



MED441
KING SAUD UNIVERSITY



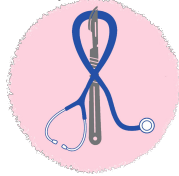
Histology team

Foundation Block | Histology

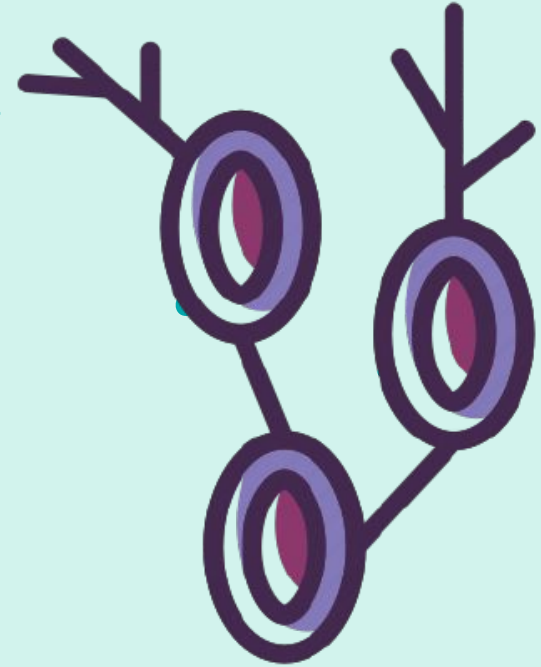
Lymphoid tissue

- Color index :
- Main text
- Important
- Female slide
- Male slide
- DR.Notes
- extra

Revised & Reviewed
by
Abdulaziz & Bahammam
Faye Wael Sondi



4



Objectives :

By the end of the lecture, the student should describe : the microscopic **structure** of the following organs in correlation with their **functions**:

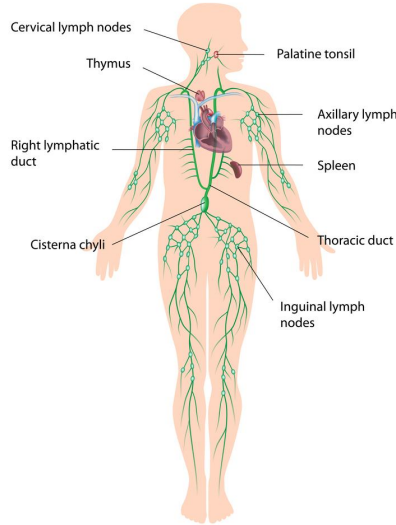
- Lymph
- nodes
- Spleen
- Tonsils
- Thymus



LYMPHOID TISSUE

Leukocyte + lymphocyte

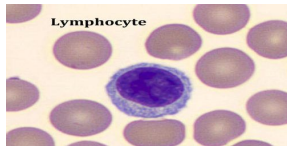
Lymphatic (organs + vessels) =
The Lymphatic System



Diffuse

Mucosa associated lymphoid tissue
Scattered (not shaped as organ)
(Mucosa = epithelial + connective tissue
(wet area) inside the mouth or nose)

LYMPHOCYTE:
FILTRATION OF THE LYMPH



Encapsulated

Has capsule

Lymph nodes

spleen

Tonsils

thymus

(incompletely encapsulated)

Lymph Nodes (L.N)

Tip!

Each Lymph node is divided into 3 Regions :
Cortex | Paracortex | Medulla

Functions

Proliferation of B and T lymphocytes

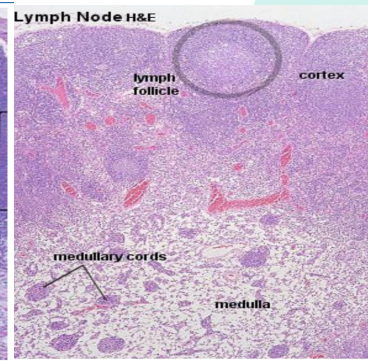
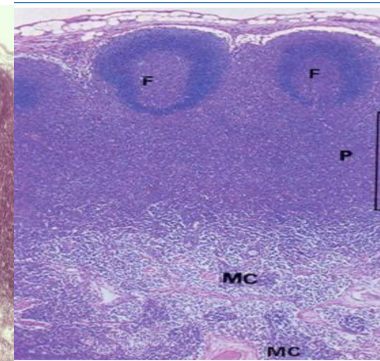
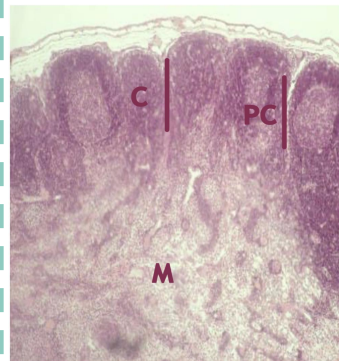
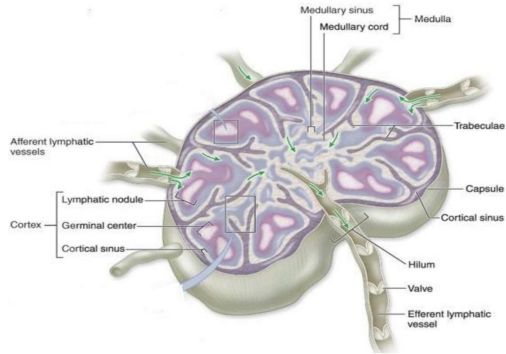
Filtration of lymph from bacteria and other foreign substances.

