

Tissues – Chapter 4

A tissue is a group of cells having similar structure and function.

Study of tissues is Histology.

There are 4 basic types of tissues. Epithelial, Connective, Muscular and Nervous

Epithelial Tissues

Epithelial Tissues are surface forming tissues. These can cover external or internal surfaces of body or organs. These lie on a common basement membrane.

	Simple Epithelium	Stratified Epithelium
1. Structure	1-layered	2-many layered
2. Function	Absorption or secretion	Protection against wear-tear
3. Examples	Squamous, Cuboidal, Columnar	Epidermis, Lining of bladder

Intercellular Junctions

3 important inter-cellular junctions are present between cell membranes of neighboring cells:

Desmosomes, Tight Junctions and Gap Junctions.

Desmosomes: small specialized areas with interlocking proteins between 2 membranes and help to hold cells of tissue together.

Tight Junctions lie near the outer margin of epithelial cells and stop outflow of intercellular fluid.

Gap Junctions: have regulated openings between neighboring cells and help in transfer of ions and small molecules.

Classification of Epithelial Tissues

Epithelia are classified on the basis of number of layers (simple or stratified) and the shape of cells (Squamous, Cuboidal and Columnar).

Simple Epithelium	Squamous	Cuboidal	Columnar	Pseudostratified
1. Cell Shape	Flat and scale like	box-like, as tall as wide	Tall and column shaped	Varied height 2 or 3 levels
2. # of layers	1-layered	1-layered	1-layered	1-layered, Look like stratified
3. Example	Lining of blood vessels, lungs	Kidney tubules, gland ducts	Inner lining of intestine	Lining of trachea

Transitional Epithelium

Transitional Epithelium is many layered like normal stratified but its cells can stretch. When it is stretched the number of layers is less than when epithelium is tension free. It lines the lining of ureters and bladder.

Stratified Epithelium

Stratified Epithelium is 2 - many layered. Most common is Squamous Stratified Epithelium. The basal layers are living and mostly columnar or Cuboidal. But the outer layers are flat and scale like, when living

the epithelium is called Non-keratinized like the lining of mouth cavity and when dead due to accumulation of protein keratin the epithelium is keratinized like the epidermis of skin.

Recap-1 Chapter-4

1. Epithelial cells have no blood supply = ----- and have -----orientation.
2. -----epithelial tissues are 1 layered and ----- are many layered E.T
3. ----- and ----- are 2 examples of intercellular bridges in between Epithelial cells.
4. -----and -----may be the surface structures on epithelial cells.
5. -----glands secrete by vesicles (no damage to cell); -----glands lose apical part of cell; and -----glands release whole cell with vesicles
6. Epithelial cells have basal end lying on a -----membrane and -----ends.
7. Shapes of cells in simple epithelium may be -----, ----- or -----.
8. -----, -----, and -----are types of simple epithelium.
9. -----epithelium is specialized for secretion or absorption and ----- epithelium is specialized for protection against wear and tear.
10. Sweat glands are ----- and oil gland in skin are -----and breast glands are ----- in nature of secretion.
11. -----epithelium lines bladder and can change # of layers in it.
12. -----epithelium lines trachea and is 1-layered but looks 2-3 layered

Glands – exocrine / endocrine

Exocrine Glands, on the basis of secretion, are of 3 kinds. Holocrine – If all the cell contents are released at same time, for example Sebaceous glands. Apocrine – Secretory vesicles accumulate in apical part of cell and released at same time, damaging the apical part of cell; for example sweat glands opening on main surface of skin. These glands have watery secretion. Merocrine – Secretory vesicles do not get stored and release contents by exocytosis causing no damage to cell; for example sweat glands opening into axilla, areola and groins. These have odorous sweat.

Connective Tissues

Classification of connective tissues is based on the nature of matrix. There are 3 main types.

Important

Connective Tissue Proper: has a semisolid jelly like matrix. Cartilage has solid matrix and is avascular. Bone has solid matrix but has is vascular (has blood supply). Blood has fluid matrix called plasma. Study the common embryonic origin, descendant cells, classes, subclasses, matrix components and functions of different connective tissues.

Loose / Dense connective tissue

	Loose Connective Tissue	Dense Connective Tissue
1. Arrangement of fibers	loose	Dense
2. Types	Areolar, adipose, reticular	Regular – tendon, ligaments Irregular-dermis of skin

Connective Tissue Proper

Areolar C.T. is loose connective tissue proper. Study well and remember description, function and location.

Adipose C.T. is loose connective tissue proper. It stores fats inside cells which look like rings with single gem.

Reticular tissue is loose Connective tissue proper. It forms a delicate network inside most lymphatic organs like spleen.

