



Histology



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Cellular constituent

Cellular constituent or component refers to the unique, highly organized substances of which cells, and thus living organisms, are composed. Cells are the structural and functional units of life. The smallest organisms are composed of only a single cell while the largest are made up of billions of cells. DNA is found in nearly all living cells, however each Cell consists of its own unique DNA sequence in its chromosome.

Examples include membranes, organelles, proteins, and nucleic acids. Whilst the majority of cellular components are located within the cell itself, some may exist in extracellular areas of an organism.

Cellular components may also be called biological matter or biological material. Most biological matter has the characteristics of soft matter, being governed by relatively small energies. All known life is made of biological matter. To be differentiated from other theoretical or fictional life forms, such life may be called carbon-based, cellular, organic, biological, or even simply living—as some definitions of life exclude alternative biochemistry.

The cell (from Latin *cella*, meaning "small room") is the basic structural, functional and biological unit of all known living organisms. Cells are the smallest unit of life that can replicate independently, and are often called the "building blocks of life". The study of cells is called cell biology.

Cells consist of a protoplasm enclosed within a membrane, which contains many biomolecules such as proteins and nucleic acids .

Organisms can be classified as unicellular (consisting of a single cell; including most bacteria) or multicellular (including plants and animals). While the number of cells in plants and animals varies from species to species, humans contain about 100 trillion (10¹⁴) cells. Most plant and animal cells are visible only under the microscope, with dimensions between 1 and 100 micrometres.

The cell was discovered by Robert Hooke in 1665. The cell theory, first developed in 1839 by Matthias Jakob Schleiden and Theodor Schwann, states that all organisms are composed of one or more cells, that all cells come from preexisting cells, that vital functions of an organism occur within cells, and that all cells contain the hereditary information necessary for regulating cell functions and for transmitting information to the next generation of cells. Cells emerged on Earth at least 3.5 billion years ago.

A biological membrane or bio membrane is an enclosing or separating membrane that acts as a selectively permeable barrier within living things. Biological membranes, in the form of cell membranes, often consist of a phospholipid bilayer with embedded, integral and peripheral proteins used in communication and transportation of chemicals and ions. Bulk lipid in membrane provides a fluid matrix for proteins to rotate and laterally diffuse for physiological functioning. Proteins are adapted to high membrane fluidity environment of lipid bilayer with the presence of an annular lipid shell, consisting of lipid molecules bound tightly to surface of integral membrane proteins. The cellular membranes should not be confused with isolating tissues formed by layers of cells, such as mucous membranes and

basement membrane In cell biology, an organelle is a specialized subunit within a cell that has a specific function, and it is usually separately enclosed within its own lipid bilayer.

The name organelle comes from the idea that these structures are to cells what an organ is to the body (hence the name organelle, the suffix -elle being a diminutive). Organelles are identified by microscopy, and can also be purified by cell fractionation. There are many types of organelles, particularly in eukaryotic cells. While prokaryotes do not possess organelles per se, some do contain protein-based microcompartments, which are thought to act as primitive organelles.

Types of organelles

While most cell biologists consider the term organelle to be synonymous with "cell compartment", other cell biologists choose to limit the term organelle to include only those that are DNA-containing, having originated from formerly autonomous microscopic organisms acquired via endosymbiosis .

Under this definition, there would only be two broad classes of organelles

- 1 mitochondria (in almost all eukaryotes)
- 2 plastids (e.g. in plants)

Other organelles are also suggested to have endosymbiotic origins, but do not contain their own DNA (notably the flagellum) Under the more restricted definition of membrane-bound structures, some parts of the cell do not qualify as organelles. Nevertheless, the use of organelle to refer to non-membrane bound structures such as ribosomes is common. This has led some texts to delineate between membrane-bound and non-membrane bound organelles. These structures are large assemblies of macromolecules that carry out particular and specialized functions, but they lack membrane boundaries. Such cell structures include:

- large RNA and protein complexes: ribosome .
- large protein complexes: proteasome .
- large DNA and protein complexes: nucleosome.

Eukaryotic organelles

Eukaryotic cells are structurally complex, and by definition are organized, in part, by interior compartments that are themselves enclosed by lipid membranes that resemble the outermost cell membrane. The larger organelles, such as the nucleus and vacuoles, are easily visible with the light microscope. They were among the first biological discoveries made after the invention of the microscope.

Types of body tissues:

Body tissues are originated from the one of the three germ layers during embryonic life:

Ectoderm: give rise to skin tissue and nervous tissue.

Endoderm: give rise to bowel and other hollow viscera.

Mesoderm: give rise to connective tissues like fibrous tissue, adipose tissue, muscles, bones, cartilage and blood vessels. Adipose tissue consist of adipocytes, fibrous tissue consist of fibroblasts, bones consist of osteocytes, cartilage, consist of chondrocytes, epidermis consist of squamous cells (keratinocytes), nervous tissue consist of astrocytes...etc

Cellular Organization

- **Cell** - composed of organelles and cytoplasm surrounded by a plasma membrane
- Human body contains many distinct types of cells
 - specialized to perform specific functions
- The structure of each cell type is related to its function

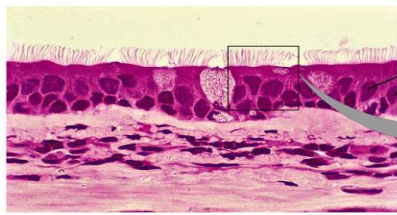
Tissue Level

- **Tissue** - a group of similar cells that perform a common function or Tissues are groups of similar cells and extracellular products that carry out a common function.

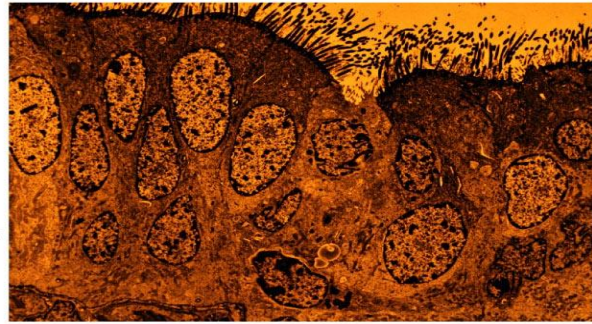
4 major types of tissues: Epithelial t. (epithelium), Connective t., Muscle t. , Nervous t.

Organ Level

- An **organ** - a group of 2 or more tissue types
 - one or more primary tissues and several secondary tissues
- Example: the stomach
 - Primary tissue - inside epithelial lining involved with secretion & absorption
 - Secondary tissues - connective, vascular, nervous, and muscle tissues
- An organ or body **system** consists of various organs with similar or related functions
 - work together to accomplish a common purpose
- There are 11 major **systems** of the body
- Serous cavities - slit like space lined by a serous membrane (serosa)
 - - Pleural cavity
 - - Pericardium cavity
 - - Peritoneum cavity
- Parietal serosa – forms the outer wall of the cavity and is continuous with the inner serosa
- Visceral serosa – covers the visceral organs
- Serous Fluid – watery lubricant secreted by both serous membranes



(a) Light micrograph



(b) Transmission electron micrograph



(c) Scanning electron micrograph

Tissues

- Cells work together in functionally related groups called tissues
- Types of tissues:
 1. Epithelial – lining and covering
 2. Connective – support
 3. Muscle – movement
 4. Nervous – control

Epithelial Tissue – or epithelium General Characteristics & Functions

- Covers a body surface or lines a body cavity
- Forms most glands
- Functions of epithelium
 - Protection
 - Absorption, secretion, and ion transport
 - Filtration
 - Forms slippery surfaces
- Lines everybody surface and all body cavities.
- Forms both the external and internal lining of many organs .

- Constitutes the majority of glands .
- Composed of one or more layers of closely packed cells that form a barrier between two compartments having different components .
- Little to no extracellular matrix .
- No blood vessels penetrate an epithelium.

Special Characteristics of Epithelia

■ Cellularity

- cells are in close contact with each other with little or no intercellular space between them

■ Specialized contacts

- may have junctions for both attachment and communication

■ Polarity

- epithelial tissues always have an apical and basal surface

■ Support by connective tissue

- at the basal surface, both the epithelial tissue and the connective tissue contribute to the basement membrane

■ Avascular

- nutrients must diffuse

■ Innervated

■ Regeneration

- epithelial tissues have a high capacity for regeneration

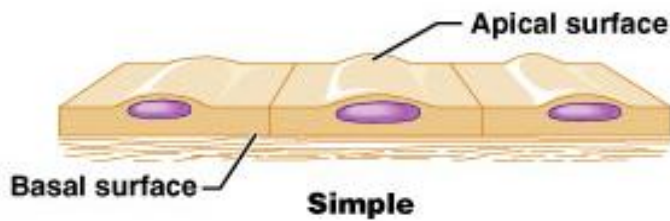
Basal Feature: The Basal Lamina

- Non cellular supporting sheet between the epithelium and the connective tissue deep to it
- Consists of proteins secreted by the epithelial cells
- **Functions:**
 - Acts as a selective filter, determining which molecules from capillaries enter the epithelium
 - Acts as scaffolding along which regenerating epithelial cells can migrate
- Basal lamina and reticular layers of the underlying connective tissue deep to it form the basement membrane

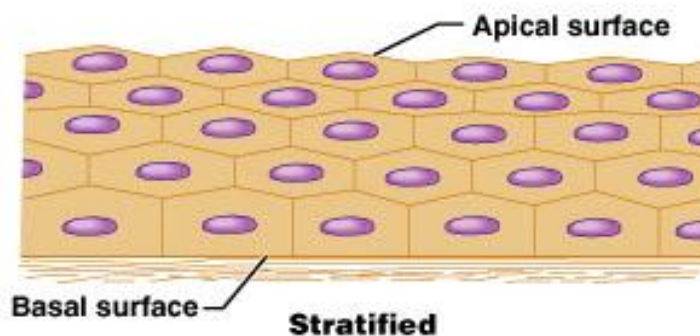
Classifications & Naming of Epithelia

- First name of tissue indicates number of layers

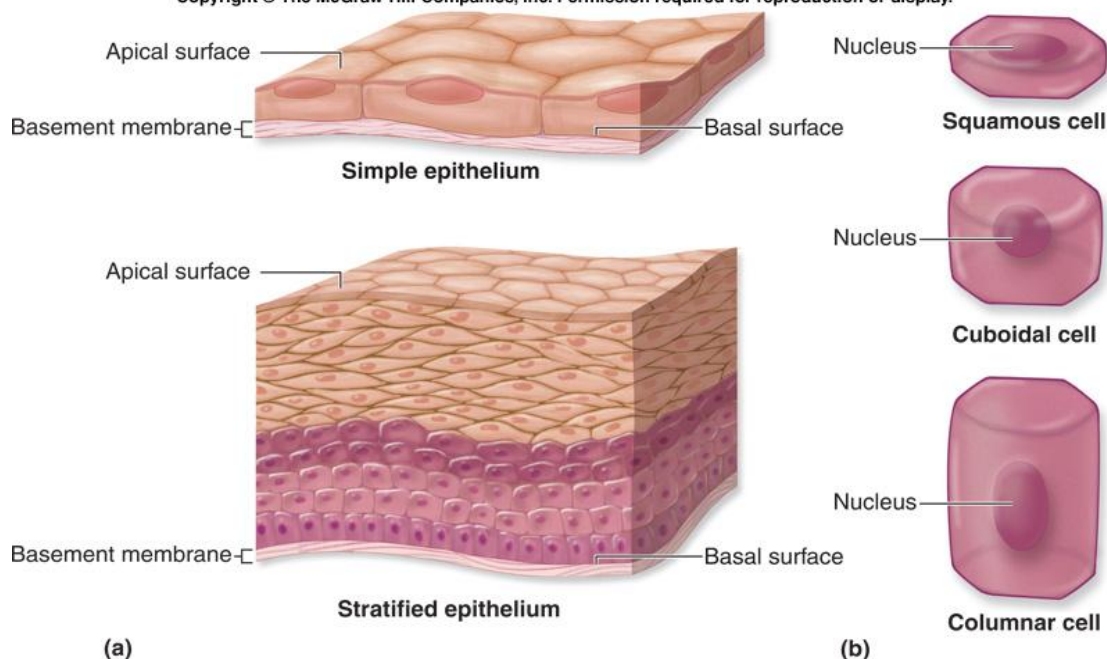
- Simple – one layer of cells



- Stratified – more than one layer of cells

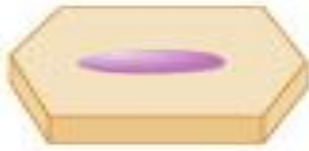


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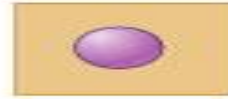
- Last name of tissue describes shape of cells

- Squamous (Pavement epithelium) – cells wider than tall (plate or “scale” like), found in abdominal cavity (peritoneum), pleural cavity (pleura), pericardial cavity (pericardium), serous membranes that consist of simple squamous called mesothelium, in the heart called endothelium, membranous labyrinth, parietal layer of bowman's capsule, alveoli.



Squamous

- Cuboidal – cells are as wide as tall, as in cubes some uriniferous tubules , surface ovary



Cuboidal

- Columnar – cells are taller than they are wide, like columns intestinal canal ciliated columnar epi. Found in uterus oviducts and bronchioles in lung . non-ciliated columnar epi. Line the stomach



Columnar

- Naming the epithelia includes both the layers (first) and the shape of the cells (second)
 - stratified cuboidal epithelium
- The name may also include any accessory structures
 - Goblet cells
 - Cilia
 - Keratin
- Special epithelial tissues (don't follow naming convention)
 - Psuedostratified
 - Transitional

Description

single layer of flat cells with disc-shaped nuclei

Special types

(Endothelium (inner covering

Slick lining of hollow organs

(Mesothelium (middle covering

Lines peritoneal, pleural, and pericardial cavities

Covers visceral organs of those cavities

Function

Passage of materials by passive diffusion and filtration

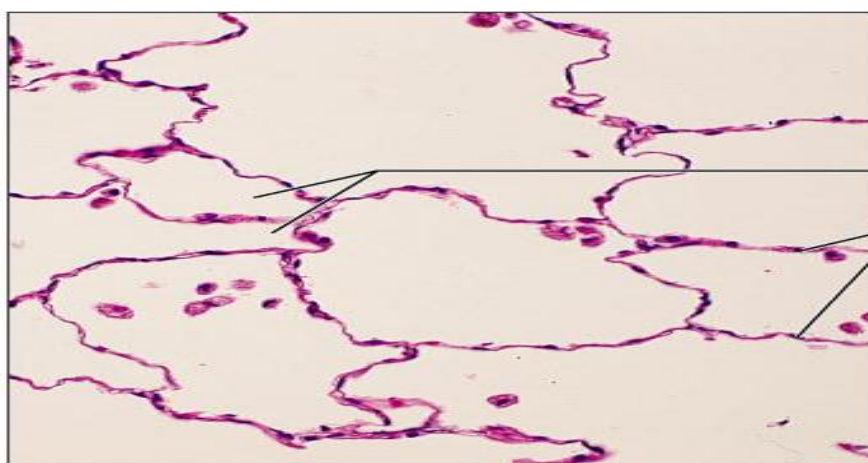
Secretes lubricating substances in serosae

Location

Renal corpuscles , Alveoli of lungs

Lining of heart, blood and lymphatic vessels

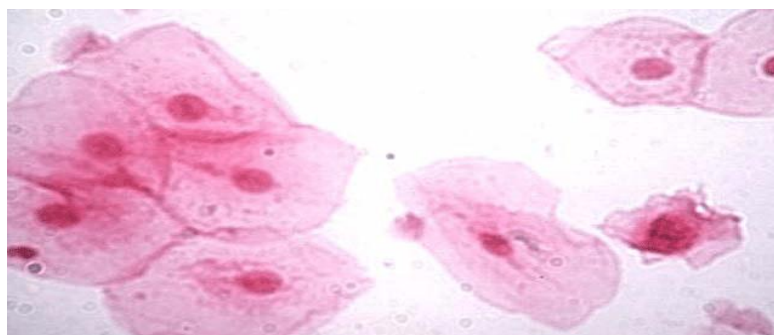
Lining of ventral body cavity (serosae)

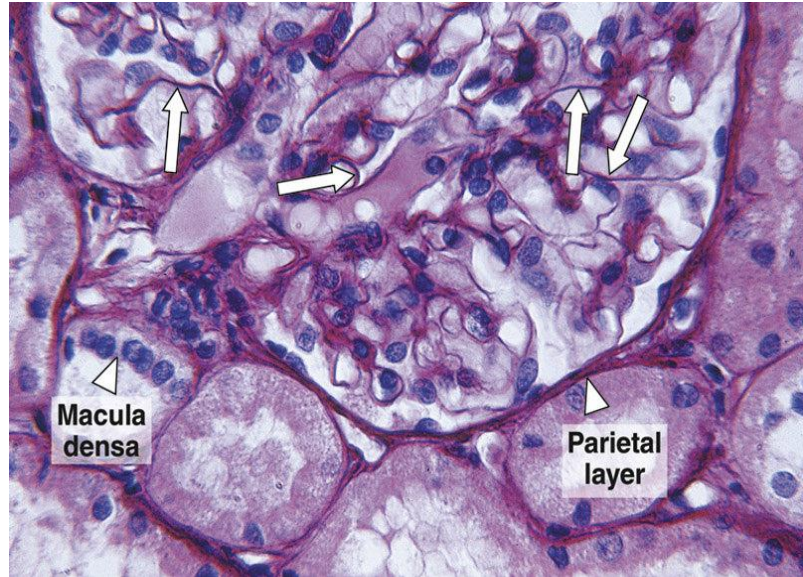
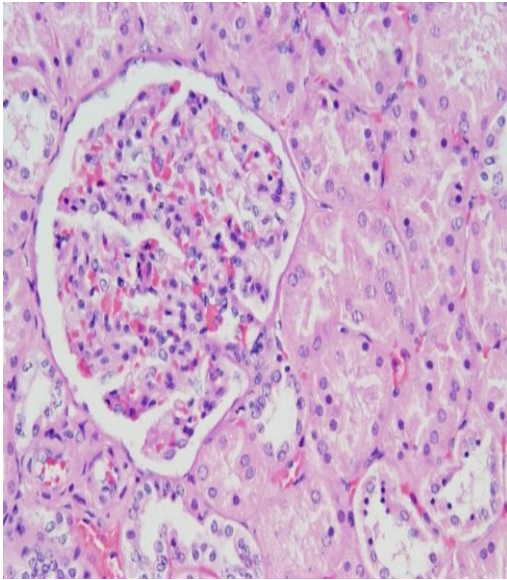


Air sacs of lung tissue

Nuclei of squamous epithelial cells

Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (400 \times).