Stroma

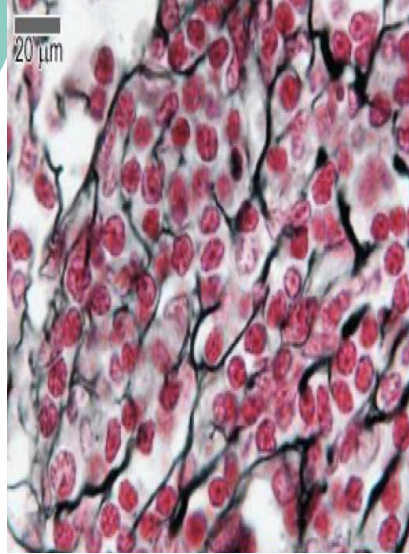
Capsule | Trabeculae (Septa) | Reticular C.T

Parenchyma

Cortex | Paracortex | Medulla



Lymph Nodes



SHAPE

Ovoid, **Kidney** shaped organs.

Each node has:

Convex Surface

Receives **Afferent lymph vessels**.

*A = Arrive

Hilum

Efferent lymph vessels

leave and drain lymph from the node.

*E = Exit

Each lymph node has

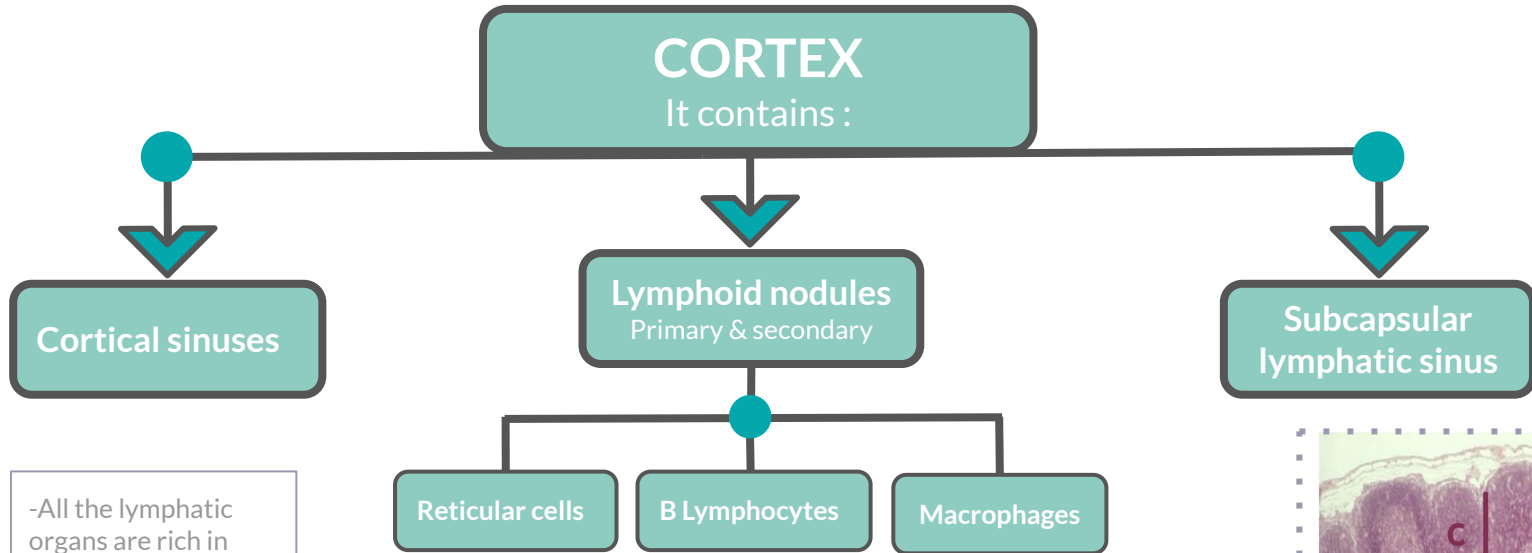
(**Capsule**) a dense connective tissue

The framework of the node

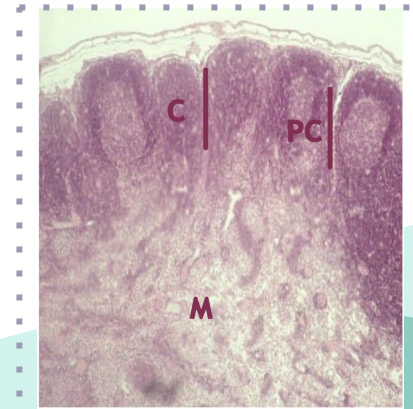
Formed by **Reticular connective tissue**.

