Lymphatic System

Rita Carey-Nita R.N.,B.S.N.

Lymphatic System

- Contains:
  - Lymph
  - Lymphatic Vessels
  - Lymphoid Tissue
  - Lymphoid Organs

Lymphatic System Function

- 3 Main Functions:

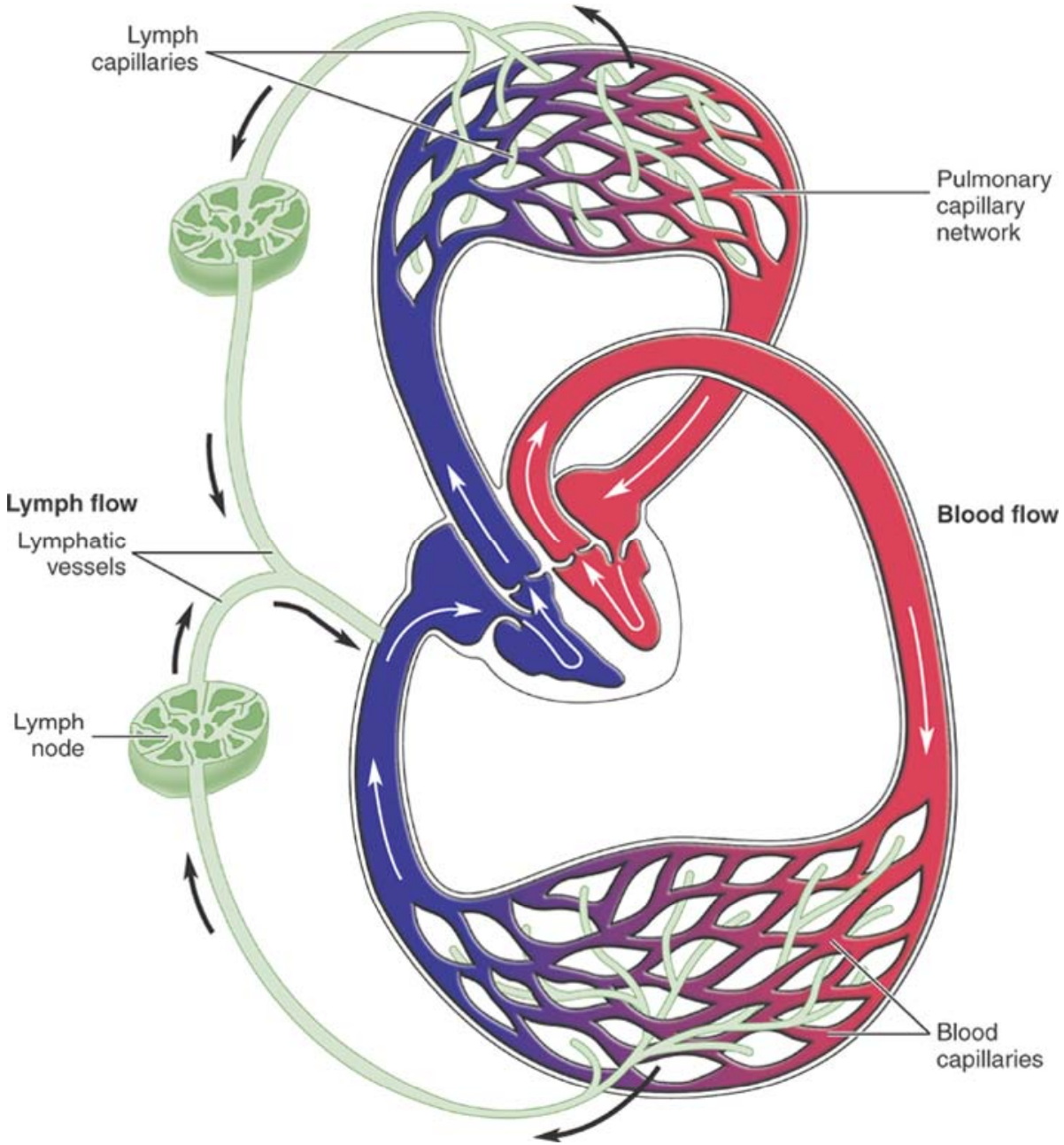
1. Lymphatic vessels return tissue fluid to the blood
2. Specialized lymphatic vessels play an important role in the intestinal absorption of fats & fat soluble vitamins
3. Lymphoid tissue helps body defend against disease

