

# **Anatomy of Lymphatic System**

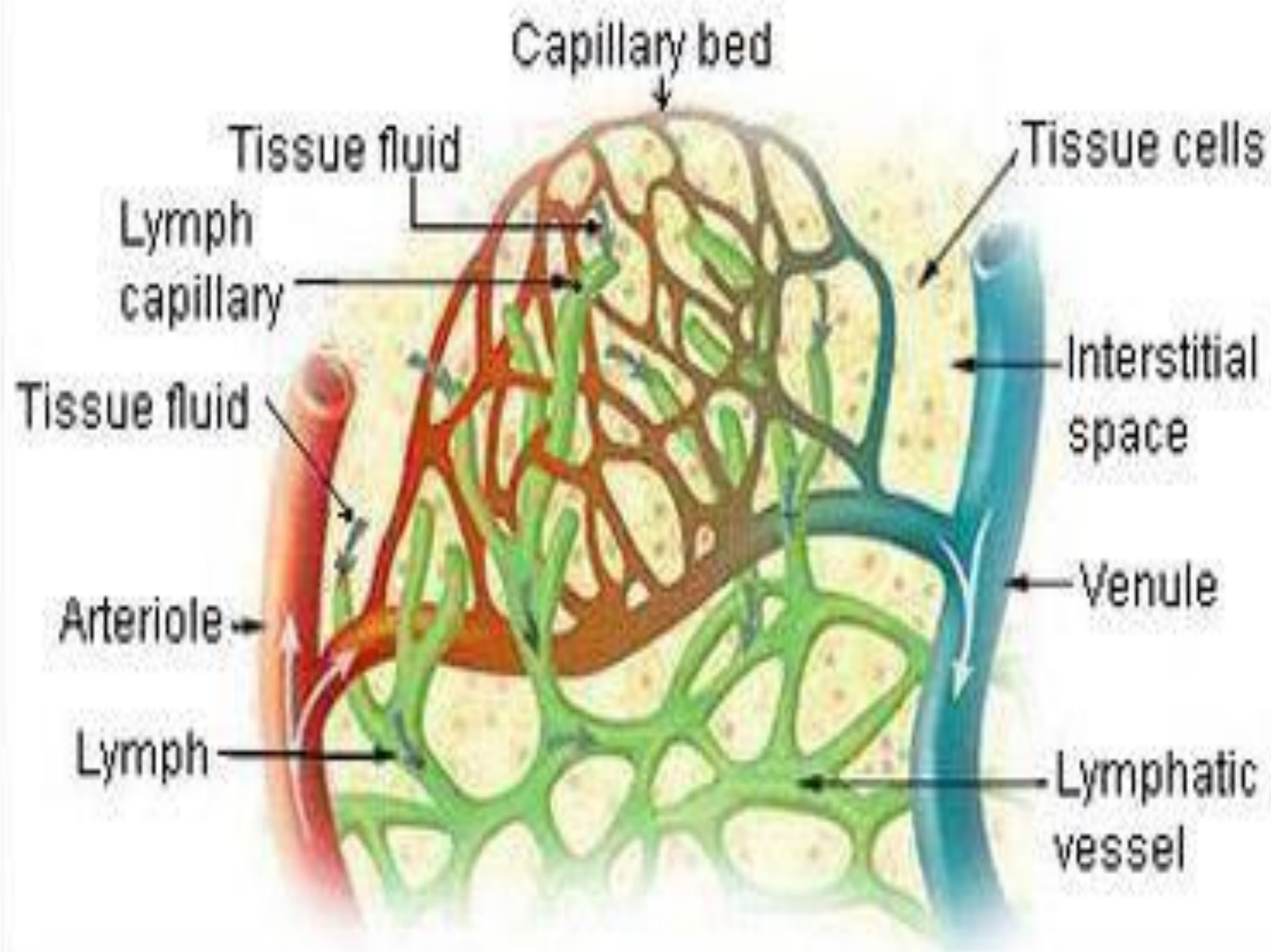
# Lymphatic System

- ◆ protects body against foreign material
- ◆ assists in circulation of body fluids between cells and bloodstream
- ◆ transports dietary fats

# Lymphatic System

## ♦ Consists of:

- lymph
- network of vessels
- lymph nodes and nodules
- tonsils
- spleen
- thymus gland