From the capsule, connective tissue **septa (trabeculae)** extend into the outer part (cortex) of the node and divide it into incomplete compartments.

Lymph Nodes



-All the lymphatic organs are rich in macrophages because it is an immune organ
-The macrophages move along the lymphatic sys. to clean it.



Lymph Nodes CORTEX

*Lymph nodule exist only on the cortex part of lymph node
*primary nodules before infection
*Secondary nodules after infection

Lymph nodules
(follicles)

Small masses of lymph tissue
(Lymphocytes)

(A) Primary nodules:
Formed of :
- virgin B lymphocytes



(B) Secondary nodules:
(with paler germinal centres)

1- **Germinal centers :**
central light areas filled with :
- activated B lymphocytes ,
B lymphoblast
- plasma cells
- macrophages.

2- The germinal center is surrounded by a **darker-staining** region called the **corona**.

* B cells is the main type of cells
* lymphocyte is inactive
* lymphoblast is active

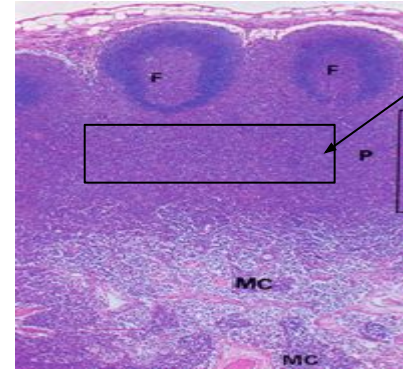
Lymph Nodes: Paracortex



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

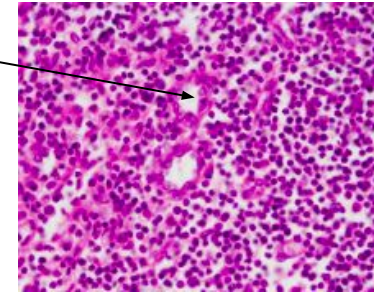
Notes :

- Paracortex is rich of T lymphocyte .
- The high endothelial venules are lined by cuboidal cells .

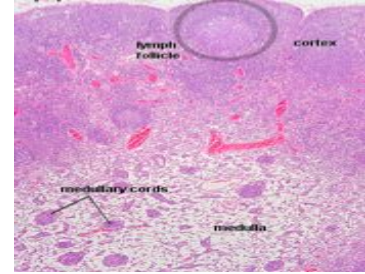
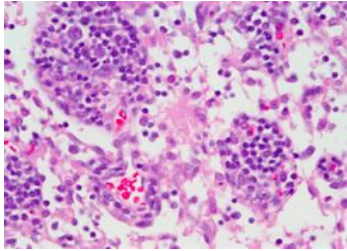


thymus dependent zone

high Endothelial
venules



Lymph Nodes: MEDULLA



Consists of:

Medullary lymph sinuses :

Continuous with the **Subcapsular** and **cortical lymph sinuses**.

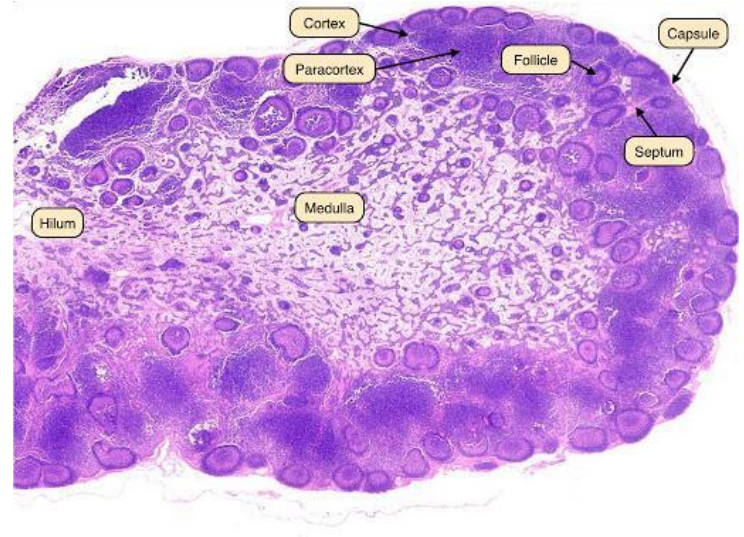
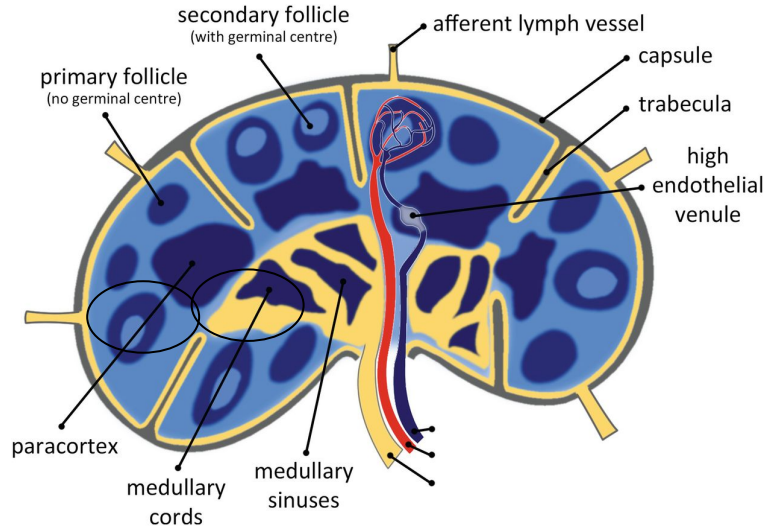
- Medulla has a large amount of medullary lymph sinuses.

