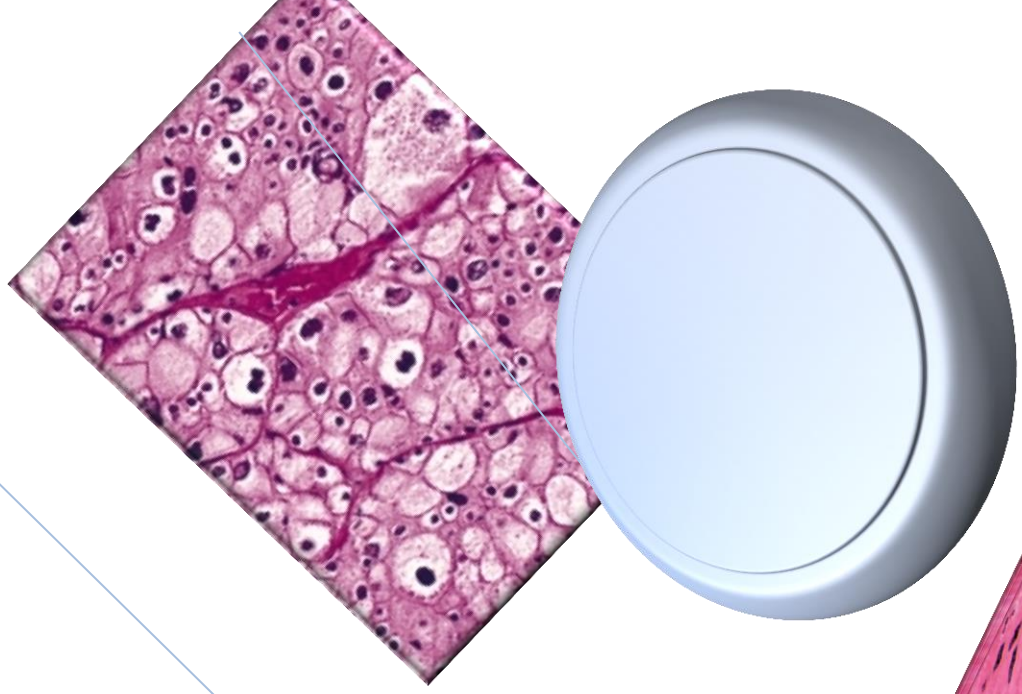
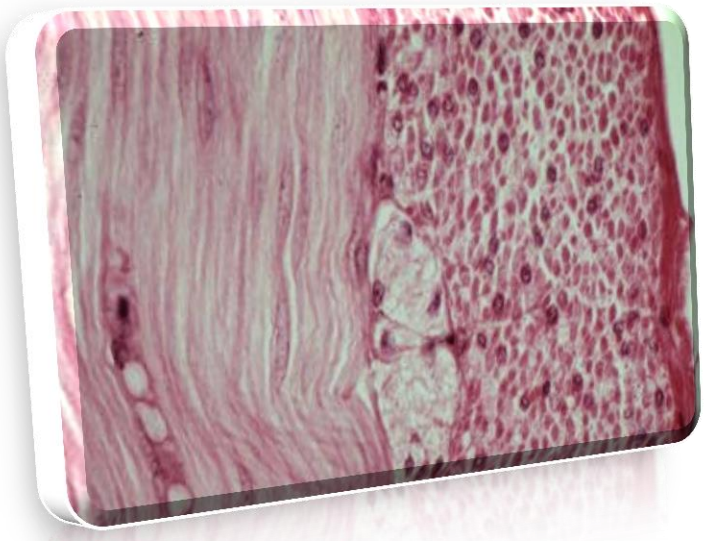


General Histology
(Practical)



Lab. 1 **General Histology**

Circulatory system

The circulatory system is composed of two separate but related components: the cardiovascular system and the lymphatic vascular system

Cardiovascular system:

Is composed of the heart, arteries, capillaries and veins

1- Arteries

Arteries are classified into three types

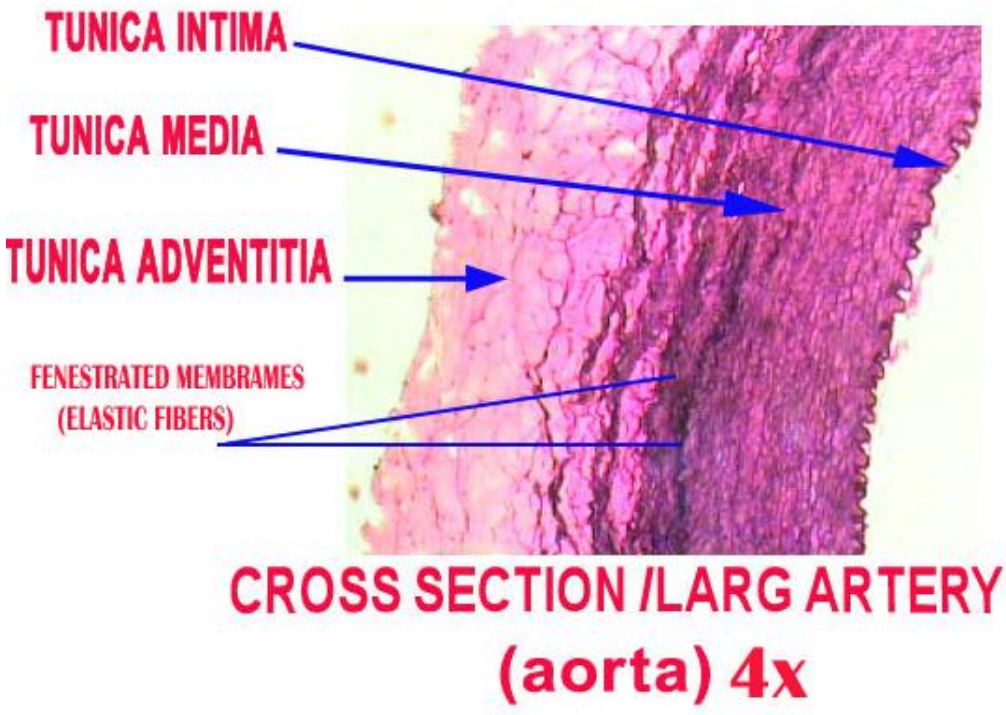
1- Large arteries (elastic arteries or conducting arteries)

2- Medium-sized arteries (muscular arteries or distributing arteries)

3- Arterioles

Large arteries:

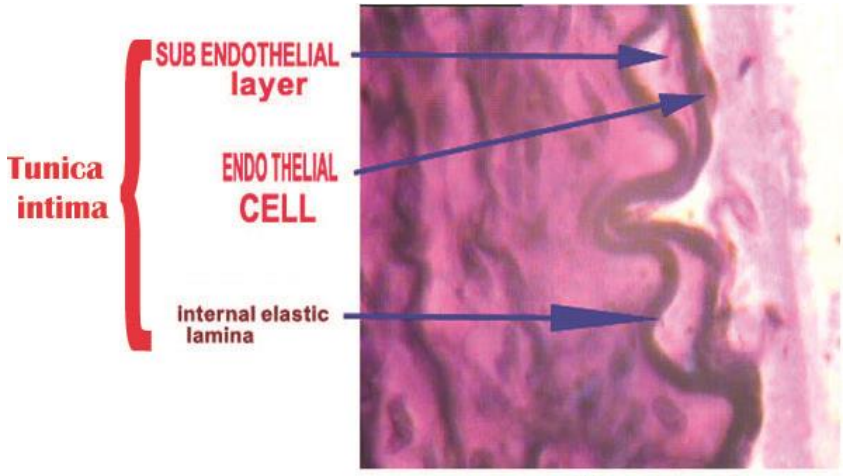
e.g. aorta (c.s in aorta)



a- **Tunica intima**: is composed of a single layer of flattened , squamous endothelial cells, which form a tube lining the lumen of the vessel rest on a basal lamina.

A sub endothelial layer lies beneath the endothelial cells.

It is composed of loose connective tissue (fibroblasts and collagen fibers) and a few scattered smooth muscle cells, both arranged longitudinally. Beneath the subendothelial layer is an internal elastic lamina.



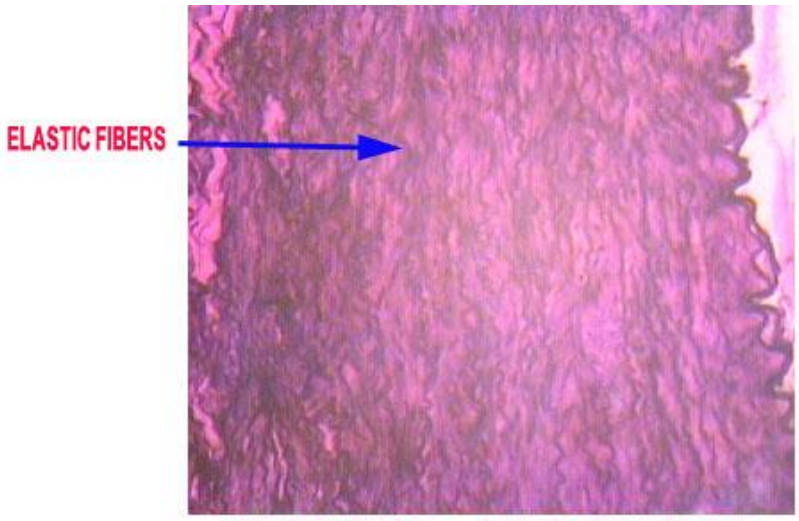
cross section in aorta (tunica intima) 40x

b- **Tunica media:** consist of many fenestrated lamellae of elastin, known as the fenestrated membranes,

Alternating with circularly oriented layers of smooth muscle cells.

The extra cellular matrix is composed of collagen, reticular and elastic fibers.

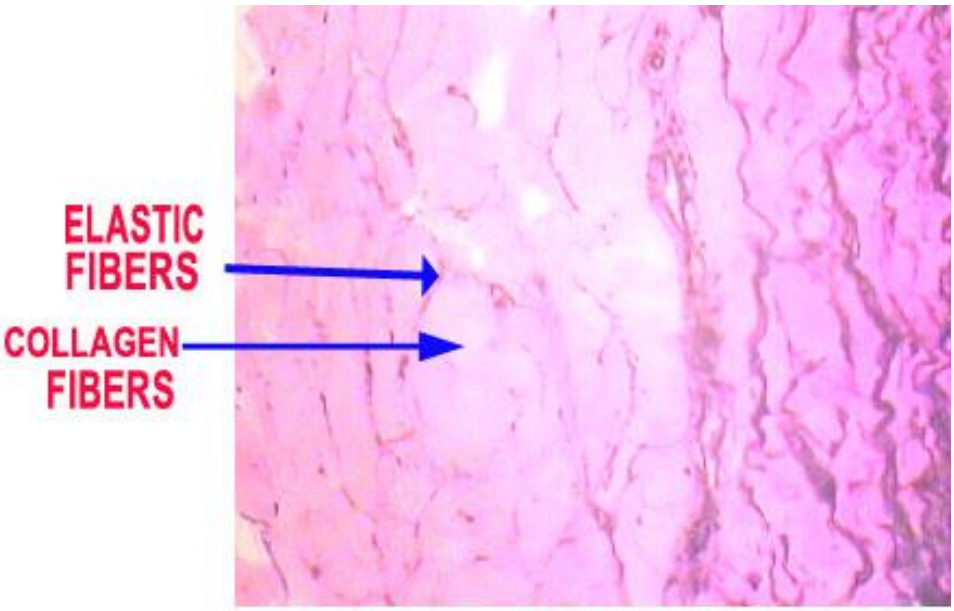
The external elastic lamina is present in the tunica media.



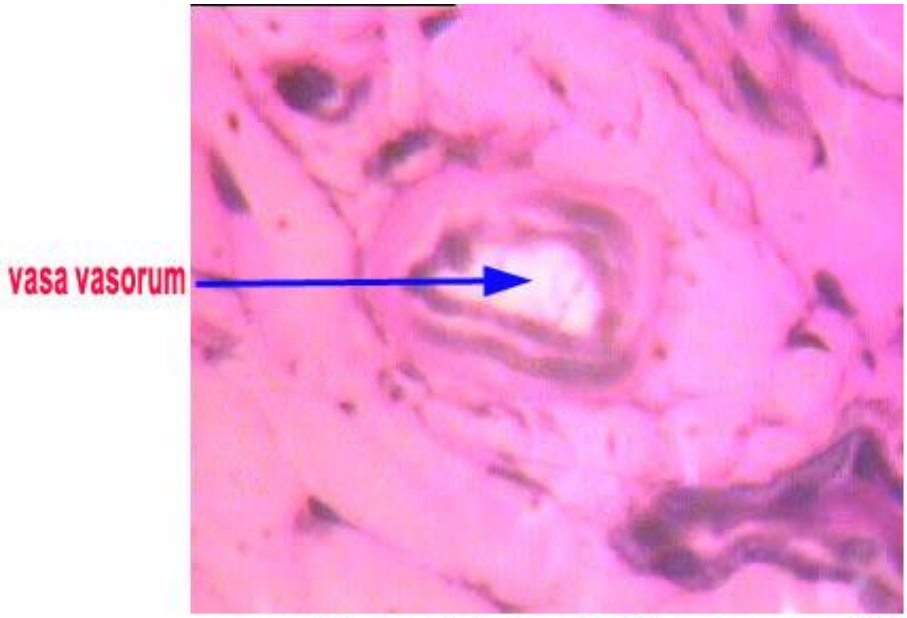
CROSS SECTION/in aorta (TUNICA MEDIA) 10x

c- **Tunica adventitia:** covering the vessels on their outside surface, composed of loose connective tissue (mostly of fibroblasts, collagen fibers and longitudinally oriented elastic fibers.

The deeper cells of the tunica adventitia are nourished by the vasa vasorum, small arteries that enter the vessel walls and branch profusely to serve the cells located in the tunica media and tunica adventitia.



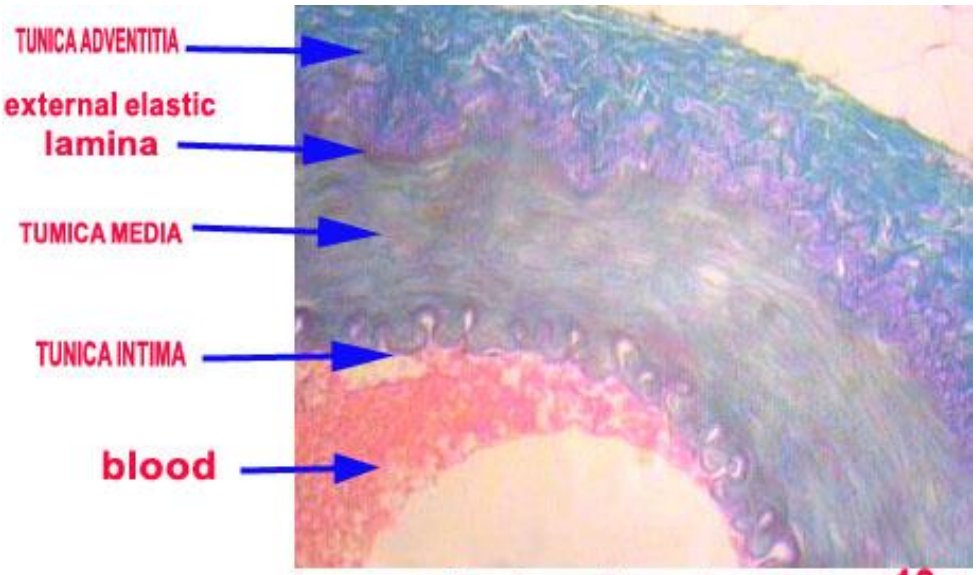
cross section/ in aorta(tunica adventitia) 10x



cross section in aorta (tunica adventitia,vasa vasorum) 40x

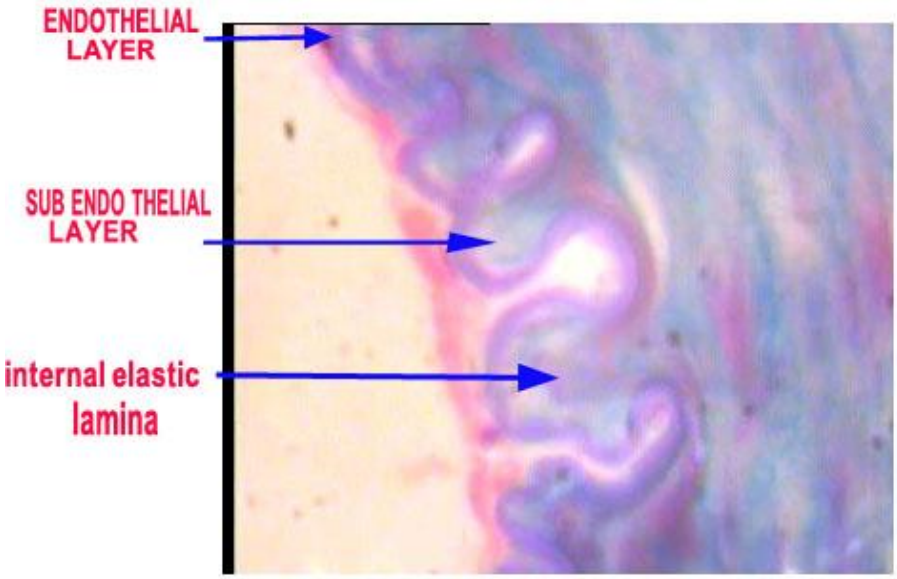
Medium sized arteries:

e.g. most of those arising from the aorta.



cross section in medium-sized Artery 10x

a- tunica intima: is thinner than in the elastic arteries but the subendothelial layer contains a few smooth muscle cells. In contrast with that of elastic arteries , the internal elastic lamina of muscular arteries is prominent and displays an undulating surface to which the endothelium conforms.



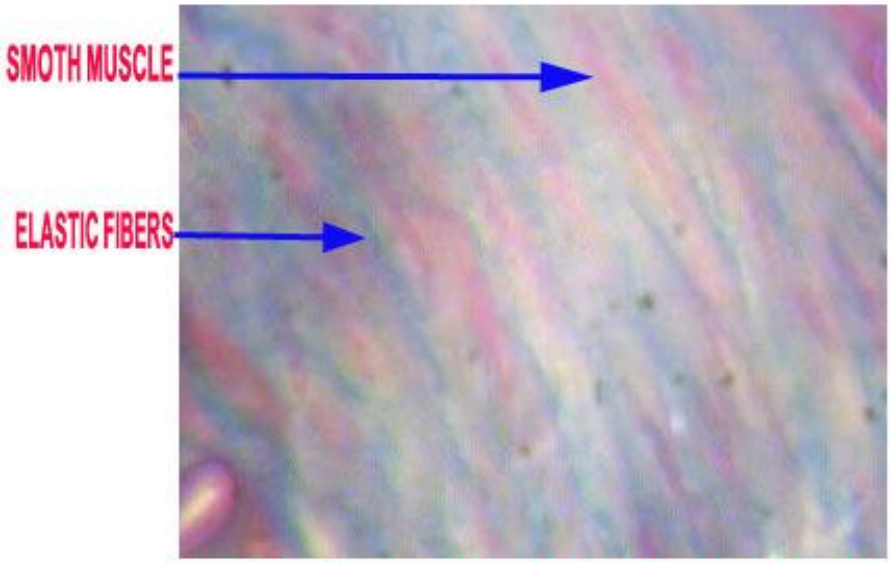
CROSS SECTIONI IN MEDIUM SIZE ARTERY(TUNICA INTIMA)40X

b- tunica media:

is composed predominantly of smooth muscles cells, but these cells are considerably smaller than those located in the walls of the viscera.

Small muscular arteries have three or four layers of smooth muscle cells, where as layer muscular arteries have more than 25 layers of circularly arranged smooth muscle cells. Interspersed within the layers of smooth muscle cells are elastic fibers and collagen fibers.

An external elastic lamina is identifiable in larger muscular arteries as several layers of thin elastic sheets.

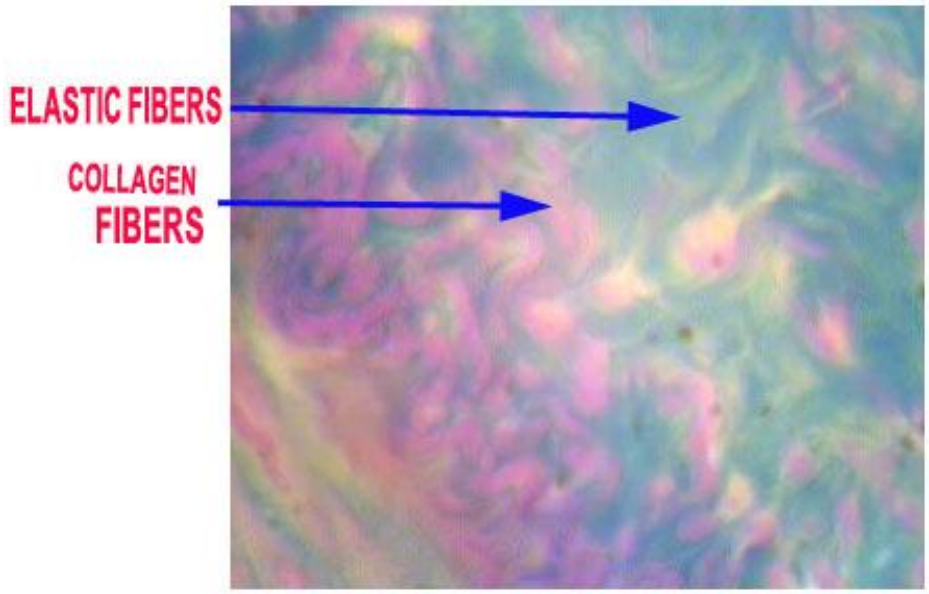


CROSS SECTION IN MEDIUM- SIZED ARTRERY (TUNICA MEDIA)

c- Tunica adventitia:

Consist of elastic fibers and collagen fibers oriented longitudinally and blend into the surrounding connective tissue .

Located at the outer region of the adventitia are vasa vasorum.



CROSS SECTIONIN MEDIUM-SIZE ARTERY (TUNICA ADVENTITIA)40X

Arterioles:

Arteries with a diameter of less than 0.1 mm. the width of the wall if an arteriole is approximately equal to the diameter of its lumen.

a- Tunica intima:

The undulating endothelial layer supported by a thin subendothelial layer.

A thin fenestrated internal elastic lamina is absent in small and terminal arterioles but present in larger arterioles.

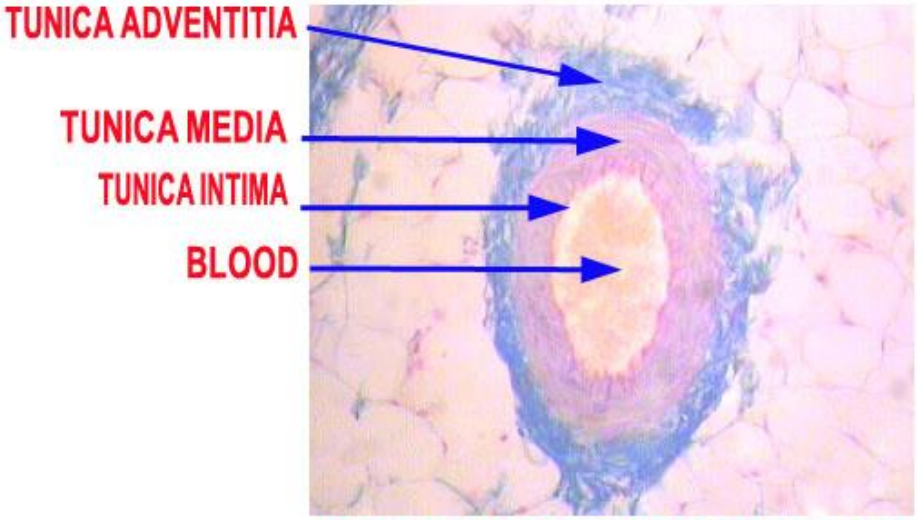
b- Tunica media:

In small arterioles it composed of a single smooth muscle cell layer that completely encircle the endothelial cells. In larger arterioles the tunica medial consists of 2-3 layers of smooth muscle cells.

Arterioles do not have an external elastic lamina.

c- Tunica adventitia:

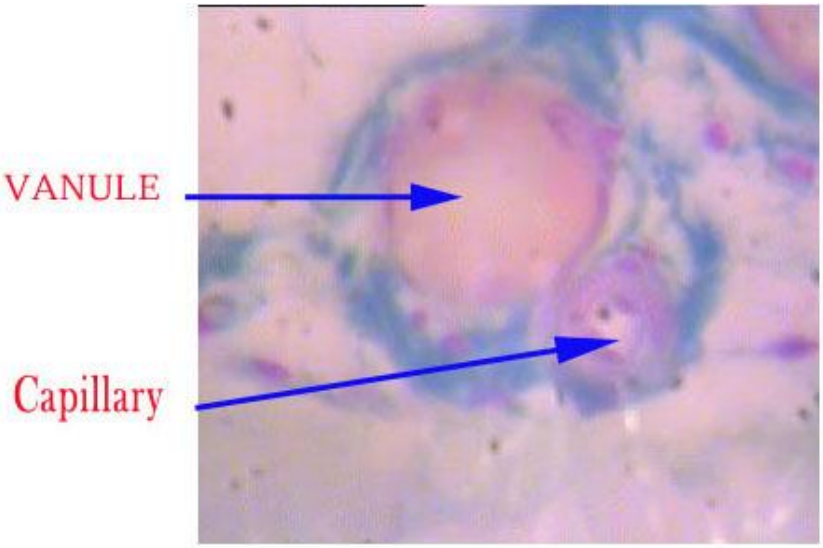
Is scant and is represented by fibroblastic connective tissue housing a few fibroblasts



CROSS SECTION IN ARTERIOLE 10X

2- Capillaries:

Capillaries are arising from the terminal ends of the arterioles, formed by a single layer of squamous endothelial cells.



CROSS SECTION/ capillary and vanule **40x**

3- Veins:

Are grouped into three categories based on size: small, medium, and large veins

a- Venules and small veins:

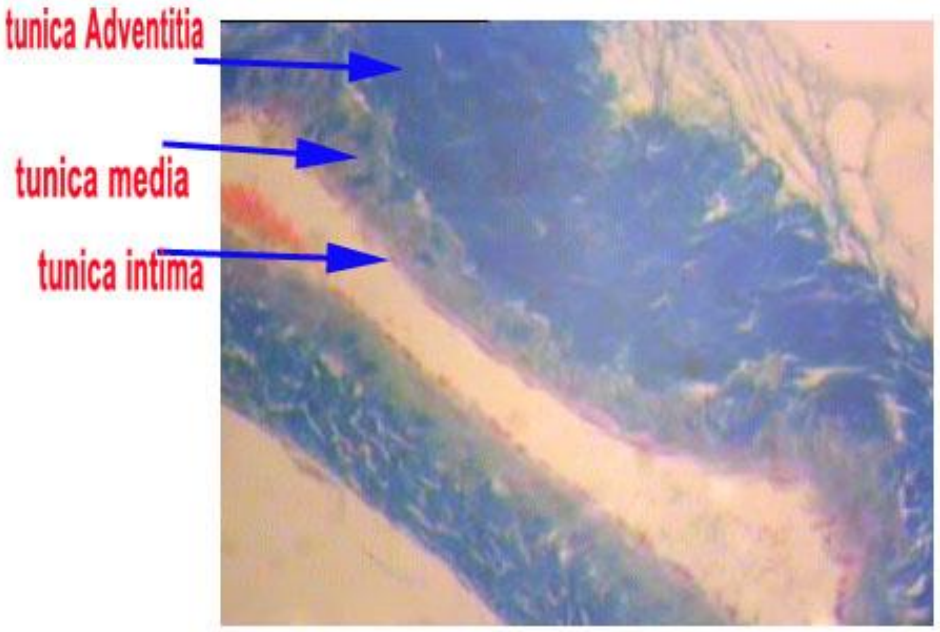
Their walls are similar to those of capillaries, with a thin endothelium surrounded by reticular fibers and pericytes. Pericytes are replaced by smooth muscle cells in larger venules.

b- Medium veins:

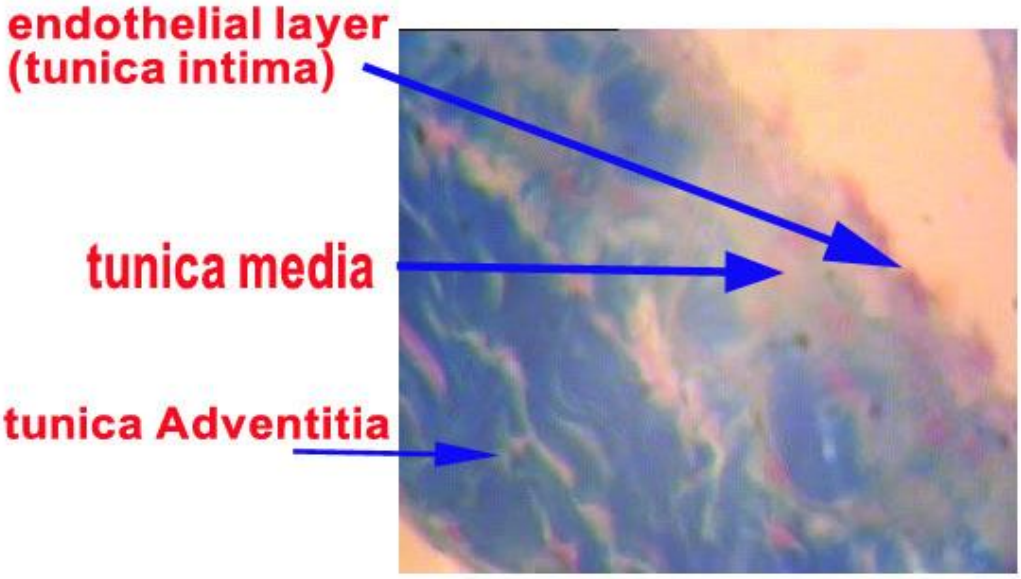
Are less than 1 cm in diameter. The tunica intima include the endothelium and its basal lamina and reticular fibers.

The smooth muscle cells of the tunica media are in closely organized layer interwoven with collagen fibers and fibroblasts.

The tunica adventitia, the thickest of the tunics, is composed of longitudinally arranged collagen bundles and elastic fibers a long with a few scattered smooth muscle cells.



cross section in medium vein 4x



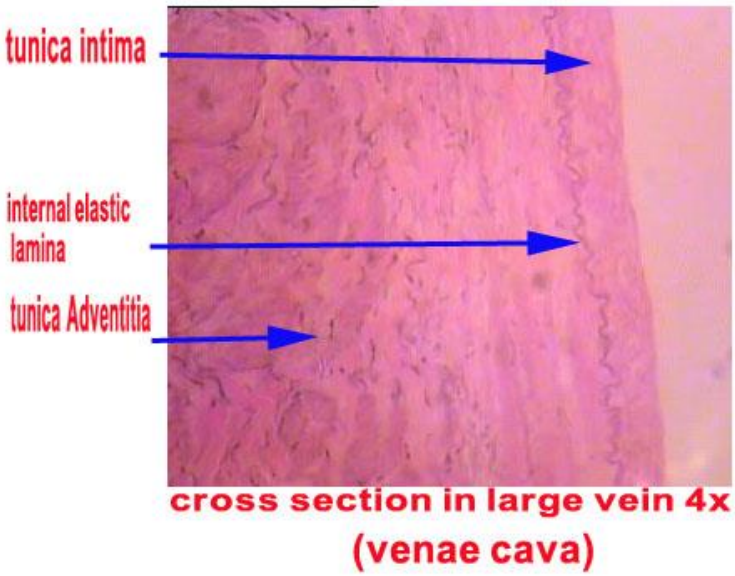
cross sectionin medium vein 10x

c- Large veins:

E.g. venae cava

The tunica intima of large veins is similar to that of small veins, except that large veins have a thick subendothelial connective tissue layer containing fibroblasts and network of elastic fibers.

There is no tunica media, in its place is a well developed tunica adventitia, which contains many elastic fibers abundant collagen fibers, and vena cava has longitudinally arranged smooth muscle cells.



s

Valve:

A venous valve is composed of two leaflets (valve cusps), each composed of a thin fold of the intima jutting out from the wall into the lumen. The thin leaflets are structurally reinforced by collagen and elastic fibers that are continuous with those of the wall.

4- Heart:

The three layers making up the heart wall are: the endocardium myocardium and epicardium.

Endocardium:

The ling of the heart lumen, which is continuous with the tunica intima of the blood vessels entering and leaving the heart.

a- The endocardium:

the lining of the heart lumen , which is continuous with tunica intima of the blood vessels entering and leaving the heart.

The endocardium is made up of an endothelium composed of simple squamous epithelium, beneath which is a layer of collagenous and elastic fibers and scattered fibroblasts. Lying deeper is a layer of dense connective tissue with elastic fibers interspersed with smooth muscle cells. A subendocardial layer of loose connective tissue contains small blood vessels, nerves and purkinje fibers from the conduction system.