Dense Connective Tissue

Regular: dense C.T. are 2 types

Tendon – rich in Collagen fibers and join muscle to bones

Ligaments – rich in elastin fibers and join bone to bone

Supporting Connective Tissues

Supporting Connective Tissues include cartilage and bone. These provide a strong framework for the body. These have a solid matrix and cells are present in spaces = lacunae. Cartilages are avascular but bones are vascular.

Cartilages

Cartilage: Chondro = cartilage, chondrocyte = cartilage cells, perichondrium = covering of cartilage formed of cells and fibers. Cartilages are avascular = lack blood supply. Cartilage has 3 kinds. The matrix is liquid having protein, polysaccharide and water.

3 Types of Cartilages

	HYALINE CARTILAGE	ELASTIC CARTILAGE	FIBROCARILAGE
1	Covers bone ends, tips of ribs, larynx, trachea	Auricle of ear and epiglottis	Pads b/w vertebrae, knees, pubic bones
2	No fibers observed in matrix	Elastic fibers visible in matrix	Collagen fibers visible in matrix
3	Provides stiff but flexible support, reduces friction b/w bones	Supports but tolerates distortion without damage	Resists compression, prevents bone to bone contact

Bone

Bone: Osteo = bone, osteocyte = bone cell, osteoblast = bone forming cell , osteoclast = bone breaking cell, Periosteum = covering of bone formed of cells and fibers.

Bone is a tough skeletal tissue matrix is formed of calcium salts with small amount of liquid around them. Collagen fibers are dominant. Osteocytes are present in lacunae arranged around central canals. The canal has blood supply in it.

Membranes

	Mucous membrane	Serous membrane	Cutaneous membrane	Synovial membrane
1	Lines cavities, open outside	Lines sealed cavities	Lines surface of body	Lines joint bone cavity
2	Surface kept moist all time	Parietal and visceral portions in close contact	Stratified epithelium, dense layer of Conn.T.	Joint cavity is lined by synovial membrane
3	Covered with mucous	Has watery fluid	Dry, prevents water loss	Synovial fluid
4	Respiratory, digestive, urinary, reproductive cavities	Pleura – lungs; pericardium – heart; Peritoneum – abdominal cavity – stomach, liver	Skin outer part <u>epidermis</u> stratified epithelium, inner part <u>dermis</u> loose connective tissue	All freely movable joints have them, knees, shoulder joint

Muscle Tissue

Muscles are specialized tissues for contraction. Sarco = muscle, Sarcolemma = covering of muscle,

muscle fiber = specialized cell formed of hundreds of Myofibrils. 3 kinds of muscle fibers, skeletal, cardiac and smooth

3 Types of Muscle Tissue		
Skeletal muscle fibers	Cardiac muscle fibers	Smooth muscle fibers
1. Long, cylindrical	Short, branched	Short, spindle shaped
2. Multinucleate, peripheral	Uninucleate, central nuclei	Uninucleate, central
3. Striations present	Striations present	No striations
4. Moves or stabilizes bones	Pumps blood	Moves food, urine, semen
5. Guards body openings	maintains blood pressure	regulates size of air and blood passages

Nerve Tissue

Nerve or Neural Tissue: It has 2 kinds of basic cells. 1 – Neurons 2 – Neuroglia.

Neurons are cells that conduct information in the form of electrical disturbances = Nerve impulses.

These cells are very long. Fig 4-14 depicts the main parts. Cell body has the nucleus. Many extensively branched appendages, Dendrites, are attached to cell body. These receive nerve impulses from other neurons. Axon is a very long appendage attached to cell body. It has branches at end bearing synaptic terminals. Axon passes on the nerve impulse to other neurons or muscles or glands through synaptic vesicles.

Neuroglia

Neuroglia are non-conducting cells. These are supporting cells and help in keeping the brain and spinal cord free of debris and germs; nourishing the neurons and play role in insulation of nerve fibers. There are 4 types of Neuroglia. **Astrocytes** are supporting and nourishing cells. **Oligodendrocytes** form neurilemma sheath around nerve fibers. **Microglia** are phagocytes and remove debris. **Ependymal cells** line central canal of spinal nerve cord.

Recap 2 Chapter 4

- and-----are 2 types of fluid connective tissues.
- , -----, and ----- are 3 kinds of cells found in loose C.T.
- fibers are straight, long, unbranched strong but flexible.
- fibers are branched and wavy and contract back after extension
- tissue is an example of connective tissue proper.
- tissue stores fats for energy.
- join bones to bones and -----join muscles to bones.
- cartilage lines joints, -----forms discs b/w vertebrae.
- Bone has -----in spaces called lacunae; bone is covered by -----.
- muscle fibers are branched and have ----- discs at ends.
- muscle fibers are single celled without any striations.
- muscle fibers are multicellular and have distinct -----.
- are neural cells that nourish and support -----.
- membrane lines inside intestine and ---membrane lines outside it.
- membranes line freely movable joints like knee and shoulder.