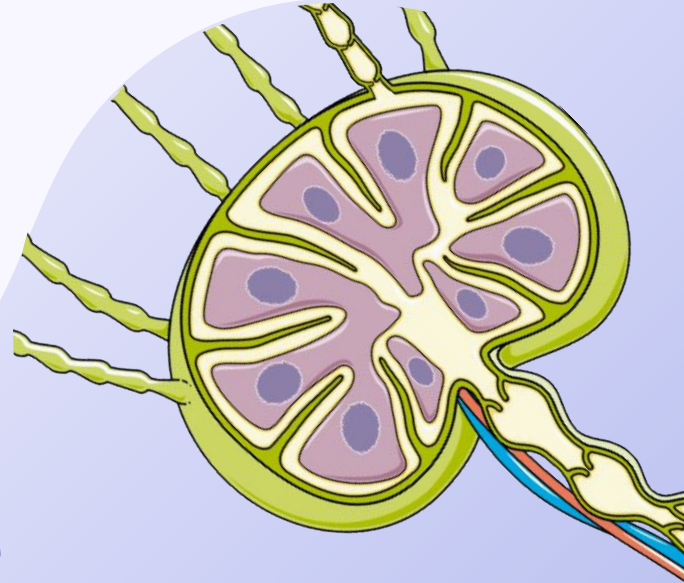


Lymphoid Tissue

Color Index:

- Main Text -Important -Notes
- Boy Slides-Girl Slides -Extra

Editing File



Objectives:

01

Classify lymphoid tissue into: Diffuse and encapsulated

02

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

- Lymph Nodes
- Thymus
- Tonsils
- Spleen

Lymphoid tissue: (Responsible for immunity)

- **Diffuse:**

mucosa-associated lymphoid tissue

(diffuse: immune cells in loose connective tissue)

(The mucosa-associated lymphoid tissue (MALT) initiates immune responses to specific antigens encountered along all mucosal surfaces)

- **Encapsulated:**

(Lymphoid tissue in form of organ)

-Lymph Nodes (L.N.) [flirtation of lymph (excessive fluid out of the blood circulation)]

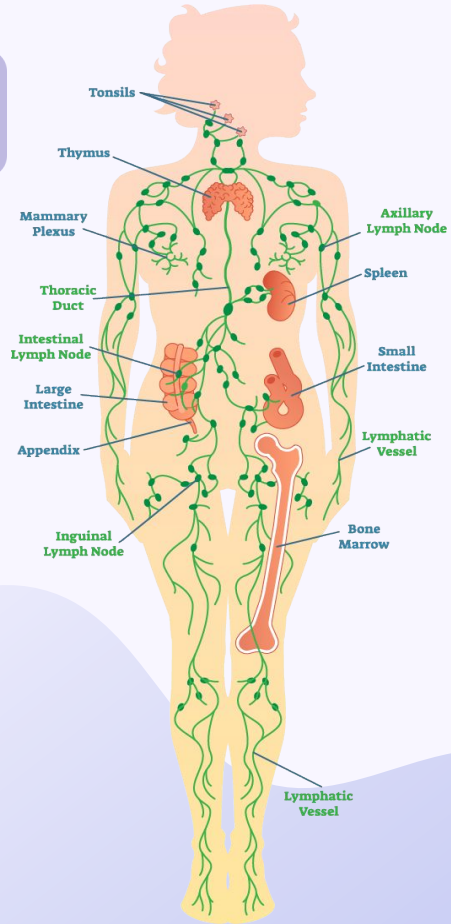
-Spleen (bloody organ, destroy and recycle old blood cells)

-Tonsils **(are incompletely encapsulated)**

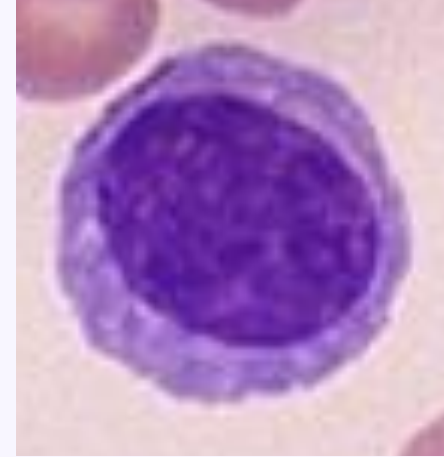
-Thymus (responsible for maturation of T-lymphocytes)

Lymphoid tissue:

موزعة في أنحاء الجسم كأنها محطات
مرتبطة بشبكة، تنقي السوائل التي تصل
الدم

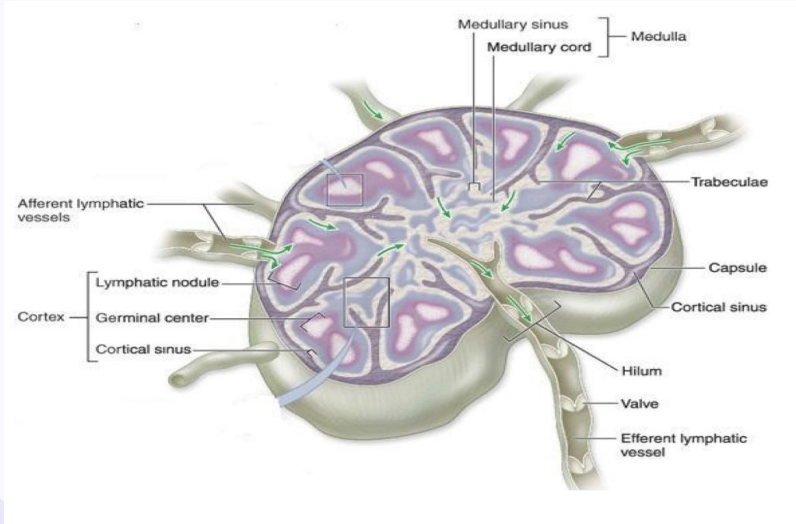


Lymphocyte



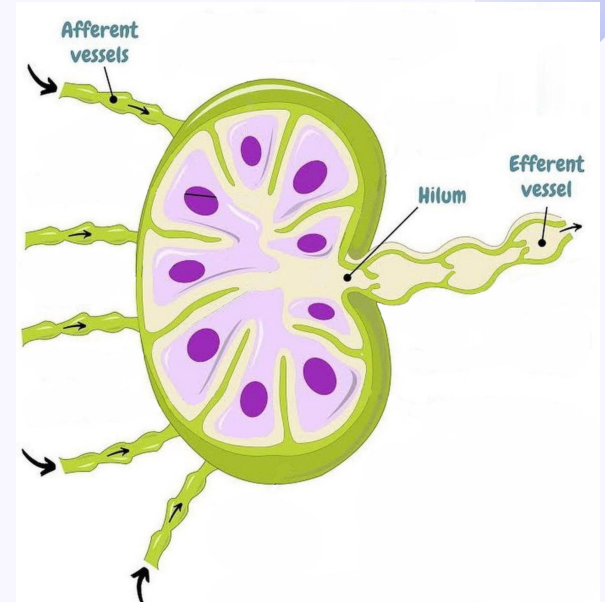
(inactive form, the nucleolus not clear)

Lymph Nodes (L.N.)



Lymph Nodes (L.N.)

- Ovoid, kidney shaped organs
- Size: 2 mm up to 12 mm.
- Example: Inguinal Lymph Node, Axillary, Cervical
- Each lymph node has:
 - A **convex surface** which receives **afferent lymph vessels** (there is many, to take up a lot)
 - A **hilum** where **efferent lymph vessels** leave and drain lymph from the node (just one, to filtrate slowly)



Afferent, A = Arrive
Efferent, E = Exit

Lymph Nodes

** Lymphatic sinuses is similar to blood capillaries but larger and contain lymph **

Stroma

(Any organ have)

Parenchyma

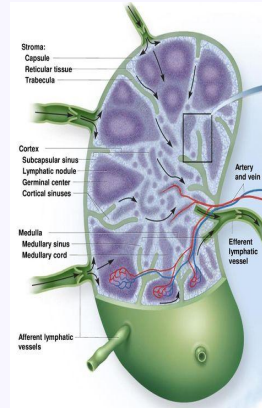
(Lymphoid tissue + Lymph sinuses)
(Functional part)

Capsule

(dense irregular collagenous C.T.)

Reticular C.T.

Trabeculae (septa)



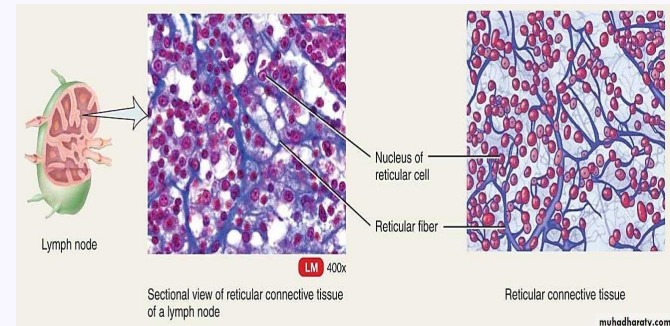
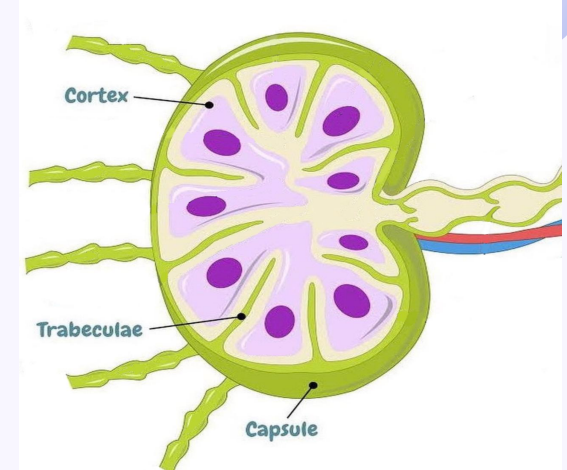
Cortex

Medulla

Paracortex

Lymph Node (L.N.)