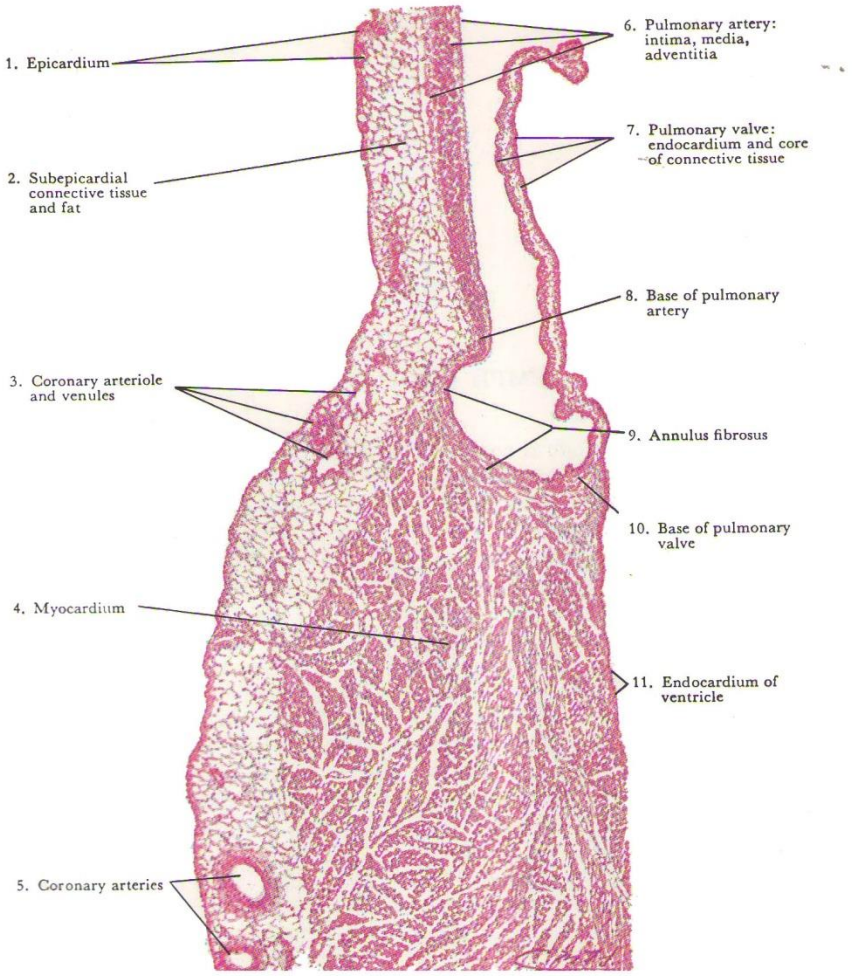
b- **Myocardium**:

the middle and thickest of the three layers of the heart, contain cardiac muscle cells, arranged in complex spirals around the orifices of the chambers.

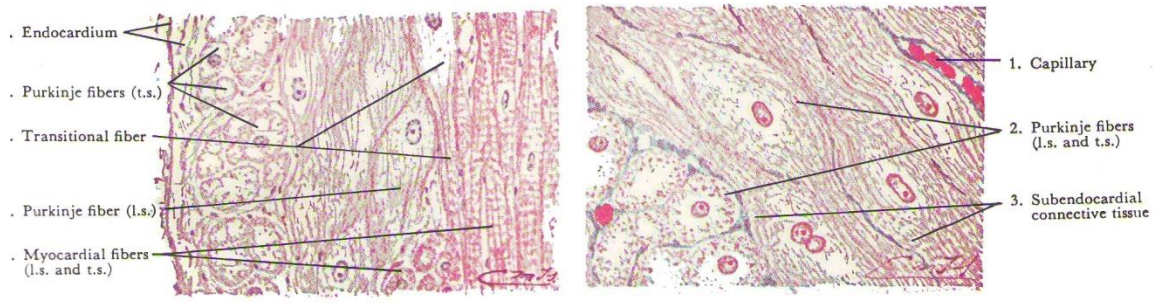
c- **Epicardium**:

the homologue of the tunica adventitia in blood vessels, is also called the visceral layer of the pericardium (composed of a simple squamous epithelium known as mesothelium) .

The subepicardial layer of loose connective tissue contains the coronary vessels, nerves and ganglia. It also is the region where fat is stored on the surface of the heart.



long itudinal section in heart (pulmonary artery , pulmonary valve ,right ventricle) 10x



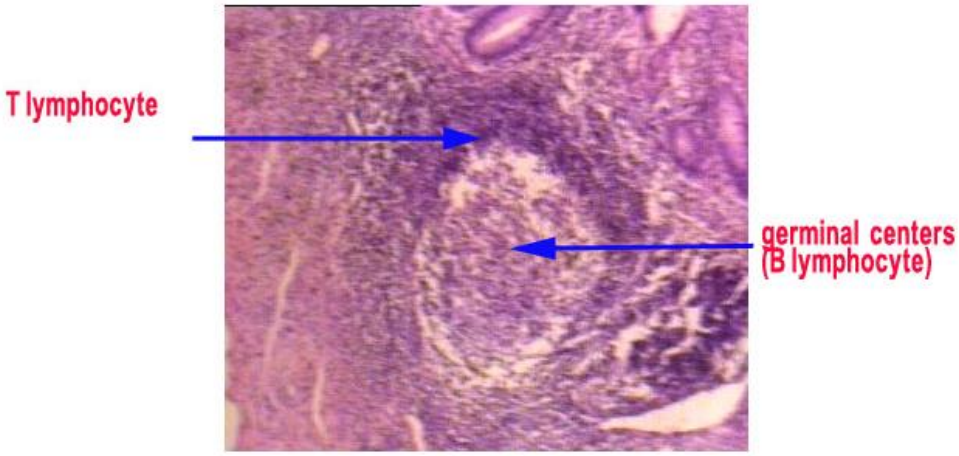
PURKINJE FIBERS (CONDUCTION FIBERS) 40x

Lab.2 General Histology

Lymphoid organs

1- Lymph nodules

You can find this nodule in the connective tissue of the digestive tract especially in the ileum, they also found in the tonsils, which appear as groups named payers patches, which are spherical aggregates of B lymphocytes, the centers of these nodules are stained paler and are called germinal centers. Surrounded by a loser region of T cells and numerous atigen-presenting cells.



peyrs patches (lymph nodule)

2- Lymph nodes

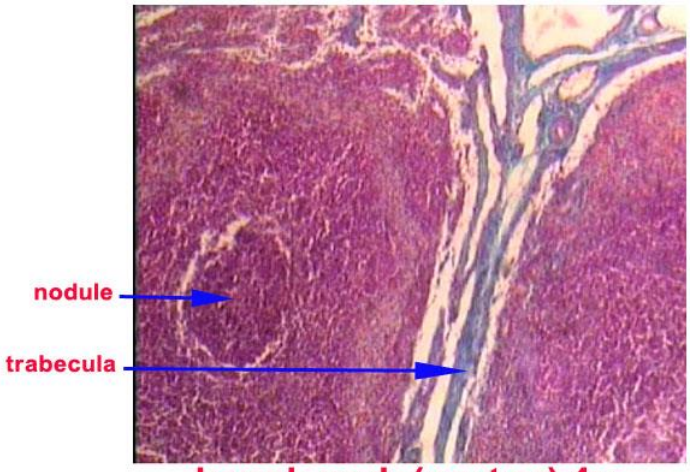
Lymph nodes are small, encapsulated oval structures interposed in the path of lymph vessels to serve as filters for the removal of bacteria and other foreign substances.

Each lymph node is less than 3 cm in diameter , possessing a fibrous connective tissue capsule, usually surrounded by adipose tissue. It has a convex surface, perforated by afferent lymph vessels that have valves. The concave surface of the node, the hilum is the site of arteries and veins entering and exiting the node. Additionally, lymph leaves the node via the efferent lymph vessels also located at the hilum, have valves also.

Histologically:

the lymph node is subdivided into three regions cortex, paracortex and medulla.

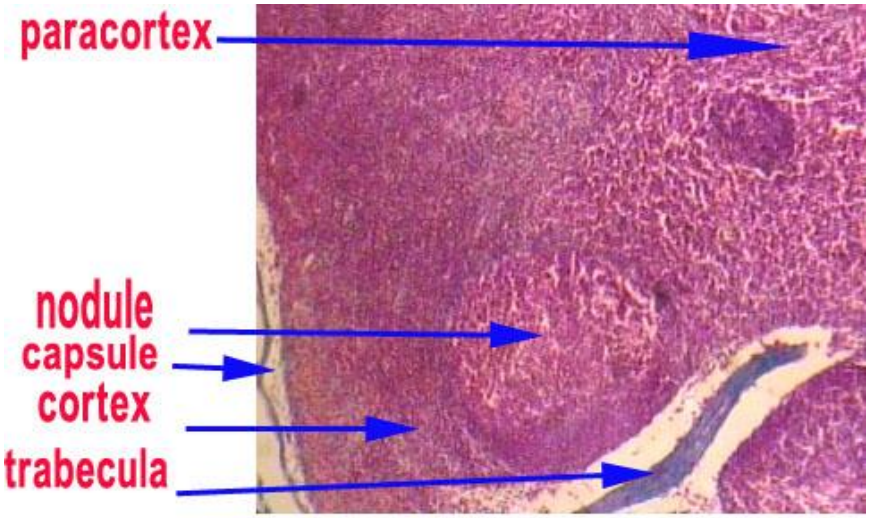
Cortex- the dense irregular collagenous connective tissue capsule of the lymph node sends trabeculae into the substance of the node.



lymph node(cortex) 4x

Suspended from the capsule and trabeculae is a three dimensional network of reticular connective tissue that form the arcetectural framework of the entire lymph node. The cortex house lymphoid nodules.

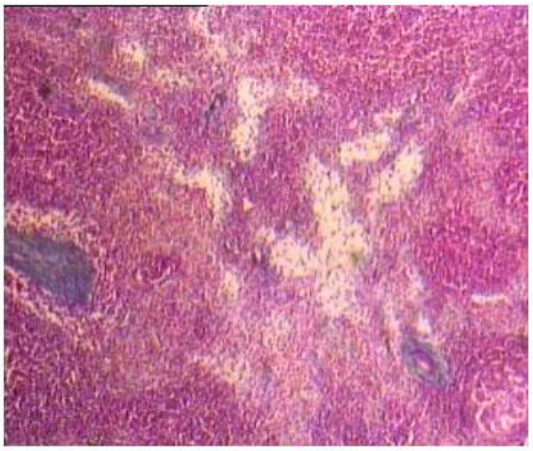
Paracortex, the region between the cortex and the medulla housing mostly T cells, high endothelial venules are located.

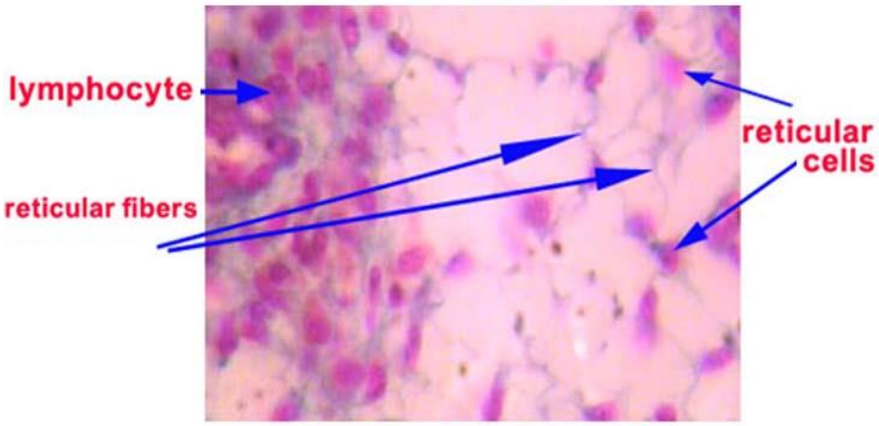


lymph node 4x

Medulla is composed of large tortuous lymph sinuses surrounded by lymphoid cells organized in clusters, known as medullary cords.

The cells of the medullary cords (lymphocytes, plasma cells and macrophages) are enmeshed in a network of reticular fibers and reticular cells.


lymph node (medulla)4x



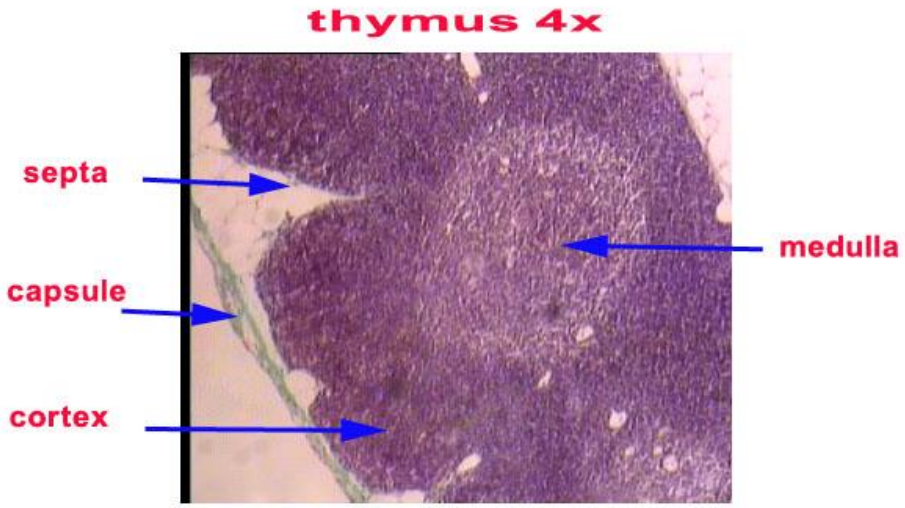
lymph node (medulla) 10x

3- **Thymus**:

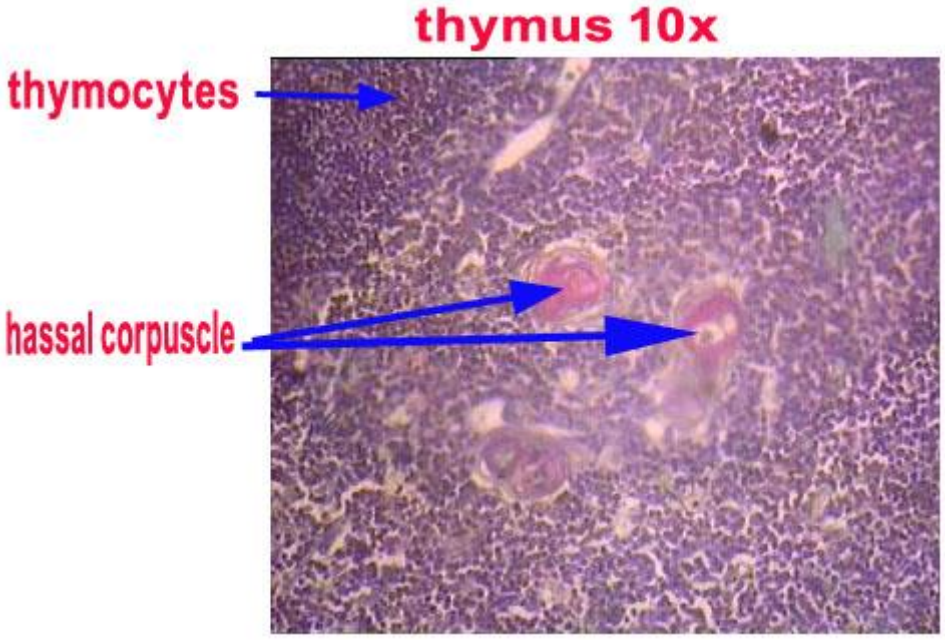
The thymus, situated in the superior mediastinum and extending over the great vessels of the heart is a small encapsulated organ composed of two lobes.

The capsule of the thymus composed of dense irregular collagenous connective tissue, sends septa in the lobes, subdividing them into incomplete lobules. Each lobule is composed of a cortex and medulla, although the medullae of adjacent lobules are confluent with each other.

The cortex of the thymus appears much darker than the medulla because of the presence of large number of T lymphocytes (thymocytes), in addition to the lymphocytes the cortex houses macrophages and epithelial reticular cells.



The thymic medulla stains much lighter than cortex, because its lymphocyte population is not nearly as profuse and houses a large number of epithelial reticular cells. These large pale staining cells coalesce around each other, forming whorl shaped thymic corpuscles (hassalls corpuscles).



4- Spleen:

The largest lymphoid organ in the body. Is located intraperitoneally, in the upper left quadrant of the abdominal cavity.

Its dense, irregular fibroblastic connective tissue capsule, housing occasional smooth muscle cells.

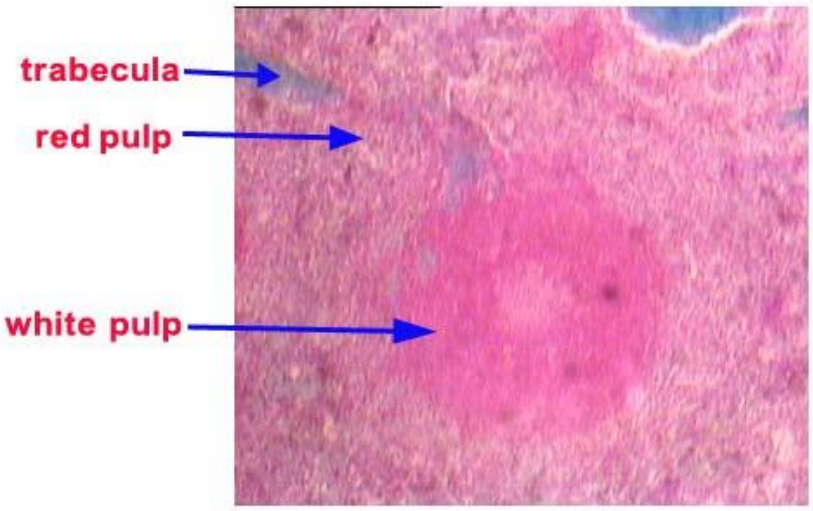
The spleen possesses a convex surface as well as concave aspect , the hilum.

The trabeculae arising from the capsule, carry blood vessels into and out of the parenchyma of the spleen.

Histologically:

The spleen has a three dimensional network of reticular fibers and associated reticular cells. The reticular fiber network is attached to the capsule as well as to the trabeculae and forms the architectural framework of this organ.

The interstices of the reticular tissue network are occupied by venous sinusesm trabeculae conveying blood vessels, and the splenic parenchyma (the white pulp surrounded by the red pulp).

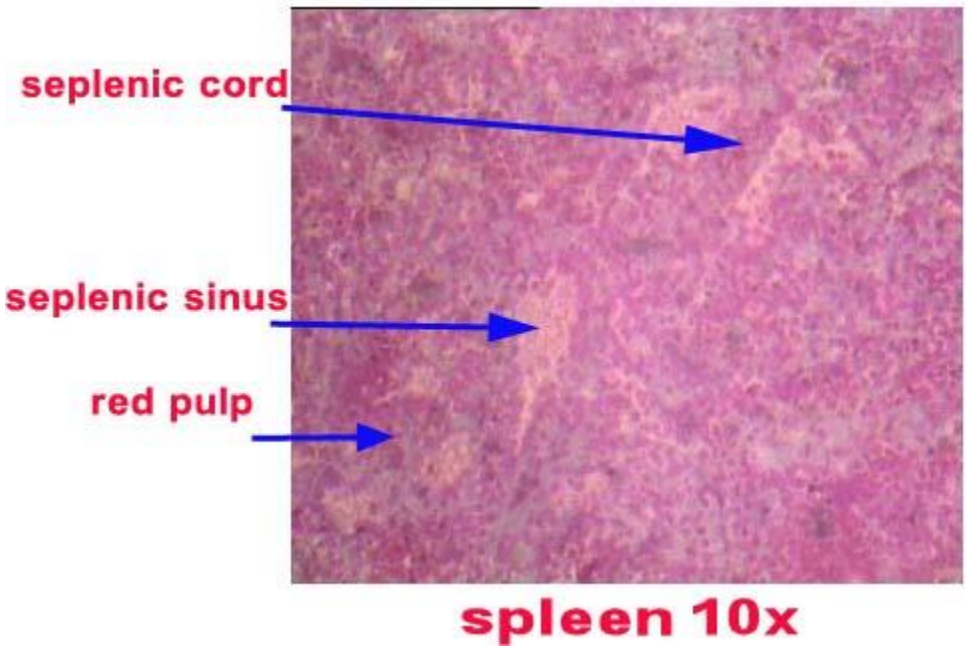


spleen 4x

The structure of the white pulp is closely associated with the central arteriole. The periarterial lymphatic sheath (PALS) that surrounds the central arteriole is composed of T lymphocytes.

Enclosed within the PALS are lymphoid nodules.

The red pulp of the spleen is composed of splenic sinuses and splenic cords.



spleen 10x

The red pulp resembles a sponge in that the spaces within the sponge represent the sinuses and the sponge material among the spaces denotes the splenic cords.

The splenic cords are composed of a loose network of reticular fibers. Which are enveloped by satellite reticular cells.

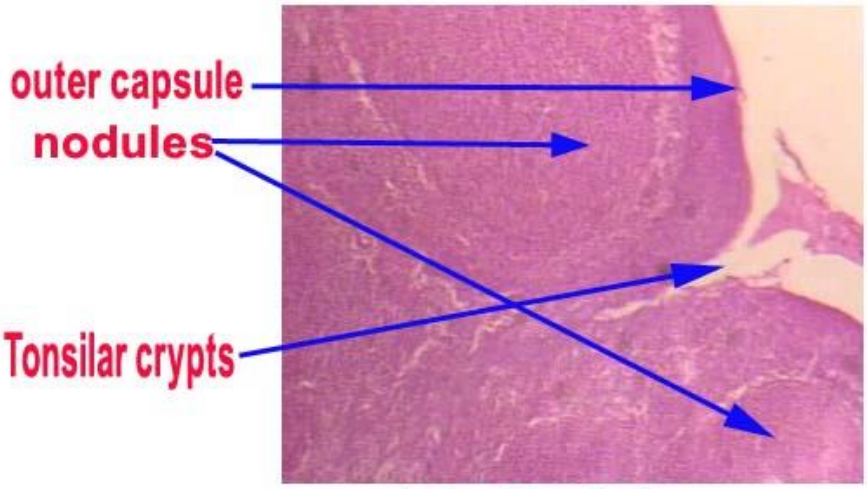
5- **Tonsils**:

Palatine tonsils: the bilateral palatine tonsils are located at the boundary of the oral cavity and oral pharynx, between the palatoglosal and the palate-pharyngeal folds.

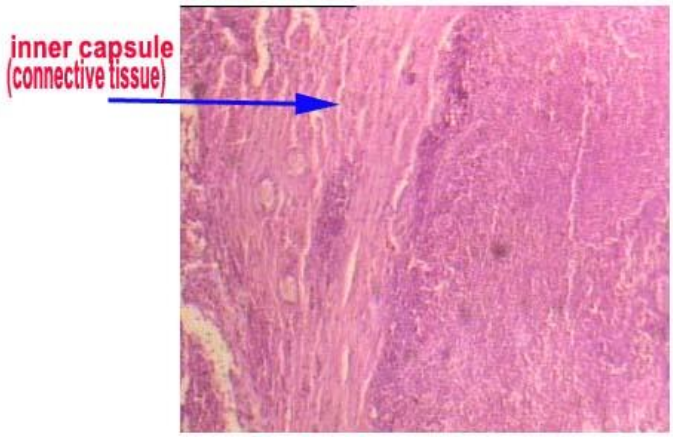
The deep aspect of each palatine tonsil is isolated from the surrounding connective tissue by a dense, fibrous capsule.

The superficial aspect of the tonsils is covered by a stratified squamous non keratinized epithelium that dips into the 10 to 12 deep cysts that invaginate the tonsilar parenchyma.

The parenchyma is composed of numerous lymphoid nodules, many of which display germinal centers.



palatine Tonsils 4x



falatine tonsils 4x

Lab.3 **General Histology**

Nervous tissue

The nervous system is organized anatomically into the central nervous system (CNS) which include the brain and spinal cord, and the peripheral nervous system (PNS) which lies outside the CNS, include cranial nerves, emanating from the brain; spinal nerves emanating from the spinal cord and their associated ganglia.

Functionally, the nervous system is divided into a sensory (afferent) component , which receives and transmits impulses to the CNS for processing and a motor (efferent) component, which originates in the CNS and transmit impulses to effectors organs through the body. The motor component is further impulses are transmitted via neurons.

In addition to the neurons, nervous tissue contains neuroglial cells, which support neurons.

Neurons:

The cell responsible for the reception and transition of nerve impulses to and from the CNS are the neurons.

Most neurons are composed of three distinct parts:

A cell body, multiple diatribes and a single axon.

Neuronal cell body:

The cell body (soma, perikaryon) is the region of the neuron containing the large pale- staining nucleus and perinuclear cytoplasm. The nucleus is large , usually spherical to ovoid, and centrally located. A well defined nucleolus is also common. The cytoplasm has abundant rough endoplasmic reticulum (RER) with many cisternae. Polyribosomes are also scattered through the cytoplasm. When these cisternae and polyribosomes are stained with basic dyes, they appear as clumps of basophilic material called nissi bodies.

Neurons are classified morphologically into:

1- Unipolar neurons:

Possess a single process and are rare in vertebrates except in early embryonic development.

2- Bipolar neurons:

Possess two processes emanating from the soma, a single dendrite and a single axon, they are located in the olfactory epithelium of the nasal cavity.

3- Pseudounipolar neurons:

Possess only one process emanating from the cell body, but this process branches later into a peripheral and a central branch. They are present in the dorsal root ganglia and in some of the cranial nerve ganglia.

4- Multipolar neurons:

Are the most common type of neurons. They possess various arrangements of multiple dendrites emanating from the soma and a single axon . they are present throughout the nervous system, and most of them are motor neurons.

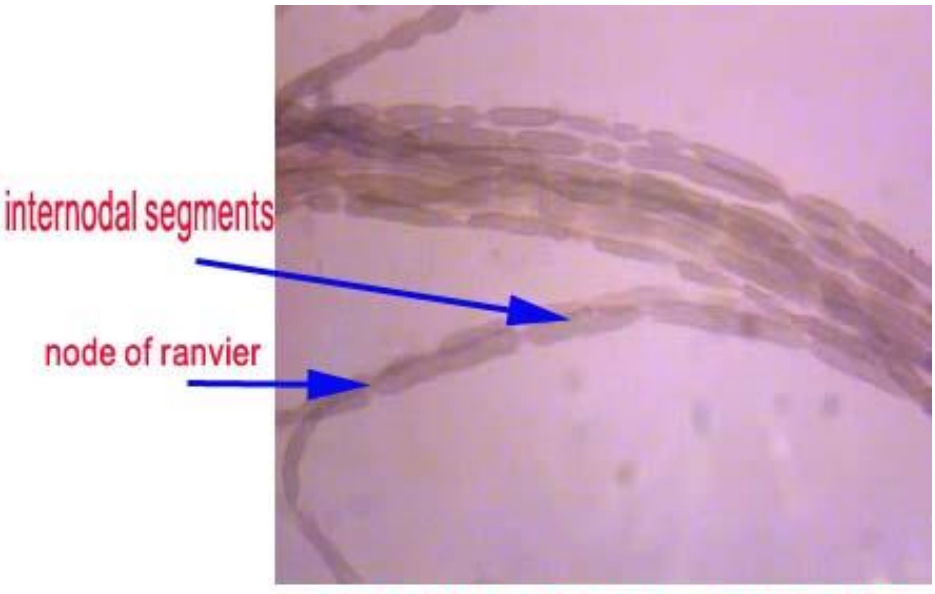
Nerve fibers:

Axons enveloped by Schwann cells which form two types of coverings over these axons: myelinated and non- myelinated.

1- Myelinated nerve fibers:

Axons that have wrapped around them are called myelinated nerves. Myelin (the plasma lemma) of the Schwann cell organized into a sheath that is wrapped several times around the axon. At regular intervals along the length of the axon, interruptions occur in the myelin sheath, called nodes of ranvier.

Areas of the axon covered by concentric lamellae of myelin and the single Schwann cell that produced the myelin are called intermodal segments, several cone shaped oblique clefts in the myelin sheath of each intermodal segment called clefts of shmidt-lantermann



myelinated nerve fibers 10x

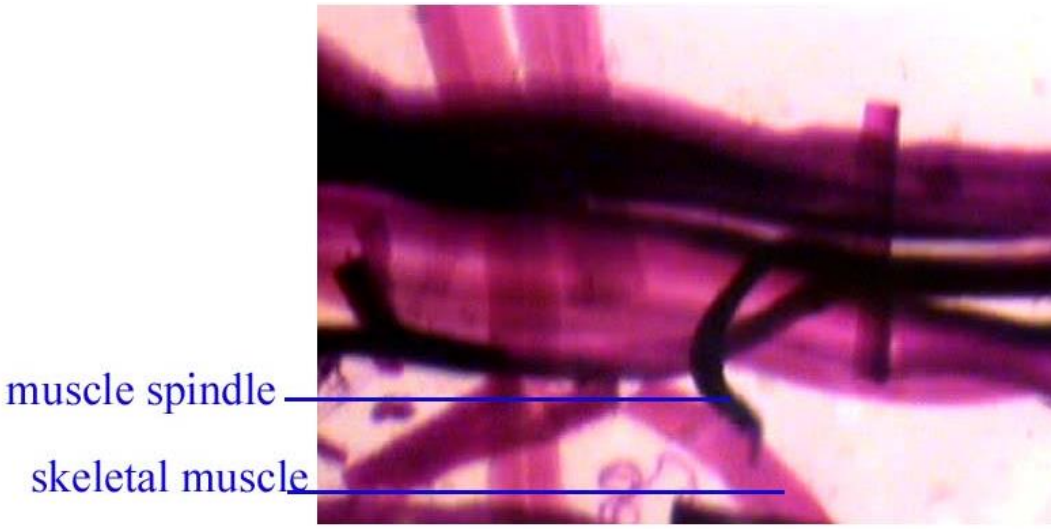
2- Unmyelinated nerve fibers:

Axons that not wrapped with many layers of myelin. These unmyelinated axons are surrounded by a single layer of Schwann cell plasma membrane and cytoplasm of the cell

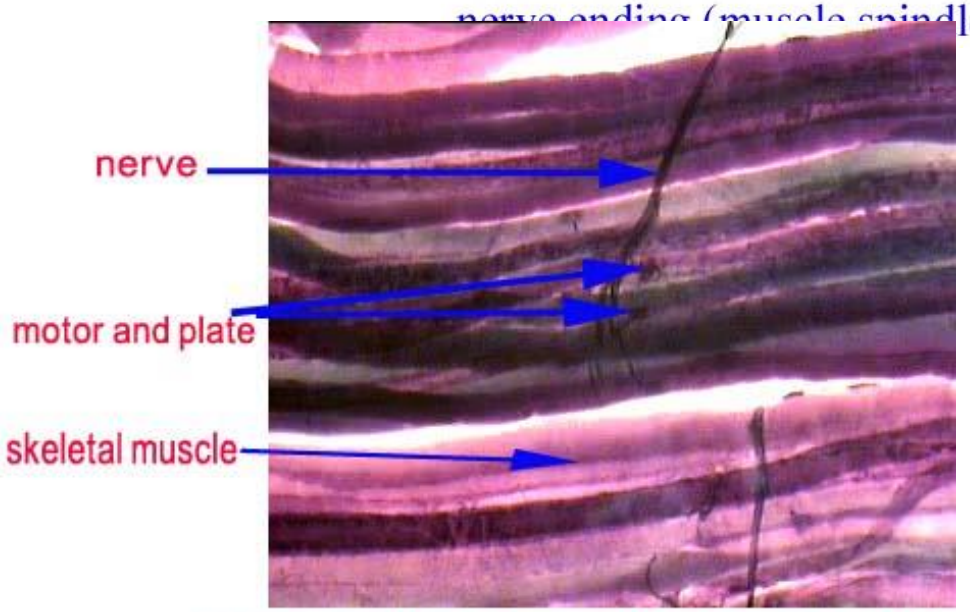
Nerve endings:

1- Motor and plate:

The axon forms abulbous expantion at its terminal end o skeletal muscle.



nerve ending (muscle spindle) 4x



nerve ending whth skeletal muscule 10x

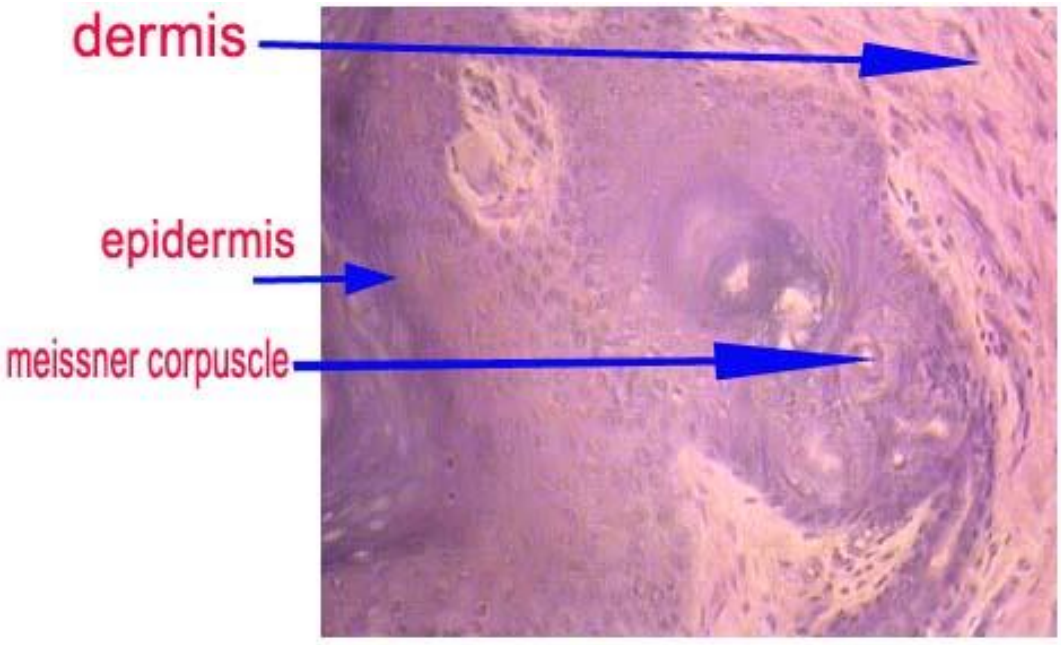
2- Muscle spindle:

The muscle spindle is a fusiform structure found between and in parallel with ordinary skeletal muscle fibers . The organ is enveloped by connective tissue capsule consisting of fibroblasts and dense collagen fibers within it there are two distinctive types of muscle fibers , known as intrafusal fibers .