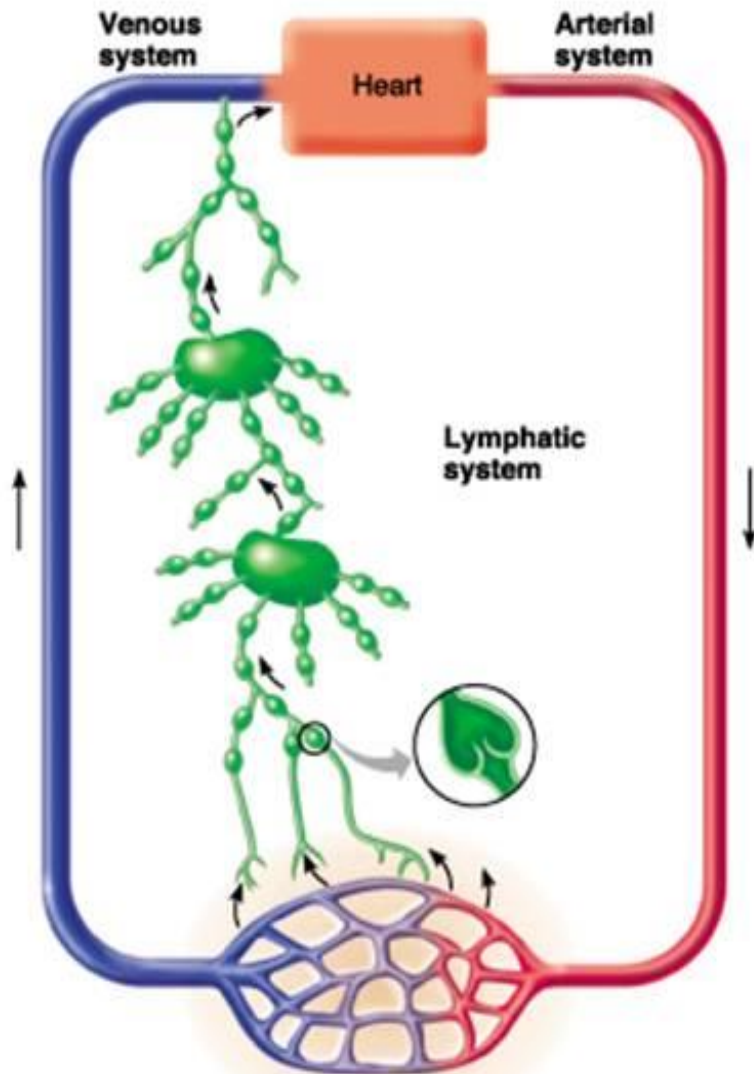


# Lymph

(lymph = clear fluid)

- ◆ derived from tissue fluid
- ◆ contains more white blood cells than plasma
- ◆ enters node through afferent lymphatic vessels
- ◆ flows through node in one direction

# LYMPHATIC SYSTEM



*Essentially a  
drainage system  
accessory to venous  
system*

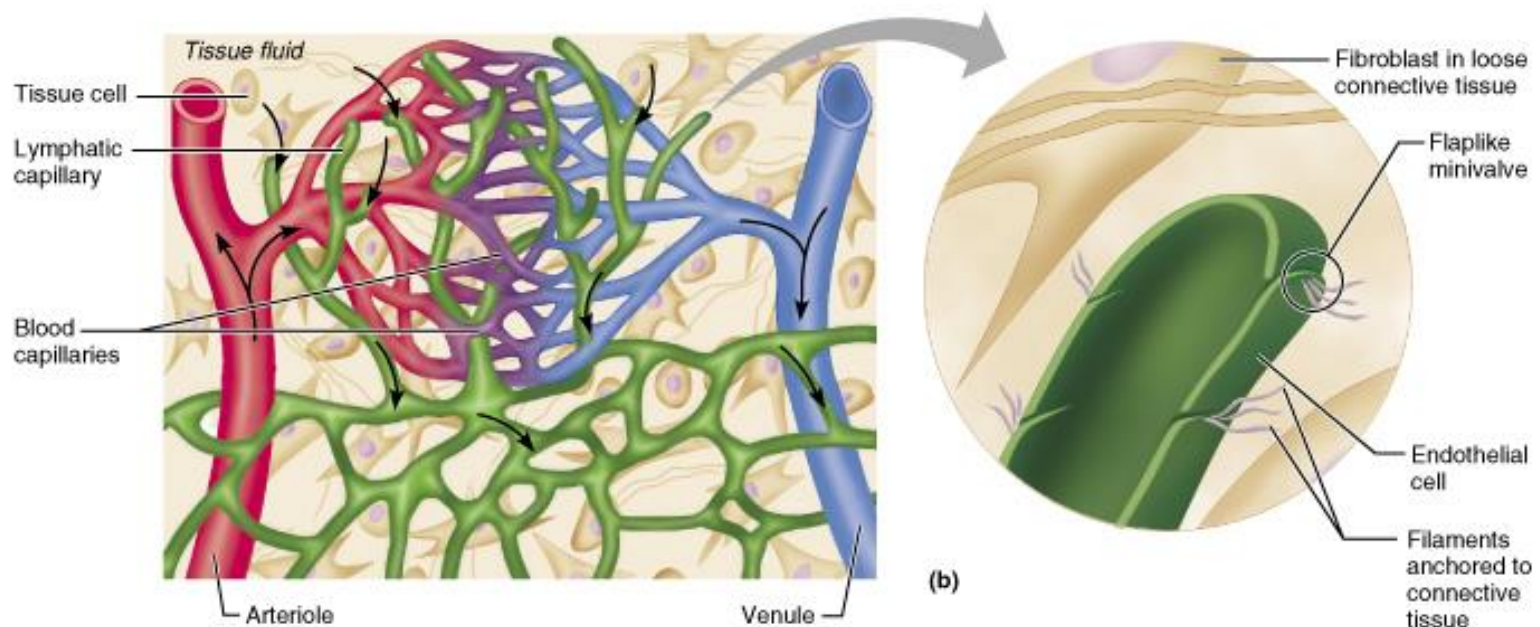
*larger particles that  
escape into tissue fluid can  
only be removed via  
lymphatic system*

# Lymph (cont.)

- ◆ flows through sinuses in lymph node cortex and then into the medulla
- ◆ exits the lymph node through efferent lymphatic vessels
- ◆ must be returned to blood stream to maintain blood volume and pressure

# Lymph Vessels

- ◆ resemble veins but have thinner walls and more valves





# Lymph Vessels

(cont.)