Simple Cuboidal Epithelium

■ Description

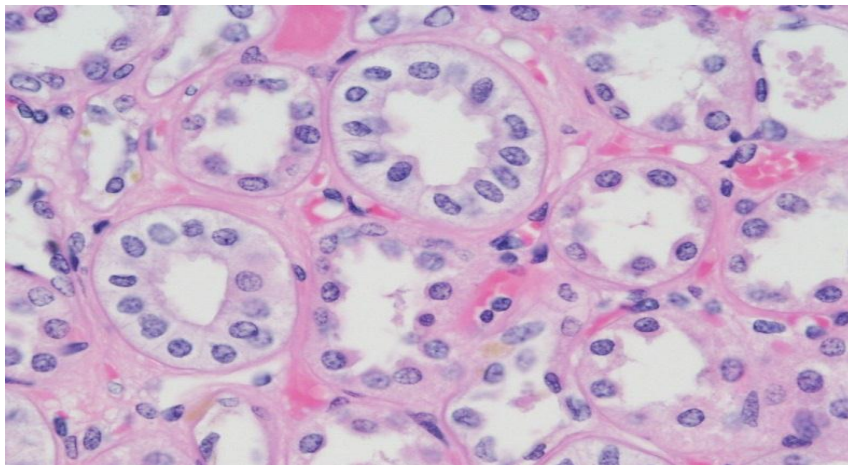
- single layer of cube-like cells with large, spherical central nuclei

■ Function

- secretion and absorption

■ Location

- kidney tubules, secretory portions of small glands, ovary & thyroid follicles



■ Description

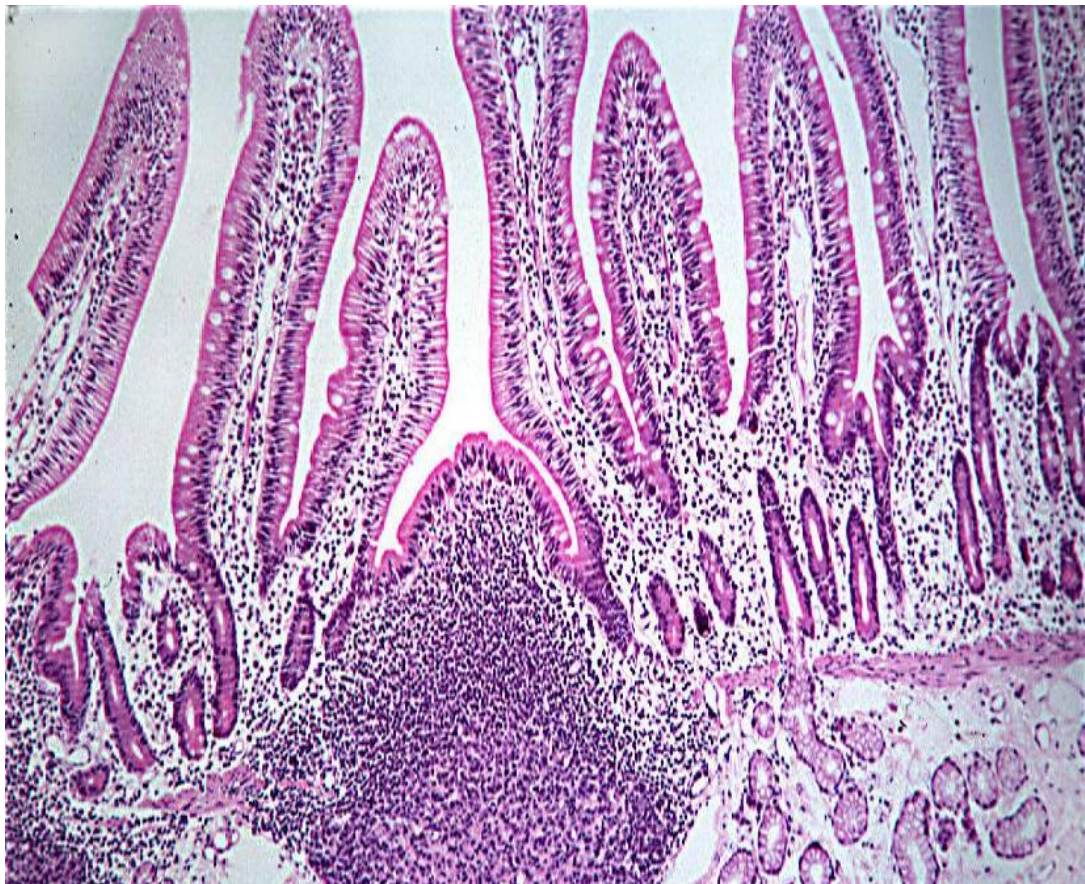
- single layer of column-shaped (rectangular) cells with oval nuclei
 - Some bear cilia at their apical surface
 - May contain goblet cells

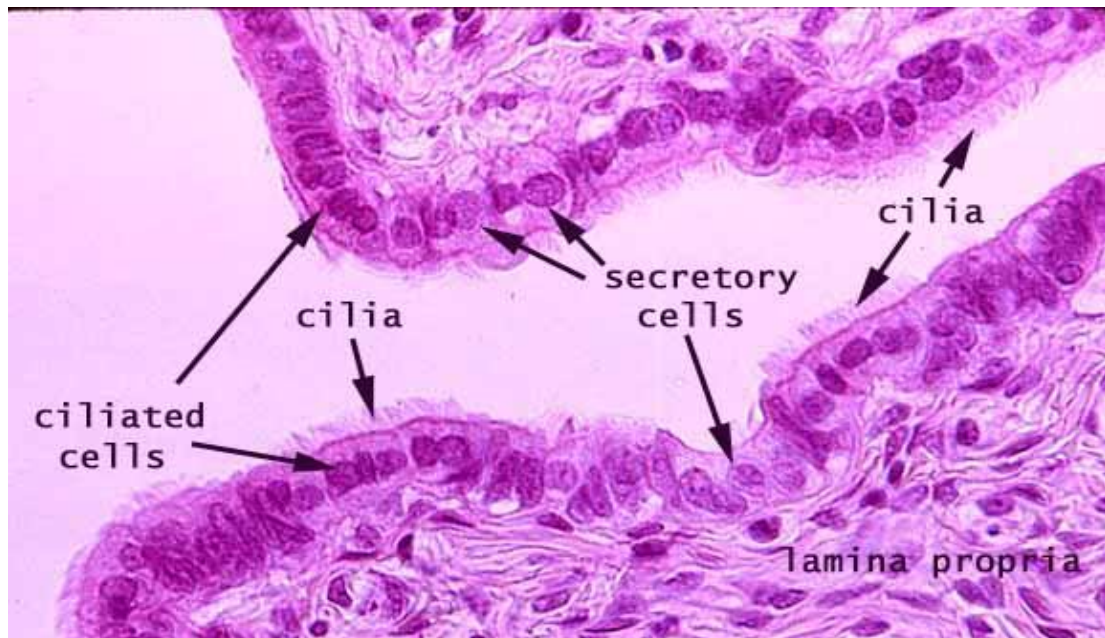
■ Function

- Absorption; secretion of mucus, enzymes, and other substances
- Ciliated type propels mucus or reproductive cells by ciliary action

■ Location

- Non-ciliated form
 - Lines digestive tract, gallbladder, ducts of some glands
- Ciliated form
 - Lines small bronchi, uterine tubes, uterus





Pseudostratified Columnar Epithelium

■ Description

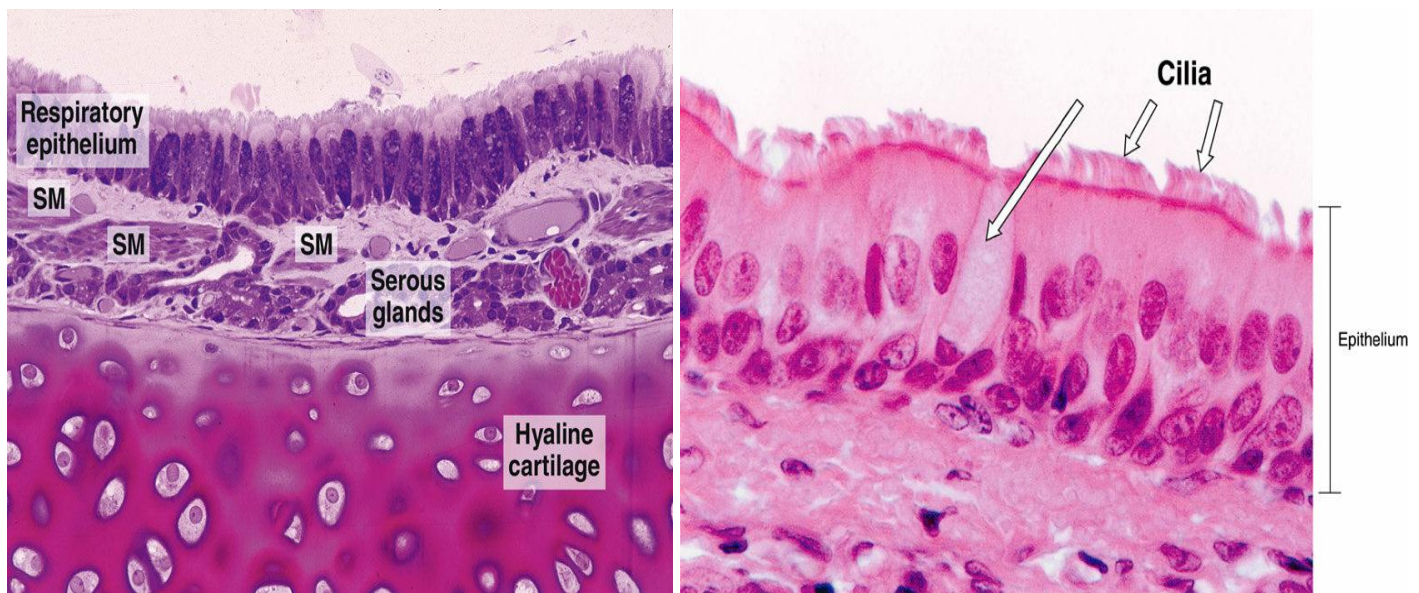
- All cells originate at basement membrane
- Only tall cells reach the apical surface
- May contain goblet cells and bear cilia
- Nuclei lie at varying heights within cells
 - Gives false impression of stratification

■ Function

- secretion of mucus; propulsion of mucus by cilia

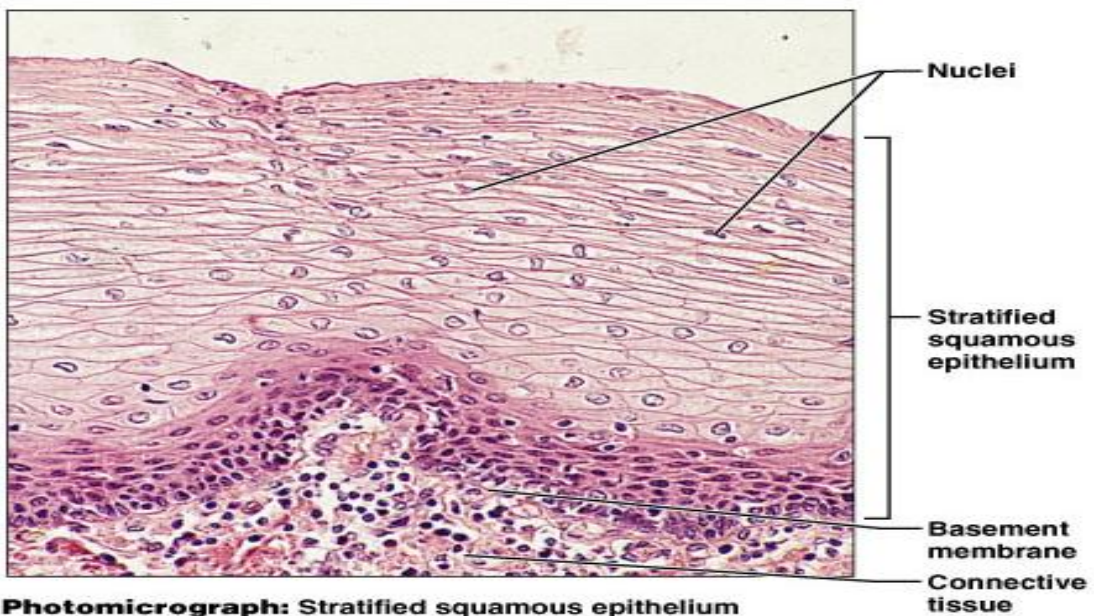
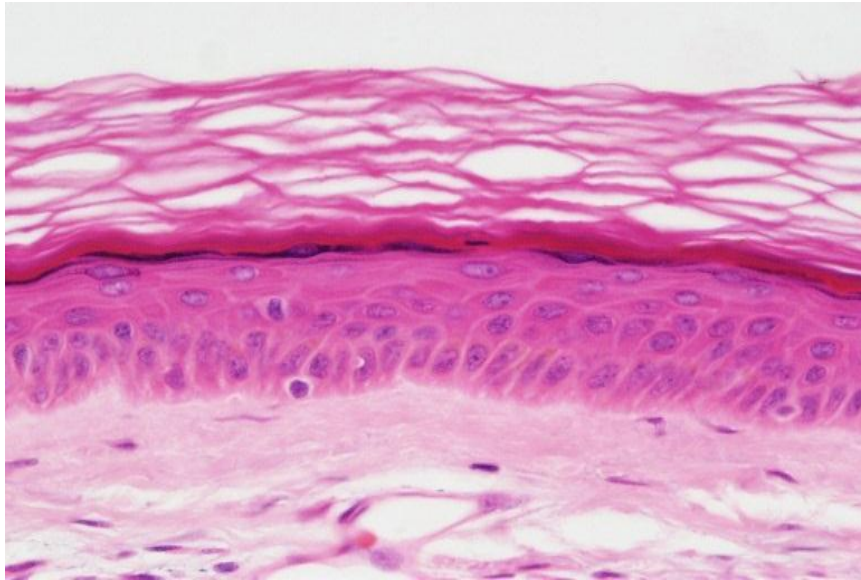
■ Locations

- Non-ciliated type
 - Ducts of male reproductive tubes
 - Ducts of large glands
- Ciliated variety
 - Lines trachea and most of upper respiratory tract

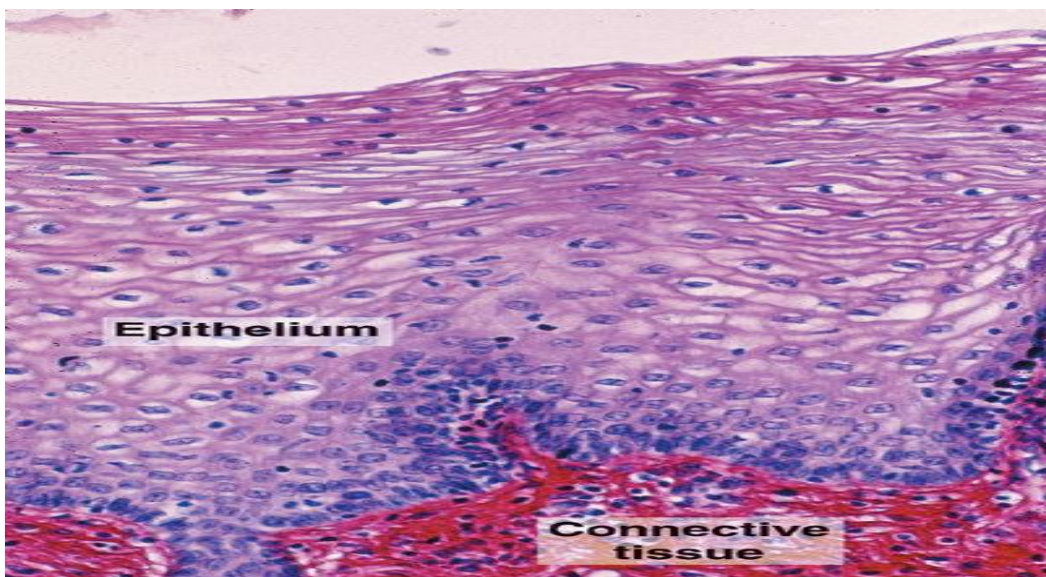


Stratified Epithelia

- Contain two or more layers of cells
- Regenerate from below
- Major role is protection
- Are named according to the shape of cells at apical layer
- **Description**
 - Many layers of cells – squamous in shape
 - Deeper layers of cells appear cuboidal or columnar
 - Thickest epithelial tissue – adapted for protection
- **Specific types**
 - Keratinized – contain the protective protein keratin
 - Surface cells are dead and full of keratin
 - Non-keratinized – forms moist lining of body openings
- **Function**
 - Protects underlying tissues in areas subject to abrasion
- **Location**
 - Keratinized – forms epidermis
 - Non-keratinized – forms lining of esophagus, mouth, and vagina



Photomicrograph: Stratified squamous epithelium lining of the esophagus (300x).



