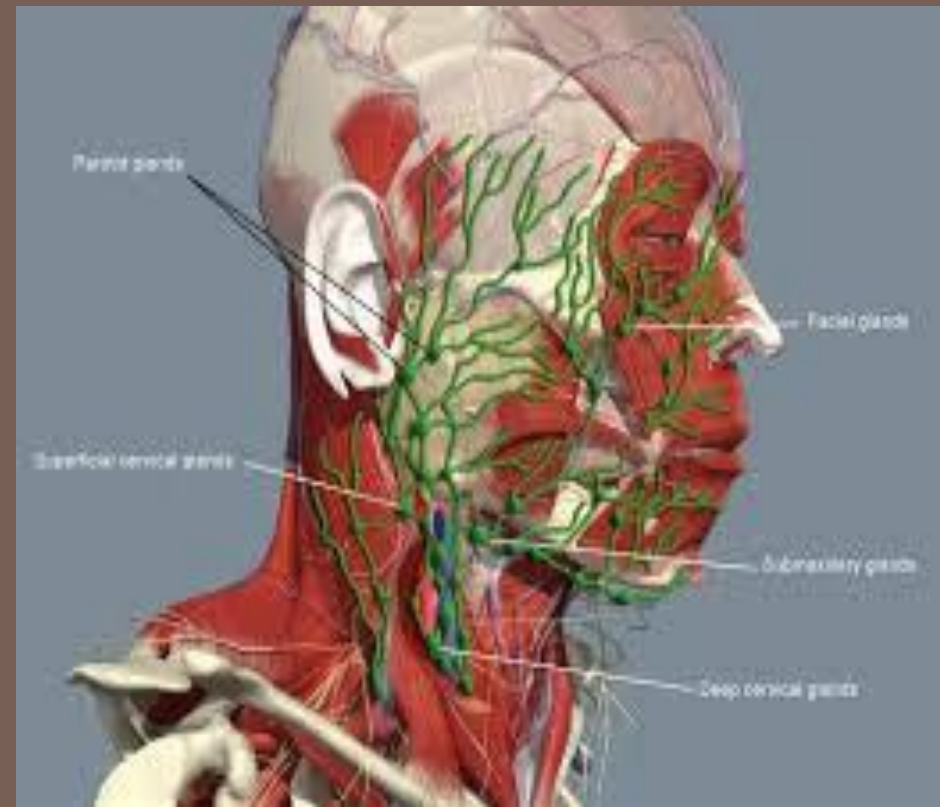


LYMPHATIC SYSTEM

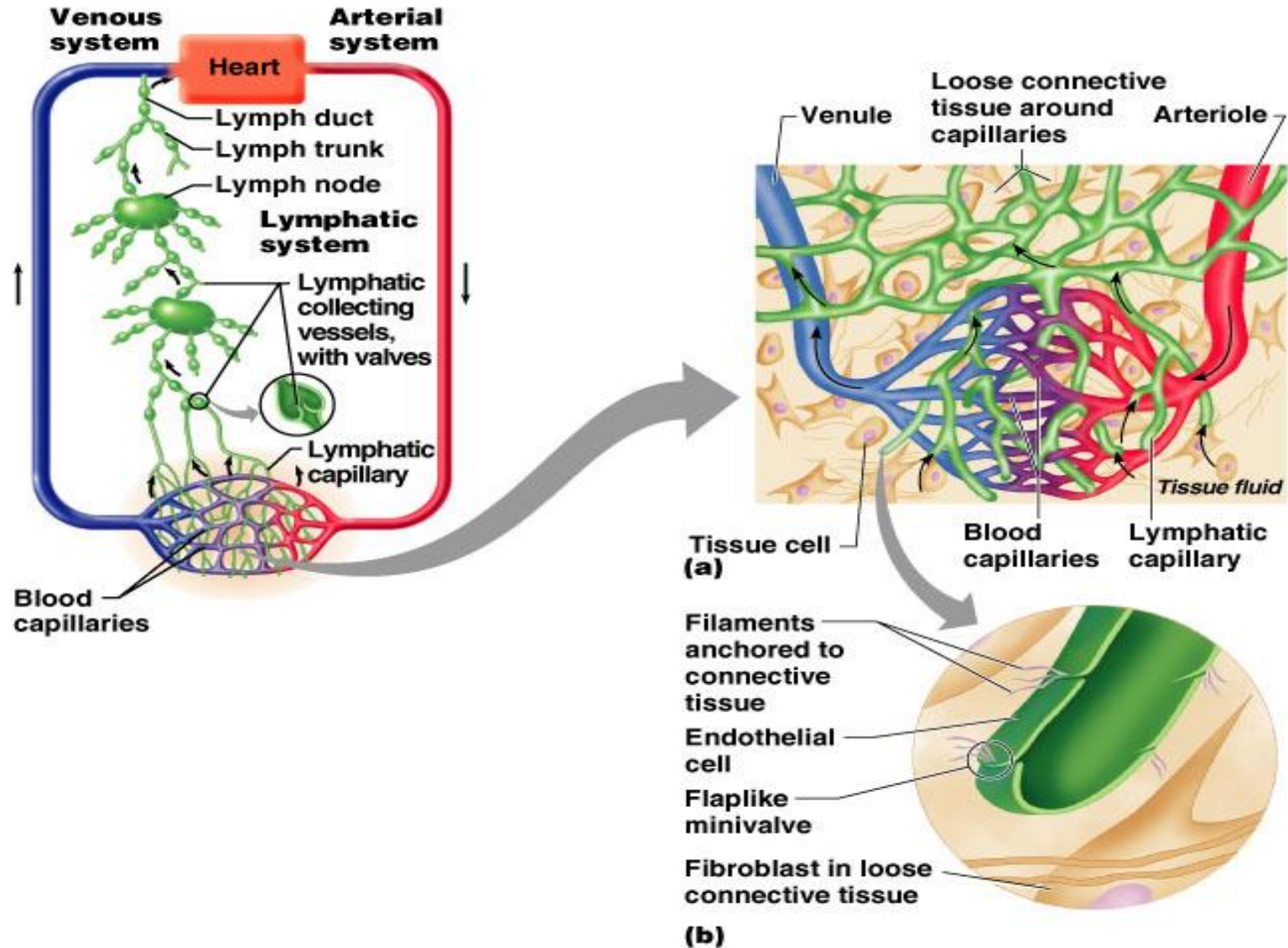


LYMPH

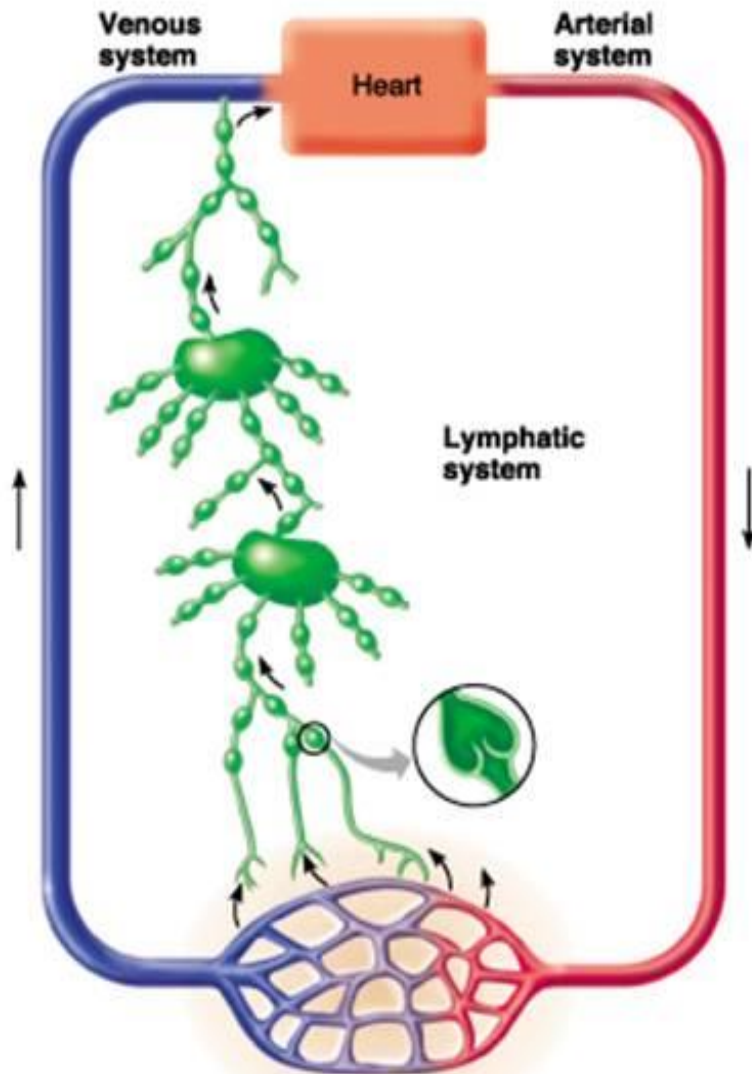
- **What is lymph?**

Tissue fluid (interstitial fluid) that enters the lymphatic vessels

FORMATION AND TRANSPORT OF TISSUE FLUID



LYMPHATIC SYSTEM



Essentially a drainage system accessory to venous system

larger particles that escape into tissue fluid can only be removed via lymphatic system

Functions of the Lymphatic System

24-

- **Reabsorbs excess interstitial fluid:**
 - returns it to the venous circulation
 - maintain blood volume levels
 - prevent interstitial fluid levels from rising out of control.

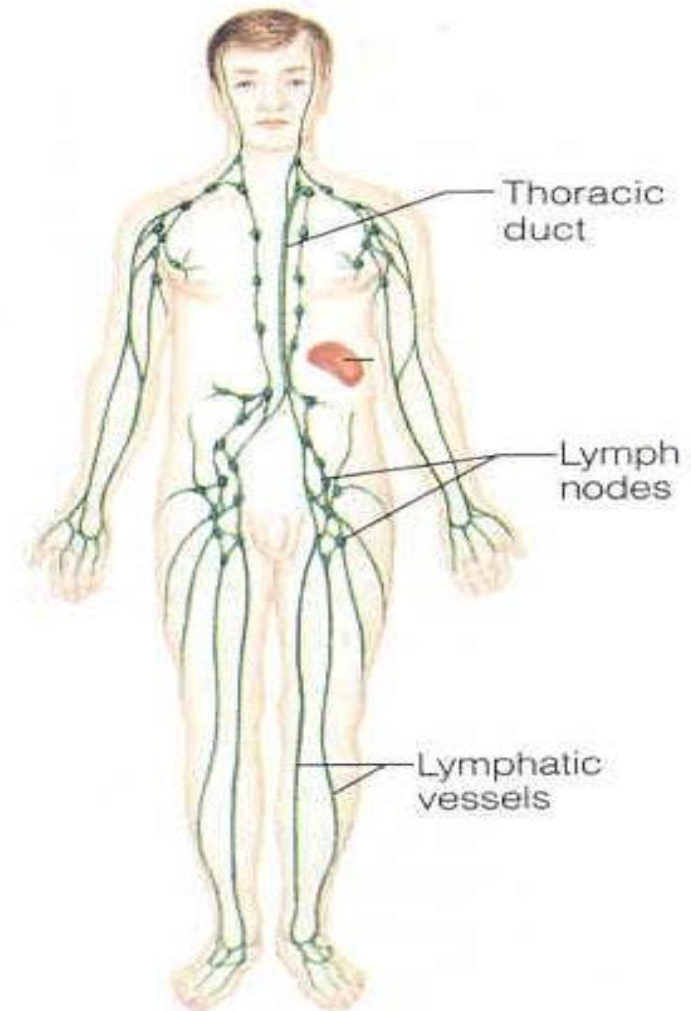
- **Transport dietary lipids:**
 - transported through **lacteals**
 - drain into larger lymphatic vessels
 - eventually into the bloodstream.

- **lymphocyte development, and the immune response .**