The muscle spindle is a muscle stretch receptor organ , innervated with both sensory and motor nerves .

3- Meissner corpuscles:

Located in some dermal papillae as pear- shaped encapsulated mechanoreceptors specialized to respond to slight deformations of to epidermis. These receptors are most common in areas of the skin especially sensitive to tactile stimulation



perpendicular section in thick skine
(meissner corpuscle) 4x

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The encapsulated mechanoreceptor located in the dermis and hypodermis, specialized to perceive pressure, touch and vibration. Panician corpuscles are large ovoid receptors. The core of the corpuscle contain the non myelinated nerves terminal surrounded by layers of modified fibroblasts and enveloped by connective tissue, forming the capsule.

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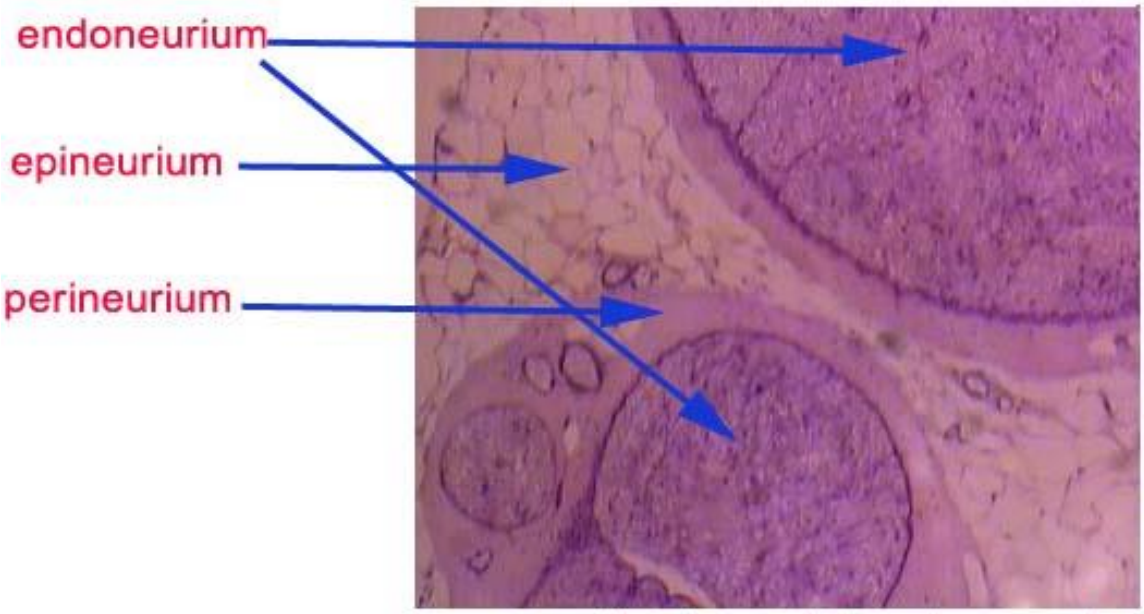
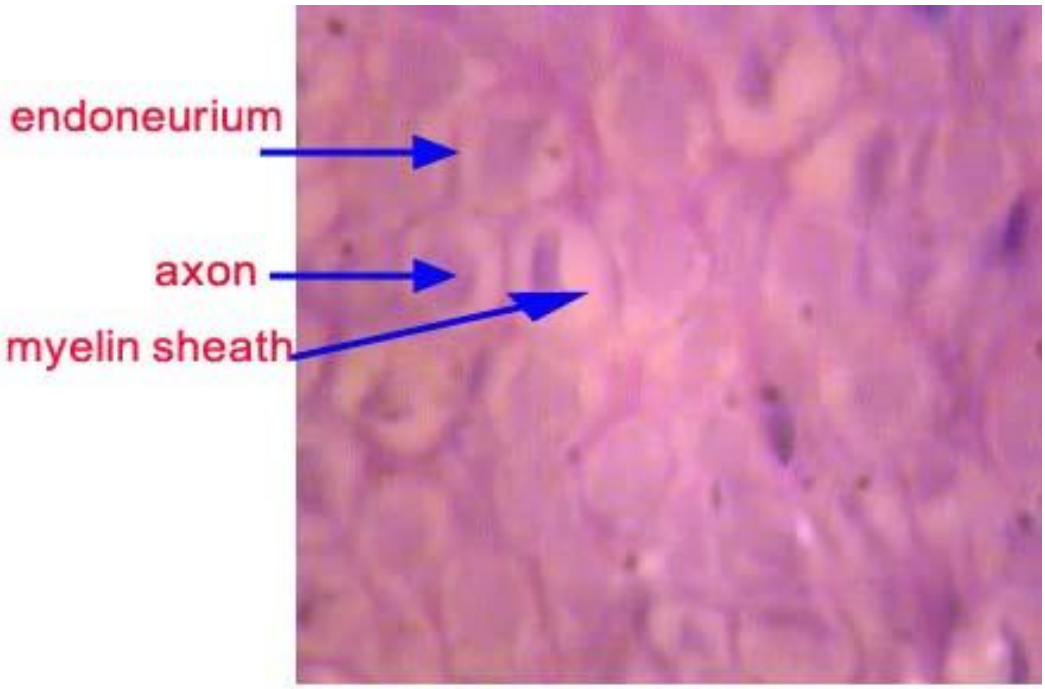
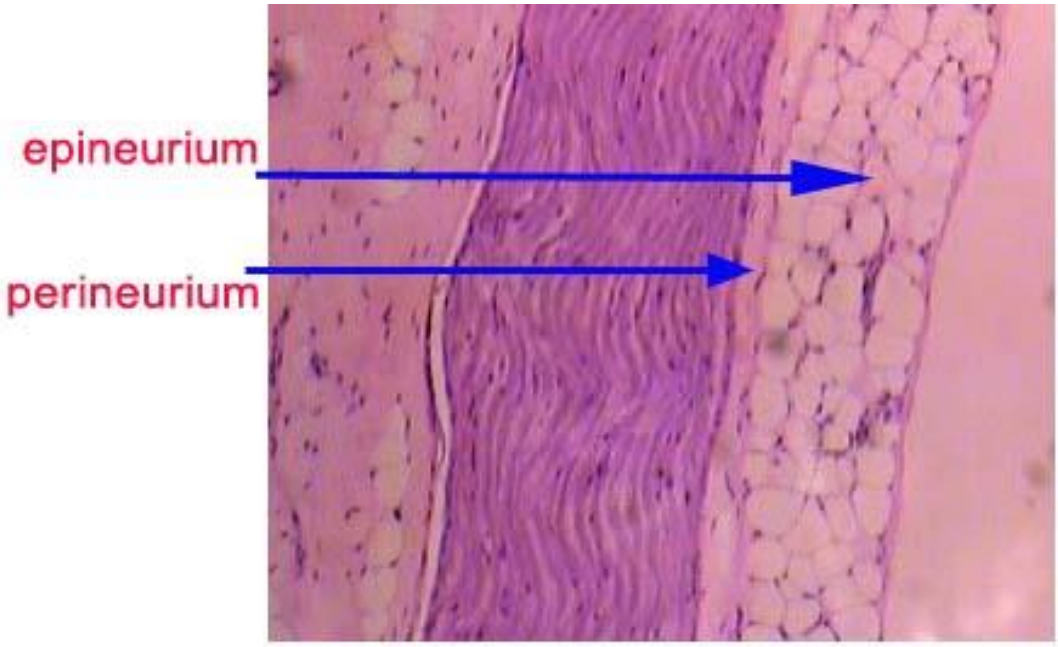
The endoneurium, the inner most layer of the investments, surrounds each axon. It is a loose connective tissue composed of a thin layer of reticular fibers, scattered fibroblasts , fixed macrophages, capillaries, and perivascular mast cells, and it is contact with the basal lamina of the Schwann cells.



cross section in peripheral nerve 4x



cross section in peripheral nerve 40x



longitudinal section in peripheral nerve 4x

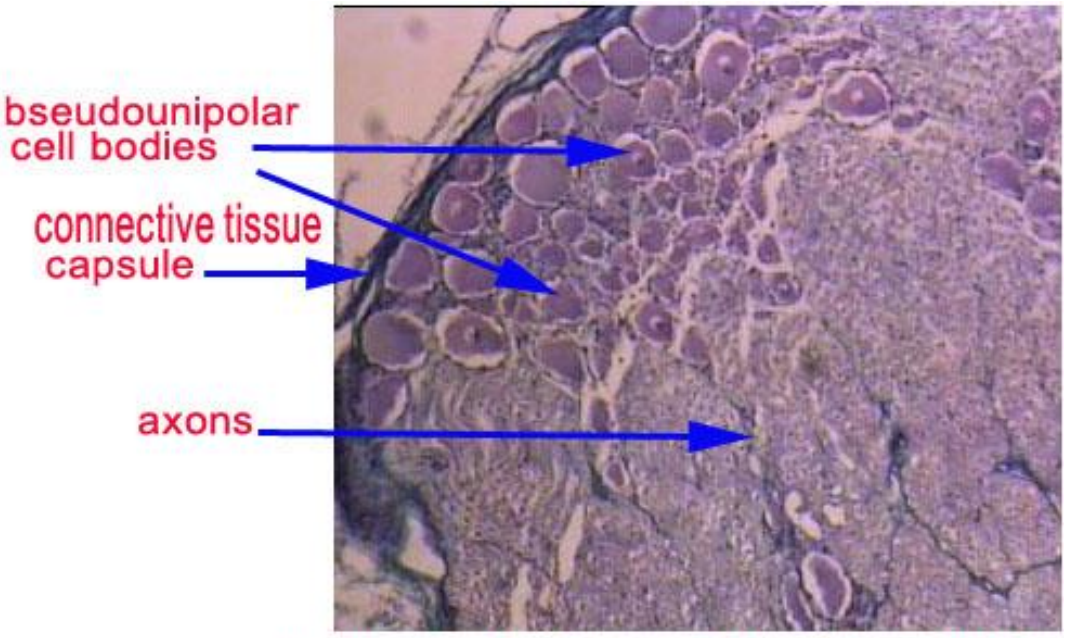
Ganglia:

Ganglia are aggregations of cell bodies of neurons located outside the CNS. There are two types, sensory ganglia and autonomic ganglia.

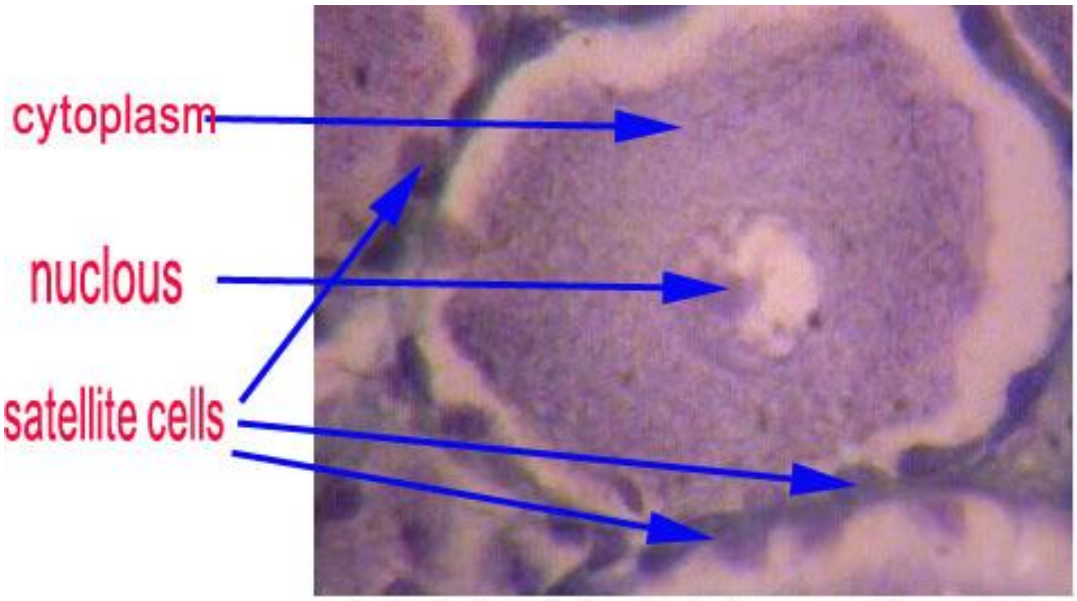
Spinal ganglia:

Sensory ganglia of the spinal nerves are called dorsal root ganglia. Sensory ganglia house pseudo unipolar cell bodies of the sensory nerve enveloped by a connective tissue capsule composed of satellite cells and collagen.

The endoneurium of each axon becomes continuous with the connective tissue surrounding the ganglia.



cross section in dorsal root gangalia (spinal ganglia) 4x



cross sectionin spinal ganglia (pseudounipolar neuron whth capsule) 40x

Central nervous system

The brain and the spinal cord consists of white matter and gray matter, white matter is composed of myelinated nerve fibers, with some unmyelinated fibers and neuroglial cells. Gray matter consist of aggregations of neuroglial cell bodies, dendrites, and unmyelinated portions of axons, as well as neuroglial cells.

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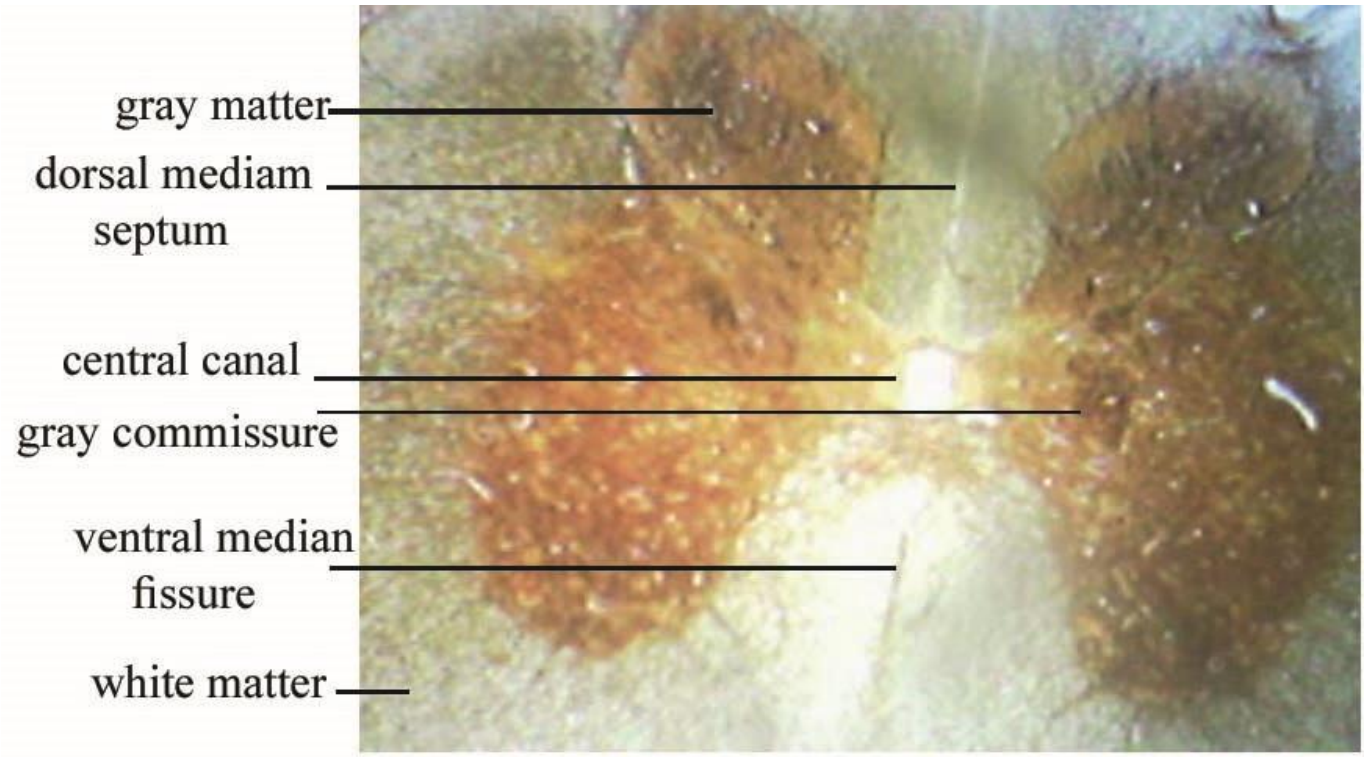
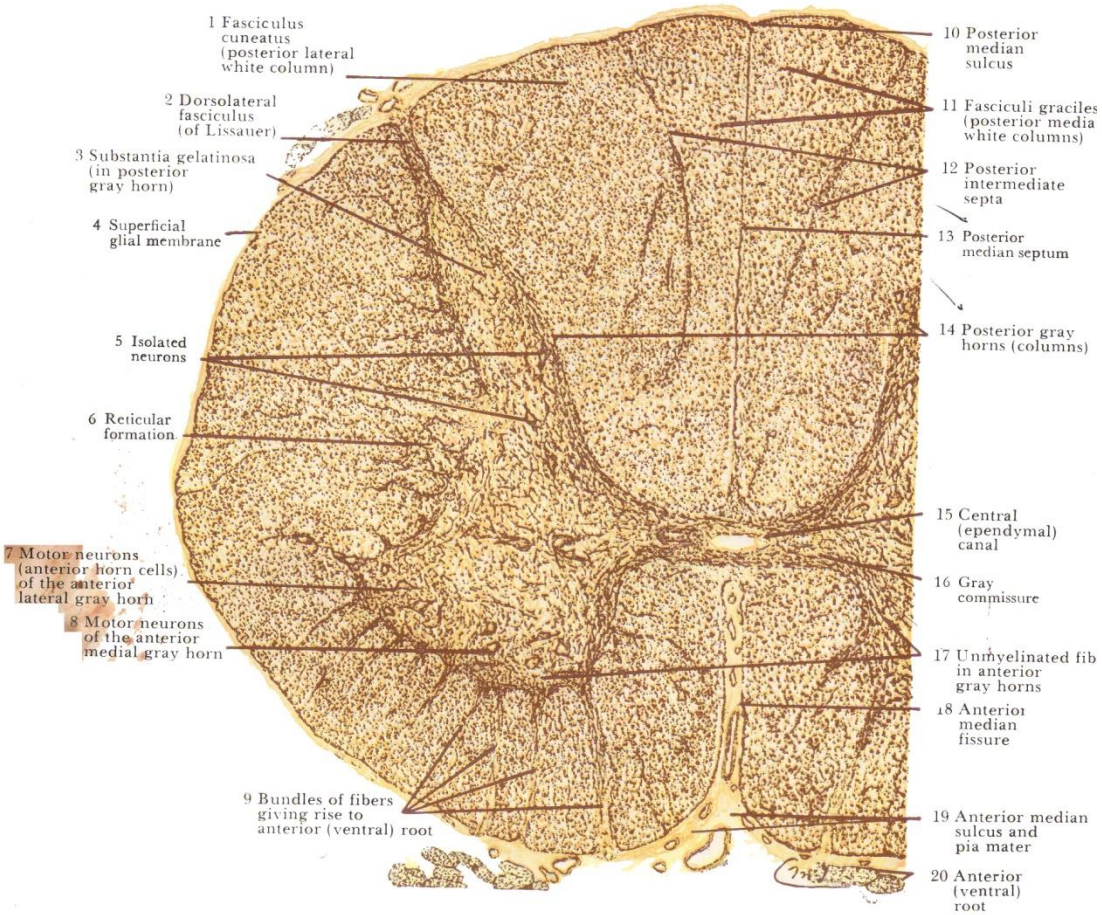
A small central canal , lined by ependymal cells and representing the lumen of the original neural tube, lies in the center of the cross bar of the H. the upper vertical bars of the H represent the dorsal horns of the spinal cord. The lower vertical bars of the H represent the ventral horns of the spinal cord, which house cell bodies of large multipolar motor neurons, whose axons exit the spinal cord via the ventral roots.



cross section in spinal cord 4x



cross section in spinal cord (cervical region)

Anterior gray horn and adjacent anterior white matter.

2- Cerebrum:

Gray matter in the brain is located at the periphery (cortex) of the cerebrum and cerebellum and forms the deeper basal ganglia , whereas the white matter lies deep to the cortex and surrounds the basal ganglia.

The gray matter at the periphery of the cerebra hemispheres is folded into many gyri sulci called the cerebral cortex. This portion of the brain is responsible for motor response and integration of sensory signals.

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3- **External pyramidal layer:** contains neuroglial cells and large pyramidal cells, which become increasingly larger from the external to the internal border of this layer.

4- **Internal granular layer:** is a thin layer and is characterized by closely arranged, small granule (satellite) cells, pyramidal cells, and neuroglial.

This layer has the greatest cell density of the cerebral cortex.

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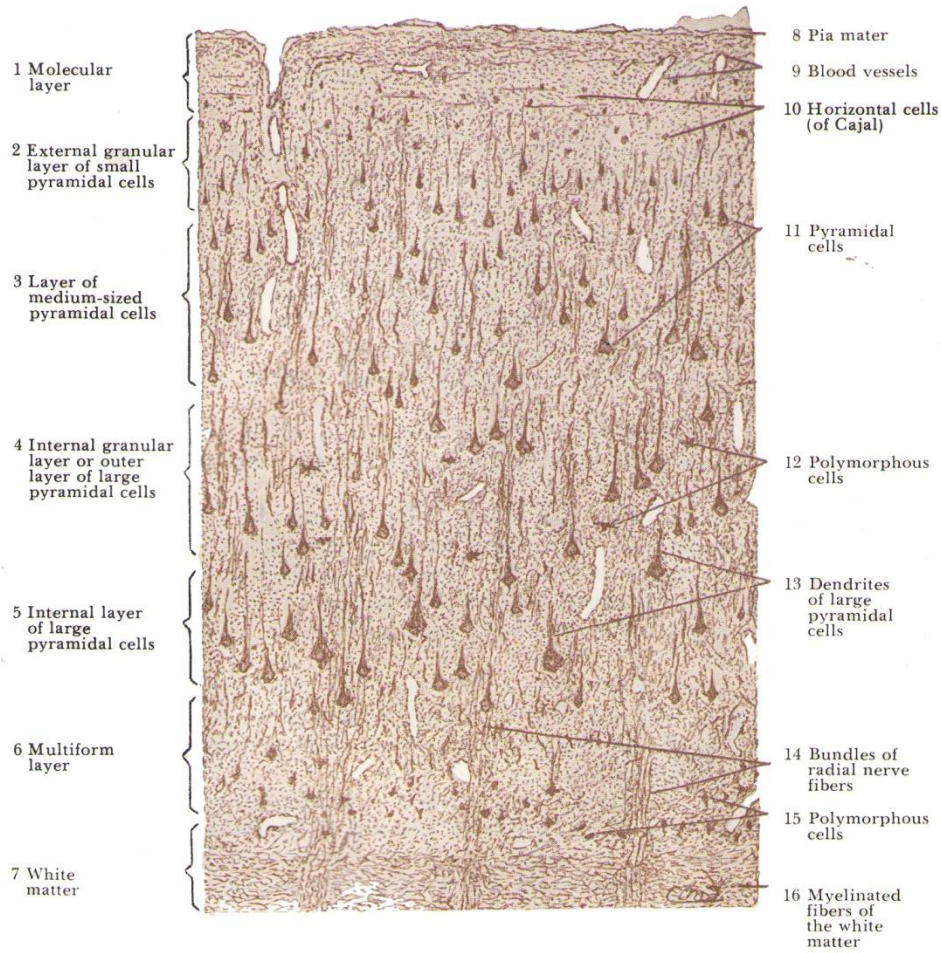


perpendicular section in cerebral cortex 10x

perpendicular section in cerebral cortex 40x

3- Cerebellum:

The layer of gray matter located in the periphery of the cerebellum is called cerebellar cortex. This portion of the brain is responsible for maintaining balance and equilibrium , muscle tone, and coordination of skeletal muscles. The cerebellar cortex is divided into three layers:

1- Molecular layer:

contains superficially located satellite cells, dendrites of purkinje cells, basket cells and unmyelinated axons from the granular layer.

2- Purkinje cell layer:

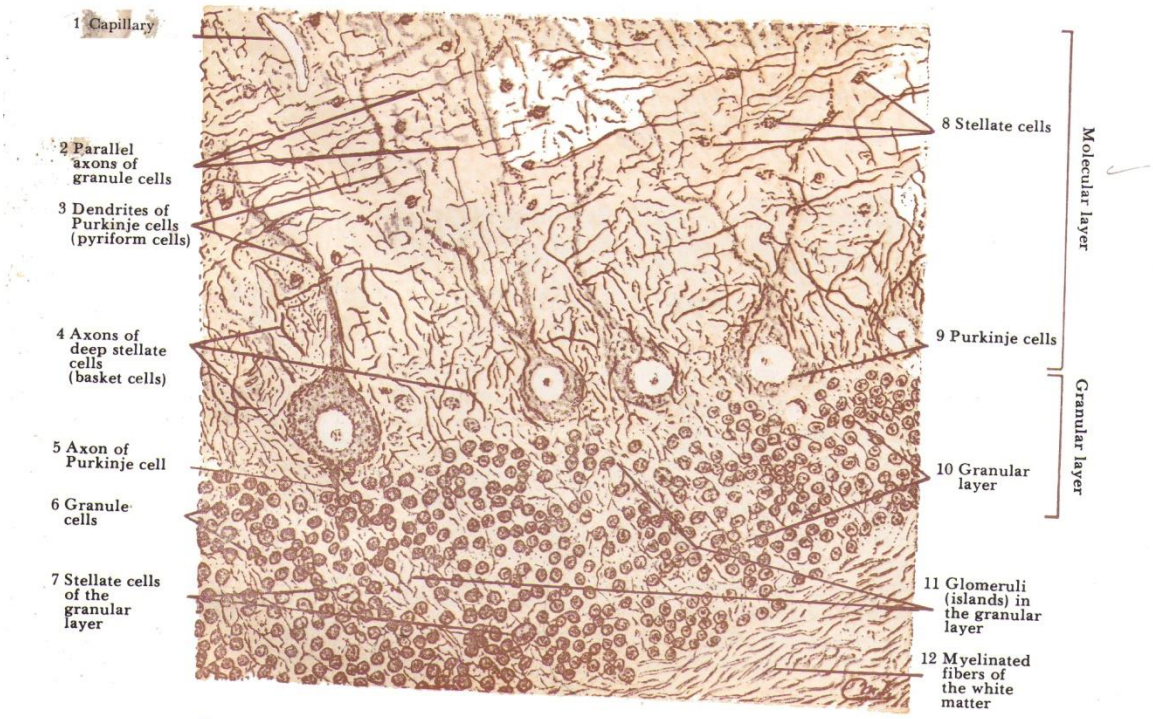
contains the large flask shaped purkinje cells, which are present only in the cerebellum.

3- Granular layer:

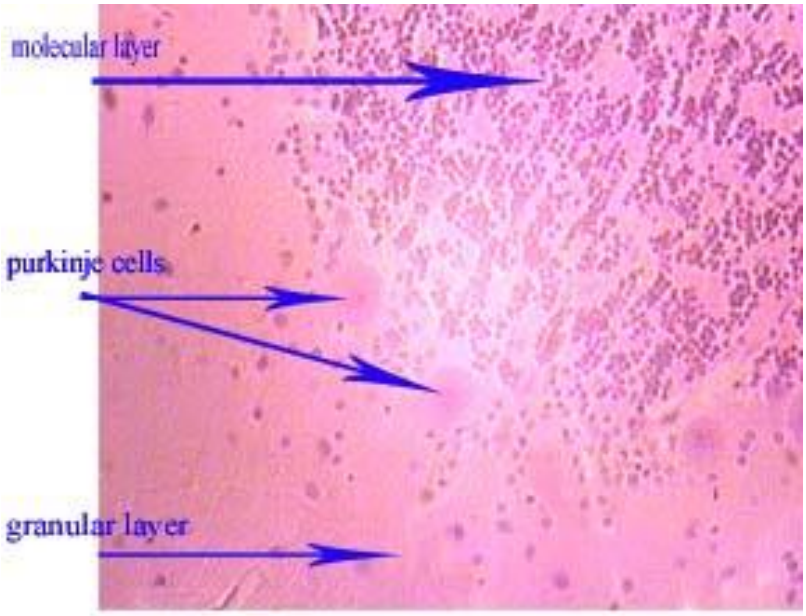
consists of small granule cells and glomeruli (cerebellar islands).

Granuli are regions of the cerebellar cortex where synapses are taking place between axons entering the cerebellum and the granule cells.

perpendicular section in cerebellum 4x



perpendicular section in cerebellum 40x



long tudinale section in cerebellum 10x

Lab.3 **General Histology**

Nervous tissue

The nervous system is organized anatomically into the central nervous system (CNS) which include the brain and spinal cord, and the peripheral nervous system (PNS) which lies outside the CNS, include cranial nerves, emanating from the brain; spinal nerves emanating from the spinal cord and their associated ganglia.

Functionally, the nervous system is divided into a sensory (afferent) component , which receives and transmits impulses to the CNS for processing and a motor (efferent) component, which originates in the CNS and transmit impulses to effectors organs through the body. The motor component is further impulses are transmitted via neurons.

In addition to the neurons, nervous tissue contains neuroglial cells, which support neurons.

Neurons:

The cell responsible for the reception and transition of nerve impulses to and from the CNS are the neurons.

Most neurons are composed of three distinct parts:

A cell body, multiple diatribes and a single axon.

Neuronal cell body:

The cell body (soma, perikaryon) is the region of the neuron containing the large pale- staining nucleus and perinuclear cytoplasm. The nucleus is large , usually spherical to ovoid, and centrally located. A well defined nucleolus is also common. The cytoplasm has abundant rough endoplasmic reticulum (RER) with many cisternae. Polyribosomes are also scattered through the cytoplasm. When these cisternae and polyribosomes are stained with basic dyes, they appear as clumps of basophilic material called nissi bodies.

Neurons are classified morphologically into:

5- Unipolar neurons:

Possess a single process and are rare in vertebrates except in early embryonic development.

6- Bipolar neurons:

Possess two processes emanating from the soma, a single dendrite and a single axon, they are located in the olfactory epithelium of the nasal cavity.

7- Pseudounipolar neurons:

Possess only one process emanating from the cell body, but this process branches later into a peripheral and a central branch. They are present in the dorsal root ganglia and in some of the cranial nerve ganglia.

8- Multipolar neurons:

Are the most common type of neurons. They possess various arrangements of multiple dendrites emanating from the soma and a single axon . they are present throughout the nervous system, and most of them are motor neurons.

