



Anatomy of Lymphatic System

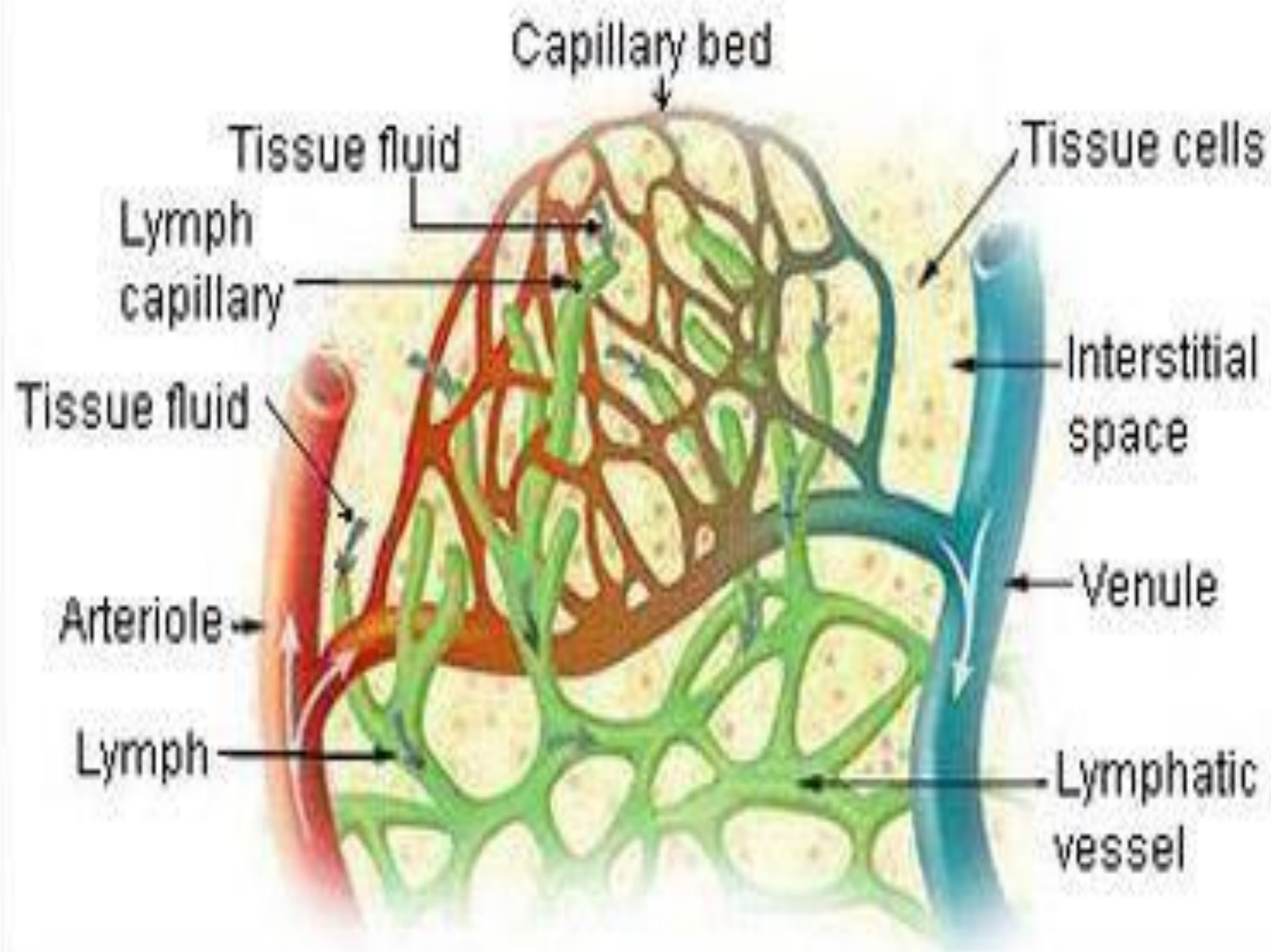
Lymphatic System

- ◆ 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

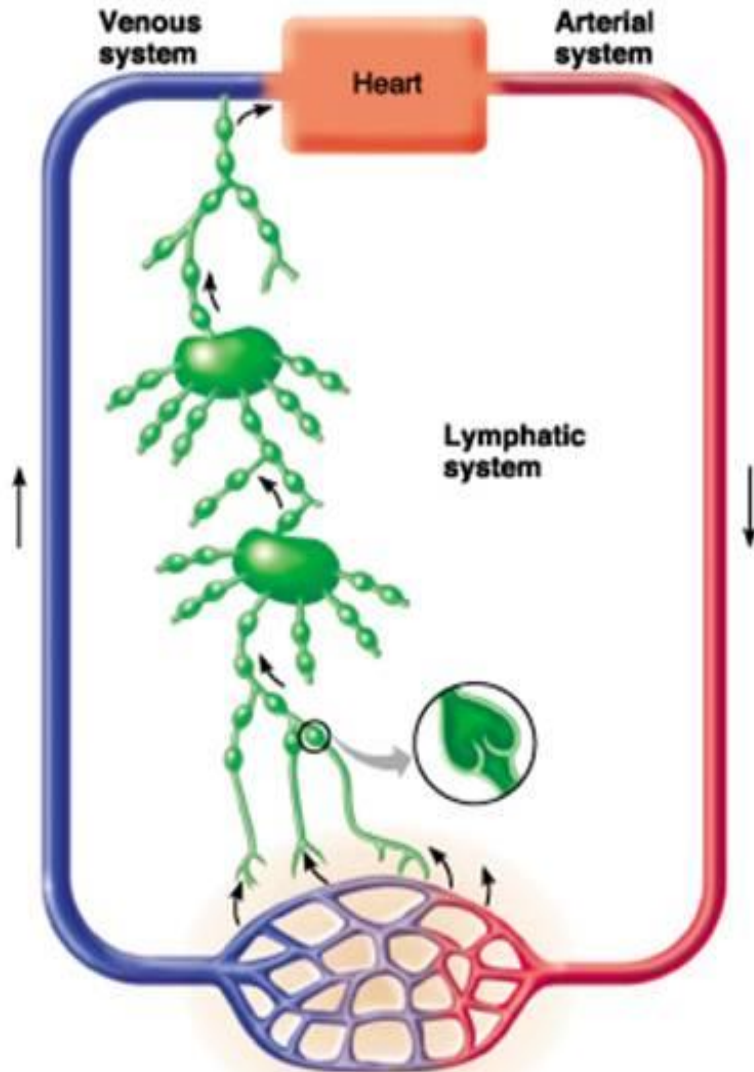


