

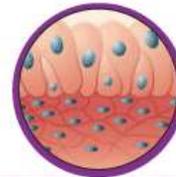
TISSUE

# Tissue

- ▶ It consists of a large no of same type of cells.
- ▶ According to the size, shape & functions of their constituent cells, tissue is of 4 main types
  - ▶ Epithelial
  - ▶ Connective
  - ▶ Muscular
  - ▶ Nervous

## FOUR TYPES OF TISSUES

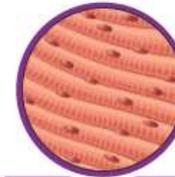
BYJU'S  
The Learning App



Epithelial tissue



Nervous tissue



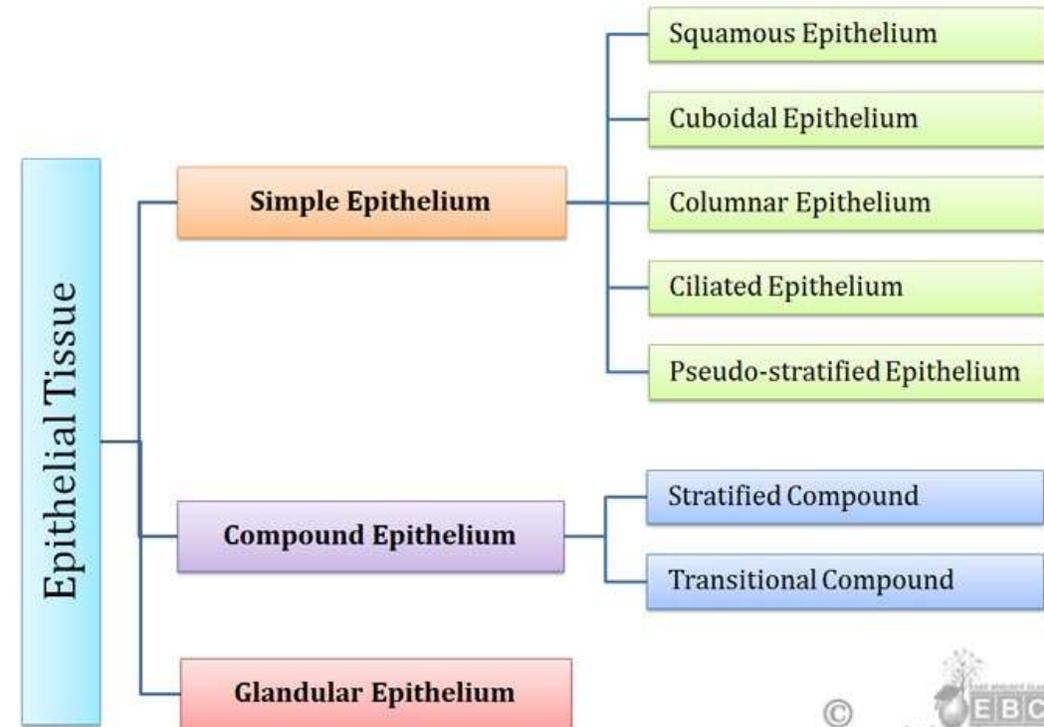
Muscle tissue



Connective tissue

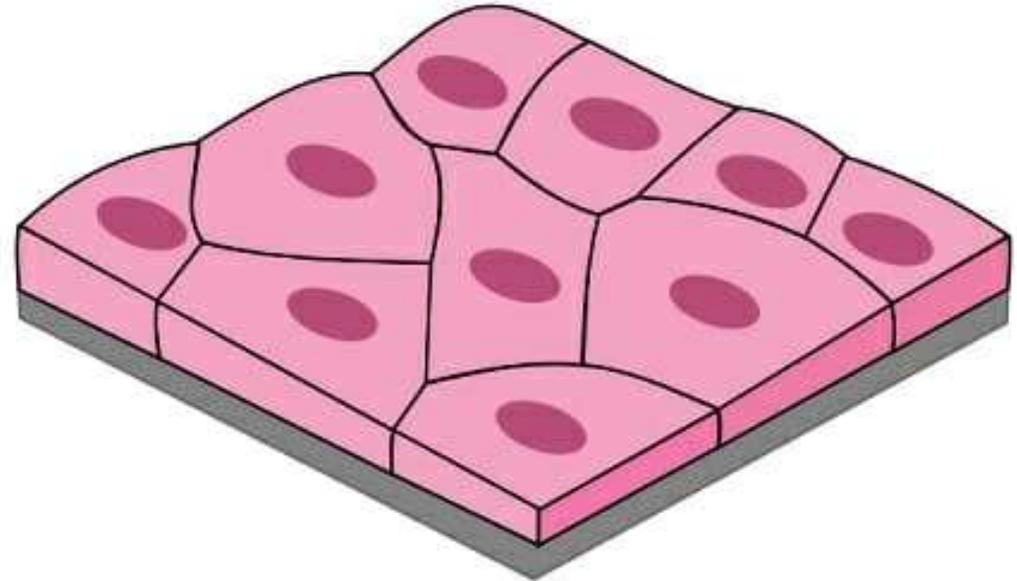
# Epithelial tissue

- ▶ The cells are very closely packed.
- ▶ There is low intercellular substance is present i.e. matrix .
- ▶ The cells lie on a basement membrane, made up of epithelial cells



# Simple Epithelium

- ▶ Single layer of identical cells present
- ▶ Usually found on absorptive or secretory surface
- ▶ According to the shape of the cells, they are of 3 types.
  - ▶ Squamous
  - ▶ Cuboidal
  - ▶ Columnar



# Simple Squamous Epithelium

- ▶ Composed of a single layer of flattened cells lying on basement membrane.
- ▶ Cells are closely packed.
- ▶ Form a thin & smooth membrane.
- ▶ Diffusion occurs very easily
- ▶ Forms the lining of heart, blood vessels, lymph vessels, alveoli, collecting duct.

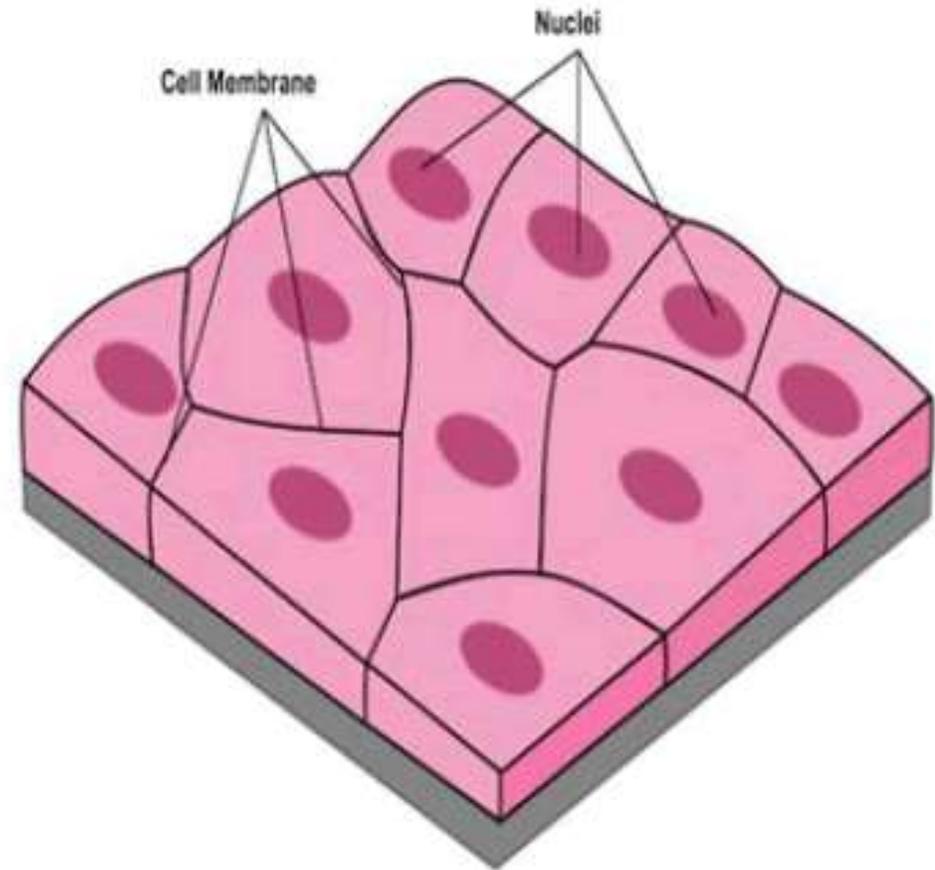


Figure 1. Simple squamous epithelium.

# Simple Cuboidal Epithelium

- ▶ Composed of a single layer of cube shaped cells lying on basement membrane.
- ▶ Very closely packed.
- ▶ Forms the wall of kidney tubules, glands.
- ▶ The cells are involved in secretion, absorption, excretion.

