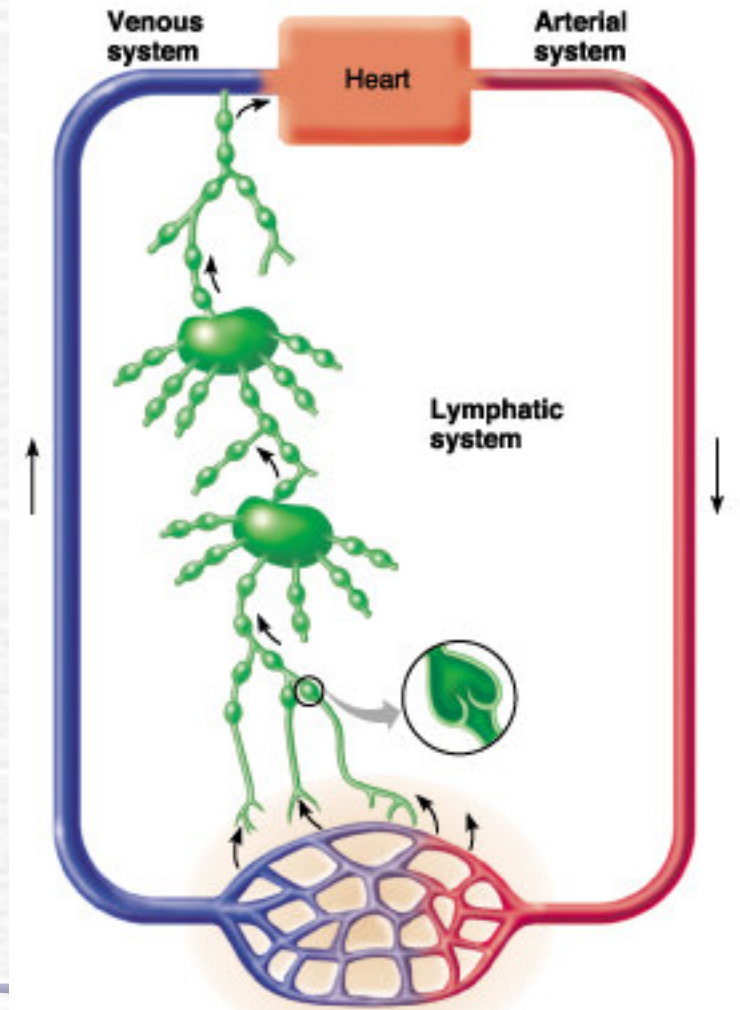


The Lymphatic and Immune systems

- Structures:
- Lymphatic vessels and lymph
- Lymphocytes
- Lymphoid tissue
- Lymphoid organs

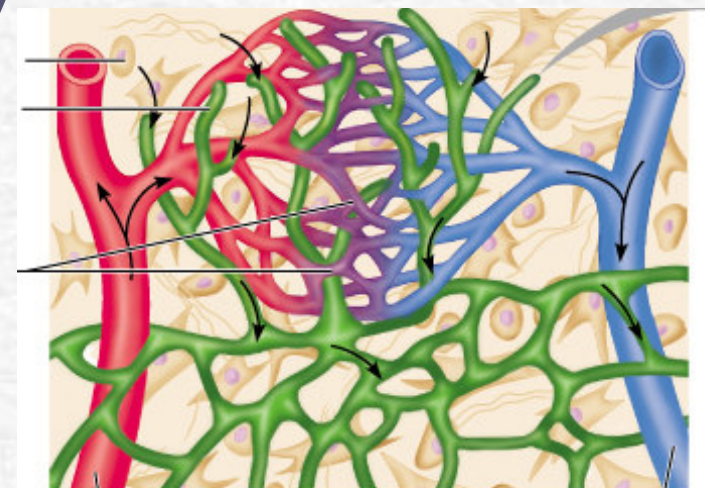
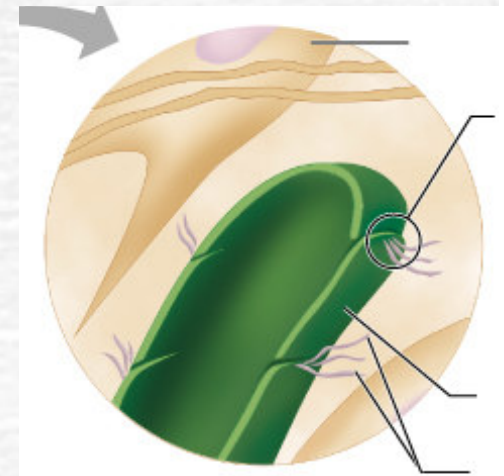
The flow of lymph

- 1-way flow from tissue towards heart
- Lymph arises from extracellular fluid
- Lymph capillaries flow into (→)
 - Lymphatic vessels
 - Through lymph nodes
 - Lymph trunks
 - Lymph ducts
 - Subclavian veins → → heart



