Ministry of Higher Education
& Scientific Research
Al-Muthanna University
Faculty of Pharmacy

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First stage

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Theory Histology

Lec. (7)

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Lymphoid system

Thymus

It is a central lymphoid organ situated in the mediastinum at the level of great vessels of the heart.

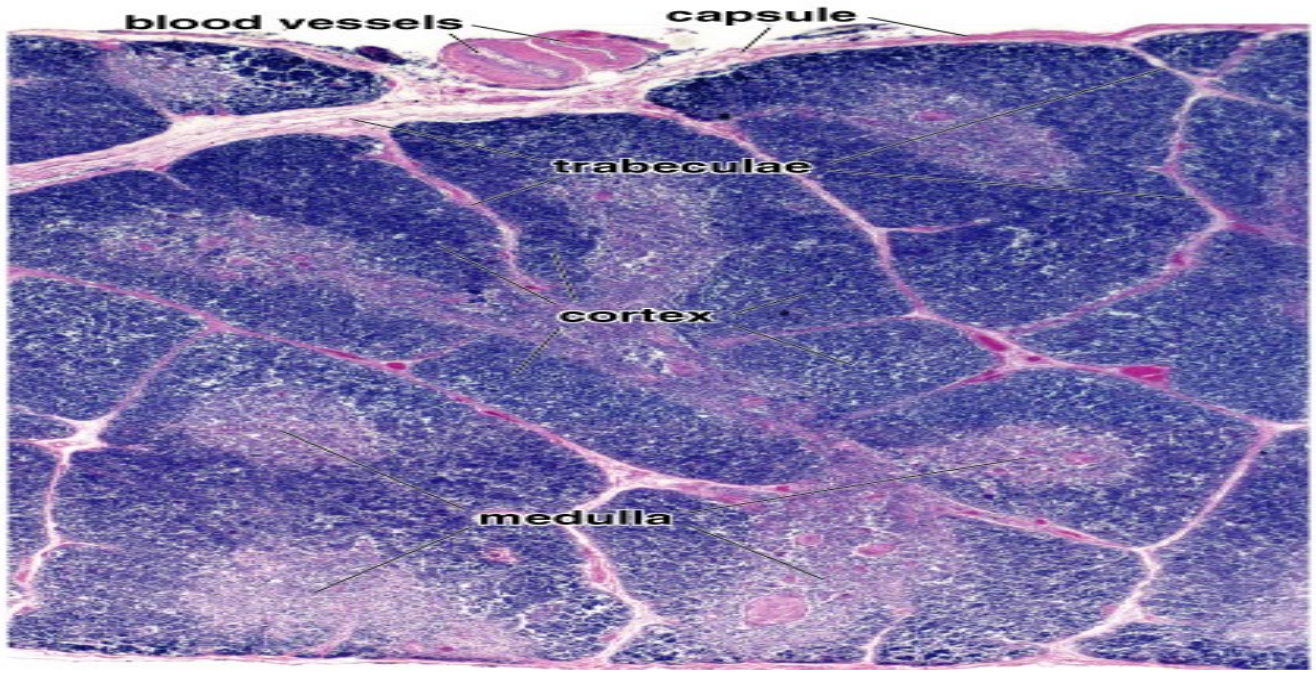
Structure of thymus

The thymus is surrounded by a CT capsule that penetrates the parenchyma, & divides it into incomplete lobules. Each lobule has a peripheral dark zone known as the cortex, & a central lighter zone, the medulla.

The cortex is composed of extensive population of T lymphocytes precursors also called **thymocytes** more than medulla so it stains more dark The cortex is the site of production of immature T lymphocytes.

The medulla stains lightly because of the presence of large number of **epithelial reticular cells**, with only 5% of mature lymphocytes.

The medulla contains ***Hassall's corpuscle***, which is the characteristic feature of thymus, consist of concentrically arranged flattened epithelial reticular cells that degenerate & sometimes calcify & die. This structure is of unknown function, & usually increases in number & size throughout life.



Spleen

Structure of spleen:

The spleen is surrounded by a dense connective tissue capsule that sends trabeculae in to the parenchyma, dividing it into incomplete compartments. The medial side of the spleen is invaginated as hilum, where arteries and nerves enter, and veins leave the organ

White pulp:

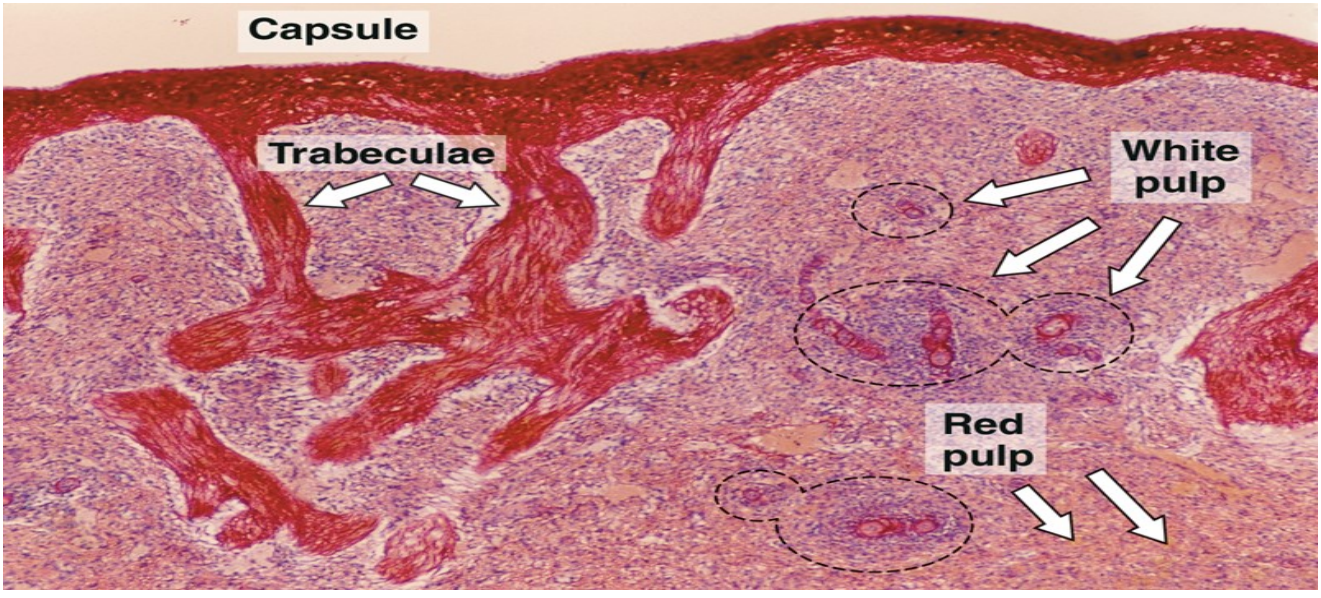
It consists of lymphoid tissue arranged in sheathes around central artery and lymphoid nodules. Between white pulp and red pulp lies a **marginal zone**, consisting of many **sinuses** and **loose lymphoid tissue**.

Red pulp

It is a reticular tissue which is composed of splenic cords (***Billroth's cords***) & sinusoids.

Splenic cords are composed of loose network of reticular cells supported by reticular fibers .

Splenic sinusoids are lined by elongated endothelial cells. Endothelial cells are enveloped by reticular fibers which arranged in a transverse direction



Epidermis:

Consists mainly of a stratified squamous keratinized epithelium, but also contains three less abundant cell types: melanocytes, Langerhans and merkel`s cells. The keratinizing epithelial cells also known as keratinocytes.

The epidermis consists of five layers of keratinocytes:

Stratum basale (stratum germinativum)

It consists of a single layer of columnar or cuboidal cells resting on basement membrane. it contains stem cells which responsible for renewal of epithelial cells.

Stratum spinosum :

Consists of cuboidal or flattened cells with central nucleus and cytoplasm whose process are filled with bundles of keratin filaments .

Stratum granulosum:

This layer consists of three to five layers of flattened polygonal cells, whose cytoplasm is filled with granules called keratohyalin granules.

Stratum lucidum

Is translucent , thin layer of flattened epidermal cells.

Stratum corneum :

Consists of 10-20 layers of flattened non nucleated keratinized cells whose cytoplasm filled with keratin.

The nervous system

Most synapses **Chemical synapse** where the transmission of impulse is through a chemical neurotransmitter and some synapses **Electrical synapse**, the transmission of impulse is through ion.

Structure of synapse:

The synapse lies at the axon terminal, which is the swollen terminal end of the axon that is closely applied to the target cell. The synapse consists of the following structure:

Presynaptic terminals: lies at the axon terminal, slightly thickened, contain special membrane protein. It is rich in mitochondria, microtubules, and a membrane-bound vesicles called **neurosecretory vesicle.** These vesicles contain the neurotransmitter which is synthesized in the cell body.

Synaptic cleft: a small gap of 20-30nm width lies between pre and post synaptic membrane. Sometimes, there are bridges at this cleft.

Postsynaptic cell membrane: slightly thickened membrane at the target cells.

When a wave of depolarization reaches synaptic terminal, it triggers the release of neurotransmitter from the neurosecretory vesicle by exocytosis, where the membrane of the vesicle is intergraded into the presynaptic membrane, and the neurotransmitter is released into the cleft then interact with receptors in the post synaptic membrane of the target cell.

blood brain barrier

Participation in the blood brain barrier **(BBB)**: the astrocyte develop process with expanded end feet **(perivascular feet)** that are linked to the endothelial cells by junctional complexes, forming a continuous barrier enveloping these endothelial cells. These feet important for ability of astrocytes to regulate vasodilation & transfer of O2 ions & other substance from the blood to neurons. Endothelial cells are linked together by occluding junctions providing a continuous barrier. The endothelial cells is non- fenestrated. This barrier prevents the passage of toxic and harmful substances from blood to brain.

