



MED437
KING SAUD UNIVERSITY

Lymphoid tissue



HISTOLOGY
TEAM 437

Red: important.

Black: in male | female slides.

Gray: notes.

Editing File

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Revised by

➤ OBJECTIVES

Describe the microscopic structure of the following organs in correlation with their functions:

- Lymph nodes.
- Spleen.
- Tonsils.
- Thymus.



LYMPHOID TISSUE

Encapsulated

Diffuse (mucosa associated lymphoid tissue)

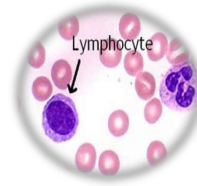
Lymph nodes

Spleen

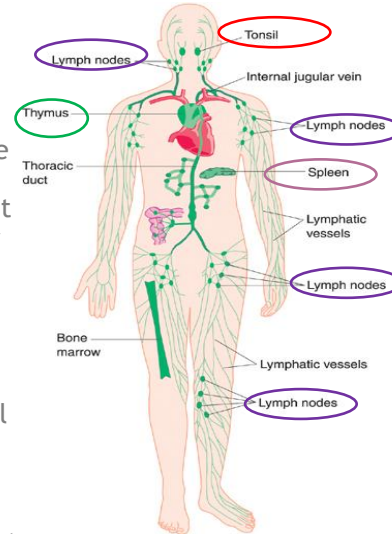
Tonsils

(Are incompletely encapsulated)

Thymus



- Mucosa is epithelial and connective tissue in wet location like inside the mouth or nose.
- LYMPH: is a pale fluid that contains white blood cells and that passes through channels in the body and helps to keep bodily tissues healthy.
- The lymph is formed when the interstitial fluid is collected through lymph capillaries.
- LYMPH SINUSES: Channels which allows the free movement of lymphatic fluid.
- T cells located in lymph nodes(paracortex), spleen (prearterial lymphatic sheaths) and tonsils.



LYMPH NODES (L.N.)

Function:

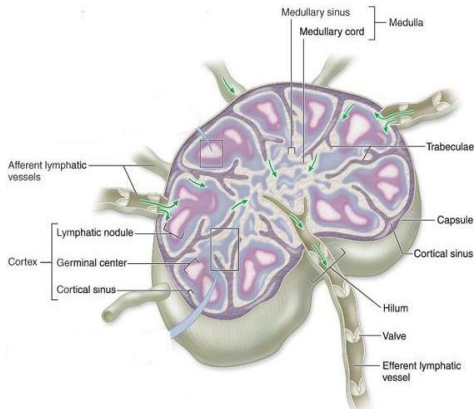
- Proliferation of B and T lymphocytes.
- Filtration of lymph from bacteria and other foreign substances.
- filtration of the lymph fluid.

(A) Stroma

Capsule

Trabeculae
(septa)

Reticular
C.T



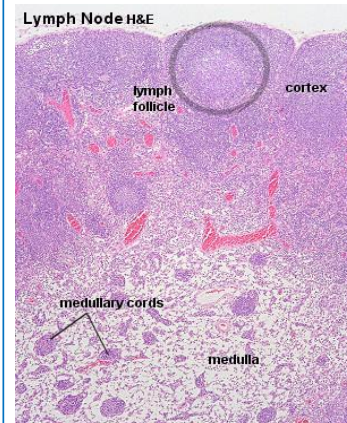
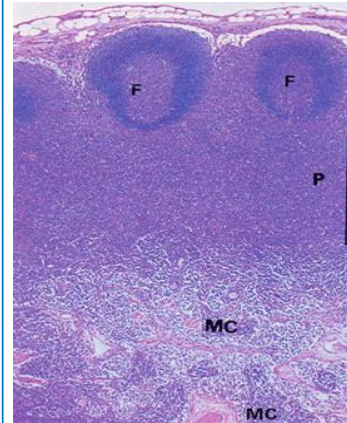
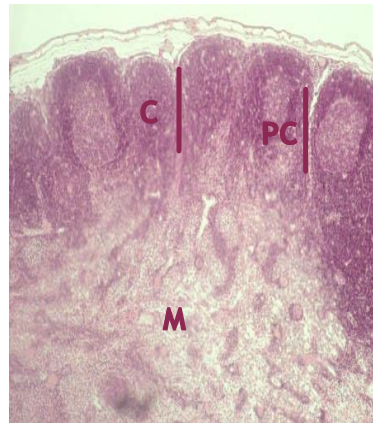
(B) Parenchyma

(lymphoid tissue + lymph sinuses)