- 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**

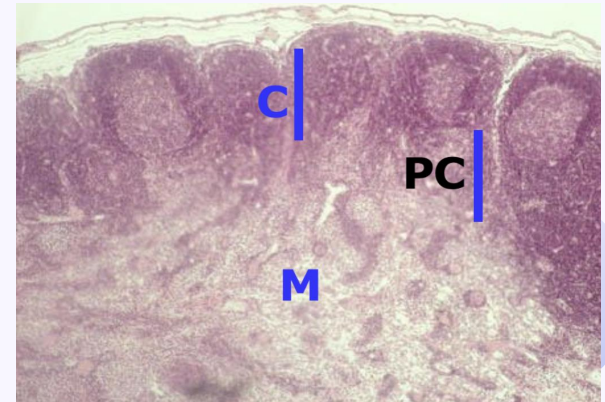
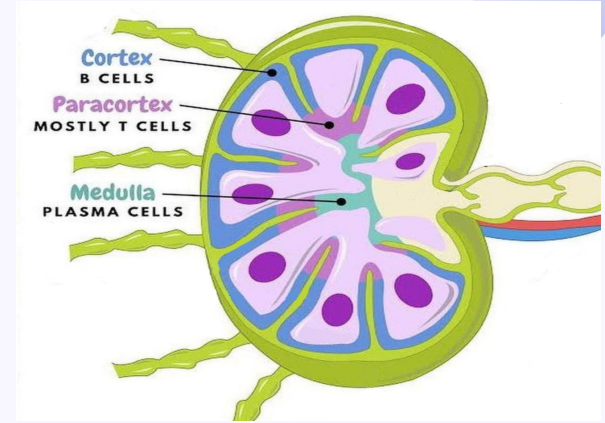


Lymph Node (L.N.)

Each lymph node is divided into three regions:

- Cortex
- Paracortex
- Medulla

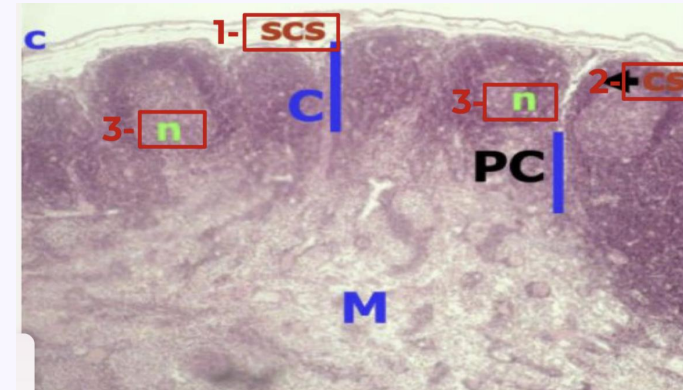
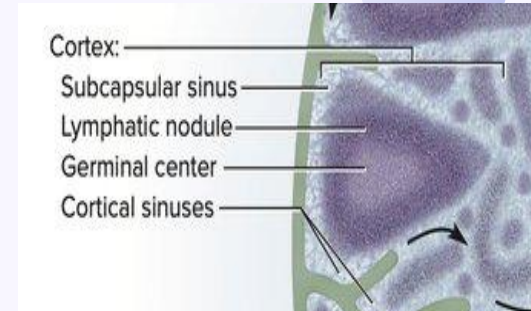
(The filtration goes through 3 stages)



Lymph Nodes (L.N.): CORTEX

Contains the:

1. Subcapsular lymphatic sinus (med43)
2. **Cortical sinuses**
3. **Lymphoid nodules** (primary & secondary) composed mainly of :
 - a. **B- lymphocytes**
 - b. **and macrophages**

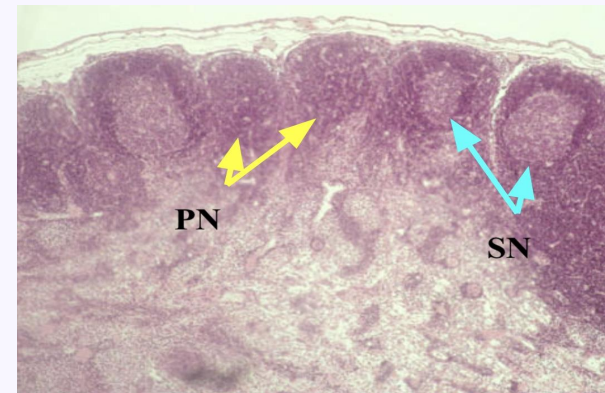
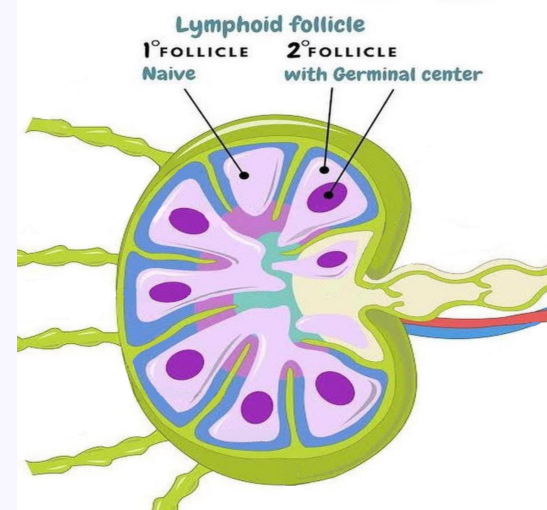


Lymph Nodules : (Follicles)

-Lymph nodules are **small masses of lymph tissue** (lymphocytes)

Lymph nodules may be:

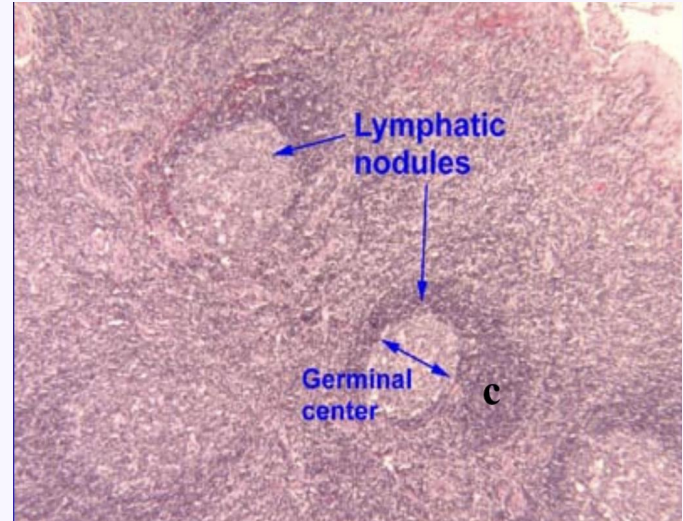
- **Primary nodules:** formed of virgin B lymphocytes without germinal centers. (still new, not activated)
- **Secondary nodules:** with paler germinal centers. (كان فيها فراغ) (من الوسط) (activated of B-lymphocytes, they will become plasma cell)



Secondary Nodules

Contain:

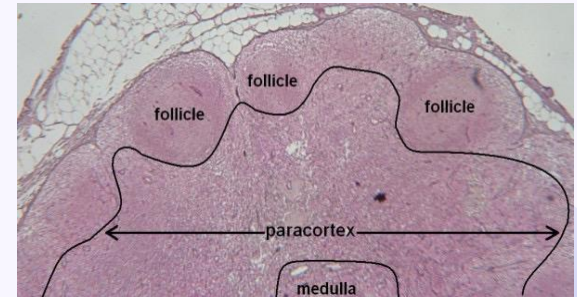
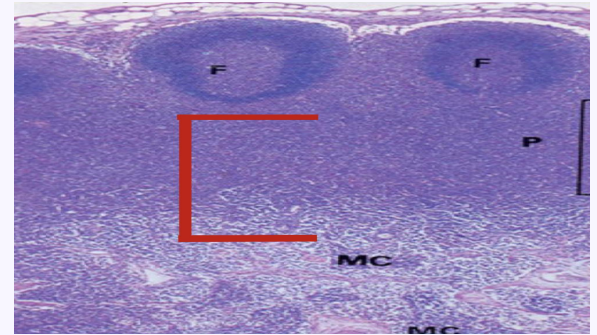
- **Germinal centers**, central light areas filled with activated B lymphocytes (B lymphoblasts), plasma cells and macrophages.
- The germinal centre is surrounded by a darker-staining region called the **corona** (formed of inactive B-lymphocytes and macrophages). -Corona is dark stain surround Germinal (Coronavirus darkens our life)



Lymph nodes (L.N): (PARACORTECX)

- It is the region between cortex and medulla.
- It is the **thymus dependent zone (area)** and contains **active T lymphocytes**
- **Has NO nodules (NO follicles)**

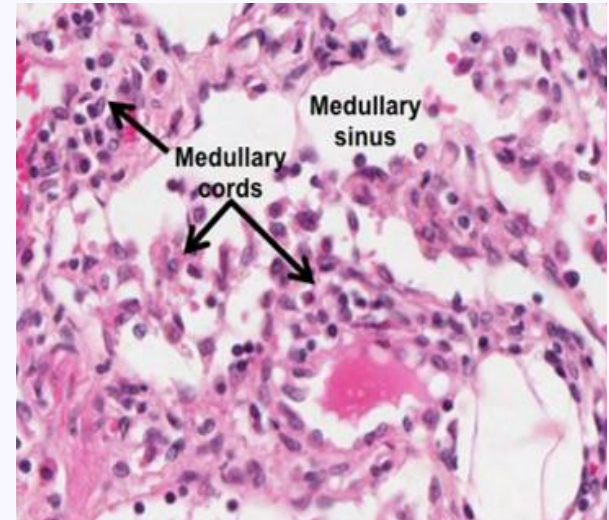
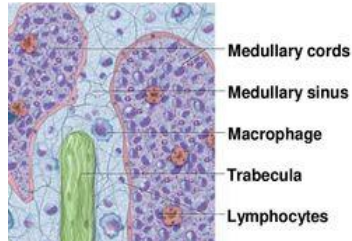
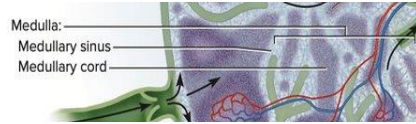
Place in lymph node rich in T lymphocytes ? Paracortex



Lymph nodes (L.N): (MEDULLA)

Consists of:

- **Medullary cords.**
- **Medullary lymph sinuses** (there is a lot)
- The **medullary cords** are composed of **B & T lymphocytes, plasma cells and macrophages.**
- The **medullary lymph sinuses** are continuous with the **cortical lymph sinuses**