Components of the Lymphatic System

24-

- **Lymph**
- **Lymphatic Vessels**
 - **Lymphatic Capillaries**
 - **Lymphatic Vessels**
 - **Lymphatic Trunks**
 - **Lymphatic Ducts**
- **Lymphatic Organs**
 - **Thymus**
 - **Lymph Nodes**
 - **Spleen**
 - **Tonsils**
- **Lymphatic cells**



Lymphatic system

Lymph Vessels

- Lymphatic **capillaries**—
- Lymphatic **collecting vessels**
- Lymphatic **trunks** —
- Lymphatic **ducts** —

Lymphatic capillary



Lymphatic vessel



Lymph node



Lymphatic vessel



Lymphatic trunk

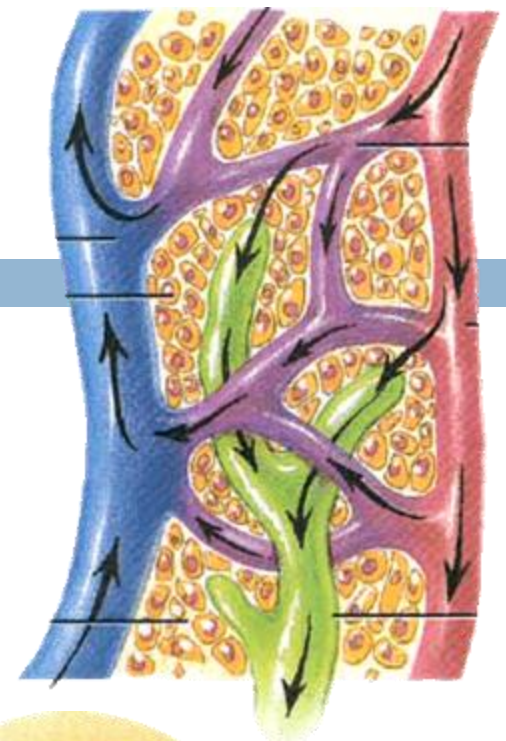


Collecting duct



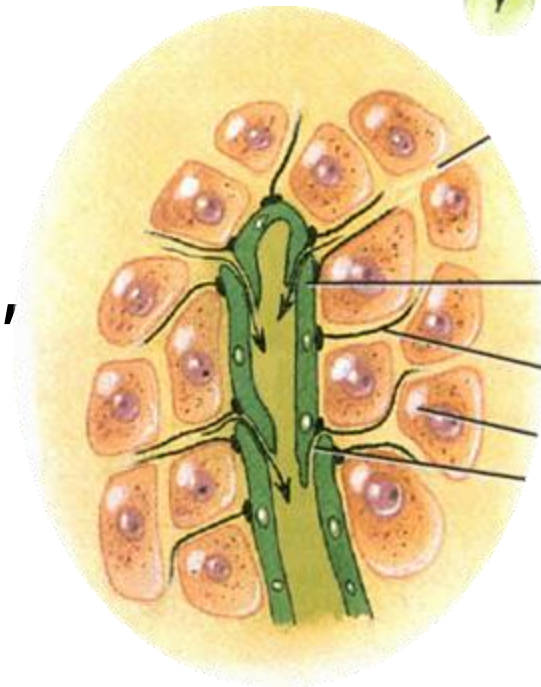
Subclavian vein

Lymphatic Capillaries



Features of structure :

- ❑ Blind end
- ❑ Single layer of overlapping endothelial cells
- ❑ More permeable than that of blood capillary
- ❑ Absent from avascular structures, brain, spinal cord splenic pulp and bone marrow