Simple Cuboidal Epithelium

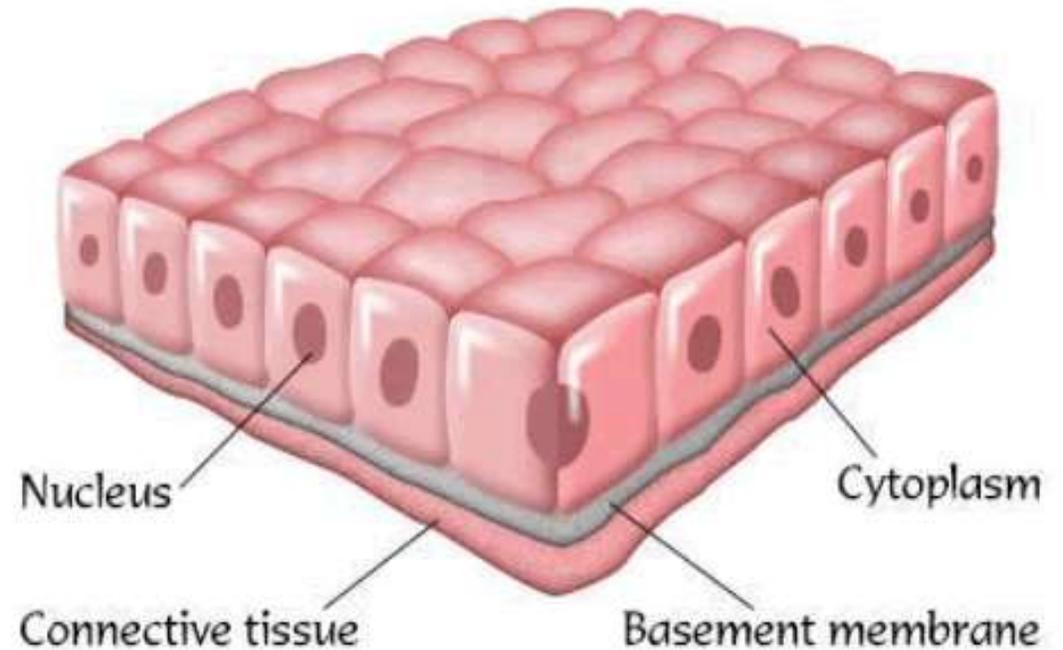
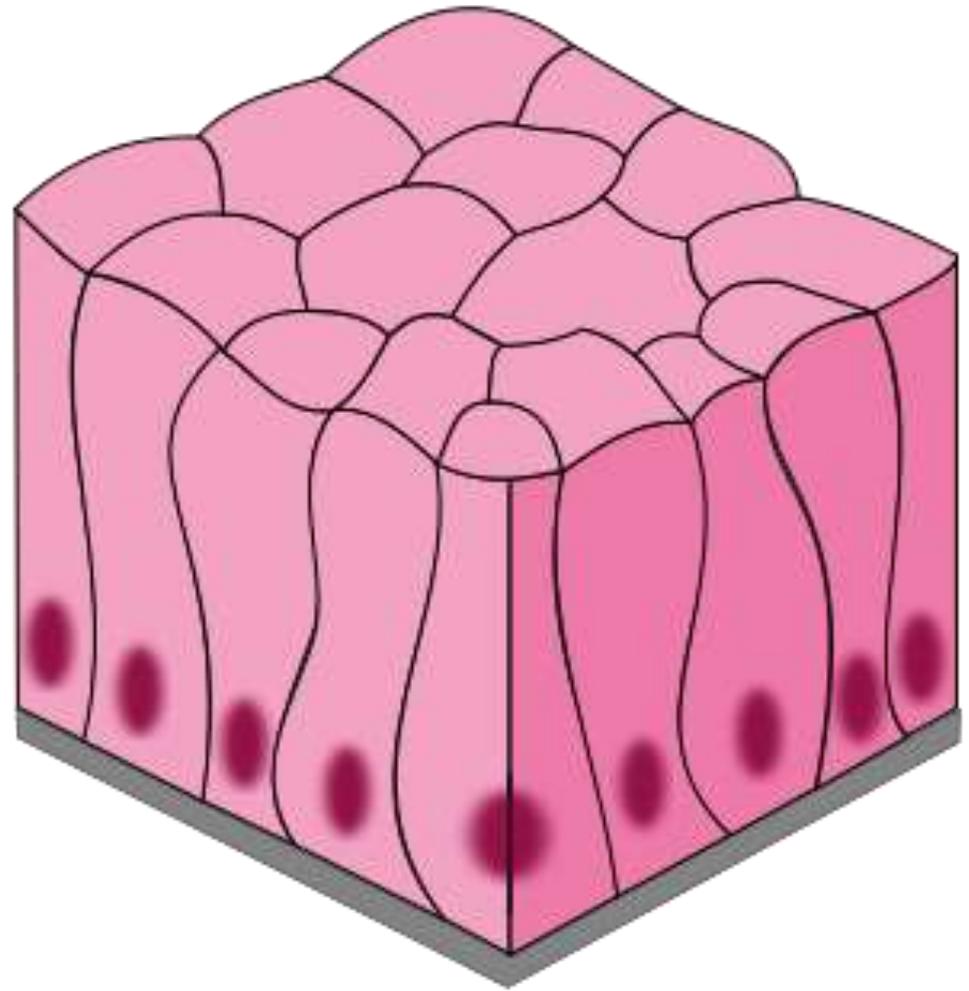


Figure 2. Simple cuboidal epithelium.

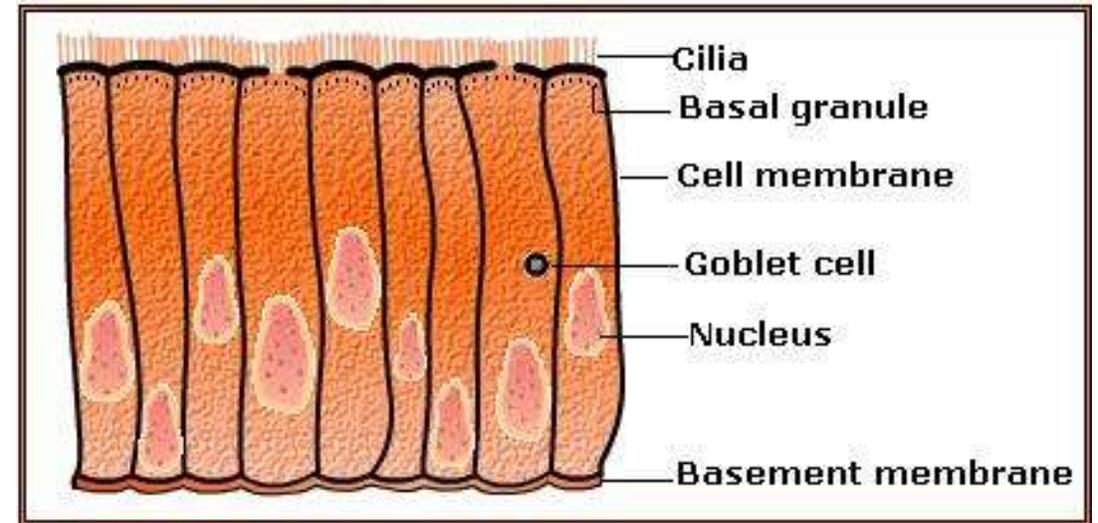
# Simple Columnar Epithelium

- ▶ Single layer of tall, thin cells on a basement membrane.
- ▶ Found in lining of stomach, small intestine, trachea.
- ▶ The cells show specific action at specific site.
  - ▶ In trachea, goblet cells secrete mucus
  - ▶ In small intestine, microvilli helps absorption



# Ciliated epithelium

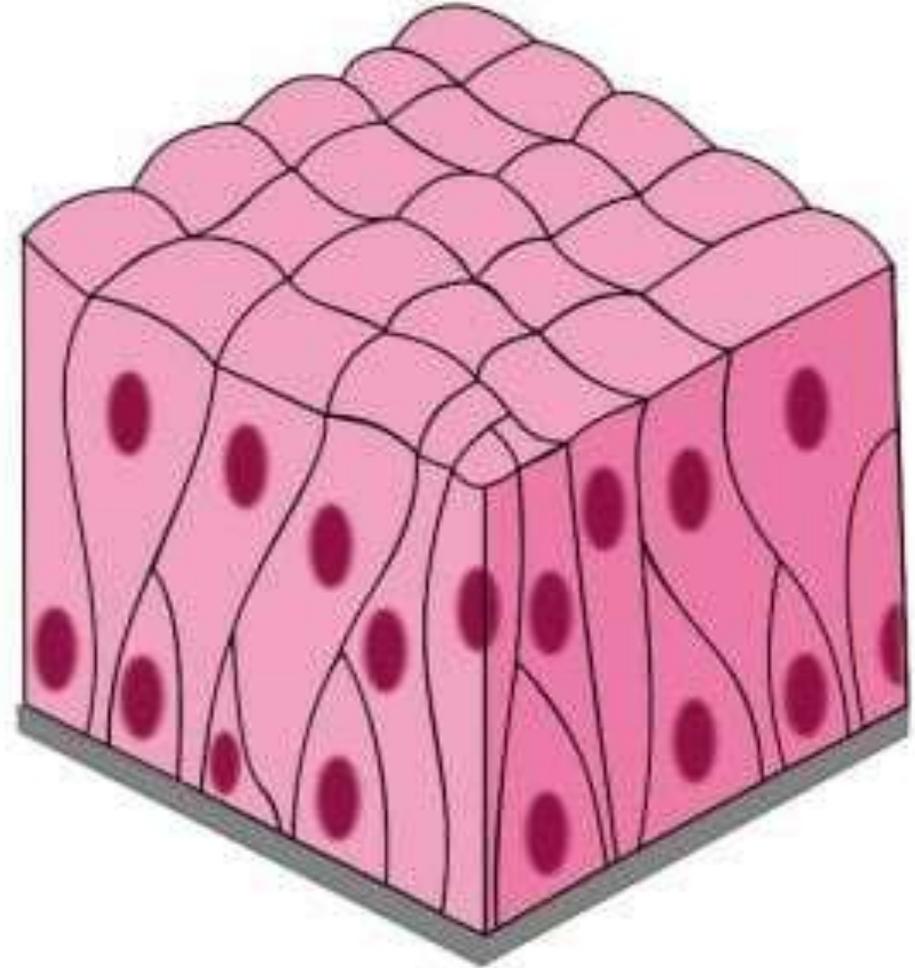
- ▶ Single layer of ciliated column-like cells with nuclei near base; contains goblet cells in some locations.
- ▶ **Location:-** Lines some bronchioles (small tubes) of respiratory tract, uterine (fallopian) tubes, uterus, efferent ducts of the testes, some paranasal sinuses, central canal of spinal cord, and ventricles of the brain.
- ▶ **Function:-** Moves mucus and other substances by ciliary action.