- ◆ no pump for lymph
- ◆ **Lymph is kept moving by:**
  - constriction of vessels
  - skeletal muscle pump
  - respiratory pump
- ◆ at intervals along vessels lymph flows into lymph nodes
- ◆ lymphatic vessels unite to form lymph trunks

# Lymph Trunks

- ◆ formed by lymphatic vessels uniting
- ◆ large tubes
- ◆ empty their lymph into lymphatic ducts

# Lymphatic Ducts

- ♦ **Lymph empties into two conducting ducts:**
  - the thoracic duct (left lymphatic duct)
  - the right lymphatic duct

Lymph from these ducts enters the blood stream via the left subclavian vein and the right subclavian vein

**Regional lymph nodes:**

Cervical nodes

Axillary nodes

Inguinal nodes

Entrance of right lymphatic duct into right subclavian vein

Internal jugular vein

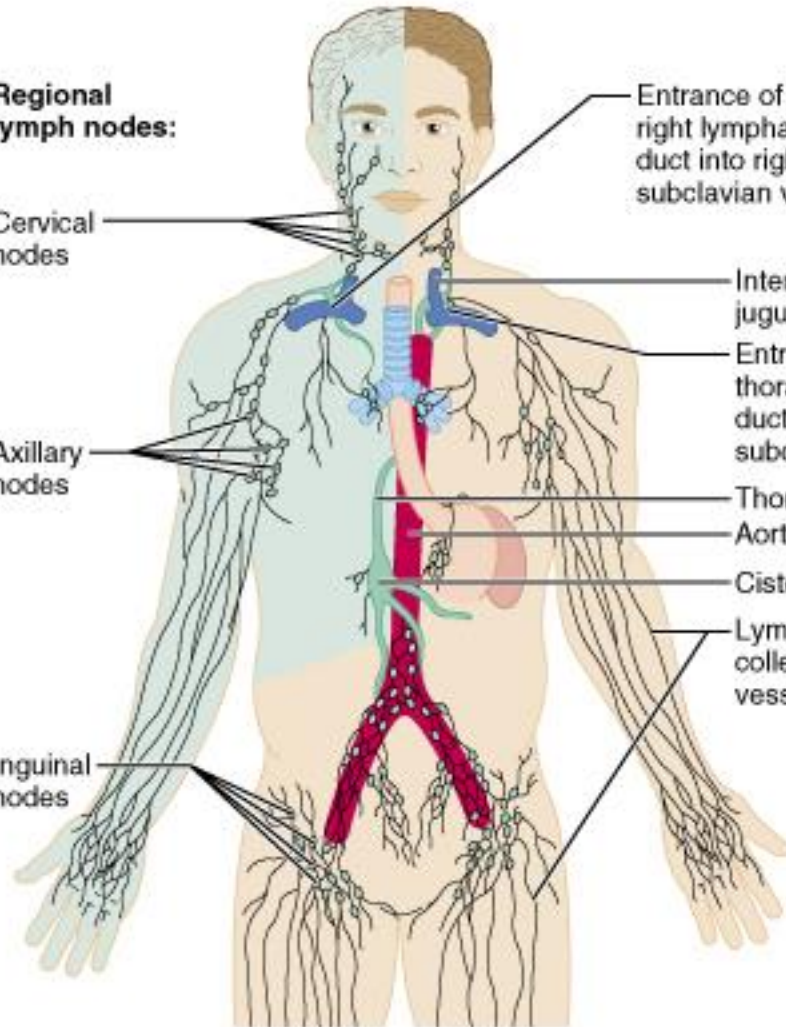
Entrance of thoracic duct into left subclavian vein

