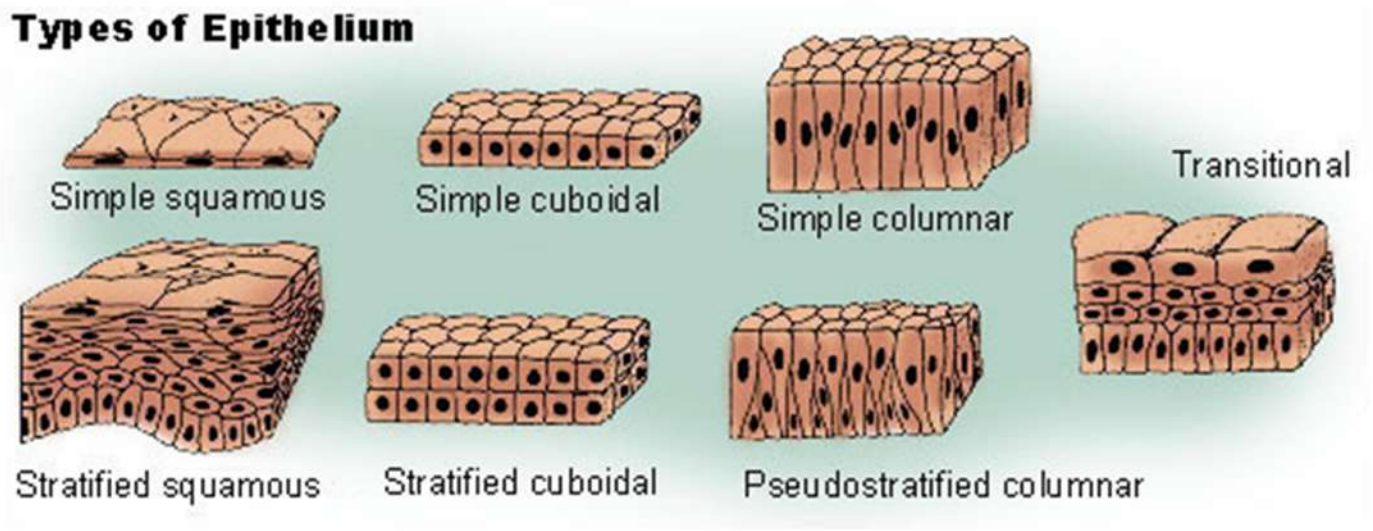
Production of body heat :- Tissue produces body heat & maintain a fluid balance in association with the muscles of whole bod

EPITHELIAL Tissues

- The epithelium or epithelia tissue covers the external body surface & lines the internal organs, Tubules, Vessels, and major body cavities.
- Cell in epithelium tissueare closely packed and arranged in one or more layer with narrow space between two cells.
- This space are filled with matrix or intercellular material.
- Which have Interstitial fluid, cells, ions, nutrients.
- The epithelical tissue have the ability to renew themselves throughout life as they contain the stem cells.
- The ability of epithelial tissue to replicate &divede holds immense significare as epithicialcell under go substantial wear & tear
- **Example :-** The epithetical cells that line the stomach, gut or the skin can be replaced, the existing ones are destoryed

Structure

Epithelial cells makeup the surface layer of the skin, mucous membrane & serous membrane



Epithelial Tissues divided into

1. Simple epithelium

Cells in simple epithelium are arranged in a single layer And furture divided

- **Simple Squamous epithelium :-** It comprises of a single layer of flat, Scale-like cells, and allow diffusion of substance through tissue.

- **Simple Cuboidal epithelium :-** It comprises of one layer of cuboid cells that rest on a basement membrane. Glands & ducts have the type of epithelium
- **Simple columnar epithelium :-** It comprises of single layer of columnar cells which are tall and slender with oval shaped nuclei located in the basal region, attached to the basement membrane.

In humans Simple columnar epithelium lines most organs of the digestive tract including the stomach & intestine.