Transitional Epithelium

■ Description

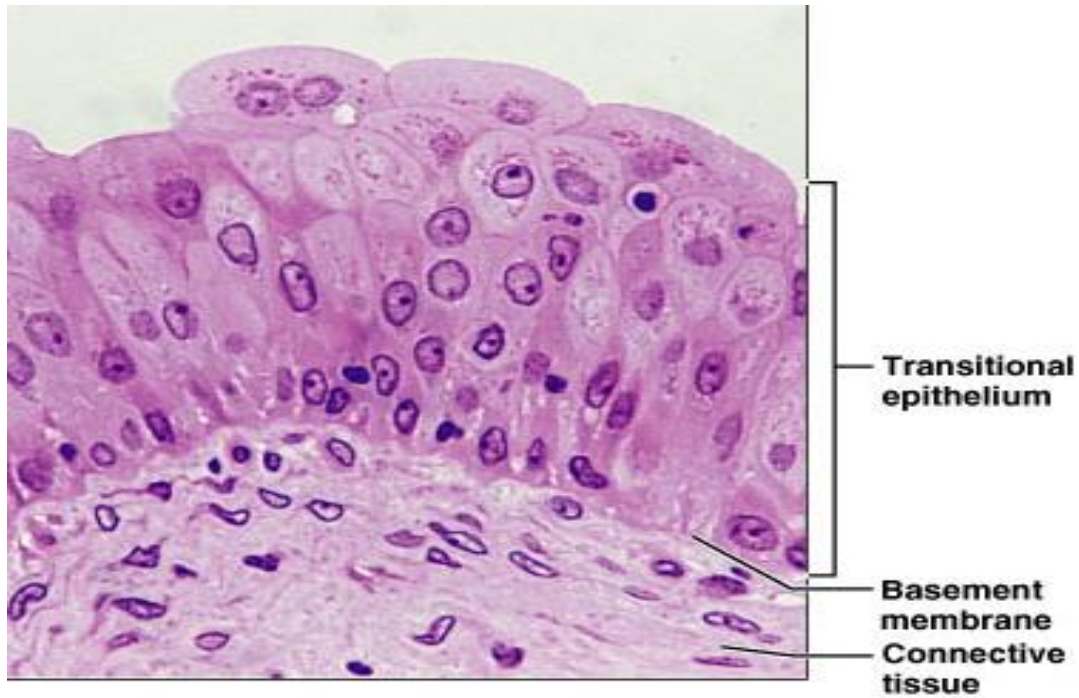
- Basal cells usually cuboidal or columnar
- Superficial cells dome-shaped or squamous

■ **Function**

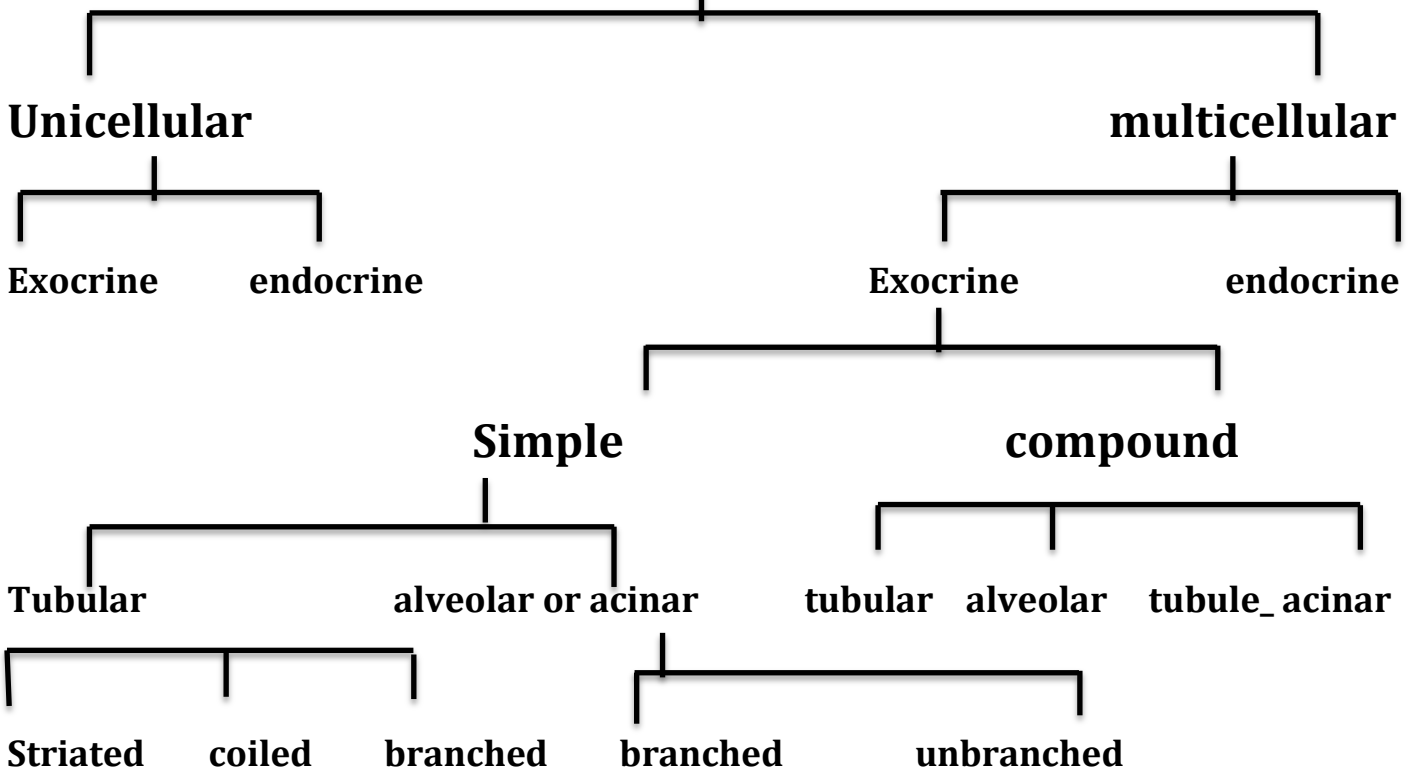
- stretches and permits distension of urinary bladder

■ **Location**

- Lines ureters, urinary bladder and part of urethra



Glandular



Glandular Epithelium

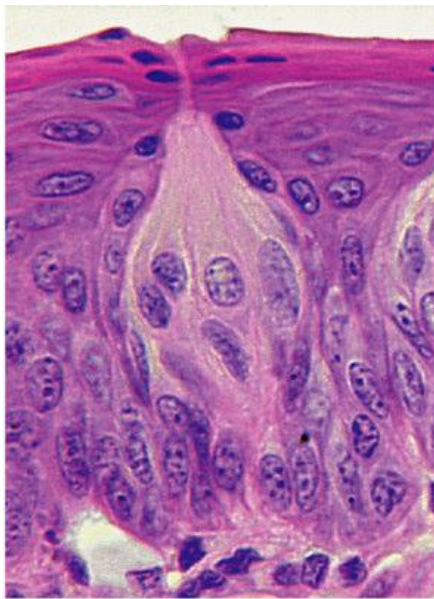
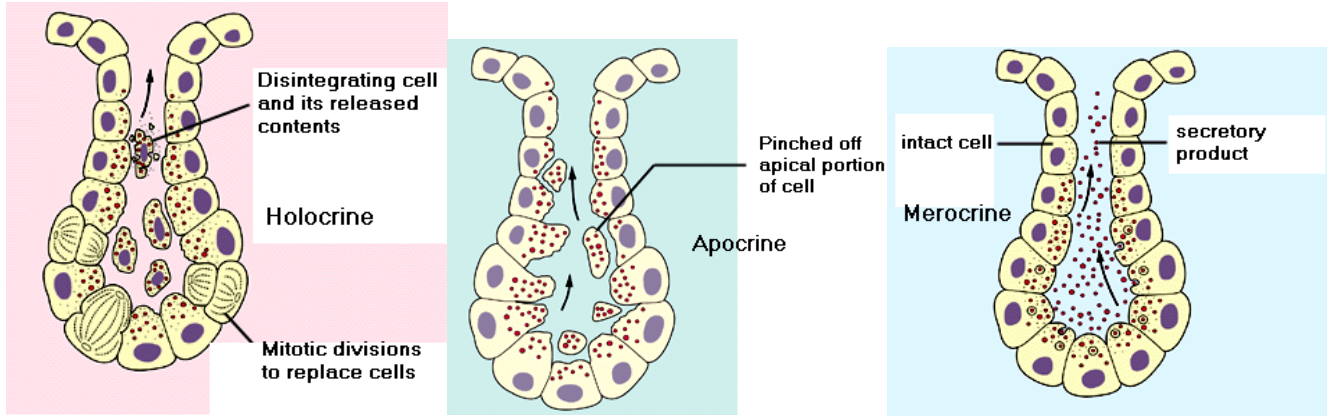
- **Ducts carry products of exocrine glands to epithelial surface**
- **Include the following diverse glands**
 - Mucus-secreting glands
 - Sweat and oil glands
 - Salivary glands
 - Liver and pancreas
 - Mammary glands
- **May be: unicellular or multicellular**

Unicellular Exocrine Glands (The Goblet Cell)

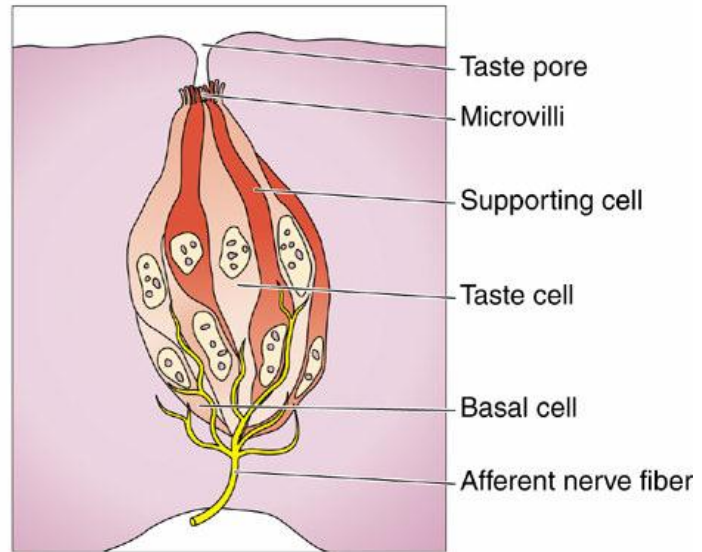
- **Goblet cells produce mucin**
- **Mucin + water → mucus**
- **Protects and lubricates many internal body surfaces**

Multicellular Exocrine Glands

- **Classified by structure (branching & shape) of duct**
- **Can also be classified by mode or type of secretion**
 - Merocrine secretion – secretory vesicles released via exocytosis (salivary glands)
 - Apocrine secretion – apical portion of the cell is lost, cytoplasm + secretory product (mammary glands)
 - Holocrine secretion – entire cell is destroyed during secretion (sebaceous gland)



A



B

Neuroepithelium (taste bud)

May also be classified by types of secretions from exocrine glands

■ Serous

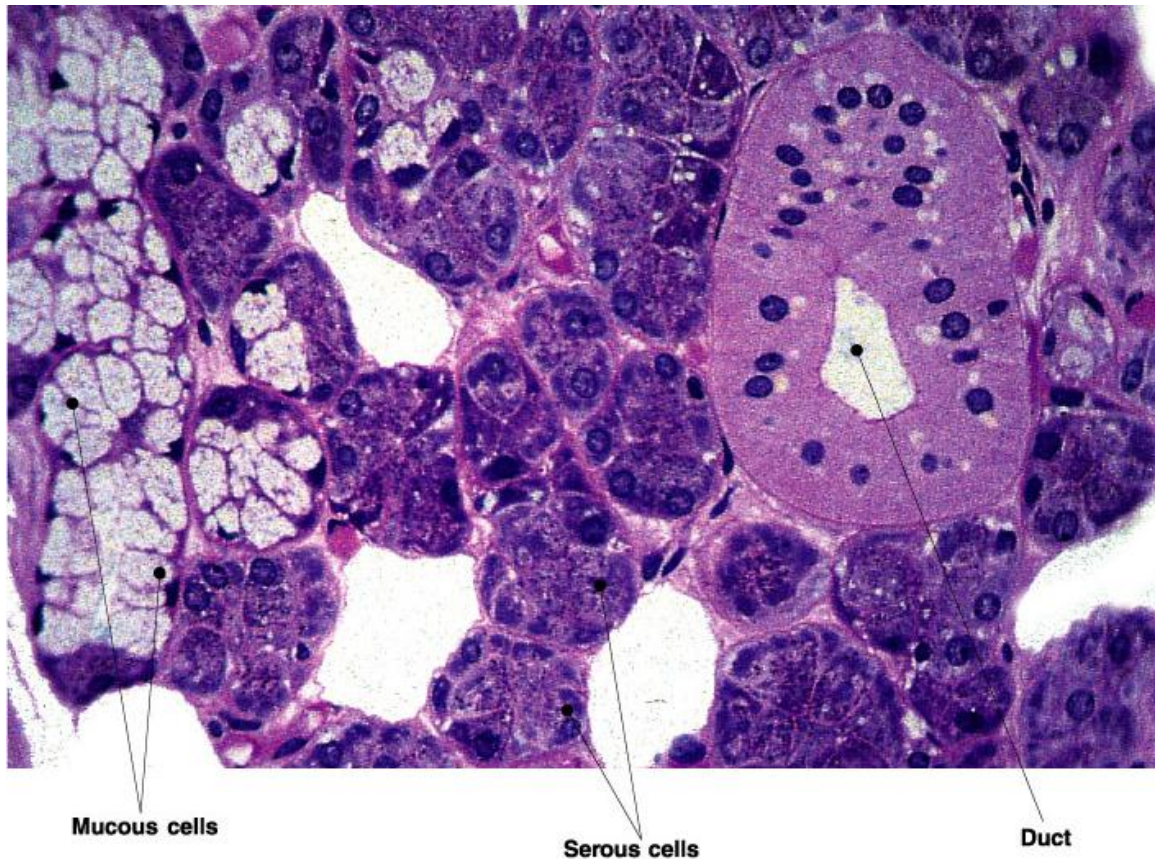
- mostly water but also contains some enzymes
- Ex. parotid glands, pancreas

■ Mucous

- mucus secretions
- Ex. sublingual glands, goblet cells

■ Mixes

- serous & mucus combined
- Ex. submandibular gland



Connective Tissues

Consist of

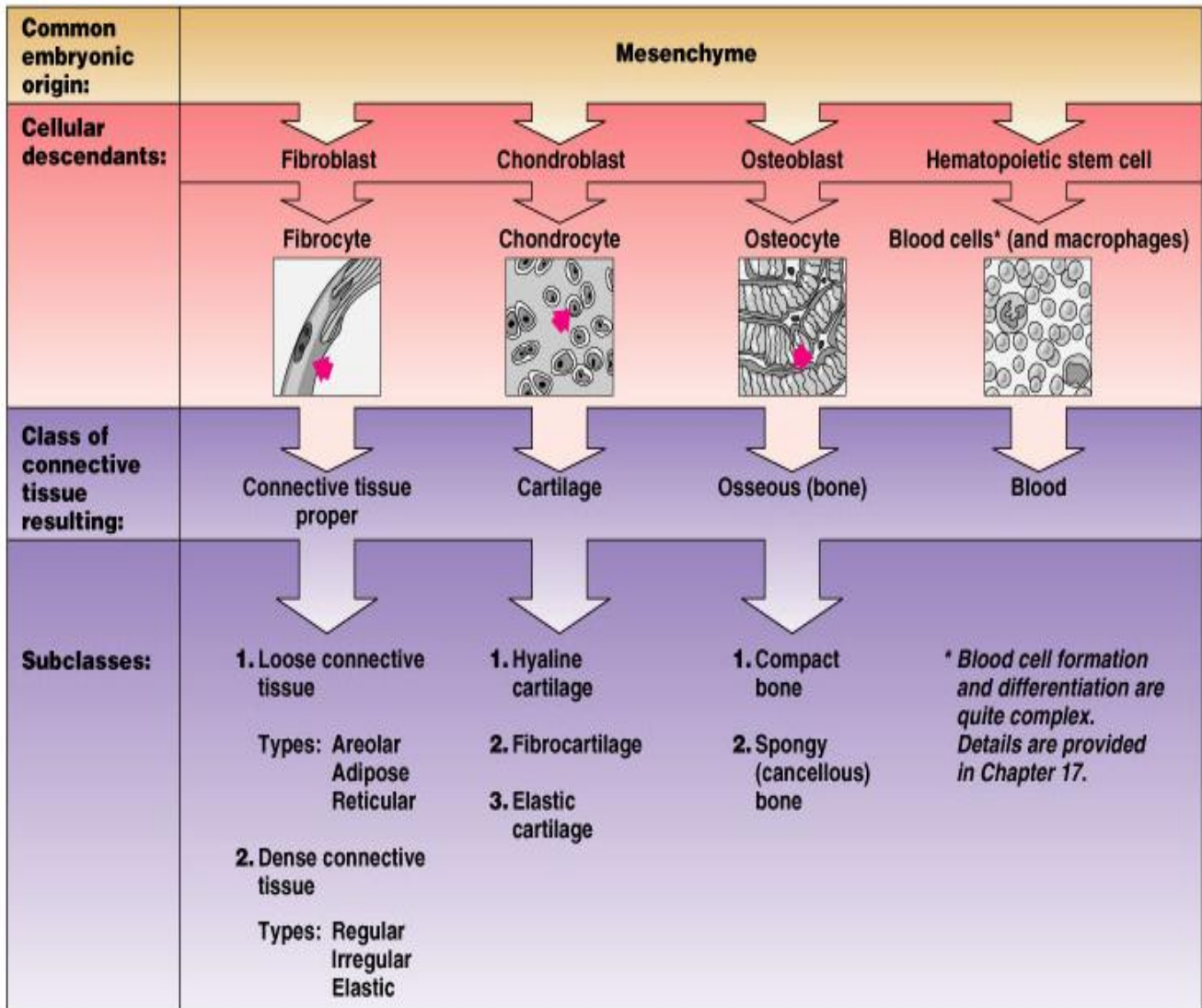
1- Cell

2-fiber

3-ground substance

The cells

- fibroblast
- undifferentiated mesenchymal cell
- macrophage
- mast cell , form heparin , histamine
- plasma cell
- adipose or fat cell
- pigment cell
- reticular cell
- leukocyte
- chondrocyte
- osteocyte



Fibers

1-White fibers or collagenous fiber

2-yellow or elastic fibers

3- Reticular fibers

Classification of connective tissue

A- General connective tissue or con. t. proper

1- Loose con. t .

a- mesenchyme

b- Areolar con. t .

c- Mucous con. t .

d- Adipose con. t .

e- Reticular con. t .