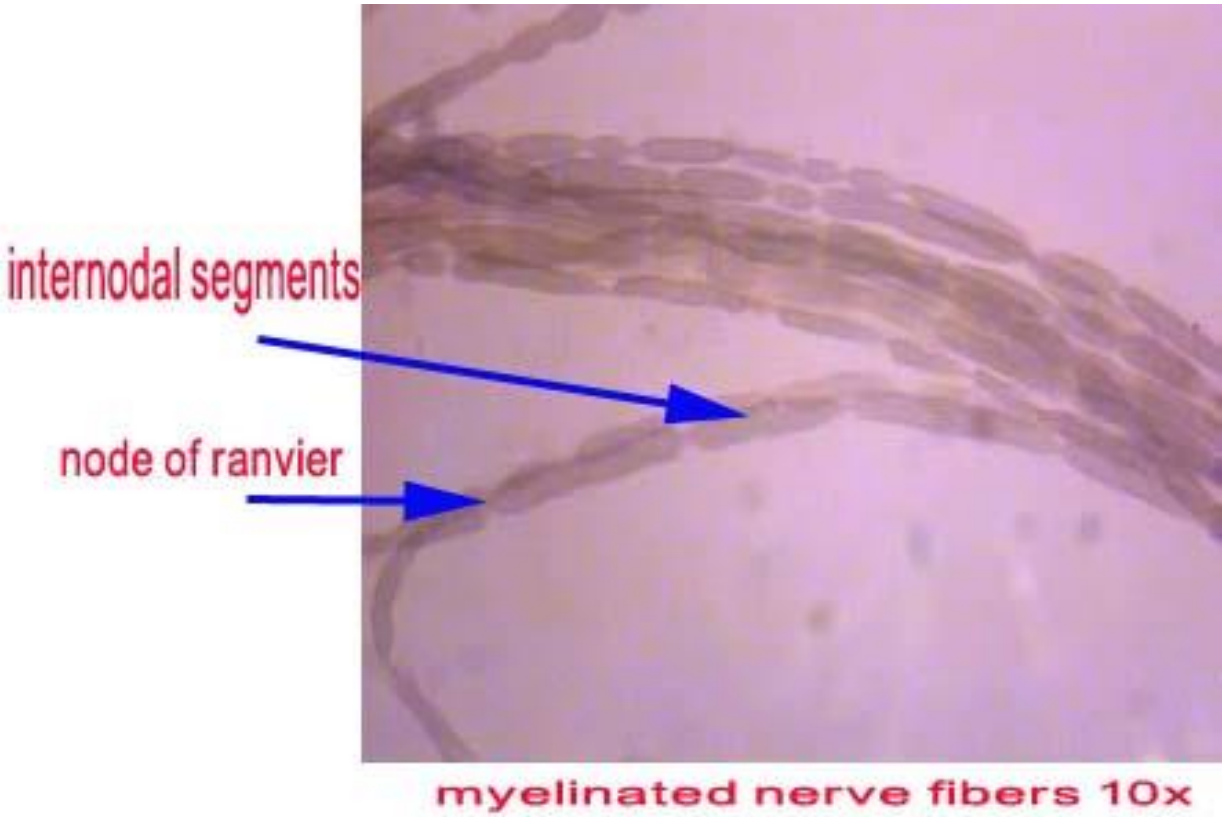
Nerve fibers:

Axons enveloped by Schwann cells which form two types of coverings over these axons: myelinated and non- myelinated.

3- Myelinated nerve fibers:

Axons that have wrapped around them are called myelinated nerves. Myelin (the plasma lemma) of the Schwann cell organized into a sheath that is wrapped several times around the axon. At regular intervals along the length of the axon, interruptions occur in the myelin sheath, called nodes of ranvier.

Areas of the axon covered by concentric lamellae of myelin and the single Schwann cell that produced the myelin are called intermodal segments, several cone shaped oblique clefts in the myelin sheath of each intermodal segment called clefts of shmidt-lantermann



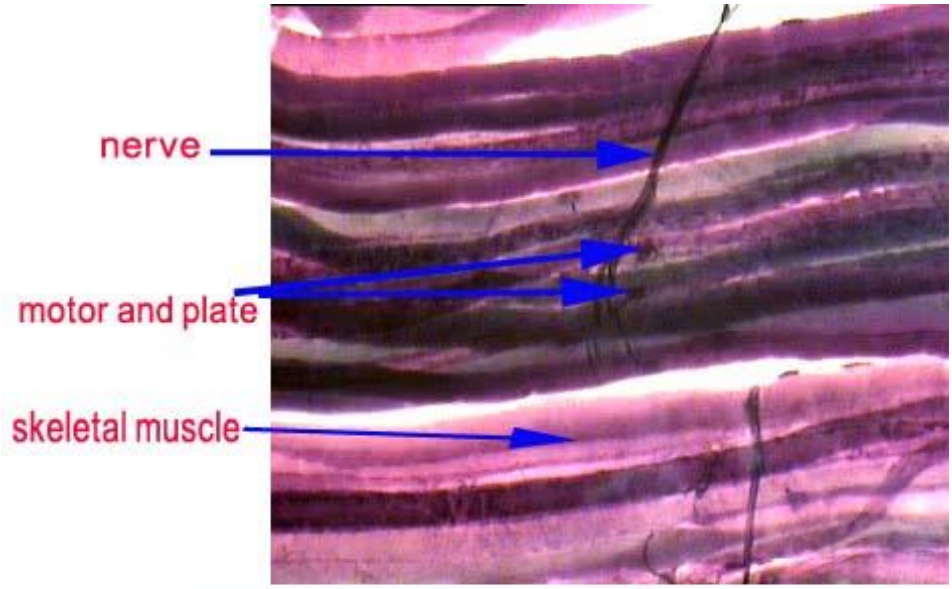
4- Unmyelinated nerve fibers:

Axons that not wrapped with many layers of myelin. These unmyelinated axons are surrounded by a single layer of Schwann cell plasma membrane and cytoplasm of the cell

Nerve endings:

5- Motor and plate:

The axon forms abulbous expantion at its terminal end o skeletal muscle.

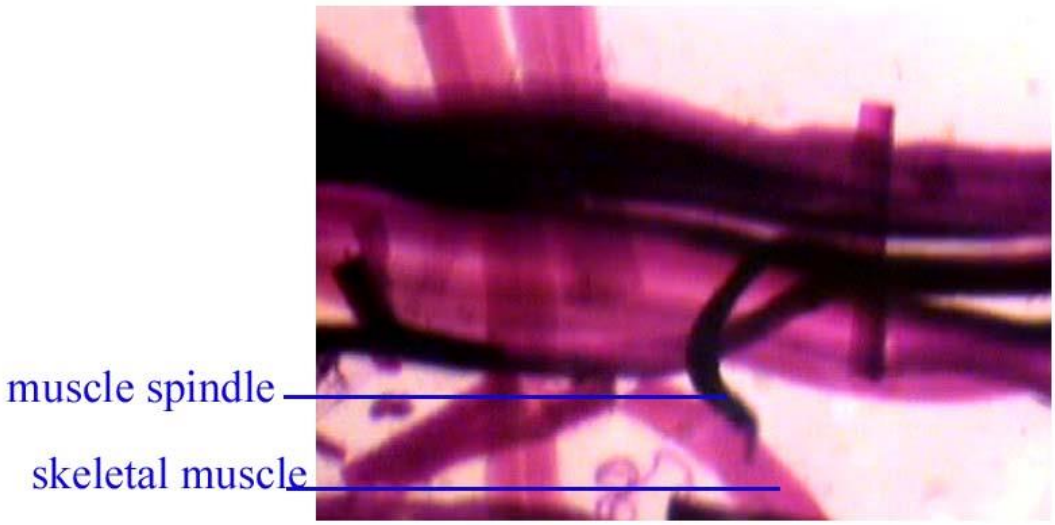


nerve ending whth skeletal muscule 10x

6- Muscle spindle:

The muscle spindle is a fusiform structure found between and in parallel with ordinary skeletal muscle fibers . The organ is enveloped by connective tissue capsule consisting of fibroblasts and dense collagen fibers within it there are two distinctive types of muscle fibers , known as intrafusal fibers .

The muscle spindle is a muscle stretch receptor organ , innervated with both sensory and motor nerves .



nerve ending (muscle spindle) 4x

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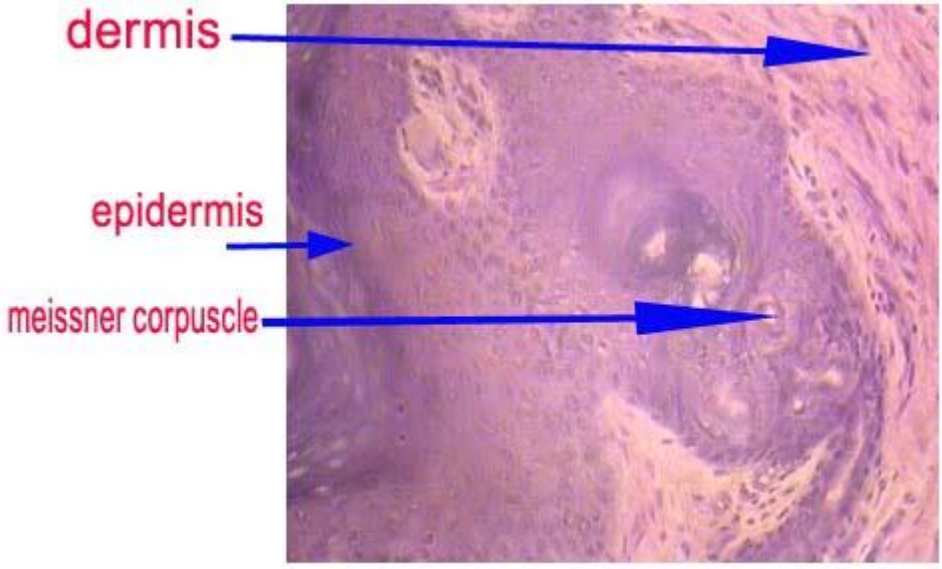

perpendicular section in thick skine (meissner corpuscle) 4x

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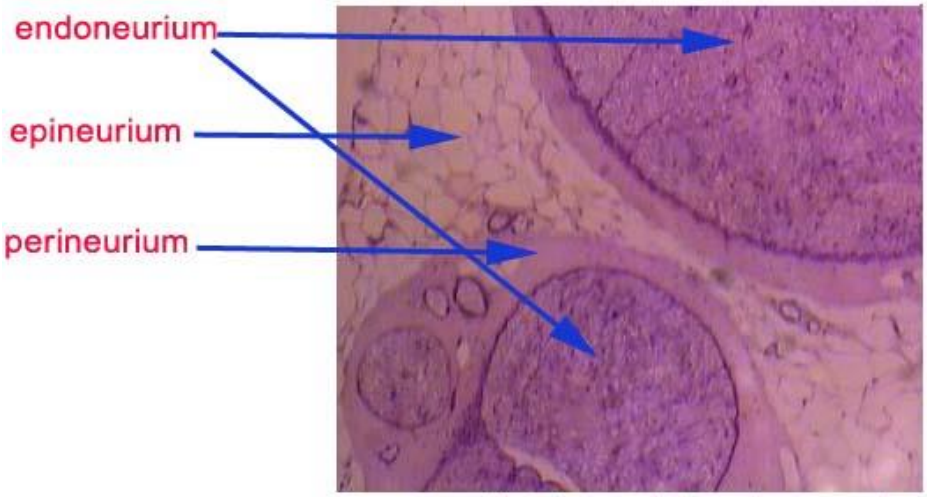
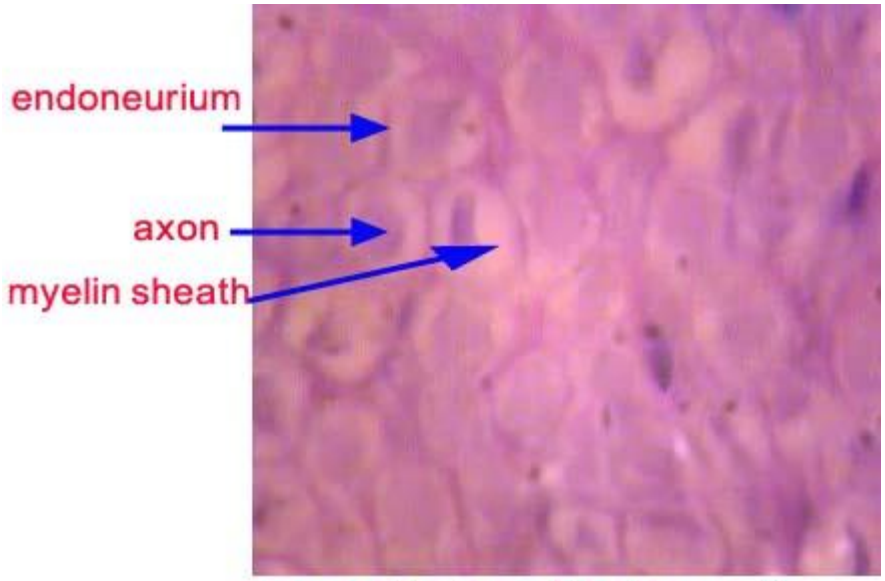
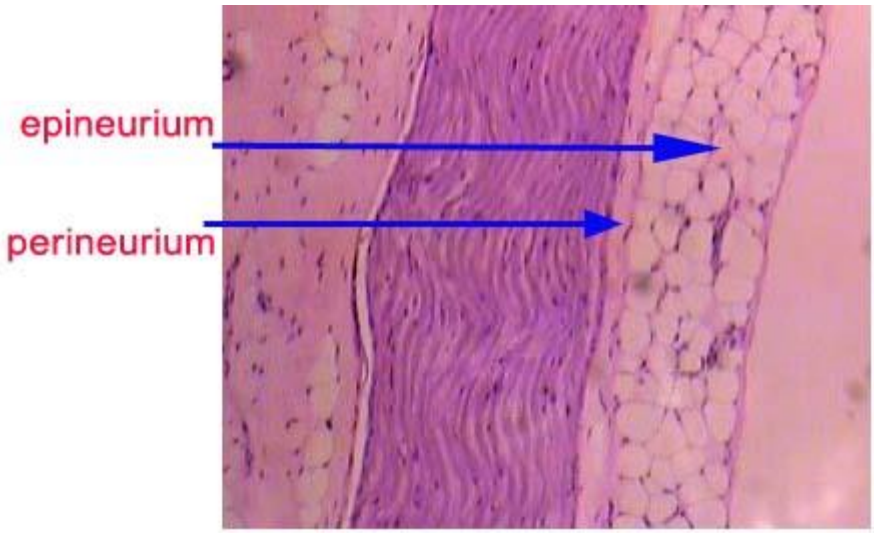


cross section in peripheral nerve 4x



cross section in peripheral nerve 40x



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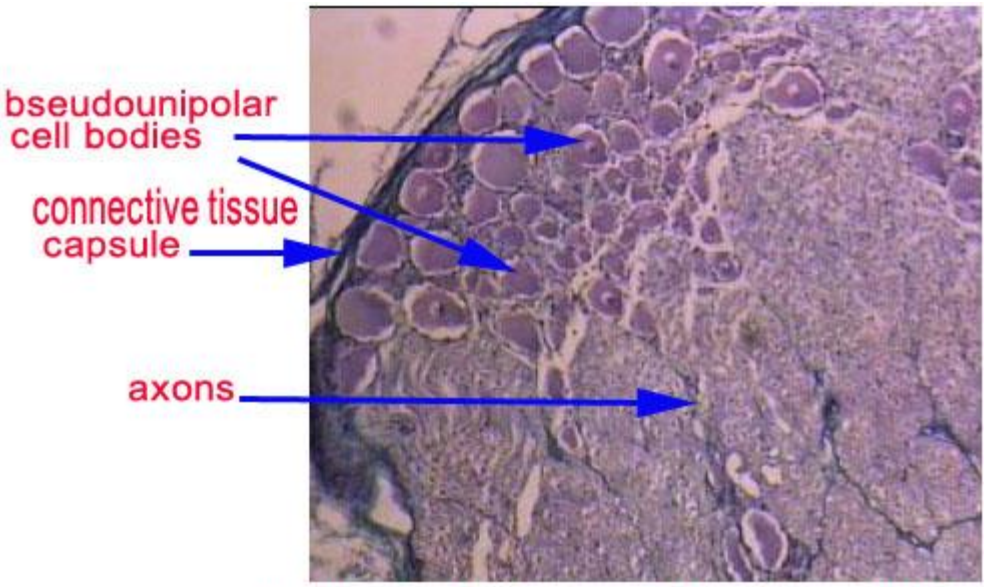
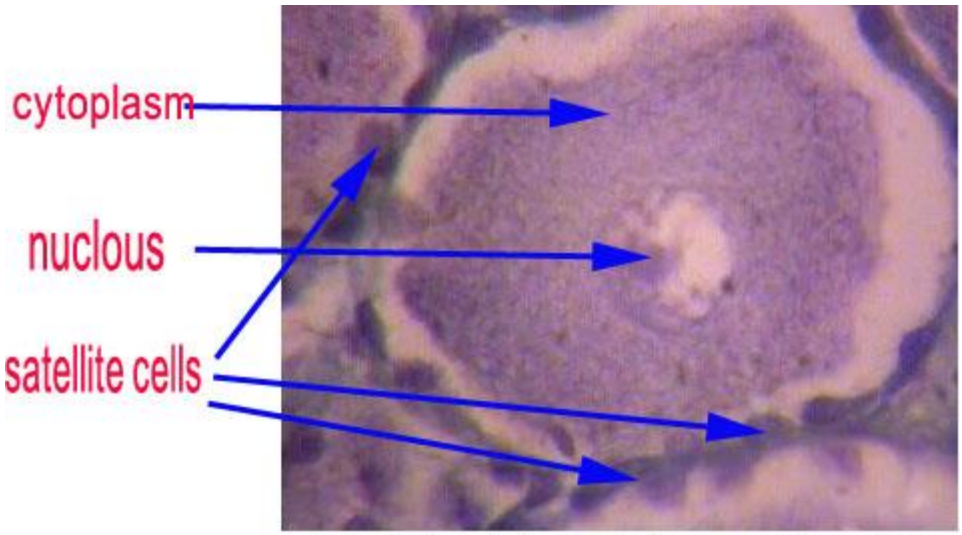


cross section in dorsal root gangalia (spinal ganglia) 4x



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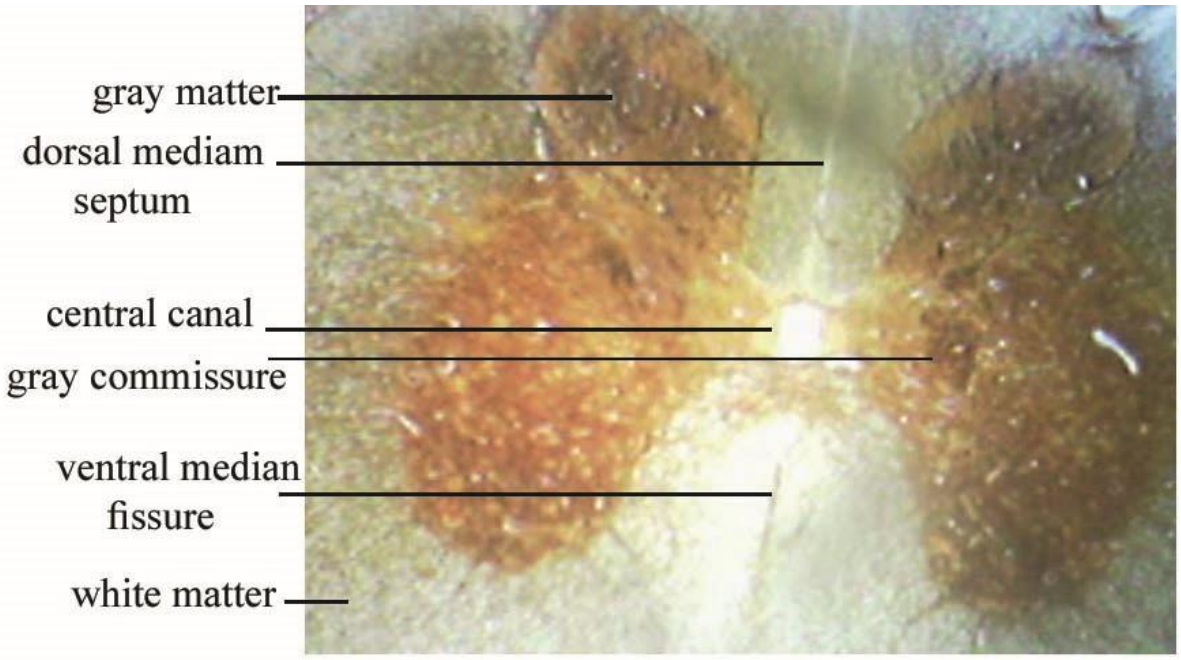
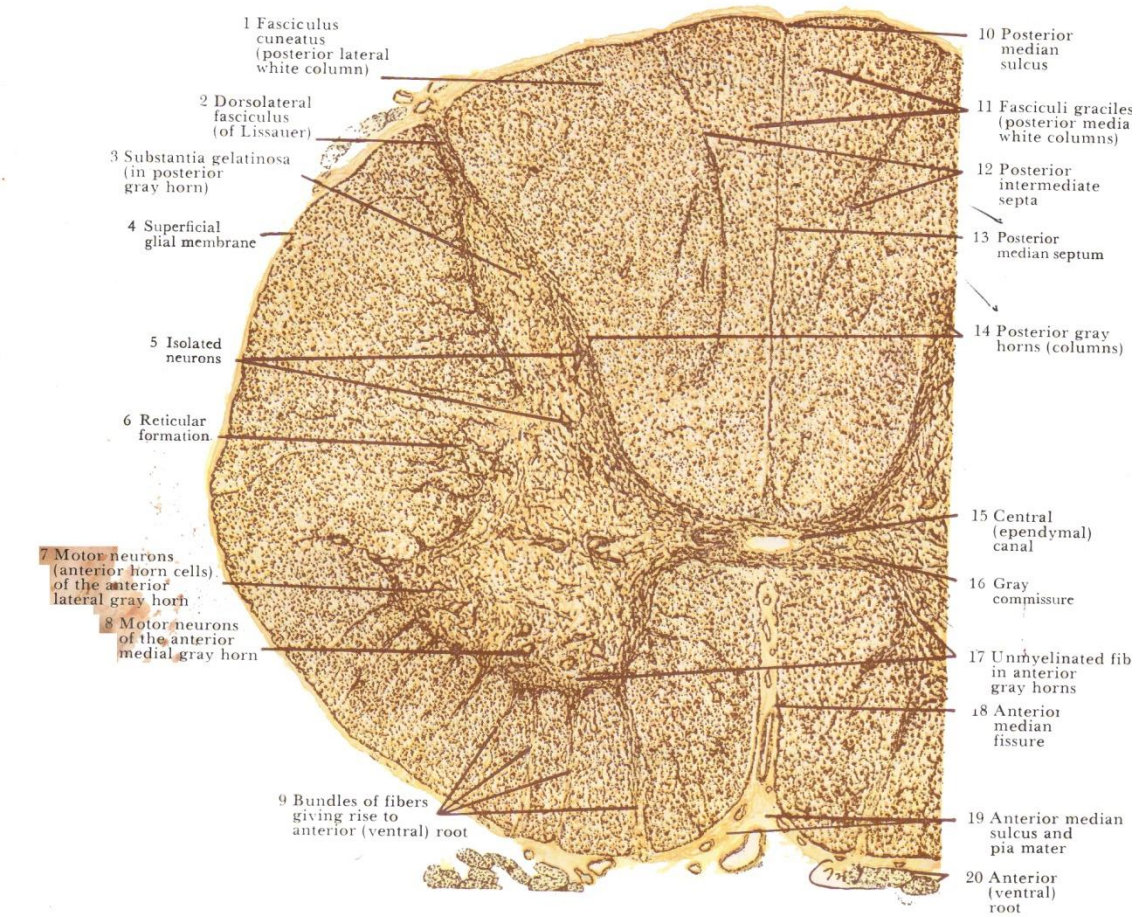


cross section in spinal cord 4x



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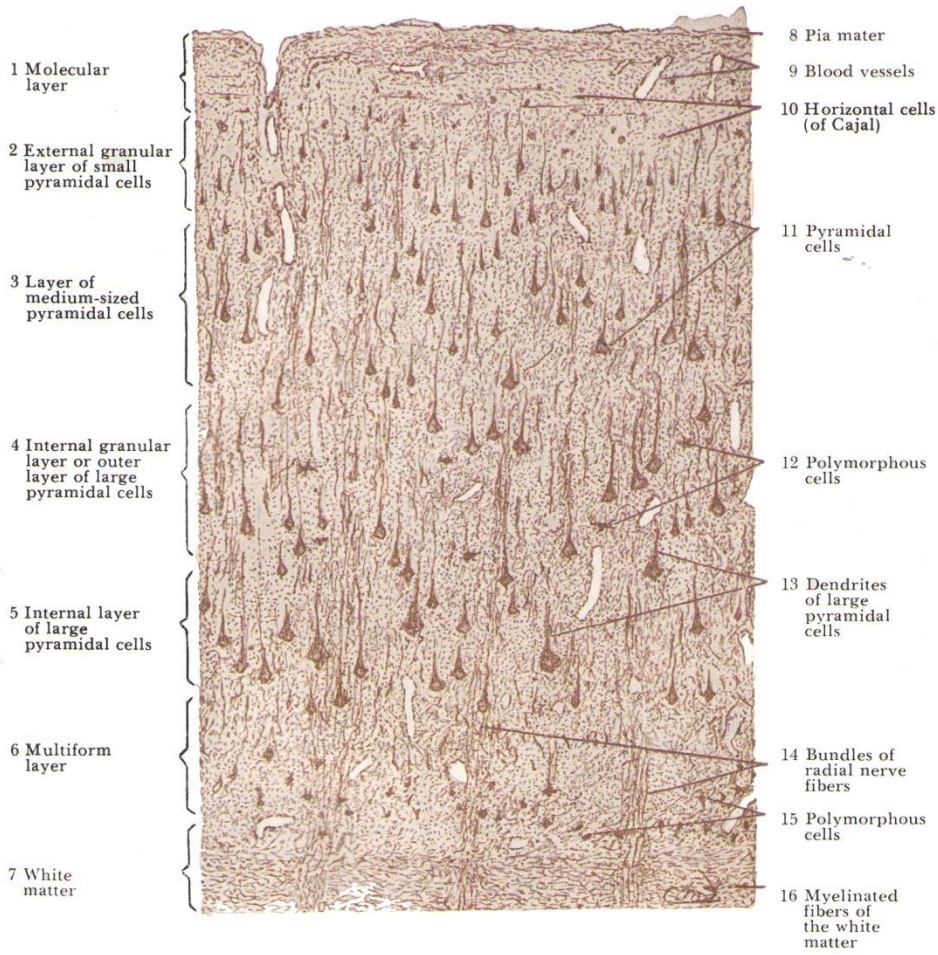

perpendicular section in cerebral cortex 10x

perpendicular section in cerebral cortex 40x

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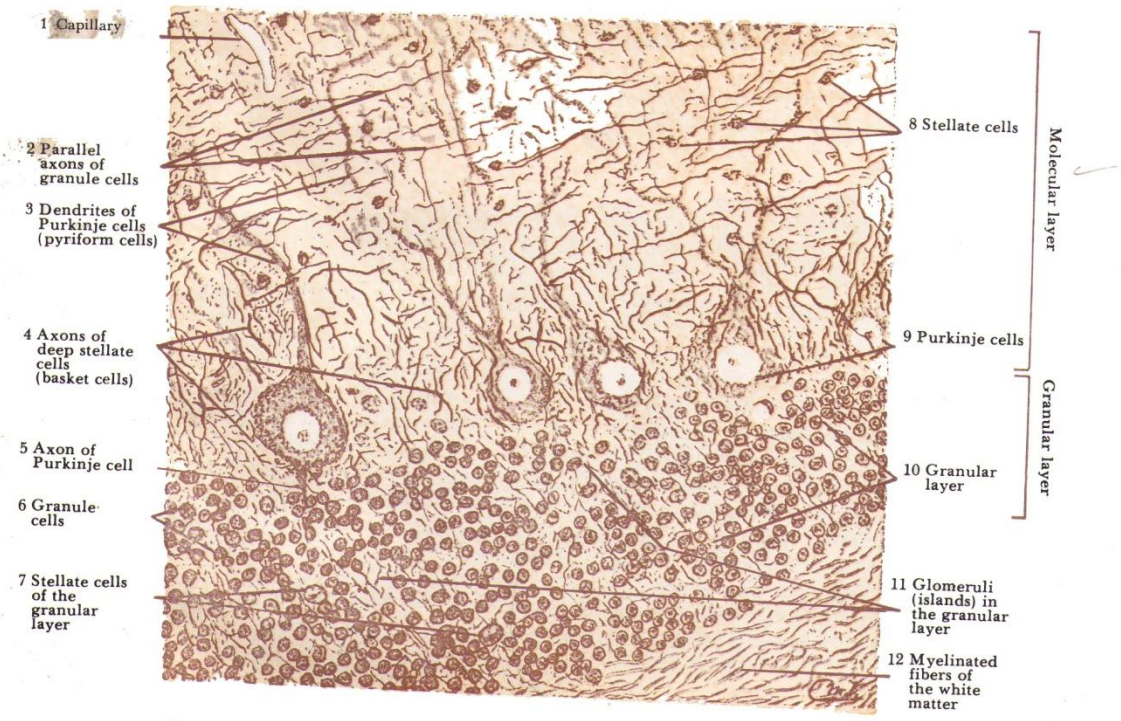
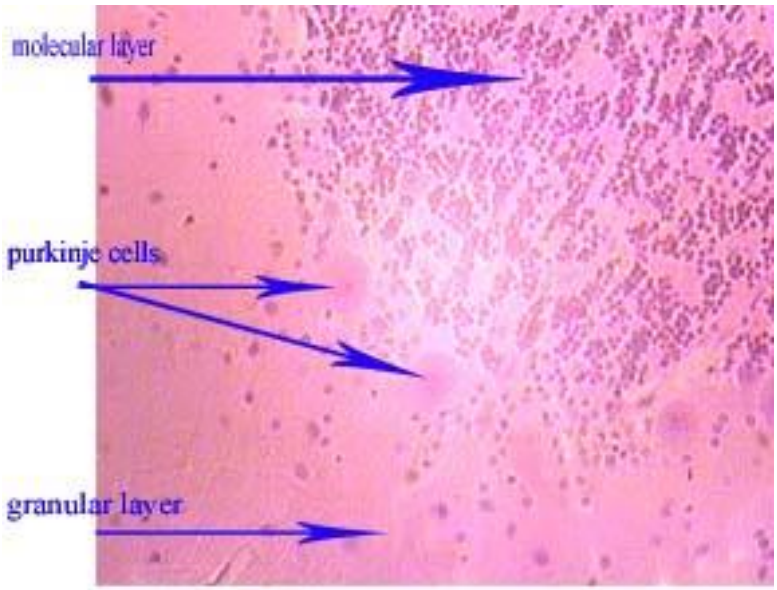
perpendicular section in cerebellum 4x



perpendicular section in cerebellum 40x



long tudinale section in cerebellum 10x

Lab .4

Digestive system

The digestive system, composed of the oral cavity, alimentary tract and associated glands.

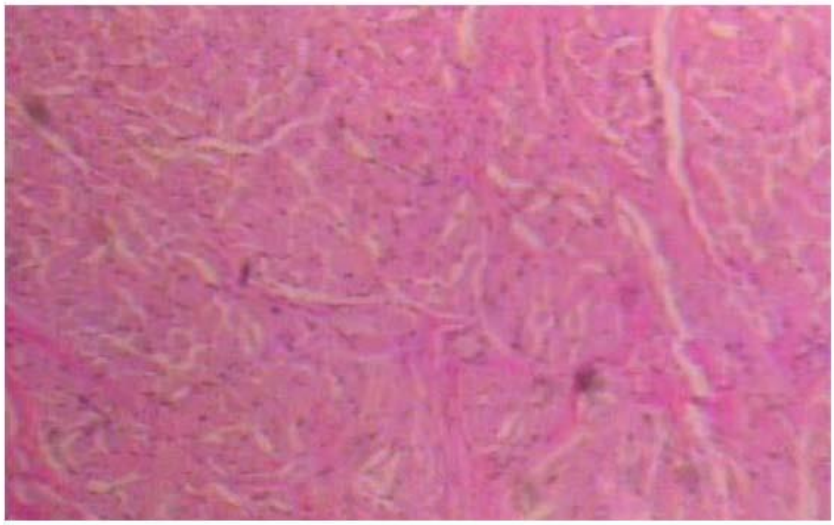
Oral cavity:

The oral cavity is lined by the oral mucosa, composed of a wet stratified squamous non keratinized epithelium and an underlying connective tissue.

Ducts of the three pairs of major salivary glands (parotid, submandibular, and sublingual) open into the oral cavity.

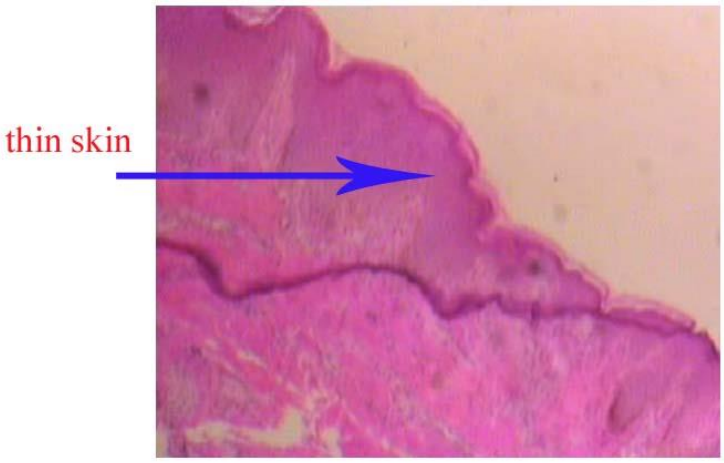
1- Lips:

The core of the lips is composed of skeletal muscle fibers. Each lip may be subdivided into three regions: the external aspect, vermilion zone and mucous aspect.