Lymph

- Lymph:
  - Clear fluid that resembles plasma
  - Primarily composed of water, electrolytes, waste from cells & some protein
  - Formed from plasma during capillary exchange
  - Leaves tissue space (interstitium) through the lymphatic vessels
  - The lymphatic vessels carry lymph toward heart & eventually empty it into the blood

Lymph Vessels

- Lymphatic vessels include lymphatic capillaries & several larger lymphatic vessels
- They form an extensive network
- Distribution is similar to the distribution of veins
- Every organ of the body has rich supply of lymphatic vessels


Lymph capillaries
Pulmonary capillary network
Lymph flow
Blood flow
Lymphatic vessels
Lymph node
Blood capillaries

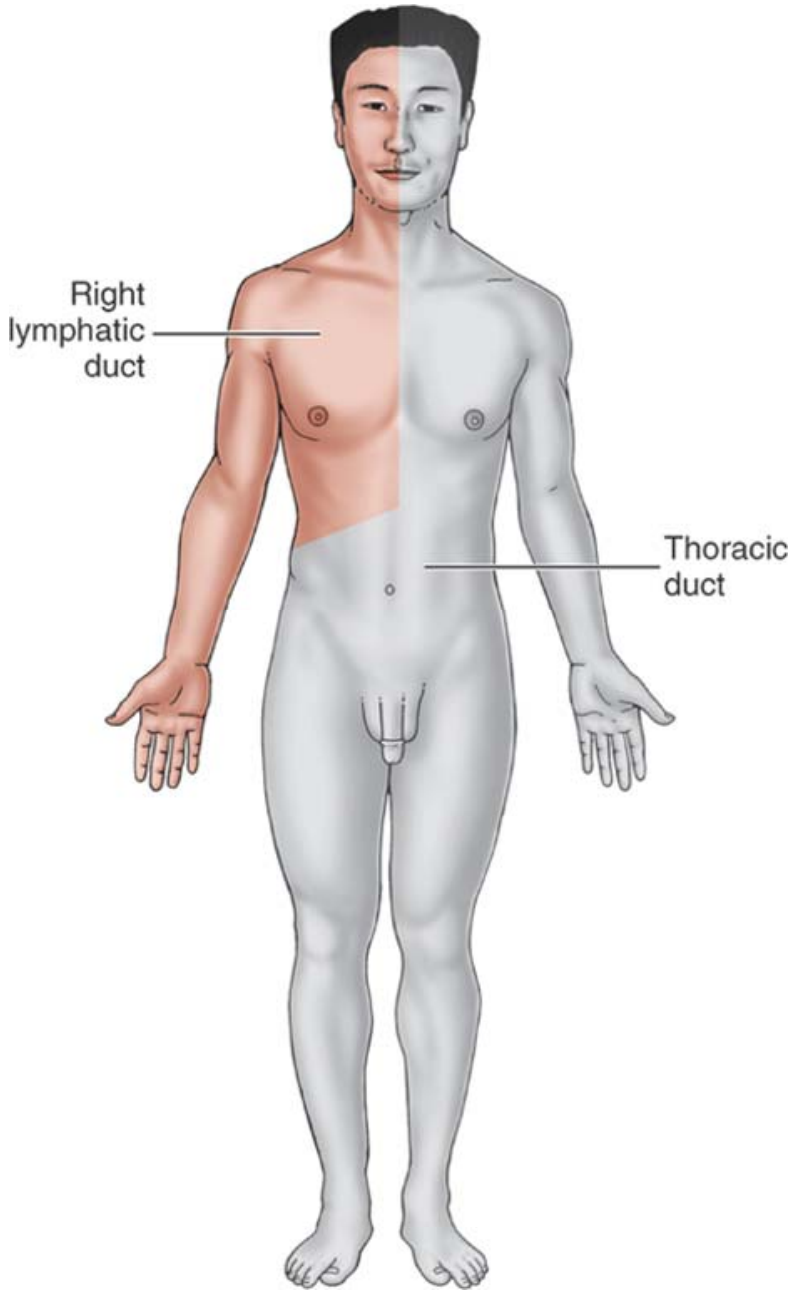

Lymphatic vessel
Arteriole
Tissue cells
Lymphatic capillaries
Venule
Capillary
Tissue spaces (interstitium)

Lymphatic Vessels

- The walls of the lymphatic capillaries are made up of a single layer of epithelium & contain large pores
- The large pores allow for the lymphatic capillaries to drain tissue fluid & proteins which creates lymph