Ciliated epithelium

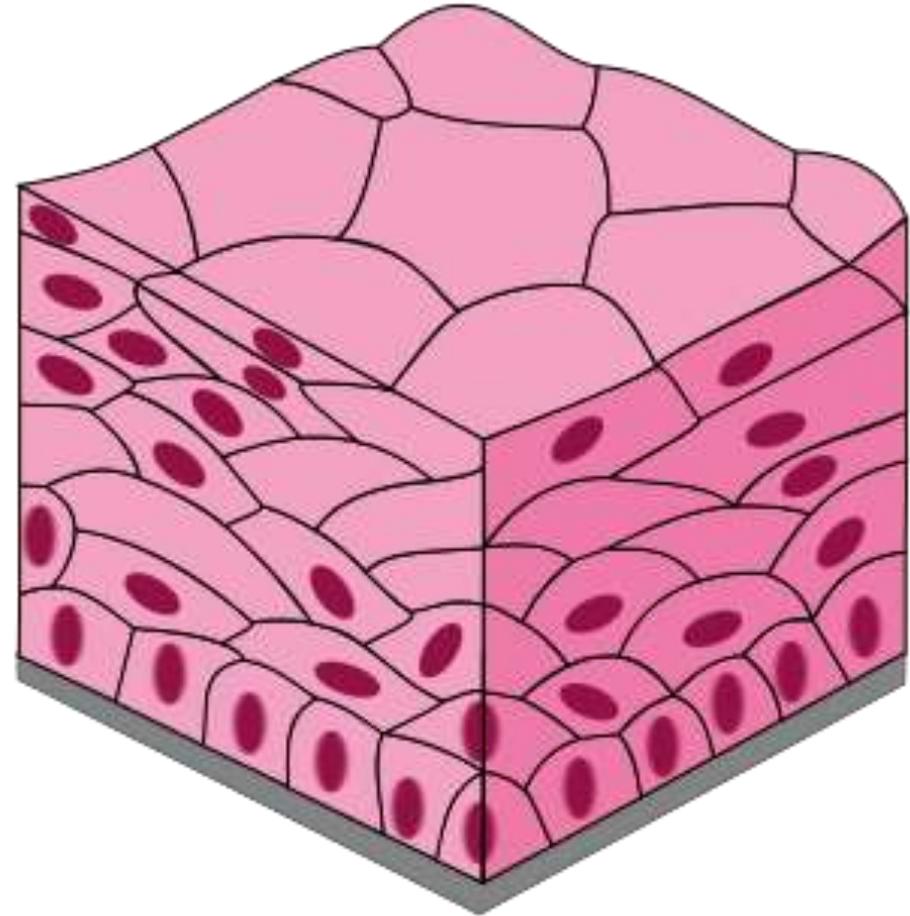
# Pseudostratified Epithelium

- ▶ Pseudo= false, stratified= multilayered.
- ▶ As the name suggest there is false appearance that the epithelium is multilayered. In fact some cells are short while the others are tall but all the cells rest on basement membrane .
- ▶ e.g. epithelial lining of trachea, lines larger ducts of many glands, epididymis and part of male urethra
- ▶ **Function:** Secretion and movement of mucus by ciliary action



# Stratified Epithelium

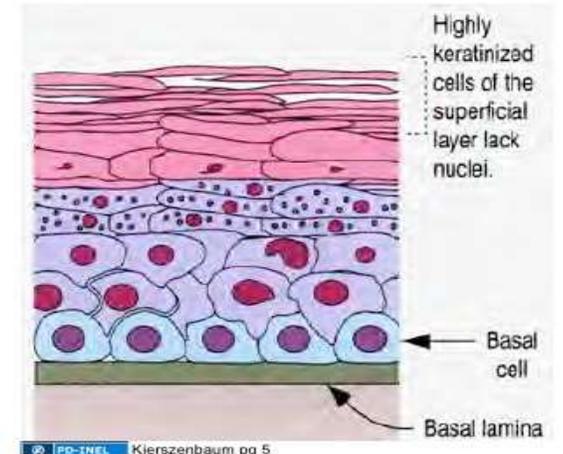
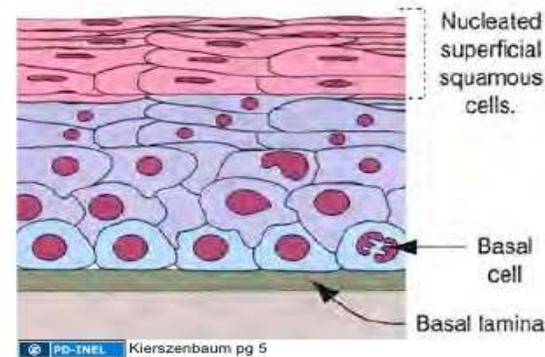
- ▶ Several layers of cells of different shape.
- ▶ Also known as compound epithelium.
- ▶ Continuous cell division occurs in the lower layer, so the cells go nearer to surface & shed there.
- ▶ Protect underlying structure from mechanical wear & tear.
- ▶ 2 main types
  - ▶ Squamous
  - ▶ Transitional



# Stratified Squamous Epithelium

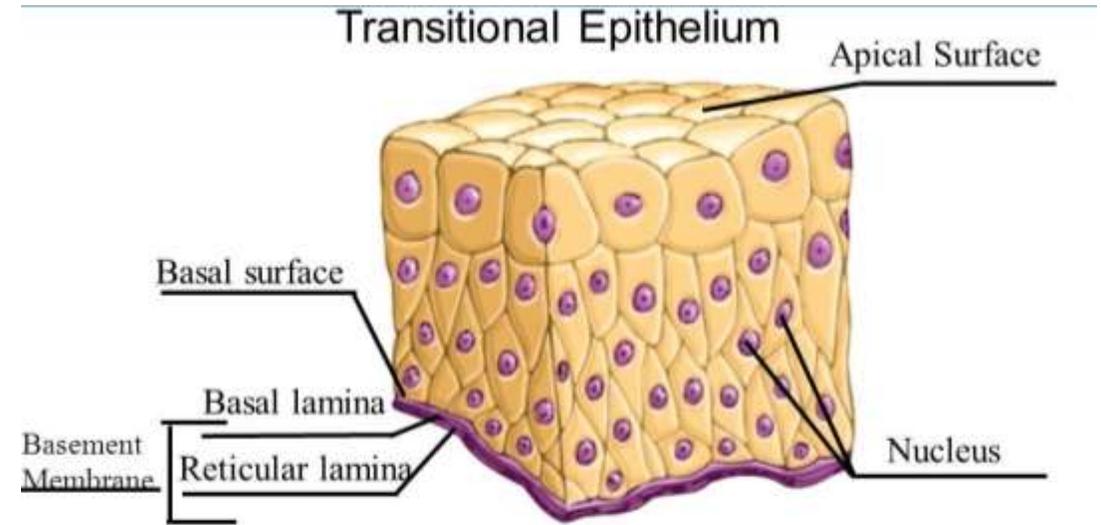
- ▶ In the deepest layer columnar cells are present
- ▶ Grow towards the surface & become flattened.
- ▶ Again it is divided into 2
  - ▶ Keratinised
    - ▶ found in dry surface i.e. skin, nails, hair
    - ▶ Protecting layer that prevents drying
  - ▶ Non-keratinized
    - ▶ Found in moist surface i.e. conjunctiva of eye, pharynx, mouth, oesophagus, vagina.

## Stratified Squamous Epithelium non-keratinized      keratinized



# Stratified Transitional Epithelium

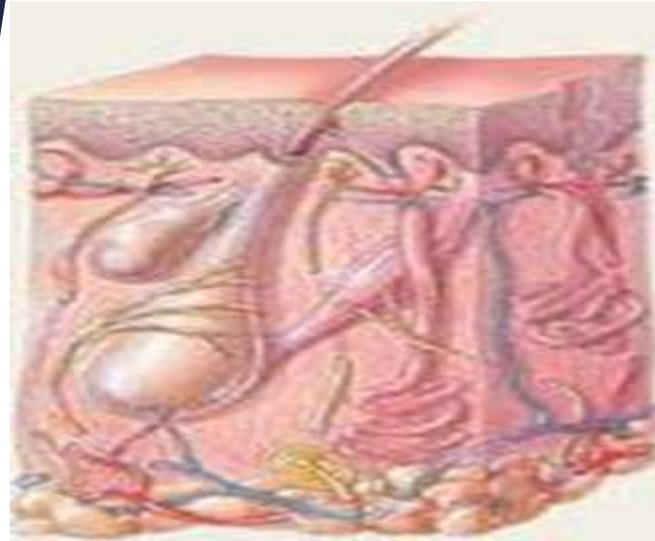
- ▶ Composed of pear shaped cells
- ▶ Lines urinary tract, bladder
- ▶ Allowed for stretching when bladder fills.