Lymphatic Capillaries –Lacteals

24-

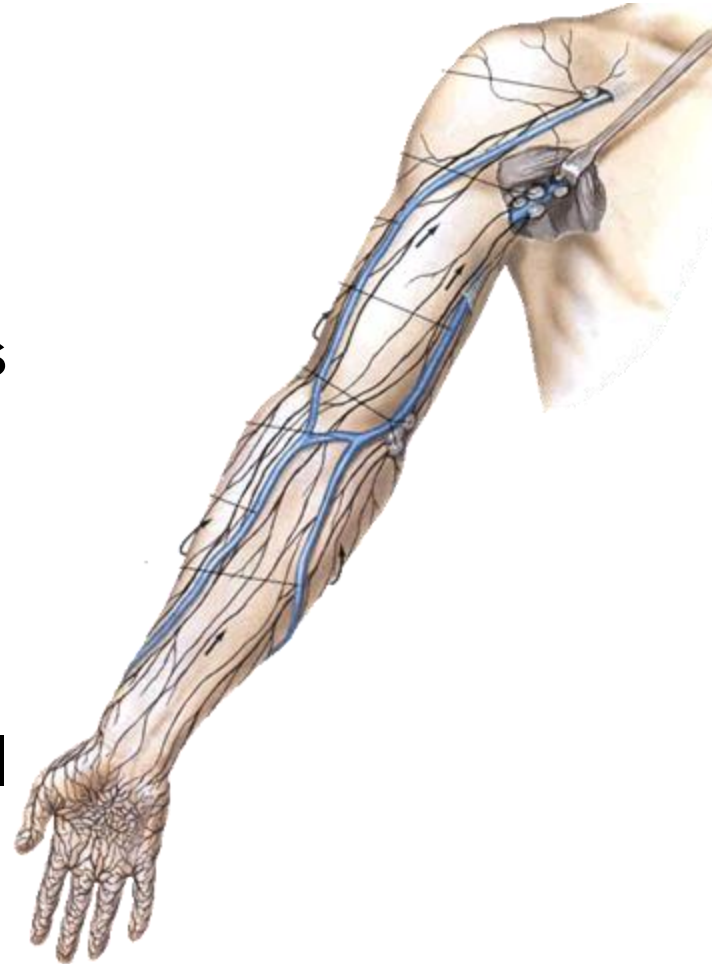
- The **small intestine** contains special types of lymphatic capillaries called lacteals .
- **Lacteals** pick up not only interstitial fluid, but also dietary lipids and lipid-soluble vitamins .
- The lymph of this area has a milky color due to the lipid and is also called **chyle**.

Lymphatic Vessels

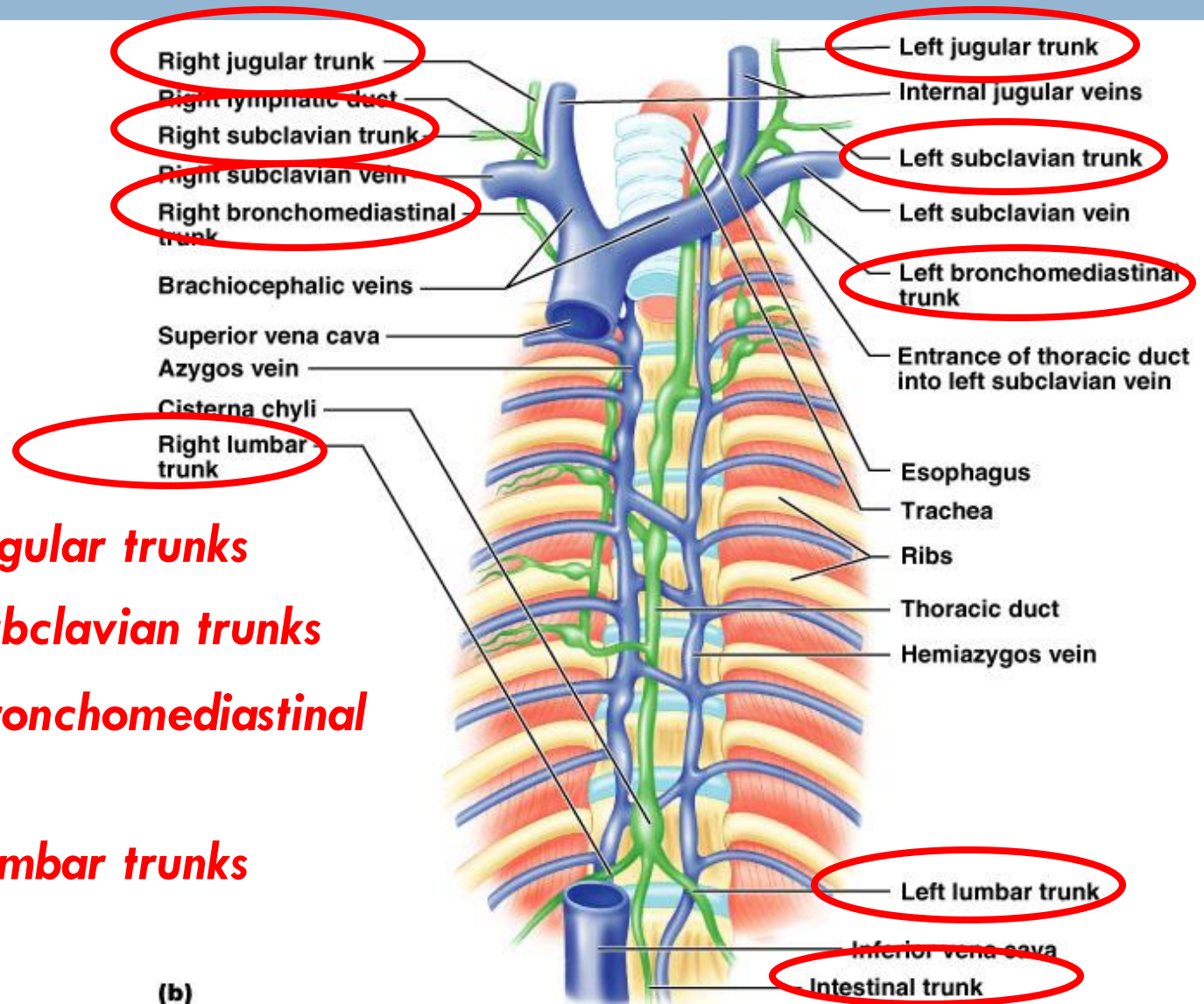
24-

Features of structure

- ❑ Three layered wall but thinner than vein ,
- ❑ More numerous valves than in vein
- ❑ Interposed by lymph nodes at intervals
- ❑ Arranged in superficial and deep sets



LYMPH TRUNKS



(b)