- Once absorbed by lymphatic capillaries, lymph flows toward the heart in a series of larger & larger lymphatic vessels until it reaches the large lymphatic ducts

Lymphatic Ducts

- Lymphatic Ducts:
  - Right lymphatic duct: lymph from right arm, right side of head & thorax
  - Thoracic Duct: lymph from the rest of the body drain into the thoracic duct
- Both ducts empty lymph into the subclavian veins
  - Right lymphatic duct drains into the right subclavian vein
  - The thoracic duct drains lymph into the left subclavian vein


Right
lymphatic
duct
Thoracic
duct

Movement of Lymph

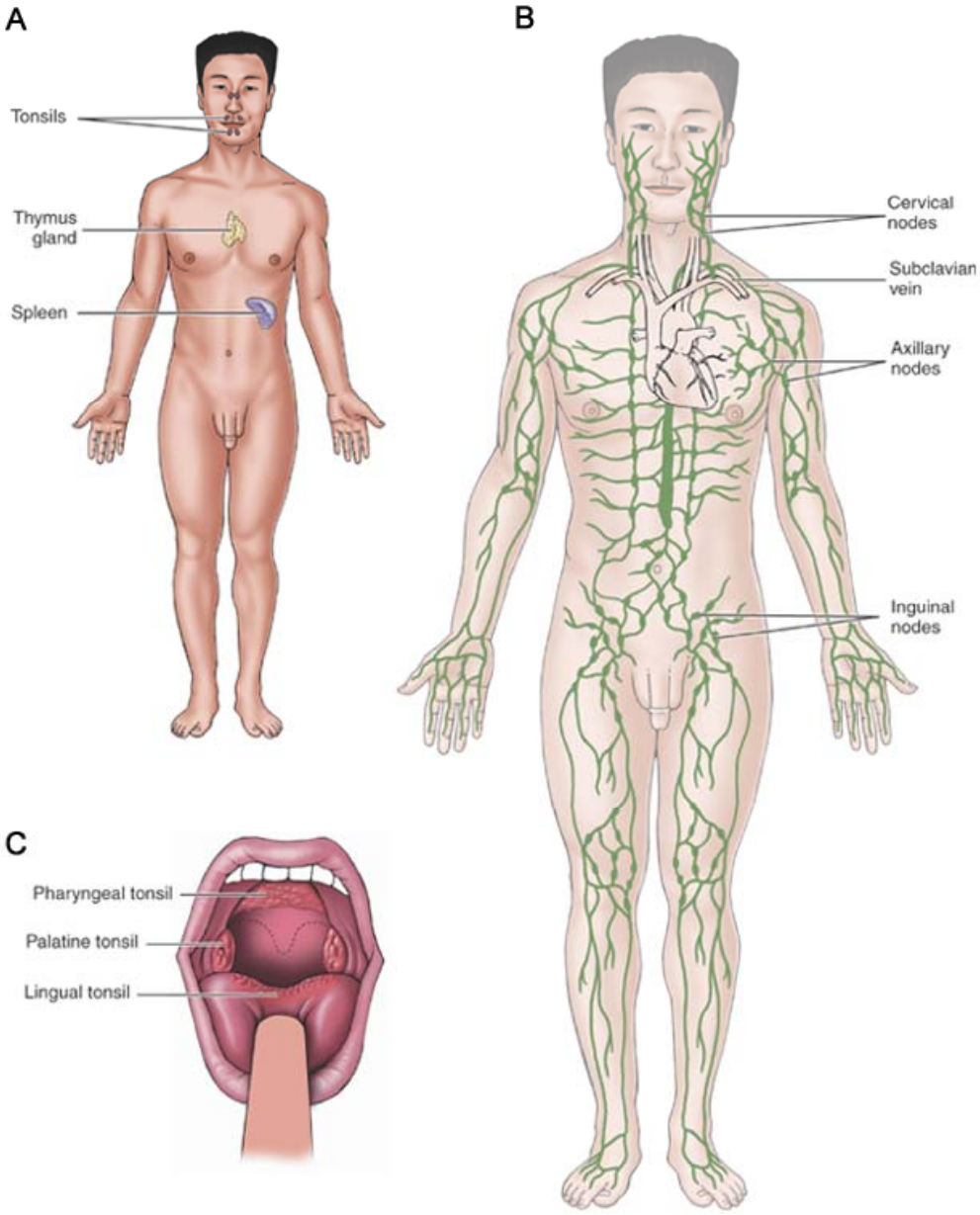
- Lymph movement occurs in the following ways:
  - Milking action of the skeletal muscles; as the muscles contract, they squeeze the surrounding lymphatic vessels, thereby pushing lymph toward the heart
  - Contraction & relaxation of the chest muscles changes intrathoracic pressure moving lymph
  - Contraction & relaxation of smooth muscle in lymphatic vessels causes lymph to flow
- Lymphatic vessels have one way flow toward heart
- Valves prevent backflow of lymph