# Glandular Epithelium

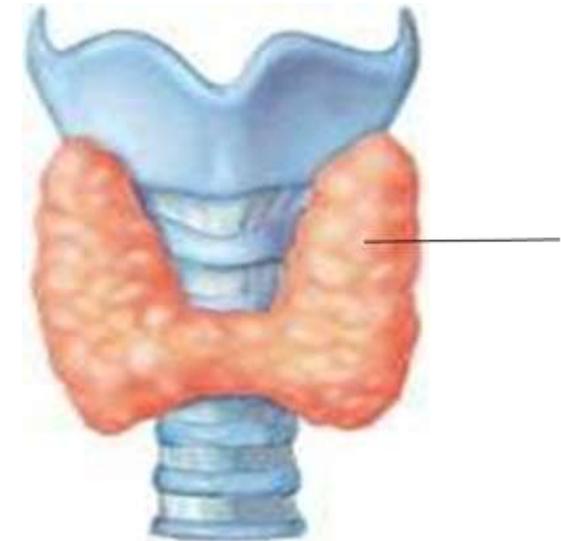
- ▶ The function of glandular epithelium is secretion
- ▶ composed of glandular cells
- ▶ lie deep to the covering and lining epithelium.
- ▶ A **gland** may consist of a single cell or a group of cells that secrete substances into ducts (tubes), onto a surface, or into the blood.
- ▶ All glands are classified into
  - ▶ **Endocrine glands**(Secretes hormones into blood)
  - ▶ Eg:- pituitary gland, pineal gland, thyroid and parathyroid glands, adrenal glands, pancreas, ovaries, testes.
  - ▶ **Exocrine glands**(Produce substances such as sweat, oil, earwax, saliva, or digestive enzymes onto surface or into body cavities.)
  - ▶ Eg:-Sweat, oil, and earwax glands, salivary glands, pancreas.

SKIN



EXOCRINE GLAND

THYROID GLAND



ENDOCRINE GLAND

# Connective Tissue

- ▶ One of the most widely distributed tissues in the body
- ▶ Functions
  - ▶ Bind together, support & strengthen other body tissue.
  - ▶ Protect & insulate internal organs
  - ▶ Compartmentalized structures i.e. skeletal muscles
  - ▶ Major transport system within the body
  - ▶ Primary locations for stored energy
  - ▶ Main source of immune responses

**CONNECTIVE TISSUE**

**LOOSE or AREOLAR** This loose connective tissue consists of small fibroblasts (1), small (2) and irregular fibers, as well as various cells in all the connective tissues. Found in the skin and around blood vessels, glands, and organs. (200 X)

**ADIPOSE** This loose connective tissue consists of large, spherical cells (1) and small fibers (2). Found under skin, around organs, and in the breasts. (200 X)

**RETICULAR** This loose connective tissue consists of a network of reticular fibers (1) that form the framework for all organs. Found in the spleen, liver, and lymph nodes. (200 X)

**ELASTIC** This tissue has many elastic fibers (1) and collagenous fibers. Fibroblasts are found between fibers. Found in walls of the aorta, trachea, vocal cords and bronchial tubes. Occurs in the wall of the human aorta. (200 X)

**DENSE or COLLAGENOUS (regular)** Parallel collagenous fibers with fibroblasts (1) between fibers. Found in tendons, ligaments, and aponeuroses. (200 X)

**DENSE or COLLAGENOUS (irregular)** This tissue has an irregular array of collagenous fibers, containing some elastic fibers and fibroblasts. Found in dermis, submucosa of digestive tract, and fascia. (200 X)

**HYALINE CARTILAGE** This tissue is composed of collagenous fibers (1) and chondrocytes (2). Found in costal cartilage of ribs, nose, trachea, ends of long bones, and articular surfaces. (200 X)

**ELASTIC CARTILAGE** This tissue is similar to hyaline cartilage but has many elastic fibers (1). Found in epiglottis and in external ear. (200 X)

**FIBROCARILAGE** This tissue contains collagenous fibers (1) and elastic fibers (2) and is found in the intervertebral discs, the knee joint, and in the ligaments. (200 X)

**BLOOD** This tissue consists of blood plasma and formed elements (1). (200 X)

**BONE** This tissue is composed of calcium salts, collagenous fibers, and osteocytes in lacunae. Occurs in human bone. (200 X)

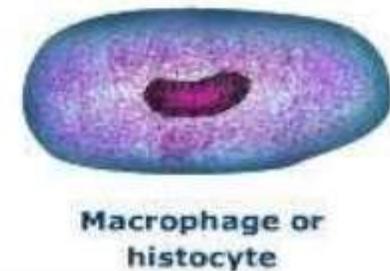
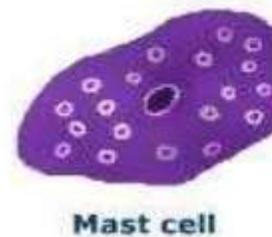
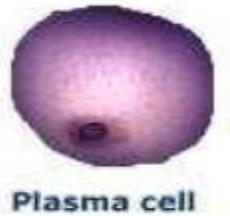
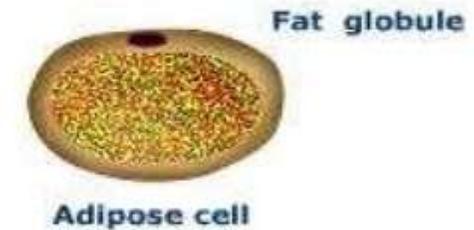
**EMBRYONIC (mesenchymal)** This tissue is found primarily in the embryo and gives rise to all adult connective tissues. (200 X)

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# Features

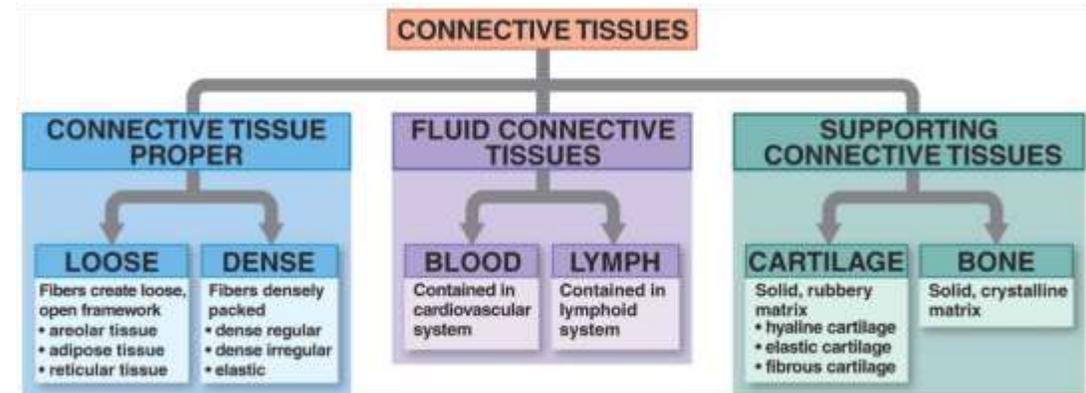
- Highly vascular
- Rich blood supply
- Consists of 2 basic elements:-
  - 1) Extracellular matrix (material located between its cells)
  - 2) Cells( produce cells of connective tissue)
- According to the type of tissues cells are of following types
  - Fibroblast
  - Macrophages
  - Plasma cells
  - Mast cells
  - Adipocytes
  - WBC