Medullary cord :

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

- **Almost all types of immune cells**

Lymph Nodes: MEDULLA



Lymph Flow Through The Lymph Node (Pathway)

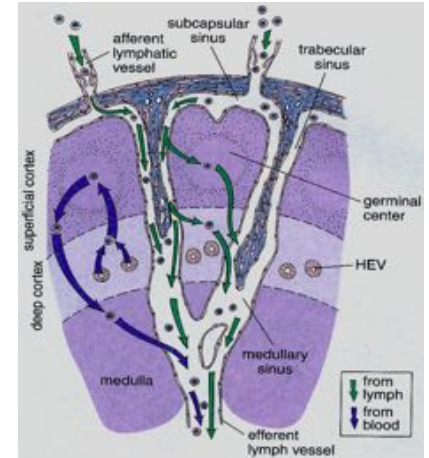
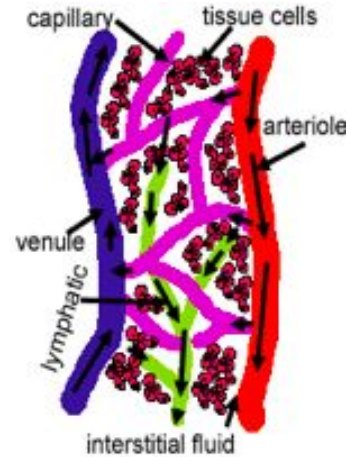
Afferent lymph vessels

Subcapsular sinuses
50% filtered

Cortical sinuses
75% filtered

Medullary sinuses
100% Completely clean

Efferent lymphatic
vessels



Lymph Node:



How it works
And general info

Function :

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

Clinical Applications

Palpable lymph node

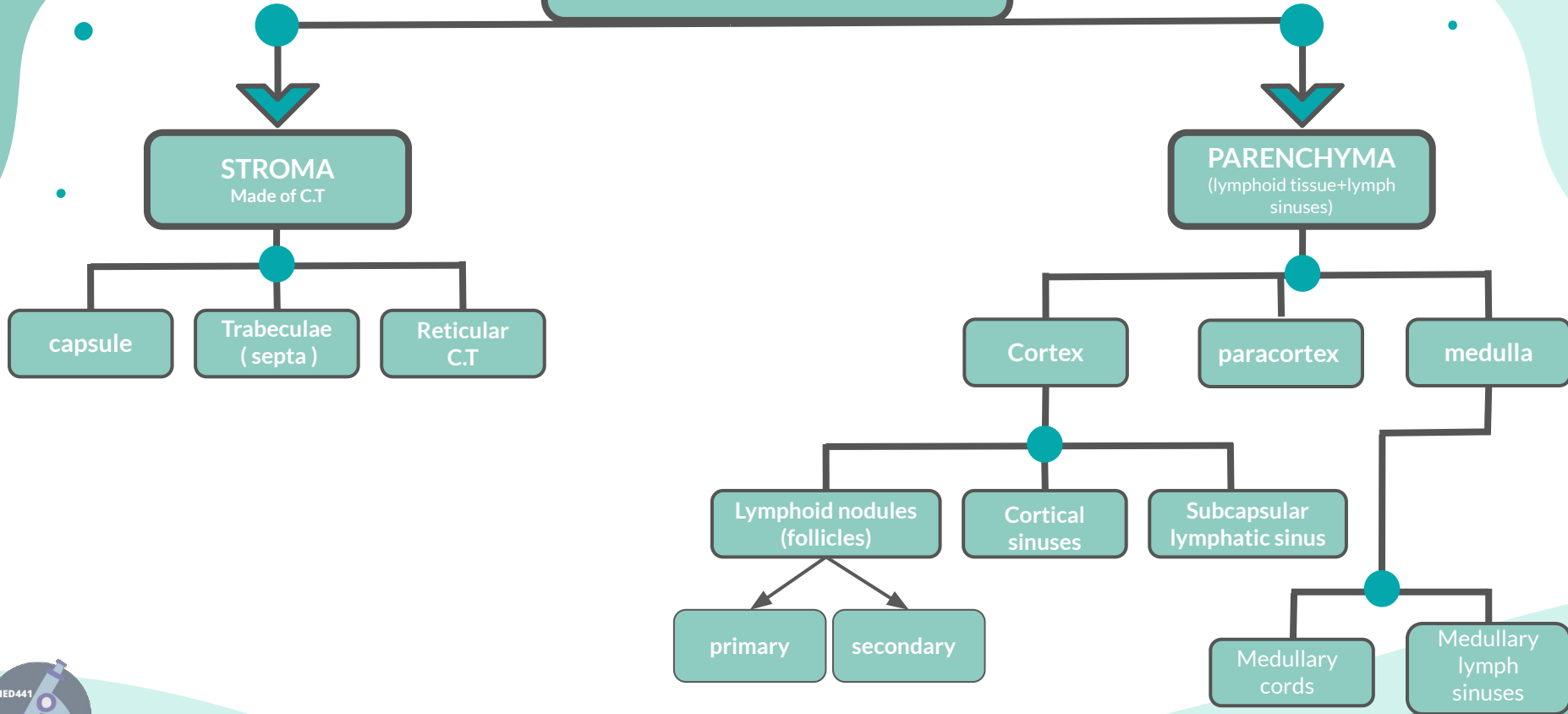
- The presence of antigen or bacteria leads to rapid proliferation of lymphocytes of the lymph node (L.N), leading to increase of L.N. to several times of its normal size, so the L.N. becomes enlarged and palpable to the touch.