- **Pseudostratified columnar epithelium :-** It also known as pseudo ciliated columnar epithelium. It Comprises only a single layer of irregularly shape columnar epithelium touching the basement membrane

Ciliated pseudo columnar epithelium is the type of respiratory epithelium found in the linings of the trachea as well as the upper respiratory tract, which allows filtering and humidification of incoming air

2. Stratified epithelium

→ Contain two or more layers of cells.
→ The function of this type of epithelium is mostly protective.
→ It further divided into

- **Keratinised stratified squamous epithelium :-** It comprises of tough keratia fibre in the squamous cells.

It forms the outer most layer of the skin protect the body against various external infection, such as mechanical stress, radiation, microbial peneration,etc.

- **Non - keratinised stratified squamous epithelium :-** It is the type of stratified squamous epithelium which lacks keratin.

The free surface of there cells remain moist, Such type of epithelium lining the oral cavity and pharynx, vagina, mouth, oesophagus.

It comprised of multiple layers of flattened squamous cells at the free surface or outer surface of the epithelial cells sheet

3. Startified cuboidal epithelium

- The epithelial layer consist of two or more rows of cuboidal cells and it arranged randomly over a basement membrane cells of stratified cuboidal epithelium are smaller in the height as compared that of columnar cells
- It is found in the ducts of sweat glands, over some portion of the epiglottis it plays a role in protection

4. Stratified columnar epithelium

- It is a rare type of epithelial tissue.
- Composed column shaped cells arranged in multiple layers it found in the anus and male urethra.
- It also occur in embryo
- This epithelium plays a protective role

5. Transitional epithelium

- It is a type of tissue that changes shape in response to stretching (stretchable epithelium)
- The Transitional epithelium lines the organs of the urinary system and is known here asurothelium

6. Glandular epithelium

- It is a type of epithelial tissue Which covers the glands of our body . Their main function is secretion
- Cells of Glandular epithelium May be present as a single unicellular glands or as a multicellular gland in the form of hollow follicles, clusters, or solid cords

Types of glands

- **Exocrine gland :-** These glands discharge their secretory product into ducts and they carry these secretion to the targed sites organs.
  For example secretion saliva of salivary glands are released into the mouth via salivary duct
- **Endocrine glands :-** These glands also known as ductless gland, discharge their secretory product directly into the blood or the interstitial fluid.
  For example pituitary, thyroid, and adernal glands

Function

Protection :- They protect the body from mechanical injury, excessive loss of water harmful chemicals, and from invalding bacteria.

Sensation :- Stimulus is received by specialised epithelial cells, which have sensory neuronding and are present on eyes, ears, nose , tongue and skin.

Secretion :- Epithelial tissue of glands are specialised to secreat specific chemical substances eg enzyme, hormones etc.

Absorption :- Cells of epithelial tissue of small intestine are specialised to absorb nutrients from the digested food.

Excretion :- Epithelial tissue of kidney are specialised to exacte waste product from the body,sweat glands excrete sweat via epithelial tissue.

Diffusion :- Simple epithelium form a thin lining that help in diffusion of nutrients,gases and Liquid.

Cleaning :- Dust particles and foreign bodies that enter the air passage are removed by ciliated epithelium.

Reduce friction :- Epithelial tissue of the circulatory system is smooth the cells are interlocked with each other tightly because of the friction between walls of the blood vessels and blood decrease.

Muscular Tissue

- Muscular Tissue are present in all parts of body These tissue assist the skeletal system in movement and locomotion of the body
- Contraction and relaxation are characteristics of this tissue. The pumping of blood by the heart, peristaltic movement of stomach, movement of food in gasto intestinal system, etc. are brought by the contraction of muscle
- The muscular Tissue is formed by the aggregation of muscle cells.

On the basis of muscle cells or fibres there are three types of muscles Tissue

1. **Skeletal muscles**
2. **Smooth or visceral muscles**
3. **Cardiac muscules**

Location

Tissue	Location	Function
Skeletal Muscle	Muscles that attach to bones, eyeball, and attached to other tissue including skin Eg face,thus helping in facial expressions	Posture bone and eye movement swollwing and produces body heat
Smooth Muscle	Gastrointestinal tract, blood vessels, bronchi, etc.	Movement of substance along respective tract and ducts, change of pupil and lens, diameter change of vessels
Cardiac Muscle	Heart muscle and major blood vessels	Heart contraction

Structure

- **Skeletal muscle :-** These muscle are attached to the bones and assist in there movement.
- **Visceral or smooth muscle :-** These are present in the inner lining of the body organs.
- **Cardiac muscle :-** These muscle are present in the heart.