2- Dense con. t .

a- Dense irregular con. t .

b- Dense regular con. t .

1-Elastic con.t .

2- White fibrous con. t .

B- Special Connective tissue

1- Skeletal con. t. consist of bone , cartilage

2- Blood

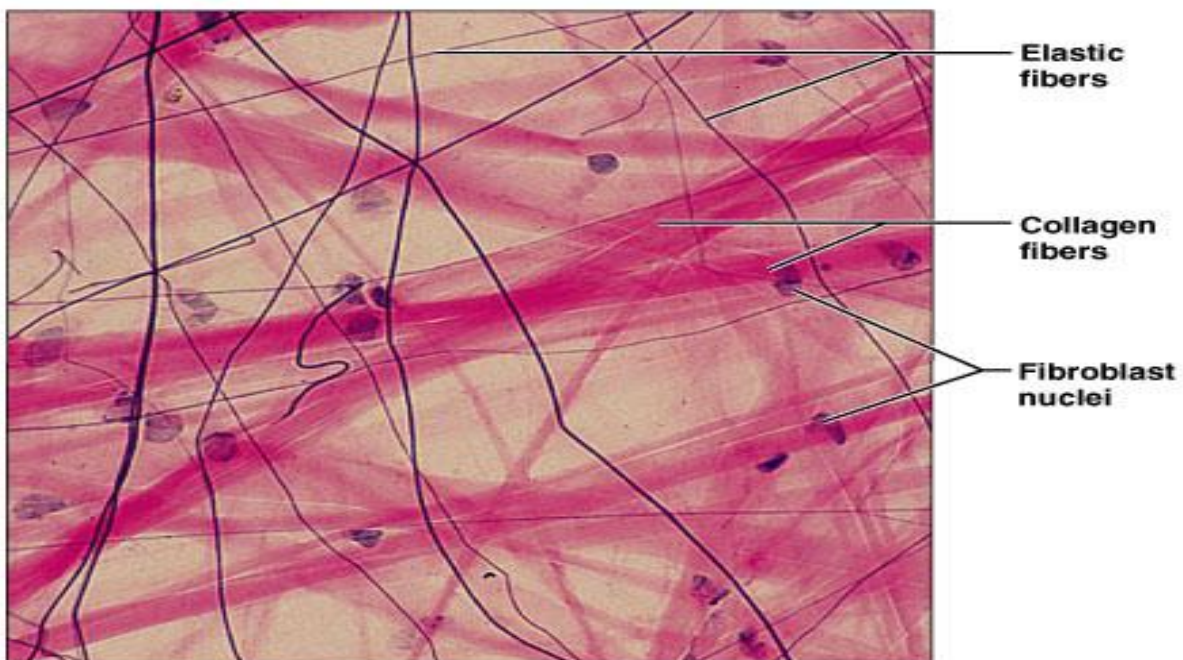
3- Lymph

4- hemopoietic t. : myeloid tissue or bone marrow , lymph tissue

Areolar Connective Tissue

■ Location

- Widely distributed under epithelia
- Packages organs
- Surrounds capillaries



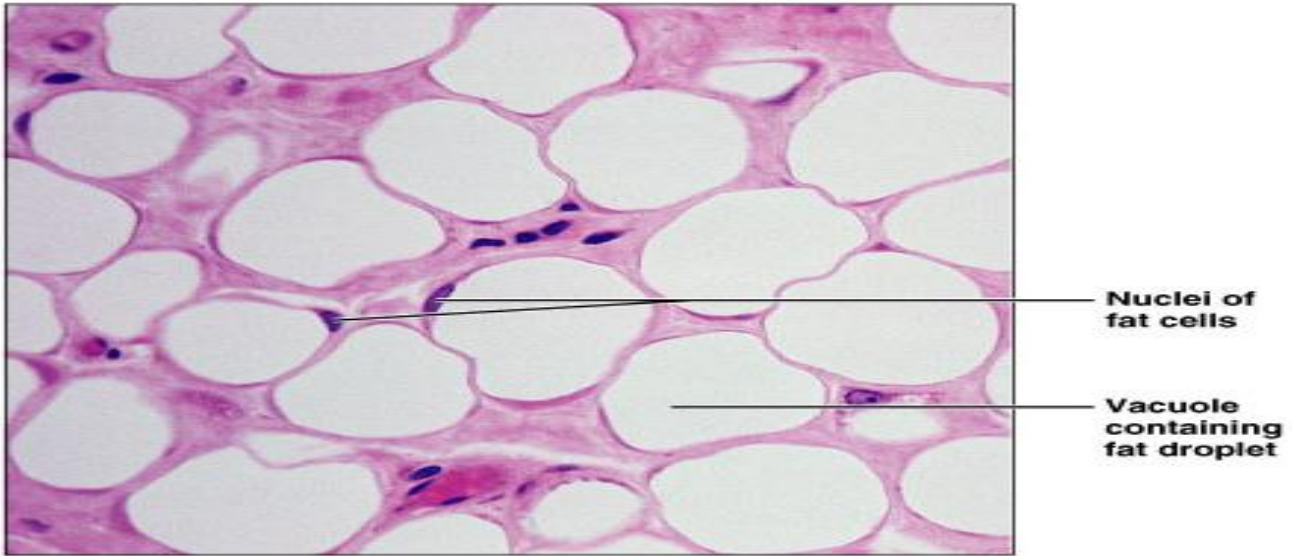
Adipose Tissue

■ Description

- Closely packed adipocytes
- Have nucleus pushed to one side by fat droplet Function
- Provides reserve food fuel
- Insulates against heat loss
- Supports and protects organs

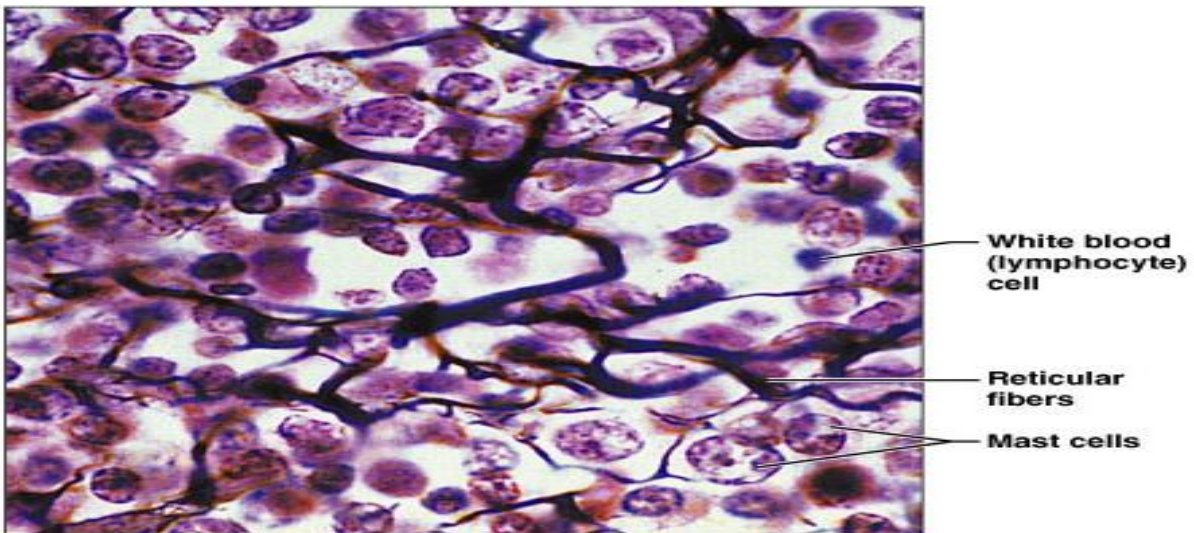
■ Location

- Under skin
- Around kidneys
- Behind eyeballs, within abdomen and in breasts



Reticular Connective Tissue

- **Description** – network of reticular fibers in loose ground substance
- **Function** – form a soft, internal skeleton (stroma) – supports other cell types
- **Location** – lymphoid organs
 - Lymph nodes, bone marrow, and spleen



Photomicrograph: Dark-staining network of reticular connective tissue fibers forming the internal skeleton of the spleen (350×).

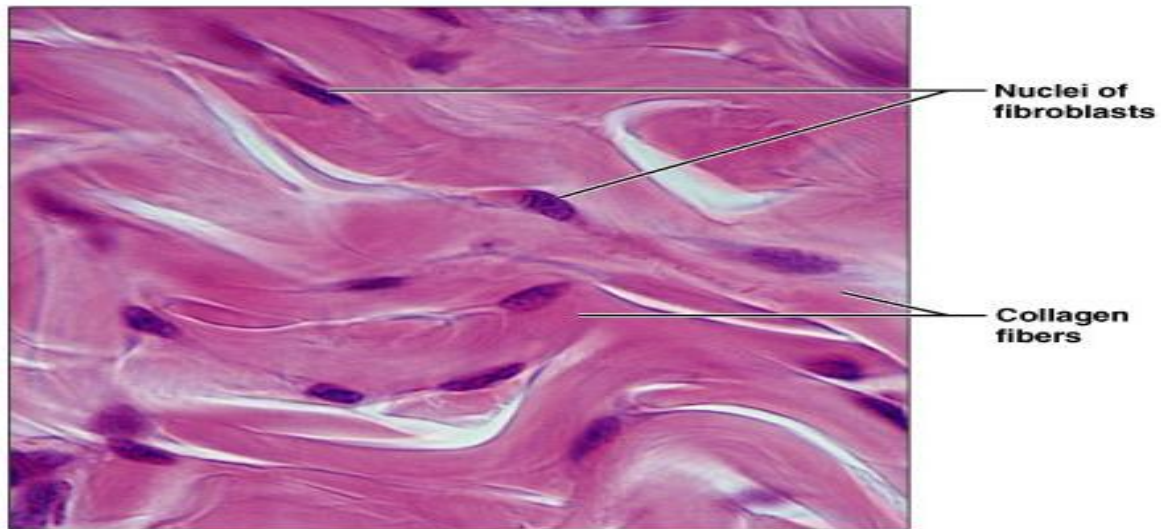
Dense Irregular Connective Tissue

- **Description**
 - Primarily *irregularly* arranged collagen fibers
 - Some elastic fibers and fibroblasts
- **Function**
 - Withstands tension

- Provides structural strength

■ Location

- Dermis of skin
- Submucosa of digestive tract
- Fibrous capsules of joints and organs



Dense Regular Connective Tissue

■ Description

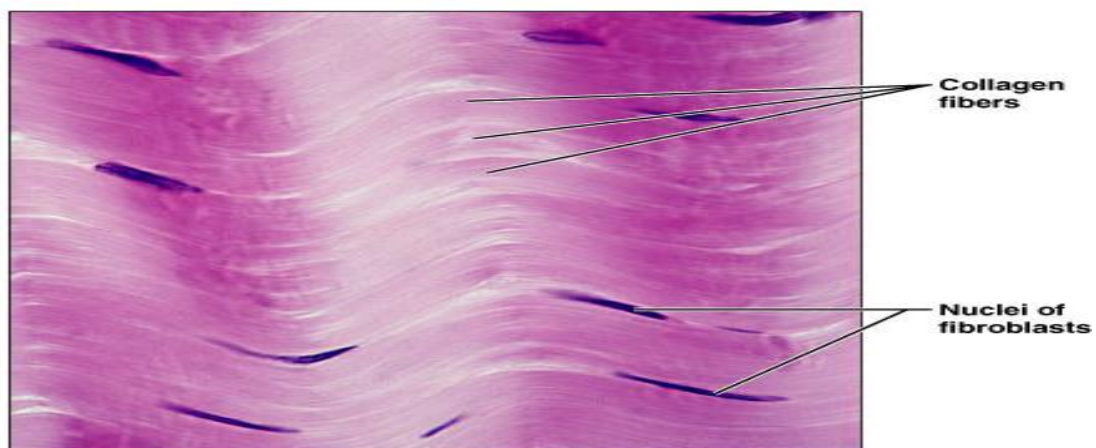
- Primarily *parallel* collagen fibers
- Fibroblasts and some elastic fibers
- Poorly vascularized

■ Function

- Attaches muscle to bone
- Attaches bone to bone
- Withstands great stress in one direction

■ Location

- Tendons and ligaments
- Aponeuroses
- Fascia around muscles



Hard Connective Tissue

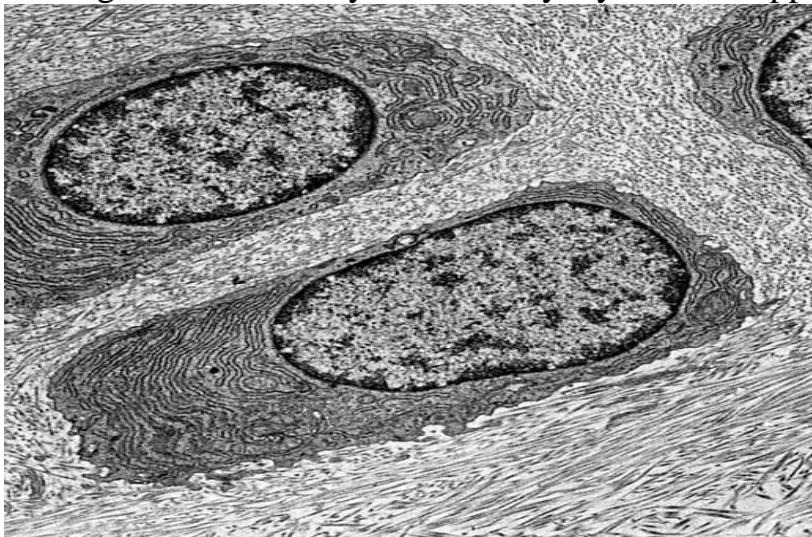
Cartilage and Bone are similar to the soft connective tissue in that they are composed of cells, fibers and ground substance (matrix).

They differ basically from the other connective tissue by the presence of substances in the intercellular material that provide firmness (as in cartilage) and rigidity (as in bone).

Cartilage

- a) **All types of cartilage are comprised of cells called chondrocytes**
- b) **Chondrocytes occupy lacunae which are located within the matrix.**
 - **Contain chondronectin, an integral membrane protein that binds to GAGs and collagen.**
 - **Mediates the adherence of chondrocytes to the extracellular matrix (ECM).**
- c) **Chondrocytes are elliptical cells with few microvilli.** During growth of cartilage, chondrocytes have a large Golgi complex, a well-developed rough endoplasmic reticulum and vacuoles containing a flocculent material.
- d) **Chondrocytes produce protein, collagen fibers and ground substance (e.g., chondroitin sulfate).**

A common characteristic of all types of cartilage is the absence of capillaries running within it. Therefore, the chondrocytes must receive nutritive substances from blood vessels in the connective tissue surrounding the cartilage by diffusion through the ground substance. The **perichondrium** consists of two layers: **Inner cellular layer** consisting of chondrogenic cells that, in young cartilage, contribute to the appositional growth of cartilage. **Outer fibrous layer** consisting of densely woven collagenous fibers and blood vessels. In adult cartilage, the fibrous layer is the only layer that is apparent.