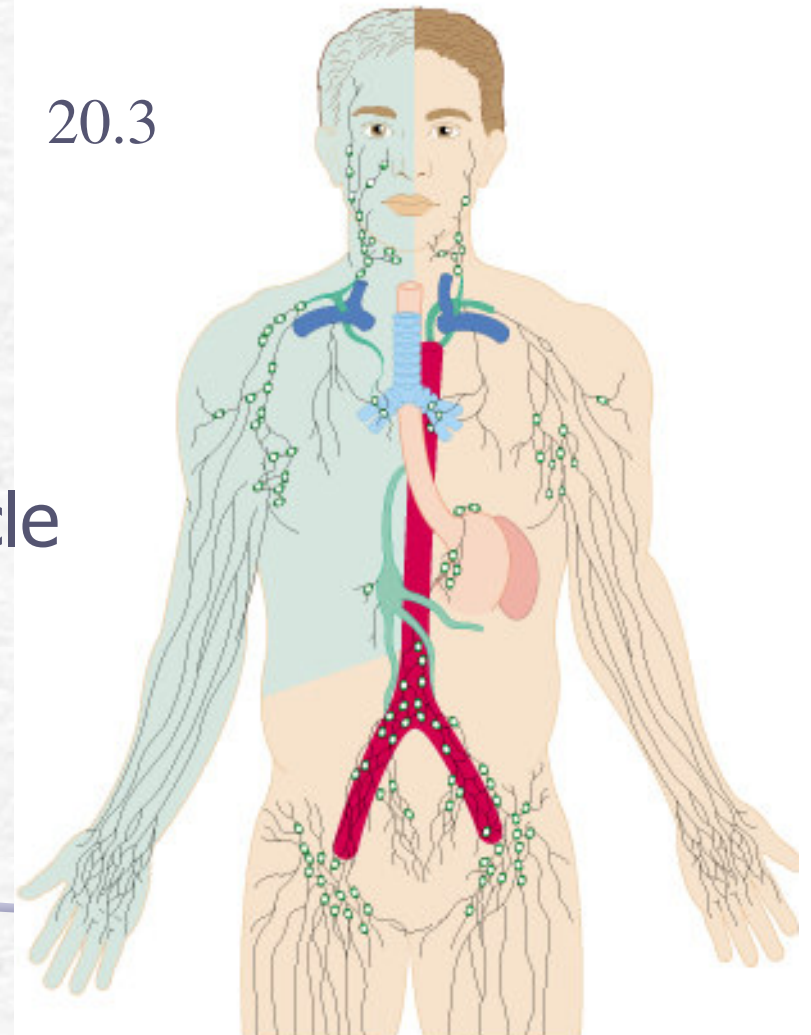
Lymph capillaries

- Closed-ended vessels
- Lined by endothelium
- 1-way flaps into capillary
 - Allows passage of tissue fluid, large proteins, bacteria, viruses, cancer cells, cell debris



Lymphatic collecting vessels

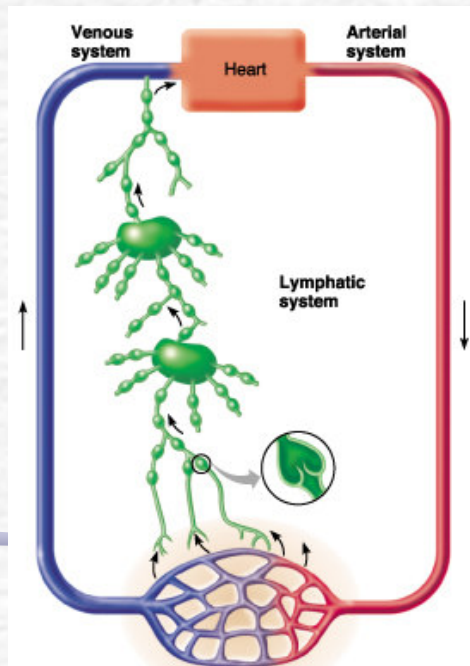
- Similar structure to blood vessels but thinner
- Many valves
- Flow of lymph
 - 1-way valves (like veins)
 - Surrounding skeletal muscle
 - Tunica media