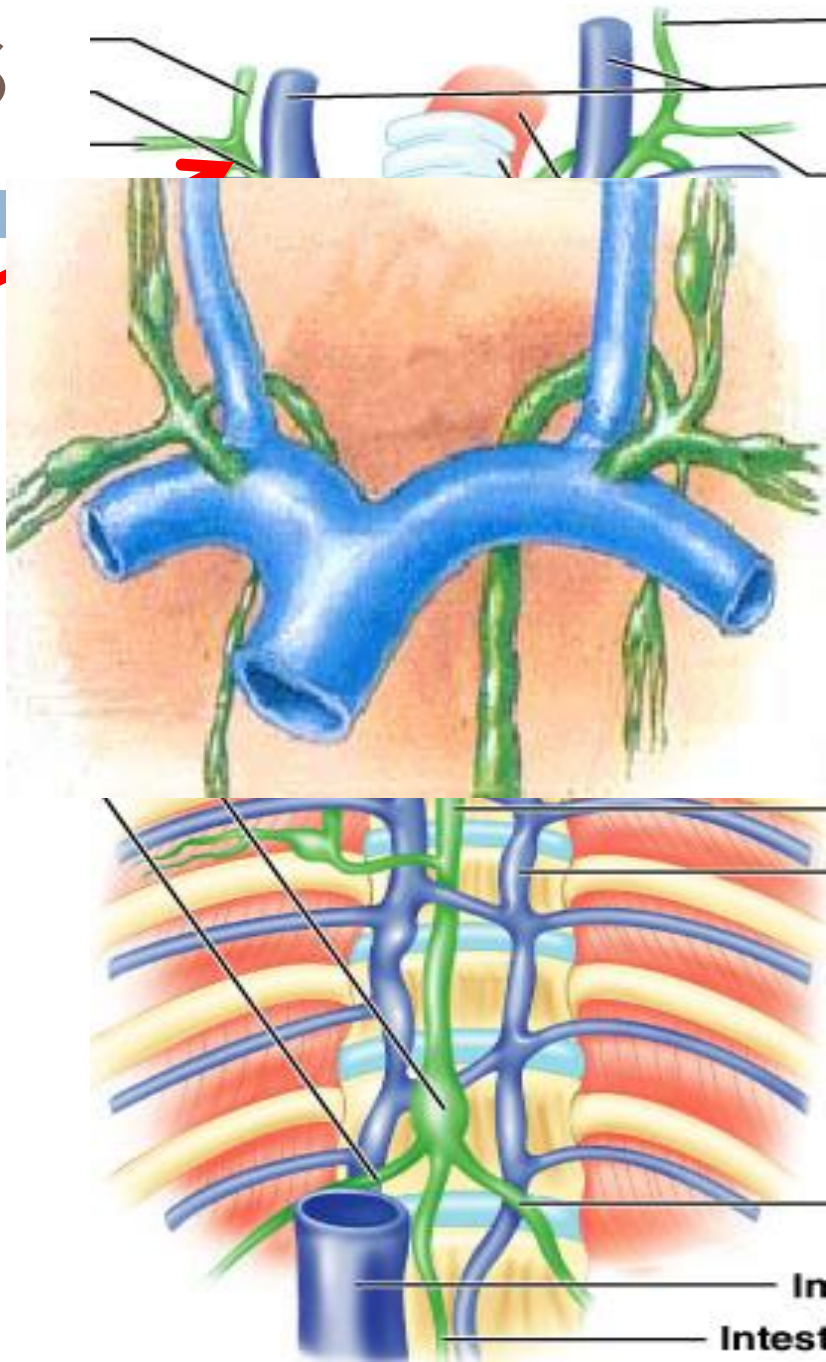
- right and left **jugular trunks**
- right and left **subclavian trunks**
- right and left **bronchomediastinal trunks**
- right and left **lumbar trunks**
- intestinal trunk**

LYMPHATIC DUCTS

24-

Right lymphatic duct

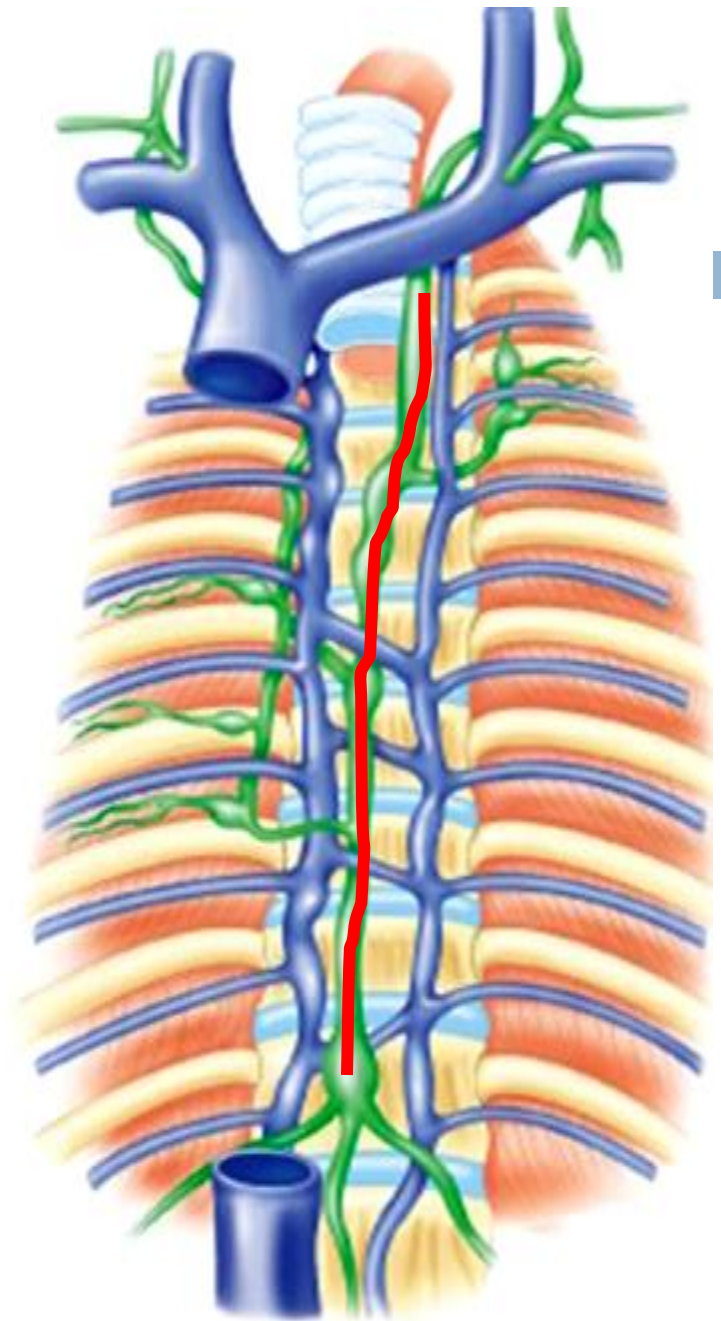
- Formed by union of **right jugular, subclavian, and bronchomediastinal trunks**
- Ends by entering the **right venous angle**



LYMPHATIC DUCTS

□ Thoracic duct

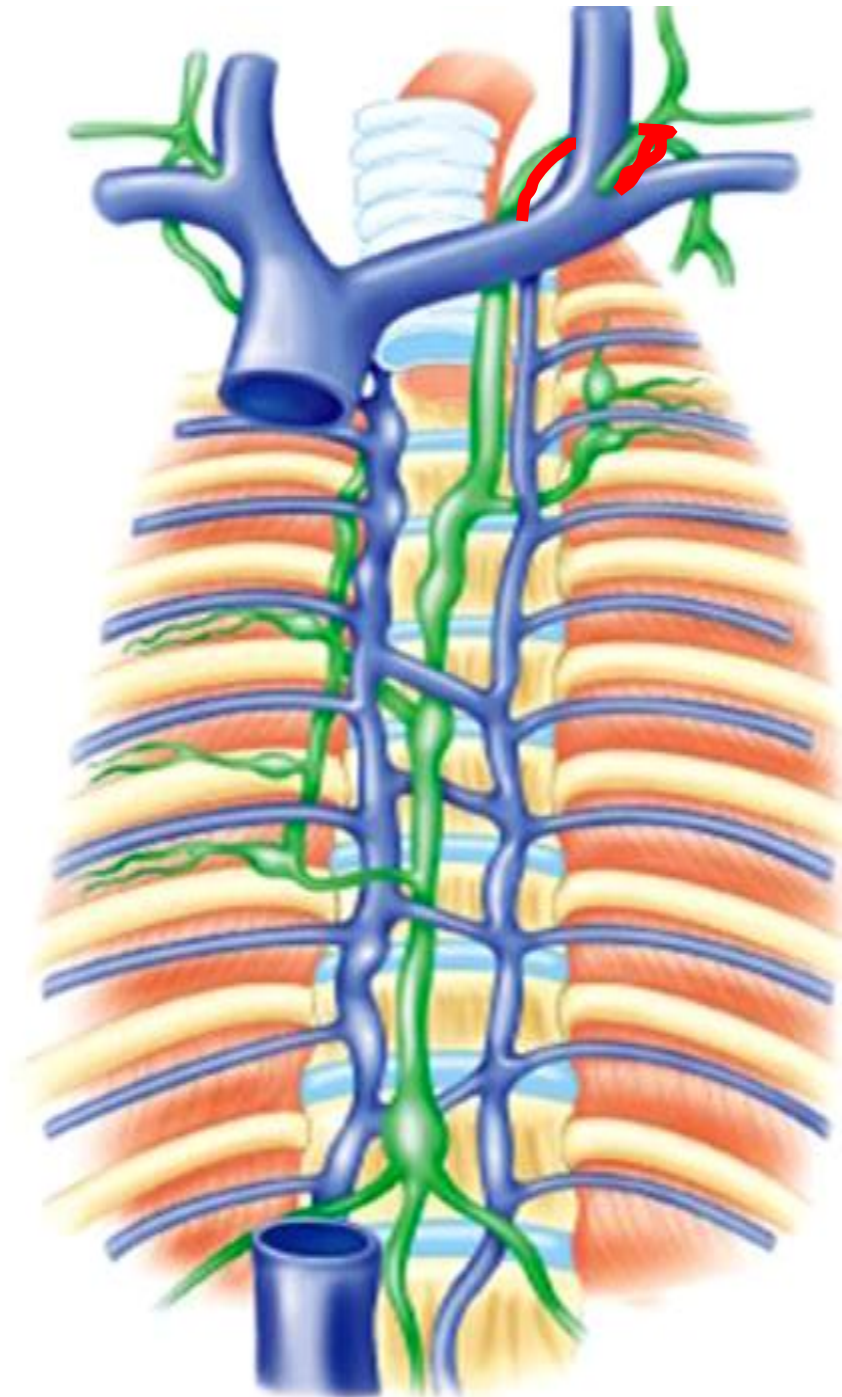
- Begins in front of L1 as a dilated sac, the **cisterna chyli**,
- formed by left and right lumbar trunks and intestinal trunk
- Enter thoracic cavity & ascends
- Travels upward, veering to the left at the level of T5