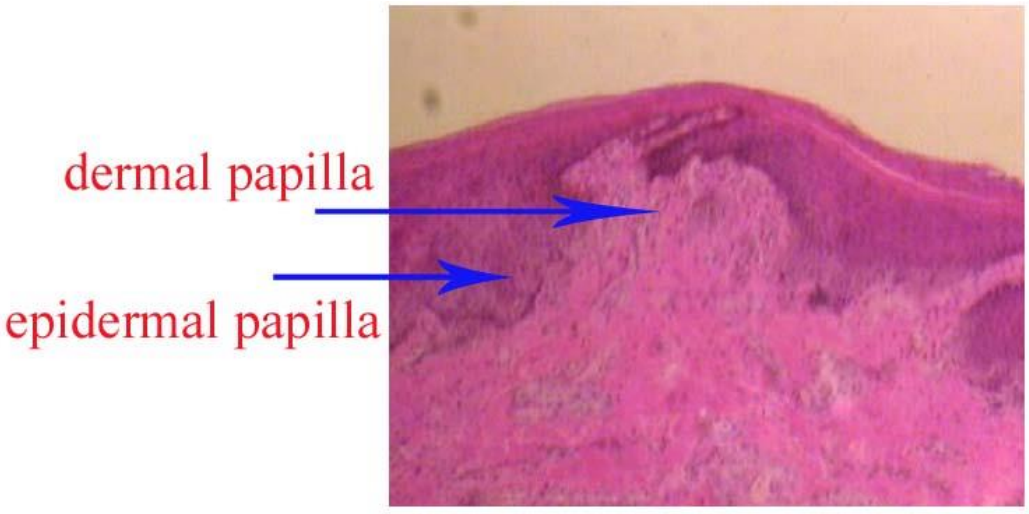
PERPENDICULAR SECTION IN LIP (SKELETAL MUSCULE) 4X

The external aspect of the lip is covered with thin skin and is associated with sweat glands, hair follicles, and sebaceous glands.



perpendiular section in lp (external aspect) 4x

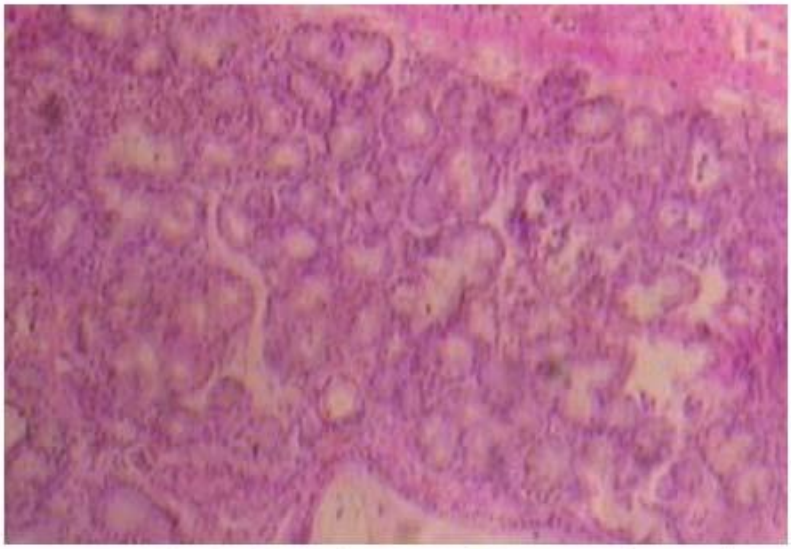
The vermilion zone , the pink region of the lip, which is also covered by thin skin, the capillary loops of the dermal papillae are close to the surface of the skin, imparting a pink color to the vermilion zone.



perpendiular section in lp (vermilion zone) 4x

The mucous (internal) aspect of the lip is always wet, and is lined by stratified squamous non keratinized epithelium.

perpendiular section in lp (internal ecpect) 4x



PERPENDICULAR SECTION IN LIP (SALIVARY GLAND) 4X

2- Tongue:

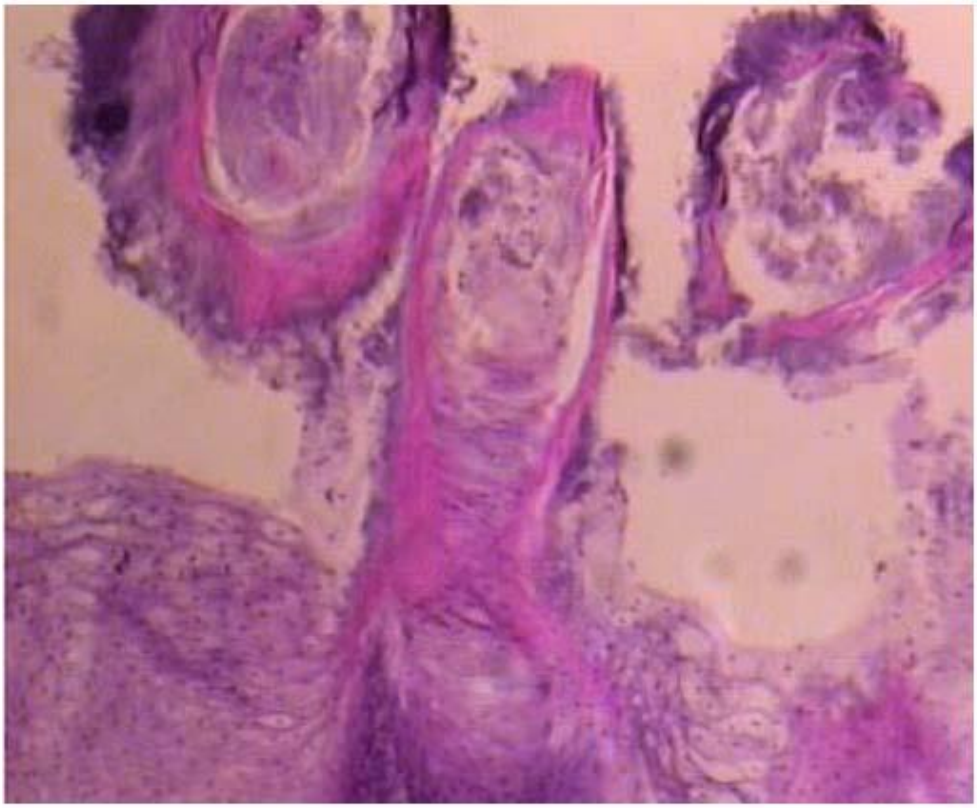
The largest structure in the oral cavity, its extreme mobility is due to the large intertwined mass of skeletal muscle fibers that composed its bulk.

The tongue has a dorsal surface, a ventral surface and two lateral surfaces.

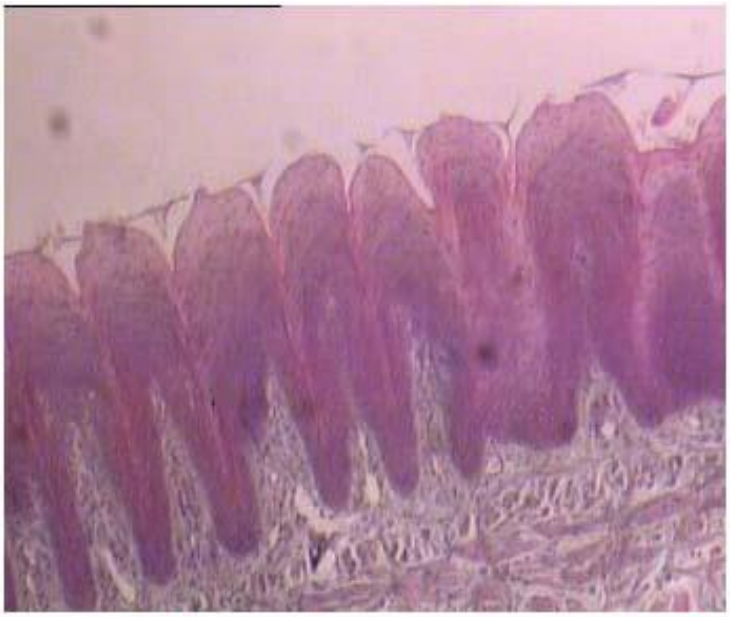
Lingual papillae, most of which project above the surface cover the anterior two thirds of the tongues dorsal surface.

The lingual papillae are classified into four types: filiform, fungiform, foliate, and circumvallate.

Filiform papillae are numerous slender structure that impart a velvety appearance to the dorsal surface. These papillae are covered by stratified squamous keratinized epithelium and filiform papillae do not have taste buds.

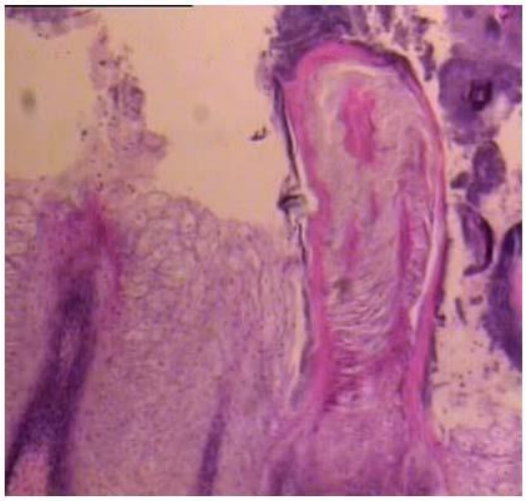


perpendicular section tongue (filliform papilla) 4x

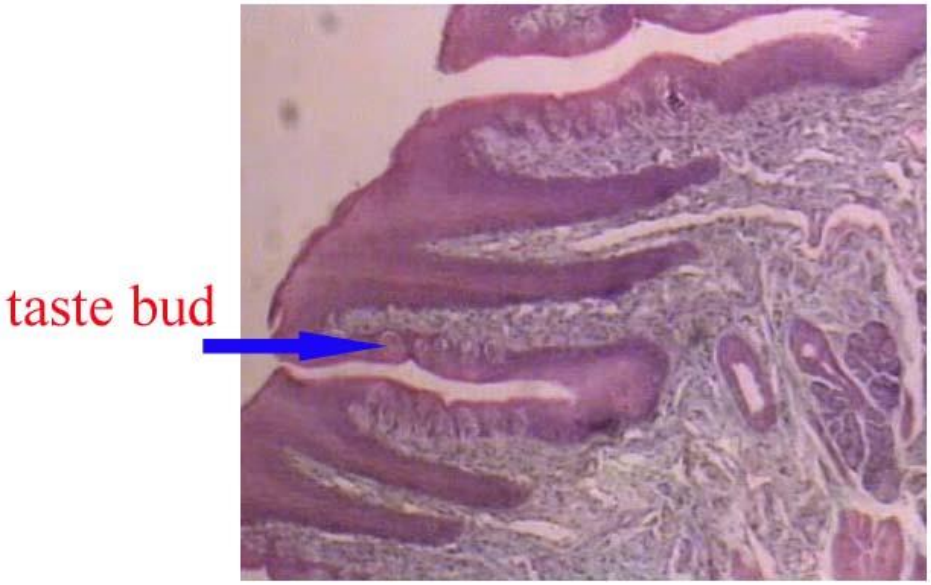


perpendicular section in tongue (filliform pappillae) 4x

Each fungiform papillae resemble a mushroom . the epithelial covering of these papillae sbratified squuamous non keratinaized . Fungiform papille have taste buds on the dorsal aspect of their cap .

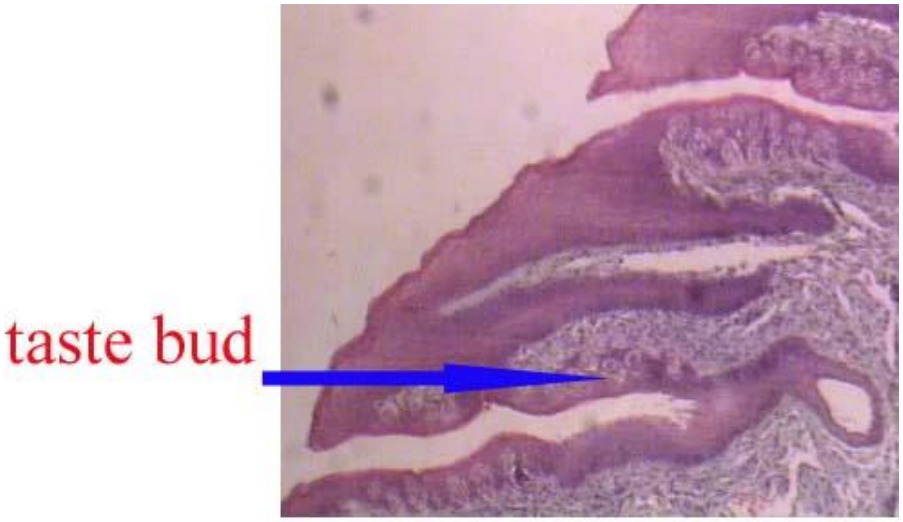


perpendicular section in tongue (fungiform pappilla) 4x



perpendicular section in tongue (fungiform pappilla) 4x

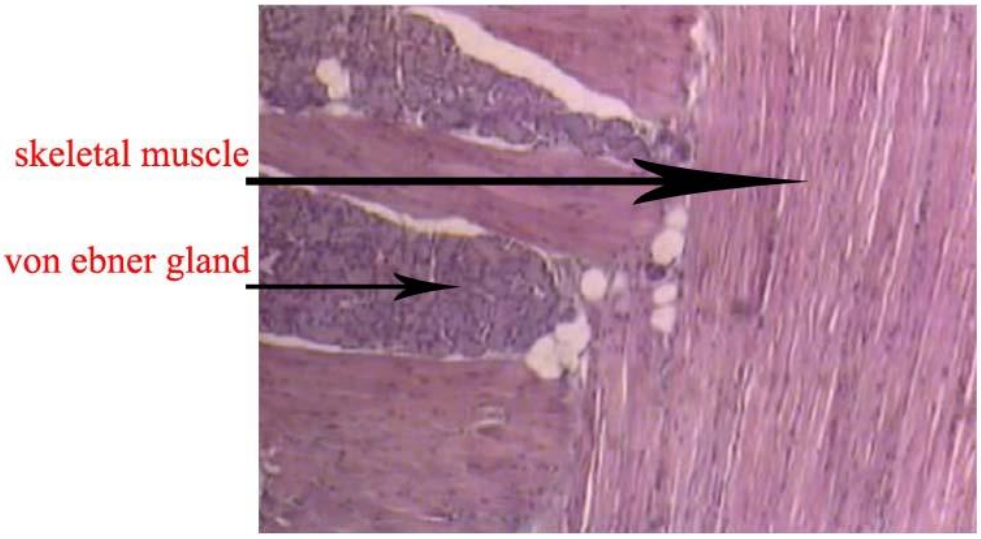
Falliate papillae are located along the posterolateral aspect of the tongue. They appear as vertical furrows. These papillae have functional taste buds in the neonate, but these buds degenerate by the second or third year of life.



perpendicular section in tongue (foliate pappilla) 4x

Slender ducts of serous minor salivary glands of von ebnor, located in the core of the tongue.

Empty into the base of the furrows.



croos section in tungue 4x

Taste buds are intraepithelial sensory organs that function in the perception of taste. Each taste bud composed of 60 to 80 spindle shaped cells, is an oval structure, and is distinctly pallor than the epithelium surrounding it.

There are 8 to 12 large circumvallate papillae in a v-shaped arrangement just anterior to the sulcus terminalis, these papillae are surrounded by an epithelially lined groove, whose base is pierced by slender ducts of glands of vonebner. The epithelial lining if the groove and the side of these papillae have taste buds.

Alimentary canal:

The history of the alimantor canal of four broad layers: the mucosa, submucosa, muscularis externa, and serosa (or adventitia). These layers are similar throughout the length of the digestive tract but display regional modifications and specializations.

Mucosa:

The lumen of the alimentary canal is lined by an epithelium, deep to which is a loose connective tissue known as the lamina propria. Surrounding this connective tissue coat is the muscularis mucosae, composed of an inner circular and an outer longitudinal layer of smooth muscle.

Submucosa:

The mucosa is surrounded by a dense, irregular fibro- elastic connective tissue layer.

Muscularis extena:

The submucosa is invested by a thick muscular layer, muscularis externa, composed of smooth muscle (except in the esophagus) and is usually organized in an inner circular and an outer longitudinal layer.

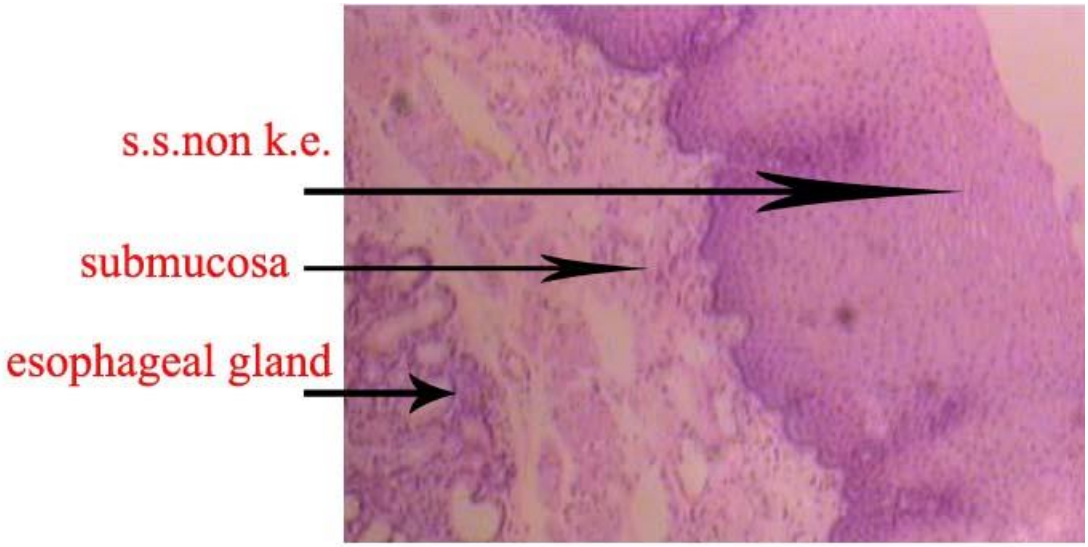
Serosa or adventitia:

The muscularis externa is enveloped by a thin connective tissue layer that may or may not be surrounded by the simple squamous epithelium of the visceral peritoneum.

1- Esophagus:

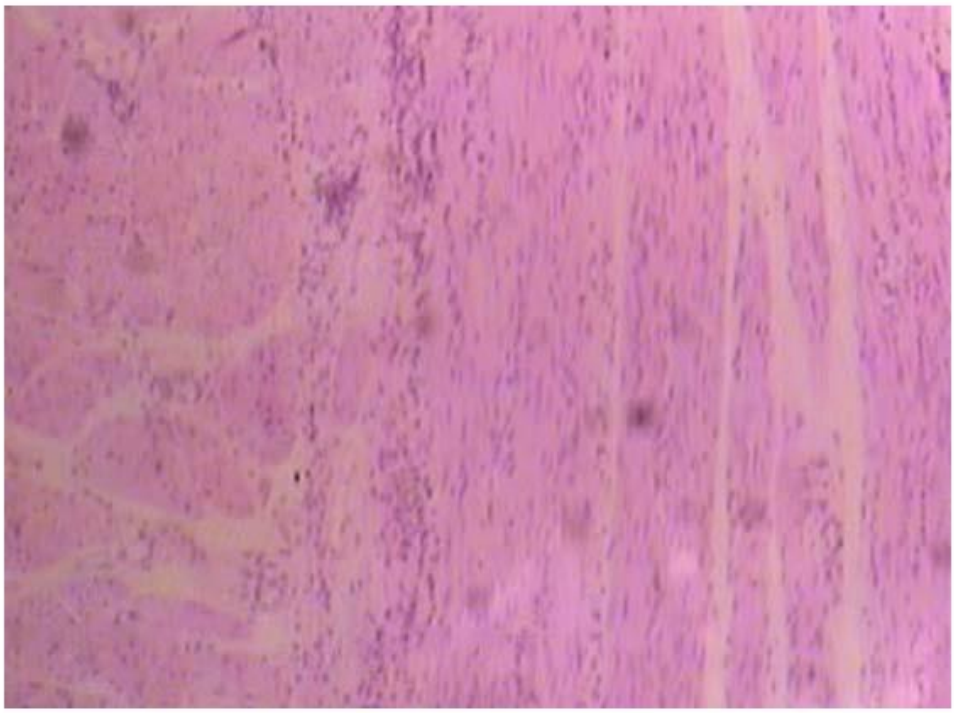
The lumen of the esophagus , lined by a stratified squamous non keratinized epithelium. The lamina propria is unremarkable . it houses esophageal cardiac glands. The musularis mucosae is unusual in that it consist of a single layer of longitudinally oriented smooth muscle fibers that become thicker closer to the stomach.

The submucosa is composed of a dense fibroplatic connective tissue, which houses the esophageal glands proper (tubuloacinar glands). The esophagous and the duodenum are the only two regions of the alimentary canal with glands in the submucosa.



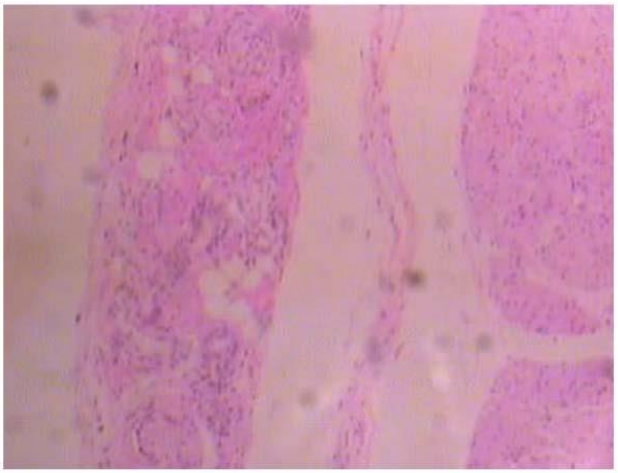
cross section in esophagus 4x

The muscularis externa is arranged in two layers. Inner circular and outer longitudinal, but they are unusual in that they are composed of both skeletal and smooth muscle fibers. The upper third of the esophagus has mostly skeletal muscle' the middle third has both skeletal and smooth and the lowest third has only smooth muscle fibers.



cross section in esophagus (muscularis externa)4x

The esophagus is covered by an adventitia until it pierces the diaphragm , when it is covered by a serosa.



cross section in esophagus (adventitia)4x

2- Stomach:

The stomach has four regions:

Cardia: is a narrow region at the gastroesophageal junction.

Fundus: is a dome shaped region to the left of the esophageal.

Body (corpus): is the largest portion, for the formation of chyme.

Pylorus: is a funnel shaped constricted portion, equipped with a thick pyloric sphincter, that controls release of chyme.

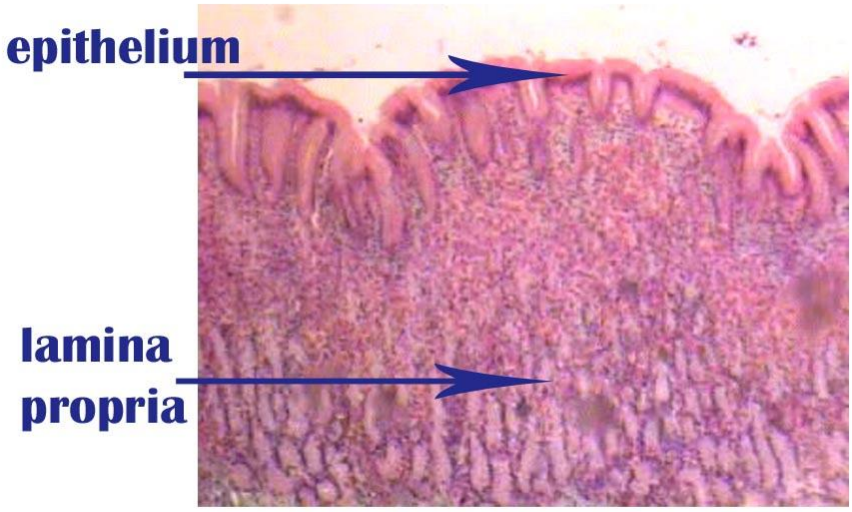
All the gastric regions display rugae, longitudinal folds of the mucosa and submucosa, the epithelial lining of the stomach invaginates into the mucosa , forming gastric pits, increase the surface area of the gastric lining.

a- Perpendicular section (P.S) is fundic portion.

1- Mucosa:

The mucosa of the fundic portion of the stomach is composed of the usual three components (epithelium lining the lumen, an underling connective tissue, the lamina propria, and the muscularis mucosae)

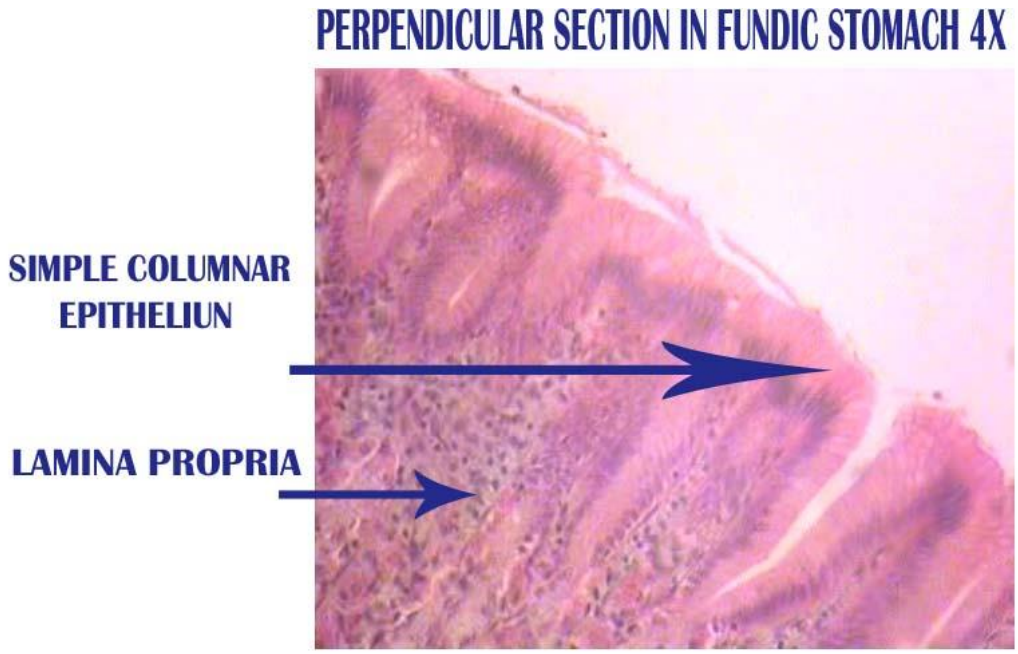
The lumen is lined by a simple columnar epithelium composed of surface lining cells.

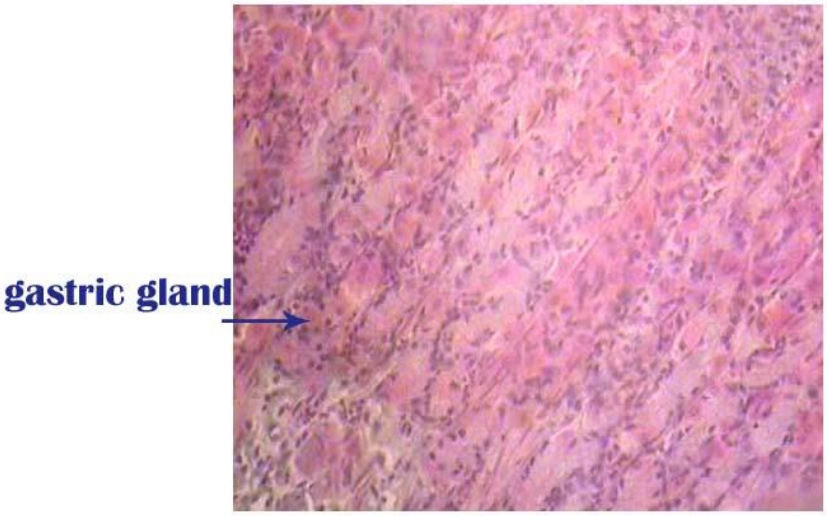


perpendicular section in fundic stomach (mucosa) 10x

The loose, highly vascularized connective tissue of the lamina propria has a rich population of plasma cells, lymphocytes , mast cells, fibroblasts, lamina propria is occupied by fundic glands.

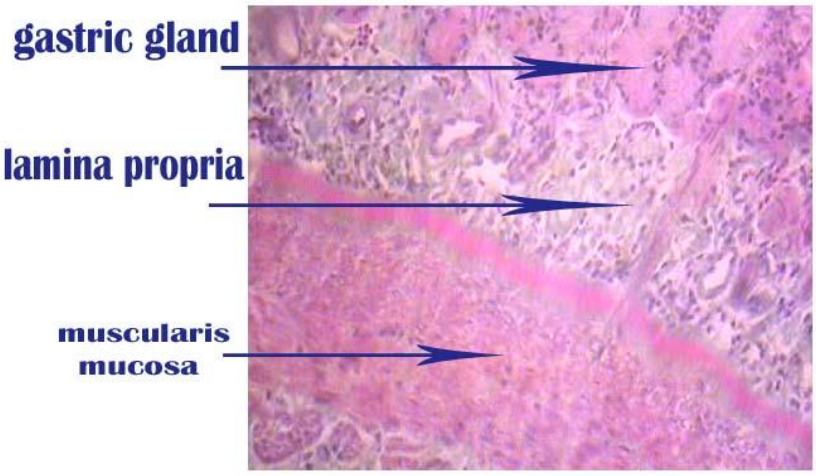
Each fundic gland extends from the muscularis mucosae to the base of the gastric pit and is subdivided into three regions, the isthmus , neck, and base, of which the base is the longest. The epithelium of the fundic gland is composed of six cell types.





PERPENDICULAR SECTION IN FUNDIC STOMACH(LAMINA PROPRIA)4X

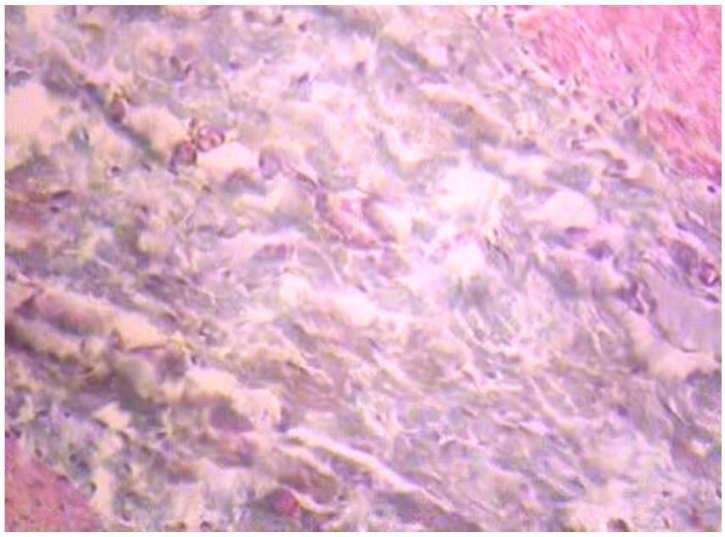
The smooth muscle cells that compose the muscularis mucosae are arranged in three layers. The inner circular and outer longitudinal layers are well defined, however, an occasional third layer (outer most longitudinal) is not always evident.



PERPENDICULAR SECTION IN FUNDIC STOMACH 4X

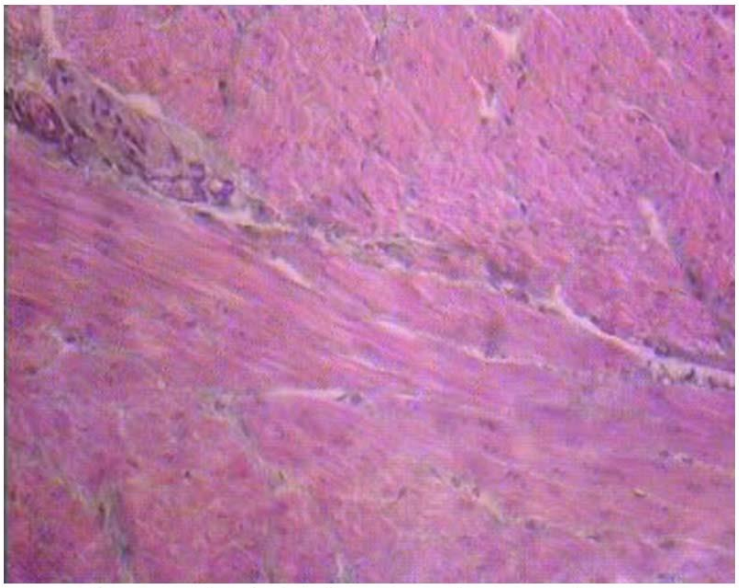
2- Submucosa:

Dense, irregular, collagenous connective tissue and has rich vascular and lymphatic network.


perpendicular section in fundic stomach (sub mucosa) 10x

3- Muscularis externa:

Smooth muscle cells arranged in three layers. The inner oblique layer is not well defined, the middle circular layer is clearly evident, and the outer longitudinal layer.