Thoracic duct

Aorta

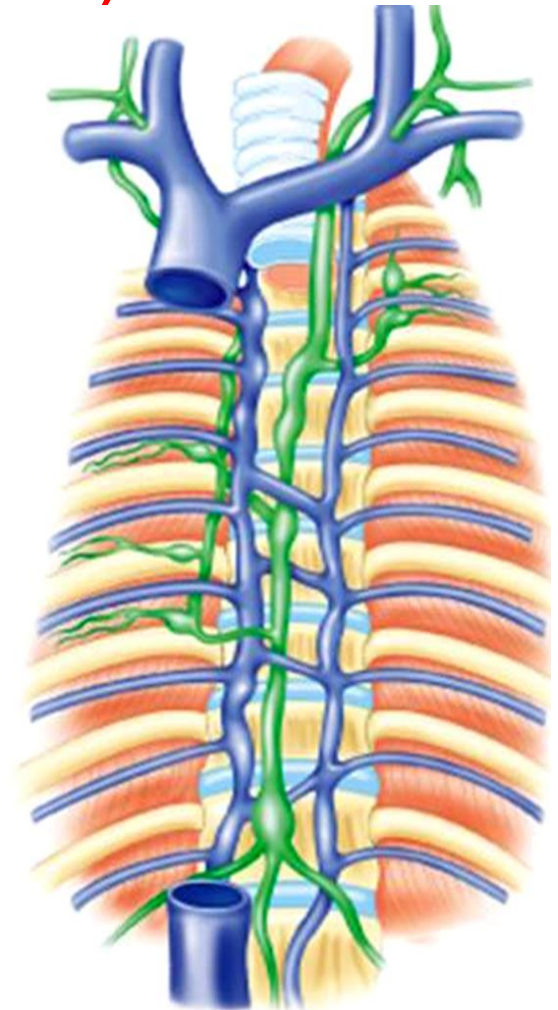
Cisterna chyli

Lymphatic collecting vessels



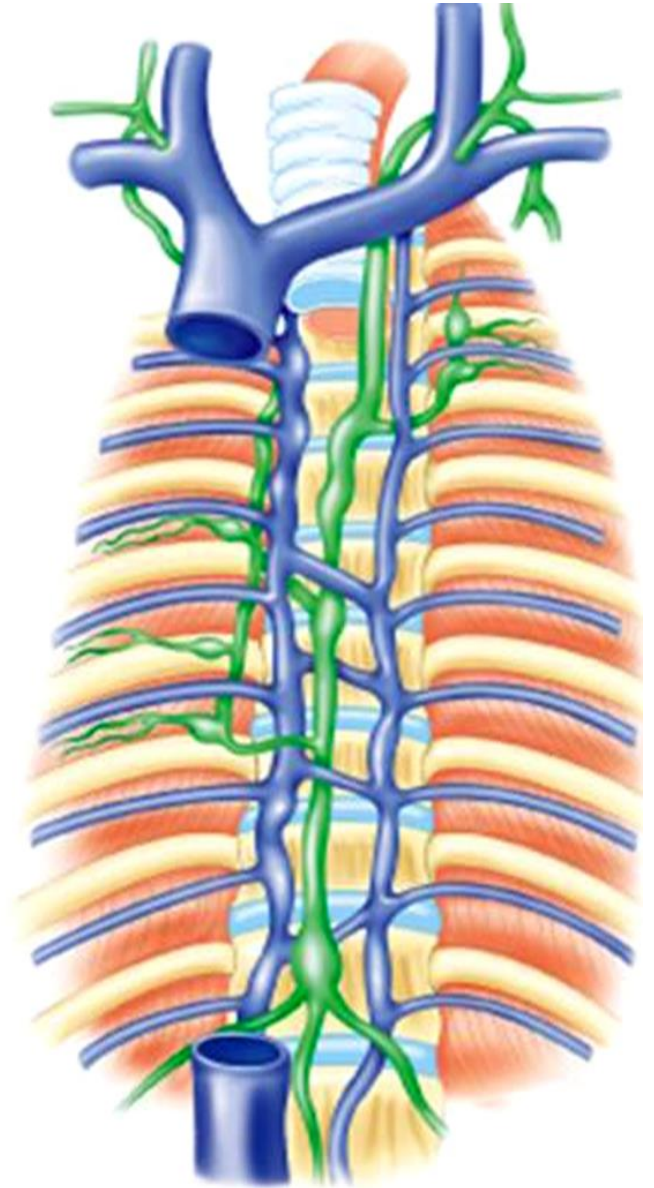
# Thoracic Duct (left lymphatic duct)

- ◆ about (38-45 cm) in length
- ◆ begins as a dilation called the cisterna chyli
- ◆ main collecting duct of lymphatic system
- ◆ receives lymph from lower body and upper left quadrant
- ◆ empties into the left subclavian vein