## ▶ Cells in connective tissues



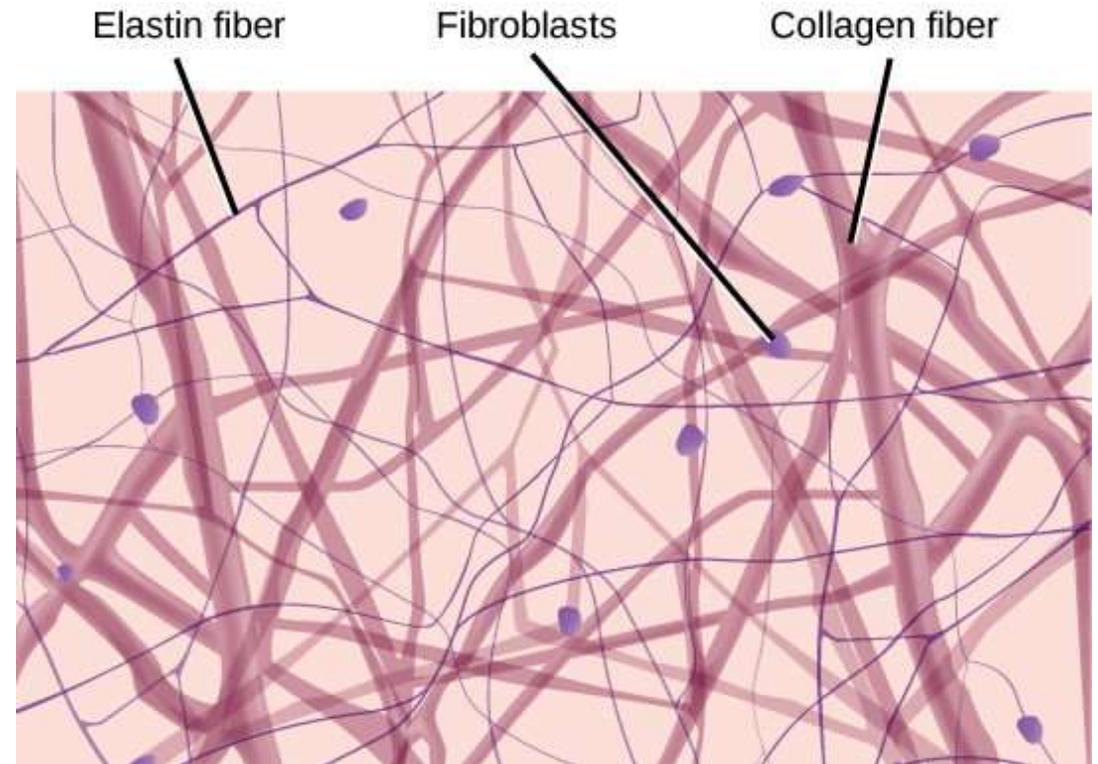
# Classification

- ▶ According to the proportion of cells & extracellular matrix
- ▶ Mature
  - 1) Loose CT
  - 2) Dense CT
  - 3) Cartilage
  - 4) Bone
  - 5) Fluid



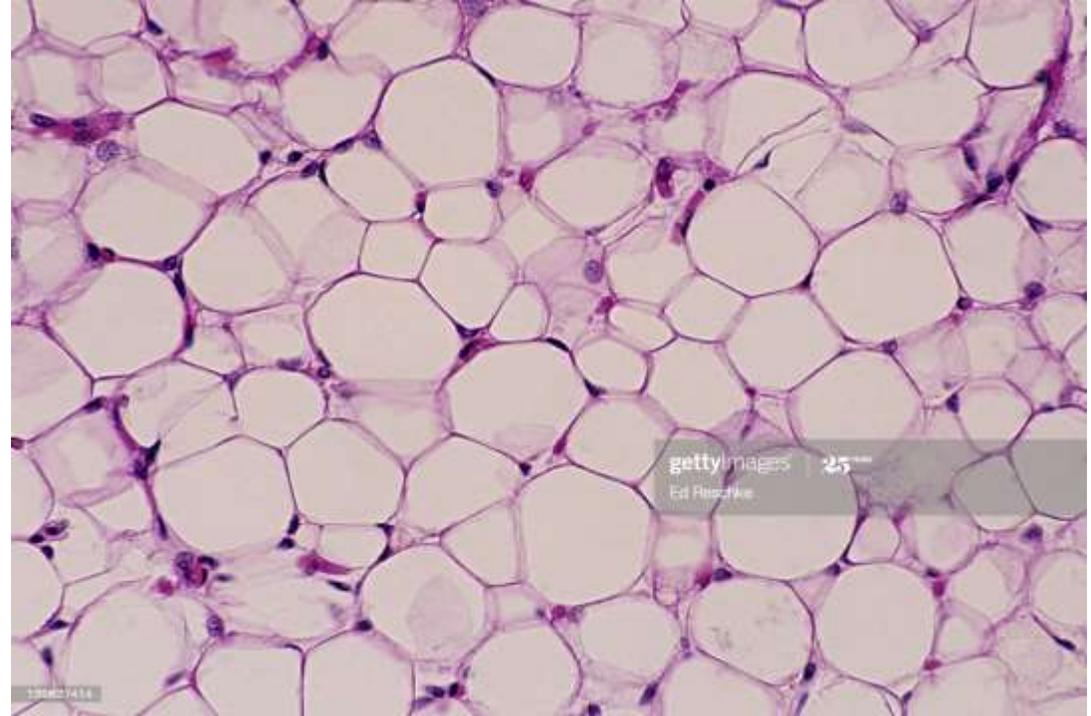
# Loose Areolar Connective Tissue

- ▶ Fibroblasts, adipocytes, mast cells, macrophages embedded with semifluid ground substance.
- ▶ They are separated by elastic & collagen fibers.
- ▶ Location- skin, muscles, blood vessels, nerves, alimentary canal
- ▶ Function- strength, elasticity, support



# Loose Adipose Connective tissue

- ▶ Derived from fibroblasts
- ▶ Specialized storage of triglycerides
- ▶ Cells contain fat droplets, cytoplasm, nucleus
- ▶ 2types
  - ▶ White AT-found in obese people
  - ▶ Found in subcutaneous layer of skin, heart, kidney, eyeball
  - ▶ Function-heat reduce, energy reserve, protect organs, Secrete leptin
  - ▶ Brown AT- darker due to very rich blood supply
  - ▶ Found around the shoulder, neck, kidney
  - ▶ Generate heat to maintain body temp



# Loose Reticular Connective tissue

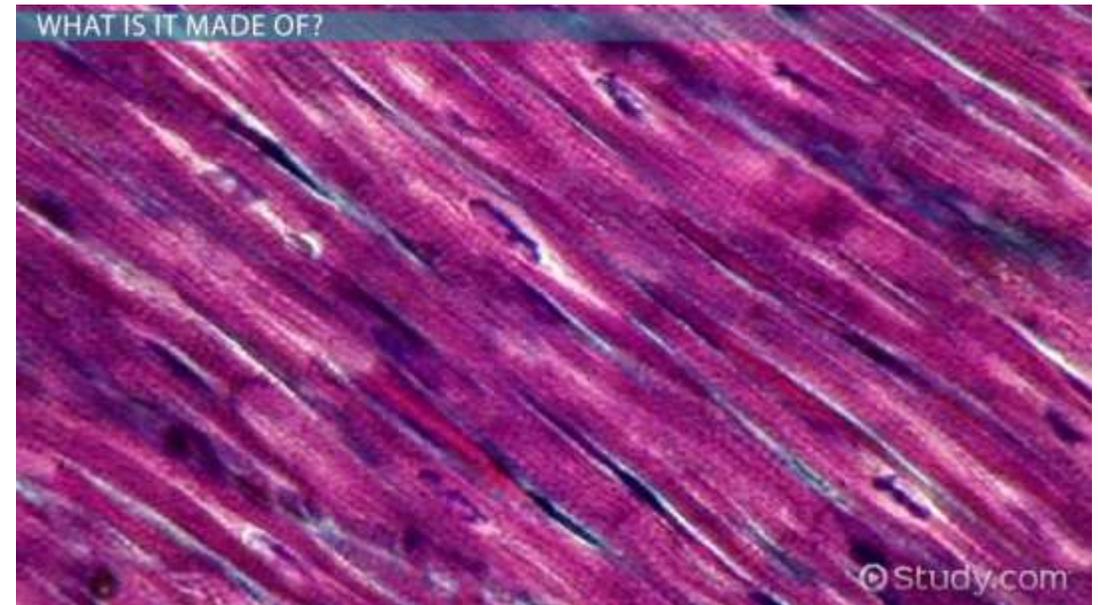
- ▶ Fine branching reticular fibers, reticular cells, semisolid matrix.
- ▶ Location- liver, spleen, lymph nodes, rbm, blood vessels
- ▶ Function-
  - ▶ binds with smooth muscle tissue cells,
  - ▶ Removes worn out blood cells in spleen & microbes in lymph nodes

## RETICULAR CONNECTIVE TISSUE



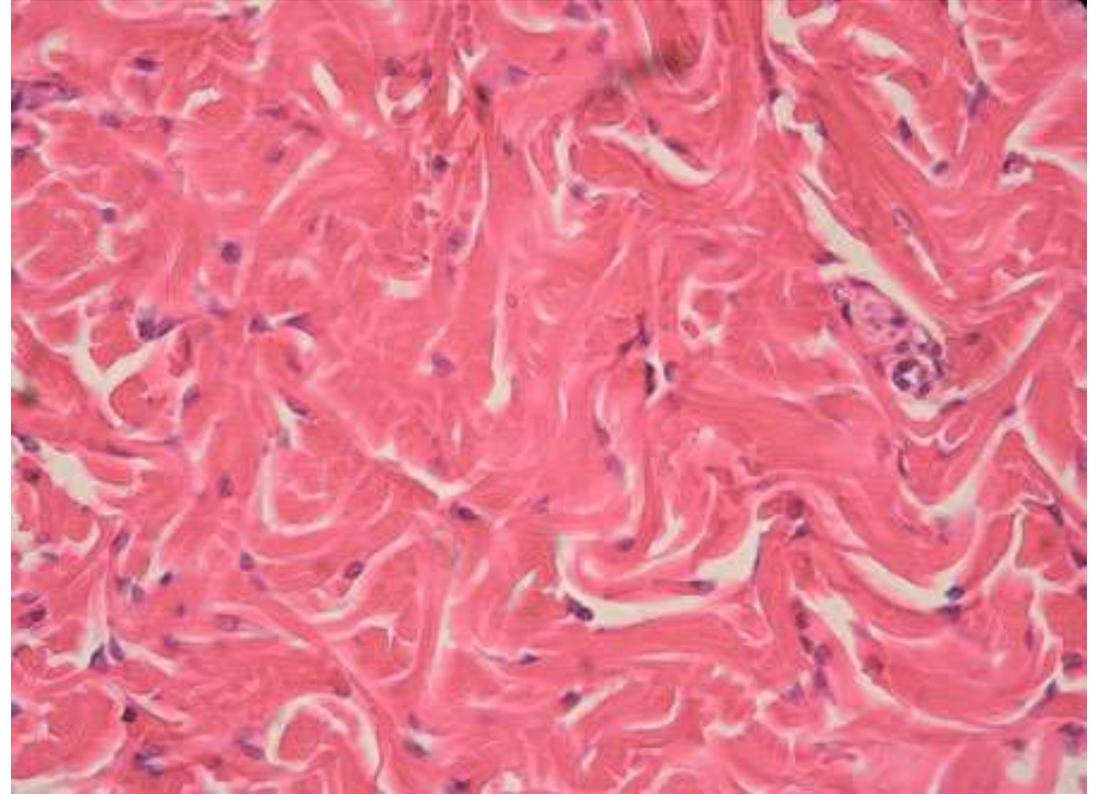
# Dense Regular Connective Tissue

- ▶ Shiny white extracellular matrix, collagen fiber
- ▶ Regularly arranged in bundles with fibroblasts
- ▶ Location- tendons, ligaments, aponeuroses
- ▶ Function- strong attachment between different structures