Lymph

(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*

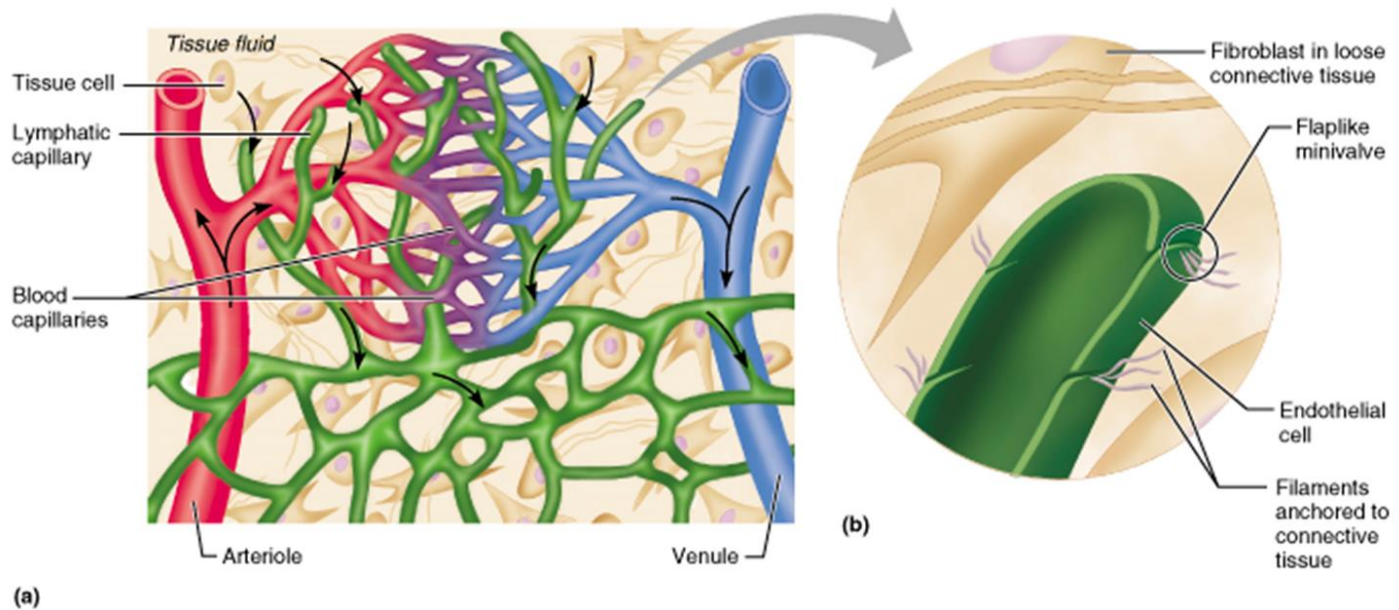
*larger particles that
escape into tissue fluid can
only be removed via
lymphatic system*