# Right Lymph

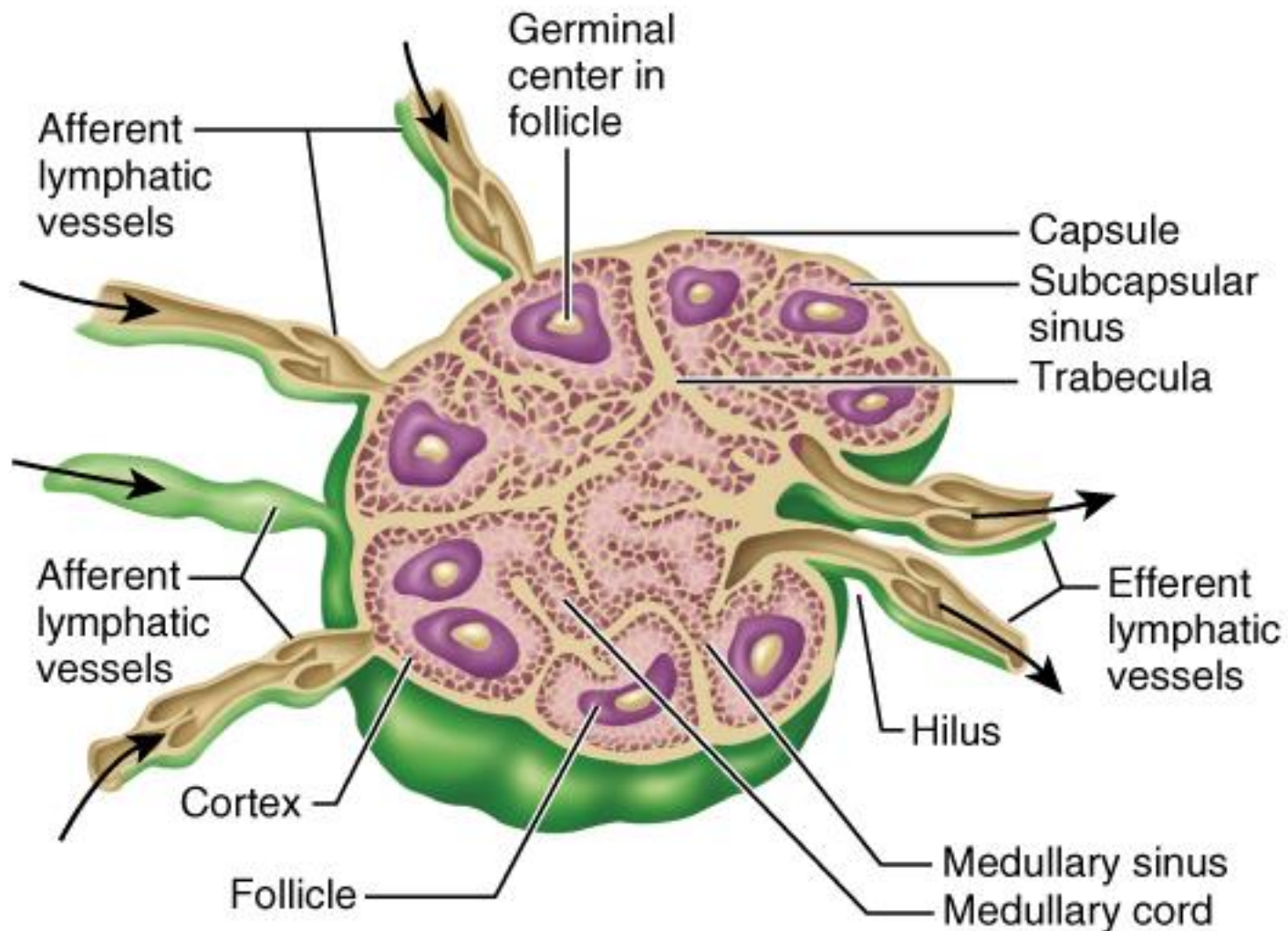
- ◆ about (1.5 cm) in length
- ◆ receives lymph from upper right quadrant
- ◆ empties into the right subclavian vein



# Lymph Nodes

- ◆ oval or bean-shaped
- ◆ masses of lymphatic tissue
- ◆ aid in defense and white blood cell formation
- ◆ located along length of lymphatic vessels
- ◆ scattered throughout the body usually in clusters