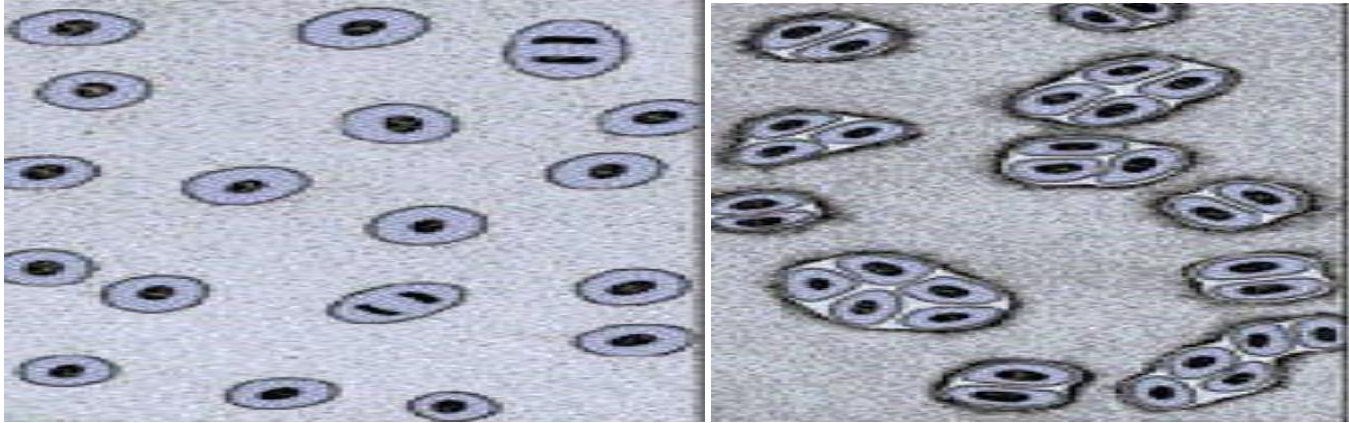


What do these features indicate?

Embryonic Development:

As the cells of most connective tissues, chondrocytes are derived from mesenchymal cells which form a mesenchymal condensation. These undifferentiated cells divide and differentiate into “**Chondrogenic**” cells, committed to becoming chondrocytes. These cells further differentiate into **chondroblasts** which create the initial ECM. When

chondroblasts become surrounded by the ECM and are in a lacuna, these cells become chondrocytes.



Interstitial Growth:

Active chondrocytes within the cartilaginous mass can undergo mitosis. Each daughter cell produces fibers and ground substance around itself so that the cartilage expands from within the matrix (**interstitial growth**). *

Groups of these daughter cells which arise from a common chondrocyte retain a close relationship and form **isogenous groups**.

■ **There are three Types:**

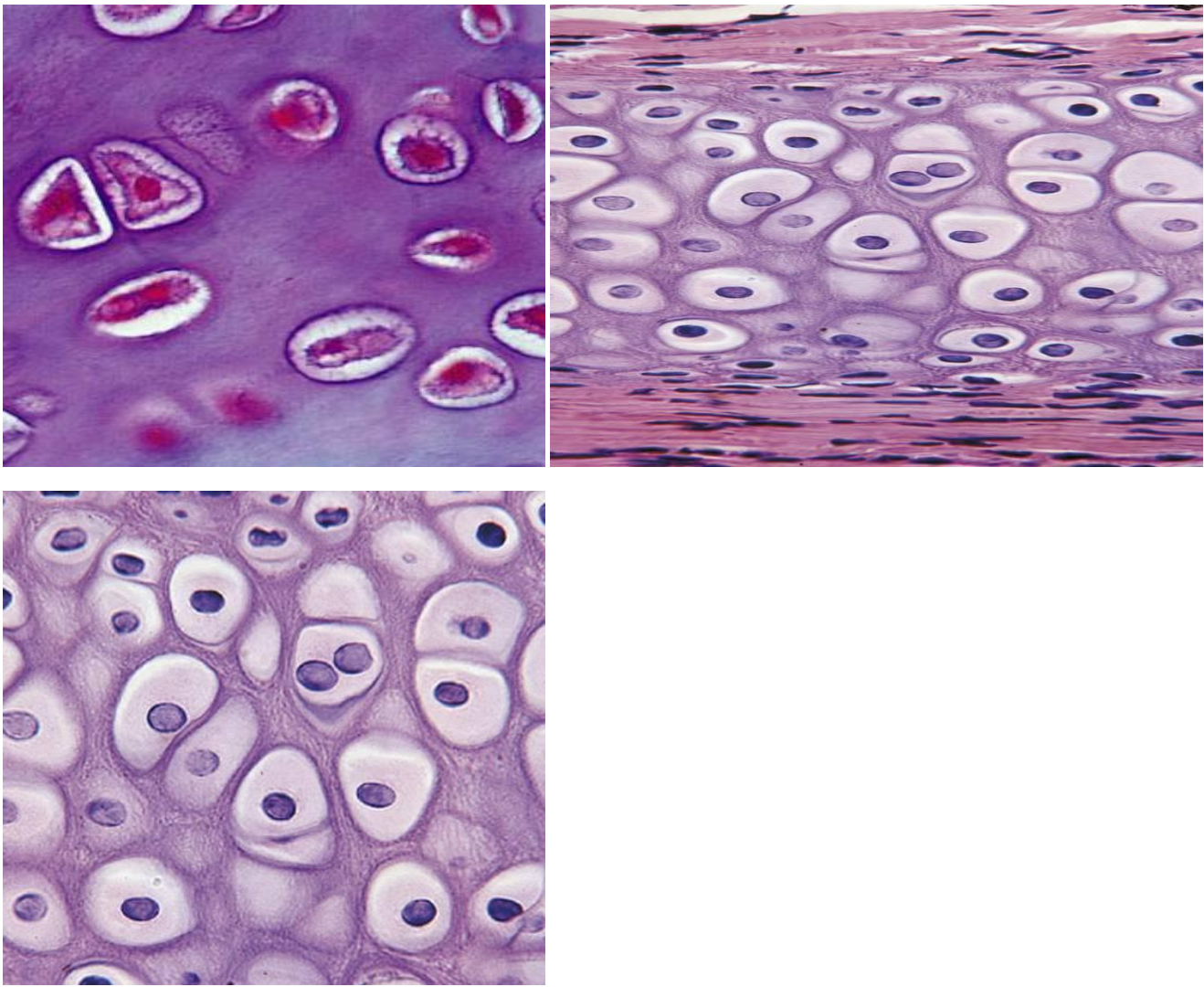
- Hyaline**
- Elastic**
- Fibrocartilage**

Hyaline cartilage:

Found on articular surfaces of bones, on the sternal ends of ribs, in the trachea and larynx, in the nose, in the external auditory meatus and in the fetal skeleton. Cells: Chondrocytes. Hyaline cartilage grows by both interstitial and appositional growth. Fibers: about 40% of the dry weight of hyaline cartilage is collagen type II . Type II collagen are fine fibrils (100 - 200 nm diameter) which form an interlacing network in the matrix. The fibrils usually do not display the 64 nm periodicity characteristic of collagen fibrils found in soft connective tissue and in bone. **Ground substance:** mainly chondroitin sulfates.

■ **Characteristics of hyaline cartilage :**

- Firm, flexible tissue
- Contains no blood vessels or nerves
- Matrix contains up to 80% water
- Cell type – chondrocyte



Elastic Cartilage

Found in the larynx, external ear (auricle), auditory tube and epiglottis. Cells: Chondrocytes are located in lacunae, similar to those seen in hyaline cartilage. Elastic cartilage grows by both interstitial and appositional growth. Fibers: In addition to collagenous fibers, elastic cartilage contains a meshwork of elastic fibrils that give the cartilage a yellow appearance in the living state. The fibrils are more heavily concentrated in the center of the cartilage mass than near the perichondrium.

The presence of elastic fibers gives this cartilage type more flexibility than hyaline or fibrocartilage. Ground substance – principally chondroitin sulfates.

■ Description

- Similar to hyaline cartilage
- More elastic fibers in matrix

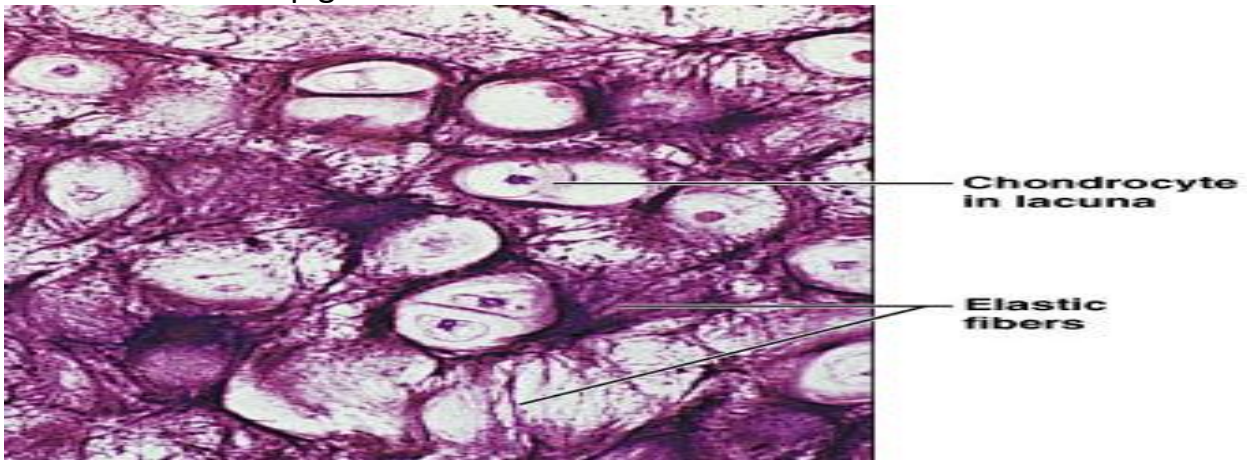
■ Function

- Maintains shape of structure
- Allows great flexibility

■ Location

- Supports external ear

□ Epiglottis



Fibrocartilage

Found in intervertebral discs, articular discs, symphysis pubis and at the insertions of tendons and ligaments. It is not surrounded by a perichondrium. Cells: chondrocytes are oriented between large collagenous fiber bundles or appear singly in an isolated fashion within lacunae. There is no identifiable perichondrium surrounding fibrocartilage, therefore, it apparently grows by interstitial growth only.* Fibers - an abundance of collagen type I fibrils that are visible in routine preparations.

■ Description

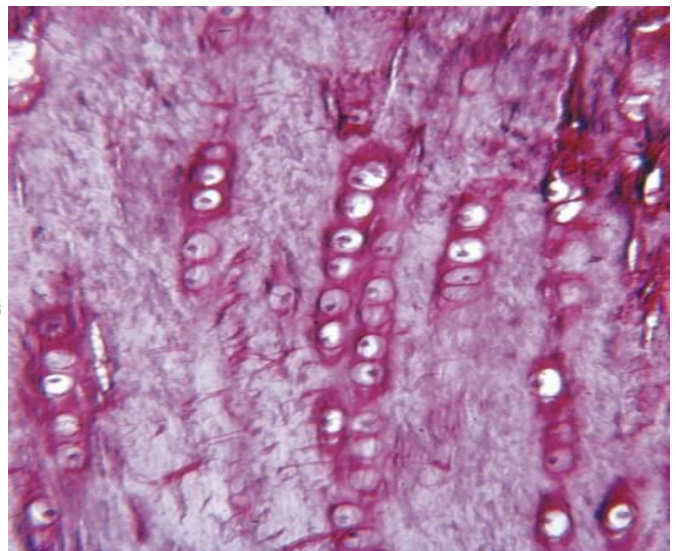
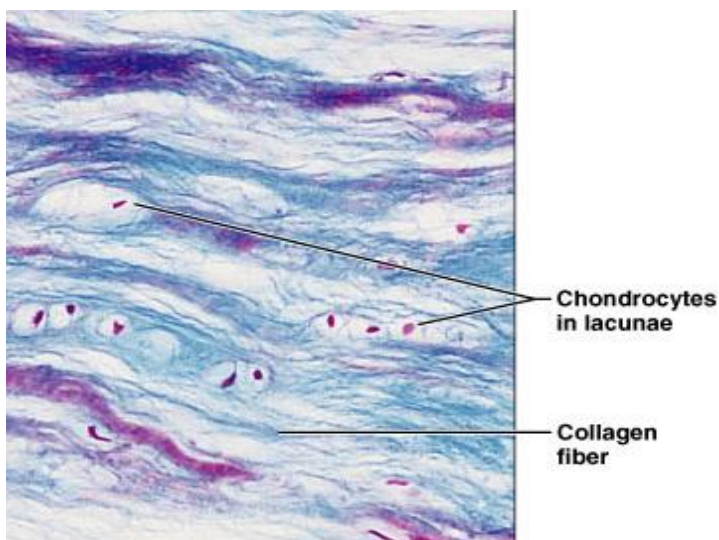
- Matrix similar, but less firm than hyaline cartilage
- Thick collagen fibers predominate

■ Function

- Tensile strength and ability to absorb compressive shock

■ Location

- Intervertebral discs
- Pubic symphysis
- Discs of knee joint



Bone Tissue

Bone is the most rigid form of the connective tissues . It forms the skeleton, provides support and protection for vital organs (e.g., brain, heart and lungs.(Serves for the attachment of muscles and encloses the marrow cavity where blood development occurs..

Similar to cartilage in that ,

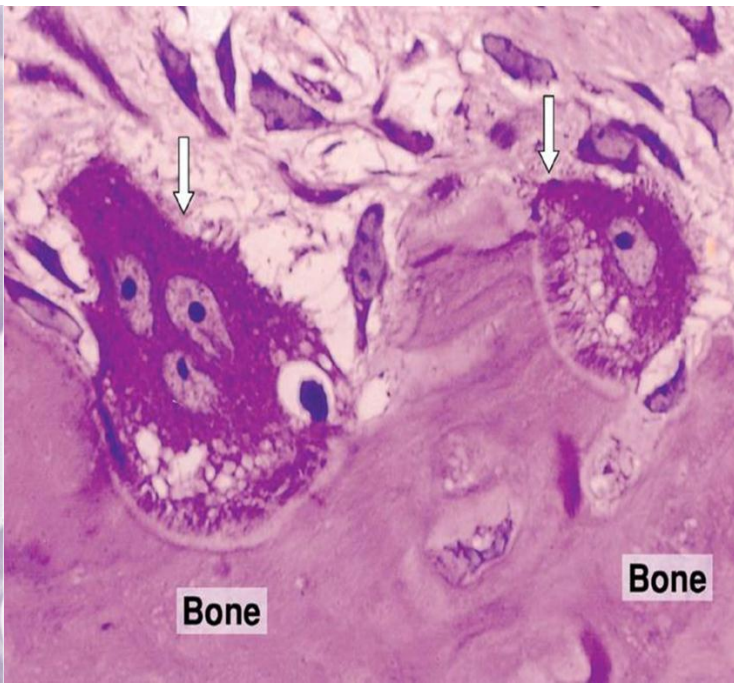
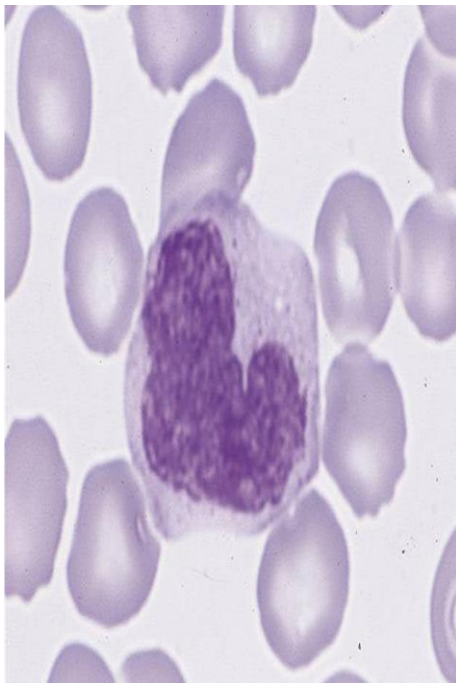
- **It is a firm tissue ,**
- **Its cells are located in lacunae**
- **It has an intercellular matrix possessing a protein-polysaccharide rich ground substance containing chondroitin sulfate**
- **It contains collagen fibrils.**

Differs from cartilage in that:

- **Inorganic salts are deposited in the bone matrix**
- **Its cells can not receive nutrients by diffusion through the inorganic matrix**
- **Canaliculi link the lacunae and serve as a means for the passage of nutrients**
- **The collagen fibrils are organized into lamellae**
- **Bone grows only appositionally.**

To study bone microscopically, fresh pieces must be decalcified before they can be sectioned, or dried pieces of bone must be ground into thin sections * . Cells called osteocytes, occupy lacunae and are somewhat evenly distributed throughout the bone tissue. * The cells conform to the shape of the lacunae and send processes into canaliculi, where they form gap junctions with the processes of adjacent cells. * Young osteocytes in the formative phase (osteoblasts) : have a well developed Golgi complex, many cisternae of rough ER and numerous mitochondria. These cells produce bone matrix . The un-calcified bone matrix made by these immature osteocytes is called osteoid.