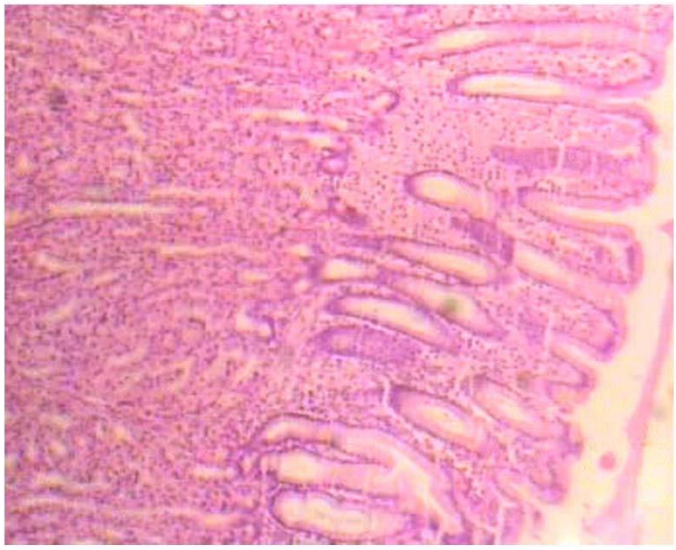
perpendicular section in fundic stomach (muscularis externa) 4x

4- Serosa:

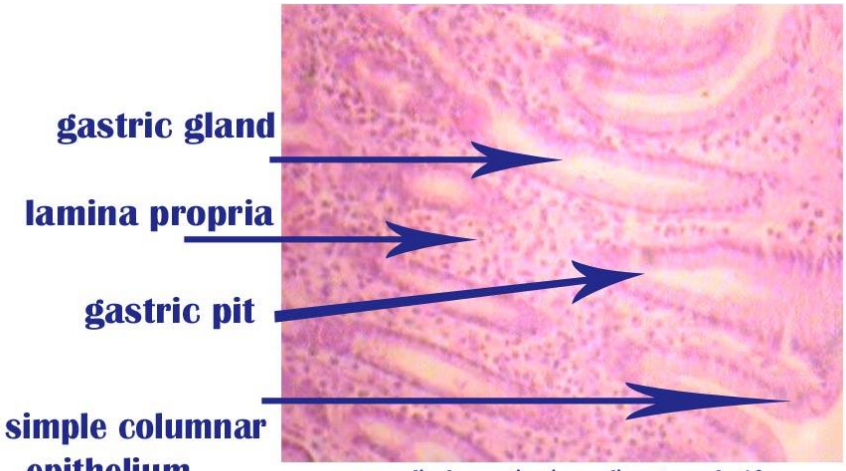
Composed of a thin, loose , subserous connective tissue covered by a smooth , wet , simple squamous epithelium.

b- Cardiac region:

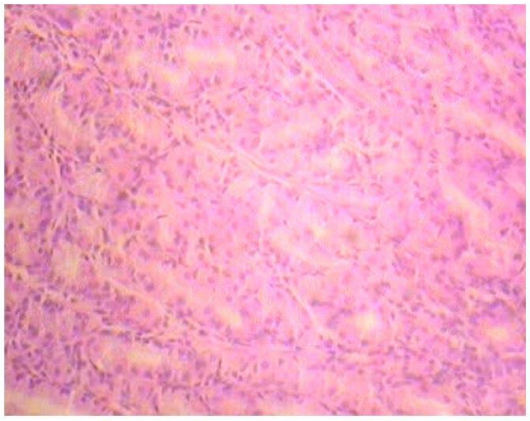
The mucosa of the cardiac region region differs from that of the fundic region in that the gastric pits are shallower and the base of its glands is highly coiled.



perpendicular section in cardiac stomach (mucosa) 4x

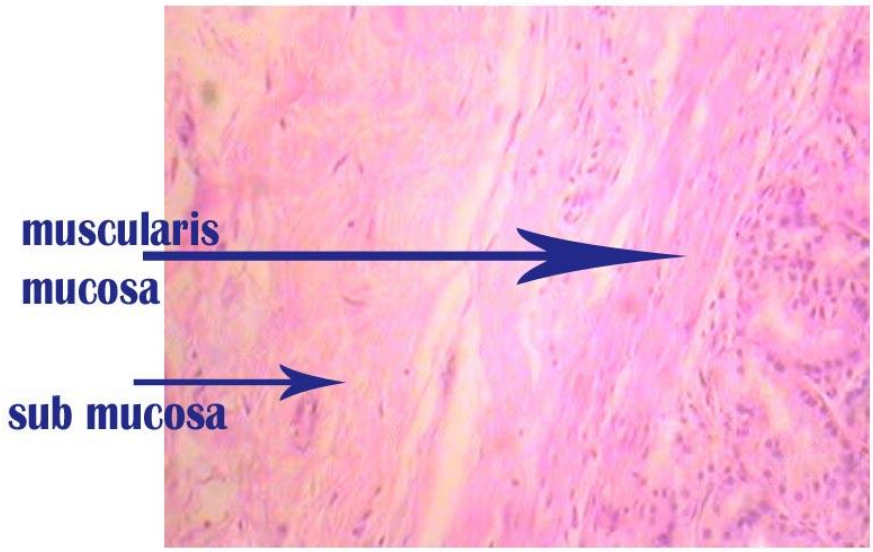


perpendicular section in cardiac stomach 10x

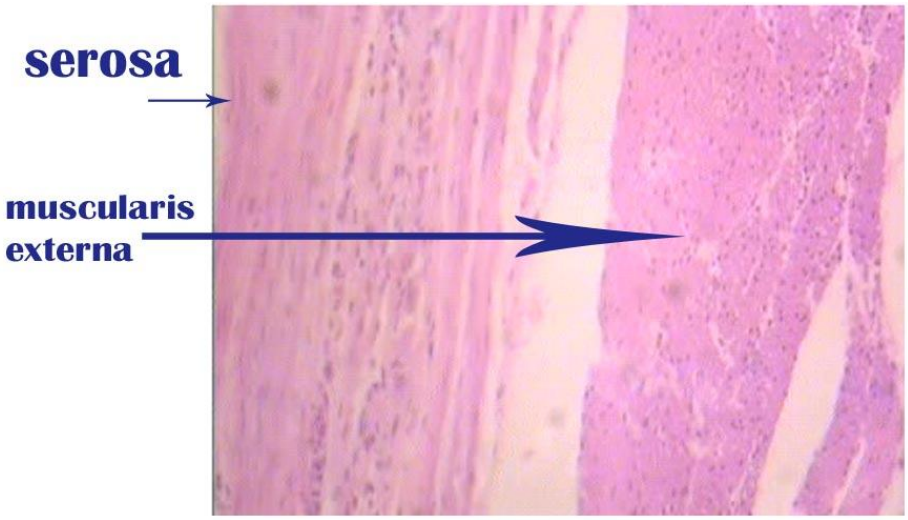


perpendicular section in cardiac stomach (gastric glands) 10x

The inner muscular layer of the muscularis externa is thicker in the cardiac region, and the outer longitodinall muscle layer is most evident.



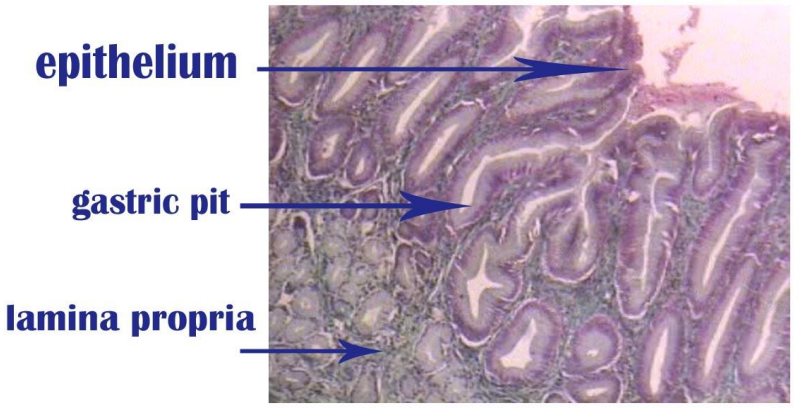
perpendicular section in cardiac stomach 10x



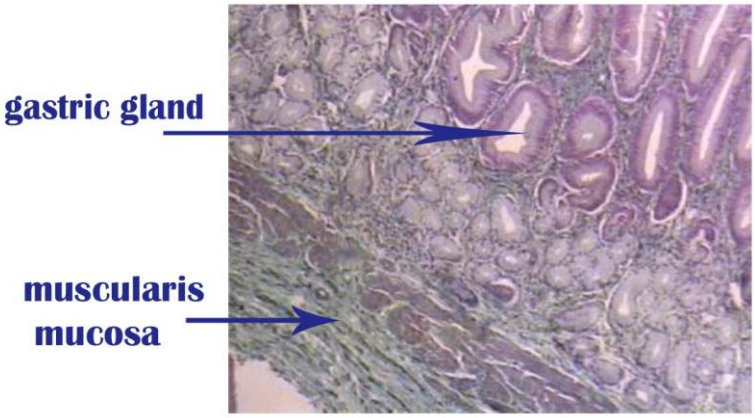
perpendicular section in cardiac stomach 10x

c- Pyloric region:

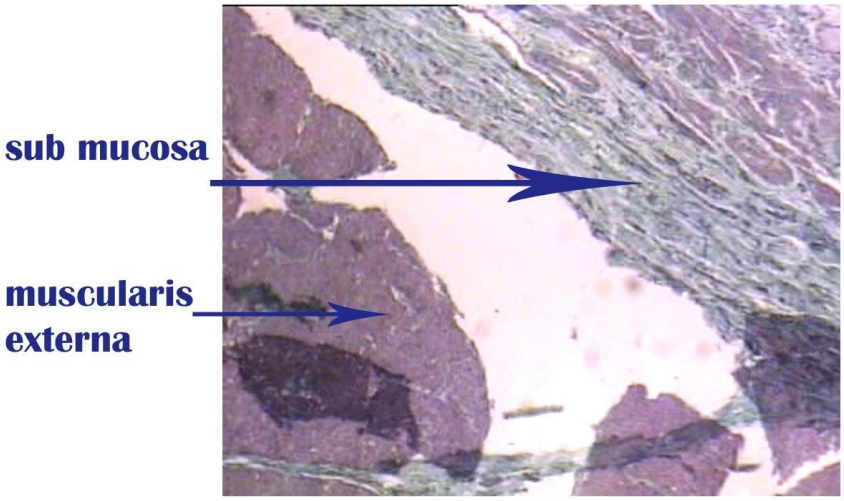
The pyloric glands are highly convoluted and tend to branch additionally, the gastric pits of the pyloric region are deeper than in both cardiac and fundic regions, extending approximately half way down into the lamina propria.



perpendicular section in pyloric stomach 4x



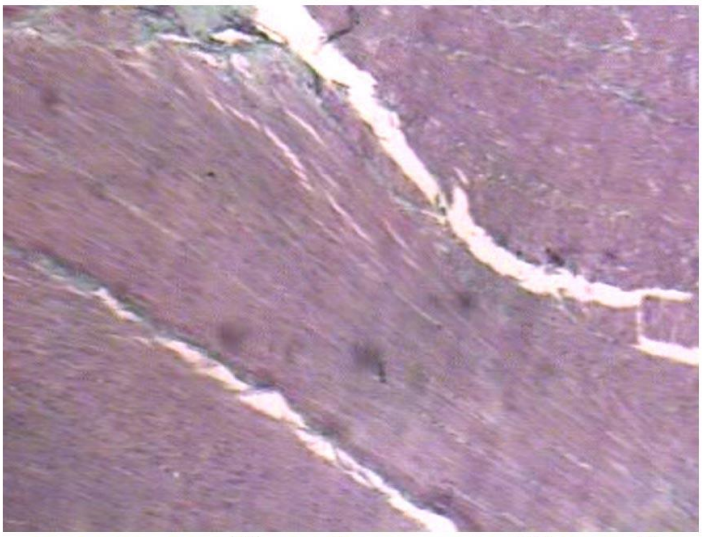
perpendicular section in pyloric stomach 4x



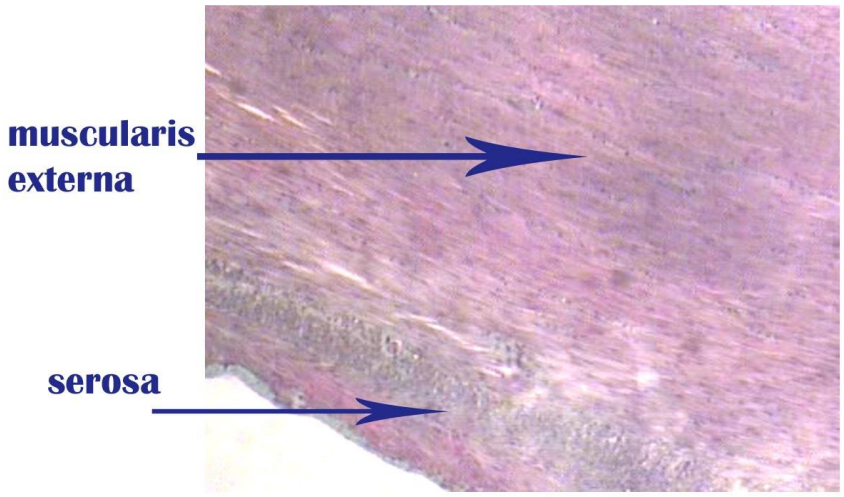
perpendicular section in pyloric stomach 4x

The outer longitudinal muscle layer of the muscularis externa is poorly developed in the pylorus.

There were some lymphoid nodules in this region.



perpendicular section in pyloric stomach (muscularis externa) 4x



perpendicular section in
pyloric stomach 4x

3- Small intestine:

It is divided into three regions, the duodenum, jejunum, and ileum

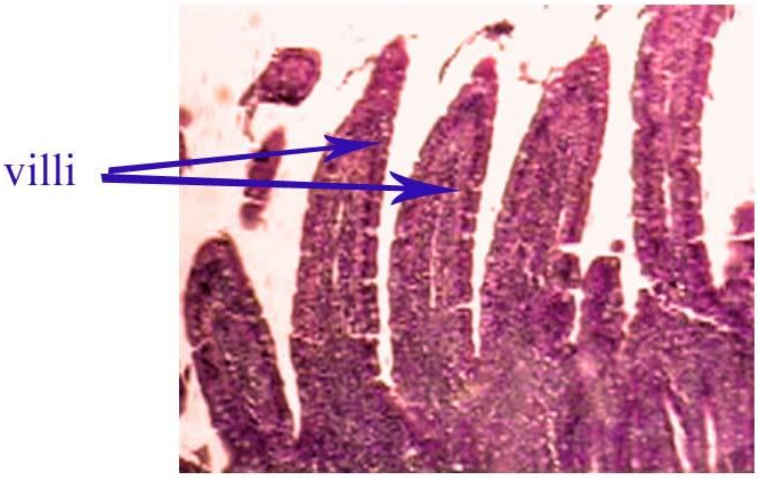
a- Intestinal mucosa:

The mucosa is composed of the usual three layers : a simple columnar epithelium, the lamina propria, the muscularis mucosae, the simple columnar epithelium covering the villi and the surface of the intervillar spaces is composed of surface absorptive cells, goblet cells, and enteroendocrine cells.

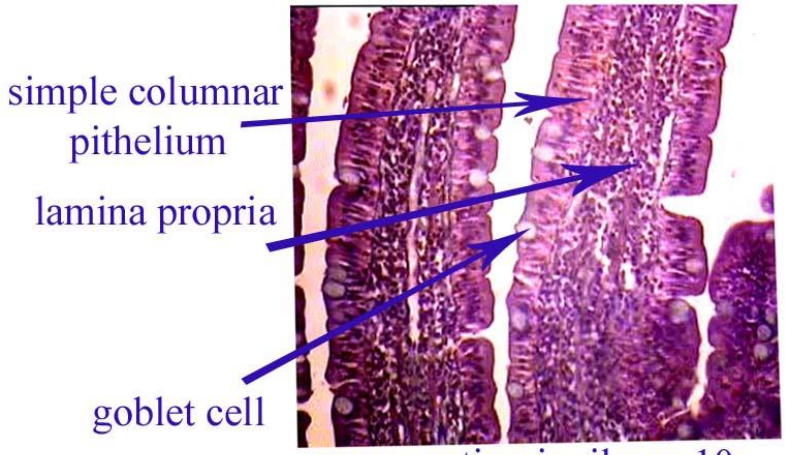
The loose connective tissue of the lamina propria forms the core of the villi. The rest of the lamina propria extending down to the muscularis mucosa, is compressed into thin sheets of highly vascularized connective tissue by the numerous tubular glands, the crypts of lieberkuhn. The lamina propria also is rich in lymphoid cells.

Crypts of lieberkun are simple tubular (or branched tubular) glands open into the intervillar spaces as perforations of the epithelial lining.

The muscularis mucosae of the small intestine is composed of an inner circular and outer longitudinal layer of smooth muscle cells.



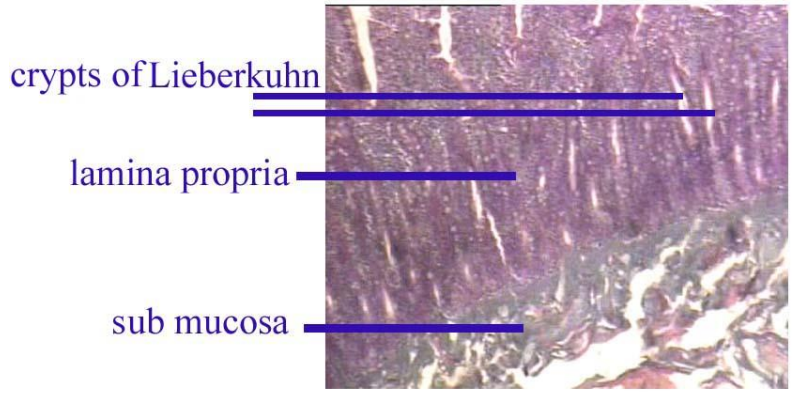
cross section in ileum 4x



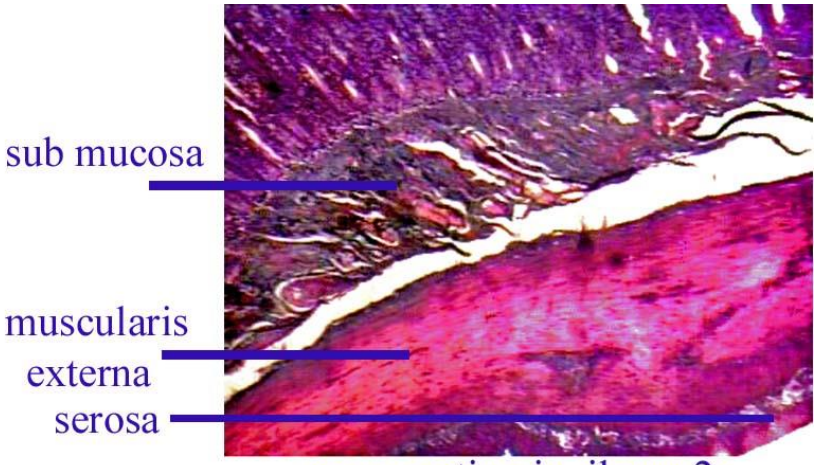
cross section in ileum 10x

b- Submucosa:

Composed of dense, irregular fibroelastic connective tissue with a rich lymphatic and vascular supply.



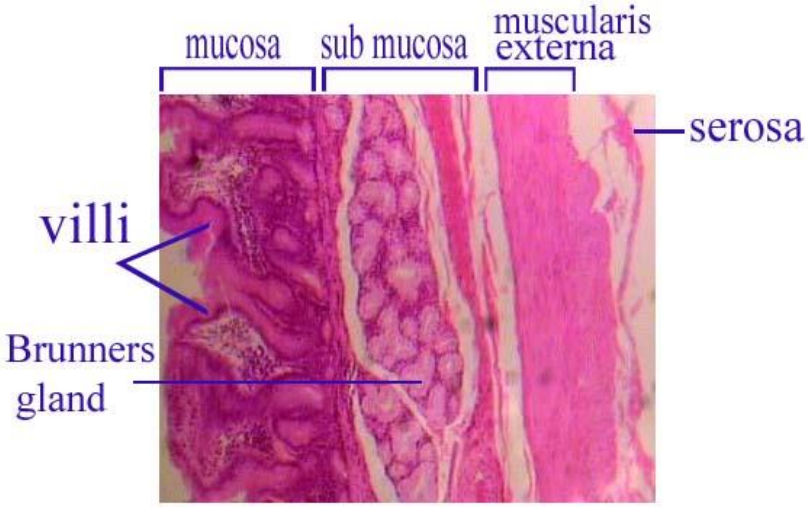
cross section in ileum 4x



cross section in ileum 2x

The Submucosa of the duodenum is unusual because it houses branners glands (duodenal glands). Branched tubuloalveolar glands, whose secretary portion resemble mucous acini.

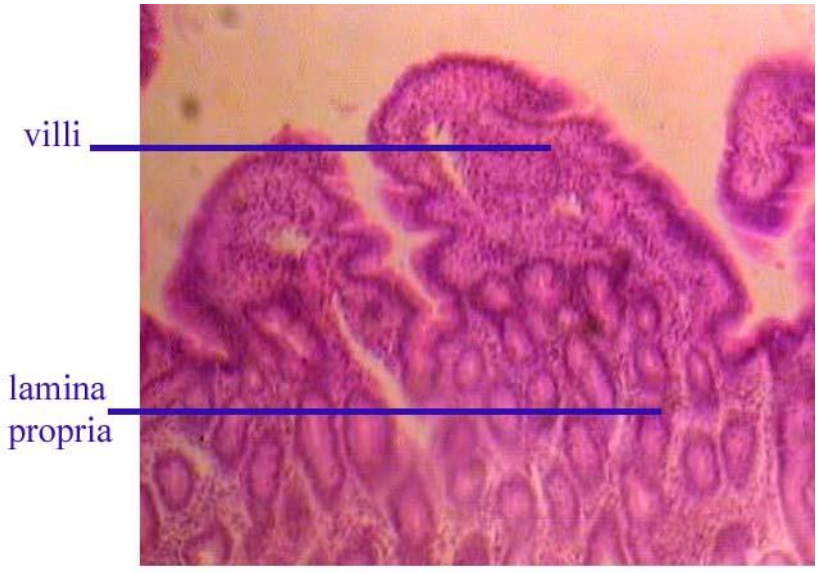
The ducts of these glands penetrate the muscularis mucosa and usually pierce the base of the crypts of lieberkuhn to deliver their secretary product into the lumen of the duodenum.



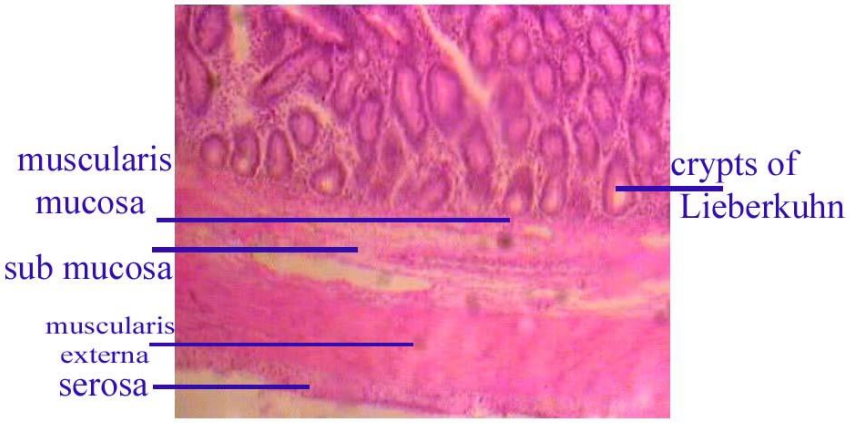
cross section in duodenum 4x

c- Muscularic externa and serosa:

The Muscularic externa is composed of an inner circular and an outer longitudinal smooth muscle layer. Small intestine is invested by a serosa.



cross section jejunum 10



cross section jejunum 4x

Differences:

The duodenum differs from the jejunum and ileum in that its villi are broader, taller, and more numerous per unit area. It has fewer goblet cells per unit area than the other segments. And it has branners glands in its Submucosa .

The villi of the jejunum are narrower , shorter, and sparser than those of the duodenum. The number of goblet cells per unit area is greater in the jejunum than in the duodenum.

The villi of the ileum are the sparsest , shortest , and narrowest of the three regions of the small intestine. The lamina propria of the ileum houses clusters of lymphoid nodules, known as payers patches.

4- Large intestine:

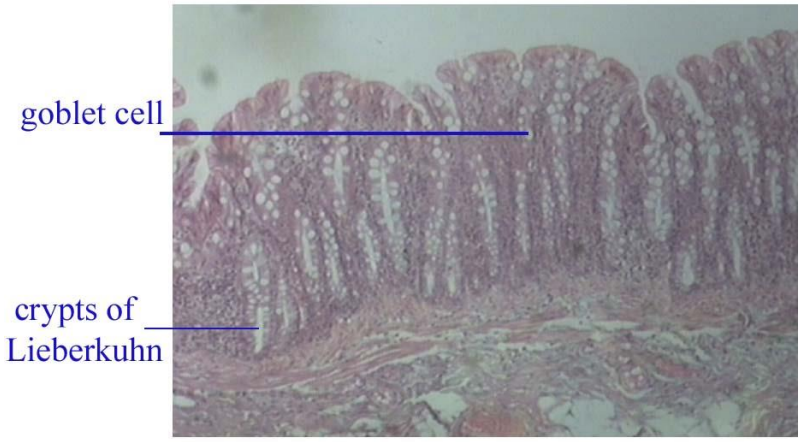
Composed of the cecum, colon, rectum, and anus. The cecum and colon are indistinguishable Histologically.

Colon:

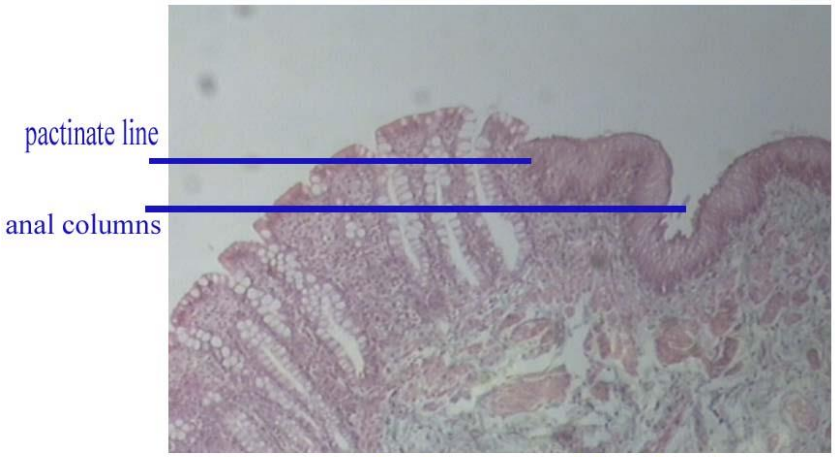
The colon has no villi but is richly endowed with crypts of lieberkuhn that are similar to those of the small intestine. The number od goblet cells increases. The

lamina propria , muscularis mucosa, and Submucosa of the colon resemble those of the small intestine. The muscularis externa is unusual in that the outer longitudinal layer is not continuous a long the surface but is gathered into three narrow ribbons of muscle fascicles, known as taenia coli.

The serosa displays numerous fat- filled pouches, called appendices epiploicae.



cross section in rectum 4x



cross section in recto anal junction 4x

Rectum and anal canal:

The histology of the rectum resembles that of the colon, except that its crypts of lieberkuhn are deeper but fewer per unit area.

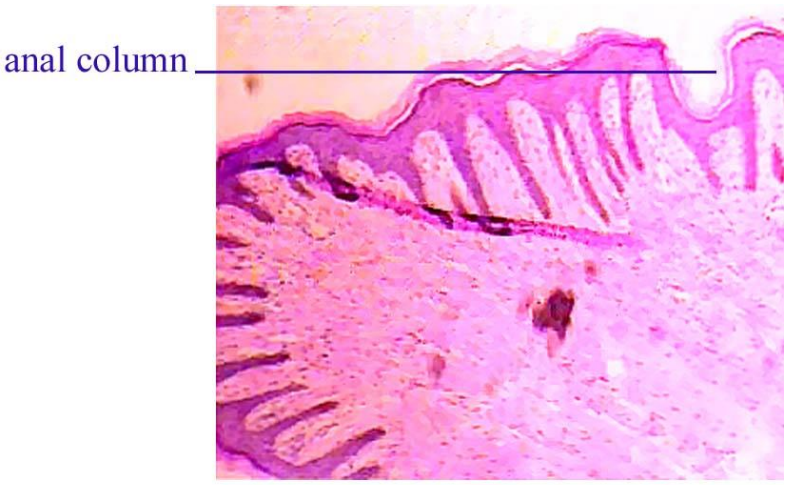
The anal canal , its crypts of lieberkuhn are short, few , and no longer present in the distal half of the canal. The mucosa also displays longitudinal folds, the anal columns. These meet one another to form, the anal valves.

The epithelium of the anal mucosa is simple cuboidal from the rectum to the pactinate line (at the level of the anal valves), stratified squamous non keratinized from the pectinate line to the external anal orifice, and stratified squamous keratinized (epidermis) at the anus. The lamina propria , a fibroelastic connective tissue , houses anal glands at the rectoanal junction and circumanal glands at the distal end of the anal canal.

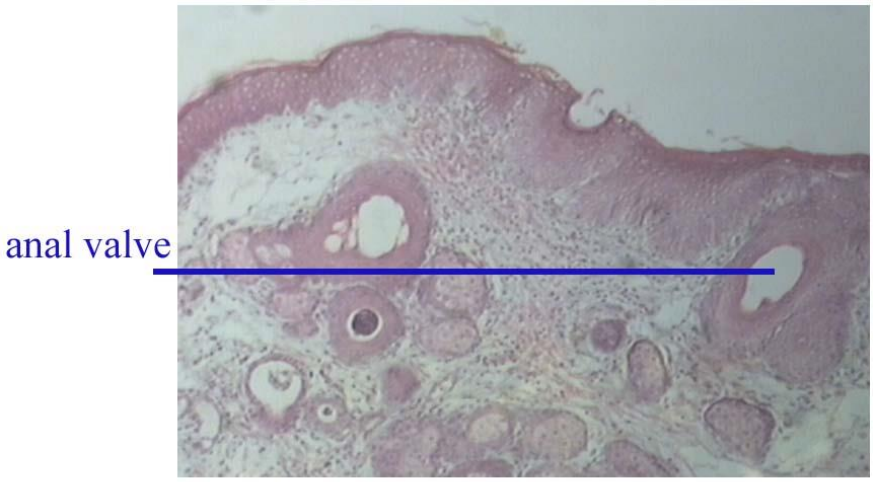
The muscularis mucosa is composed of an inner circular and an outer longitudinal layer of smooth muscle.

The Submucosa is composed of fibroelastic connective tissue . it houses two venous plexuses , the internal hemorrhoidal plexus, and the external hemorrhoidal plexus.

The muscularis externa consists of an inner circular and an outer longitudinal smooth muscle layer. The inner layer becomes thickened as it encircles the region of the pectinate line to form the internal anal sphincter muscle. The outer layer continue as fibroelastic sheet surrounding the internal sphincter . skeletal muscles form an external anal sphincter muscle.



cross section in anal canal 4x



cross section in anal canal 4x

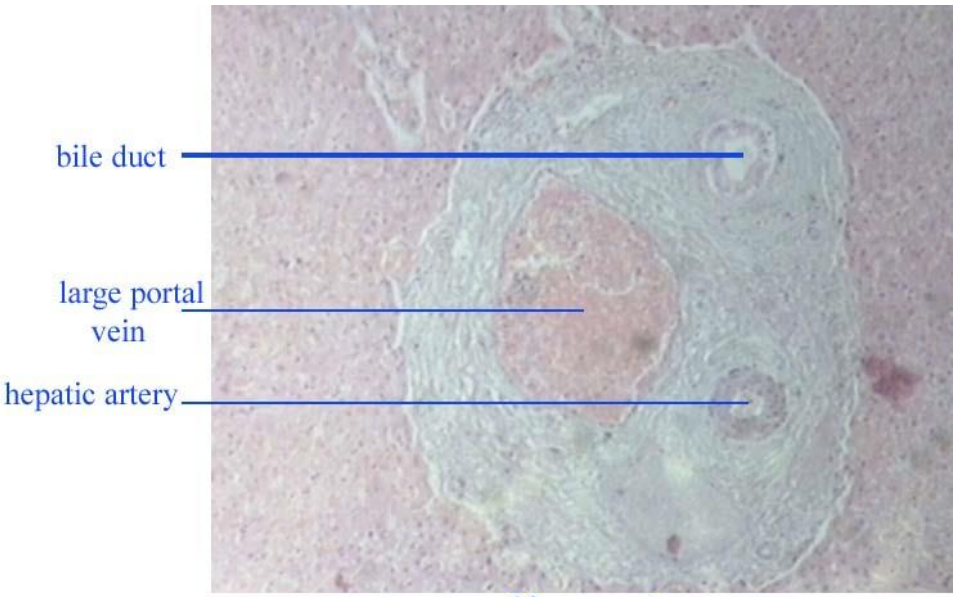
Liver: __

The liver is enveloped by peritoneum ,which forms a simple squamous epithelium covering over the dense, irregular connective tissue capsule (Gilsson's capsule) of the paranchymal cells ,the hepatocytes ,

liver 4x

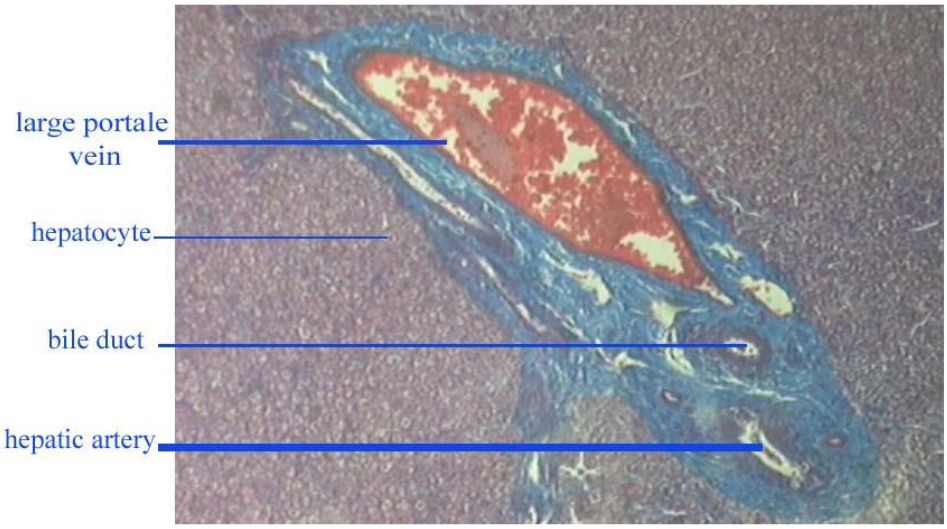
Hepatocytes are arranged in hexagonal-shaped lobules ,these lobules are demarcated by slender connective tissue elements in animals ,however in humans their boundaries can be only be approximated because of the scarcity of connective tissue and the closely packed arrangement of the lobules ,where three lobules contact each other ,the region of connective tissue known as portal area (triad) ,which house branches of hepatic artery ,large portal vein ,inter lobular bile ducts recognized by simple cuboidal epithelium) ,and lymph vessels .