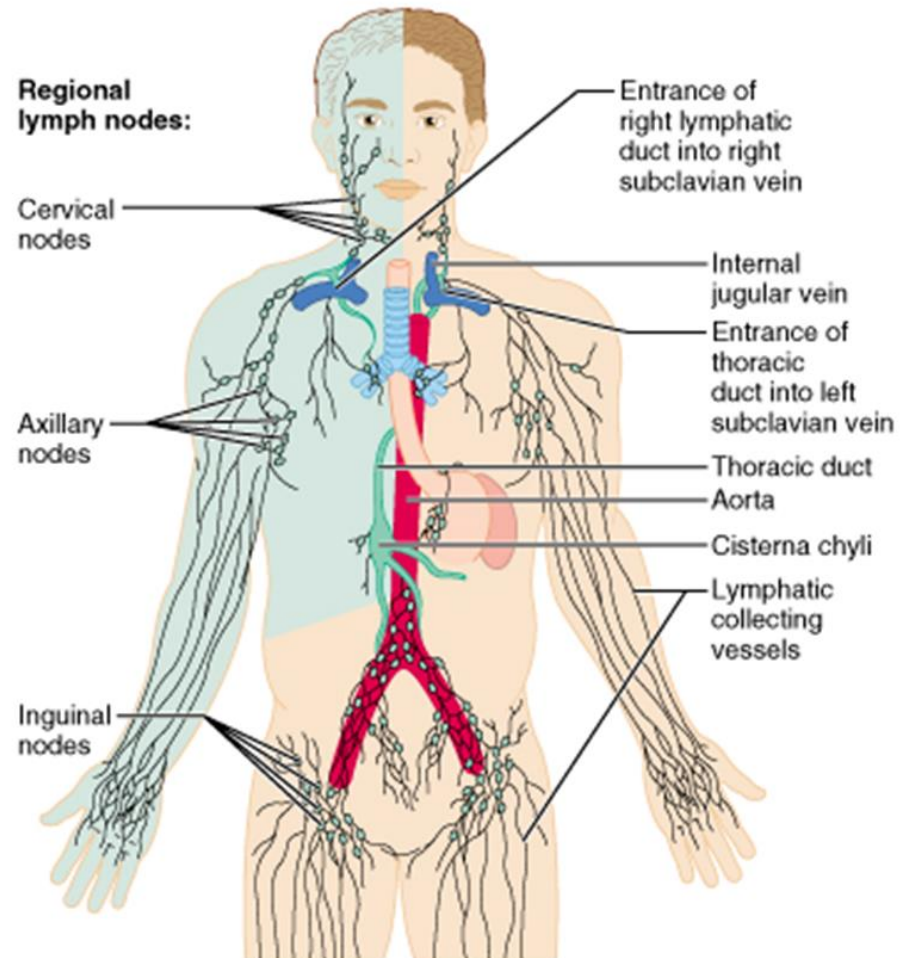
**(a)**

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# Major Lymph Nodes

- ◆ cervical
- ◆ axillary
- ◆ inguinal
- ◆ mesenteric



# Cervical

- ◆ located in neck area
- ◆ filter lymph from head and neck

# Axillary

- ◆ located in armpits
- ◆ filter lymph from hand, arm, breast

# Inguinal

- ◆ located in groin area
- ◆ filter lymph from lower extremities and external genital organs

# Mesenteric

- ◆ located in abdominal peritoneum
- ◆ aid in infection control after abdominal surgery
- ◆ filter lymph from abdominal cavity

# Metastasis

- ♦ process by which bacteria or body cells are spread from one body part to another through lymphatic or circulatory systems
- ♦ cancer cells migrate to nearby nodes, eg. breast cancer to axillary nodes

# Tonsils

- ◆ aggregations of large lymphatic nodules
- ◆ embedded in mucous membrane
- ◆ located beneath epithelium of pharynx and oral cavities
- ◆ protect nasal and oral cavities
- ◆ **Three types:**
  - nasopharyngeal tonsils
  - palatine tonsils
  - lingual tonsils

# Nasopharyngeal Tonsils

- ◆ commonly called adenoids
- ◆ **Located:**
  - behind nose
  - on roof of posterior wall of pharynx
  - posterior opening of nasal cavity

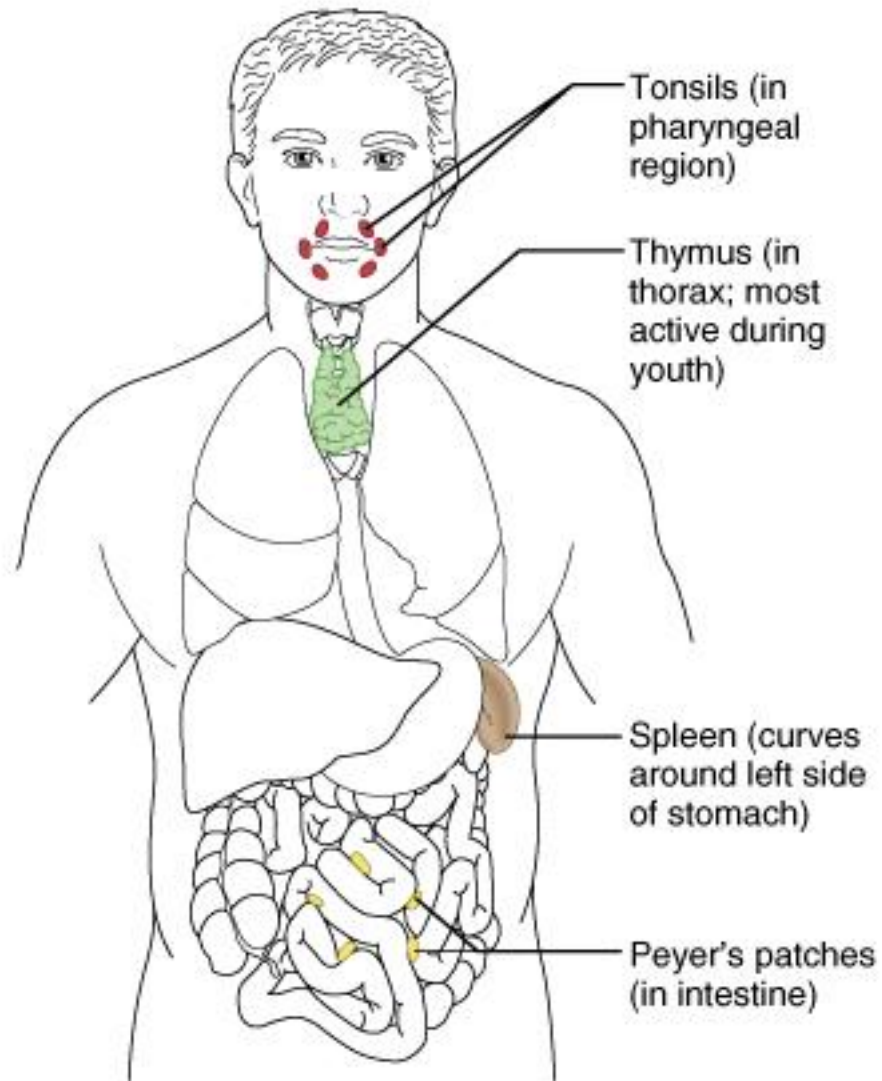
# Palatine Tonsils

- ◆ usually referred to as the “tonsils”
- ◆ **Location:**
  - back of mouth
  - lateral walls of pharynx
- ◆ most commonly removed - tonsillectomy