Osteoclasts :These cells secrete acids, collagenase and other proteolytic enzymes. Extensive ruffled border of the cell lies next to area of bone being resorbed. Formed by the fusion of monocytes (part of the mononuclear phagocyte system).



Osteoclasts

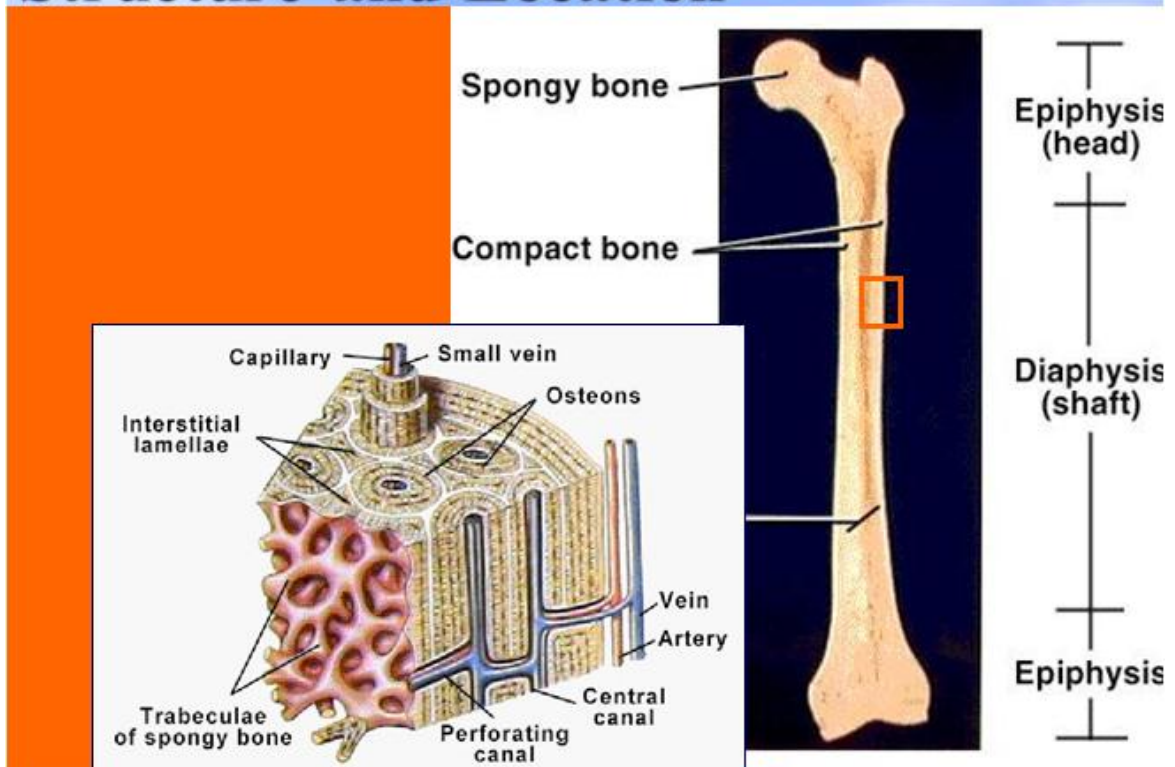
■ **Function**

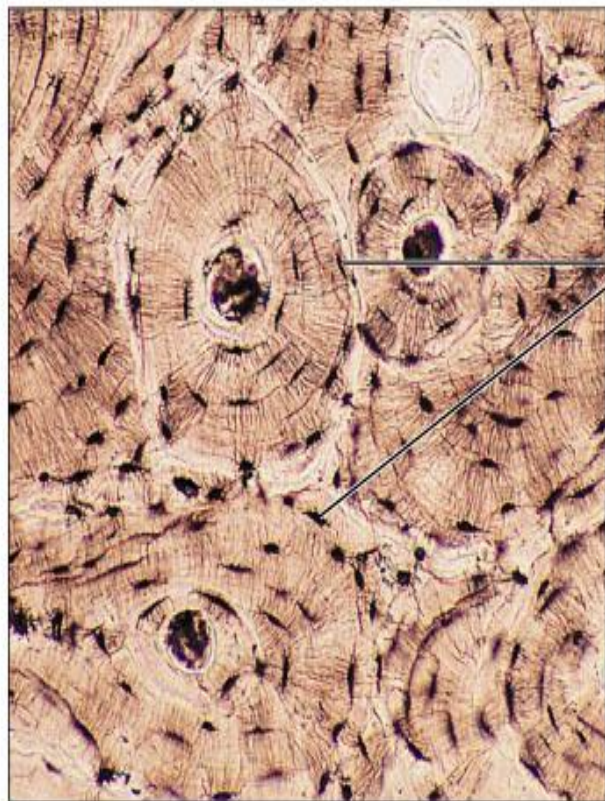
- Supports and protects organs
- Provides levers and attachment site for muscles
- Stores calcium and other minerals
- Stores fat
- Marrow is site for blood cell formation