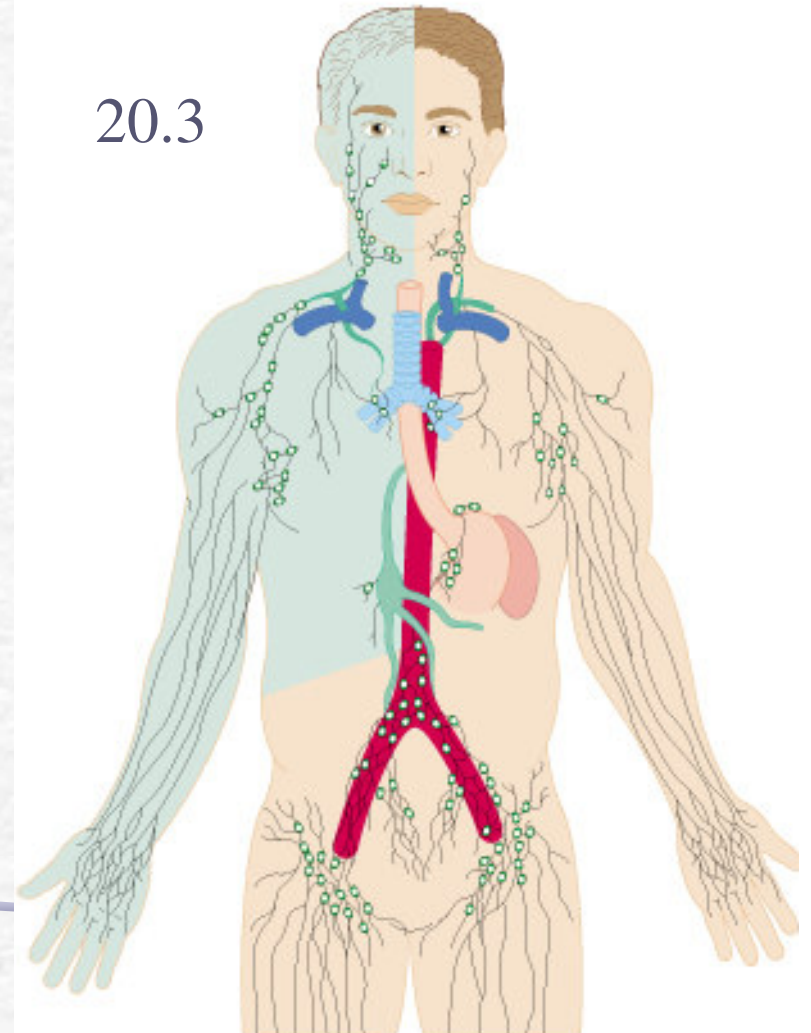
Lymph nodes

- Scattered in trunk
- Located along lymphatic vessels
 - Cleanses lymph

20.1



20.3

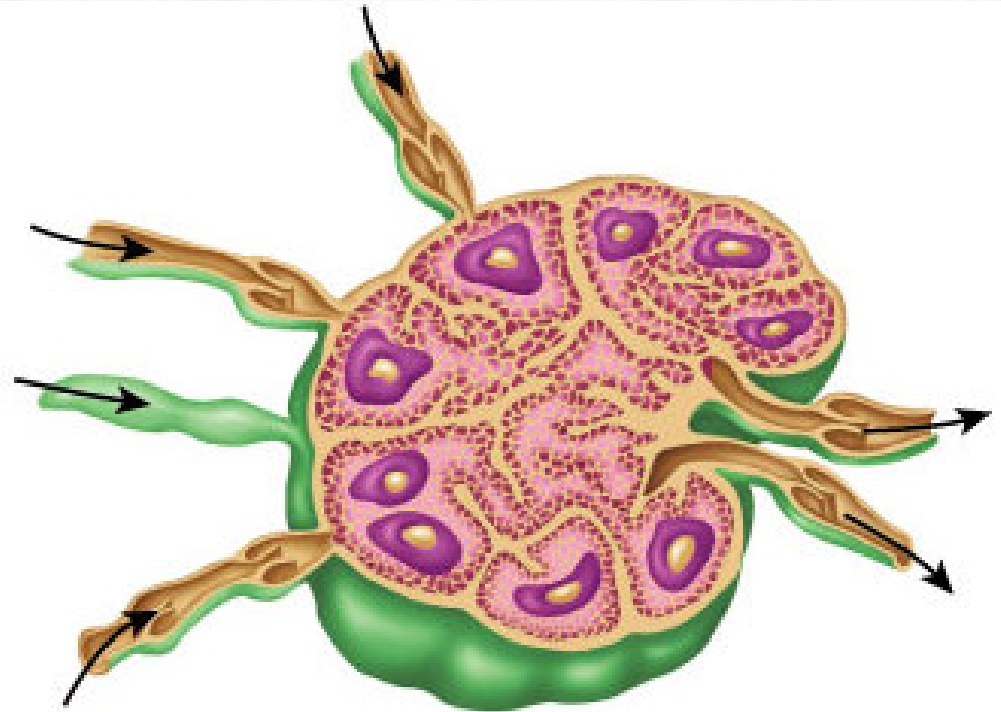


Lymph node structure

Support structures

- Capsule
 - Afferent and efferent lymphatics
- Trabeculae
- Reticular fibers

