

LYMPHATIC SYSTEM

A&P

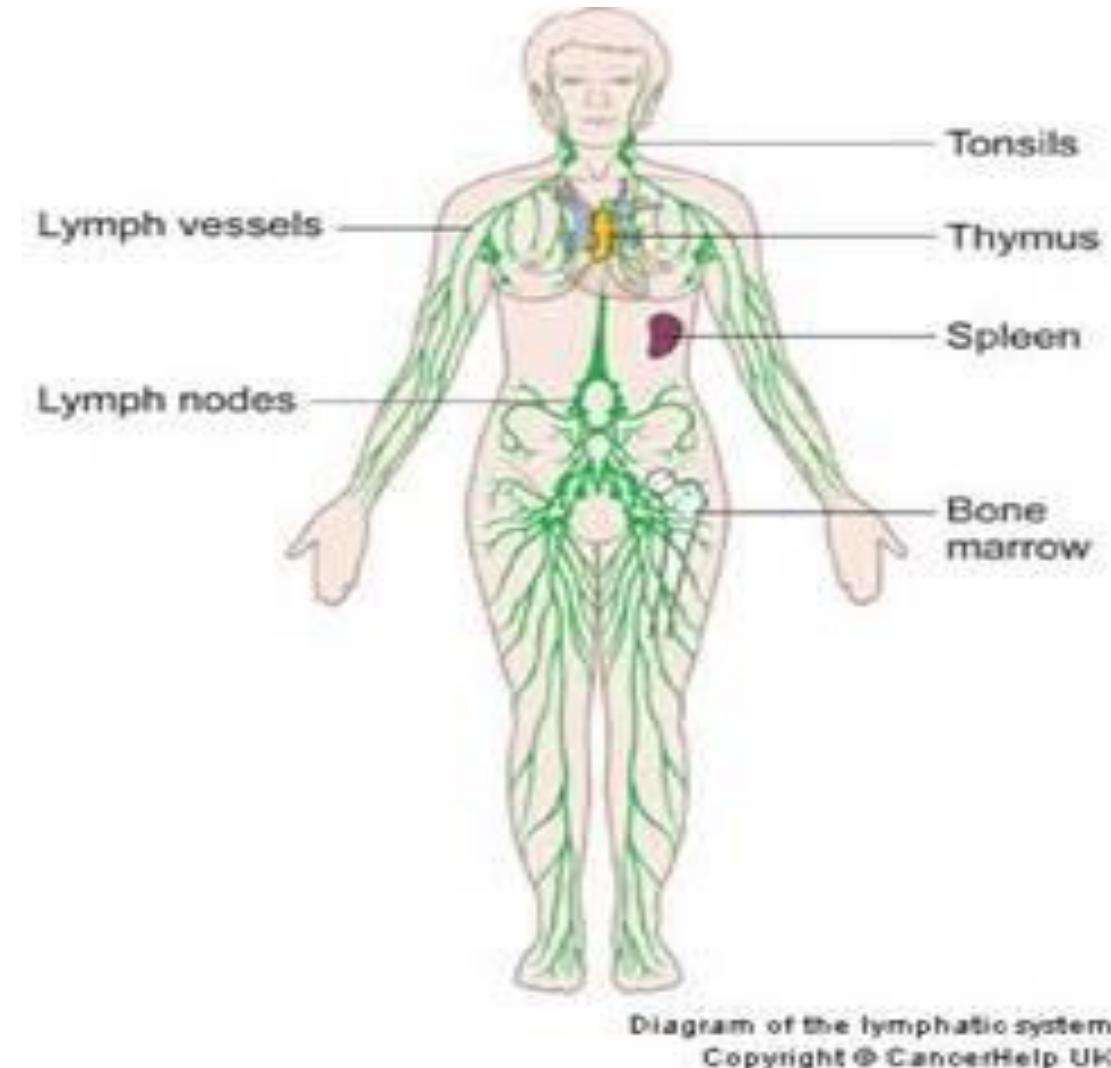
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OBJECTIVES

5. Explain structures and functions of lymphatic system.
 - A. Identify the structures and components that make up lymphatic system and their respective functions
 - B. Identify the types of immunity and immune responses (article information).
 - C. Describe the relationship between the lymphatic system and the circulatory system and immunity.

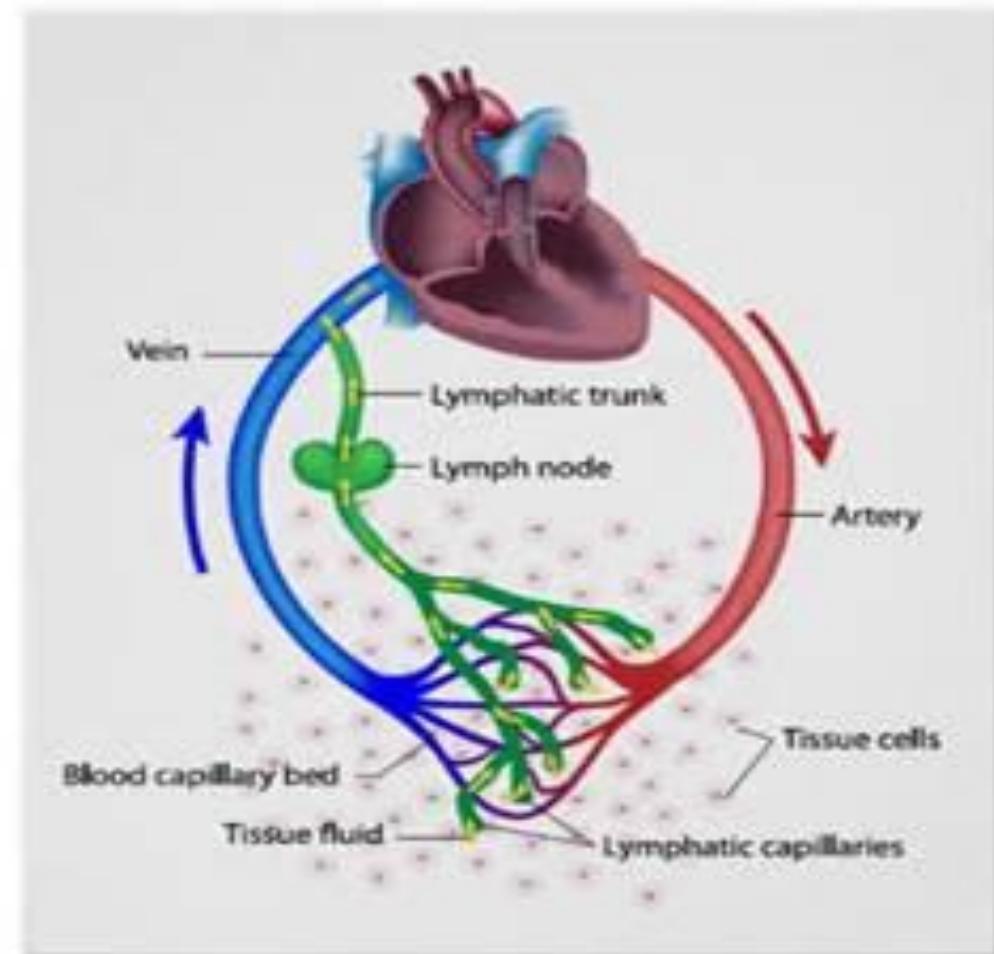
LYMPHATIC SYSTEM CONSISTS OF:

- Lymph
- Lymphatic vessels
- Lymph nodes
- Lymphatic ducts
- Lymphatic tissue



LYMPHATIC SYSTEM FUNCTIONS:

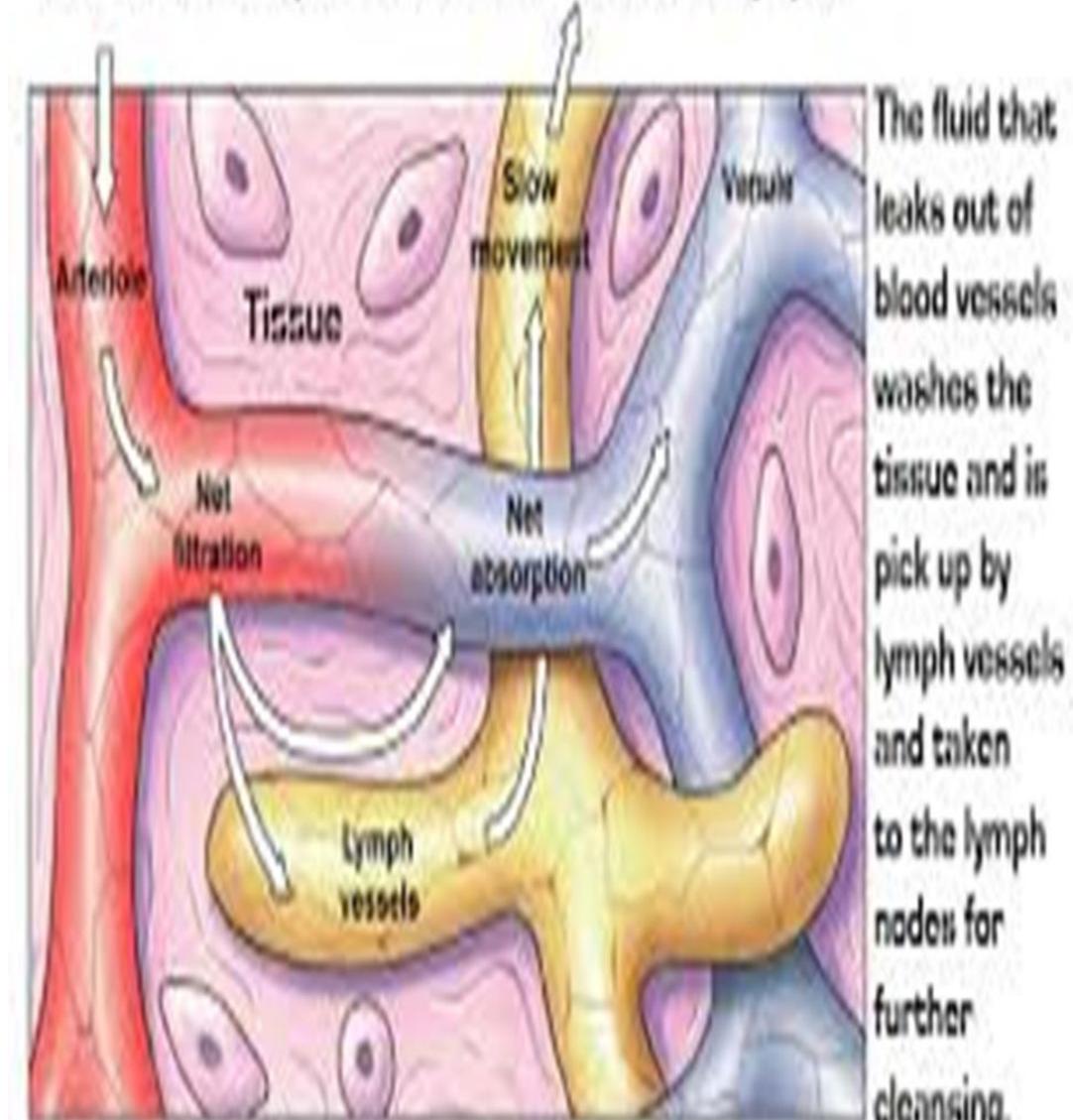
- ❑ Works with the CV system to remove wastes and excess fluids from the tissues
- ❑ Part of the body's defense (immune system) to protect us from pathogens



LYMPH:

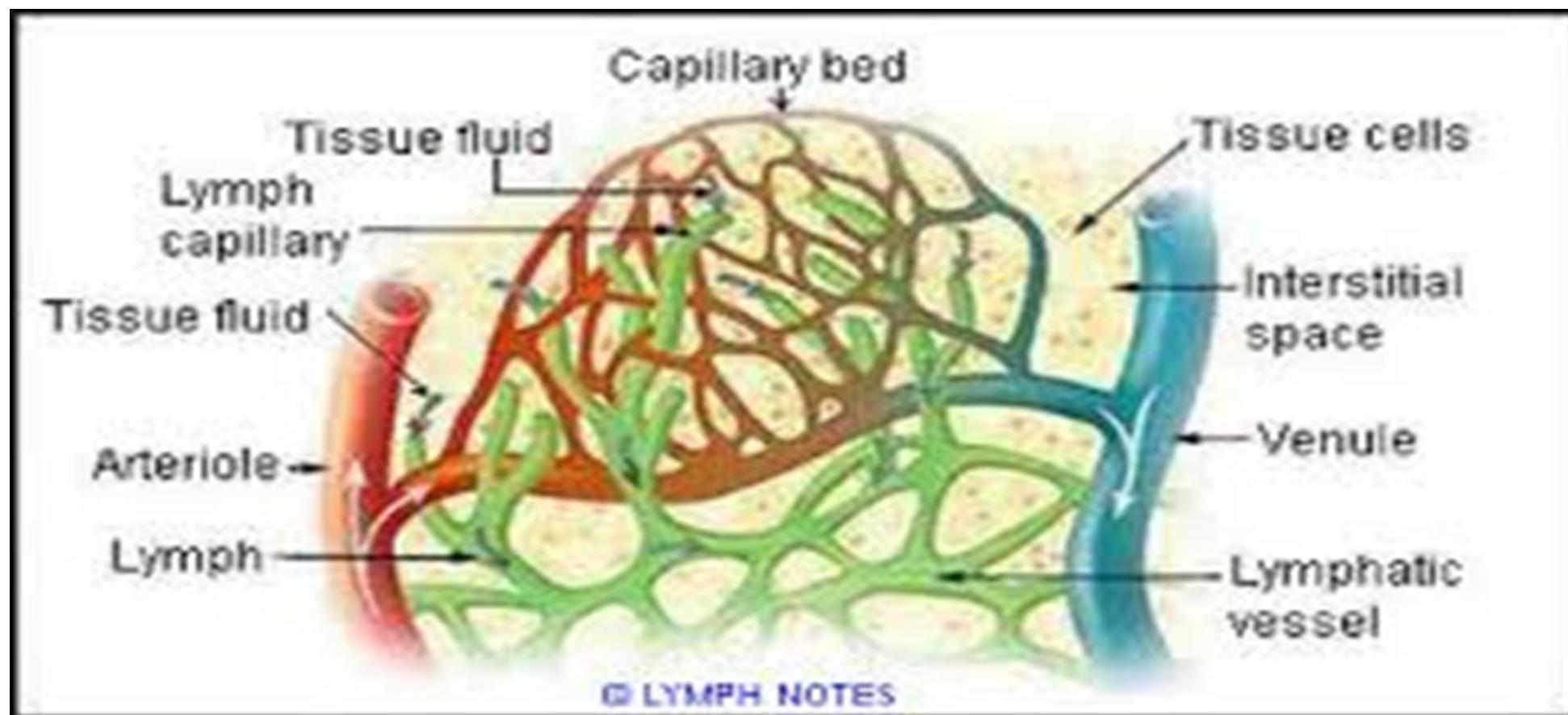
- Thin, watery fluid made of intercellular (interstitial) fluid
- It forms when plasma leaks out of blood vessels into tissue spaces
- Made of water, digested nutrients, salts, hormones, O₂, CO₂, lymphocytes, metabolic wastes (urea)
- Once this interstitial fluid enters lymphatic system it is called lymph

The white arrow represents the fluid that becomes lymph.



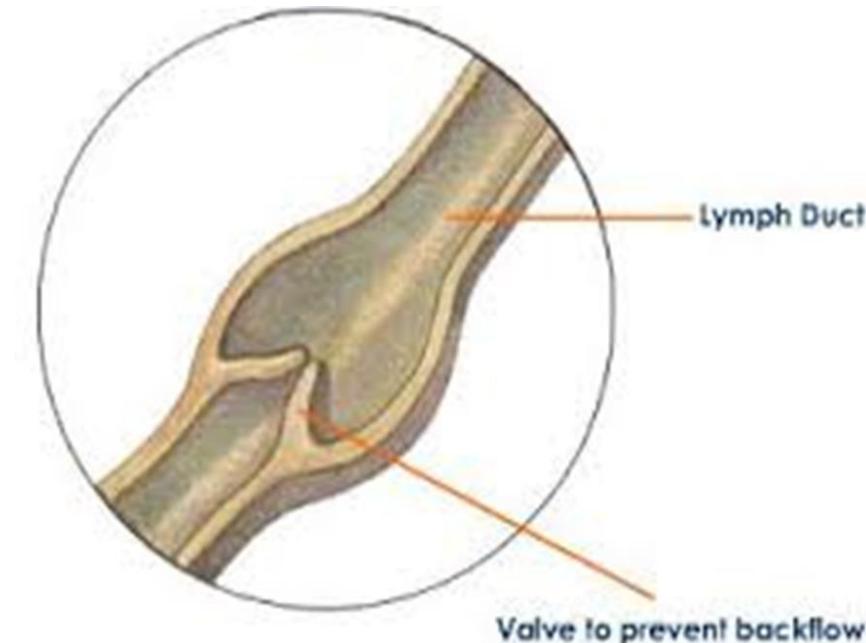
LYMPHATIC VESSELS:

- Located in almost all body tissues close to blood vessels



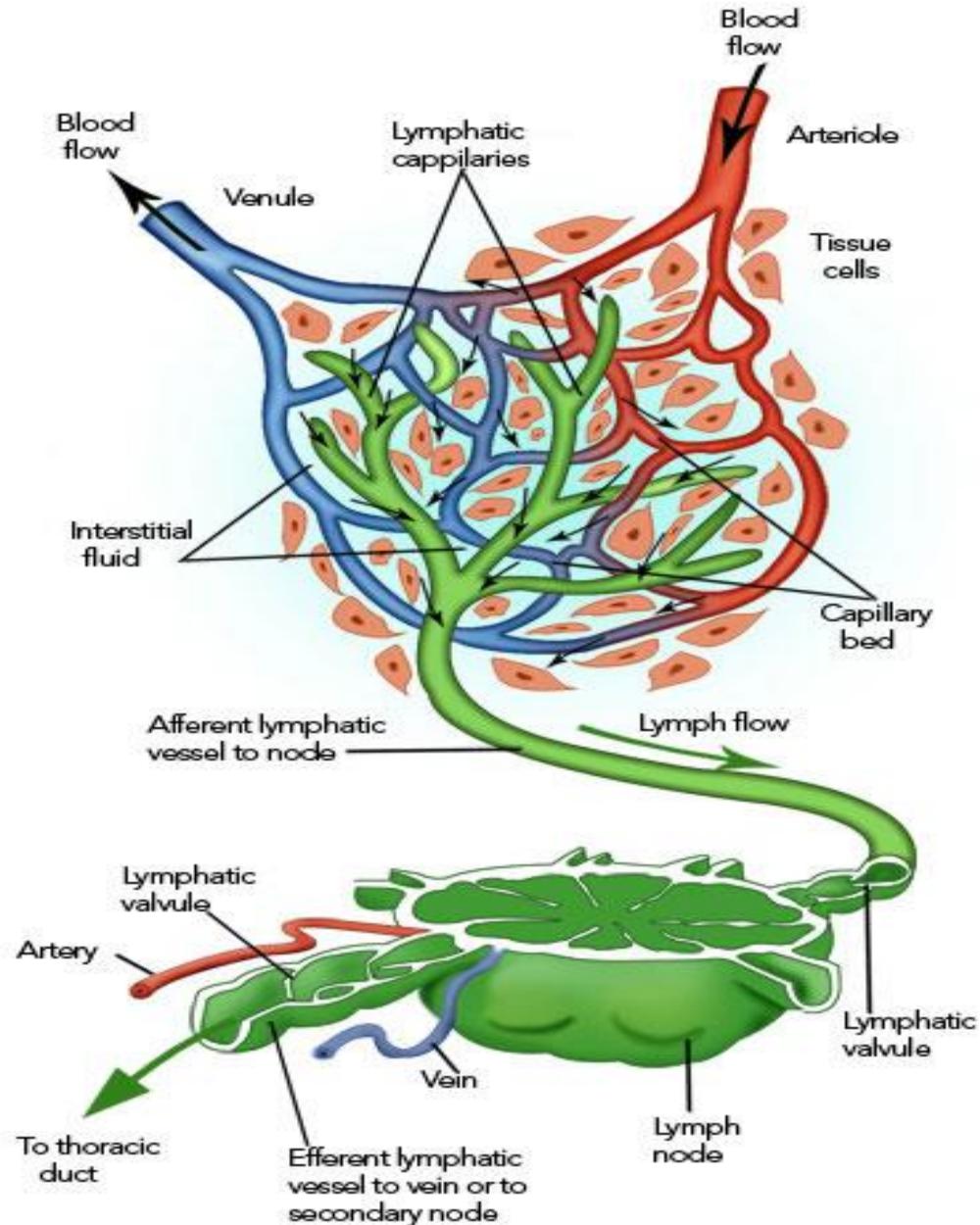
LYMPHATIC VESSELS:

- Contain valves to keep lymph flowing in one direction
- Skeletal muscle contractions against lymph vessels cause lymph to flow through the vessels



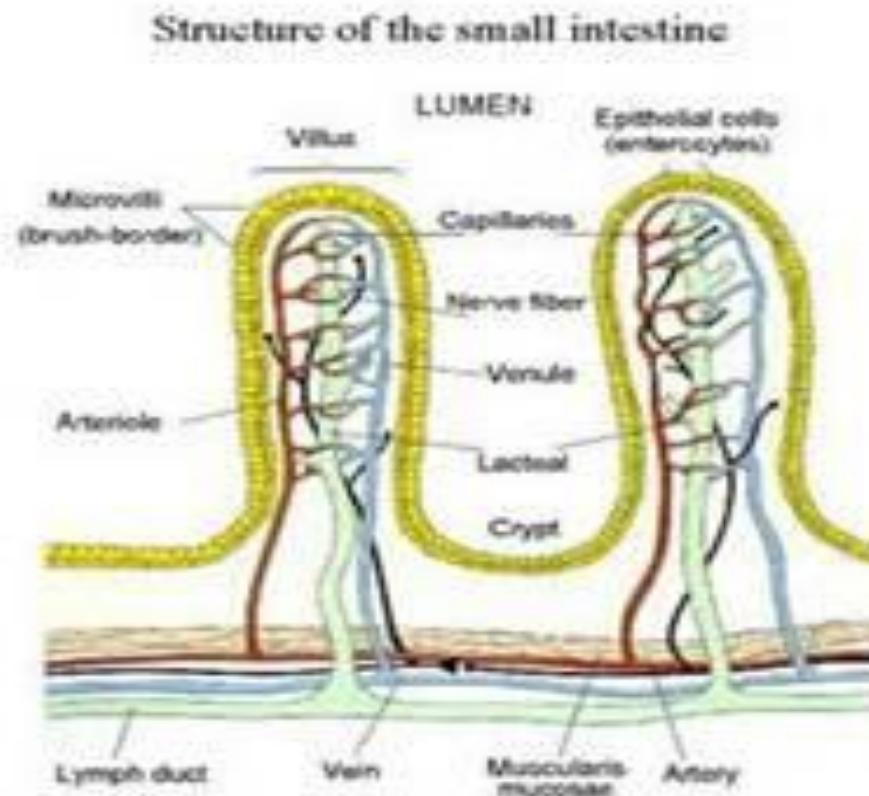
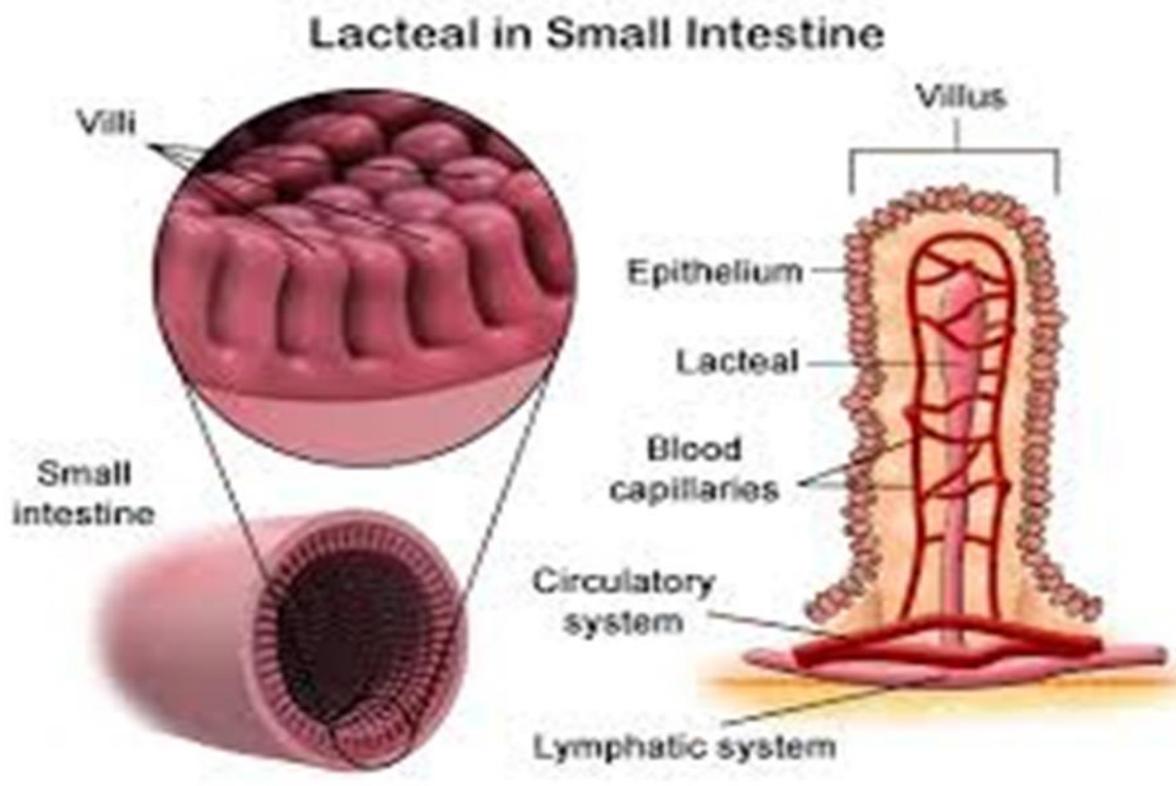
LYMPHATIC VESSELS:

- **Lymphatic capillaries**=small, open-ended lymph vessels that pick up lymph at tissues
- Lymphatic capillaries join together to form larger lymphatic vessels which pass through lymph nodes



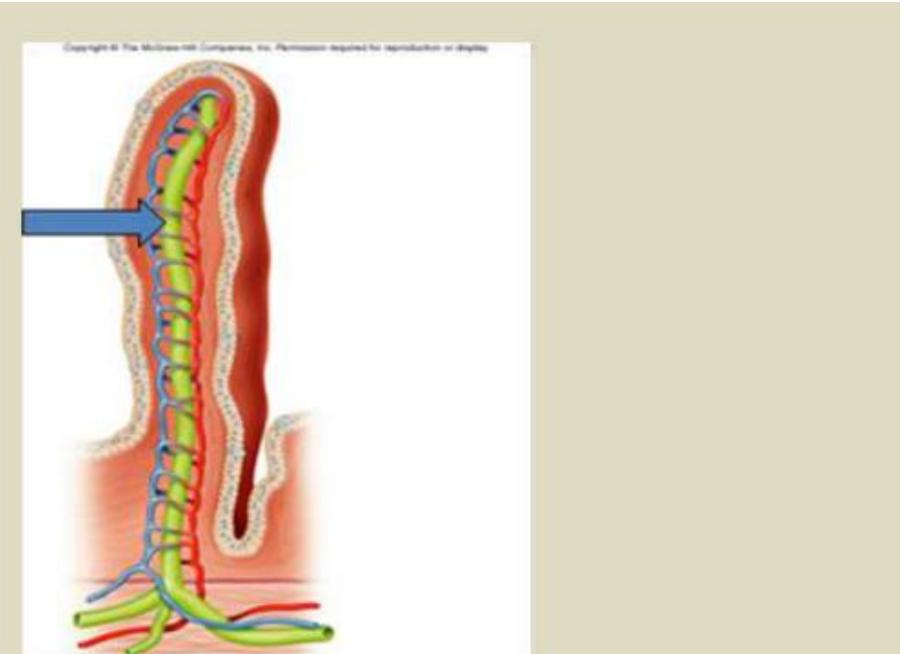
LYMPHATIC VESSELS:

- Lacteals=specialized lymph capillaries in the small intestines that pick up digested lipids (fats)



LYMPHATIC VESSELS:

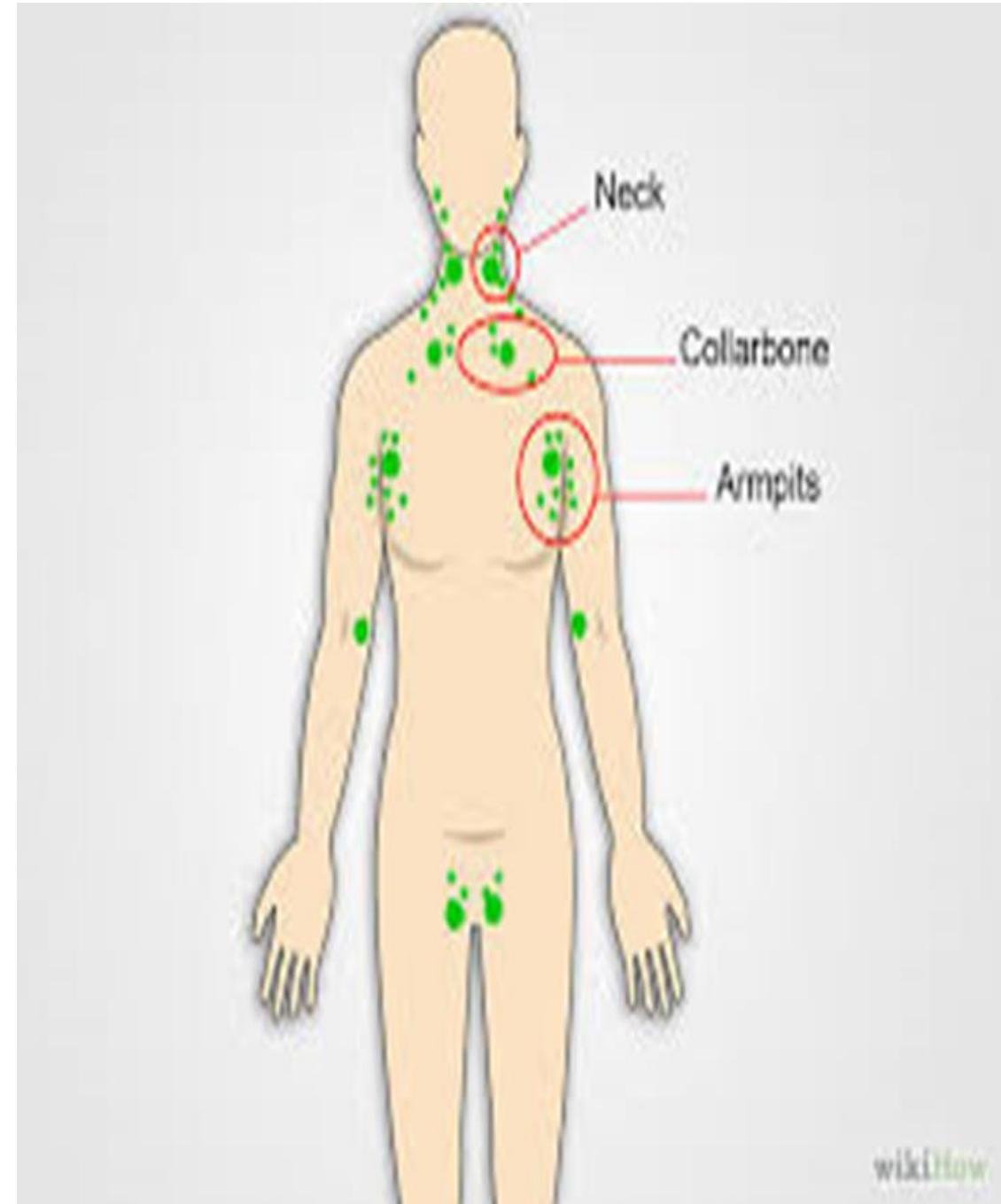
- Chyle=lymph mixed with lipids
- Lacteals transport chyle to the bloodstream through the thoracic duct



Name this lymphatic vessel.

LYMPH NODES:

- AKA lymph glands
- Located in clusters all over the body
- Small, round, or oval masses
- Size ranges from pinhead to almond
- Filter lymph and remove impurities- carbon, cancer cells, pathogens, dead blood cells



LYMPH NODES:

- Produce lymphocytes (type of WBC) and antibodies (fight infection)
- Purified lymph with added lymphocytes and antibodies leaves node by a single lymphatic vessel

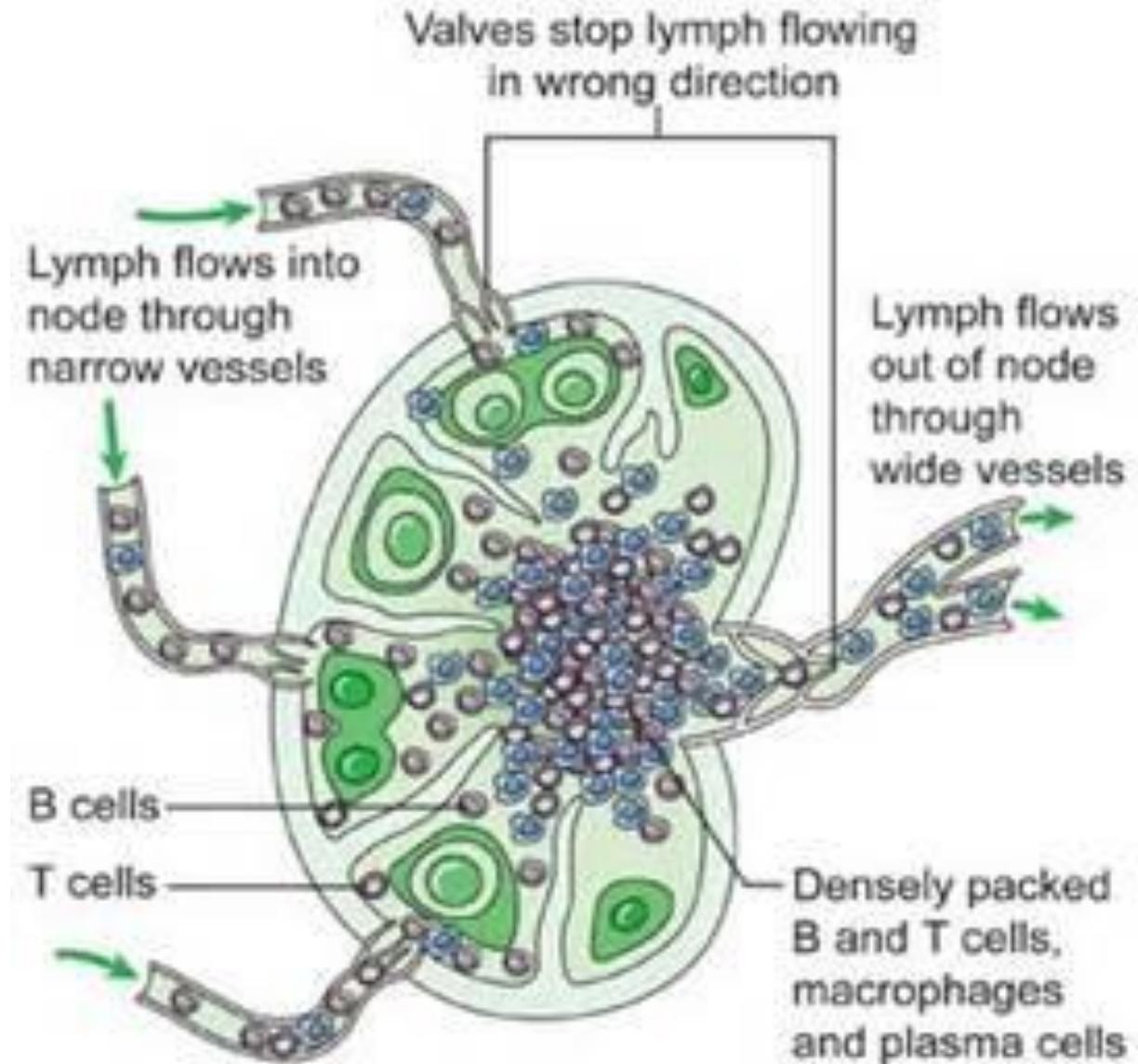
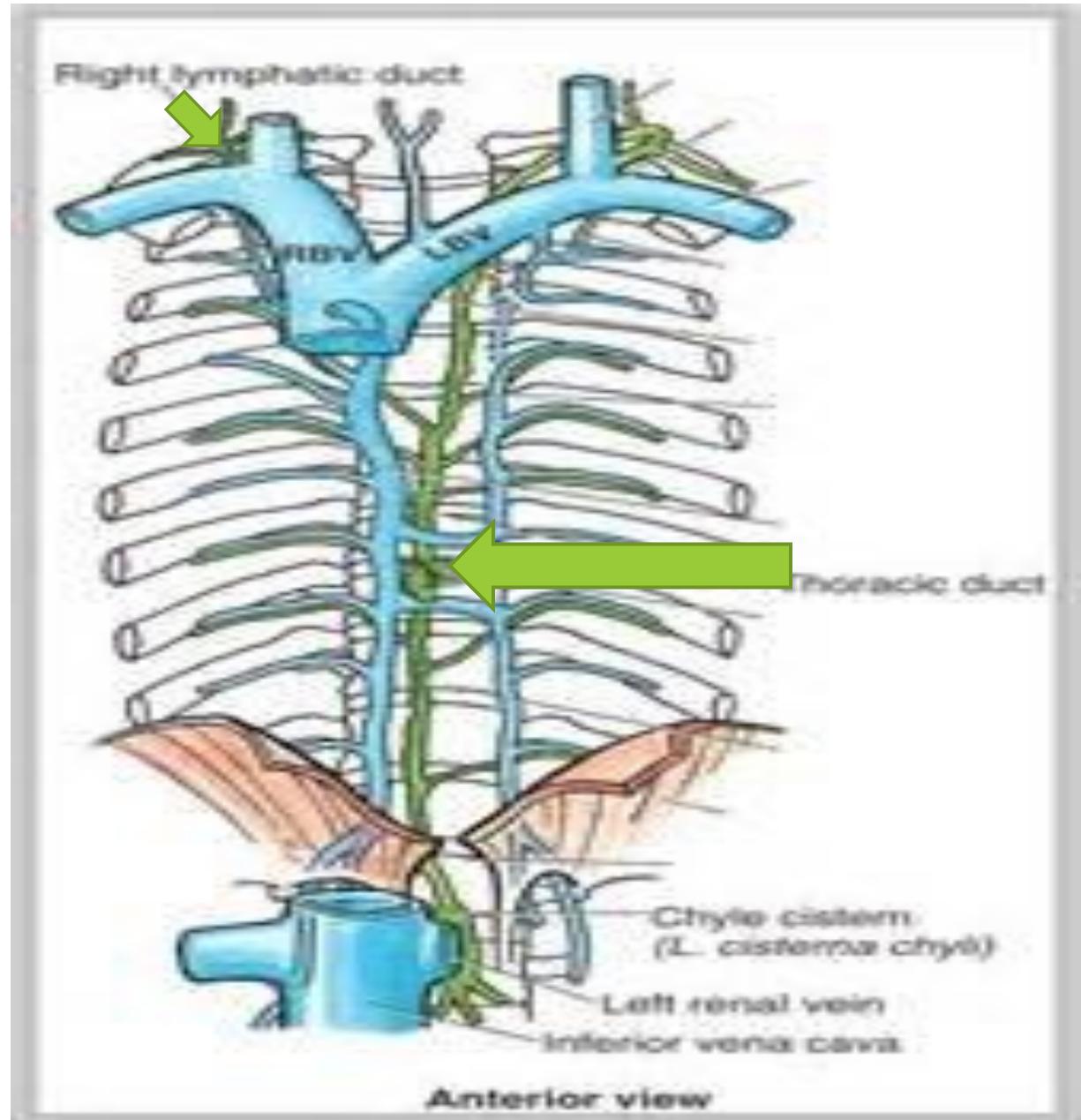