Note :

If there is infection it will be painful in this situation it is (palpable) .

Palpable : محسوسه

LYMPH NODES



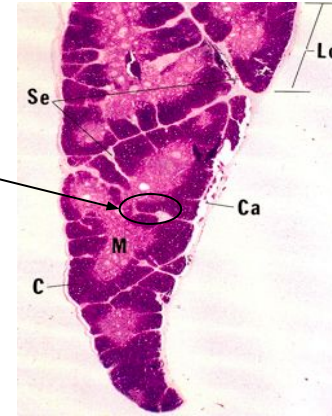
THYMUS

- **Stroma:**

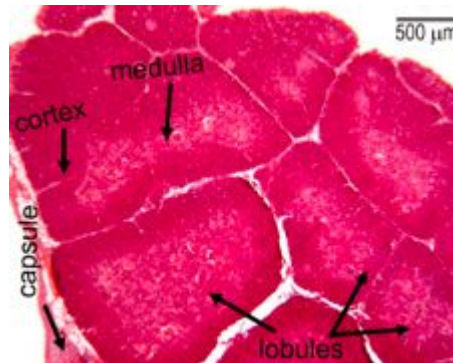
- Capsule
- Interlobular trabeculae: incomplete reticular formation

- **Thymic lobule:**

- Cortex
- Medulla



Incomplete interlobular trabeculae
no



Note :

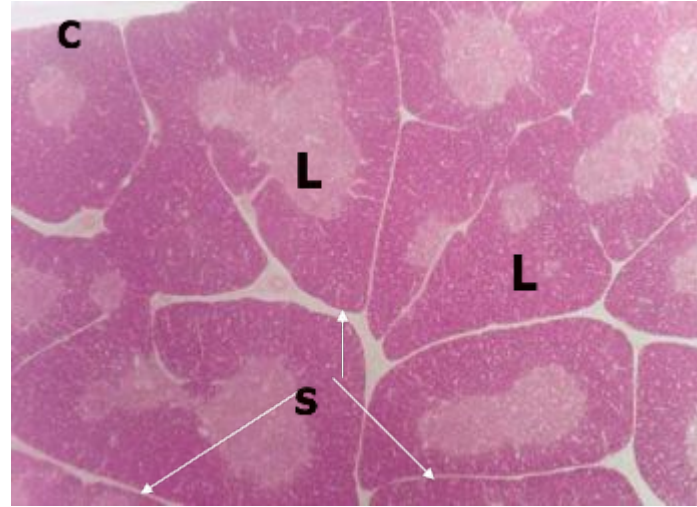
- Thymus : between heart and sternum.
- Each lobe is unit .
- Thymus is a primary organ (why ? cause the activation and programming of T cell occur in it) - Also this is the importance or the main function of thymus)

THYMUS

نيمونكس : T في thymus يعني
انها تحتوي فقط على T cells .

- **Bilobed** lymphatic organ located in **thorax** (in chest) .
- 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**

(only T -lymphocyte + very important).