Lymph

- ◆ 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

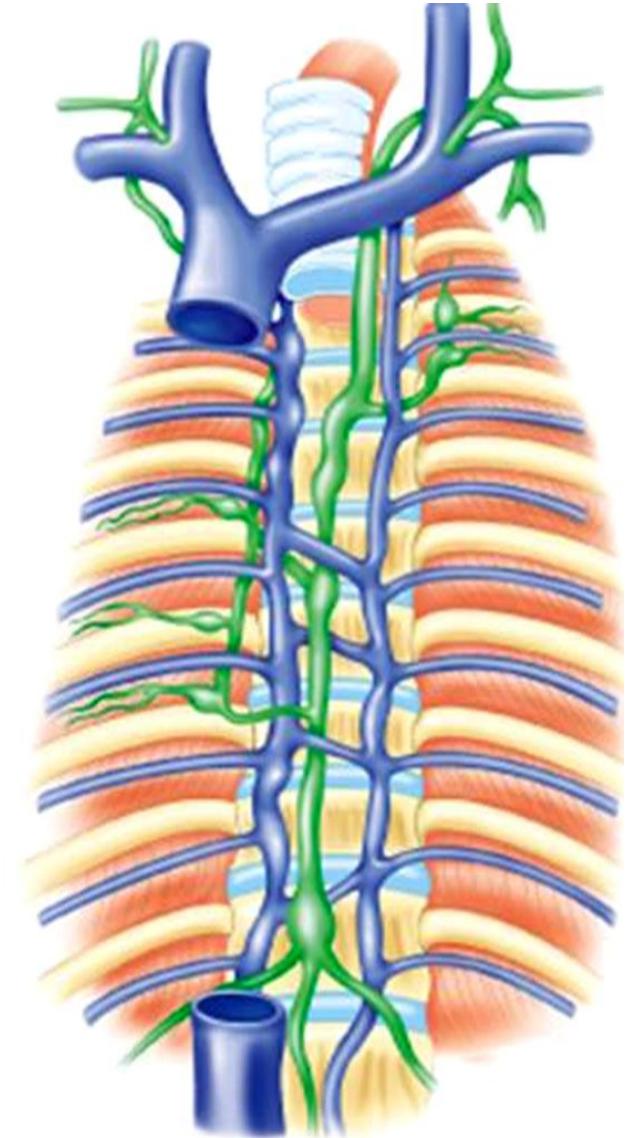


Lymph Vessels

- ◆ 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

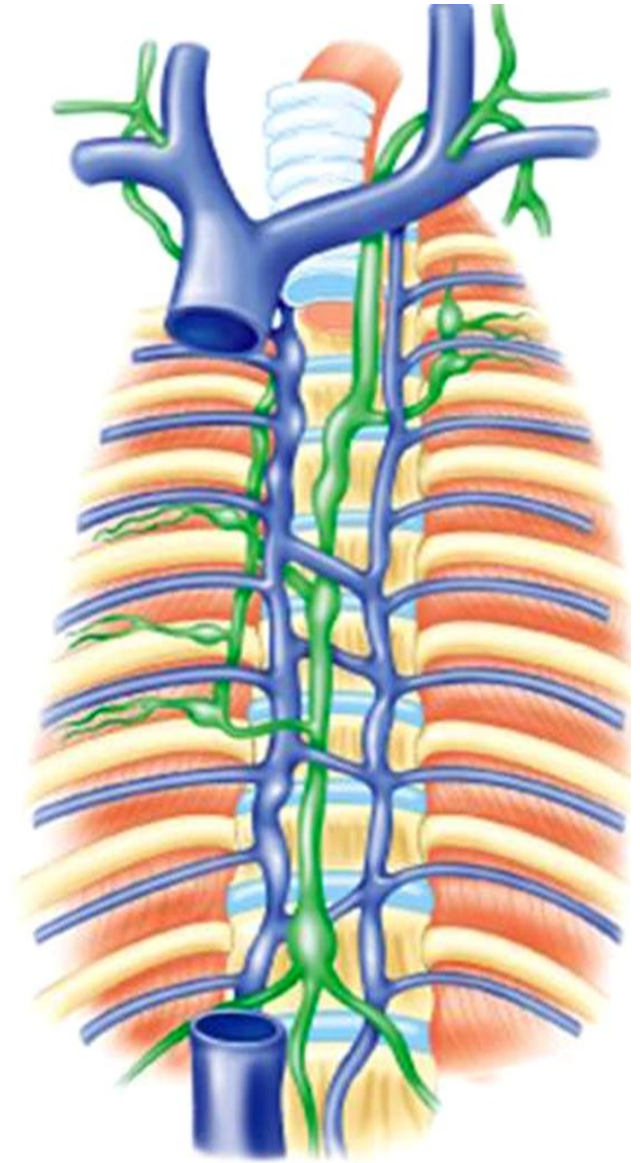
Thoracic Duct

(left lymphatic duct)