The longitudinal axis of each lobule is occupied by the central vein , the initial branch of the hepatic vein ,that hepatocytes radiate from it forming fenestrated plates of liver cells separated by vascular spaces (hepatic sinusoids). Resident macrophages, known as kuffer cells , are also associated with sinusoidal lining cells in the sinusoids .



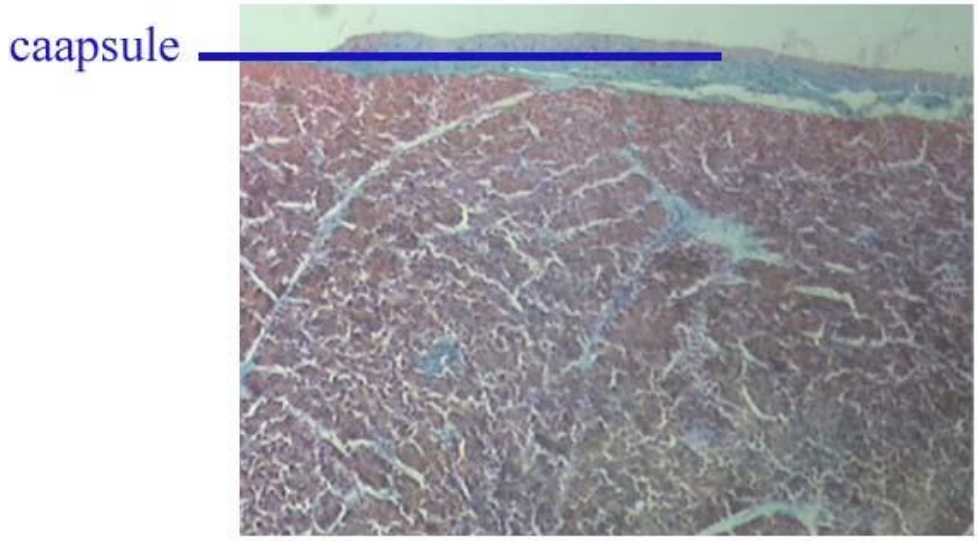
liver 4x

liver 4x



Pancreas :

The connective tissue capsule forms septa, which subdivide the gland into lobules ,the pancreas produces exocrine and endocrine secretions ,the endocrine components . (islets of langerhans) ,are scattered among the exocrine secretory acini .



pencrias 4x

Exocrine pancreas :

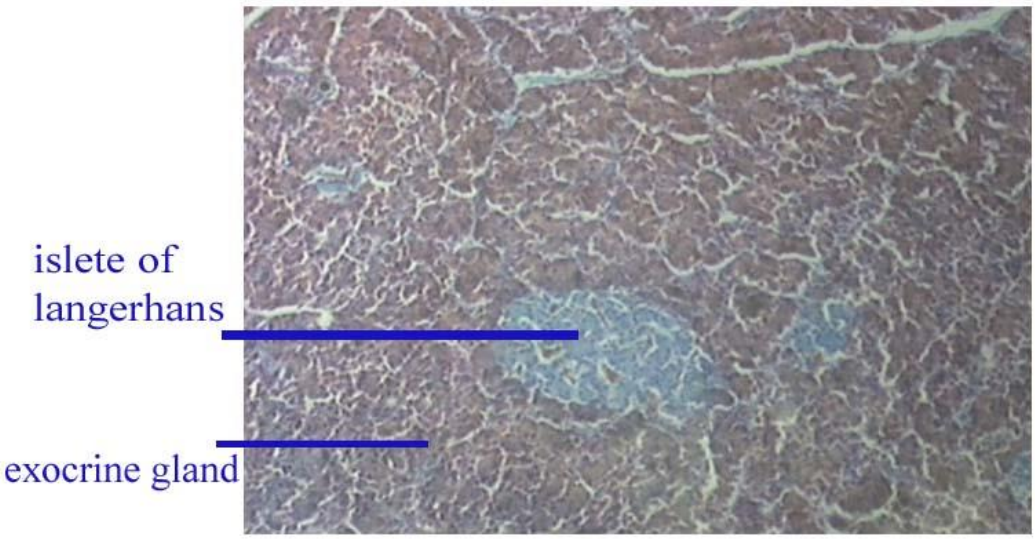
The exocrine pancreas is a compound tubuloacinar gland .forty to fifty acinar cells form around to oval acinus whose lumen is occupied by three to four low cuboidal centroacinar cells ,the beginning of the duct system of the pancreas ,the presence of a distinguishing characteristic of this gland . the shape of each acinar cell is pyramid with round nucleus basally located and surrounded by basophilic cytoplasm.

Endocrine pancreas :

Each islet of langerhans is a richly vascularized spherical conglomeration of approximately 3000 cells .the approximately 1 million islets distributed through the human pancreas constitute the endocrine pancreas .greater number of islets are pancreas are present in the tail .each islet is surrounded by reticular fibers ,which enter the substance of the islet to encircle the network of capillaries .

Five types of cells compose the parenchyma of each islet of langerhans :

B –cells ,α –cells , c-cells , p-cells and G-cells



pencrias 4x

Lab .5

Integument

The integument, composed of skin and its appendages, sweat gland, sebaceous glands, hair nails, is the largest organ.

Skin consists of two layers an outer epidermis and a deeper connective tissue layer, the dermis. The epidermis is composed of stratified squamous keratinized epithelium. Lying directly below and enterdigitating with the epidermis, composed of dense irregular collagenous connective tissue. The interface between the epidermis and dermis is formed by raised ridges of the dermis, the dermal ridges (papillae), which interdigitable with invaginations of the epidermis, called epidermal ridges.

The hypodermis a loose connective tissue containing varying amounts of fat, underlies the skin. The hypodermis is not part of the skin but is the superficial fascia that covers the entire body, immediately deep to the skin.

Thick skin:

Thick skin covers the palms and soles. The epidermis of the thick skin is characterized by the presence of all five layers.

Thick skin lack hair follicles, Arrector pili muscles, and sebaceous glands but does have sweat glands.

1- stratum basale (stratum germinativum).

The deepest layer of the epidermis , supported by a basal lamina and sits on the dermis, forming an irregular interface. The stratum basale consists of a single layer of mitotically active , cuboidal to low columnar- shaped cells containing basophilic cytoplasm and large nucleus.

2- Stratum spinosum:

The thickest layer of the epidermis , composed of polyhedral to flattened cells. Some histologists refer to the two layers. The stratum basale and the stratum spinosum, as the malpighian layer.

3- Stratum granulosum:

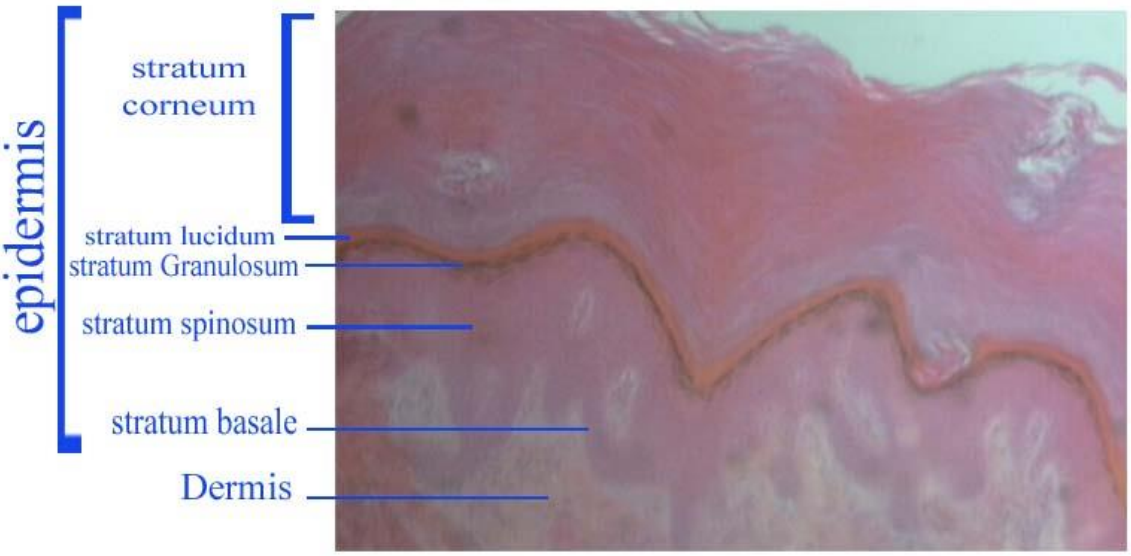
The stratum granulosum , consisting of three to five layers of flattened keratinocytes , is the most superficial layer of the epidermis in which cells possess nuclei. The cytoplasm of the keratinocytes in this layer contains large, irregularly shaped , coarse, basophilic keratohyalin granules

4- Stratum lucidum:

The clear homogenous , lightly staining thin layer of cells immediately superficial to the stratum granulosum is the statum lucidum. This layer is present only in thick skin. Although the flattened cells of the stratum lucidum lack organelles and nuclei.

5- Stratum corneum:

The most superficial layer of the skin, the stratum corneum , is composed of numerous keratin filaments embedded in an amorphous matrix.



perpendicular section in thick skin 4x

Thin skin:

Thin skin covers most of the remainder of the body. The epidermis of thin skin has a thin stratum corneum and lacks a definite stratum lucidum and stratum granulosum.

Thin skin contains hair follicles , Arrector pili muscles, sebaceous glands and sweat glands.

Dermis:

The region of the skin lying directly beneath the epidermis called the dermis, is divided into two layers: the superficial, loosely woven papillary layer and the deeper much denser reticular layer.

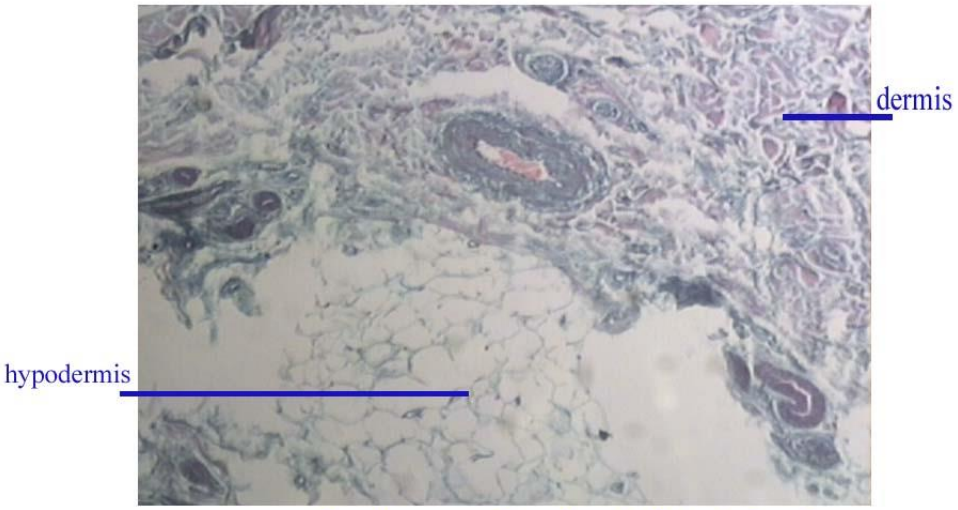
Papillary layer is composed of a loose connective tissue whose thin collagen fibers and elastic fibers are arranged in loose networks, it contains fibroblasts, macrophages, mast cells and other cells common to connective tissue.

The papillary layer also possesses many capillary loops, which extent to the epidermis, dermis interface.

Located in some dermal papillae are meissner corpuscles.

The reticular layer is composed of dense , irregular collagenous connective tissue, displaying thick collagen fibers which are closely packed into large bundles.

Networks of thick elastic fibers are intermingled with the collagen fibers. Cells are more sparse in this layer than in the papillary layer. That include fibroblasts, mast cells, lymphocytes, macrophages, and frequently fat cells in the deeper aspect of the reticular layer

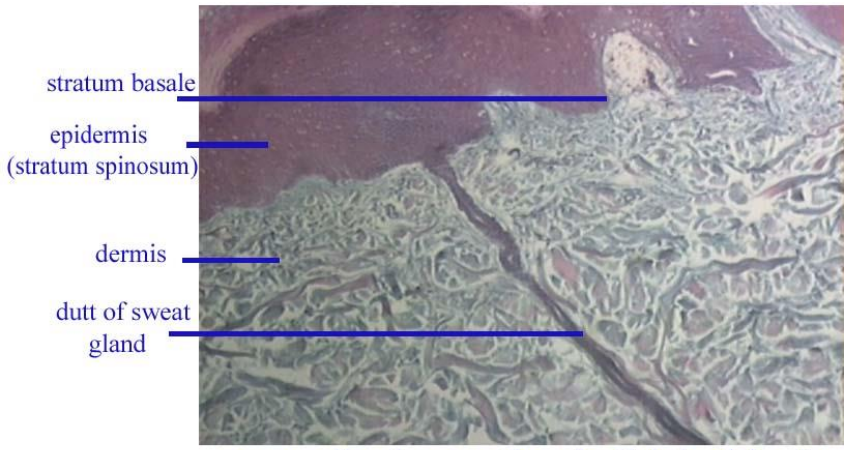


perpndicular section in thick skin 4x

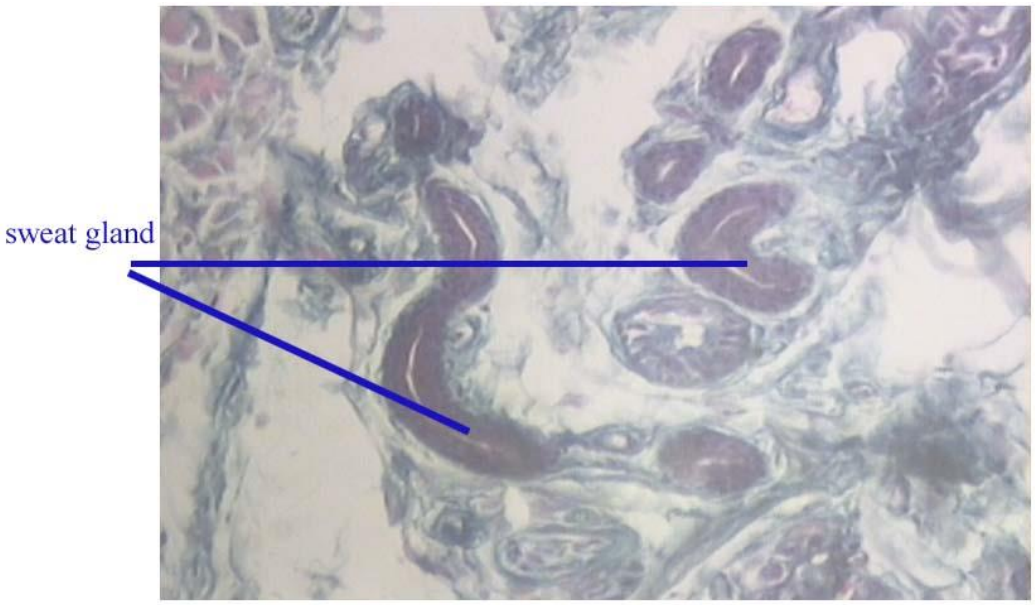
Skin appendages:

1- Sweat glands:

Sweat glands are simple coiled tubular glands (the secretary unit is composed of simple cuboidal to low columnar epithelium) located deep in the dermis or in the underlying hypodermis. Passing from the secretary portion of the gland is a slender, coiled duct (composed of two layers of stratified cuboidal epithelium) that traverses the dermis and epidermis to open on the surface of the skin at a sweat pore.



perpndicular section in thick skin 4x



perpndicular section in thick skin 4x

2- Sebaceous glands:

Except for the palms of the hands, soles of the feet, and body embedded in the dermis and hypodermis. These glands are most abundant on the face , scalp, and the forehead. The ducts of the glands open into the upper one third of the

follicular canal. The ducts in certain regions of the body lacking hair follicles open onto the surface of the skin. Sebaceous glands are lobular with clusters of acini opening into single short ducts.

3- Hair:

Hair follicles, the organs from which hairs develop, arise from invaginations of the epidermis invading the dermis, hypodermis, or booth. Hair follicles are surrounded by dense accumulations of fibrous connective tissue belonging to the dermis. A thickened basal lamina, the glassy membrane, separate the dermis from the epithelium of the hair follicle. The expanded terminus of the hair follicle , the hair root, is intended to confirm to the shape of the dermal papilla pushing into it.

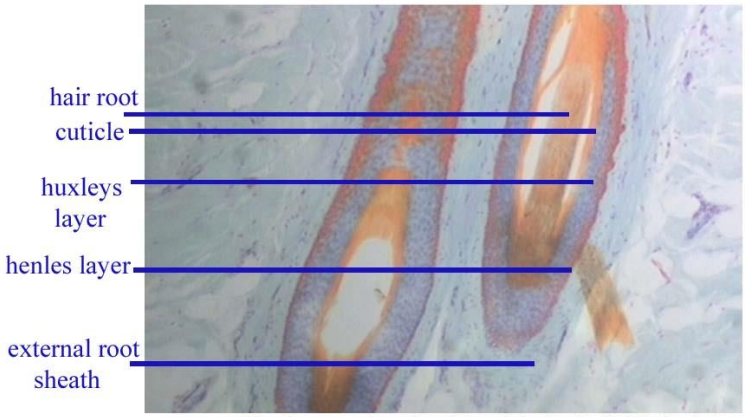
These two structures together are known as the hair bulb. The outer layers of follicular epithelium from the external root sheath , which is composed of a single layer at the hair bulb and several layers near the surface of the skin.

Internal to the external root sheath are a number of layers of cells forming internal root sheath, consisting of three component:

1- An outer single row of cuboidal cells, henle's layer, which contact the innermost layer of cells of the external root sheath.

2- One or two layers of flattered cells forming huxley's layer

3- The cuticle of the internal root sheath, formed by overlapping scale , like cells whose free ends project toward the base of the hair follicle. The internal root sheath ends where the duct of the sebaceous gland attaches to the hair follicle.



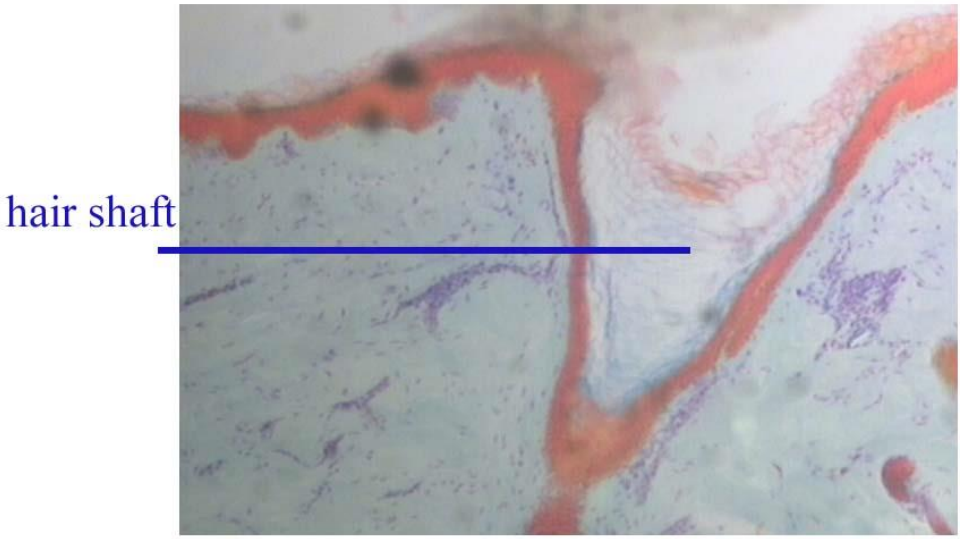
perpendicular section in thin skin(hair follicles) 4x

The hair shaft is the long slender filament that extend to and through the surface of the epidermis.

It consists of three regions: medulla, cortex, and cuticle of the hair.

The cells of the cortex are displaced upward, they synthesize abundant keratin filaments and trichohyalin granules (resembling keratohyalin granules of the epidermis).

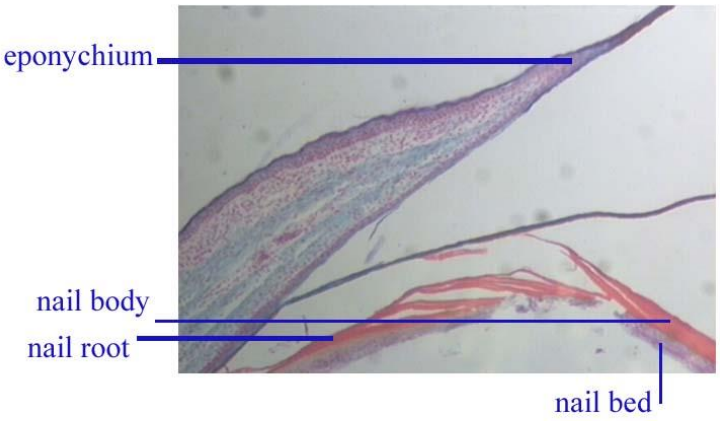
Arrector pili muscle attached to the connective tissue sheath surrounding the hair follicles and to the papillary layer of the dermis.



perpendicular section in thin skin 4x

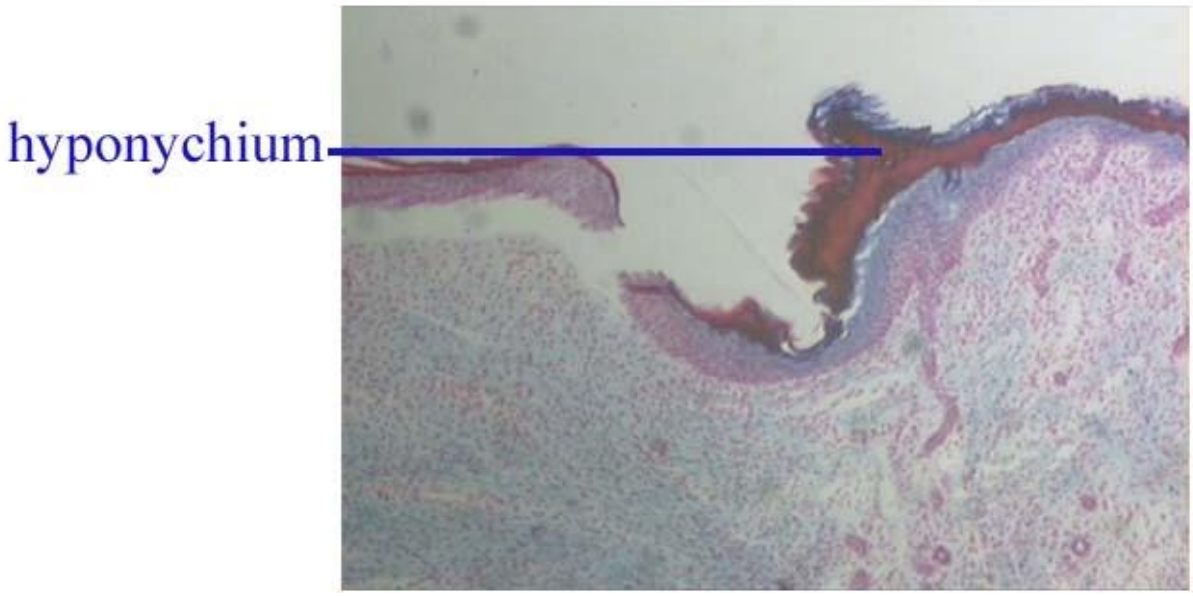
4- The nails:

located on the distal phalanx of each finger, and toe, are composed of plates of heavily compacted, highly keratinized epithelial cells, called the nail plate, lying on the epidermis , known as the nail bed, the nail root is located beneath the proximal nail fold.



longitudinal section in nail 4x

The stratum corneum of the proximal nail fold forms the eponychium. Laterally, the skin turns under as lateral nail folds, forming the lateral nail grooves. The lunula , the white crescent, is observed at the proximal end of the nail. The distal end of the nail plate is not attached to the nail bed, which becomes continuous with the skin of the finger tip. Near this junction is an accumulation of stratum corneum, called the hyponychium.



longitudinal section in nail 4x

Lab.6

Endocrine system

1- Pituitary gland (hypophysis)

It has two subdivisions, which develop from different embryologic sources : the Adenohypopysis and the neurohypophysis. Within each subdivision are various regions, that have specialized cells that release different hormones.

Adenohypopysis (anterior pituitary)

1- Pars distalis (pars anterior)

2- Pars intermedia

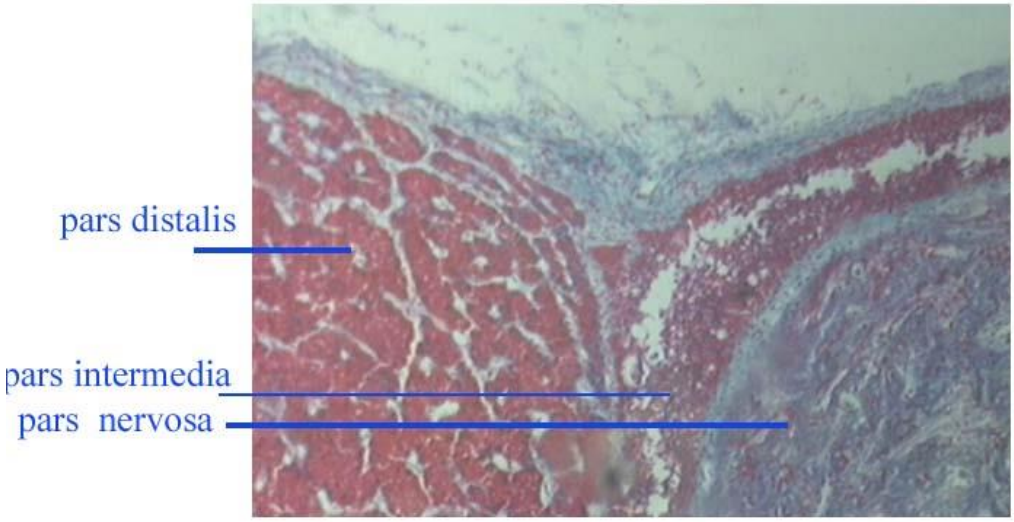
3- Pars tuberalis

Neurohypophysis (posterior pituitary)

1- Median eminence

2- Infundibulum

3- Pars nervosa



Pituitary Gland 4x

Pars distalis: the parenchymal cells of the pars distalis that have an affinity for dyes are called **chromophils**. Those that have no affinity for dyes are called **chromophobes**.

Chromophils are further subdivided into **acidophils** or **basophils**.

The most abundant cells in the pars distalis are acidophils, whose granules , large orange to red. These small rounded acidophils are of two kinds, somatotrophs and mammotrophs.

Basophils stain blue with basic dyes. There are three subtypes of basophils: corticotrophs, thyrotrophs, and gonatrophs.

Chromophobes; groups of small weakly staining cells.

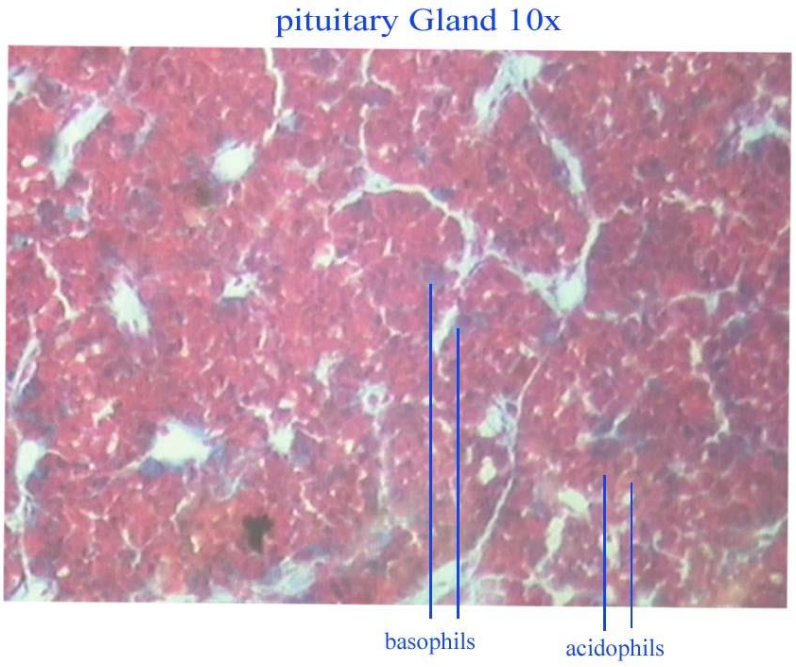
Parsintermedia: lying between the pars distalis and the pars nervosa, characterized by many cuboidal cells lined.

The pars tuberalis surrounded the hypophyseal stalk but it is absent on its posterior aspect.

Hypothalamohypophyseal tract :

Unmyelinated axons of neurosecretory cells whose cells bodies lie in hypothalamus enter the poster pituitary.

Pars nervosa: receives the distal terminals of the axons of the hupothalamo hypophyseal tract.



2- Thyroid gland:

It lies just inferior to the larynx. It is composed of two lobes connected by an isthmus. The gland is surrounded by a slender, dense, irregular collagenous

connective tissue capsule. Septa derived from it subdivide the gland into lobules. Embedded within the capsule on the posterior aspect of the gland, are the parathyroid glands.

The thyroid gland stores its secretary substance in the Lumina of follicles. These cyst like structures ranging from 0.2 to 0.9 mm in diameter are composed of a simple cuboidal epithelium surrounding a colloid filler lumen.

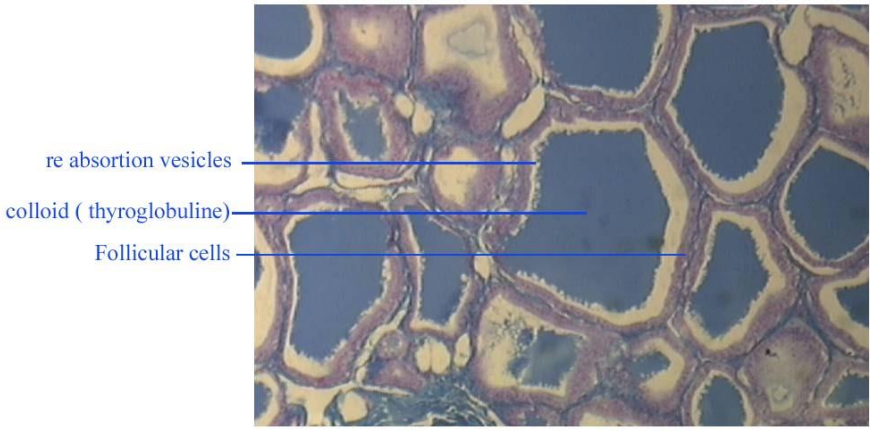
Follicular cells (principal cells):

Range from squamous to low columnar in shape, being tallest when stimulated these cells have a round to ovoid nucleus, and basophilic cytoplasm.

Parafollicular cells (clear cells, C cells):

Pale staining lie in clusters or singly within the epithelium , but they do not reach the lumen of the follicle.