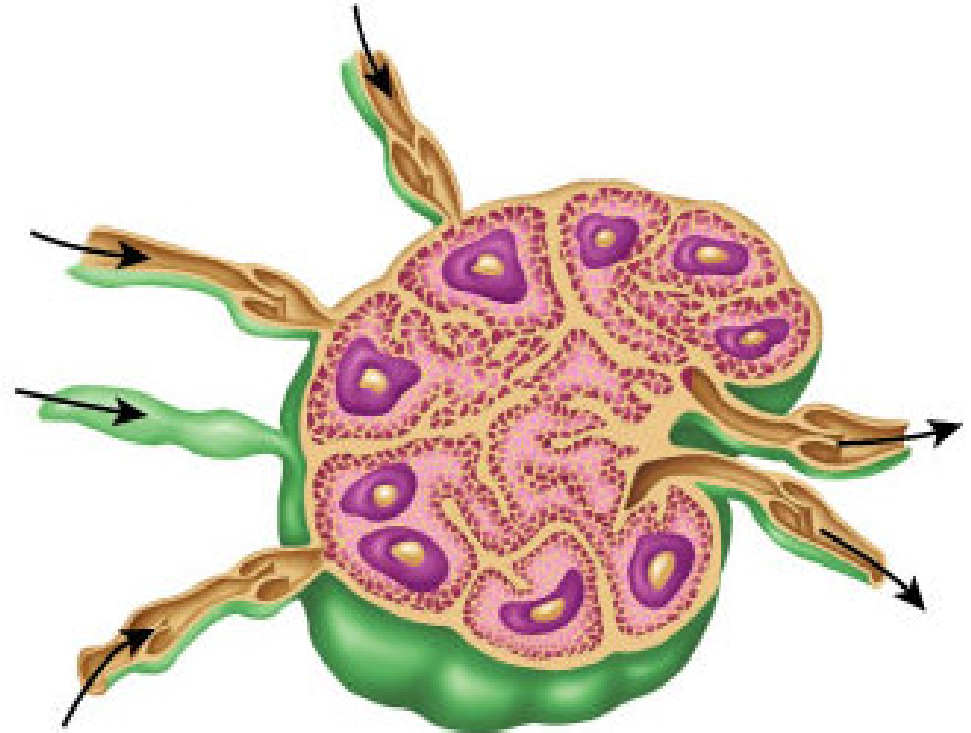
Hilus



20.4a

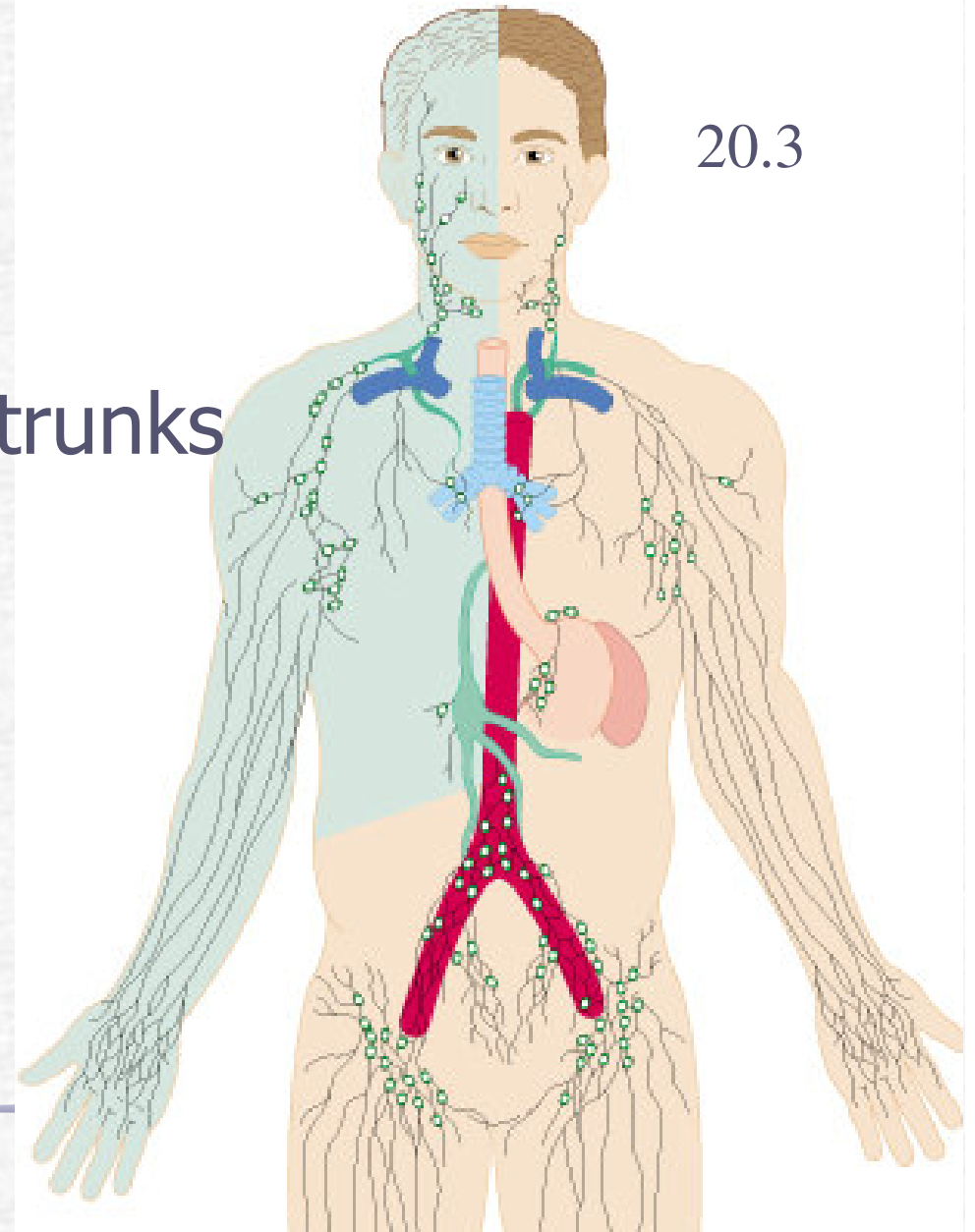
Lymph Node Function

- Produce new B and T cells
- Filter lymph



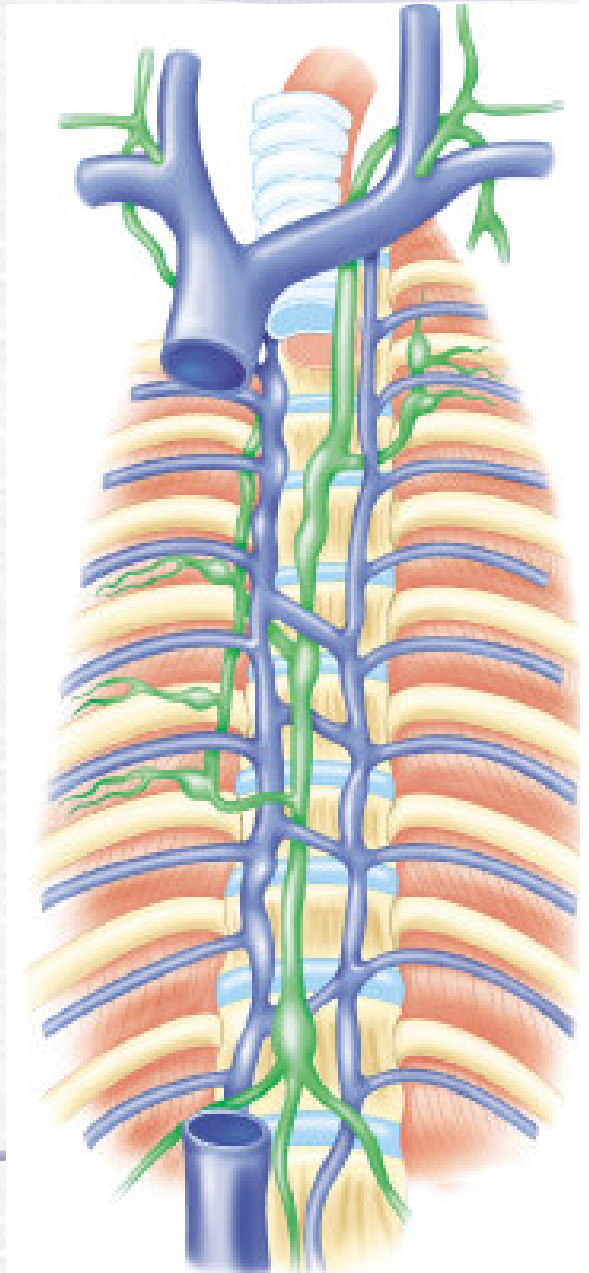
Lymph trunks

- Lumbar trunks
- Intestinal trunks
- Bronchomediastinal trunks
- Subclavian trunks
- Jugular trunks