Cortex of L.N

Paracortex of L.N

Medulla of L.N



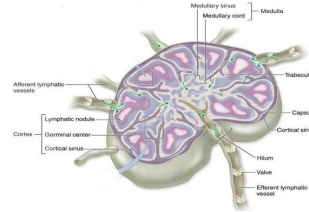
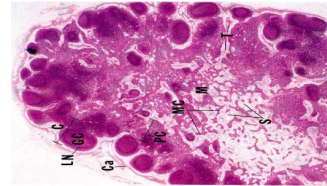
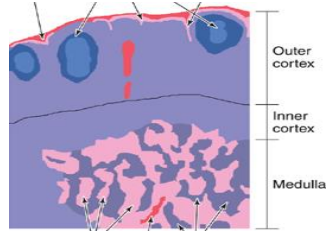
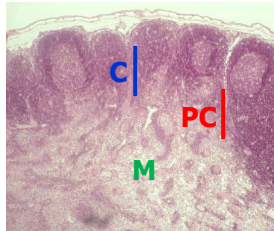
➤ LYMPH NODES (L.N.)

- Ovoid, kidney shaped organs.
- Each node has:
 - 1- A **convex surface** which receives afferent lymph vessels
 - 2- A **hilum** where efferent lymph vessels leave and drain lymph from the node.
- Each lymph node has a dense connective tissue **capsule**.
- From the capsule, connective tissue **septa (trabeculae)** extend into the outer part (cortex) of the node and divide it into incomplete compartments
- The framework of the node is formed by **reticular connective tissue**.
- Each lymph node is divided into three regions:

1- CORTEX

2- Paracortex

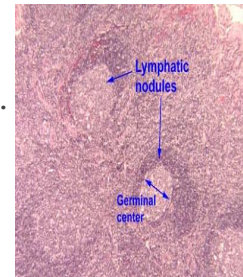
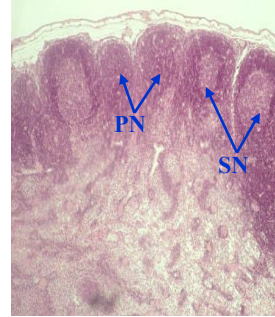
3- Medulla



➤ CORTEX:

contains:

- **Subcapsular lymphatic sinus.**
- **Cortical sinuses.**
- **Lymphoid nodules (Follicles):**
 - Composed mainly of B lymphocytes, macrophages and reticular cells
 - Lymph nodules are small masses of lymph tissue (**lymphocytes**).
 - Lymph nodules may be:
 - (A) **Primary nodules:** formed of virgin B lymphocytes.
 - (B) **Secondary nodules:** with paler germinal centers and it **Contain:**
 - **Germinal centers**, central light areas filled with activated **lymphocytes** (B lymphoblast), **plasma cells** and **macrophages**.
 - The germinal center is surrounded by a darker-staining region called the **corona**.



➤ PARACORTEX:

- It is the region between cortex and medulla.
- It is the **thymus dependent zone** and contains **T lymphocytes**.
- It contains **high endothelial venules** through which lymphocytes enter the lymph node; B cells enter the cortex and T cells settle in the paracortex.
- Has NO nodules.

➤ MEDULLA:

Consists of:

- **Medullary cords**.

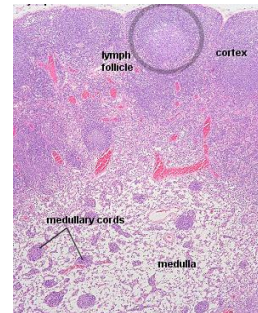
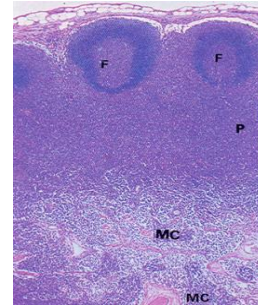
are composed of:

B & T lymphocytes, **plasma cells** and **macrophages**.

- **Medullary lymph sinuses**.

are continuous with:

the subcapsular and **cortical lymph sinuses**.



LYMPH FLOW THROUGH THE LYMPH NODE



Clinical Applications

Palpable lymph node

The presence of antigen or bacteria leads to rapid proliferation of lymphocytes of the lymph node (L.N), leading to increase of L.N. to several times of its normal size, so the L.N. becomes enlarged and palpable to the touch.



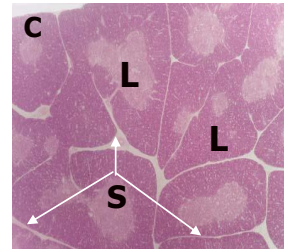
THYMUS

Function:

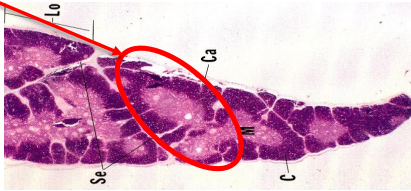
- Maturation of T lymphocytes (produce immunocompetent T lymphocytes).
- It involutes after puberty and becomes infiltrated by adipose tissue.
- Remnants of thymus remain in adult to form T lymphocytes.
- No B lymphocytes, no plasma cells in the thymus.