■ **Location**

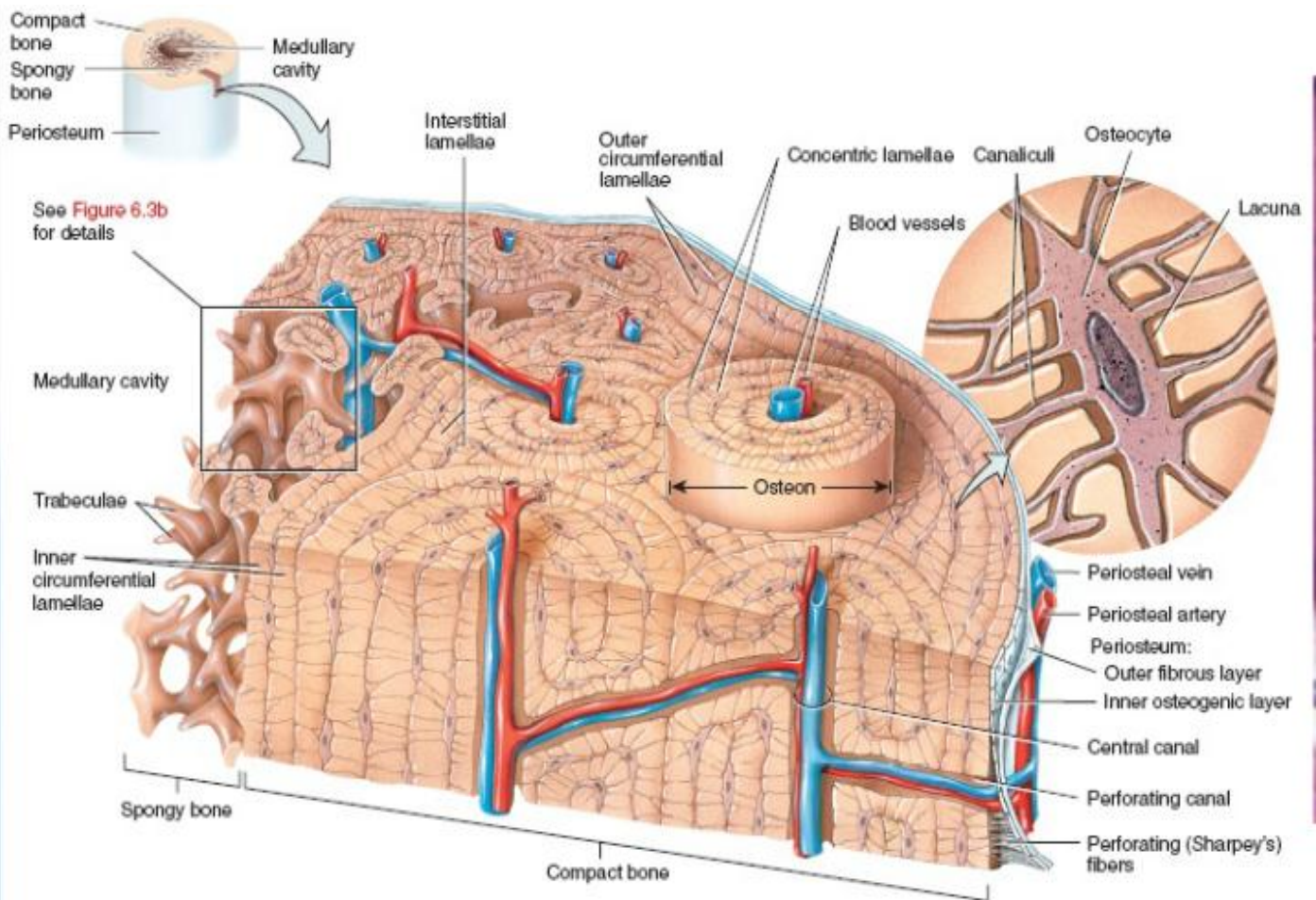
- Bones

Structure and Location

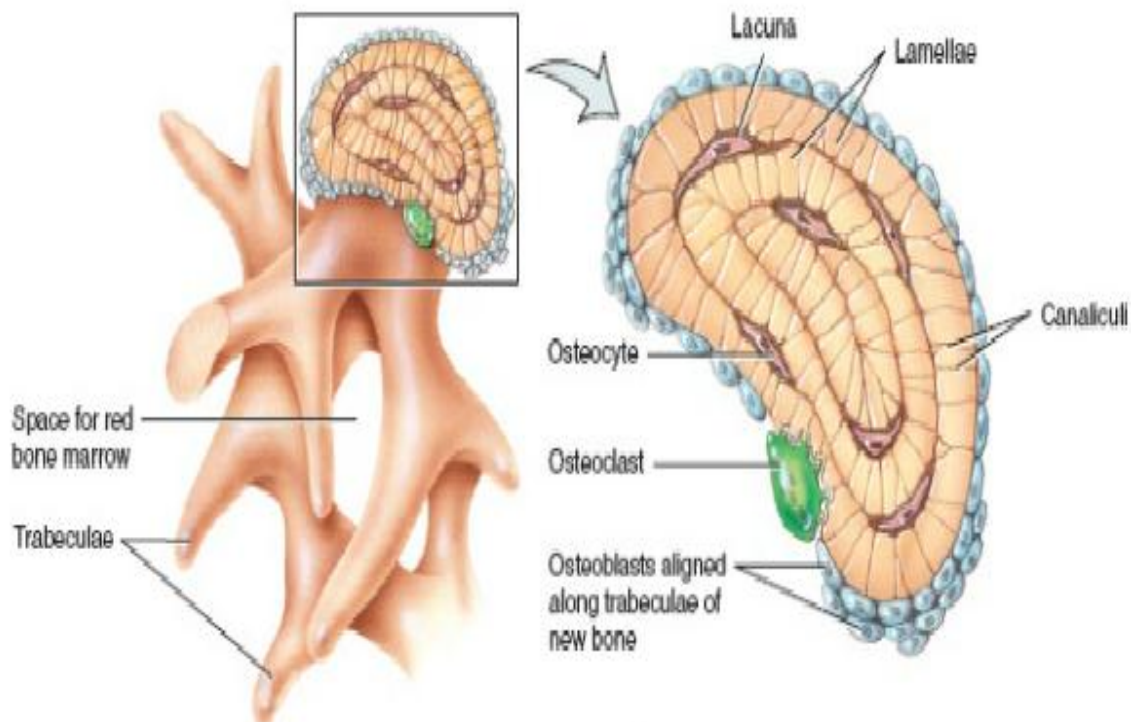




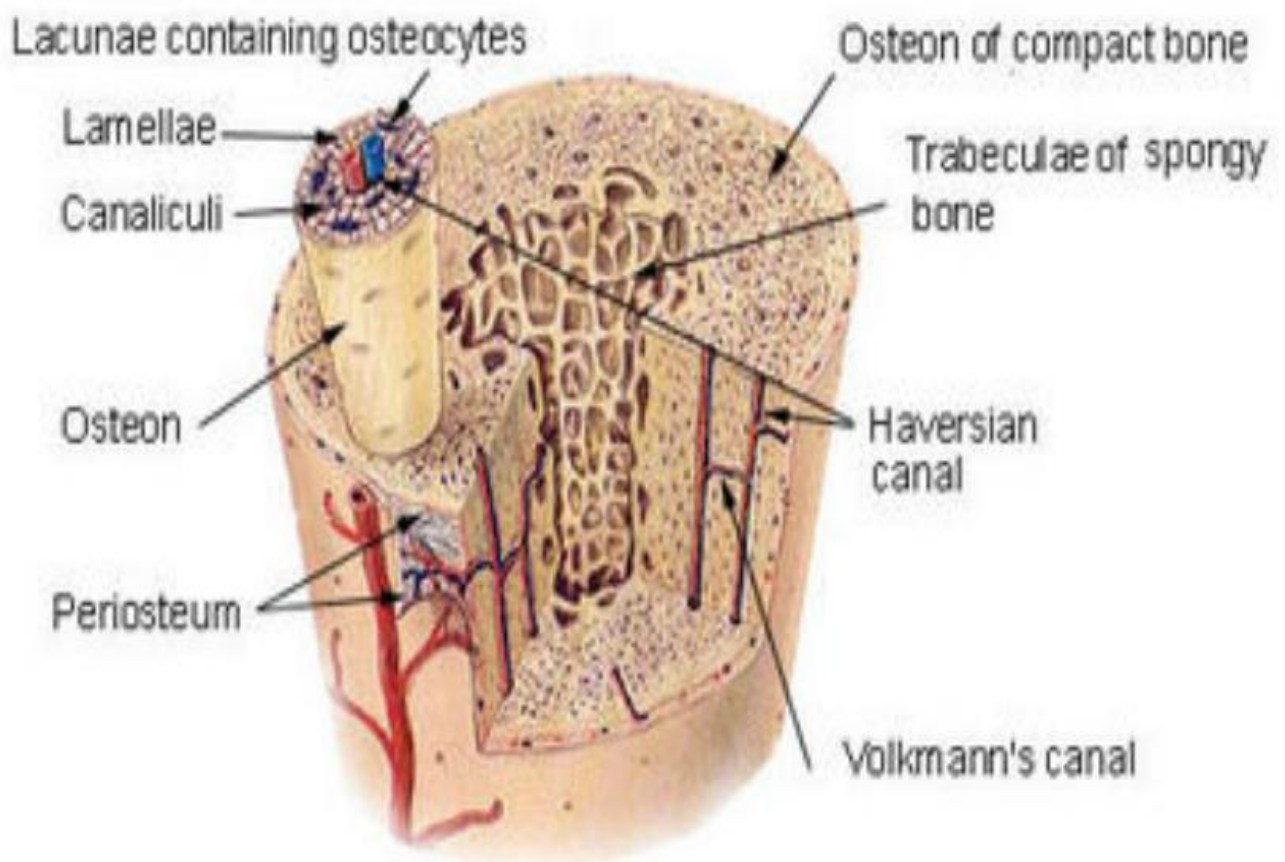
Osteocytes in lacunae

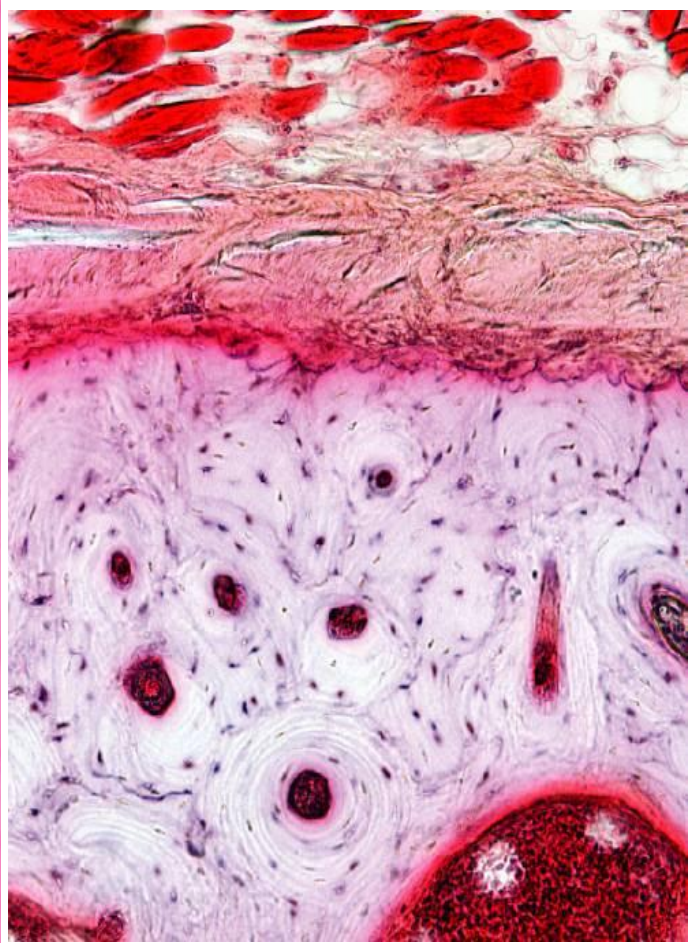
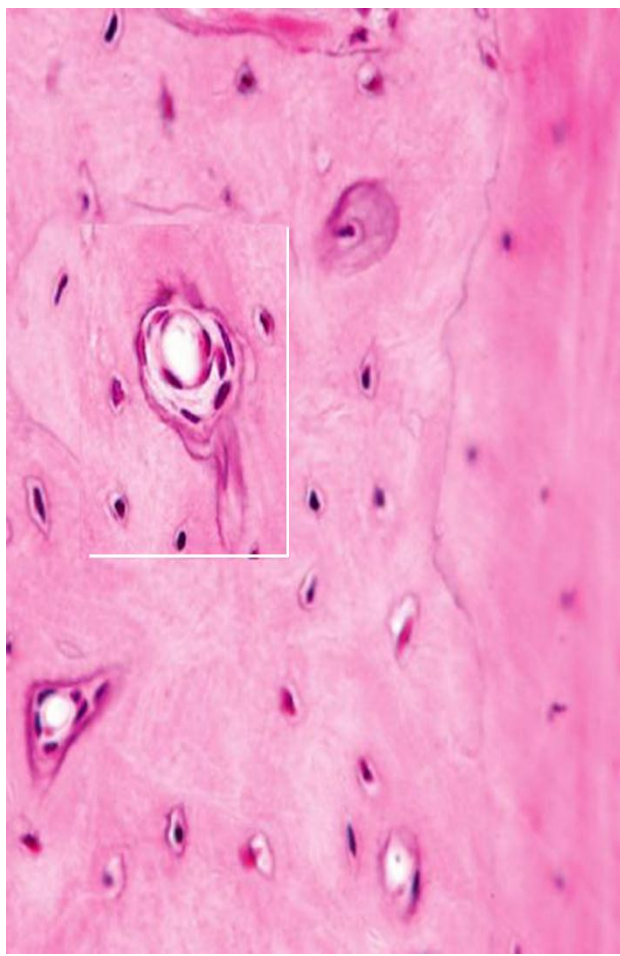
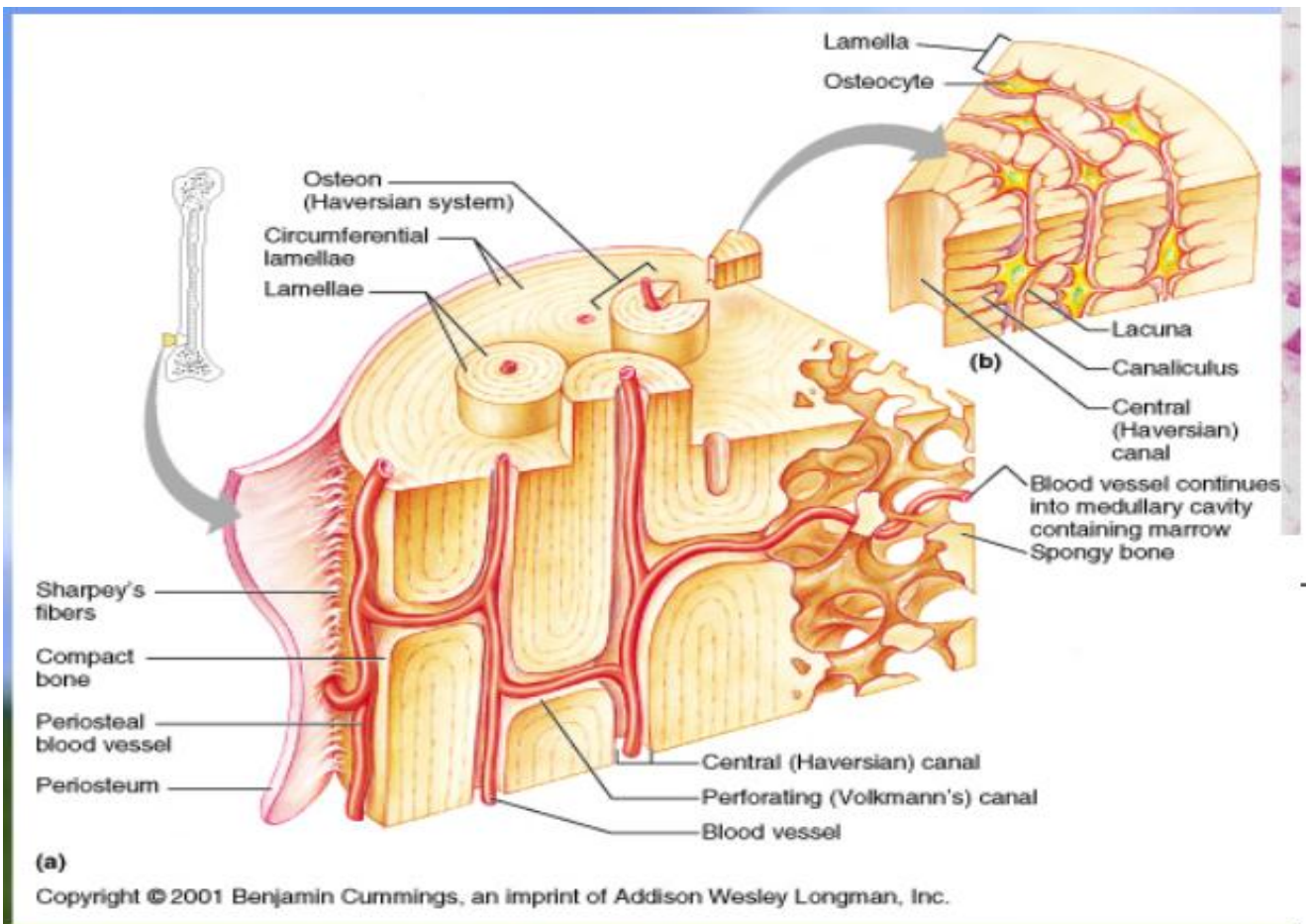


(a) Osteons (haversian systems) in compact bone and trabeculae in spongy bone

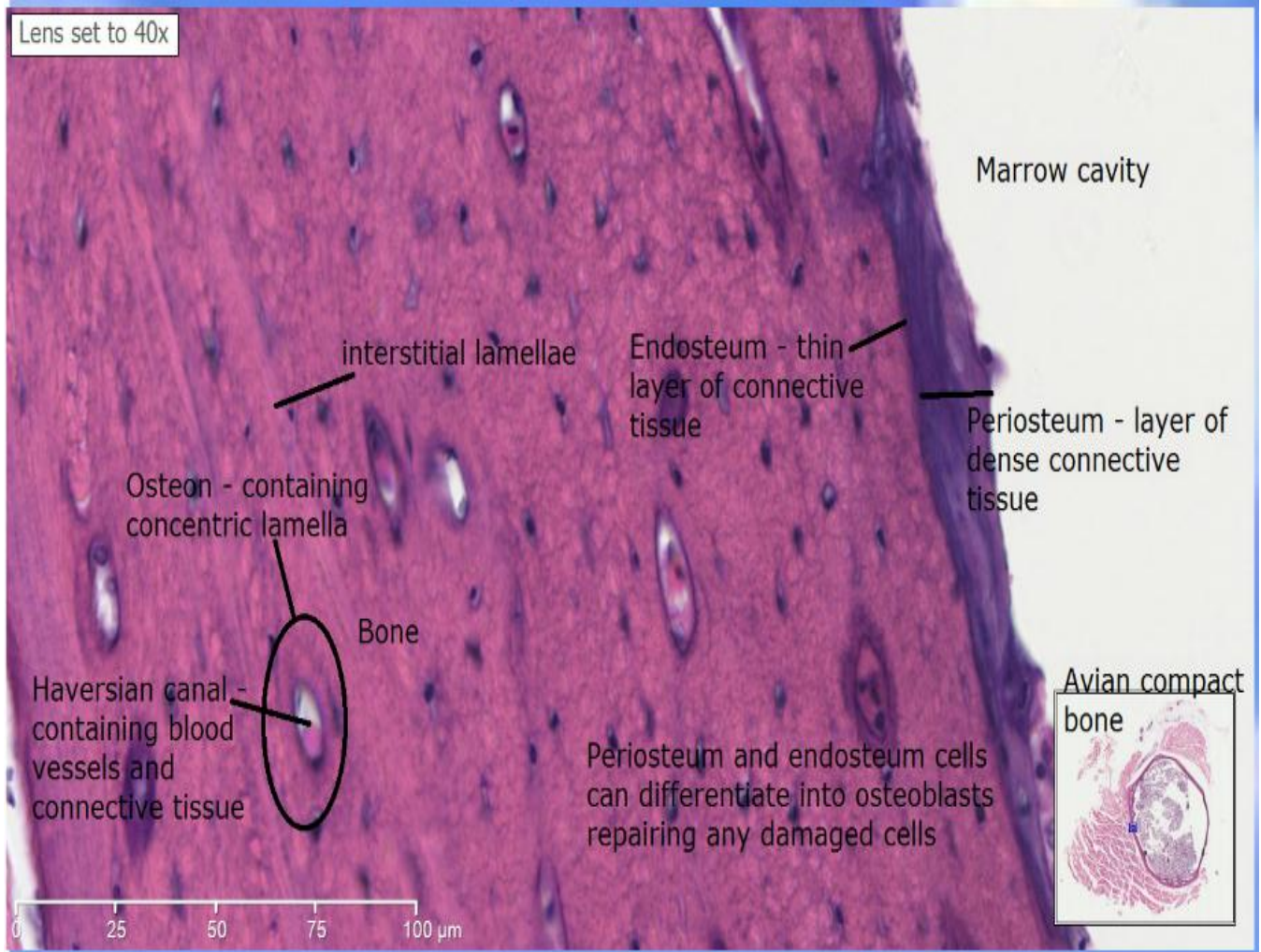


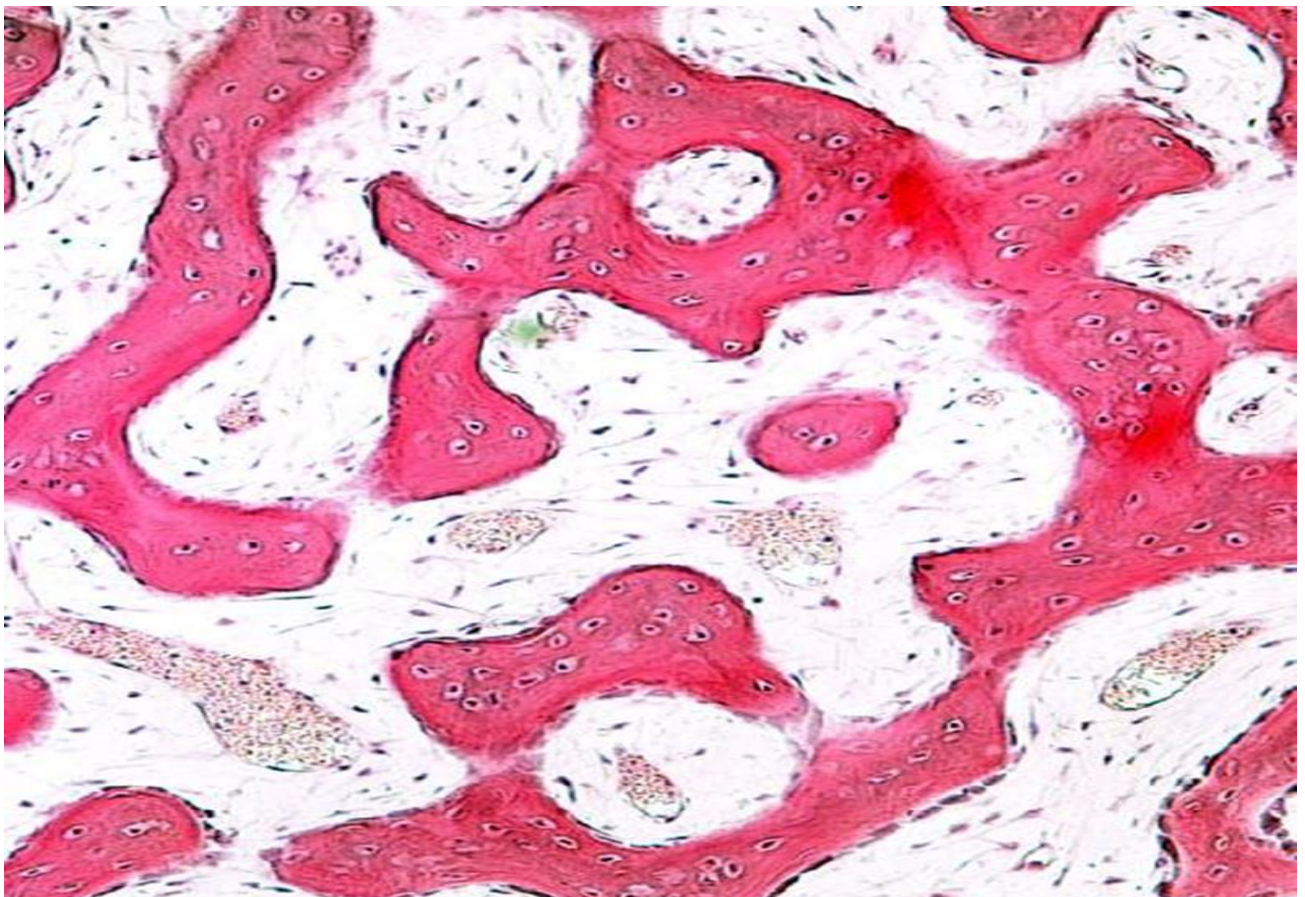
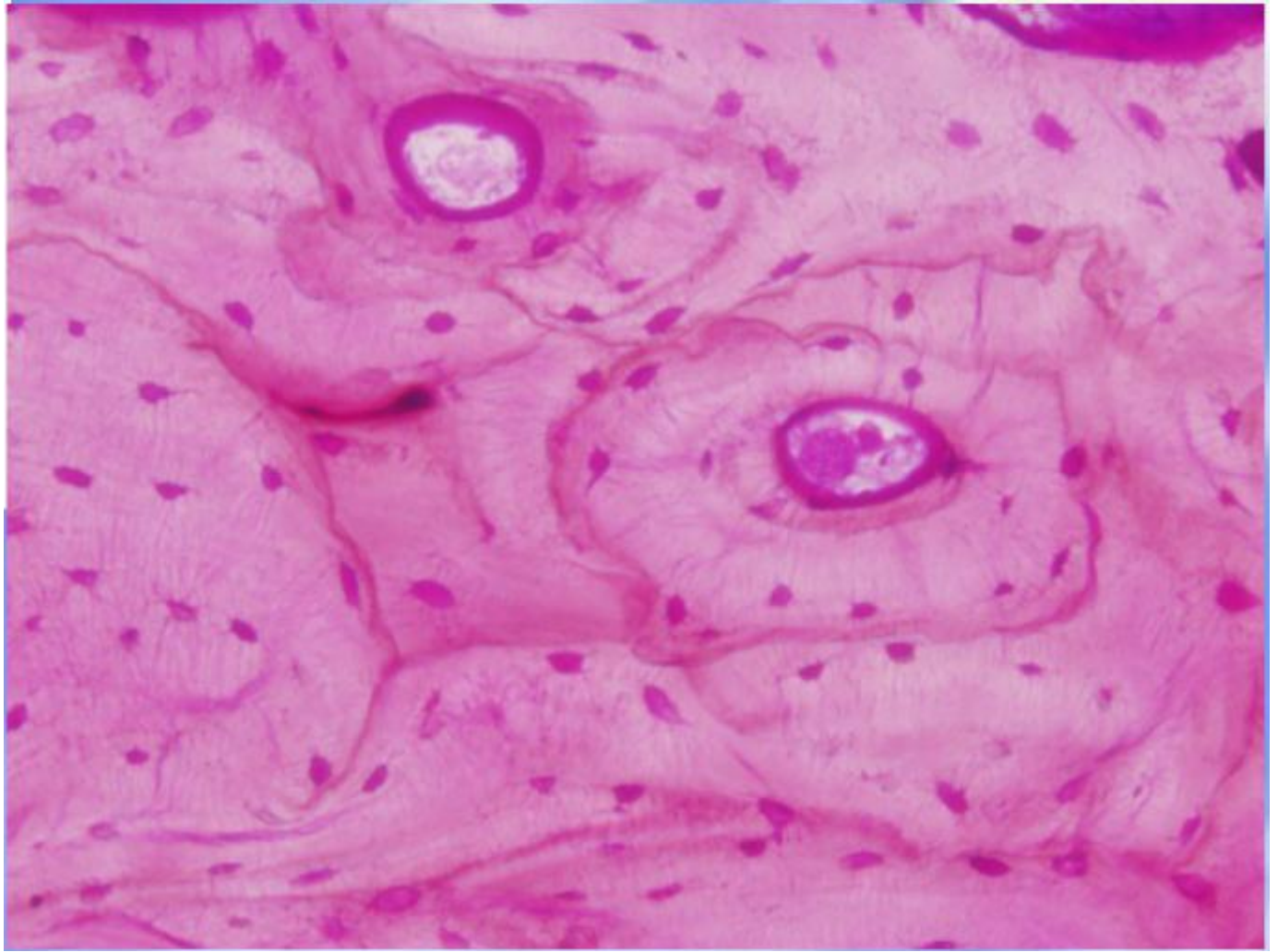
Compact Bone & Spongy (Cancellous Bone)