Lymph flow through the lymph node

Afferent Lymph Vessels



Subcapsular Sinuses



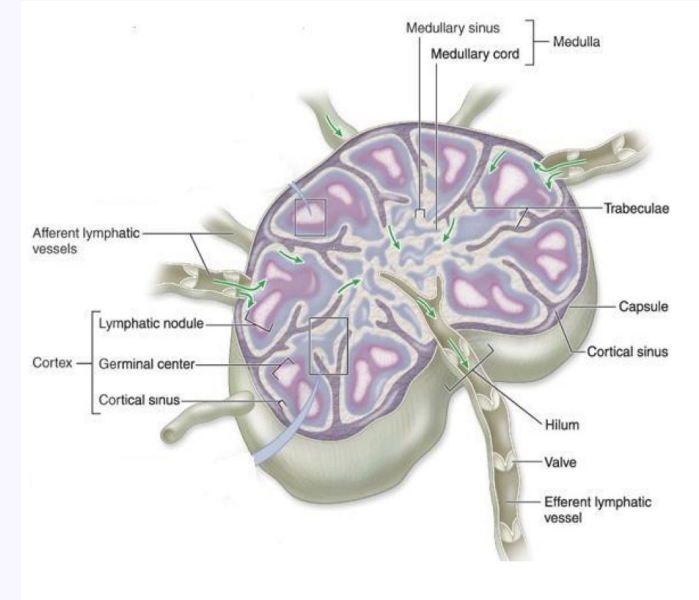
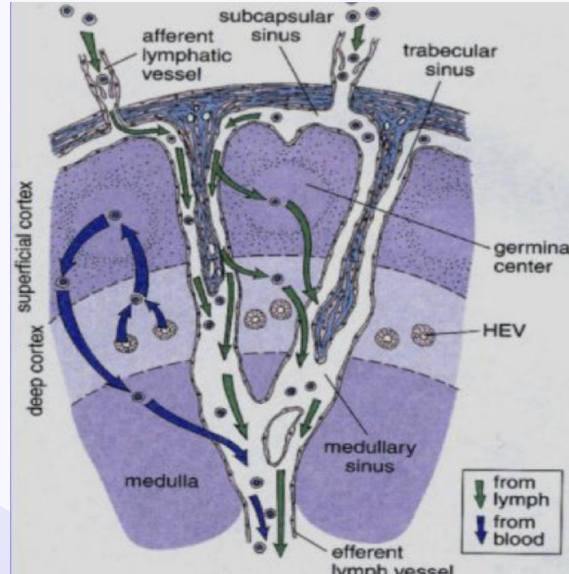
Cortical Sinuses



Medullary Sinuses

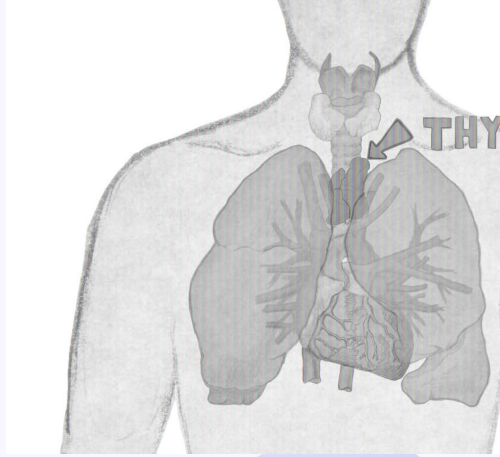


Efferent Lymphatic Vessels



Lymph Node: (FUNCTION)

- Maintenance and Proliferation of:
 - **B lymphocytes** (from bone marrow immunologically active)
 - **T lymphocytes** (in lymph node (programmed) active, formed in bone marrow inactive then go to thymus gland to be immunologically active)
- **Filtration of lymph** from bacteria and other foreign substances.



THYMUS

(الغدة الزعترية)

THYMUS

A

Stroma:

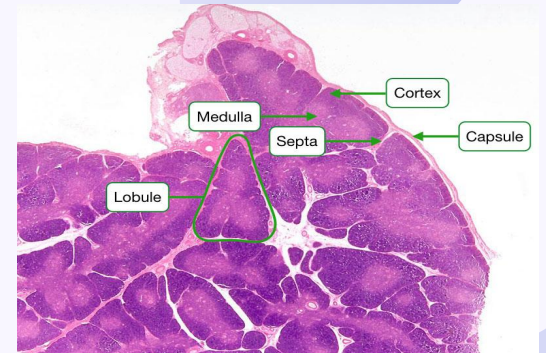
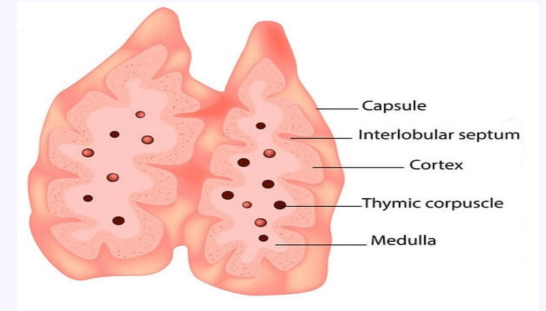
1. Capsule
2. Interlobular trabeculae:
incomplete

B

Thymic lobule:

1. Cortex
2. Medulla

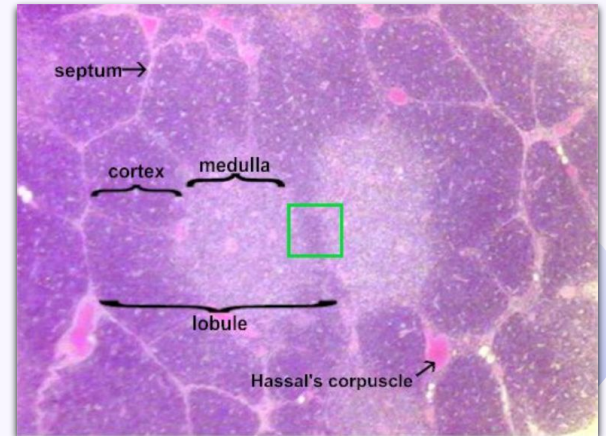
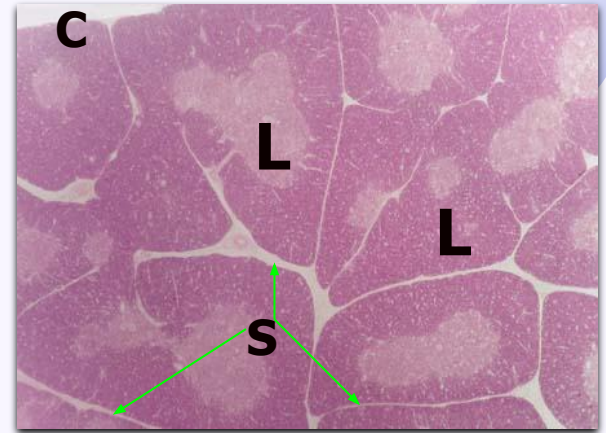
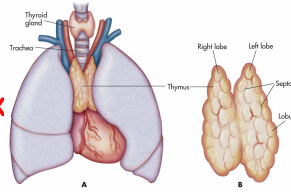
The cortex stains more darkly than the medulla, because it contains more lymphocytes than the medulla



- Lobules are NOT Spherical
- There are NO lymphatic nodules in thymus
- Also there are NO B lymphocytes

THYMUS

- Bilobed lymphatic organ located in **thorax** (in the chest, between sternum and heart)
- Enclosed in a thin connective tissue capsule
- **Septa (trabeculae)** from the capsule into the organ, subdividing it into **incomplete lobules**
- Possesses no (لا يمتلك) lymph nodules, no lymph sinuses, no reticular fibers.

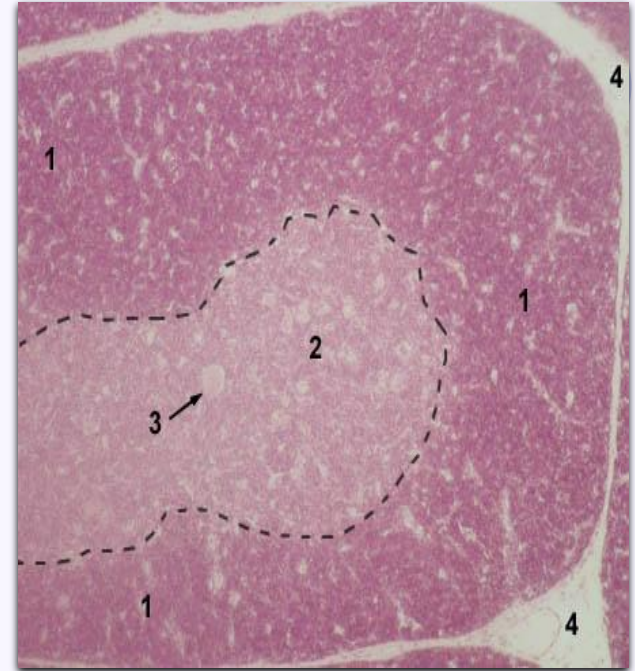


THYMUS

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

CORTEX:

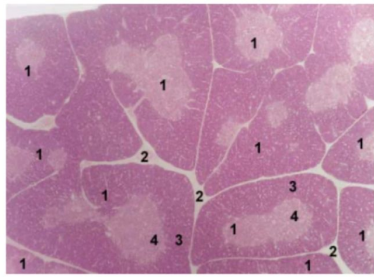
is darker than the medulla because it is populated with **immunologically immature T-lymphocytes** (T-lymphoblasts) (**more than 90% will die**), **epithelial reticular cells**, and **macrophages** (**Why? To get rid of the dead T-lymphocytes**). Here the immature T cells undergo proliferation, and transform into mature cells and then migrate to medulla.



THYMUS

Stained with haematoxylin and eosin

- 1 - lobules
- 2 - interlobular connective tissue (septa)
- 3 - cortex
- 4 - medulla



- 1 - **cortex**
- 2 - **medulla**
- 3 - **Hassall's corpuscle**
- 4 - **interlobular connective tissue (septa)**

THYMUS

MEDULLA:

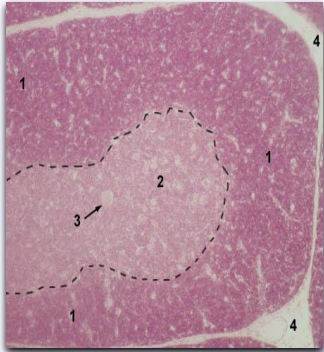
- mature T-lymphocytes
- epithelial reticular cells

(Epithelial reticular cells are special component only for thymus, it's responsible for maturation of T cells)

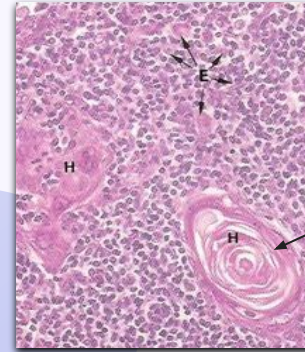
- thymic (Hassall's) corpuscles
- macrophages.