(A) Stroma		(B) Thymic lobule	
Capsule	Interlobular trabeculae (incomplete)	Cortex	Medulla

- Bilobed lymphoid organ located in thorax.
- Enclosed in a thin connective tissue **capsule**.
- **Septa (trabeculae)** from the capsule into the organ, subdividing it into incomplete **lobules**.
- Possesses **no lymph nodules, no lymph sinuses, no reticular fibers**.
- Thymus gland doesn't have B cells.
- The white area in thymus it is full of connective tissue.
- B cell is secreted by bone marrow (programed).
- No lymphocytes plasma cells in the thymus.



- Each **lobule** is divided into an outer **cortex** and inner **medulla**.



CORTEX:

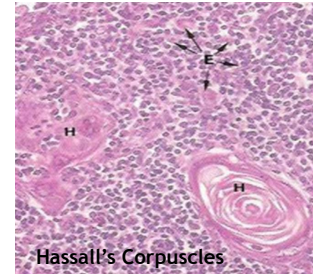
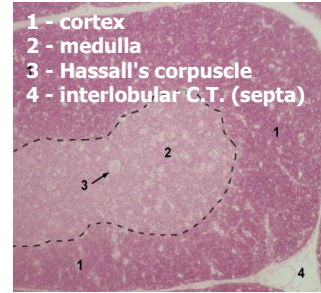
- is darker than the medulla because it is populated with **immunologically immature T-lymphocytes (more than 90% will die)**, **epithelial reticular cells**, and **macrophages**. Here the immature T cells undergo proliferation, and transform into mature cells and then migrate to medulla.
- T cell is secreted by bone marrow (not programmed) than it will stay in thymus gland until maturation.
- Inactive T cell will be in cortex of thymus than it will be engulf by macrophages.
- Active T cell will be in medulla of the thymus.



➤ MEDULLA:

consists of

- **mature T-lymphocytes**
- **epithelial reticular cells:**
Epithelial reticular cells are special component only for thymus.
Epithelial reticular cells responsible for maturation of T cell.
- **macrophages.**
- **thymic (Hassall's) corpuscles:**
Hassall's corpuscles are unique structure for medulla of thymus
 - 1- Are composed of groups of concentrically arranged **keratinized epithelial reticular cells.**
 - 2- Are found in medulla of thymic lobules.
 - 3- Increase in number with age.
 - 4- Probably represent a degenerative process.



TONSILS

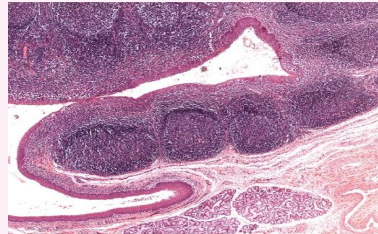
The tonsils are incompletely encapsulated aggregates of lymphoid nodules that guard the entrance to the pharynx

Function:

- production of antibodies.

palatine tonsils

- **Bilateral**, located at the entrance of the oral pharynx.
- Incomplete **capsule** separates its deep aspect from the wall of the pharynx.
- The superficial aspect is covered by stratified squamous nonkeratinized **epithelium** that dips into 10-12 **crypts**.
- The **parenchyma** is composed of lymphoid nodules with germinal centers.



Pharyngeal
tonsils

Lingual
tonsils

SPLEEN

Functions:

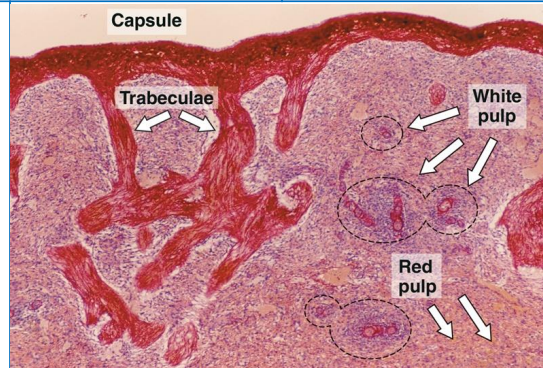
- Filtration of blood.
- Phagocytosis of old RBCs & old blood platelets & invading microorganisms.
- Production & proliferation of immunocompetent B & T lymphocytes.
- Production of antibodies.

(A) Stroma

- Capsule.
- Trabeculae.
- Reticular C.T.

(B) Parenchyma

- White pulp.
- Red pulp.