THORACIC DUCT.....

15

- **At the root of the neck, it turns laterally**
- **arches forwards and descends to enter the left venous angle**
- **before termination, it receives the left jugular, Subclavian and broncho-mediastinal trunk**

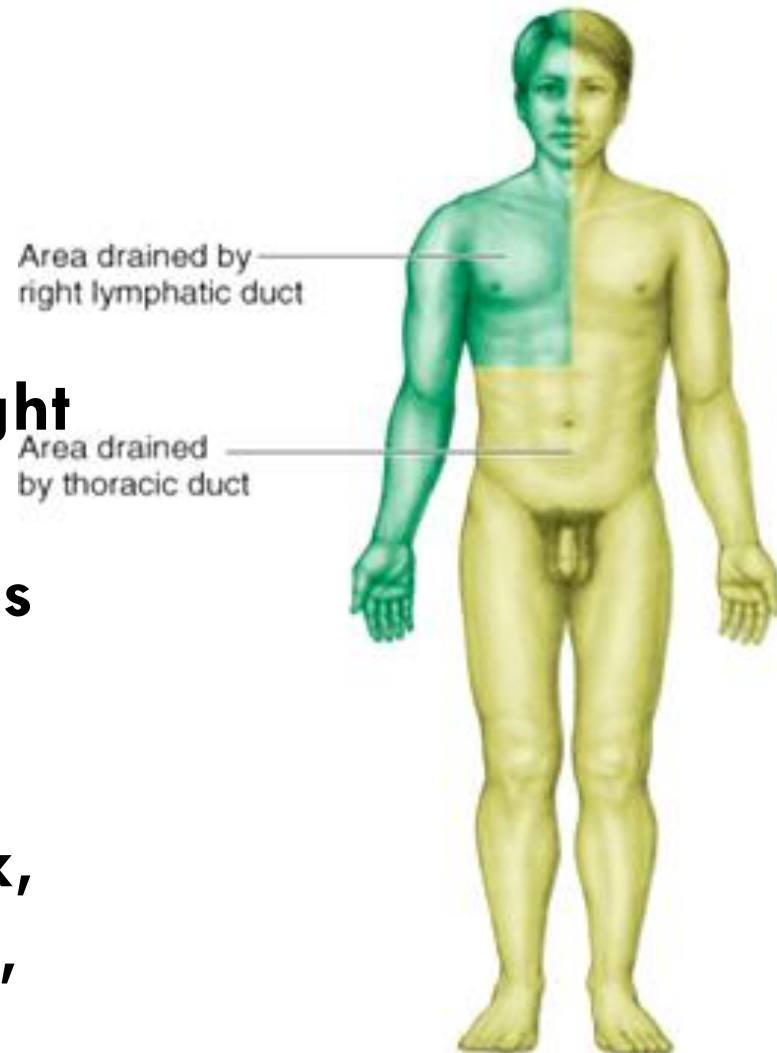


DRAINAGE PATTERN

RIGHT LYMPHATIC DUCT -

Receives lymph from right half of head, neck, thorax and right upper limb, right lung, right side of heart, right surface of liver

THORACIC DUCT - Drains lymph from lower limbs, pelvic cavity, abdominal cavity, left side of thorax, and left side of the head, neck and left upper limb



(b) Lymph drainage pattern

Lymphatic Cells

24-

- Also called **lymphoid cells** .
- Located in both the lymphatic system and the cardiovascular system .
- Work together to elicit an **immune response** .
- Types of lymphatic cells are :
 - ▣ **macrophages**
 - ▣ **epithelial cells**
 - ▣ **dendritic cells**
 - ▣ **lymphocytes**