Diagram of a lymph node
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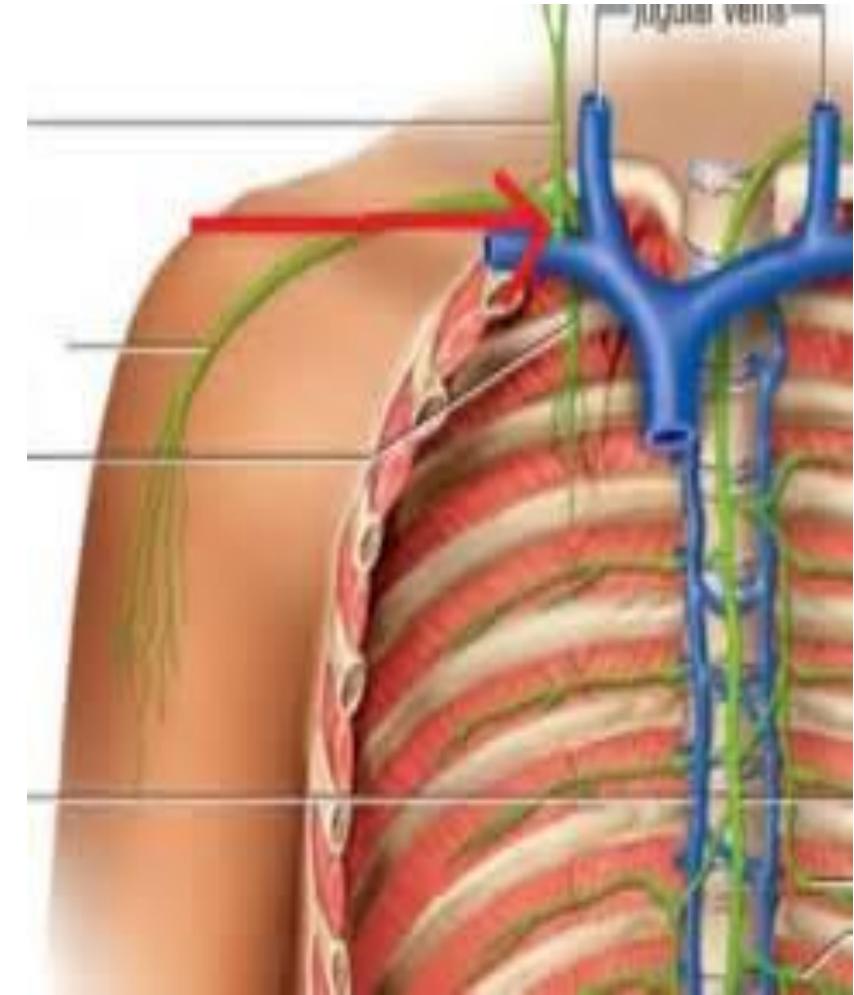
LYMPHATIC DUCTS:

- As lymphatic vessels leave nodes, they continue to join together to form larger lymph vessels
- These vessels drain into 1 of 2 **lymphatic ducts**: **right lymphatic duct or thoracic duct**



LYMPHATIC DUCTS:

- **Right lymphatic duct**-short tube, receives all the purified lymph from R side of head & neck, R chest, & R arm
- It empties into the R subclavian vein, returning the purified lymph to the blood



LYMPHATIC DUCTS:

- **Thoracic Duct**-larger than R lymphatic duct
- Drains lymph from the rest of the body
- It empties into the L subclavian vein