- ◆ about 15-18 inches (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

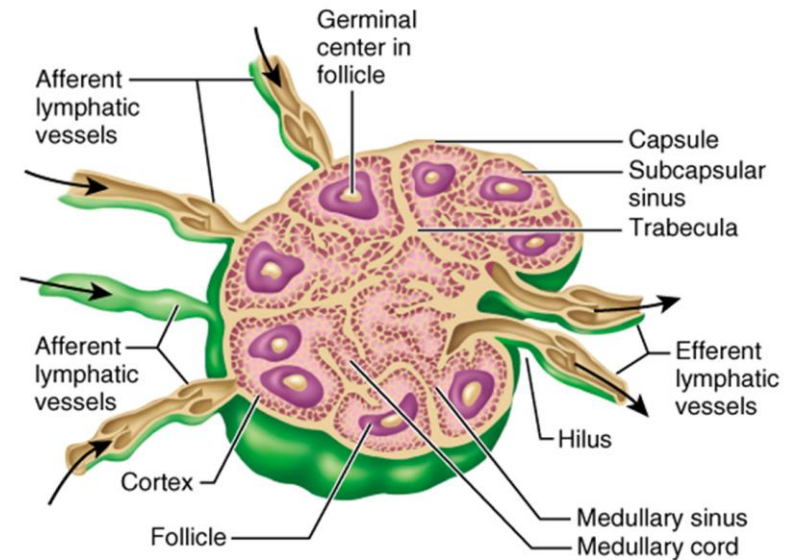
Right Lymphatic Duct

- ◆ about 0.5 inches (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

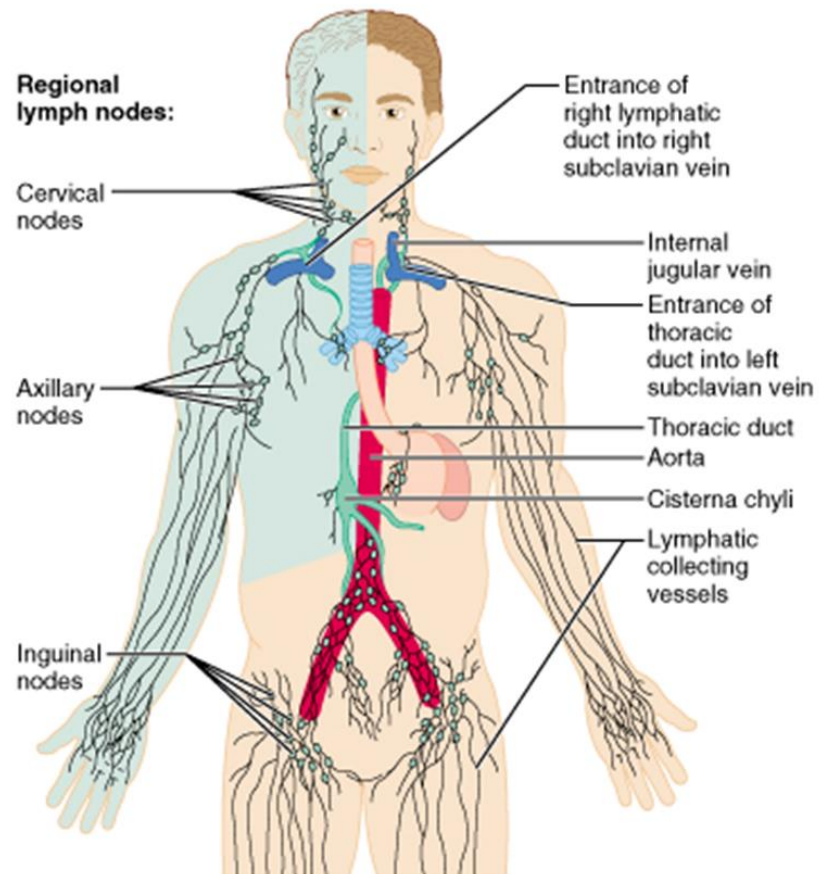


(a)

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Major Lymph Nodes