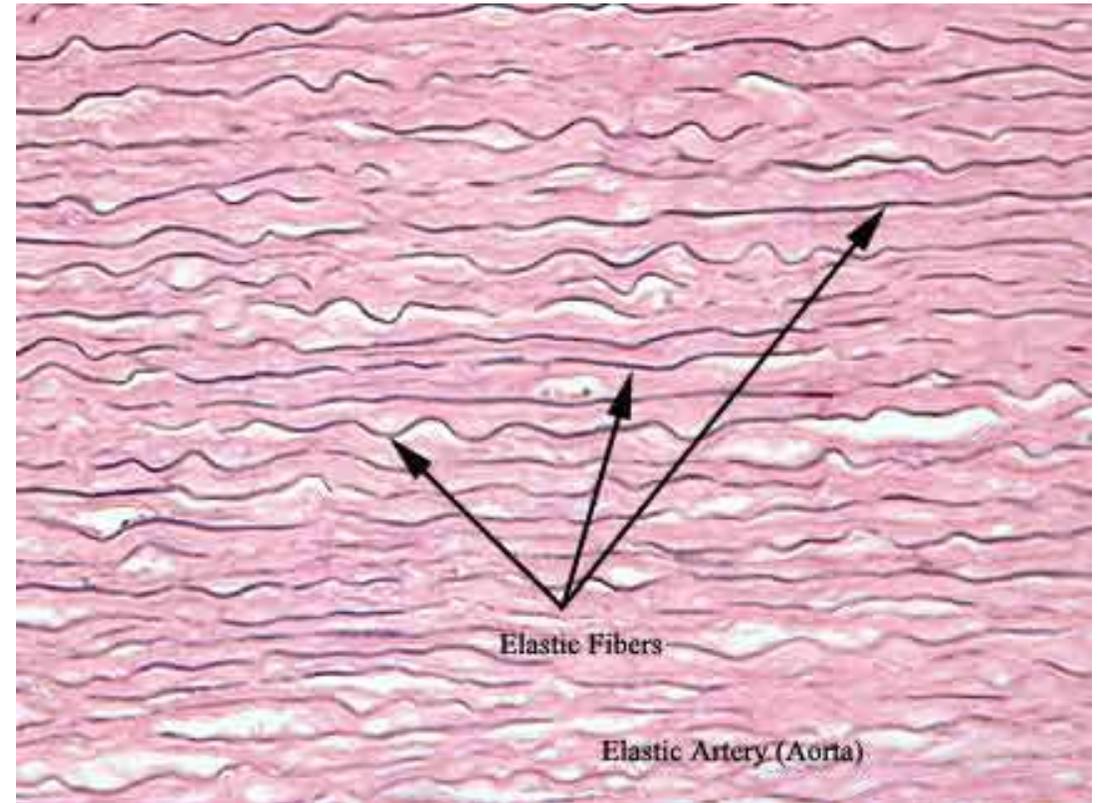
# Dense Irregular connective tissue

- ▶ Collagen fibers are irregularly arranged with fibroblast
- ▶ Location- dermis of skin, kidney, liver, blood vessels, heart valve, lymph node
- ▶ Function- provide pulling strength in different directions



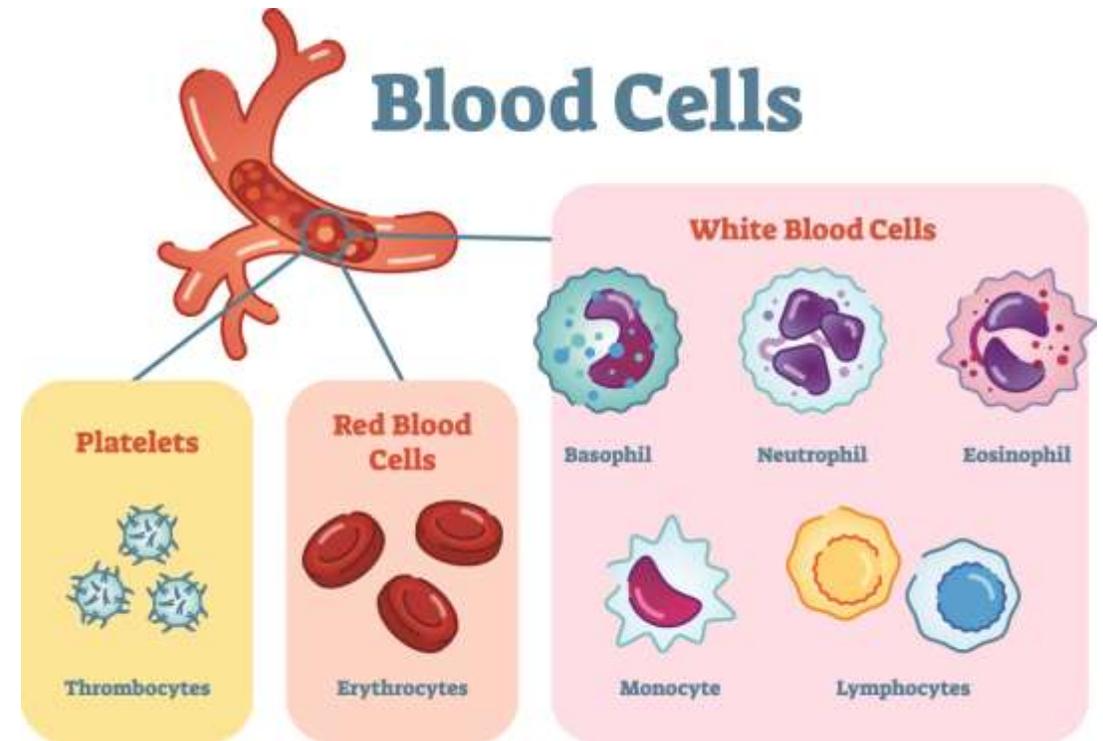
# Dense Elastic Connective Tissue

- ▶ Elastic fibers with fibroblasts between fibers
- ▶ Yellowish tissue
- ▶ Locations- lungs, wall of artery, trachea, bronchi, larynx, ligaments
- ▶ Function-
  - ▶ allow stretching of organs
  - ▶ maintains elasticity of lung tissue & arteries



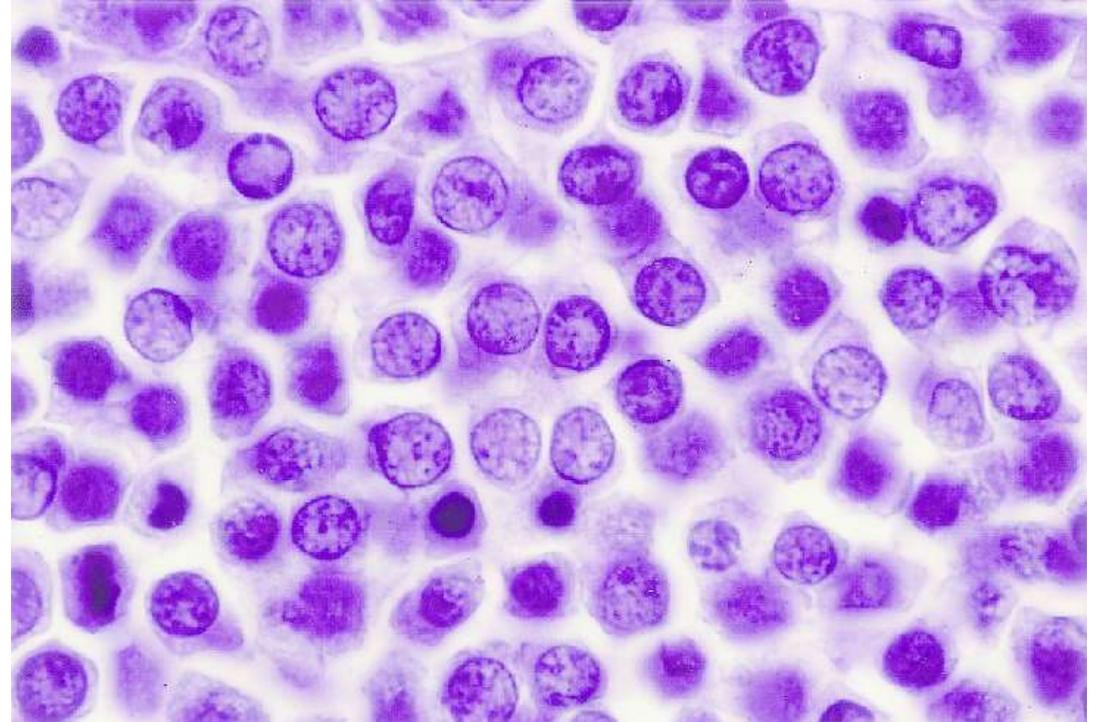
# Blood

- ▶ Specialized liquid connective tissue that consists of cells surrounded by liquid extracellular matrix i.e. blood plasma.
- ▶ Location- circulatory system
- ▶ Function-
  - ▶ It helps in the transportation of oxygen, carbon dioxide, nutrients, wastes, hormones to and from body cells.