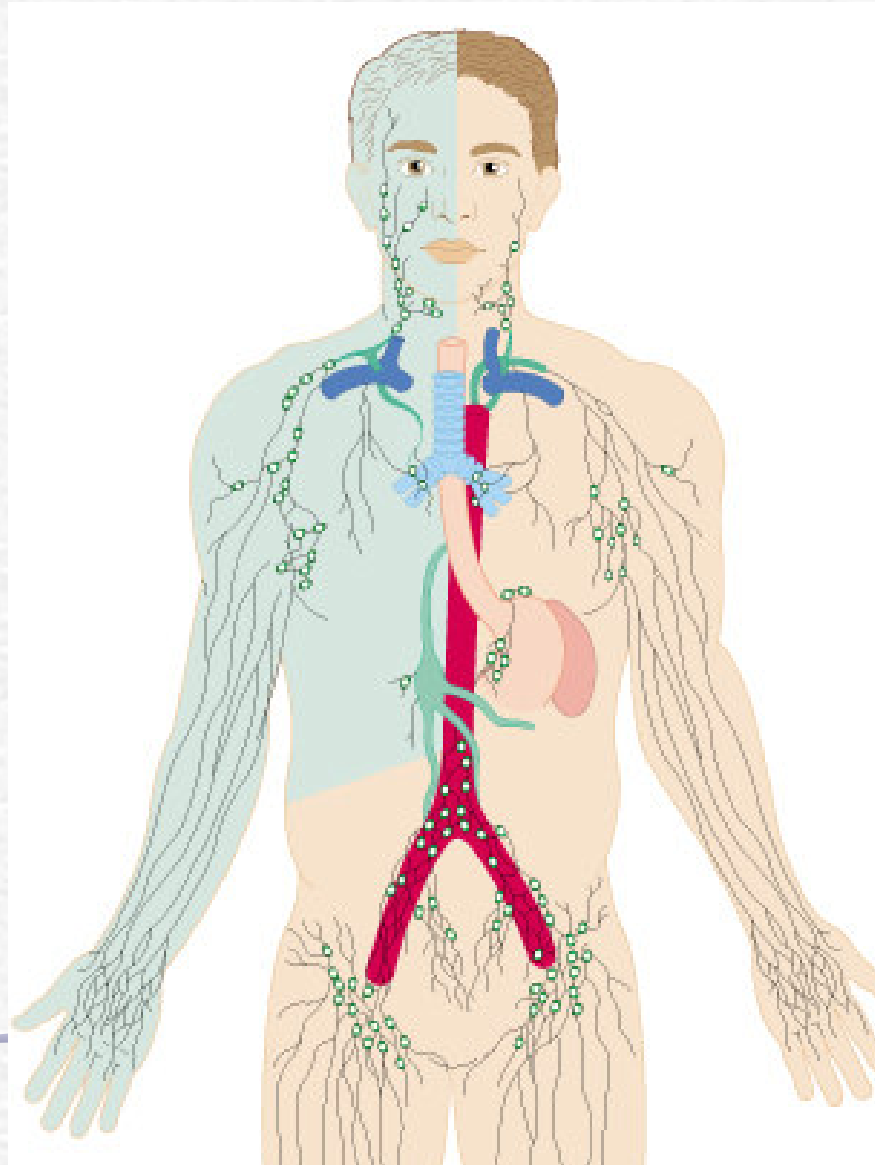


Lymph ducts

- Thoracic (L) lymphatic duct
 - Drains $\frac{3}{4}$ of lymph
 - L head, neck, thorax, upper extremity
 - R&L abdomen, lower extremities
- Right lymph duct
 - R head, neck, thorax, upper extremity
- Ducts drain into subclavian veins



Lymph ducts



20.3

The immune system

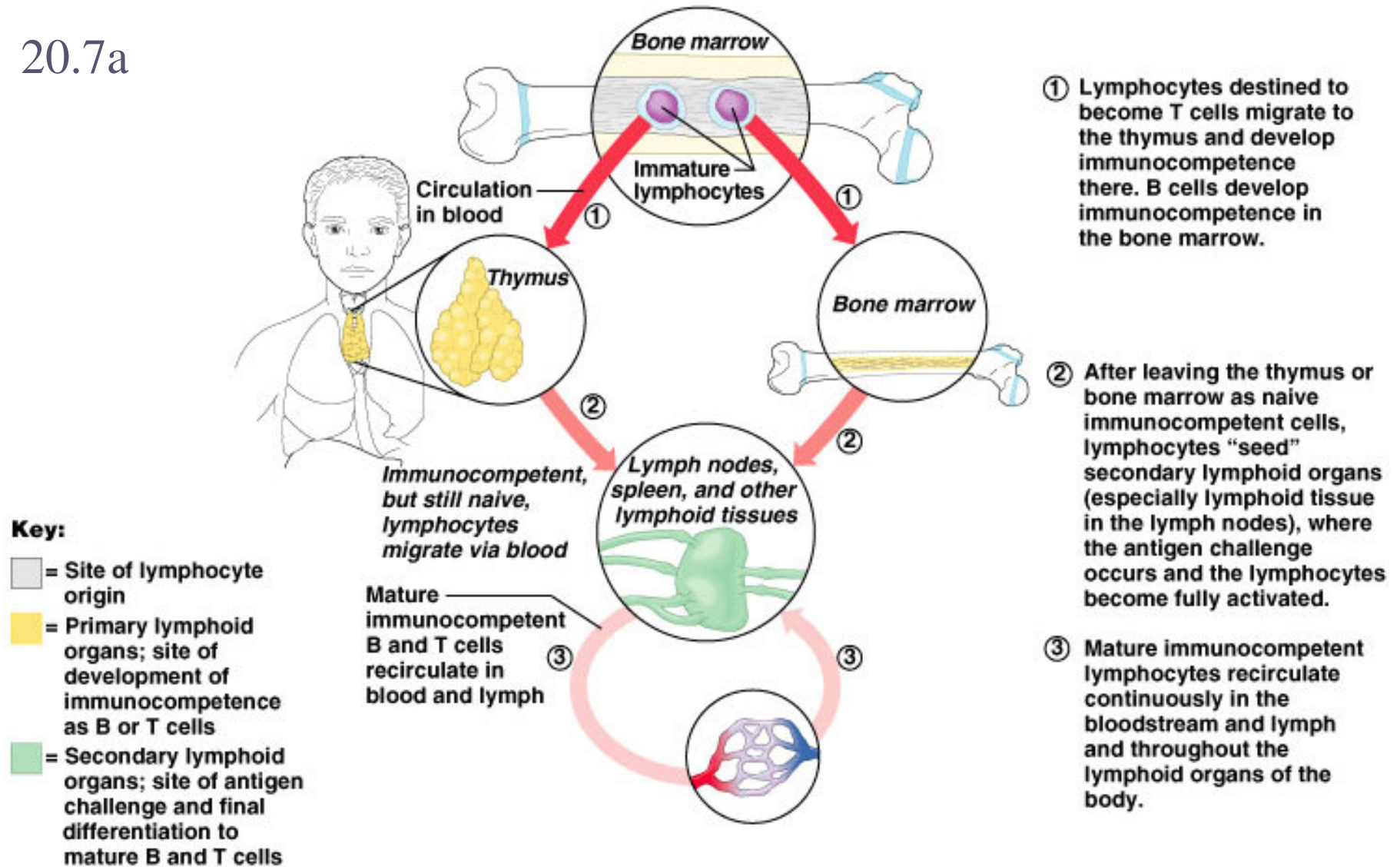
- Main defense against disease
- Includes
 - Lymphocytes
 - Lymphoid tissue
 - Lymph organs

Lymphocytes

- Attack antigens
- B lymphocytes produce Ab
- T lymphocytes destroy antigen-bearing cells

Lymphocyte Activation

20.7a



① Lymphocytes destined to become T cells migrate to the thymus and develop immunocompetence there. B cells develop immunocompetence in the bone marrow.

② After leaving the thymus or bone marrow as naive immunocompetent cells, lymphocytes “seed” secondary lymphoid organs (especially lymphoid tissue in the lymph nodes), where the antigen challenge occurs and the lymphocytes become fully activated.