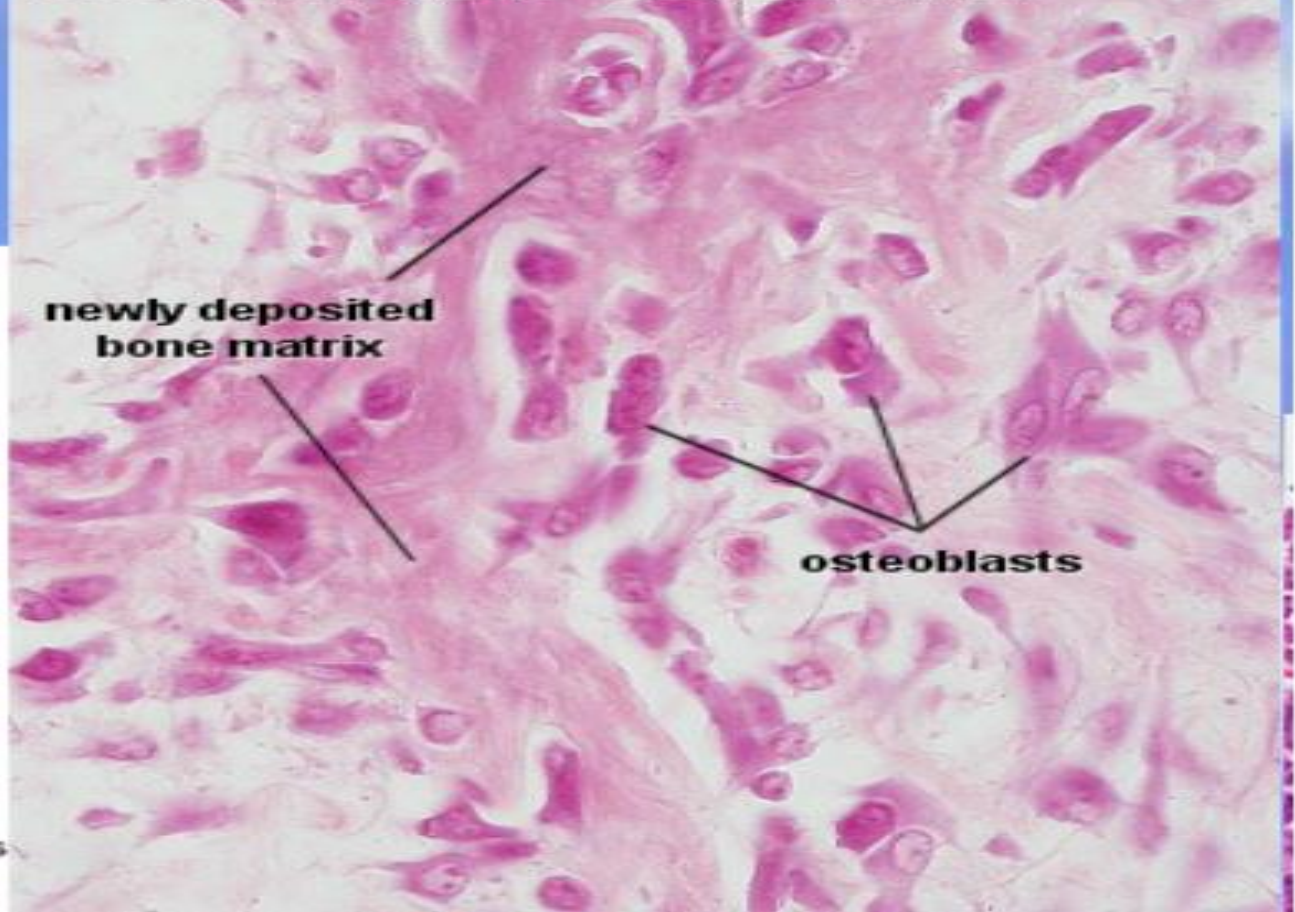


Lens set to 40x

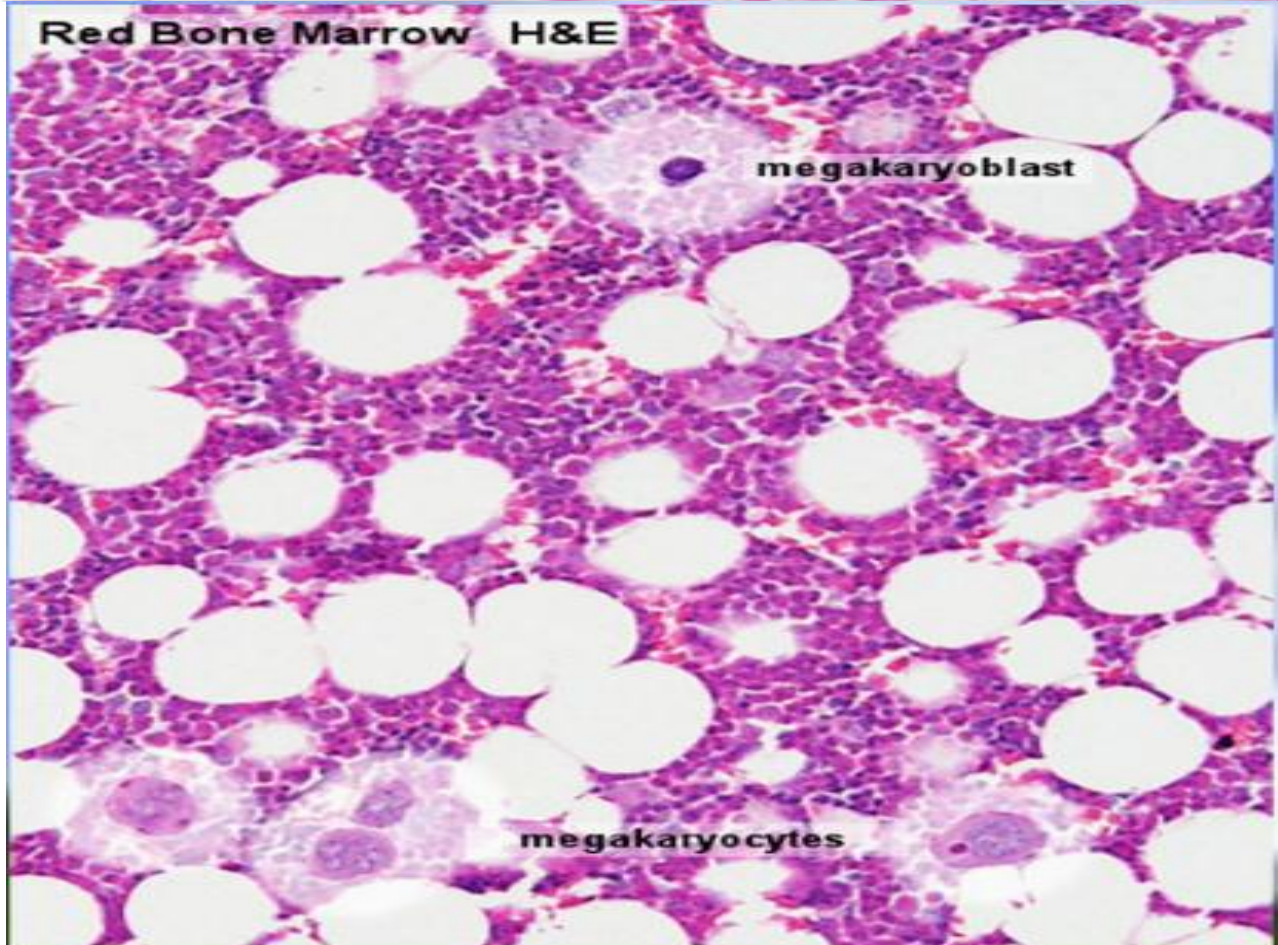


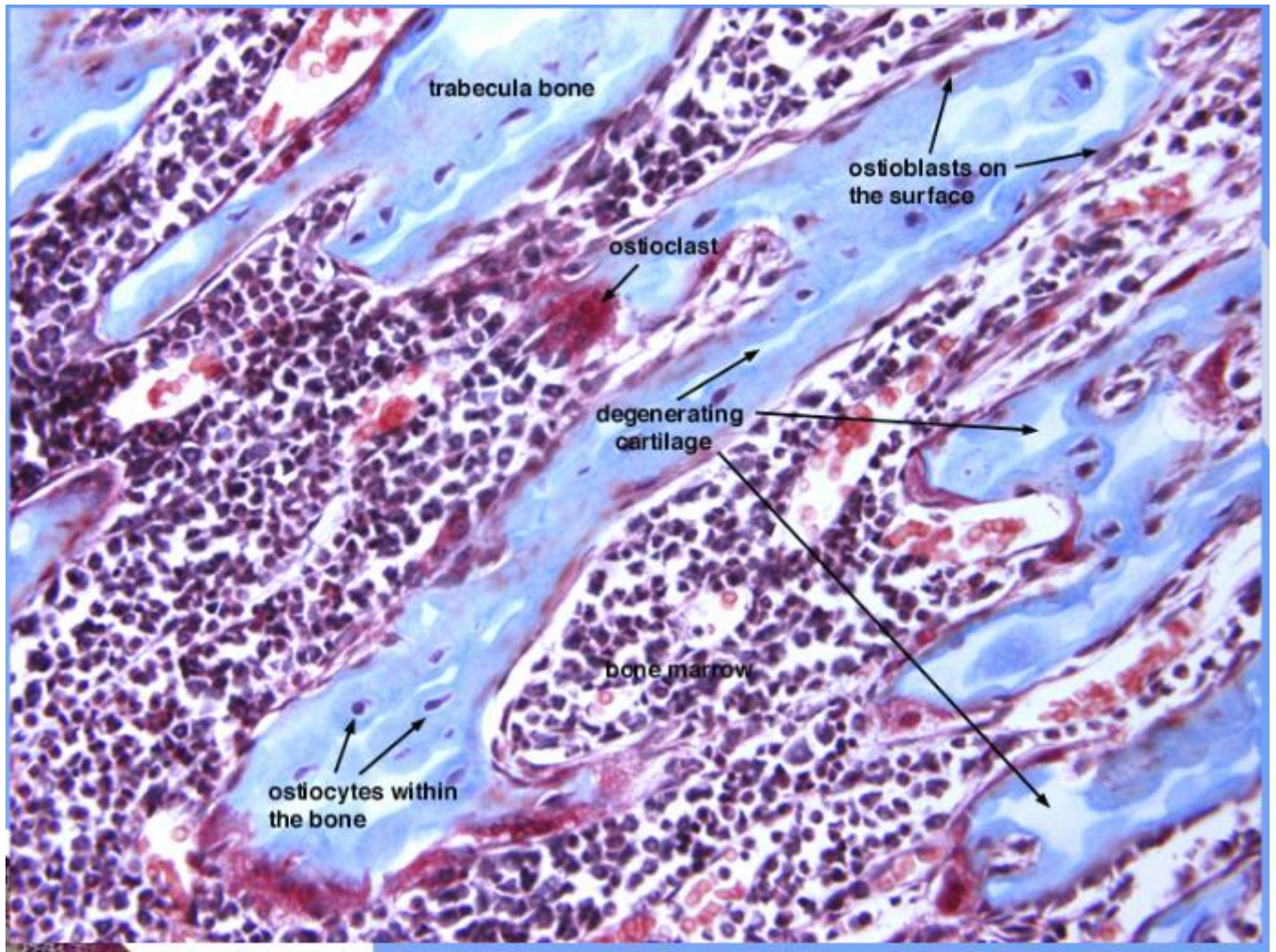


Intramembranous Ossification H&E



Red Bone Marrow H&E





List of [exocrine glands](#)[\[edit\]](#)

Name(s)	Location	Product	Structure
Apocrine sweat glands	skin		coiled tubular
Bauhin's glands , anterior lingual glands	tongue , near tip	nonserous or mixed	
Brunner's glands ,	duodenum	mucous	compound tubular
Bronchopulmonary glands	lungs	mucous	
Bulbourethral glands , Cowper's glands, Mery's glands	penis , base	Pre-ejaculate	
Ciaccio's glands , accessory lacrimal	eye		

<u>glands</u>			
<u>Cobelli's glands</u>	<u>esophagus</u> , just above the <u>cardia</u> , in the <u>mucosa</u>	mucous	
<u>Ebner's glands</u>	<u>tongue</u>	serous	
<u>Eccrine sweat glands</u>	<u>skin</u>		coiled tubular
<u>Esophageal glands</u>	<u>esophagus</u>	mucous	racemose
<u>Exocrine pancreasm</u>	<u>pancreas</u>	serous	tubulo-acinar
<u>Fränkel's glands</u>	<u>vocal cords</u> , below the edge		
<u>Gastric chief cell</u> , <u>Wasmann's glands</u>	<u>stomach</u>	serous	
<u>Glomus coccygeum</u> , coccygeal gland, <u>Luschka's gland</u> or gangliona	<u>coccyx</u> , near the tip		
<u>Goblet cells</u>	<u>digestive tract</u> , <u>respiratory tract</u>	mucous	simple unicellular
<u>Henle's glands</u>	<u>eyelids</u> , in the <u>conjunctiva</u>		tubular
<u>Krause's glands</u>	<u>conjunctiva</u> , middle portion	mucous	
<u>Lieberkuhn's glands</u>	<u>intestines</u> , surface of <u>mucous membrane</u>		simple tubular
<u>Litré's glands</u> , <u>Morgagni's glands</u>	<u>spongy portion of the urethra</u>		racemose
<u>Lumbar glands</u>	abdomen, near the back		
<u>Mammary gland</u>	<u>breast</u>		compound tubulo-acinar
<u>Meibomian gland</u>	<u>eyelids</u>	sebaceous	

<u>Moll's glands</u>	<u>eyelids</u>		
<u>Montgomery's glands</u>	mammary <u>areola</u>	sebaceous	
Naboth's glands	<u>cervix</u> and <u>os uteri</u>	mucous	
<u>Olfactory glands</u> , Bowman's glands	<u>nose</u> , <u>olfactory</u> region		
<u>Paneth cells</u>	<u>small intestine</u>	serous	
Gley's glands, Sandstroem's glands, <u>parathyroid gland</u>	in the neck		
<u>Parotid gland</u>	<u>mouth</u>	serous	tubulo- alveolar
<u>Peyer's patches</u> (or glands)	<u>ileum</u> , <u>lymphatic</u> glands		
<u>Prostate</u>	surrounds the <u>urethra</u> just below the <u>urinary bladder</u>		
<u>Pyloric glands</u>	<u>stomach</u>	mucous	simple branched tubular
<u>Sebaceous gland</u>	<u>skin</u>	sebum	acinar - branched
<u>Sublingual gland</u> , Rivini's gland	<u>mouth</u>	mucus (primarily)	tubulo- alveolar
<u>Submandibular gland</u>	<u>mouth</u>	mixed (M+S)	tubulo- alveolar
<u>Sudoriparous glands</u> , Boerhaave's glands	<u>skin</u>		
<u>Sigmund's glands</u>	<u>epitrochlear lymph nodes</u> of <u>axilla</u>		
<u>Suzanne's gland</u>	mouth, beneath the <u>alveolo-</u>	mucous	

	lingual groove ^[1]		
Tiedmann's glands, Bartholin's glands , vulvovaginal glands	vulva , vagina		
Uterine glands	uterus		
Weber's glands	tongue	mucous	tubular
Glands of Zeis	eyelids , free edges	sebaceous	

List of [endocrine glands](#) [\[edit\]](#)

Name(s)	Location	Product	Structure	Functions
Adrenal	A PAIR OF GLANDS LOCATED ATOP EACH KIDNEY			
Hypothalamus				
Pineal	MID-CRANIUM BEHIND FOREHEAD			
Pituitary	BASE OF THE BRAIN			
Thyroid	2 PART GLAND ON THE FRONT OF THE WINDPIPE & SHAPED LIKE A BUTTERFLY			
Thymus	UNDER THE BREAST BONE IN THE UPPER CHEST			
Pancreas	BELOW THE STOMACH			
Testes	LOCATED IN THE PELVIC AREA IN FRONT OF THE RECTUM OF THE MALE.			
Ovaries	FEMALE GLANDS LOCATED IN THE LOWER ABDOMEN			

Skin [\[edit\]](#)

There are several specialized glands within the human [integumentary system](#) that are derived from apocrine or sebaceous gland precursors. There are no specialized variants of eccrine glands.

Specialized glands within the human integumentary system

Name	Precursor gland derived from ^[2]	Anatomic location
<u>Ceruminous gland</u>	<u>Apocrine</u>	<u>Ear canal</u>
<u>Mammary gland</u>	<u>Apocrine</u>	Breast
<u>Moll's gland</u>	<u>Apocrine</u>	Eyelid margin
<u>Tyson's gland</u>	<u>Sebaceous</u>	Genital skin
<u>Meibomian gland</u>	<u>Sebaceous</u>	<u>Tarsal plate</u>
<u>Gland of Zeis</u>	<u>Sebaceous</u>	Associated with eyelashes on eyelid margin
<u>Montgomery gland</u>	<u>Sebaceous</u>	<u>Areola</u>
<u>Fordyce spot</u>	<u>Sebaceous</u>	<u>Vermillion border</u>

Preparing Human Tissue

1st - specimens are fixed (preserved)

2nd - sectioned (thinly sliced)

3rd - stained (color stains or metals added)

Note -Type of stain used depends on the microscope

Light microscopy – organic dyes

-acidic and basic stains

Electron microscopy – heavy-metal salts

-deflect electrons

- color property of light

- Mescher, Junqueira's Basic Histology, 12th ed., McGraw-Hill 2003.