LYMPHATIC ORGANS

2 group based on function

Primary organs: sites where stem cell divide and mature

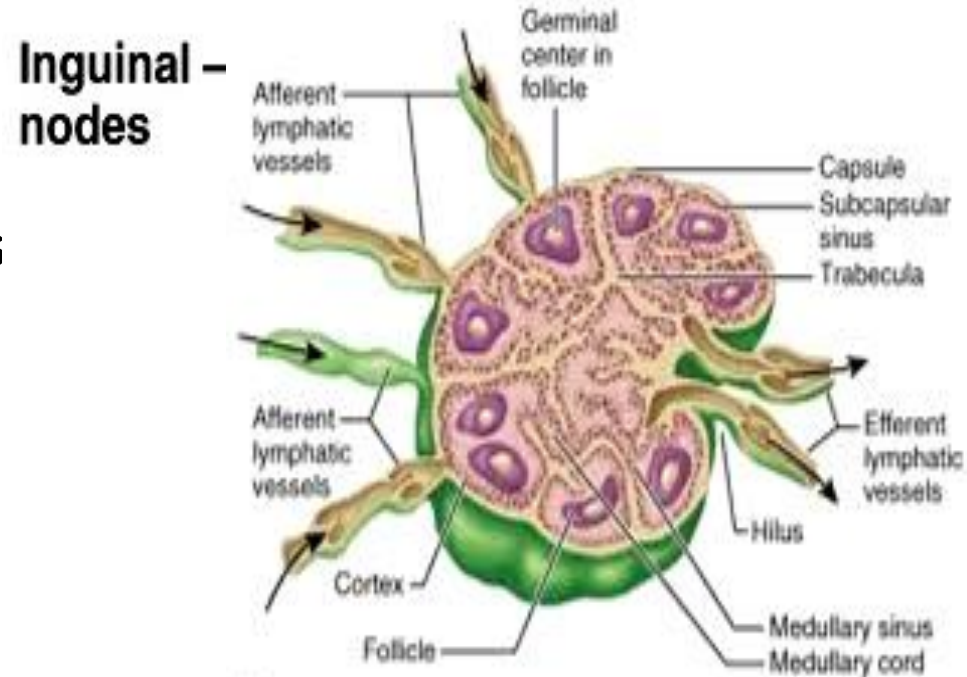
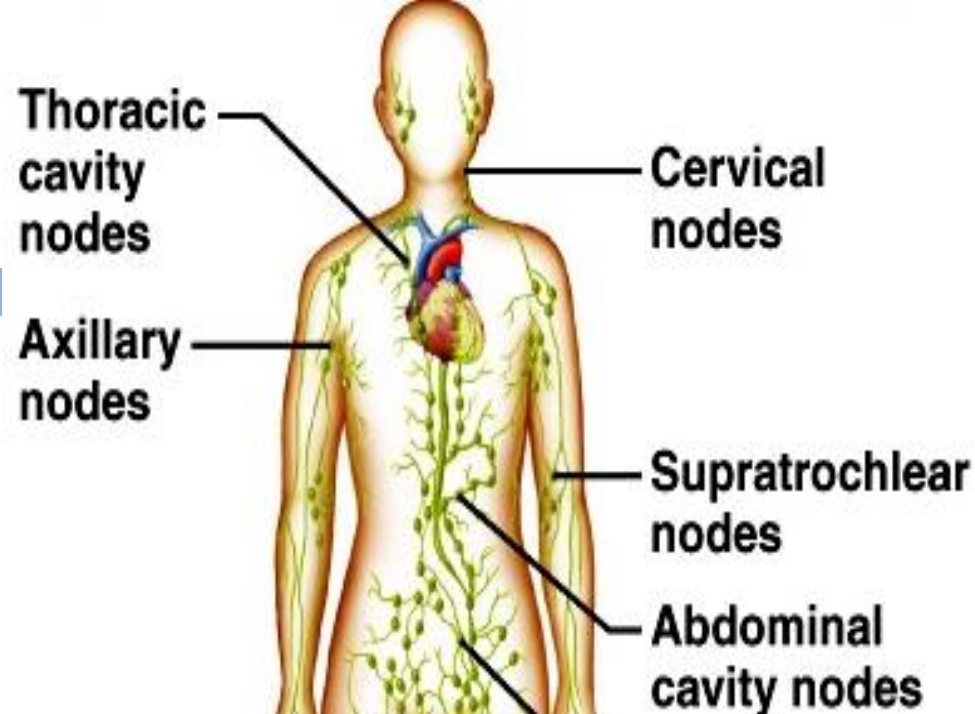
- ▣ **Red bone marrow**
- ▣ **Thymus gland**

Secondary organs: sites where most immune response occur

- ▣ **Lymph nodes**
- ▣ **Lymph nodules**
- ▣ **Spleen**

Lymph Nodes

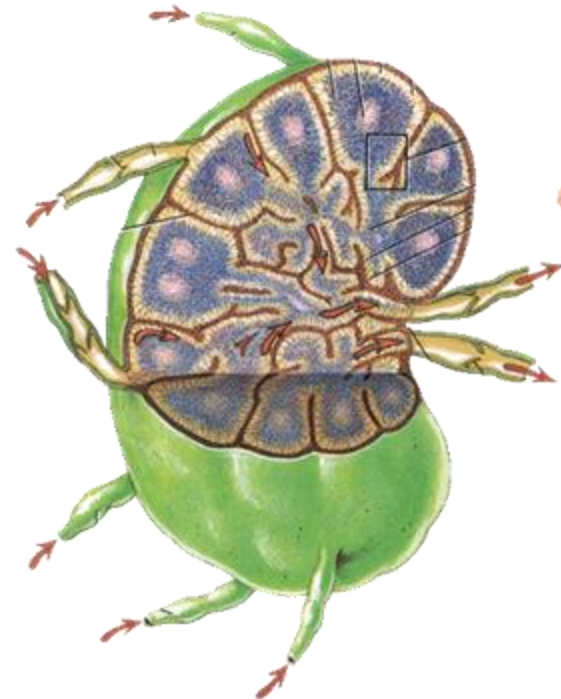
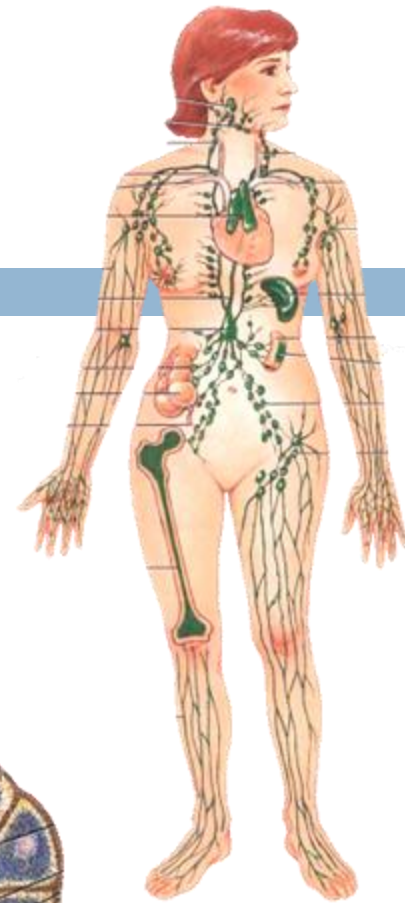
- 24- **Small, round or oval**
- located along the pathways of lymph vessels .**
- length from 25 -1 millimeters**
- Typically found in clusters**
- receive lymph from many body regions .**
- Lymph nodes are also found individually**