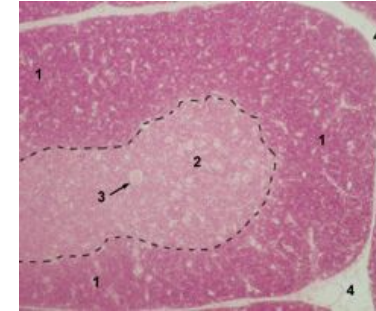
Note :

- Why it is thin ? cause the thymus protected by the sternum
- No lymph nodules (why ? cause there are no B cells)

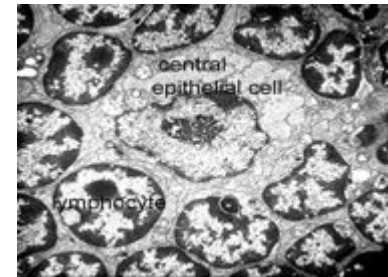
THYMUS



T cell development



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



- 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.

- More than 90% will die by macrophages (phagocytosis)
- Only 10% of T-lymphocyte will be mature

Epithelial reticular cells (epithelial : contain cytokeratin , reticular : Secretes hormone - like Incubation-).

THYMUS



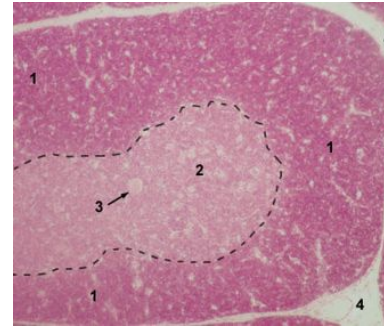
For more info
about thymus

MEDULLA:

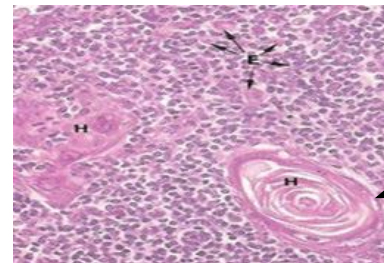
- consists of:
 - **mature** T-lymphocyte
 - epithelial reticular cells
 - thymic (Hassall's) corpuscles
 - Macrophages.

Hassall's Corpuscles :

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



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



Hassall's corpuscle

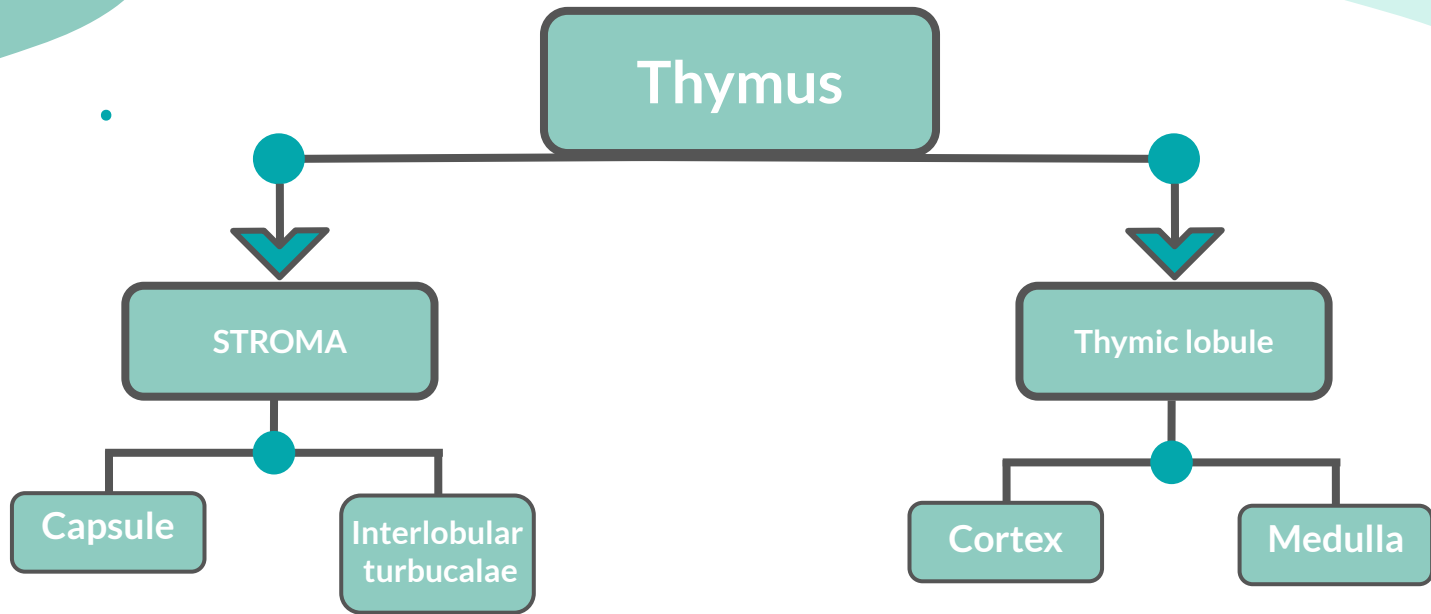
Function of thymus

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.