# Lingual Tonsils

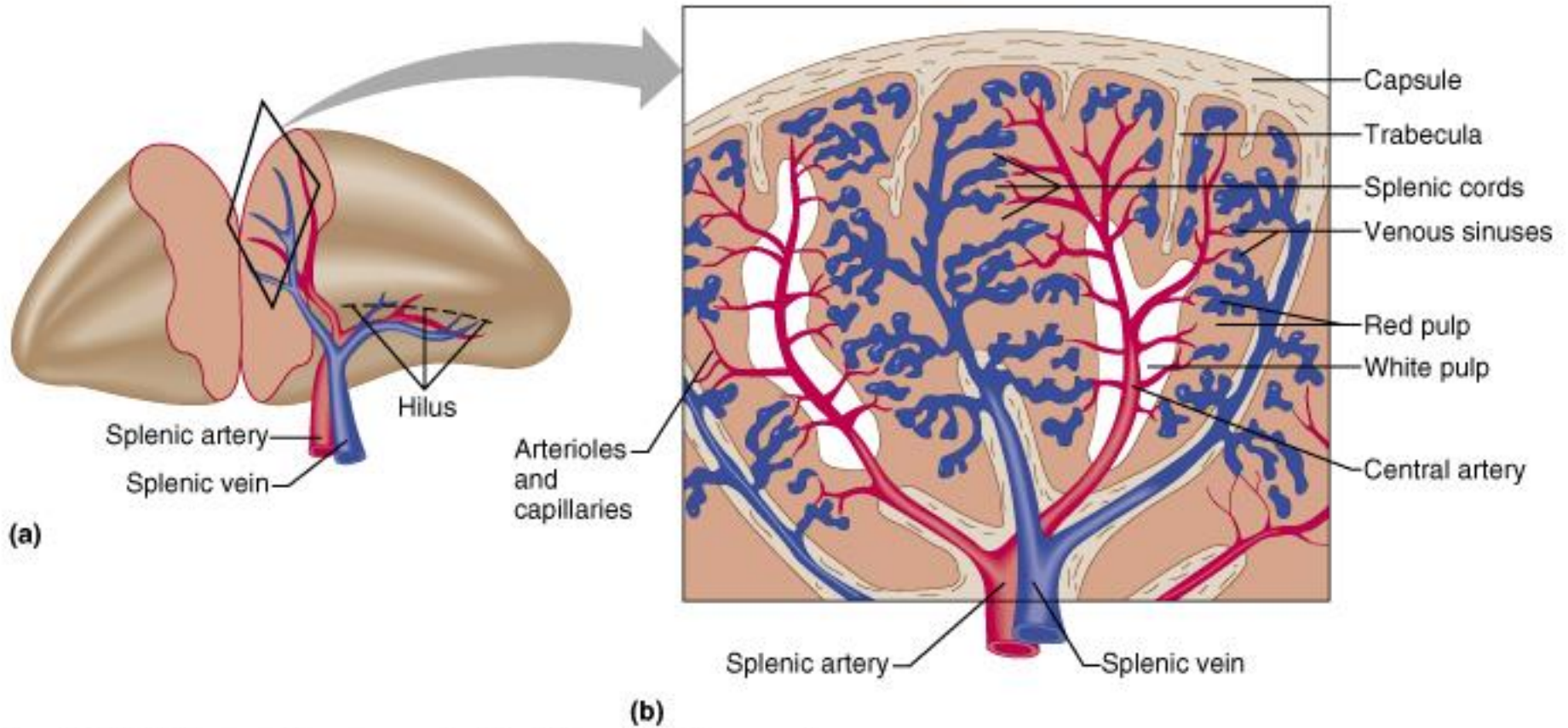
- ◆ base of tongue
- ◆ first line of defense from exterior





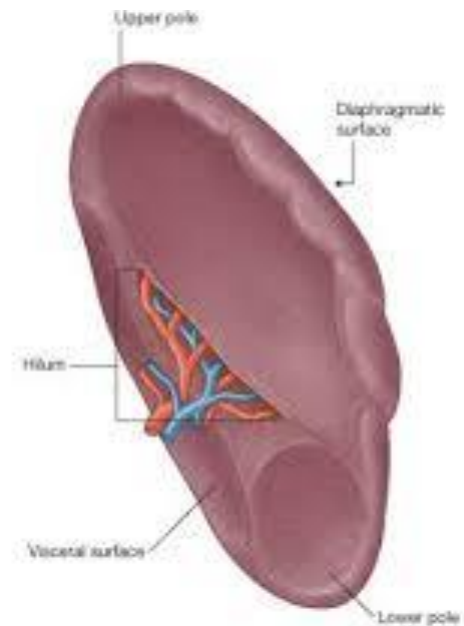
# Spleen

- ◆ largest lymphatic organ
- ◆ located in upper left abdominal quadrant
- ◆ between fundus of stomach and diaphragm
- ◆ resembles a large lymph node
- ◆ filters blood