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Lymphatic Drainage

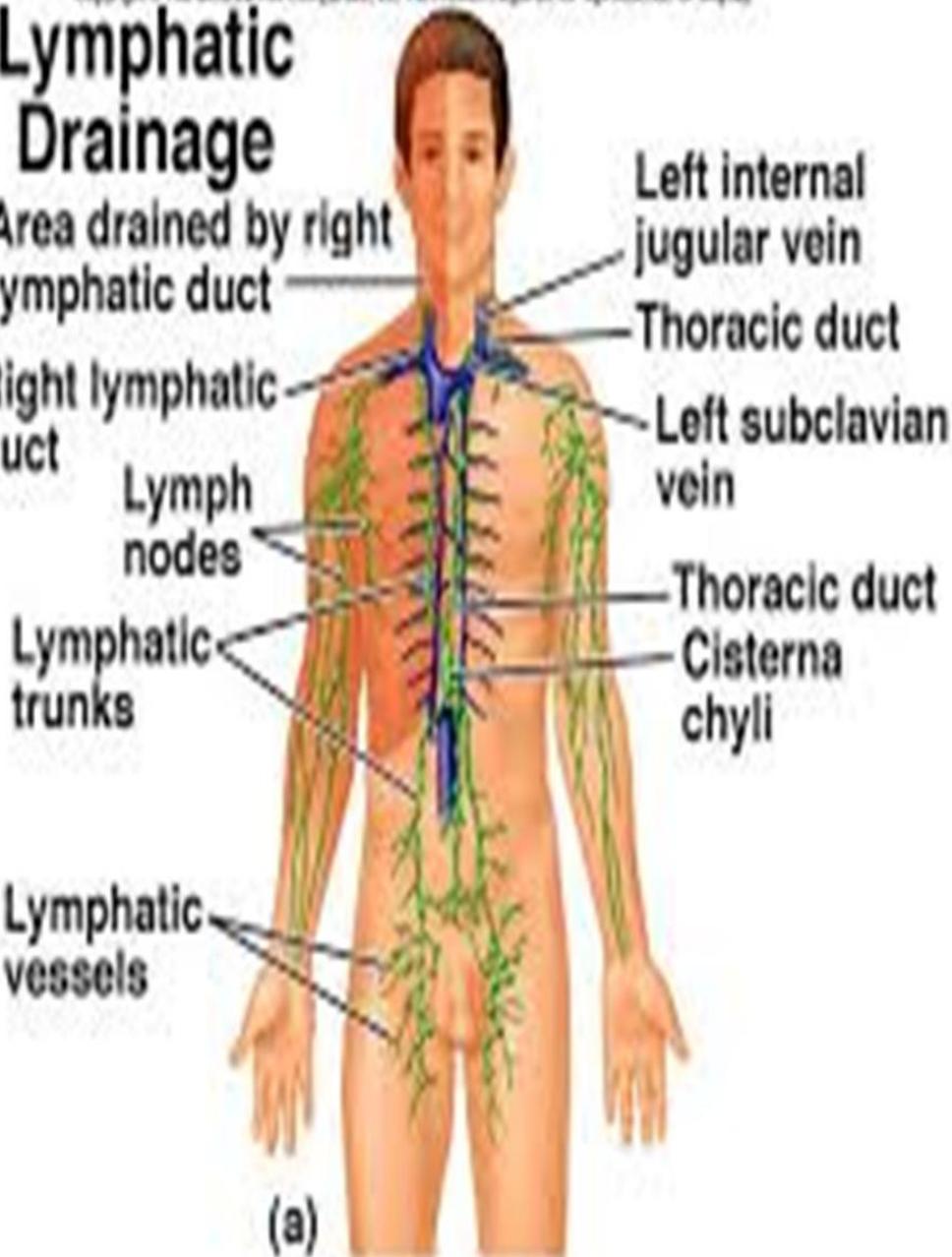
Area drained by right lymphatic duct

Right lymphatic duct

Lymph nodes

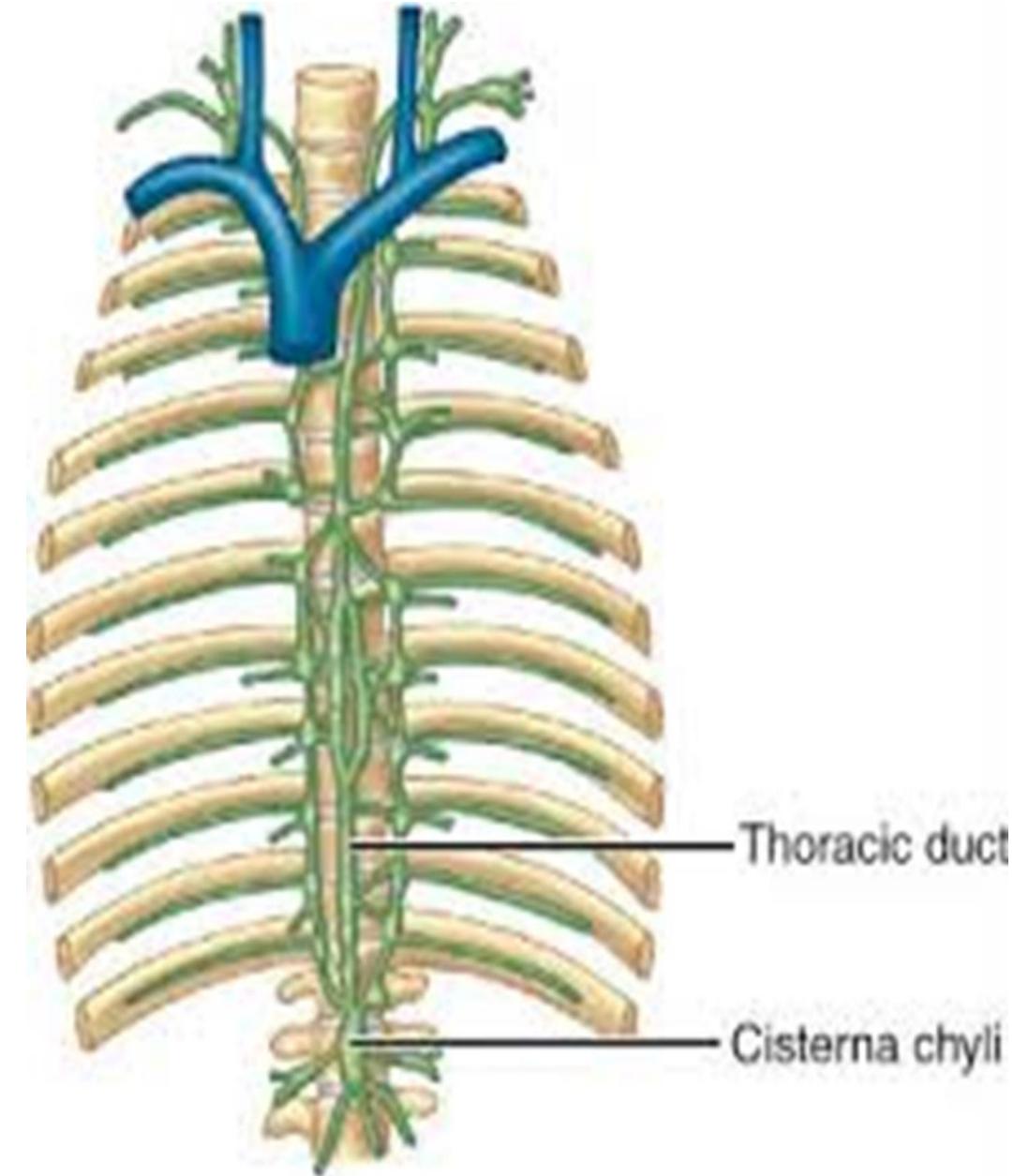
Lymphatic trunks

Lymphatic vessels

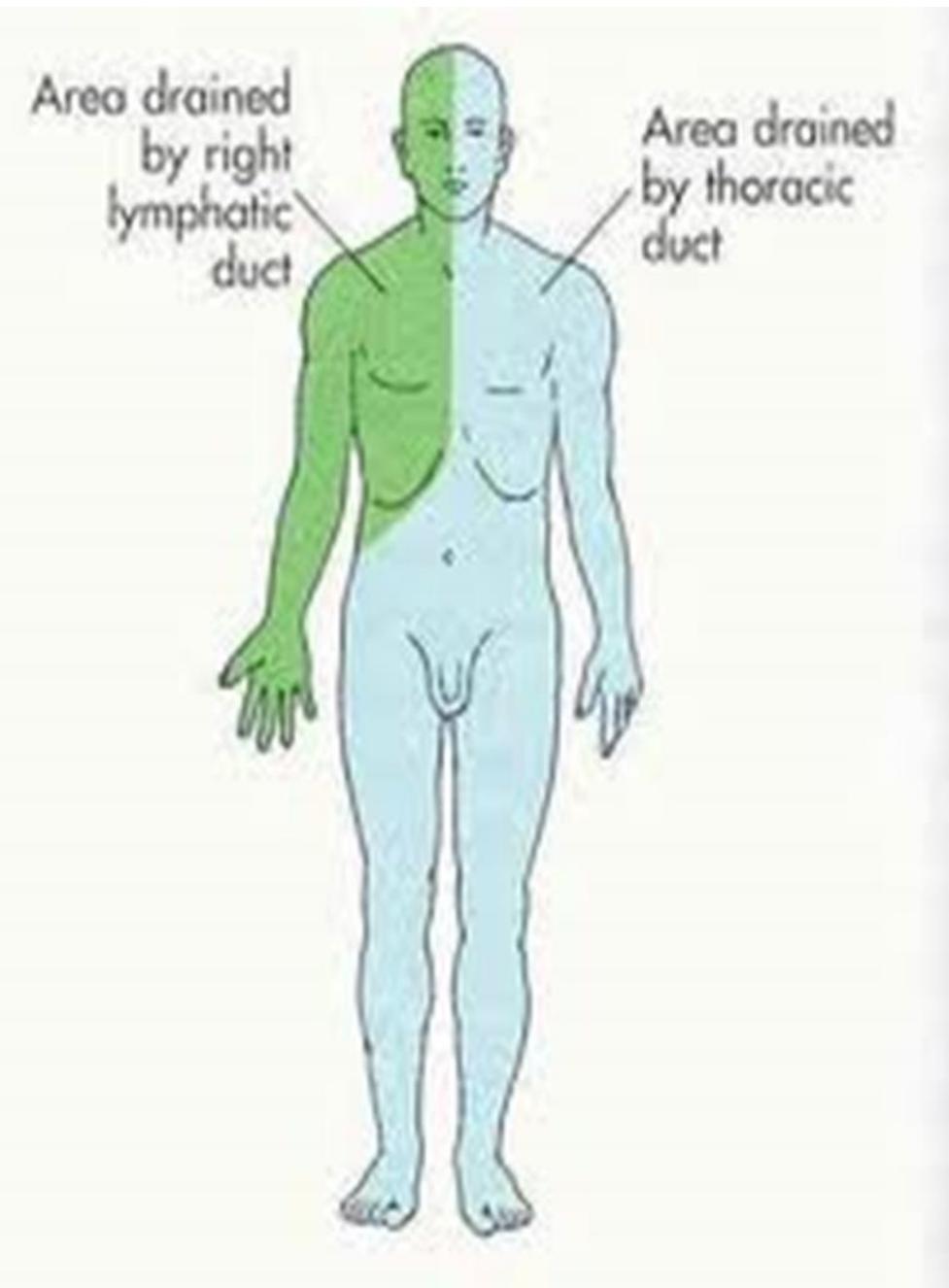
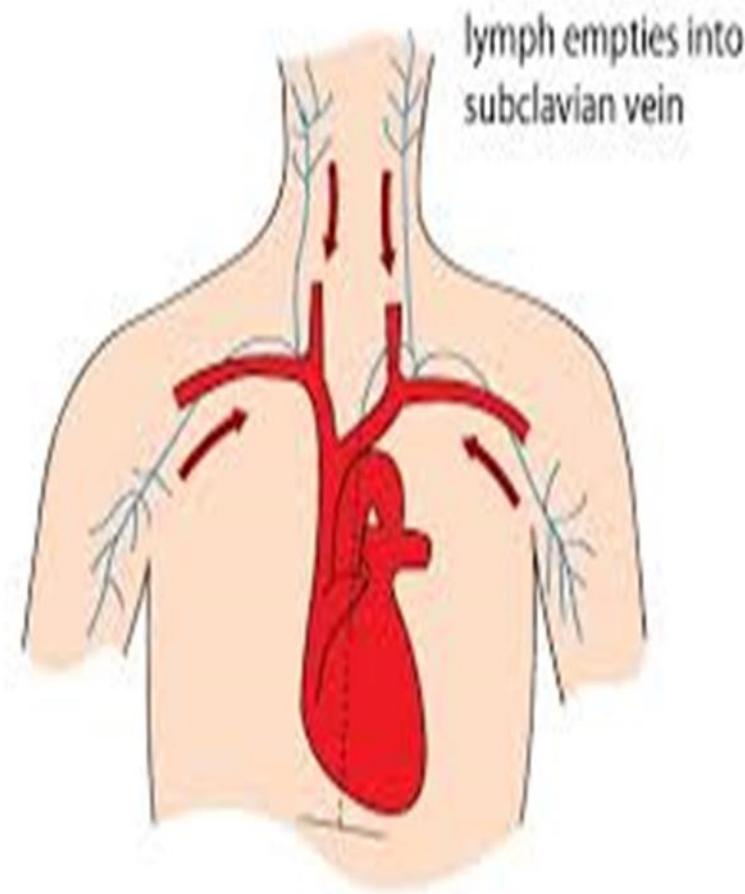


LYMPHATIC DUCTS:

- **Cisterna chyli**-enlarged pouchlike structure found at the start of the thoracic duct
- It serves as a storage area for purified lymph before this lymph returns to the bloodstream
- It receives chyle from the intestinal lacteals

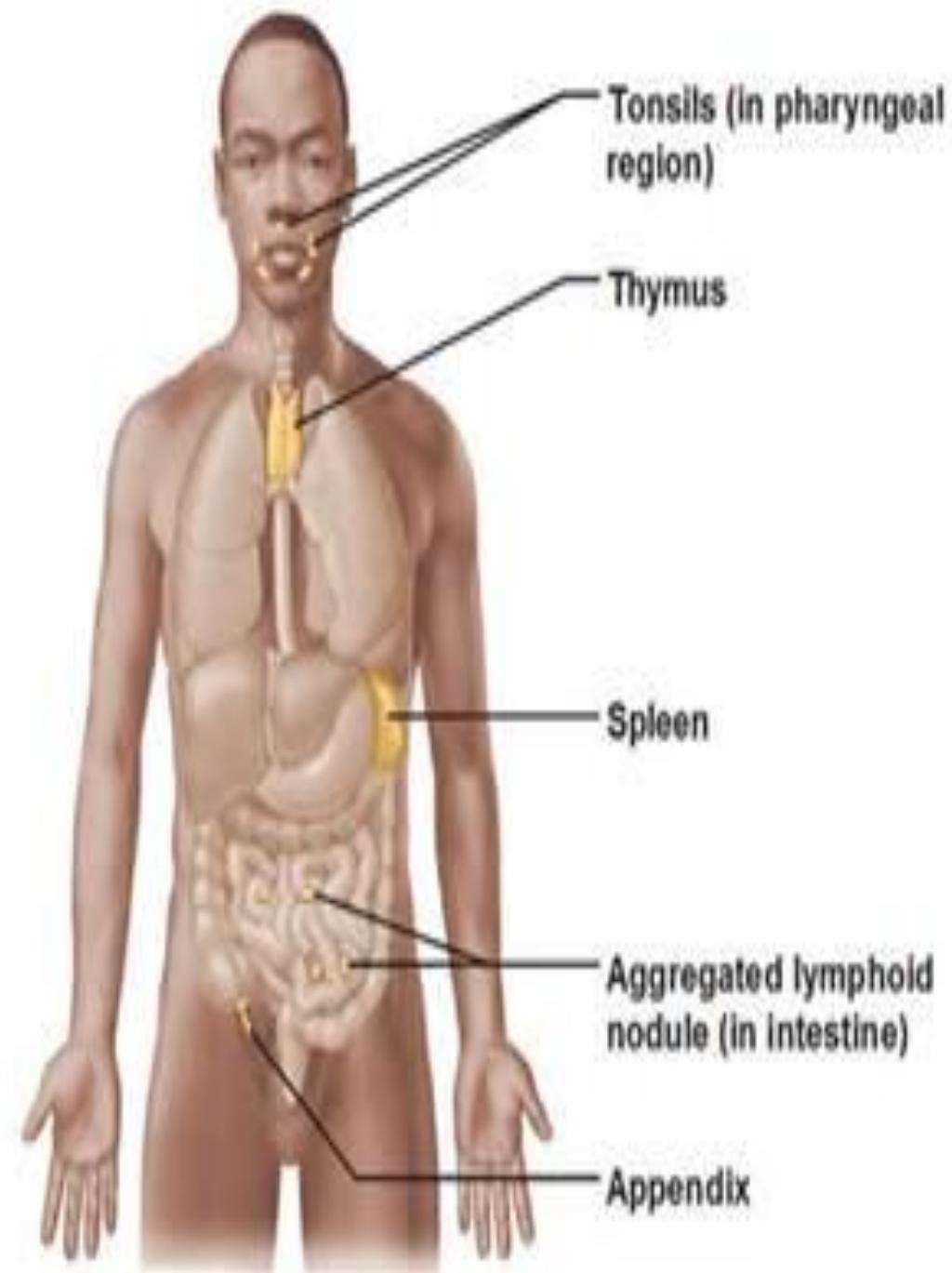


LYMPHATIC DUCTS:



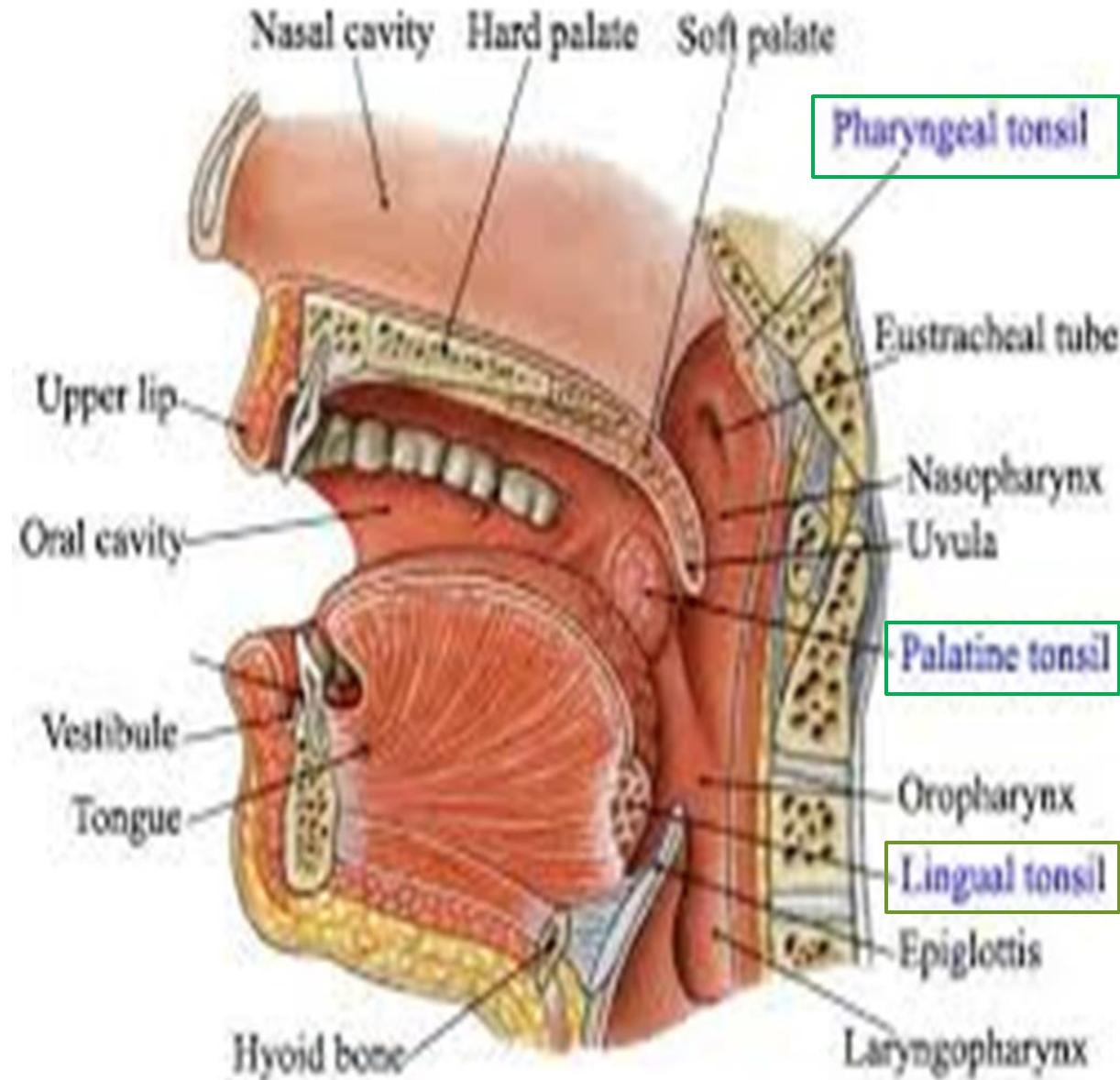
LYMPHATIC TISSUE:

- *Tonsils*
- *Spleen*
- *Thymus*



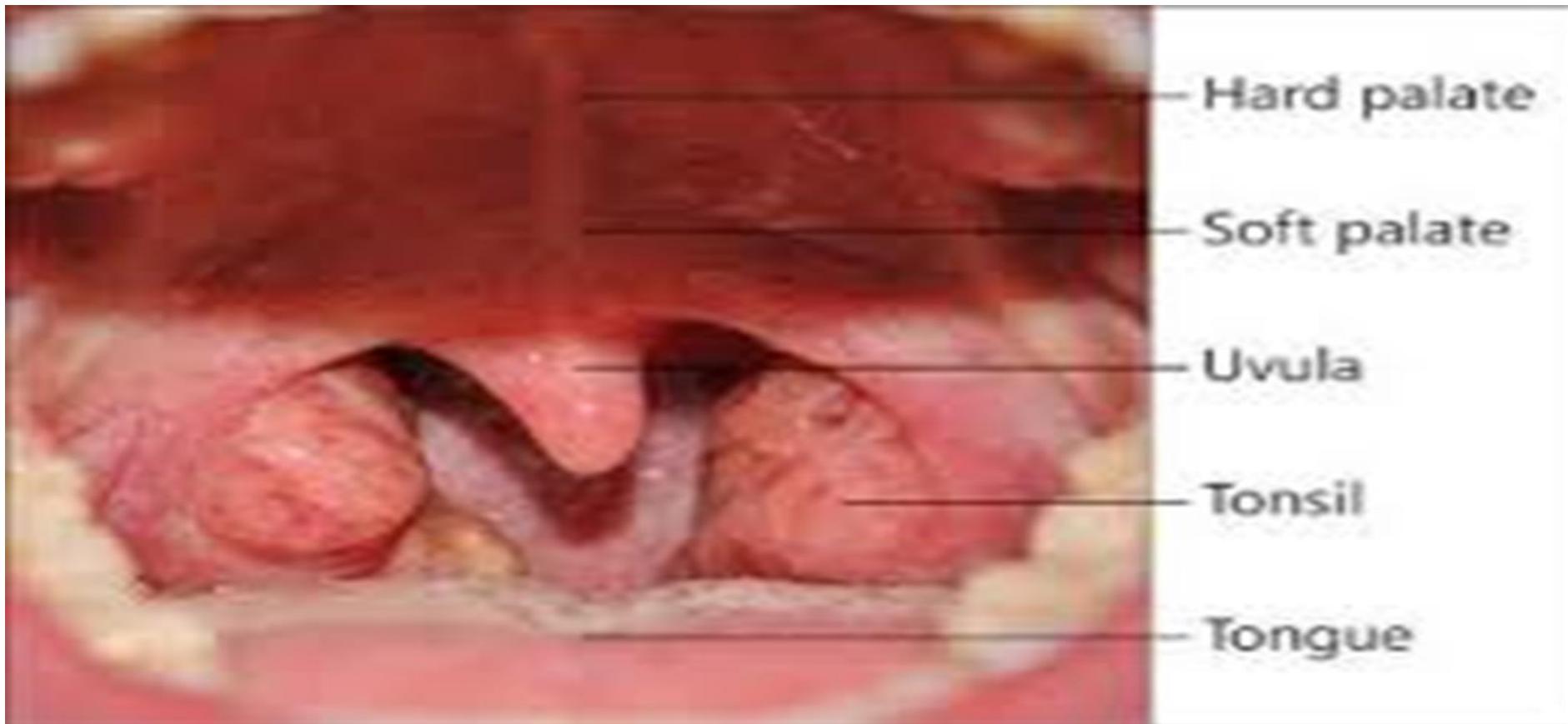
TONSILS:

- Masses of lymphatic tissue that filter interstitial fluid
- 3 pairs of tonsils:
 1. **Palatine tonsils** = located on each side of the soft palate
 2. **Pharyngeal tonsils** = AKA adenoids, located in nasopharynx
 3. **Lingual tonsils**=located on the back of the tongue



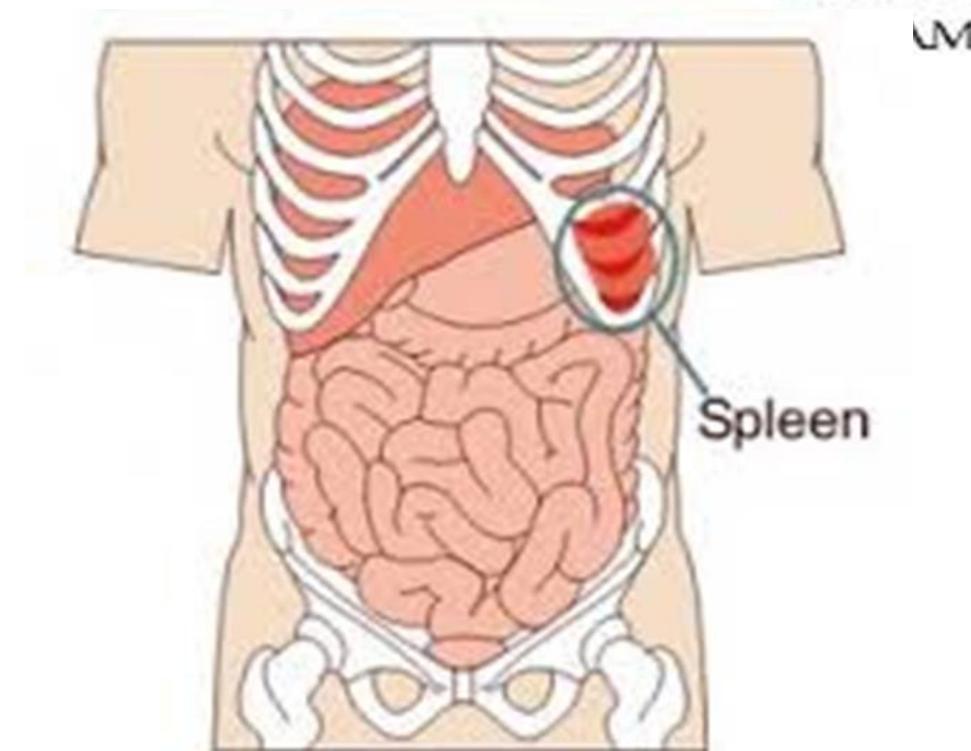
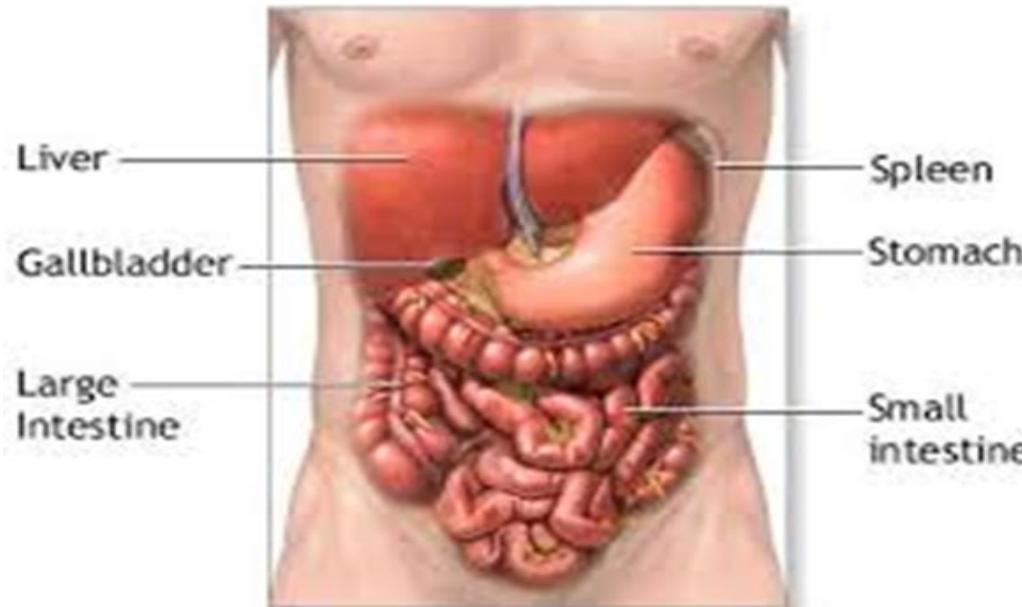
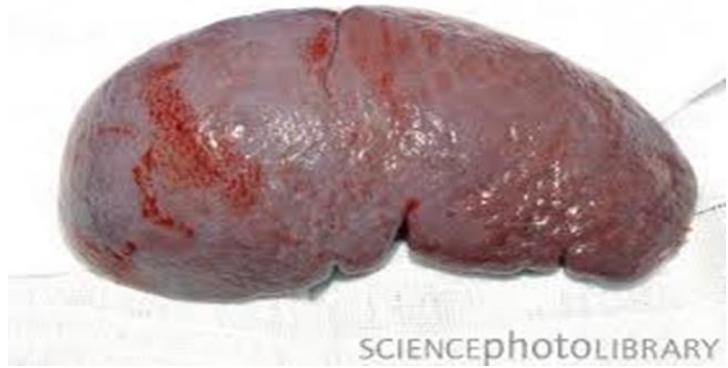
TONSILS:

- Which tonsils can you see here?



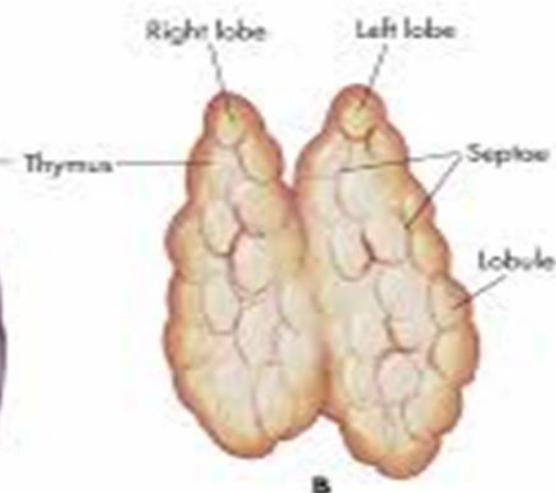
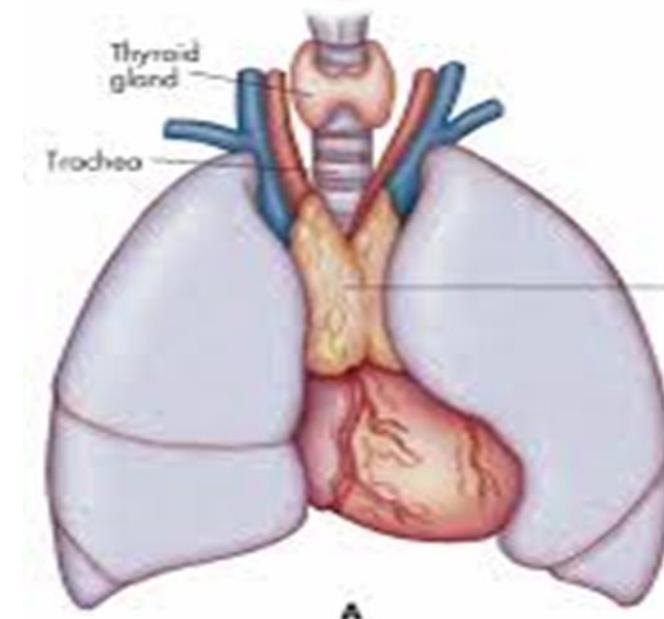
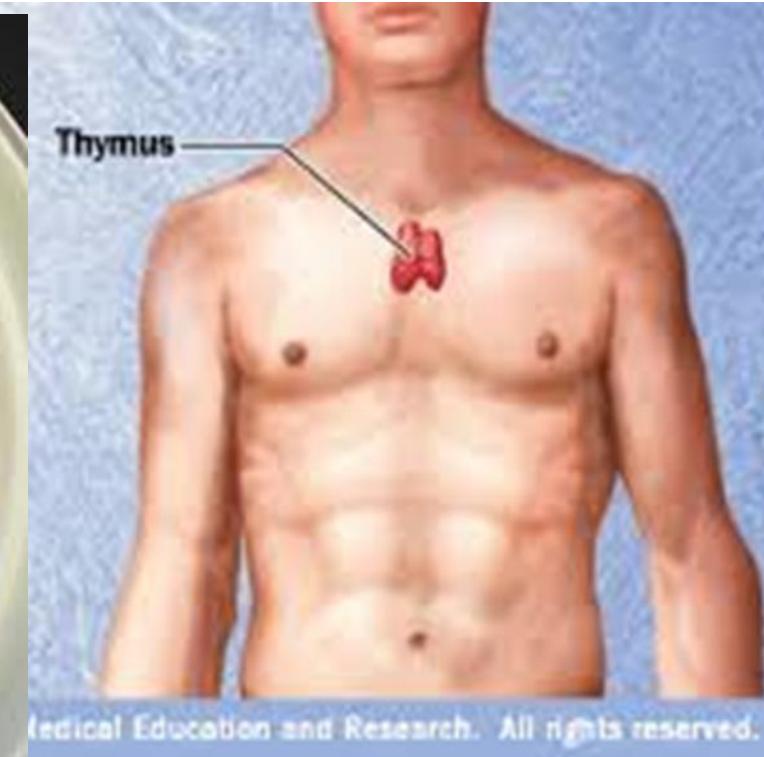
SPLEEN:

- Organ located beneath the L side of the diaphragm & posterior to the upper part of the stomach
- Produces WBCs & antibodies
- Destroys thrombocytes & old RBCs
- Stores RBCs to release into bloodstream if excessive bleeding occurs
- Filters metabolites & wastes from body tissues

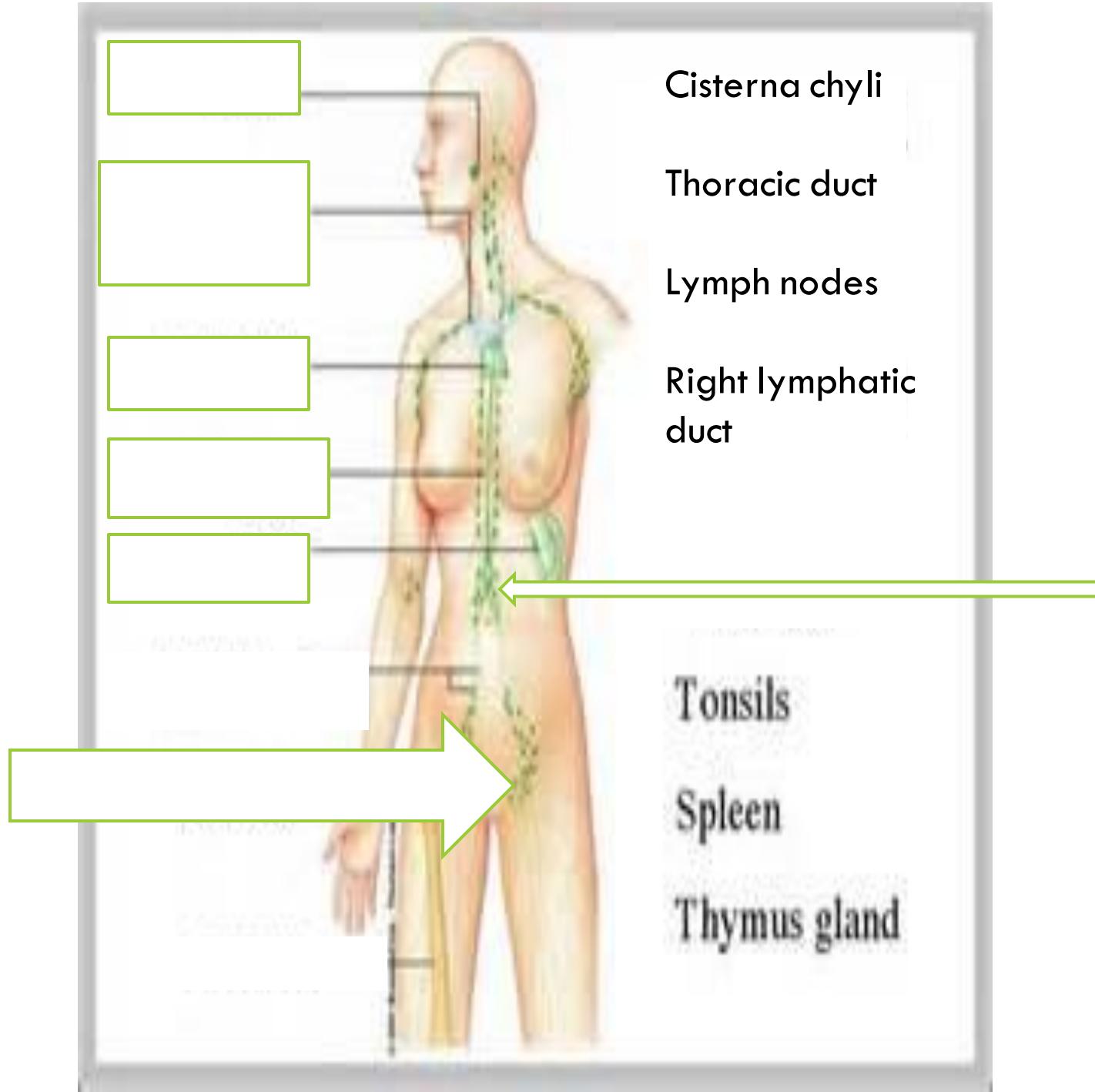


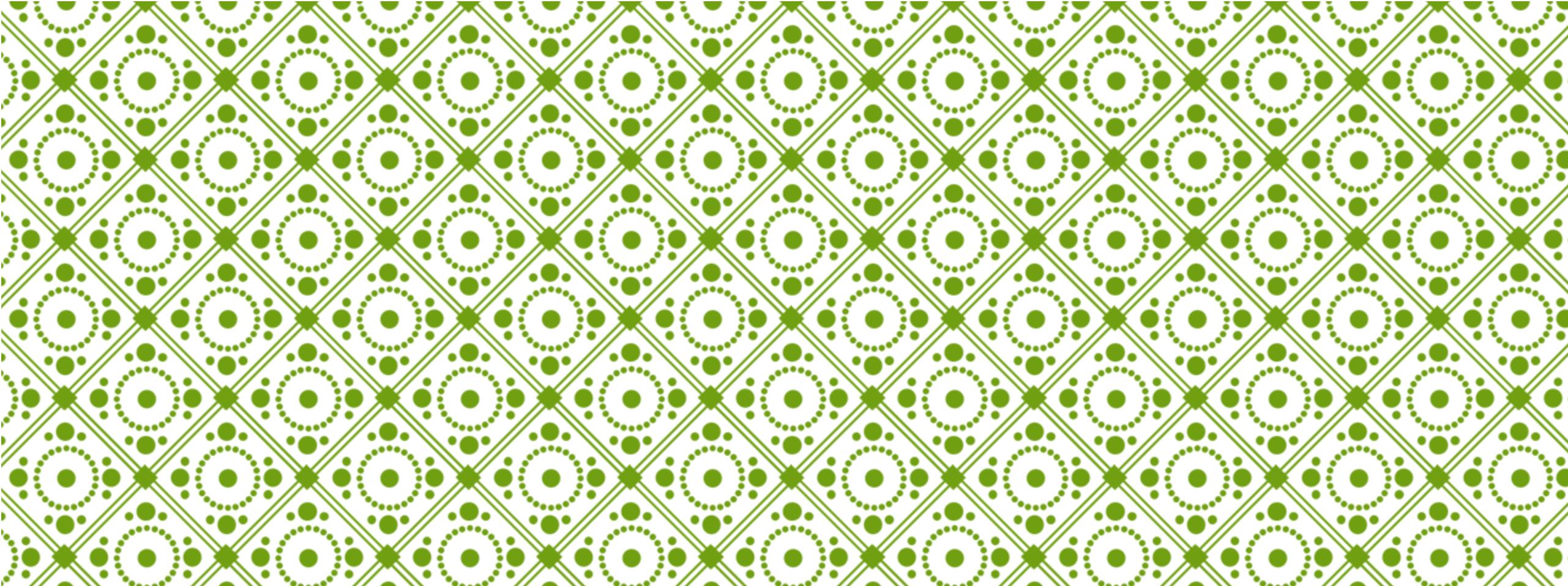
THYMUS:

- Mass of lymph tissue in the center of the upper chest
- Produces antibodies & lymphocytes to fight infection
- Atrophies (wastes away) after puberty and is replaced by fat & connective tissue
- Its function is taken over by the lymph nodes



LABEL THE DIAGRAM WITH THE WORDS FROM THE BANK:





LYMPHATIC SYSTEM

A&P REVIEW QUESTIONS

TEST YOUR KNOWLEDGE

What organ recycles red blood cells?

- A) lymph node
- B) spleen
- C) thymus
- D) lingual tonsil

Correct answer: B

TEST YOUR KNOWLEDGE

Where are the lingual tonsils located?

- A) tongue
- B) Nose
- C) lips
- D) on the voice box

Correct: A

TEST YOUR KNOWLEDGE

What causes lymph to flow through lymph vessels?

- A) peristalsis
- B) the heart
- C) Contractions of skeletal muscles against lymph vessels
- D) Wavelike contractions of the muscular lining of lymph vessels

Correct answer: C

TEST YOUR KNOWLEDGE

If a child does not have a functioning thymus, her or she might have difficulty:

- A) fighting infection
- B) breathing
- C) Swallowing
- D) Removing toxic waste from the body

Correct answer: A

TEST YOUR KNOWLEDGE

Where would you find lymph vessels?

- A) In tissues that do not have blood vessels
- B) In the 4 chambers of the heart
- C) Throughout the body
- D) Only in organs of the digestive system

Correct answer: C

TEST YOUR KNOWLEDGE

A lymph node has two important functions. What are they?

- A) lymphocyte production and pumping lymph fluid
- B) Transportation of fats and lymph fluid
- C) Lymphocyte production and lymph filtration
- D) Pumping lymph fluid and transporting fats.

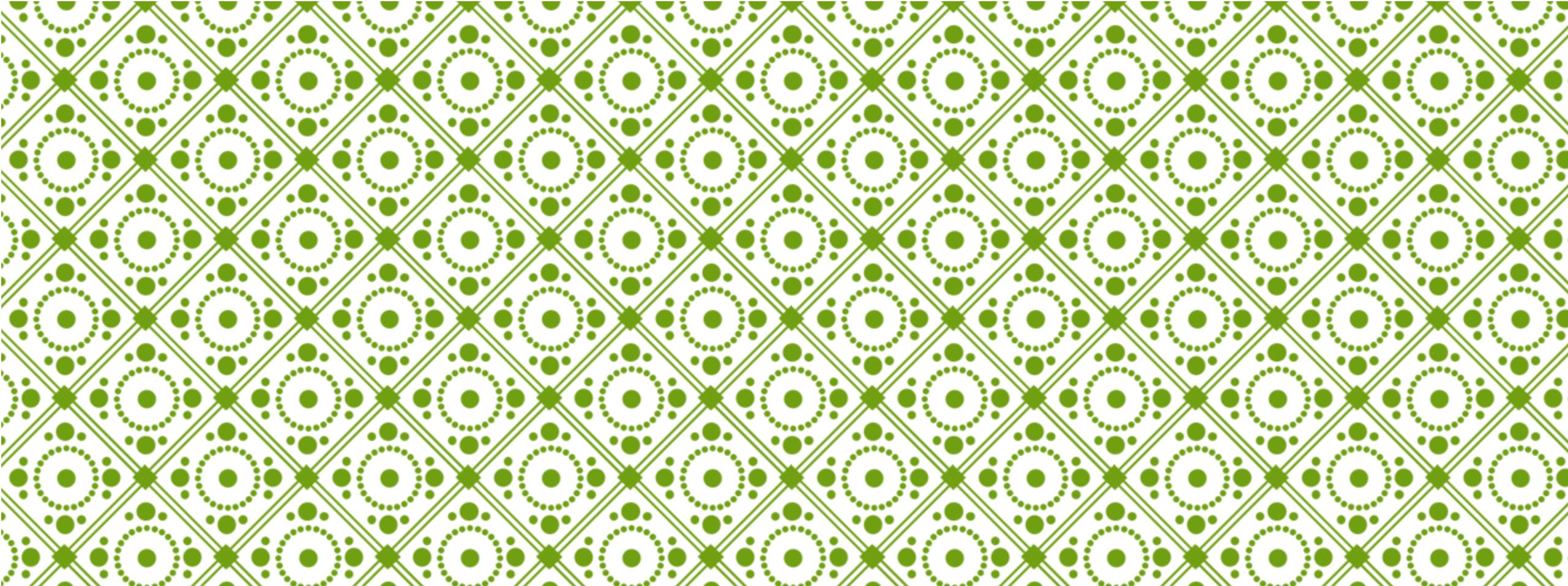
Correct answer: C

TEST YOUR KNOWLEDGE

What cells are a normal component of both lymph and blood?