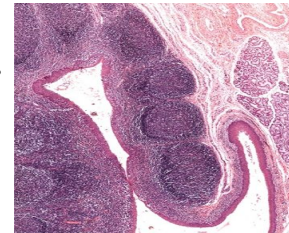


Tonsils

- The tonsils (palatine, pharyngeal, and lingual) 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 **to increase the tonsils surfers area** .
- The parenchyma is composed of **lymphoid nodules** with germinal centers.



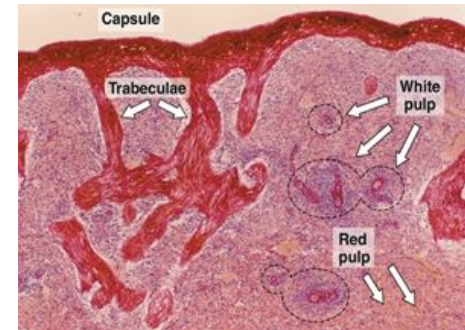
SPLEEN

Stroma of Spleen:-

- **Capsule :**
 - Is covered by visceral layer of peritoneum; mesothelium.
 - 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.**

Parenchyma of Spleen:-

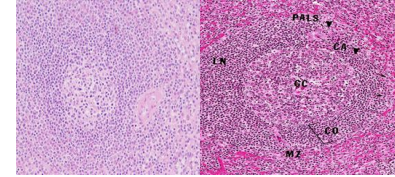
- **Consist of:**
 - White pulp
 - Red pulp.
- **Has no** cortex, no medulla, no afferent lymphatic vessel.



Parenchyma of Spleen

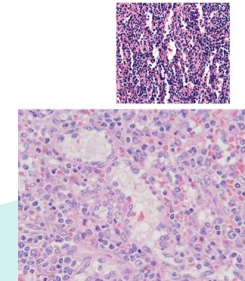
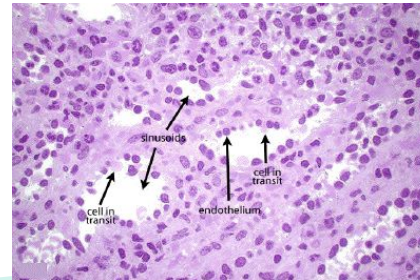
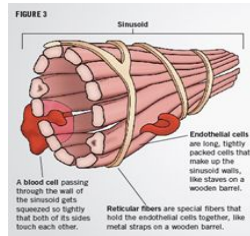
White Pulp :

- Periarterial lymphatic sheaths (**PALS**): housing T lymphocytes.
- Lymphoid follicles (with germinal centers): housing B lymphocytes.
- N.B. Both have the **eccentrically located central artery** (central arteriole) (follicular arteriole).



Red pulp :

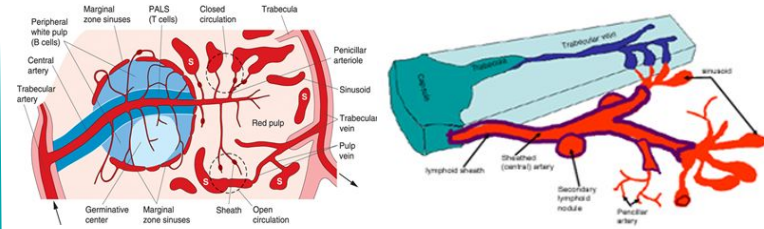
- **Splenic (pulp) cords:**
 - Extravasated blood cells, lymphocytes, plasma cells, macrophages & reticular cells and fibers.
- **Splenic blood sinusoids:**
 - Lined with elongated fusiform endothelial cells with large intercellular spaces & supported by discontinuous, circular basement membrane.



• Cells of parenchyma of spleen

- 1) Lymphocytes.
- 2) Plasma cells.
- 3) Macrophages.
- 4) Blood elements (RBCs, leukocytes and blood platelets).

Splenic Microcirculation :



Clinical application

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.