1. Skeletal muscle

- Muscle fibres of skeletal muscles are cylindrical shaped multinucleated cell having a group of muscle fibris.
- **Example :-** Muscle of limbs and their body walls. There are joined to bones by collagen fibre bundles called tendons.
- Skeletal muscle are voluntary in nature and supplied by the cerebrospinal nerve.
- Skeletal muscle are controlled by somatic nervous system

Characteristics feature

- Cylindrical shaped with long fibres.
- Length fibres varies from several millimetres to inches.
- Width varies from 10 um -100 um.
- The fibres are arranged in bundles with in whole muscle and are known as fascicles

2.Smooth muscle

Smooth muscle fibres are thin and spindle shaped and consist of actin (thin) and myosin (thick) filaments sliding over each other in order to bring about cell's construction

Characteristics feature

- They are unstriated muscle fibres having a single nuclei.
- The muscle are involuntary in nature and are controlled by the autonomical nervous system.
- The cells of smooth muscle are splender shaped and are arranged in sheets.
- Sarcomera is absent in the smooth muscle cells.

3. Cardiac muscules

- Cardiac muscle are cross striated involuntary muscle found in myocardium of heart.
- Cardiac muscle are much like smooth muscle in terms of their function.
- Structurally are like skeletal muscle.
- These muscles help in generating contraction which are automatic and rhythmic in nature.
- Several cardiac muscle cells join end to end in a linear fashion to form a cardiac muscle
- Cells 100 um in length . 15 um in diameter