Hassall's Corpuscles:

- composed of groups of concentrically arranged **keratinized epithelial reticular cells**.
- Are found **in medulla** of thymic lobules. (Only in medulla)
- Probably represent a degenerative process



- 1 - cortex
- 2 - medulla
- 3 - Hassall's corpuscle
- 4 - interlobular connective tissue (septa)



Hassall's corpuscle

THYMUS

01

Function:
Formation, Maturation
of T lymphocytes.

03

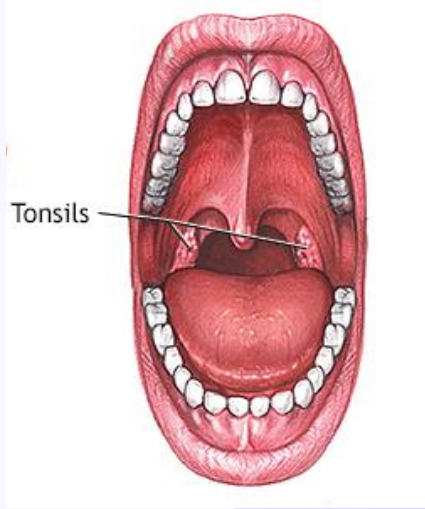
Remnants of thymus
remain in adult to form
T lymphocytes.

02

It involutes after
puberty and becomes
infiltrated by adipose
tissue.

04

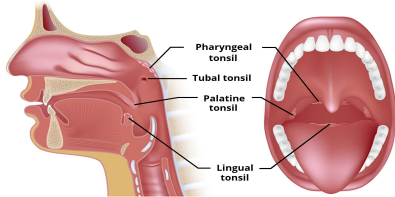
NO B lymphocytes,
NO plasma cells in the
thymus.



TONSILS

(اللوز)

TONSILS



- The tonsils (palatine (back of the throat), pharyngeal (near the nasal cavity), and lingual (posterior part tongue)) are incompletely encapsulated aggregates of lymphoid nodules that guard the entrance to the pharynx.
- Function: **production of antibodies.**

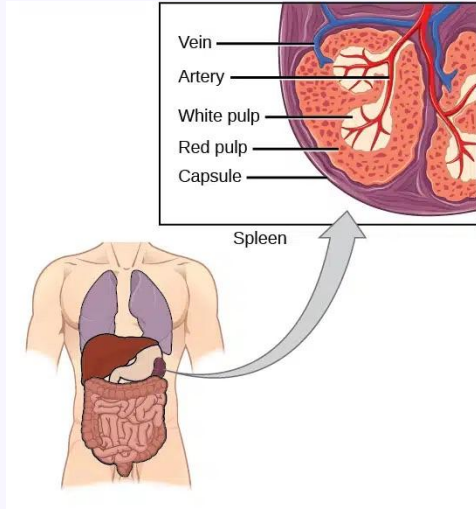
Palatine tonsils

Bilateral, located at the entrance of the **oropharynx.**

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. **To increase the tonsils surface area.**

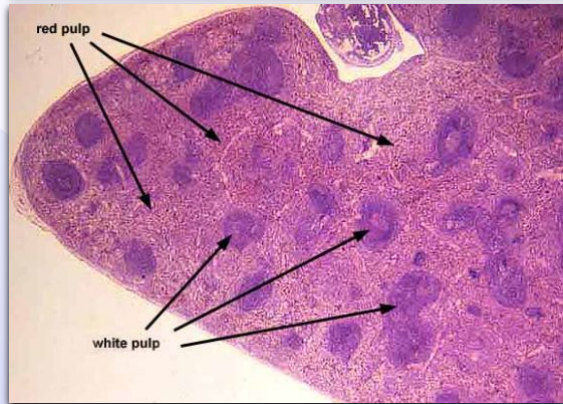
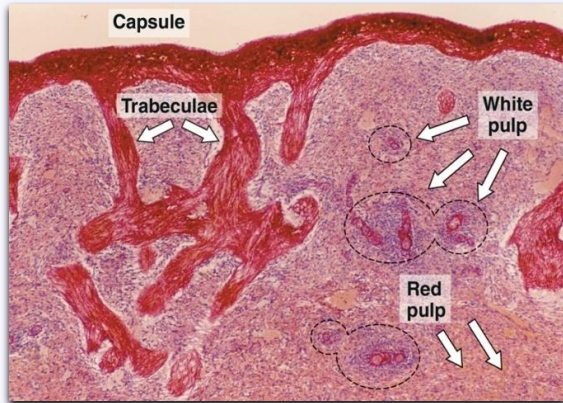
The parenchyma is composed of **lymphoid nodules** with germinal centers.