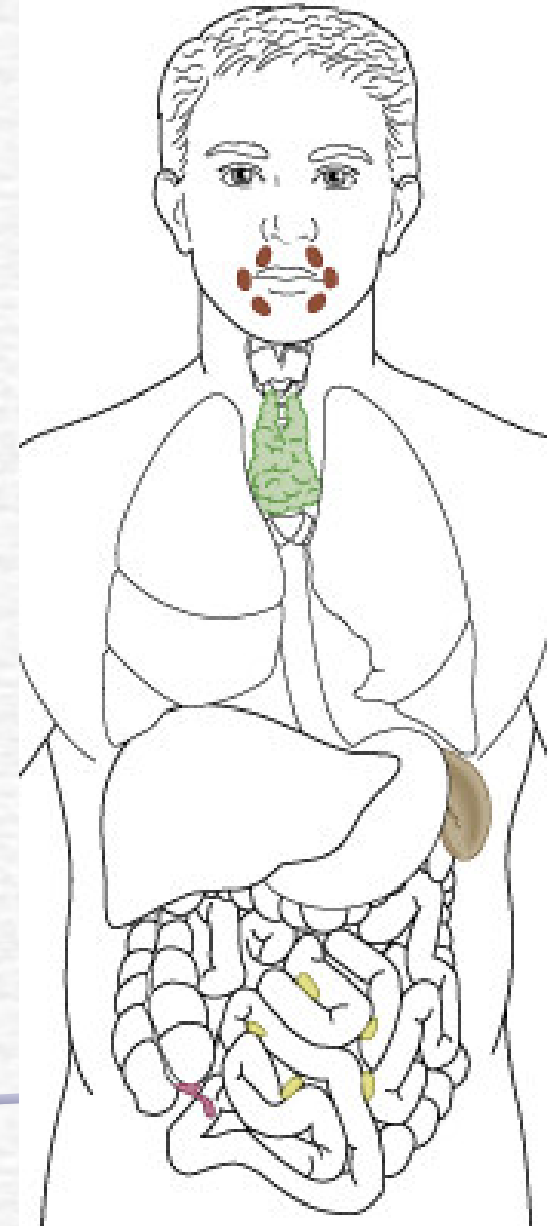
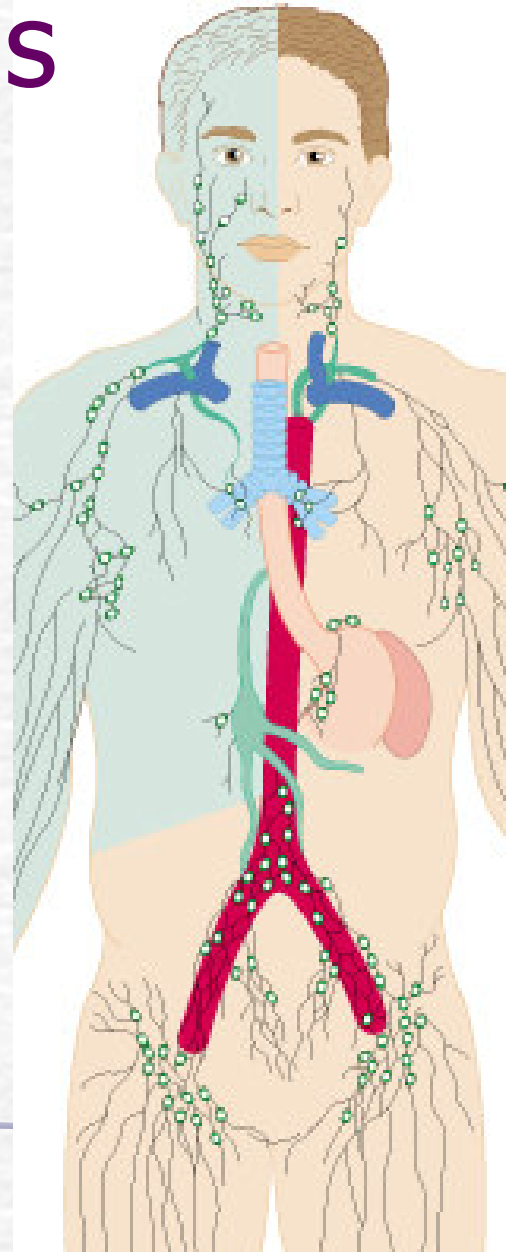
③ Mature immunocompetent lymphocytes recirculate continuously in the bloodstream and lymph and throughout the lymphoid organs of the body.

(a)

Lymphoid organs

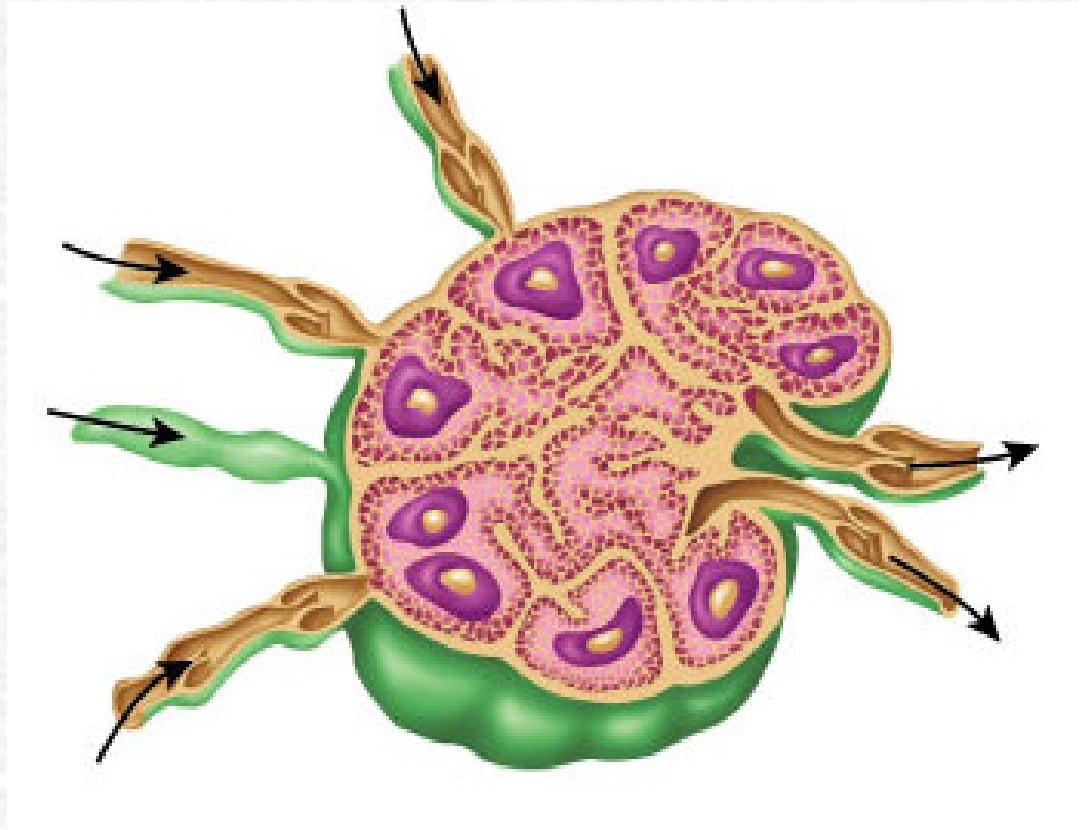
- Lymph nodes
- Spleen
- Thymus
- Tonsils