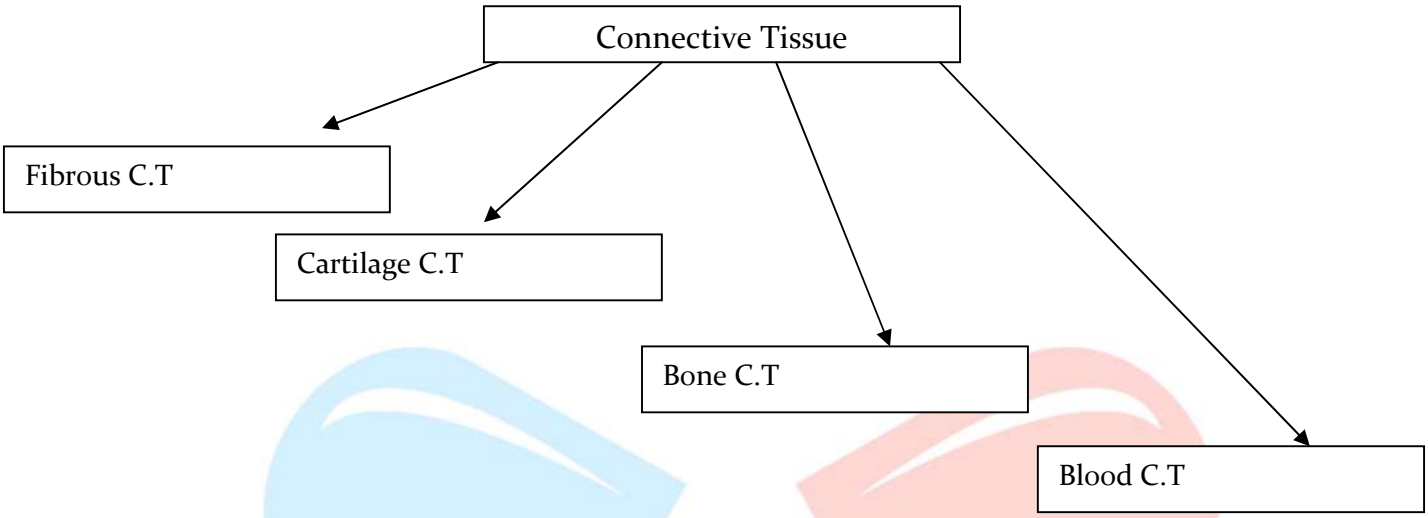
Function

- Osseous Tissue Movement . Osseous muscle tissue allows movements of joints.
- Body heat production. These tissue help in the production of a large amount of heat as well as maintenance of fluid balance of the whole body
- Body posture maintenance. Posture maintenance formation of walls of body cavity and organs support with in the cavities are all carried out with the help of muscular Tissue
- Protection. Muscles form a protective layer around different organs, Tissue as well as blood vessels
- Expression. Expression of felling, throughts,etc are processed by the brain and perceived by the muscles
- Example. It is displayed in the form of expression in face

Connective tissue

- Connective tissue, group of tissue in the body that maintain the form of the body and its organs and provide cohesion and internal support
- Connective tissue is the most diverse and wider tissue in the human body
- Connective tissue have extensive amount of extracellular matrix embebbed with cells, fluid and different kinds of fibres
- These substances are known as ground substance

Connective tissue can be classified as



1. Fibrous connective tissue

This is the most diversified type of connective tissue and is also known as fibro-connective tissue or connective tissue. Futher divided into

- **Loose fibrous connective tissue Areolar**

- It was earlier referred to as Areolar tissue
- It is named as loose tissue due to its property of strechability
- Which connects several adjacent body structure by acting as elastic glue thus allows movements
- Loose fibrous connective tissue also has white blood cells or leukocytes

2. Cartilage tissues

- Cartilage tissue have only one type of cells which also known as chondrocyte.
- Chondrocyte produce the fibres and the tough,rubbery ground substance of cartilage.

Types of cartilage tissue

- Hyaline cartilage tissue
- Fibro cartilage tissue
- Elastic cartilage tissue

3. Bone tissue

- Bone is a hard connective tissue and is also known as osseous Tissue.
- Matrix of bone mainly consists of collegen fibres and mineral salt crystals.
- Hardness of bone due to the presence of there mineral crystals.
- Bone tissue are oragan of the skeletal system.
- Which provide support and protective to the body.
- It also serves as a site of attachment for muscles.

Types of bone tissue

- **Compact bone tissue :-** This bone tissue forms the hard shell of bone and is also known as cotical bone forms the hard external layer of all bones and surrounded the medullary cavity or bone marrow
- **Cancellous (spongy) tissue :-** On the inner side many bones have a lattice of thin beams of cancellous bone tissue.This thin beams or tubicular, form a frame work that supports soft tissue

4. Blood tissue

- Blood is a liquid connective tissue which is very different form all the other connective tissue
- Blood is mainly composed of
  - **Plasma :-** It is a liquid portion and form around 55% of blood
  - **Blood cells :-** It forms a solid portion of the blood and account for the remaining 45% of blood
    RBC or erythrocytes
    WBC or leukocytes
    Platelets or thrombocytes

Function

- Various functions of the connective tissue include.
- They connect different tissue of the body.
- They support various tissue, organs,and structure of the body.
- They bind together various organs of the body.
- Blood helps in defending the body against foreign substance.
- It transport substance and respiratory gases from one body part to the other body part.

Nervous tissue

- The nervous system is specialised in rapid regulations, integration,and coordination of activities of various body parts
- All the body cells have the property of excitability, irritability and conductivity but the cells of nervous tissue are much more advanced than any other type of tissue
- These tissues are responsible for rapid communication and coordination between various parts of body
- The nervous or nerve cells are functional and structural unit of nervous tissue
- These cells are specialised to receive stimulus to conduct impulses and to bring response against any stimulus
- The nervous tissue together forms organs of nervous system i.ebrain,spinal cord and nerves

Location

Location of cells of Nervous Tissue	
Neurons	Central and Peripheral neurons and nerve fibres
Supporting Cells	Astrocyte in C.N.S Microglia cells in brain Schwann cells in Peripheral nervous system

Function

- The stimuli are sensed in both internal as well as external environment by the bcells of nervous tissue.
- They help in the transmission of impulse from the CNS to muscles.
- They help in impulse transmission to the involuntary glands and muscles.

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