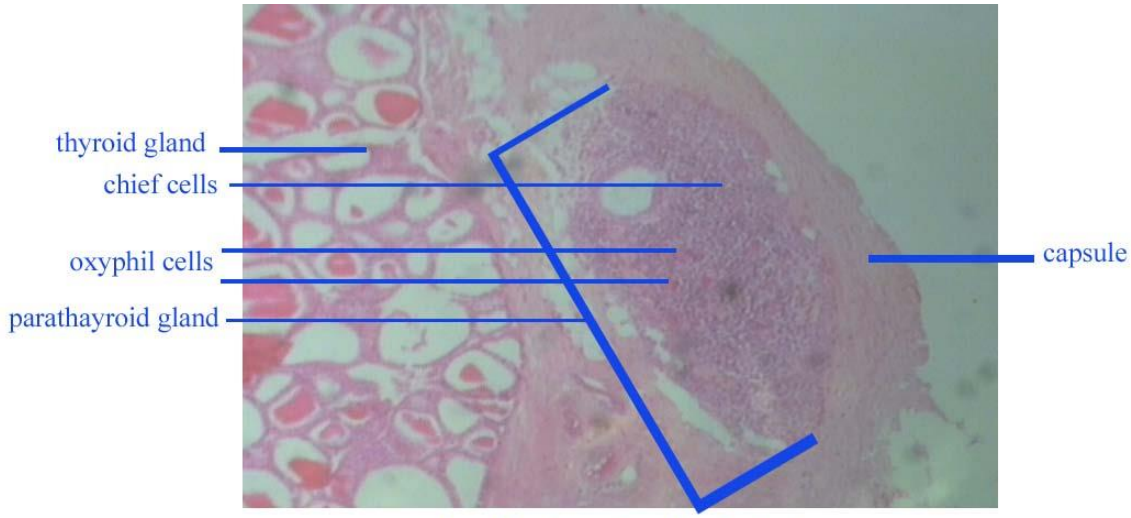
Numerous re absorption vesicles dispersed in the colloid.



Thyroid gland 10x

3- Parathyroid glands:

The parathyroid , usually four, located on the posterior surface of the thyroid (superior and inferior). The gland is a small ovoid structure . the parenchyma is composed of two cells: chief cells and oxyphil cells , chief cells eosino-philic staining, oxyphil cells are less numerous, larger and more deeply stained with eosin than chief cells.



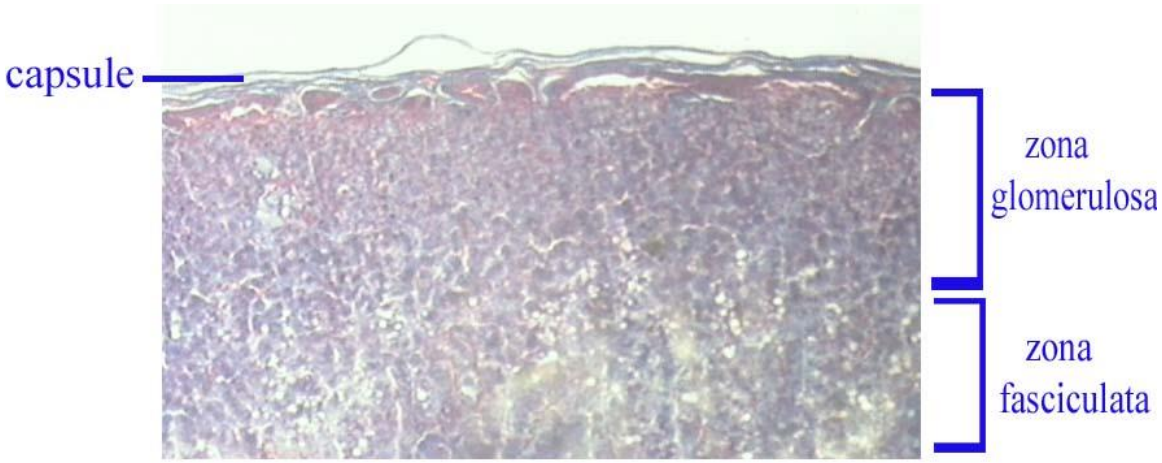
thyroid and parathyroid glands 4x

4- Suprarenal (adrenal) glands:

They are located at the superior poles of the kidneys. The parenchyma is divided into two Histologically and functionally different regions

1- Supra renal cortex: outer yellowish portion, about 80% to 90%

2- Supra renal medulla: small , dark, inner portion.



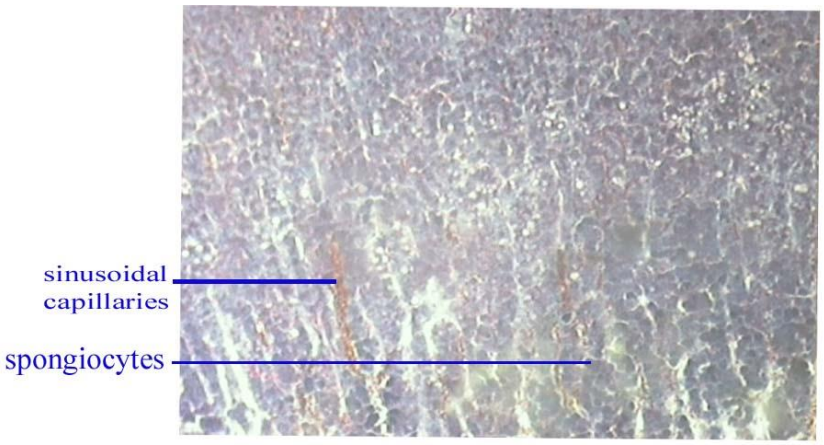
perpendicular section in adrenal gland 4x

The cortex contains parenchymal cells that synthesize and secrete several steroid hormones without storing them. It is subdivided into three zones:-

1- Zona glomerulosa

2- Zona fasciculate

3- Zona reticularis

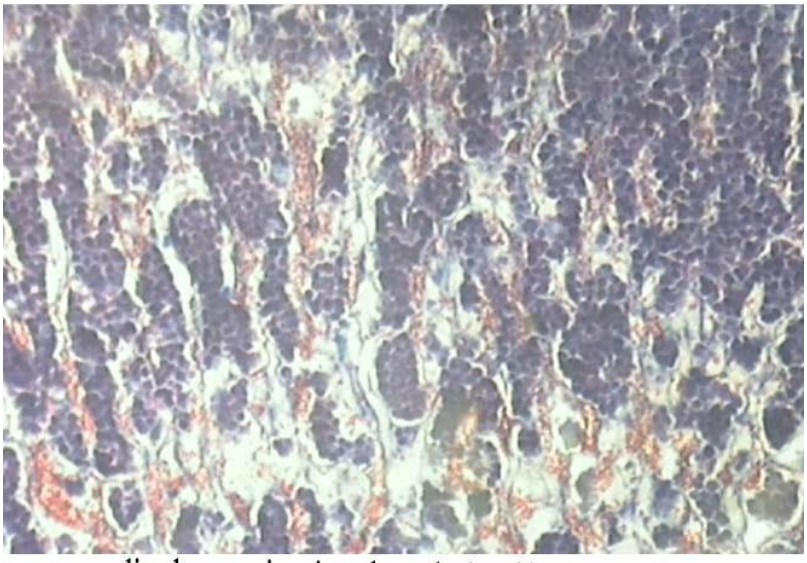


perpendicular section in adrenal gland(zona fasciculata) 4x

1- **Zona glomerulosa**: consisting about 13% of total adrenal volume. The small columnar cells composing this zone are arranged in cords and clusters.

2- **Zona fasciculate:** the largest layer of the cortex, up to 80% of the total volume of the gland. This zone contains sinusoidal capillaries arranged longitudinally between the columns of parenchymal cells. The polyhedral cells in this layer are larger than the cells of the zona glomerulosa, and are arranged in radial columns, these cells called spongiocytes.

3- **Zona reticularis:** constituting about 7% of gland volume. The darkly staining acidophilic cells are arranged anastomosing cords. They are similar to the spongiocytes but smaller.

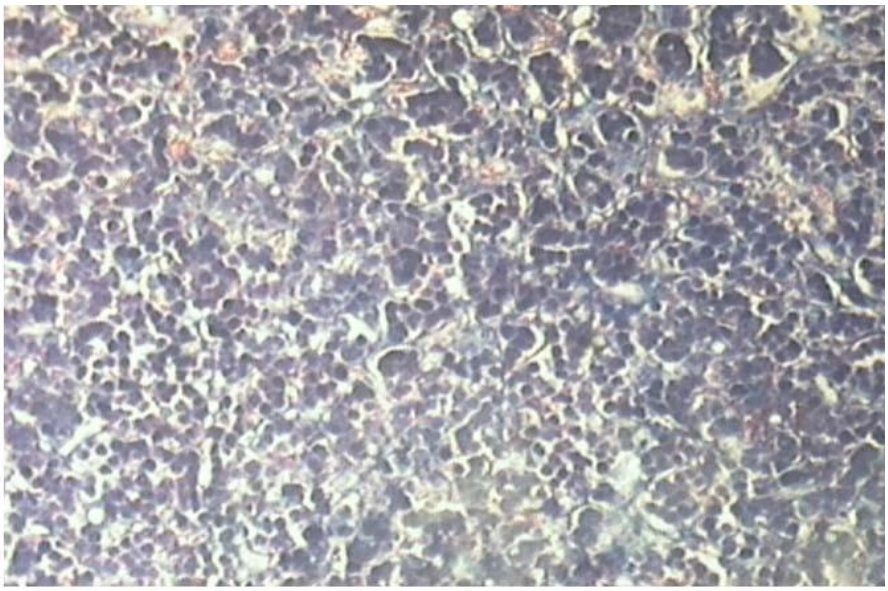


perpendicular section in adrenal gland(zona reticularis) 4x

4- **Medulla** : the parenchymal cells:

1- Chromaffin in cells

2- Sympathetic ganglion cells, which are scattered through the connective tissue, chromaffin are large epithelioid cells, arranged in clusters or short cords.



perpendicular section in adrenal gland(medulla) 4x

5- **Pineal gland:** it is conically shaped, the parenchymal cells are composed of Pinealocytes and interstitial cells.

Pinealocytes are basophilic cells with one or two long processes.

Lab.7

Urinary system

Kidney

The kidney embedded in per renal fat, lies with its convex border situated laterally and its concave hilum facing medially. Branches of the renal artery and vein, lymph vessels, and ureter pierce the kidney at its hilum. The ureter is expanded at this region, forming the renal pelvis.

The kidney is separated into a cortex and medulla . the cortical region is dark and granular , whereas the renal pyramids.

The apex is surrounded by a cup like minor calyx, joining of twp pr three forms , major calyx, which are larger subdivisions empty into the renal pelvis, neighboring pyramids are separated by cortical columns.

Substances may be observed in the cortex :

1- Red granules (renal corpuscles)

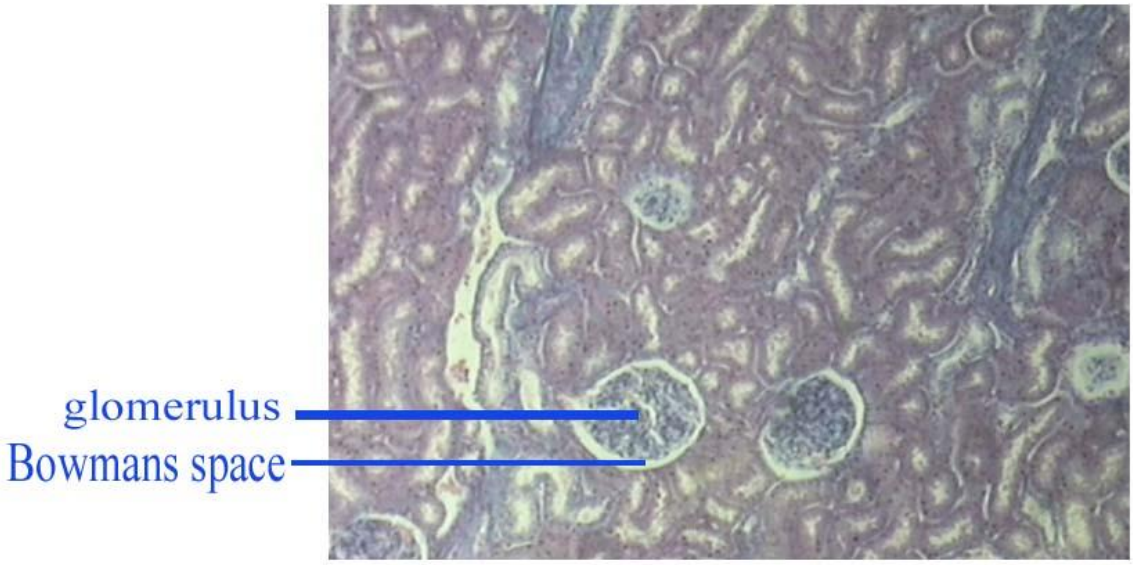
2- Convoluted tubules , (the cortical labyrinth)

3- Longitudinal striations (medullary rays).

The functional unit of the kidney is the uriiniferous tubule, a highly convoluted structure which consists of the nephrons and the collecting tubule, the renal corpuscle of the nephrons is located in the cortex and tubular parts are located in the medulla.

The renal corpuscle, an oval round structure composed of a tuft of capillaries, the glomerulus , which is invaginate into bowmen's capsule, the space inside it known as bowman's space (urinary space).

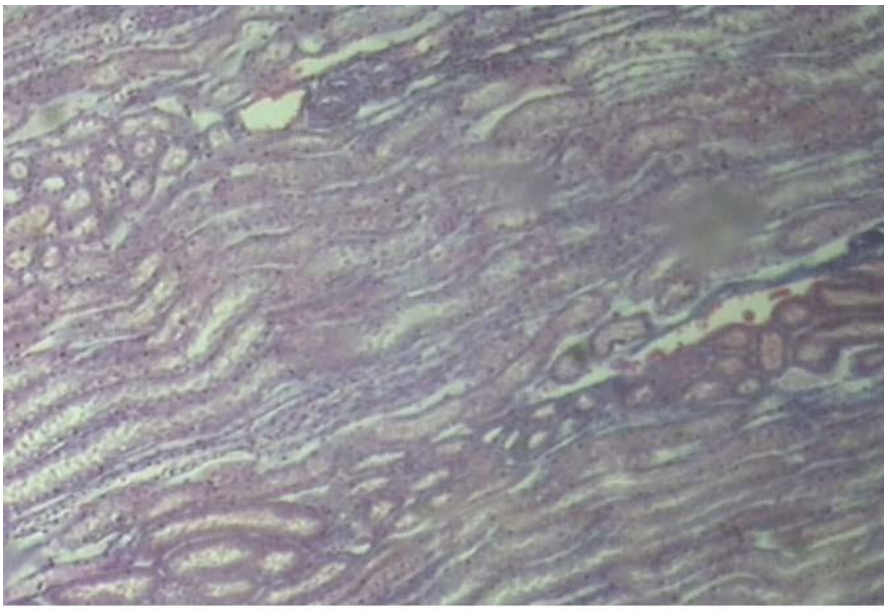
The visceral layer of bowman's capsule composed of modified epithelium cells called podocytes. The outer wall surrounding bowman's space composed of simple squamous epithelial cells, is the parietal layer.



kidney(cortex) 4x

Bowman space drains into the proximal tubule (simple cuboidal E.) , the pars recta of the proximal tubule as the thin limb of the henles loop. The distal tubule is subdivided into the pars vecta, which as the continuation of the ascending thin limb of henles loop is also known as the ascending thick L of the H.L., and the pars convolute (distal convoluted tubule).

Interposed between the ascending thick limb and the distal convoluted tubule is a modified region known as muscular densa. The cells of it are tall, narrow, pale cells.



kidney(medulla) 4x

Ureter:

The ureters are hollow, cylindrical tubes, consisting of **1**- mucosa which lines the lumen

2- muscular coat, **3**- fibrous connective tissue covering

The mucosa present several folds, when the ureter is empty but that are absent when the ureter is distended, consist of the transitional epithelial lining (3-5 cell layers), when a layer of dense irregular fibrous connective tissue (the lamina propria). The muscularis is composed of two layers of smooth muscle cells. The outer layer is arranged circularly and the inner is longitudinally, but in the lower

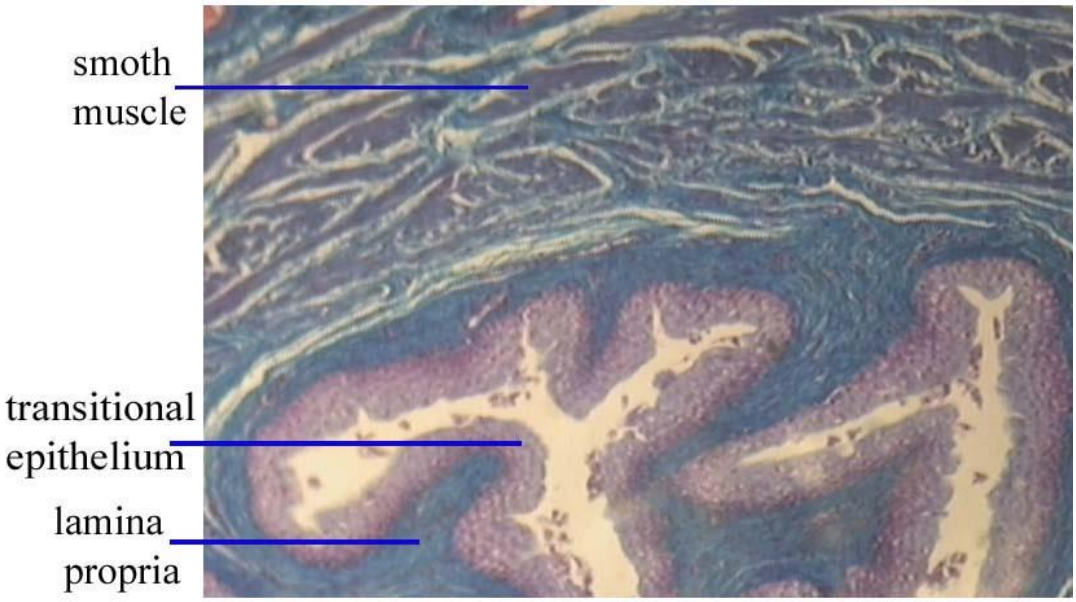
third, near the urinary bladder a third muscle layer oriented longitudinally, is added onto the existing surface of the existing muscle coat.

The fibrous outer coat is unremarkable.

Urinary bladder:

Its mucosa also act as an osmotic barrier between the urine and the lamina propria.

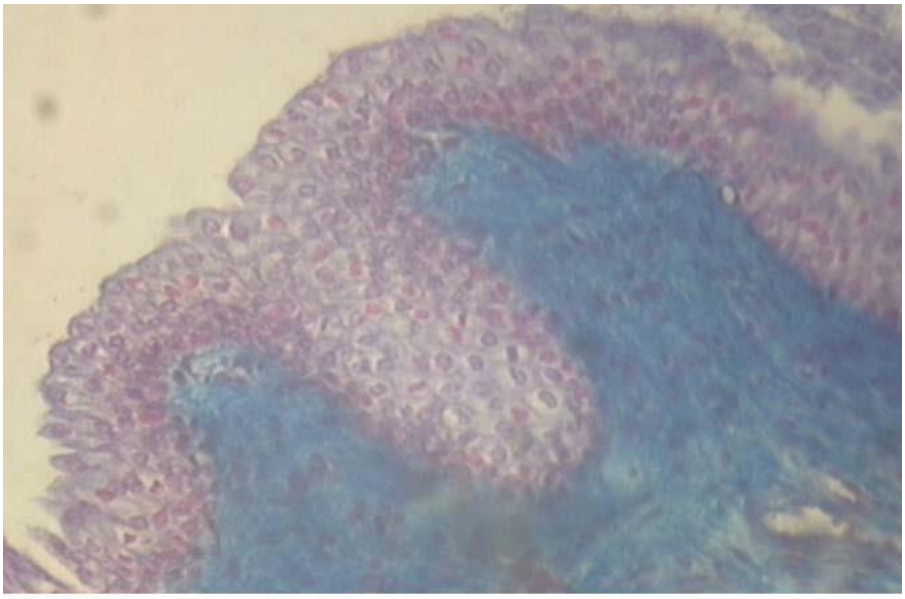
The mucosa of the bladder is arranged in numerous folds, which disappear when the bladder becomes distended with urine. During distension, the large round dome shaped cells of the transitional epithelium become stretched and change their morphology to become flattened.



cross section inurinary bladder 4x

The lamina propria may be subdivided into two layers: a more superficial, dense , irregular collagenous connective tissue and a deeper, looser layer of connective tissue composed of collagen and elastic fibers.

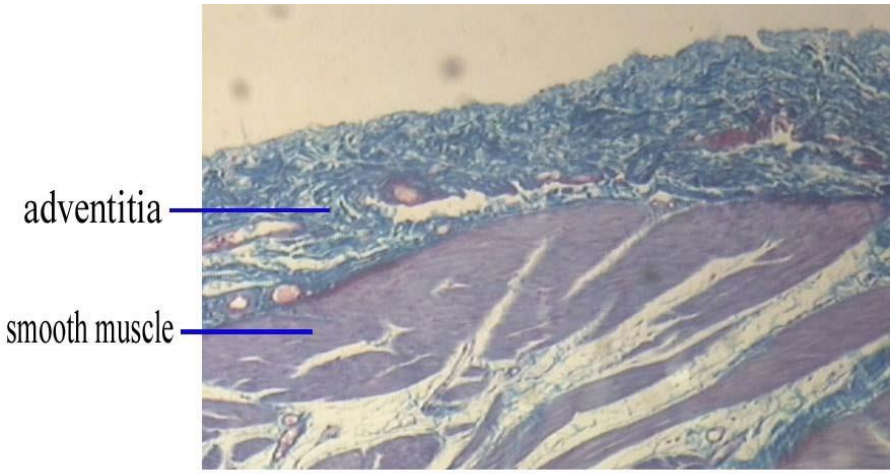
At the region surrounding the urethral orifice, mucous glands may be found, in the lamina propria. They secrete a viscous fluid that lubricates the urethral orifice .



cross section in unurinary bladder (mucosa) 4x

The muscular coat is composed of three layers of smooth muscles, arranged as a thin , inner longitudinal layer, a thick middle circular layer, and a thin outer longitudinal layer.

The adventitia is composed of dense, irregular collagenous connective tissue.



cross section inurinary bladder 4x

Male urethra:

The male urethra is 15 to 20 cm long, with three regions, prostatic, membranous and penile urethra.

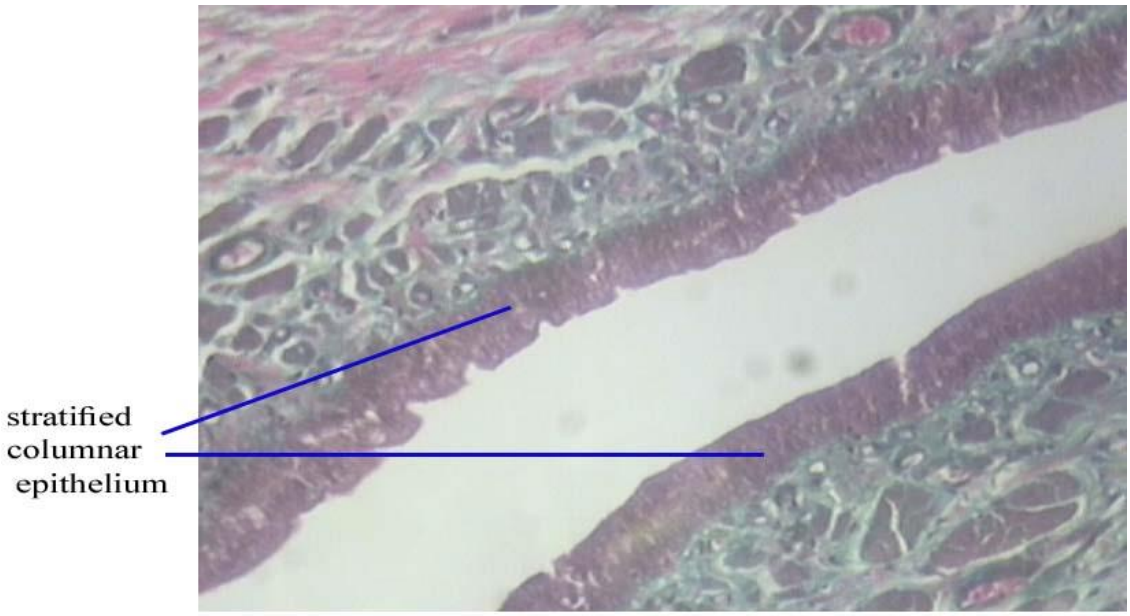
1- The prostatic urethra, 3-4 cm long, lies entirely in the prostate gland. It is lined by transitional epithelium and receives the opening of many tiny ducts of the prostate.

2- The second segment is only 1-2 cm long and is known as membranous urethra, because it passes through the perineal membrane (urogenital diaphragm). Its lined by stratified columnar epithelium, interspersed with patches of pseudo stratified columnar epithelium.

3- The final segment is the longest (15 cm). it passes through the length of the penis. This segment is known as spongiose urethra (penile urethra) because it is located in the corpus spongiosum. It is lined by stratified columnar epithelium

interspersed with patches of pseudo stratified columnar and stratified squamous non keratinized epithelium.

The lamina propria of all three regions is composed of a loose fibro elastic connective tissue with a rich vascular supply. It houses numerous glands of littre, whose mucous secretion lubricates the epithelial lining of the urethra.



cross section in male urethra 4x

Lab.8

Respiratory system

The conducting portion of the respiratory system is composed of the : 1- nasal cavity.

2- mouth

3- nasopharynx

4- pharynx

5- larynx

6- trachea

7- primary bronchi, secondary bronchi (lobar bronchi), bronchioles, and terminal bronchioles.

Nasal cavity:

1- Anterior portion of the nasal cavity (vestibule) :

this region is lined by skin and have vibrissae, short stiff hairs that prevent larger dust particles from entering the nasal cavity. The dermis of the vestibule houses numerous sebaceous and sweat glands.

2- Posterior aspect of the nasal cavity:

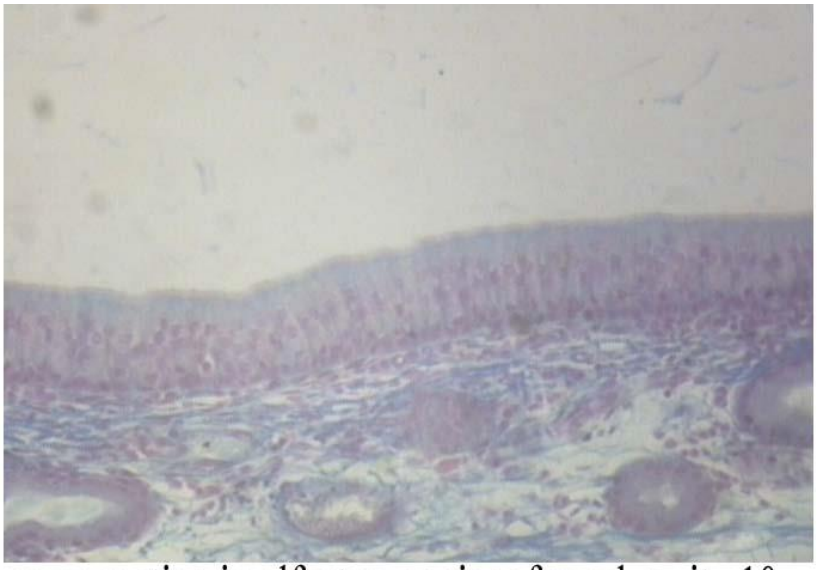
Except for the vestibule and the olfactory region, the nasal cavity is lined by pseudo stratified ciliated columnar epithelium, called the respiratory epithelium. The goblet cell population increases in the deeper region.

The sub epithelial connective tissue (lamina propria) is richly vascularized , housing large arterial plexuses and venous sinuses.

The lamina propria has many seromucous glands and abundant lymphoid elements, including occasional lymphoid nodules, mast cells, and plasma cells.

3- Olfactory region of the nasal cavity:

The roof of t he nasal cavity is covered by olfactory epithelium, composed of **three types** of cells:



cross section in olfactory regionof nasal cavity 10x

1- Olfactory cells: are bipolar neurons whose apical aspect of the distal terminus of its slender dendrite, is modified to form a bulb.

the olfactory vesicles. The nucleus is spherical and is closer to the basal lamina.

2- Sustentacular cells:

tall columnar cells whose apical aspects have asteriated border composed of microvilli. Their oral nuclei are in the apical one third of the cell.

The apical cytoplasm has secretary granules housing a yellow pigment characteristic of the color of the olfactory mucosa in the living person.

3- Basal cells

Are short, basophilic, pyramid- shaped cells whose apical aspect so not reach the surface. Their nuclei are centrally located, but because these are short cells, these nuclei occupy the basal one third of the epithelium.

Lamina propria:

Composed of a richly vascularized , loose to dense irregular collagenous connective tissue. It houses numerous lymphoid elements as well as the collection of axons of the olfactory cells, which form fascicles of unmyelinated nerve fibers. Bowman's glands, which produce a serous secretary product, are indicative of the mucosa.

-nasopharynx:

This continuous cavity is subdivided into three regions:

1- Superior nasopharynx, lined by respiratory epithelium.

2- Middle oral pharynx.

3- Inferior laryngeal pharynx , are lined by stratified squamous epithelium.

The lamina propria is composed of loose connective tissue housing seromucous glands and lymphoid elements. The lamina propria of the posterior nasopharynx houses pharyngeal tonsil, an unencapsulated collections of lymphoid tissue.

Larynx:

situated between the pharynx and the trachea. The wall of the larynx is reinforces by several hyaline cartilages (the unpaired thyroid and cricoids cartilages, and the inferior aspect of the paired arytenoids) and elastic cartilages (the unpaired epiglottis, the paired corniculate and cunciform cartilages and the superior aspect of the arytenoids).

These cartilages are connected to each other by ligaments, are connected to each other by ligaments, and their movements with respect to one another are controlled by intrinsic and extrinsic skeletal muscle.

The lumen of the larynx is characterized by two pairs of shelf like folds, the superiorly positioned vestibular folds and the inferiorly placed vocal folds. Their lamina propria composed of loose connective tissue, houses seromucous glands, adipose cells and lymphoid elements.

The free edge of each vocal folds is reinforced by dense, regular elastic connective tissue, the vocal ligament.

The larynx is lined by pseudostratified ciliated columnar epithelium, except on the superior surfaces of the epiglottis and vocal folds which are covered by stratified squamous non keratinized epithelium .

Trachea:

It begins at cricoids cartilage of the larynx and ends then it bifurcates to form the primary bronchi.

The wall of the trachea is reinforced by 10- 12 horseshoe shaped hyaline cartilage rings (c-rings).

The open ends of these rings face posteriorly and are connected by each other by smooth muscle, the trachealis muscle.

The perichondria of the c-rings are connected to one another by fibroelastic connective tissue that provides flexibility to the trachea and permit its elongation during inspiration.

The trachea has three layers:

1- **Mucosa:** composed of

a- Ciliated pseudostratified columnar epithelium separated from the lamina propria by thick basement membrane.

The epithelium is composed of six cell types:

1- Goblet cells, those have an arrow basally stem and theca containing secretary granules, the constitute about 30 %

2- Ciliated columnar cells, these tall, slender cells have a basally located nucleus and possess cilia.

3- Basal cells, compose about 30% of the total cell. They are located on the basement membrane.

4- Bruch cells: constitute 3% , they are narrow , columnar cells with tall microvilli

5- Serous cells: about 3% , are columnar cells, they have apical microvilli, and apical granules.

6- Cells of the diffuse neuro endocrine system (DNES): known as small granule cells make up 3% to 4% contain numerous granules in their basal cytoplasm.

b- Lamina propria and elastic fibers:

Composed of a loose fibroelastic connective tissue . it contains lymphoid elements (e.g. lymphoid nodules , lymphocytes, and neutrophils) as well as mucous and seromucous glands.

A dense layer of elastic fibers, the elastic lamina separates the lamina propria from the underlying sub mucosa.

2- Submucosa:

Composed of irregular fibroelastic connective tissue housing numerous mucous and seromucous glands, lymphoid elements are also present in the sub mucosa .

3- Adventitia:

Composed of fibroelastic connective tissue.

-bronchial tree:

The bronchial tree begins at the bifurcation of the trachea' as the right and left primary bronchi, forming branches that gradually decrease in size.

Primary (extra pulmonary) bronchi:

The structure of the primary bronchi is identical to that of the trachea except that they are smaller in diameter and their walls are thinner . each primary bronchus, accompanied by the pulmonary arteries, veins and lymph vessels.

The right bronchus trifurcates to lead to the three lobes of the right lung, and the left sending a branch to the two lobes of the left lung, then enter the substance of the lungs as intrapulmonary bronchi.

Secondary and tertiary (intrapulmonary) bronchi:

They are similar to the primary bronchi with the following exceptions:

1- The cartilage c-rings are replaced by irregular plates of hyaline cartilage that completely surrounded the Lumina of the intrapulmonary bronchi

2- The smooth muscle is located at the interface of the fibroelastic lamina propria and Submucosa as two distinct smooth muscle layers spiraling in opposite directions.