# Structure of Spleen

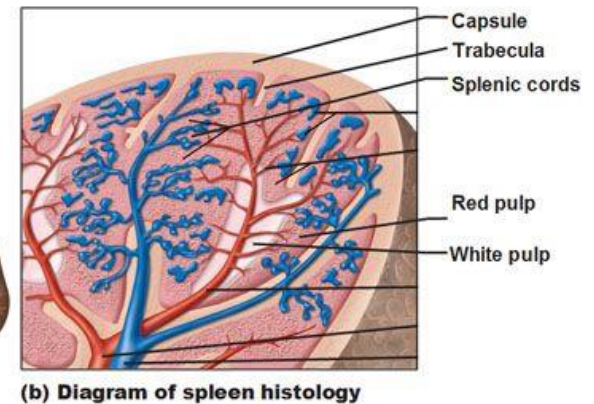
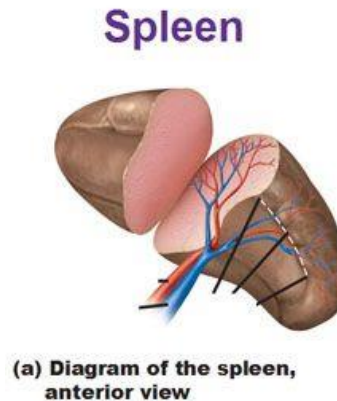
- ◆ capsule
  - covering of dense connective tissue
- ◆ hilum
  - depression on medial surface
  - nerves and arteries enter spleen, veins and lymphatic vessel exit



# Structure of Spleen

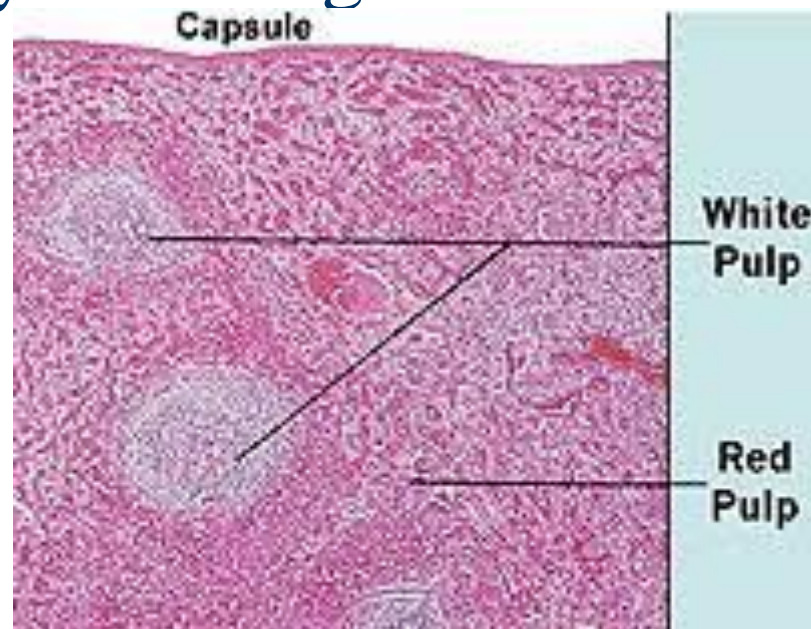
(cont.)

- ◆ trabeculae
  - extensions of capsule, form partitions within the spleen
- ◆ Pulp
- ◆
  - tissue inside
  - divided into red and white



# White Pulp

- ◆ consists of lymphatic tissue
- ◆ mostly lymphocytes arranged around central arteries



# Red Pulp

- ♦ **Consists of:**

- venous sinuses filled with blood
- cords of splenic tissue

consists of red blood cells, macrophages, lymphocytes, plasma cells, and granulocytes

# Functions of Spleen

- ◆ phagocytosis of bacteria and worn out or damaged red blood cells and platelets
- ◆ stores and releases blood in times of demand, e.g., hemorrhage
- ◆ functions in immunity as a site of B cell proliferation into plasma cells
- ◆ does not filter lymph because it has no afferent lymphatic vessels or lymph sinuses



# Thymus Gland

- ◆ two-lobed organ
- ◆ located in upper part of chest along trachea
- ◆ inferior to thyroid gland, posterior to sternum
- ◆ largest and most active during prenatal period and infancy
- ◆ after puberty it decreases in size

# Thymus Gland

(cont.)

- ◆ composed of lymphatic tissue
- ◆ subdivided into lobules
- ◆ immature T cells originating in the bone marrow migrate to thymus via blood
- ◆ in thymus, cells develop into mature T cells for release into circulation
- ◆ thymic hormones aid in maturation of T cells

# Removal of Thymus

(thymectomy)

- ◆ can be removed but decreased T-cell production results
- ◆ possible acute susceptibility to infection

# Removal of Spleen

## (splenectomy)

- ◆ can be removed
- ◆ other organs, e.g. the liver and bone marrow can compensate for it
- ◆ increased susceptibility to disease may result

# MALT..

- ◆ Is mucosa associated lymphatic tissues.
- ◆ It is infiltration of mucosa by large numbers of lymphocytes.
- ◆ Ex. Peyres patches of small intestine

◆ Questions?