Lymph node

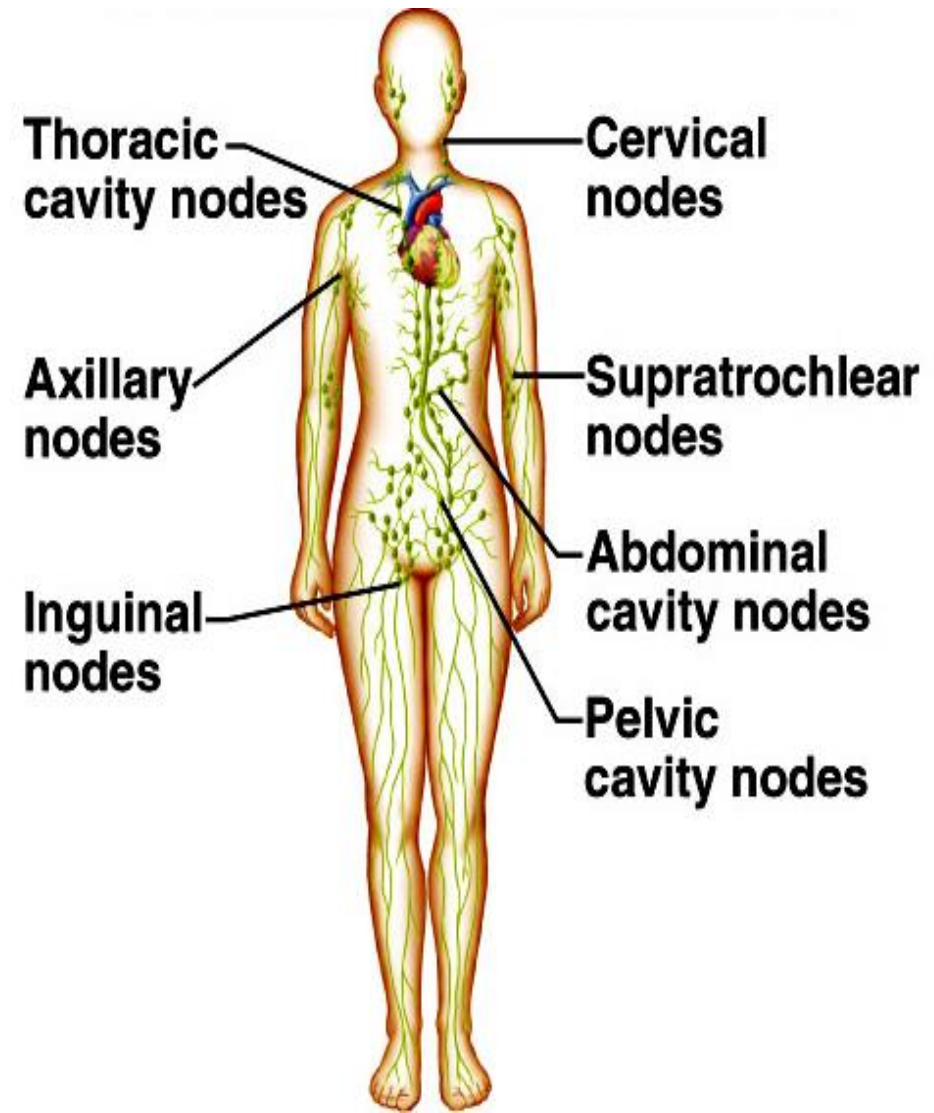
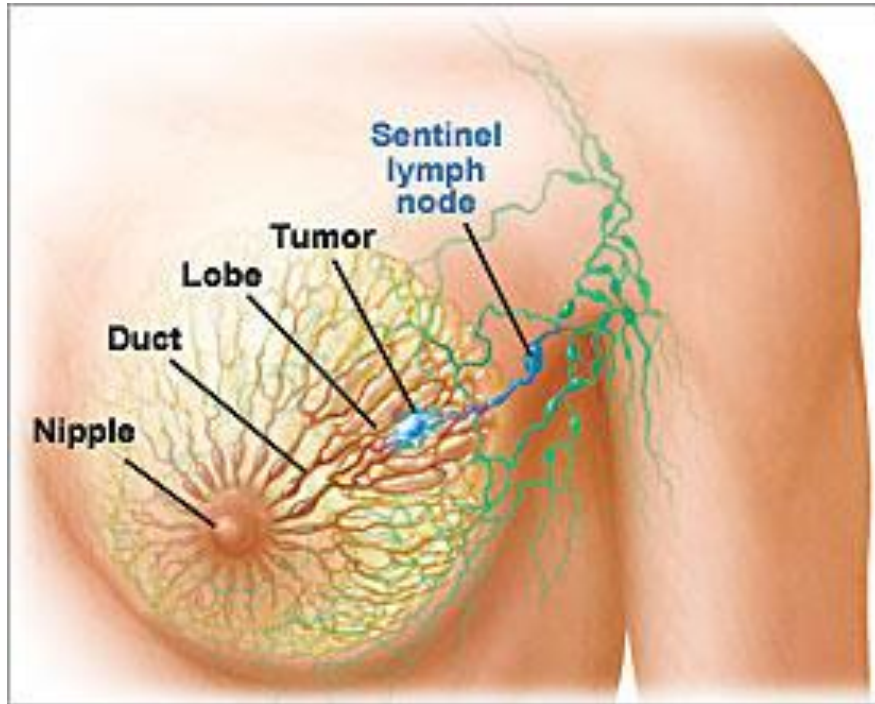
Features

- ❑ Bean-shaped bodies
- ❑ With **afferent vessels** (entering at the periphery) and **efferent lymph vessels** (emerging at the hilus)
- ❑ Arranged in groups, along the blood vessels or the flexural side of the joint
- ❑ Divided into **superficial and deep** groups



Regional Lymph drainage

21



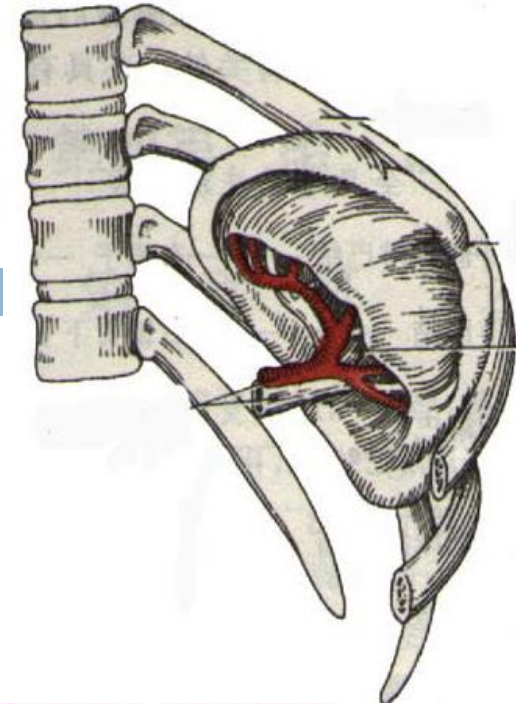
- Regional Lymph Node is the lymph node where the lymph of the organ or part of the body drainage to firstly

Sentinel Lymph Node in clinic

Spleen

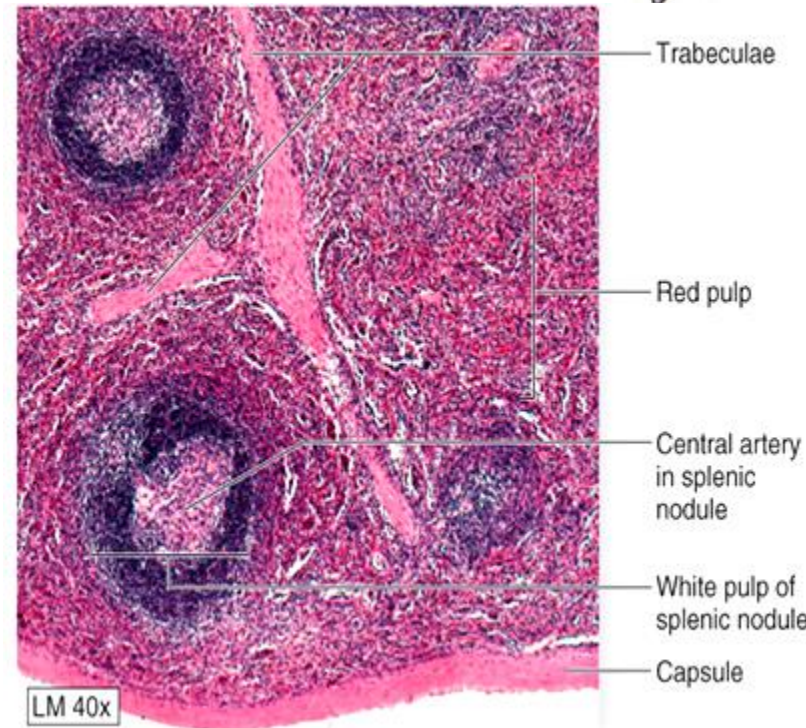
Location

- Left epigastric region
- between 9th-11th rib
- in line of 10th rib



- Largest lymphatic organ in the body .
- Can vary considerably in size and weight