Functions of Spleen

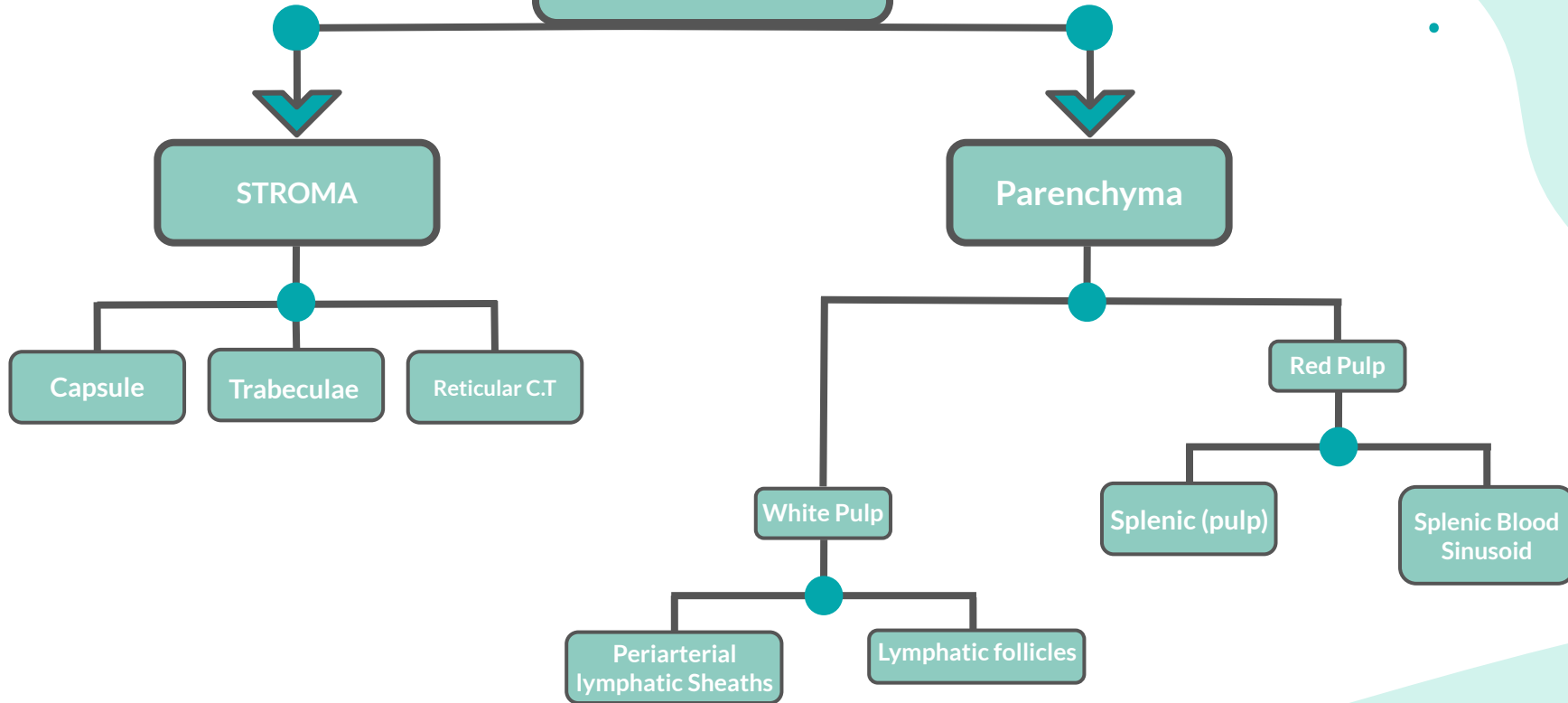
Filtration of blood.

Phagocytosis of old RBCs & old blood platelets & invading microorganisms.

Production & proliferation of immunocompetent B & T lymphocytes.

Production of antibodies.

Spleen





Quiz!

Answers

1
2
3
4
5
6

B
D
A
A
D
B

Q(1): Which of the following doesn't have lymph nodules, sinuses, and no reticular fibers ?

A spleen

B Thymus

C Tonsils

D Both A & B

Q(2): Production of antibodies is done by?

A Spleen

B Thymus

C Tonsils

D Both A & C

Q(3): What is the FUNCTION OF THYMUS?

A Maturation of T lymphocytes

B Maturation of B lymphocytes

C Maturation of T&B lymphocytes

D Filtration the lymph

Q(4): Which of the following Enter the Lymphatic Node Cortex

A B cells

B T cells

C macrophages

D A and B

Q(5): Hassall's corpuscles are found in

A Spleen

B Lymph nodes

C Thymus cortex

D Thymus medulla

Q(6): Periarterial lymphatic sheaths (PALS) are found in

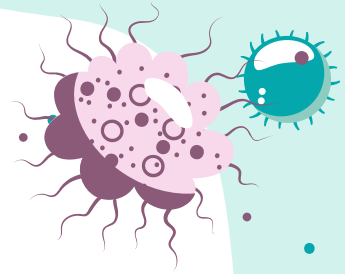
A Red pulp

B White pulp

C Trabeculae

D Reticular C.T.

The Creative Crew!



Foundation Block | Histology Team (441)



Boys Captain

Alwaleed Alnasser



Girls Captain

Norah Alawlah



• Abdullah Alqarni

• Abdulrahman Mokhtar

• Abdulmajeed Alharbi

• Mansor Aldoajy

• Mohammed Alhaqbani

• Ziyad Al-Abduljabbar

• Iyah Alhasan

• Hussah Alshareef

• Lobna Altimimy

• Zahra Alsultan

• Fay Al Luhaidan

• Sarah Al-homaydy

• Sara Al-Majed