20.3,20.9



Lymph nodes

- Filter lymph
- B lymphocytes
 - Produced in germinal center
- T lymphocytes
 - Mature at corticomedullary junction

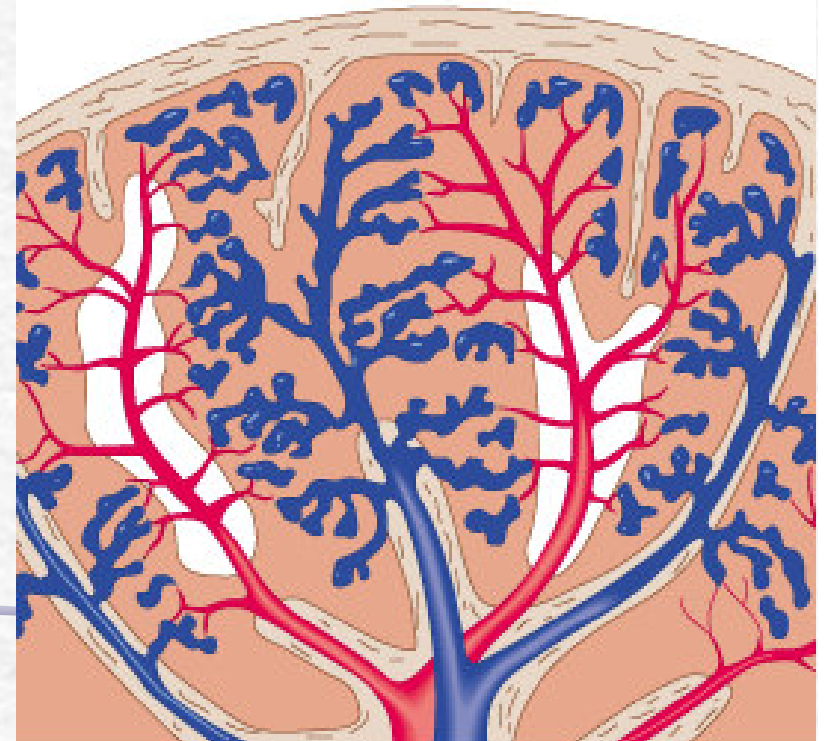
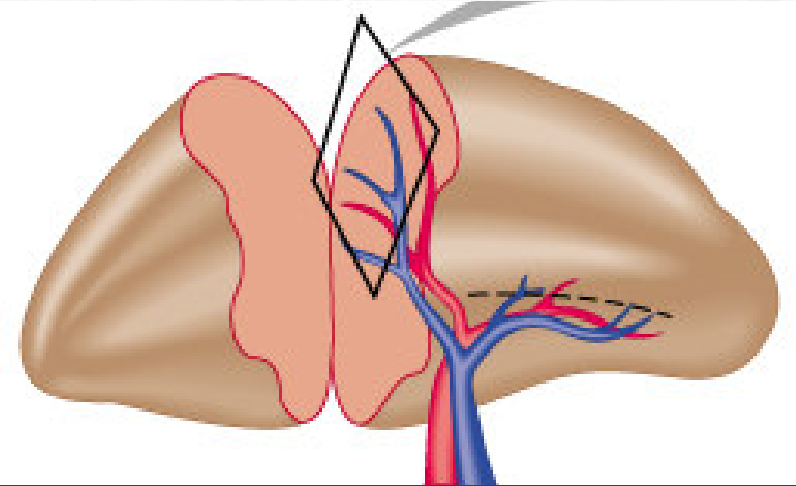


20.4a

Spleen

Supporting tissue

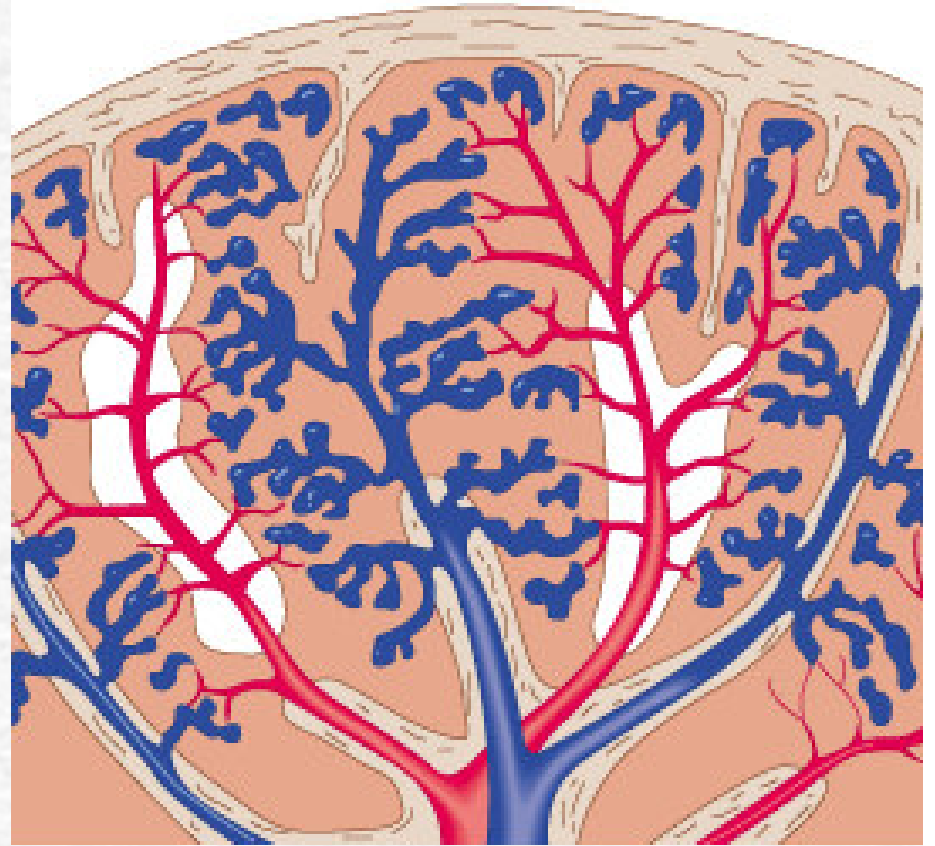
- Capsule
 - Hilus
 - Splenic artery
- Trabeculae
 - Trabecular arteries