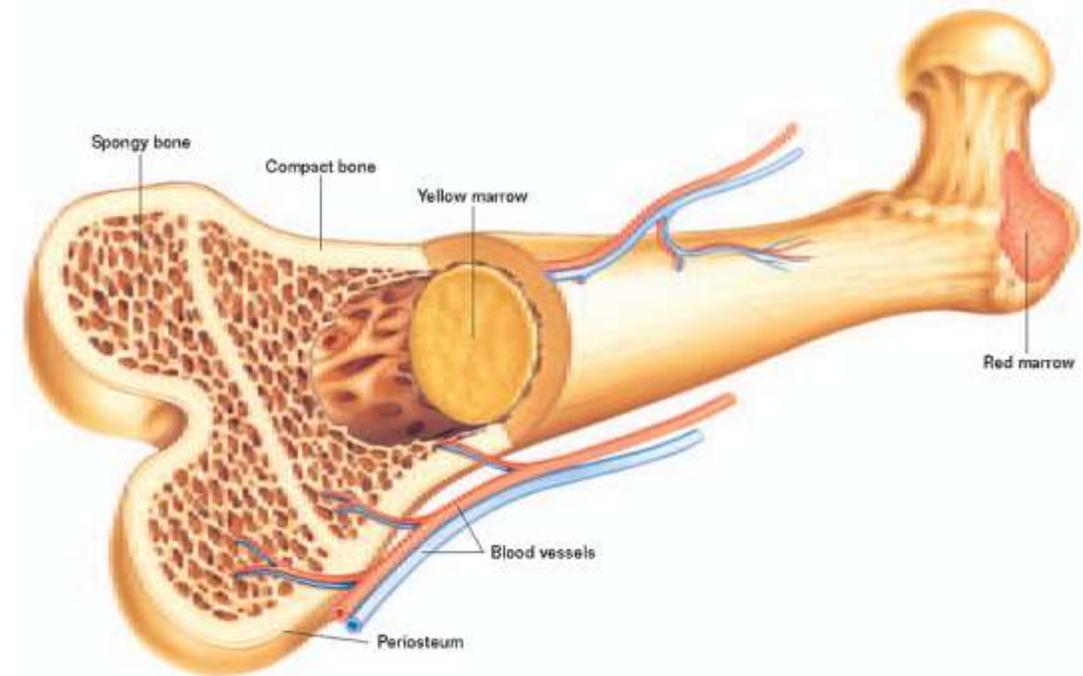
# Lymph

- ▶ The interstitial fluid when passes into lymphatic vessels is lymph.
- ▶ **Lymph** is the fluid that flows through the lymphatic system
- ▶ Location- lymphatic vessels, lymphatic tissues, lymph nodes
- ▶ Function-
  - ▶ Produce lymphocytes
  - ▶ Transports lipids & lipid soluble vitamins
  - ▶ Protect body against infection



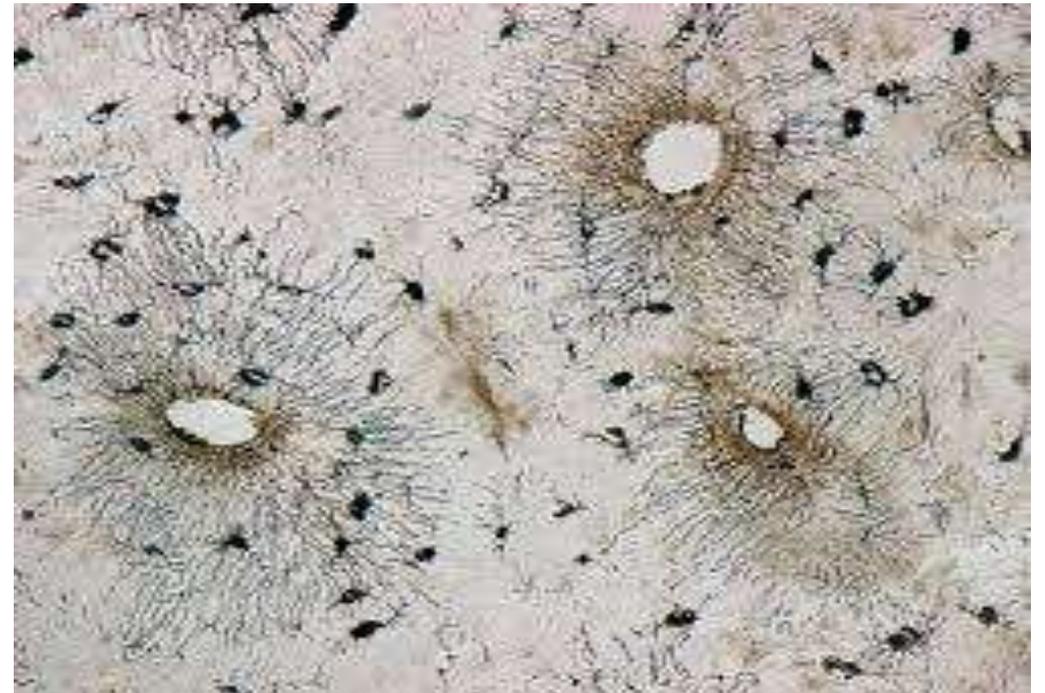
# Bone

- ▶ Complex living tissue which continually construct new bone tissue & repair broken bone tissue
- ▶ Bone cells are surrounded by collagen fibers & strengthened by inorganic salts like  $\text{Ca}^{+2}$  & P
- ▶ Two types of bones are identified
  - ▶ Compact bone
  - ▶ Spongy bone



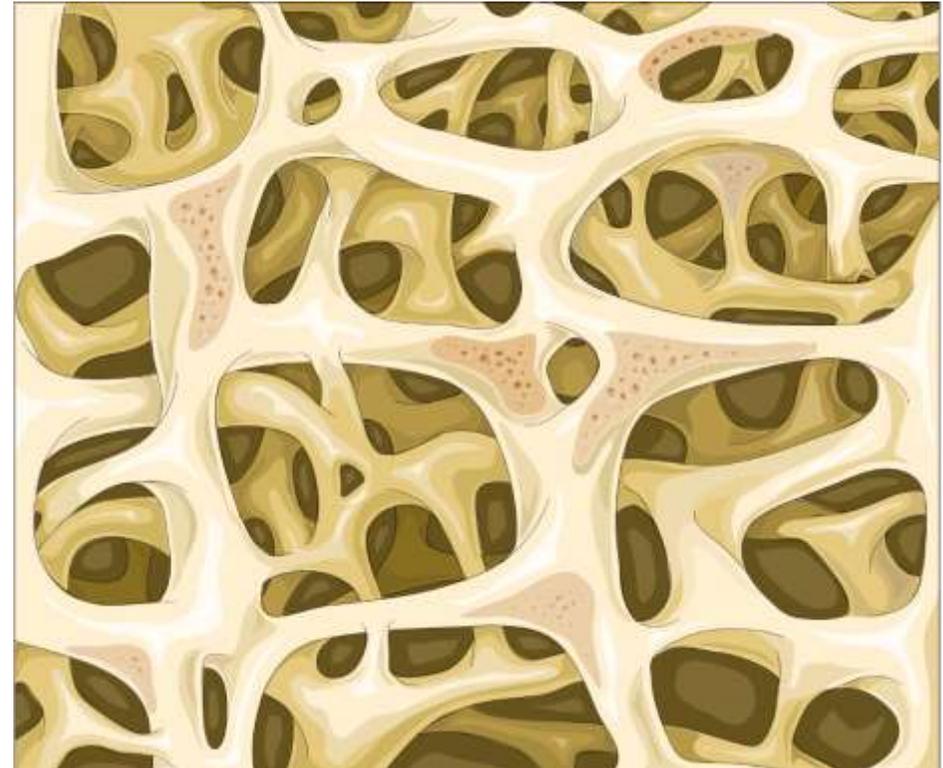
# Compact bone

- ▶ Contains few spaces, so strongest bone tissue
- ▶ Structural unit is osteon or haversian system
- ▶ Location- long bones, flat bones, covering of all bones
- ▶ Function-
  - ▶ Provides protection & support
  - ▶ Resist the stress produced by weight & movement