Note: No cortex, No medulla, No afferent lymphatic vessel.

➤ STROMA OF SPLEEN:

• Capsule:

- 1- is covered by visceral layer of peritoneum; mesothelium
- 2- Is formed of fibromuscular C.T. : **Dense fibrous C.T.** + **smooth muscle cells.**

• Trabeculae:

Are irregular, incomplete, divide the spleen into intercommunicating compartments (lobules).

• Reticular C.T. :

Reticular connective tissue located in lymph nodes, bone marrow, spleen and liver.

➤ PARENCHYMA OF SPLEEN:

(A) White Pulp:

1) Periarterial lymphatic sheaths (PALS): housing T lymphocytes.

2) Lymphoid follicles (with germinal centers): housing B lymphocytes.

Note: Both 1&2 have the centrally located central artery (central arteriole) (follicular arteriole).

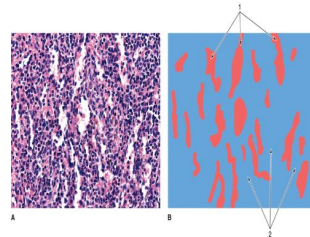
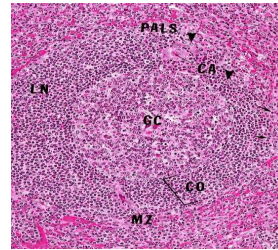
(B) Red pulp:

1) Splenic (pulp) cords:

Extravasated blood cells, plasma cells, macrophages & reticular cells and fibers.

2) Splenic blood sinusoids:

Are lined with elongated fusiform endothelial cells with large intercellular spaces & supported by discontinuous, circular basement membrane.



CELLS OF PARENCHYMA OF SPLEEN

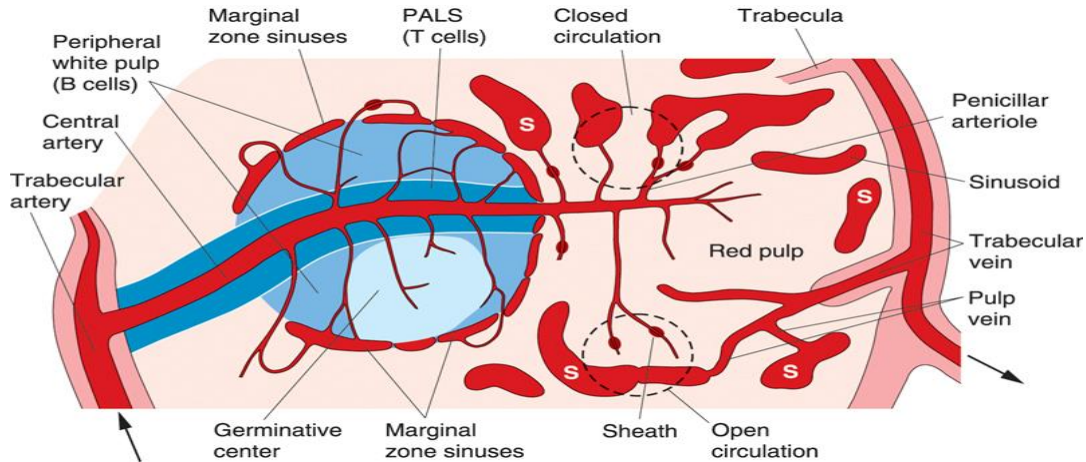
1. Lymphocytes.

2. Plasma cells.

3. Macrophages.

4. Blood elements
(RBCs, leucocytes and
blood platelets).

Splenic Microcirculation



Clinical Applications

Rupture of the Spleen

Spleen is a fragile or friable organ, so major trauma to the upper left abdominal quadrant usually leads to rupture of the spleen. Surgical removal of that ruptured spleen is essential.



➤ **QUESTIONS:**

Q1: Part of the stroma?

- A) Capsule B) Cortex C) Medulla D) Paracortex

Q2: One of spleen's functions is?

- A) Maturation of T lymphocytes B) filtration of the lymph fluid
C) Production of antigens D) Filtration of blood

Q3: which one of these is not found in the spleen?

- A) White pulp B) Capsule C) afferent lymphatic vessel D) Trabeculae

Q4: The presence of _____ leads to enlarged lymph node:

- A) Red Blood Cells B) Antigens or Microorganisms C) Neutrophils D) Antibodies

Q5: Surgical removal of the spleen is essential if?

- A) It is inflamed B) It is attacked by microorganisms C) It is Ruptured D) All the above

C -5
B -4
C -3
D -2
A -1



” لنكن يداً بيد ليرى العالم إنجازاتنا
وتحتلوا شقاء اليوم لأجل حلم الغد ”

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