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



(a)

◆ **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

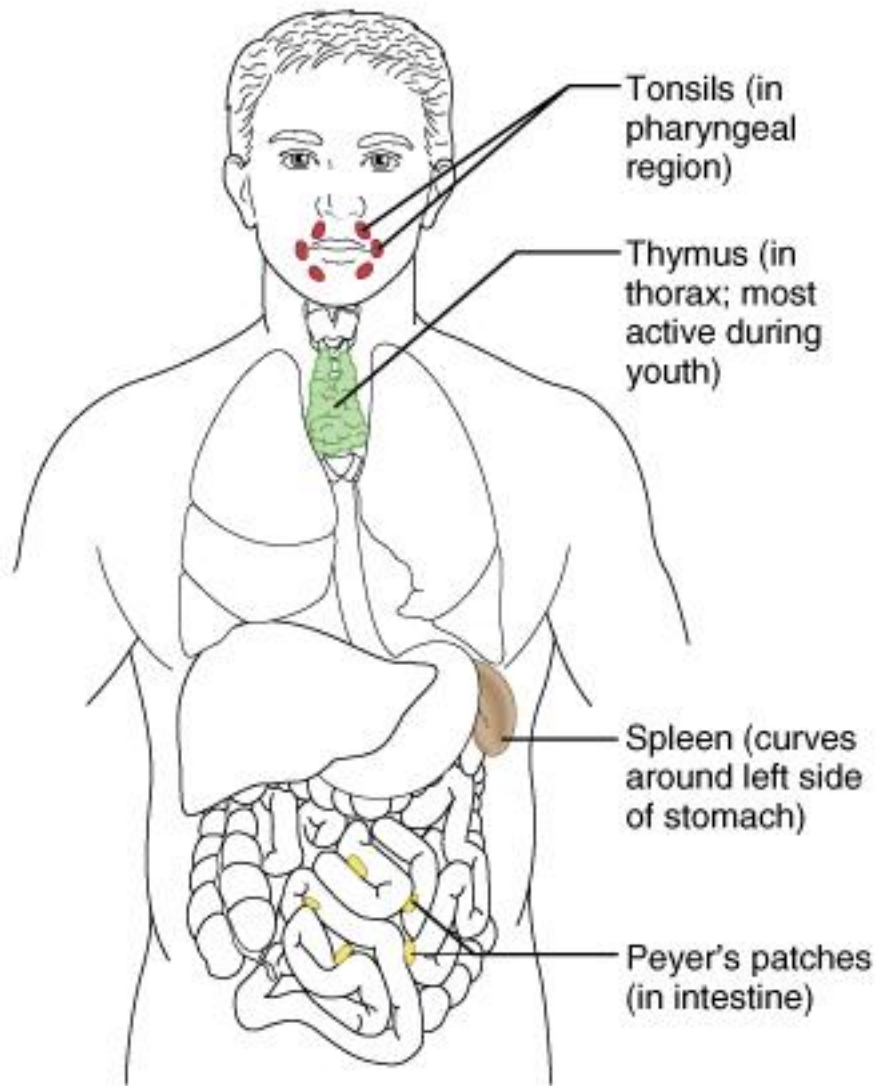
- ◆ located in abdominal peritoneum
- ◆ aid in infection control after abdominal surgery
- ◆ filter lymph from abdominal cavity