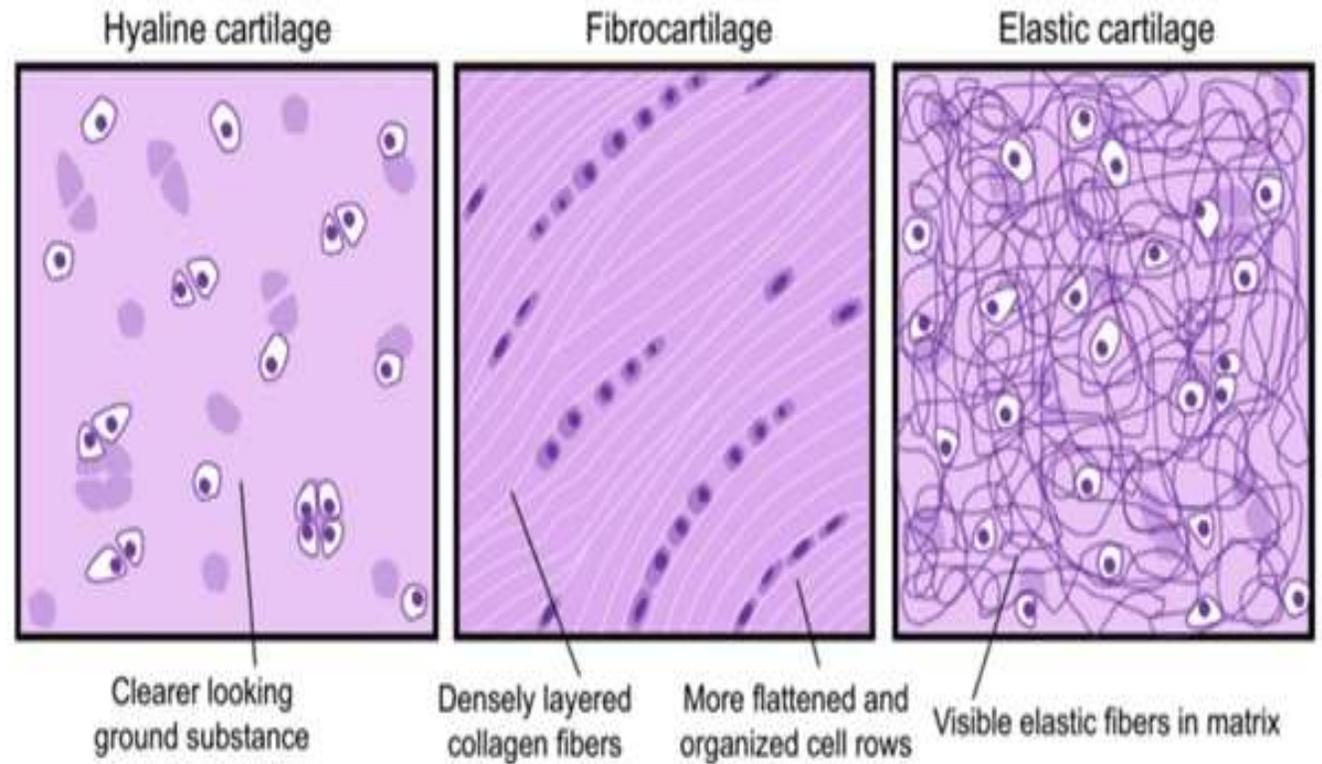
# Spongy bone

- ▶ Does not contain osteons
- ▶ Location- interior part of all bones
- ▶ Function-
  - ▶ Blood cell production
  - ▶ Ion exchange
  - ▶ Supplies nutrients to osteocytes
  - ▶ Removes waste



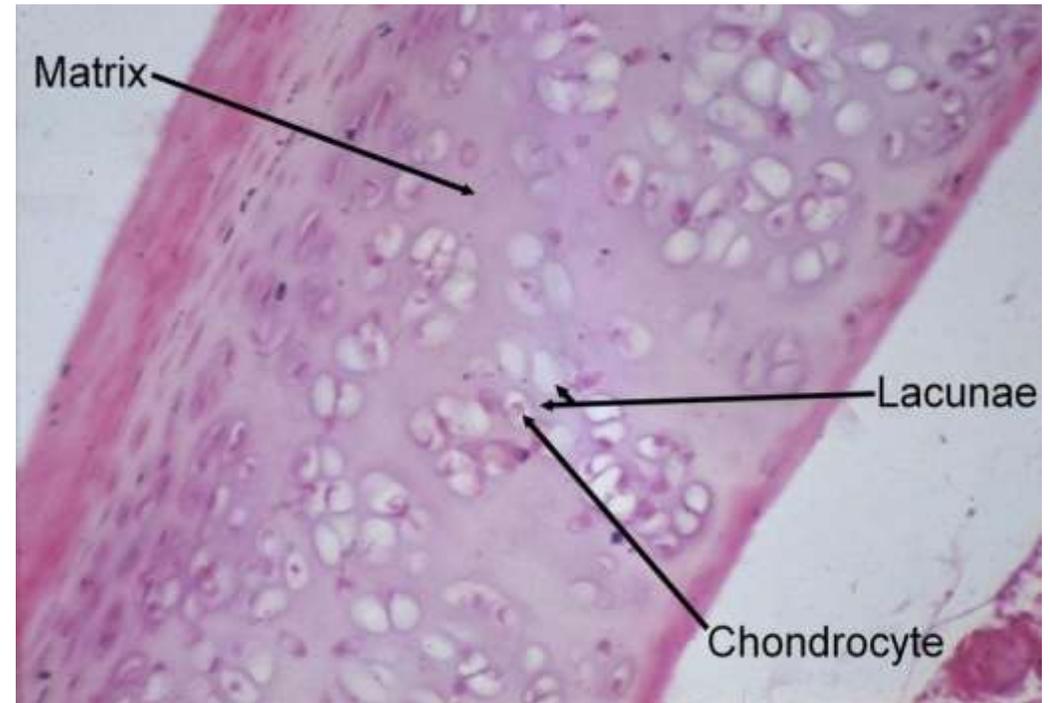
# Cartilage

- ▶ Support the tissue in the body
- ▶ Forms almost entire embryonic skeleton
- ▶ Persists through out life, found at the lubricated articular surface of most joints
- ▶ During development, bone replaces cartilage.
- ▶ Divided into 3 types
  - ▶ Hyaline
  - ▶ Fibro
  - ▶ Elastic



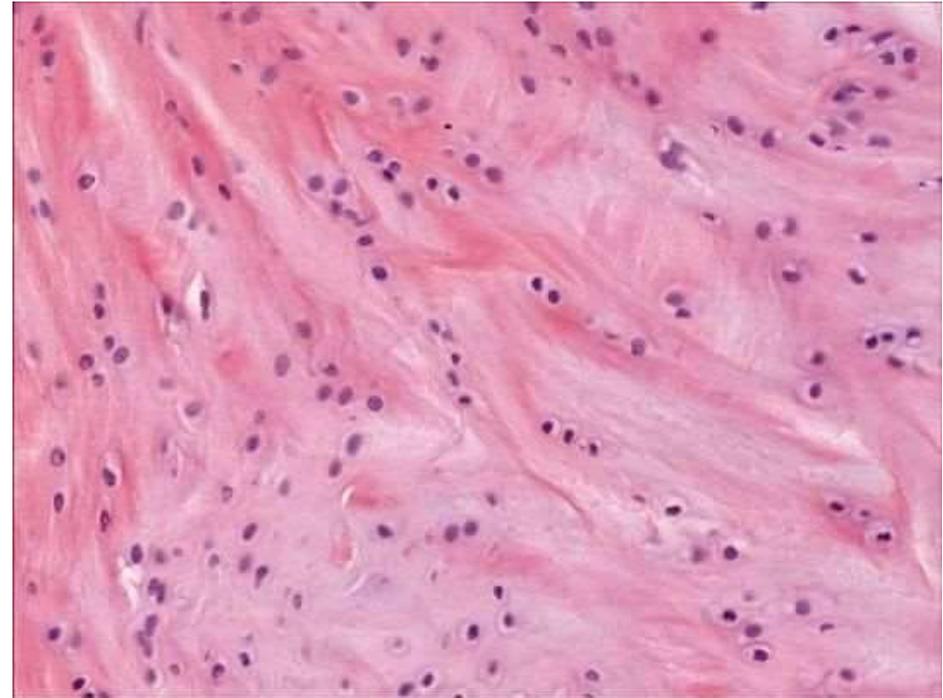
# Hyaline Cartilage

- ▶ Contains resilient gel as ground substance
- ▶ Bluish white shiny substance
- ▶ Chondrocytes are found in lacunae surrounded by perichondrium
- ▶ Location- long bones, anterior ends of bones, nose, some parts of upper respiratory tract, embryonic & fetal skeleton
- ▶ Function- Provides smooth surfaces for movements of joints, flexibility, support weakest cartilages.



# Fibrocartilage

- ▶ Chondrocytes scattered among thick bundles of collagen fibers within extracellular matrix
- ▶ Location- pubic symphysis, intervertebral disc
- ▶ Function-
  - ▶ Support and join structures
  - ▶ Provides strength and rigidity that makes it the strongest.



# Elastic Cartilage

- ▶ Chondrocytes in thread like network of elastic fibers within extracellular matrix
- ▶ Location- on the top of larynx, part of external ear, auditory tubes
- ▶ Function-
  - ▶ Provides strength & elasticity
  - ▶ Maintains shape of the structure.