20.11ab

Spleen

- Functional tissue:
- White pulp
 - Lymphocytes around central arteries
 - Branches of trabecular arteries
 - Immune response to antigens
 - Produces both B & T lymphocytes

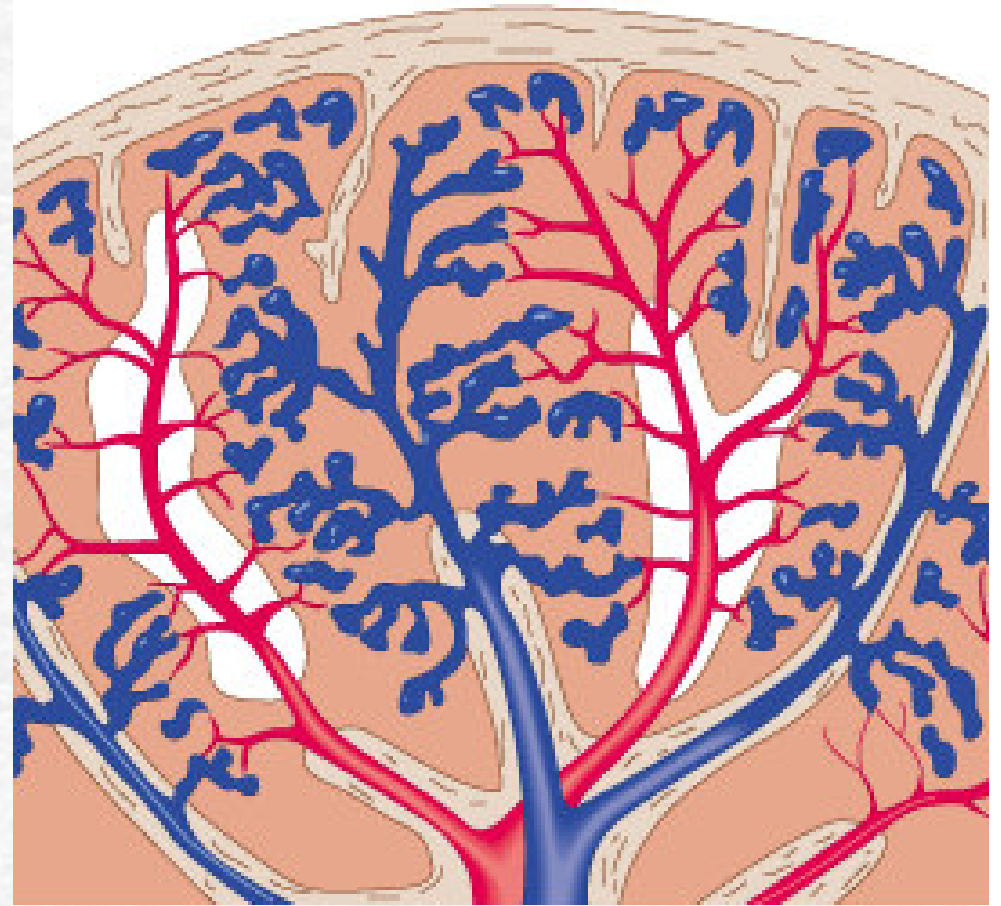


20.11b

Spleen

Red pulp

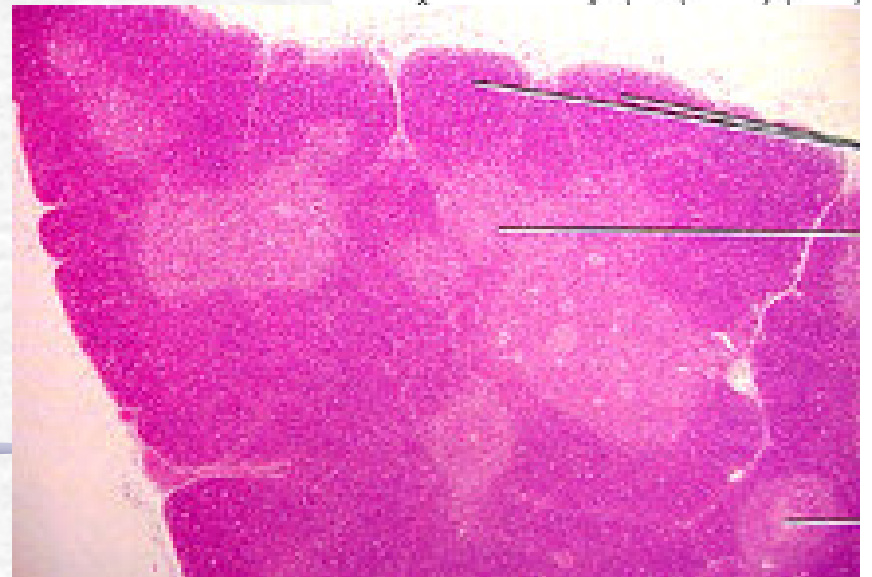
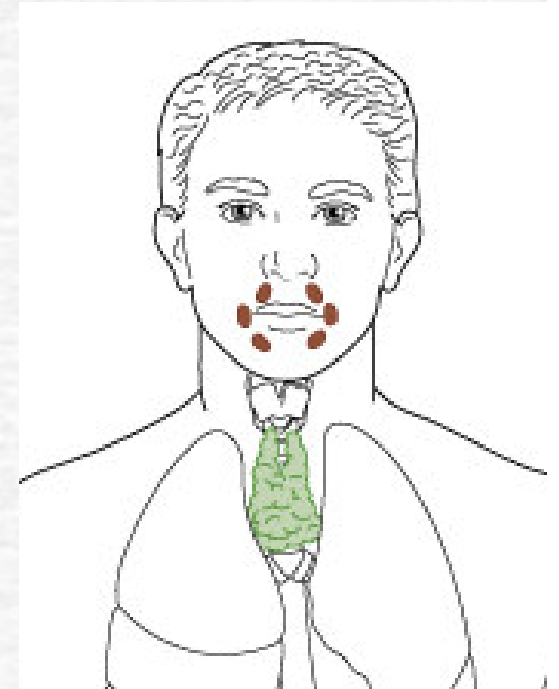
- Venous sinuses (splenic sinusoids)
- Splenic cords
 - Lymphocytes
 - Reticular fibers
 - Macrophages
 - Cleanse blood
 - Remove old rbc's



20.11b

Thymus

- Located in thorax
 - Posterior to sternum
- Supporting structures
 - Capsule
 - Trabeculae



20.9,20.10b