Central nervous system

It consists of cerebrum, cerebellum and spinal cord.

They are also covered by a membrane of CT called **meninges.** These meninges are arranged from outside as:

1-**Dura mater**: composed of **dense CT**, continuous with the periosteum of the skull

2- **Arachnoid mater:** consist of ***CT devoid of blood vessels.***

3- **Pia mater**: composed of **loose CT**, rich in blood vessels.

Brain

It consists of two parts:

Cerebrum-1: when sectioned, it shows two different regions; the superficial one appear grey and called **grey matter**, and the inner or deep one which appears white and called **white matter**.

a- ***Grey matter***: forms the cerebral cortex. It consists of six layers of cerebrum grey matter are:

1- Molecular layer:

2- External granular layer

3- External pyramidal layer

4- Internal granular layer

5- Internal pyramidal layer

6- Multiform layer:

b- ***White matter:*** The main component is the myelinated nerve fibers, and oligodendrocytes. It has no neuronal cell bodies.

Cerebellum like cerebrum, it consist of an external grey matter, and an inner white matter; the medulla.

1-***Grey matter***: consist of three layers:

a- Molecular layer:

b- **Purkinje cell layer**:

c- **Granular layer:**

2- ***White matter***: consist of myelinated nerve fibers.

Spinal cord

In cross section, two regions are recognized; an outer white matter, and an inner grey matter، with a central opening called central canal.

1-Gray matter: it has an H- shape. The arms of H represent the posterior horns, while the legs represent the anterior horns. Central canal is lined By ependymal cells، which are Low columnar, ciliated cells.

2- White matter: consist mainly of myelinated nerve fibers.

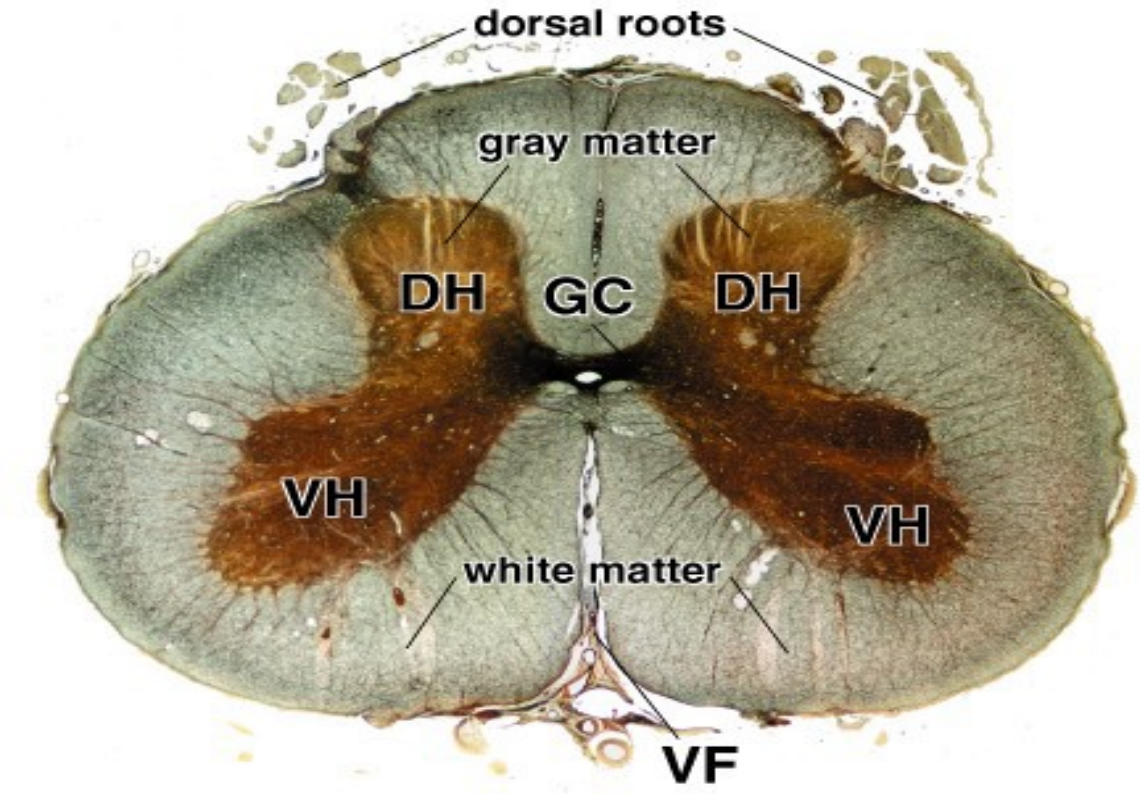


Figure 11.26. **Cross section of the human spinal cord.** *VH*, ventral horns; *DH*, dorsal horns; *GC*, gray commissure; *V*, ventral fissure. X5.