SPLEEN

(الطحال)

Stroma of Spleen



1-Capsule:

- is covered by visceral layer of peritoneum; mesothelium
- Is formed of fibromuscular C.T. : **(Dense fibrous C.T. + smooth muscle cells)** (In emergencies such as hemorrhage, smooth muscle in the vessel walls and in the capsule of the spleen contracts and this squeezes the blood out of the spleen into the general circulation)

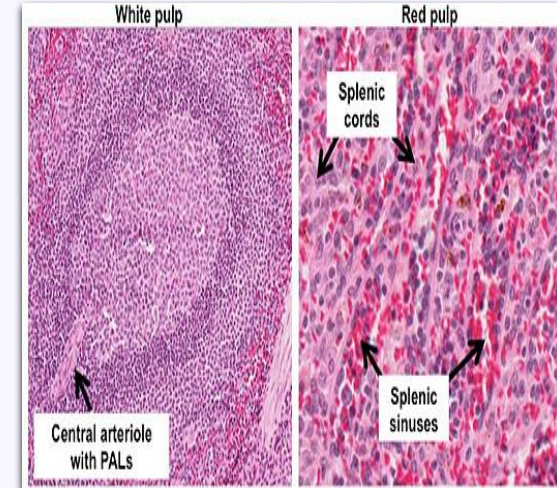
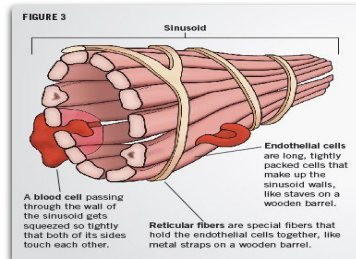
2-Trabeculae:

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

3-Reticular C.T.

Parenchyma of Spleen

- **White Pulp:**
 - 1-Periarterial lymphatic sheaths (**PALS**): housing T lymphocytes.
 - 2-Lymphoid follicles (with germinal centers): housing B lymphocytes.
 - N.B. **Both** 1&2 surround the central arteriole (follicular arteriole)
- **Red pulp:**
 - 1-Splenic (pulp) cords: contain Extravasated blood cells, lymphocytes, plasma cells, macrophages & reticular cells, fibers.
 - 2-Splenic blood sinusoids: Are lined with elongated endothelial cells with large intercellular spaces & supported by discontinuous, circular basement membrane.



-No cortex,
-No medulla,
-No afferent lymphatic vessel.

Cells of parenchyma of spleen

01

Lymphocytes

02

Plasma cells

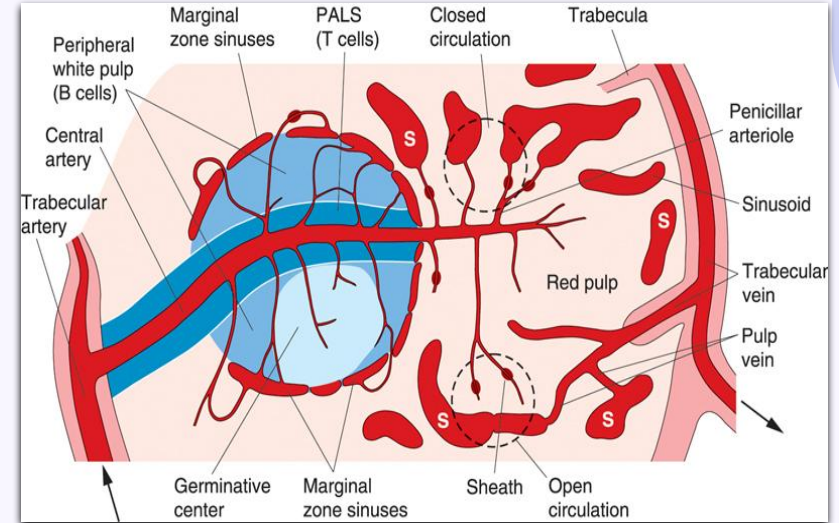
03

Macrophages

04

Blood elements (RBCs, leucocytes and blood platelets)

Splenic Microcirculation



Functions of Spleen



Filtration of blood



Phagocytosis of old RBCs & old blood platelets & invading microorganisms

B,T

Production & proliferation of immunocompetent B & T lymphocytes



Production of antibodies

MCQs

1- Place in lymph node rich in T lymphocytes ?

A- Cortex

B- Paracortex

C- Medulla

D- Stroma

2- Which one of these is not found in the spleen ?

A- White pulp

B- Capsule

C- Afferent
lymphatic
vessels

D- Trabeculae

3- Which of the following possesses no lymph nodules, no lymph sinuses, no reticular fibers?

A-Thymus

B- Lymph node

C- Spleen

D- Tonsils

MCQs

4- Where can we find the Thymus dependent zone?

A- Cortex of lymph node

B- Paracortex of lymph node

D- Medulla of lymph node

C- Palatine tonsils

5- The germinal center in secondary nodules is surrounded by :

A- Dark stain called gerinol

B- Light dark

C- Other cells

D- Dark stain called corona

6- Presence of leads to enlarged lymph node.

A- Red blood cells

B- Antigens or bacteria

C- Neutrophils

D- Antibodies



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

The Team

Team Leaders:

- Ahmad Addas
- Hessah Alghanim

Team Members:

- Saud Alsaeed
- Fahad Alqahtani
- Abdulaziz Alobathani
- Ibrahim Albabtain 
- Fahad Albalawi
- Faisal Alessa
- Yazan Alkheder
- Ziyad Bukhari
- Joud Alahmari
- Lulwah Alwabel
- Hessah Alyousef
- Haneen Baatiah 
- Norah Alnoshan
- Lina Albaqiyh
- Layan Alsubaie
- Ghaida Alotaibi