- A) erythrocytes
- B) lymphocytes
- C) platelets
- D) thrombocytes

Correct answer: B



LYMPHATIC SYSTEM

Diseases/Disorders

OBJECTIVES

6. Discuss diseases of lymphatic system and related signs, symptoms and treatment methods.

A. Identify diseases/disorders that affect lymph system:

Adenitis, Hodgkin's lymphoma, lymphangitis, splenomegaly, tonsillitis

B. Identify s/s associated with these diseases.

LYMPHATIC SYSTEM

Diseases and abnormal conditions include:

- *Adenitis*
- *Hodgkins' Disease*
- *Lymphangitis*
- *Splenomegaly*
- *Tonsillitis*

ADENITIS

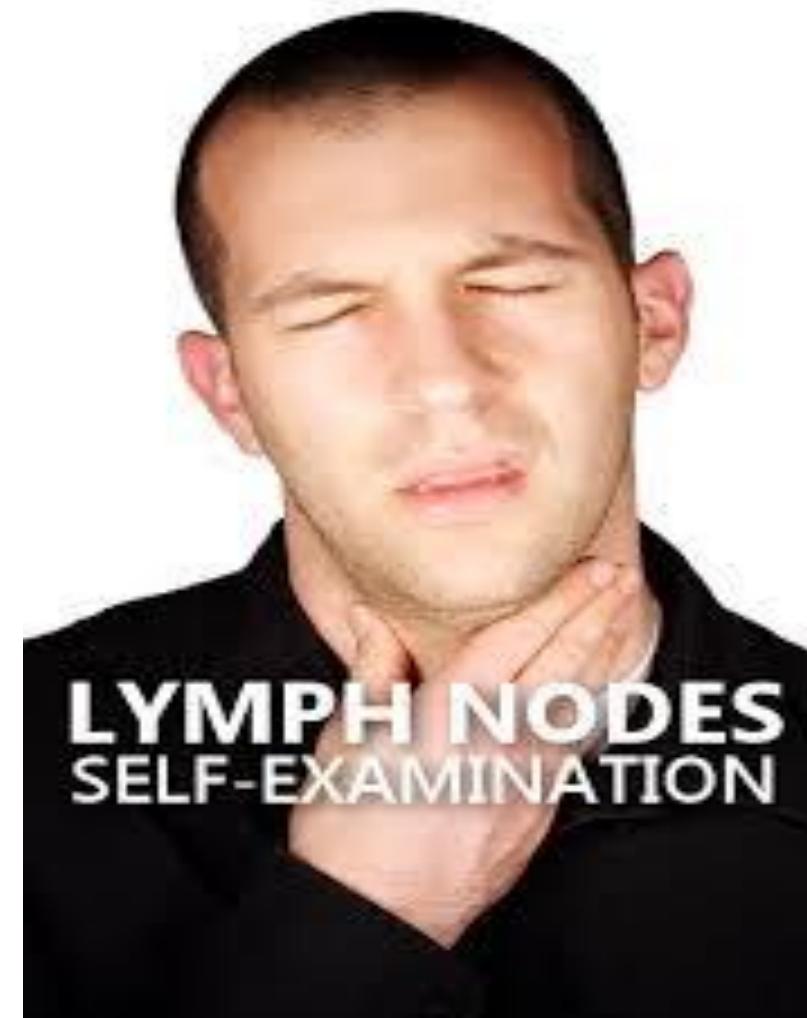
- ❖ Inflammation or infection of the lymph nodes
- ❖ Caused by large amount of harmful substances (pathogens, cancer cells) enter the lymph nodes and infect them
- ❖ **S/SX**=fever, swollen & painful nodes which if not treated can form an abscess
- ❖ **Tx**=abx & warm, moist compresses; I&D for abscess
- ❖ I&D video



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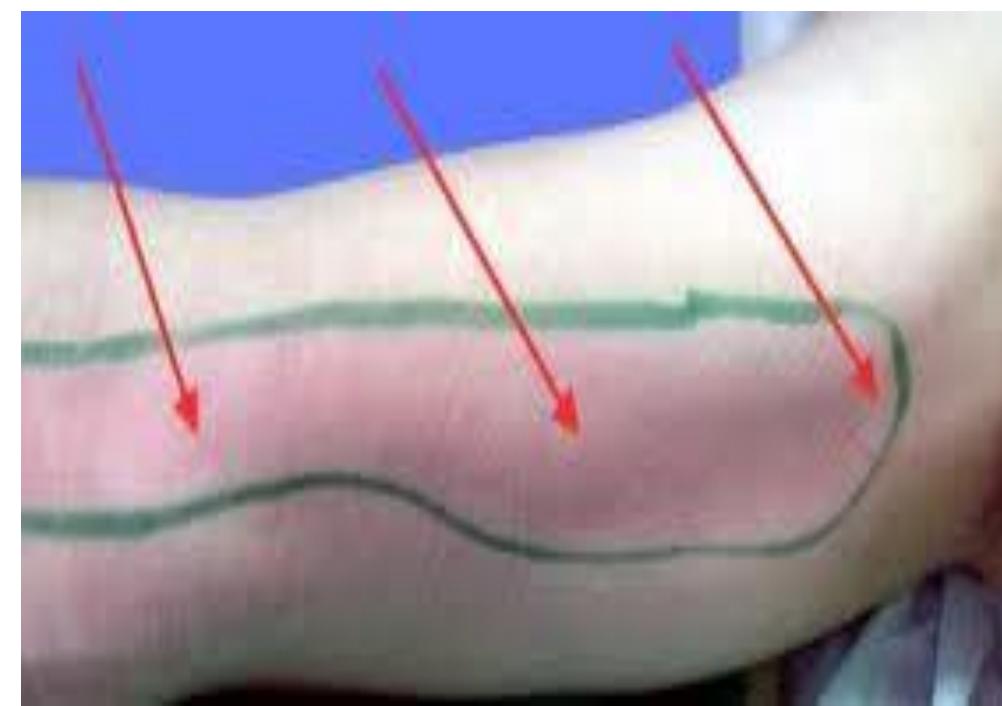
HODGKIN'S DISEASE

- ❖ Chronic, malignant disease of lymph nodes
- ❖ Most common form of lymphoma (tumor of lymph tissue)
- ❖ **S/Sx**=painless swelling of nodes, fever, night sweats, weight loss, fatigue, pruritus
- ❖ **Tx**=chemotherapy, radiation
- ❖ 5:58 Hodgkin's video



LYMPHANGITIS

- ❖ Inflammation of lymphatic vessels
- ❖ Usually results from infxn in extremity
- ❖ **S/Sx**=red streak extending up an UE or LE from the source of infxn; fever, chills, tenderness or pain
- ❖ **Tx**=abx, rest, elevation of affected part; warm, moist compresses
- ❖ 2:07 leg lymphangitis video



SPLENOMEGALY

- ❖ Enlargement of spleen
- ❖ Results from abnormal accumulation of RBCs, mononucleosis, cirrhosis of the liver
- ❖ **S/Sx**=swelling, abd pain, ruptured spleen,increased destruction of RBCs leads to anemia, leukopenia, & thrombocytopenia
- ❖ If spleen ruptures it can lead to intraperitoneal hemorrhage & shock can lead to death
- ❖ **Tx**=for severe cases where cause cannot be treated splenectomy is done
- ❖ 12:21 splenectomy surgery

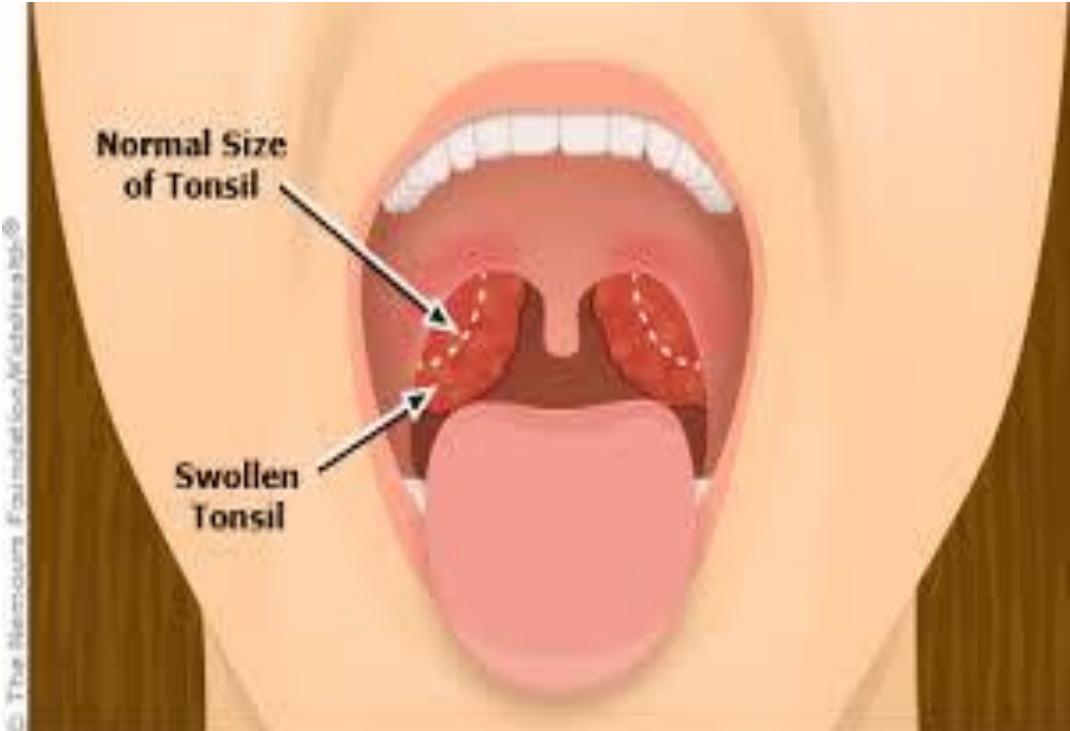


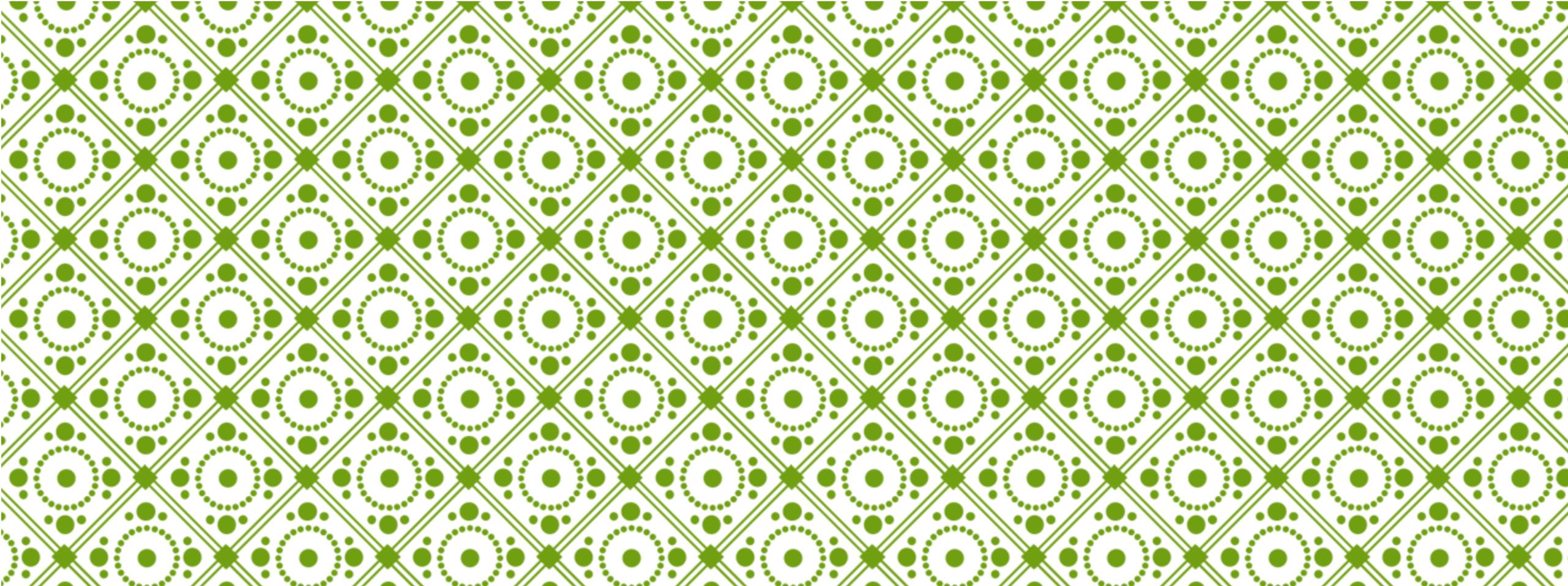
TONSILLITIS

- ❖ Inflammation or infxn of tonsils-usually pharyngeal & palatine tonsils
- ❖ **S/Sx**=throat pain, dysphagia, fever, white or yellow spots of exudate on tonsils, swollen nodes near mandible
- ❖ **Tx**=abx, warm throat irrigations, rest, analgesics; tonsillectomy

TONSILLITIS

- ❖ Tonsillectomy =
surgical removal of tonsils
- ❖ Used for pts with:
 - ✓ chronic tonsillitis
 - ✓ frequent infections
 - ✓ hypertrophy (enlargement) that causes obstruction of the airway
- ❖ 2:47 T&A animation video
- ❖ 1:59 tonsillectomy surgery video





LYMPHATIC SYSTEM DISEASE REVIEW QUESTIONS

TEST YOUR KNOWLEDGE

What disorder of the lymph system is classified as a malignancy?

- A) adenitis
- B) Hodgkin's disease
- C) splenomegaly
- D) tonsillitis

Correct answer: B

TEST YOUR KNOWLEDGE

Juan is a firefighter who is diagnosed with splenomegaly. Why would his doctor tell Juan he cannot go to work for a month?

- A) his is most likely contagious
- B) his throat could swell shut and block his airway
- C) If bumped in the abdomen, his spleen could rupture
- D) He cannot be exposed to others because he cannot fight infection

Correct answer: C

TEST YOUR KNOWLEDGE

What is the usual treatment for occasional bouts of tonsillitis?

- A) tonsillectomy
- B) splenectomy
- C) antibiotics and warm throat irrigations
- D) narcotic pain medication and steroids

Correct answer: C