Function

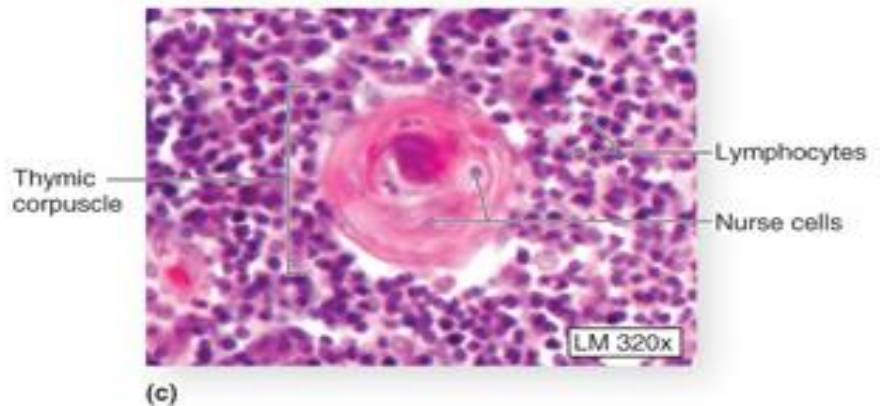
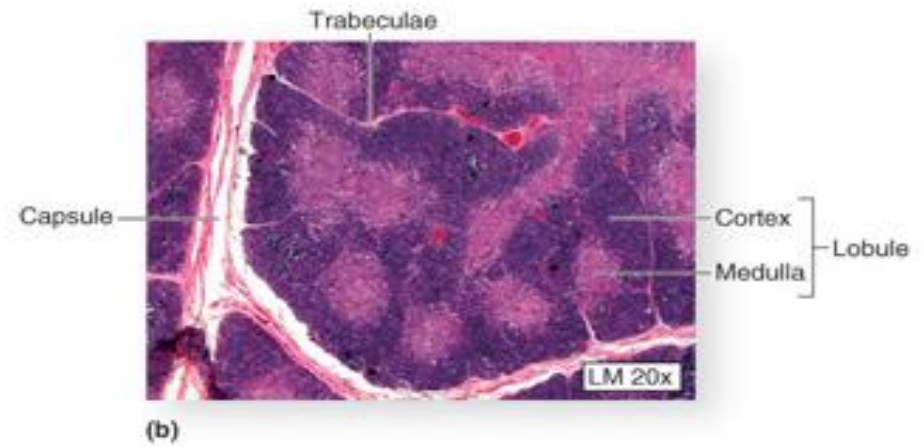
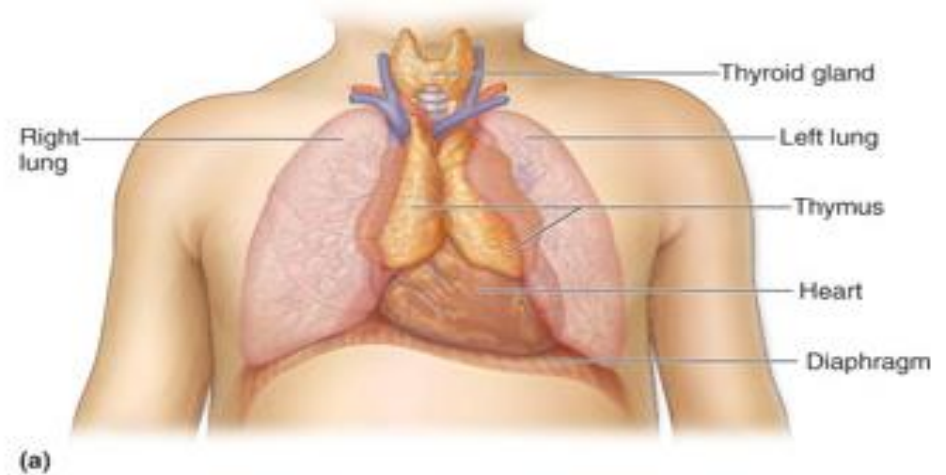


THYMUS

23

Features

- ❑ Consists of two elongated lobes
- ❑ Is a large organ in the fetus
- ❑ Occupies the thoracic cavity behind the sternum
- ❑ Secrete lymphopoietin



Lymphatic Nodules

24-

- **Oval clusters of lymphatic cells with some extracellular matrix that are not surrounded by a connective tissue capsule.**

- Filter and attack antigens .

- In some areas of the body, many lymphatic nodules group together to form larger structures.
 - mucosa-associated lymphatic tissue (MALT) or tonsils
 - very prominent in the mucosa of the small intestine, primarily in the ileum
 - **Peyer patches**
 - also present in the appendix

MALT

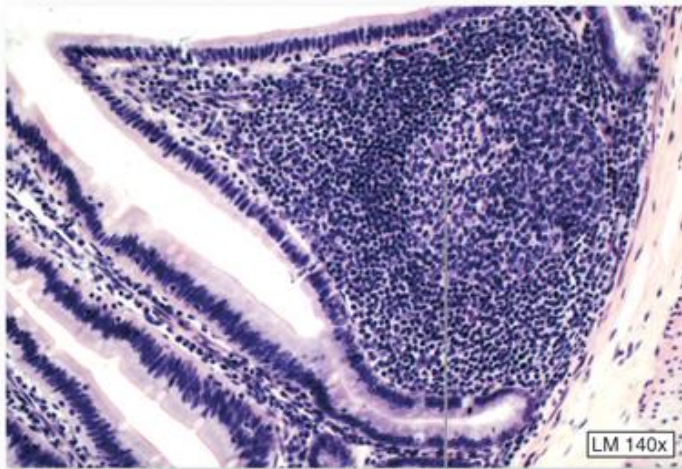
- MALT – mucosa-associated lymphatic tissue:
 - Peyer's patches, tonsils, and the appendix (digestive tract)
 - Lymphoid nodules in the walls of the bronchi (respiratory tract)
- MALT protects the digestive and respiratory systems from foreign matter

Tonsils

24-

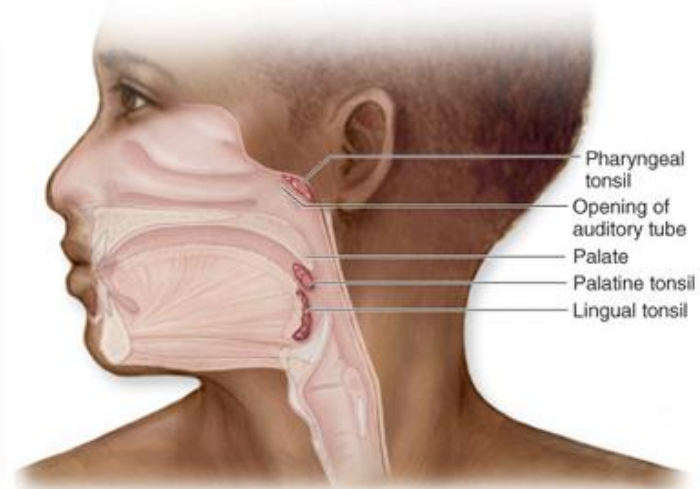
- **clusters of lymphatic cells** and extracellular matrix not completely surrounded by a connective tissue capsule.
- **Consist of multiple germinal centers and crypts**
- **Several groups of tonsils form a protective ring around the pharynx .**
 - **pharyngeal tonsils (or adenoids)** in nasopharynx
 - **palatine tonsils** in oral cavity
 - **lingual tonsils** along posterior one-third of the tongue

MALT (Mucosa Associated Lymphoid Tissue)

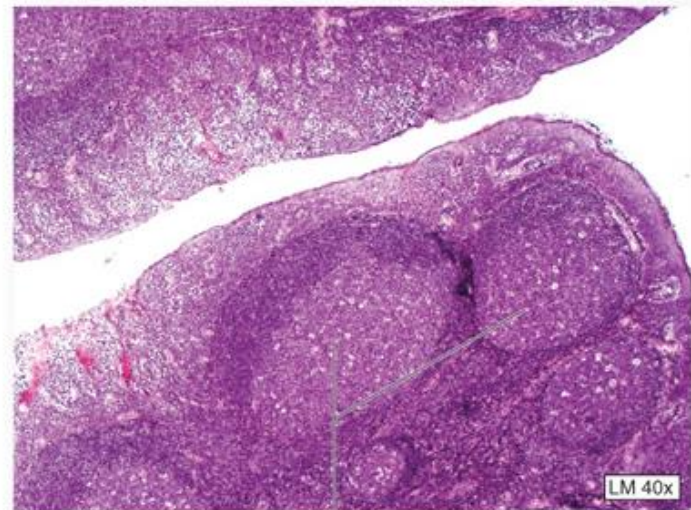


Simple columnar epithelium of small intestine MALT (Peyer patches)

(a)



(b)



Lymphatic nodules



Quiz

QUESTION. 1

- I am a part of lymphatic system and protect the body by clearing worn out red cells and foreign bodies from the blood stream. Who am I?



- A. Thymus
- B. Palatine Tonsil
- C. Spleen
- D. Lymph node

QUESTION. 2

- **Which of these is a primary lymphoid organ?**
 - A. Lymph Node**
 - B. Spleen**
 - C. Tonsil**
 - D. Bone Marrow**