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 - chemotherapy is necessary once metastasis occurs

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

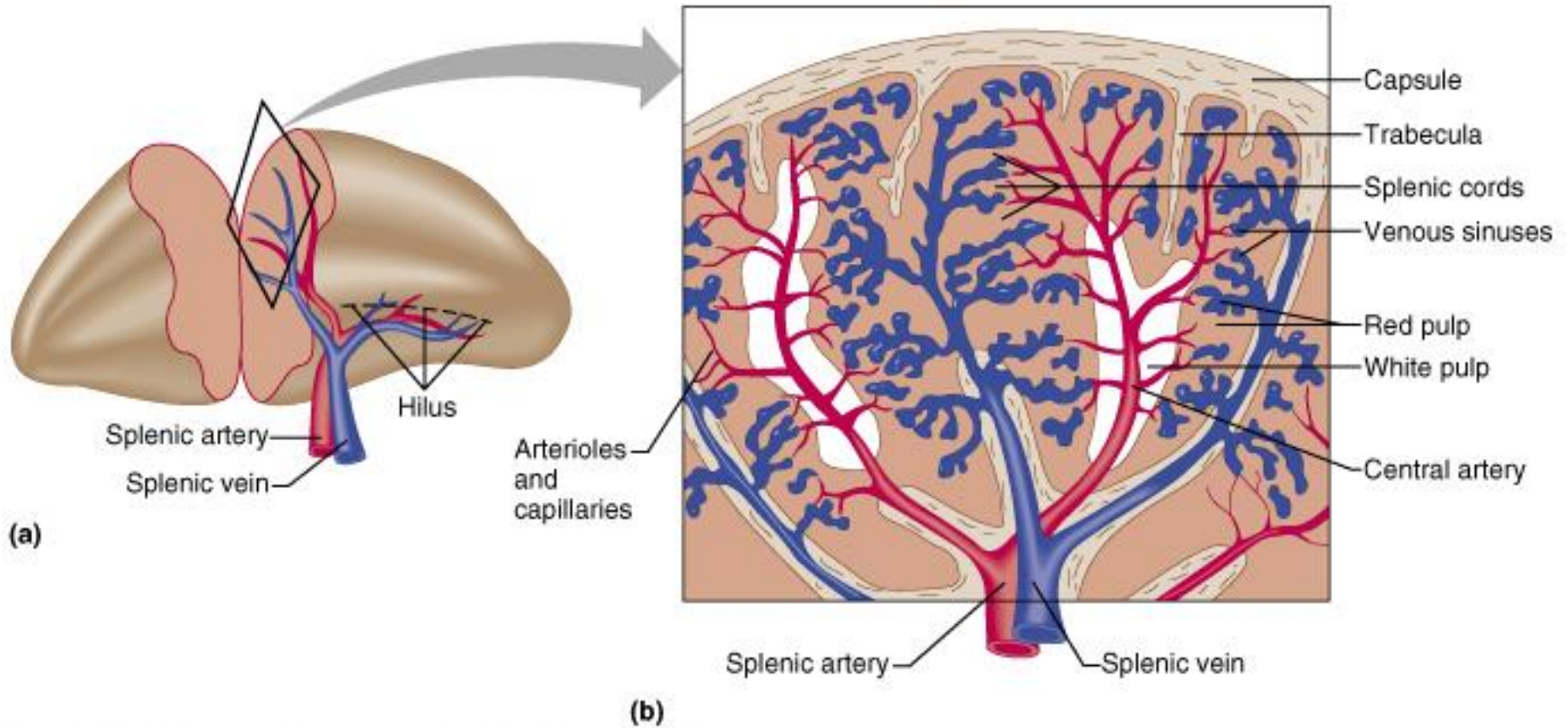
- ◆ usually referred to as the “tonsils”
- ◆ **Location:**
 - back of mouth
 - lateral walls of pharynx
- ◆ most commonly removed - tonsillectomy

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
- ◆ 5-6 inches long, 2-3 inches wide
- ◆ 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

- ◆ 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