Lymphoid Organs

- Include:
  - Lymph nodes
  - Tonsils
  - Thymus gland
  - Spleen
- Function:
  - Defend the body against disease by filtering particles such as pathogens & cancer cells from lymph, tissue fluid & blood
  - Supports the function of lymphocytes

Lymph Nodes

- Small pea-shaped patches of lymphatic tissue
- Acts as a filter of lymph as it flows through the lymphatic vessels
- Appear in clusters
- Larger cluster include:
  - Cervical: head & neck area
  - Axillary: armpit
  - Inguinal: groin region


A
Tonsils
Thymus gland
Spleen
B
Cervical nodes
Subclavian vein
Axillary nodes
Inguinal nodes
C
Pharyngeal tonsil
Palatine tonsil
Lingual tonsil

Lymph Nodes

- Lymph Nodes:
  - Contain several compartments called nodules
  - Separated by lymph sinuses
  - Masses of lymphocytes & macrophages which have the function of immunity & phagocytosis
  - Protect the body against disease
- Afferent lymphatic vessels carry lymph into the node for cleansing
- Efferent lymphatic vessels is where lymph exits the node & travels toward the heart

Tonsils

- Tonsils:
  - Partially encapsulated lymph nodes in the throat area
  - Filter tissue fluid contaminated with pathogens that enter the body through the nose or mouth
- Three sets:
  - Palatine tonsils: small masses of lymphoid tissue located at the opening of the oral cavity into the pharynx
  - Pharyngeal tonsils: AKA adenoids; located at the opening of the nasal cavity in upper pharynx
  - Lingual tonsils: located at back of tongue

Thymus Gland

- Thymus gland:
  - Located in the upper thorax behind the sternum & below the thyroid gland
  - Most active during early life
  - Crucial role in immunity development from before birth to few months after
  - Gland involutes after puberty & is replaced by connective tissue & fat

Thymus Gland

- Function:
  - Concerned with the processing & maturation of T cells
  - Secretes hormone thymosins which promotes the maturation of lymphocytes within the thymus gland
  - Promotes the growth & activity of lymphocytes in lymphoid functions throughout the body

Spleen

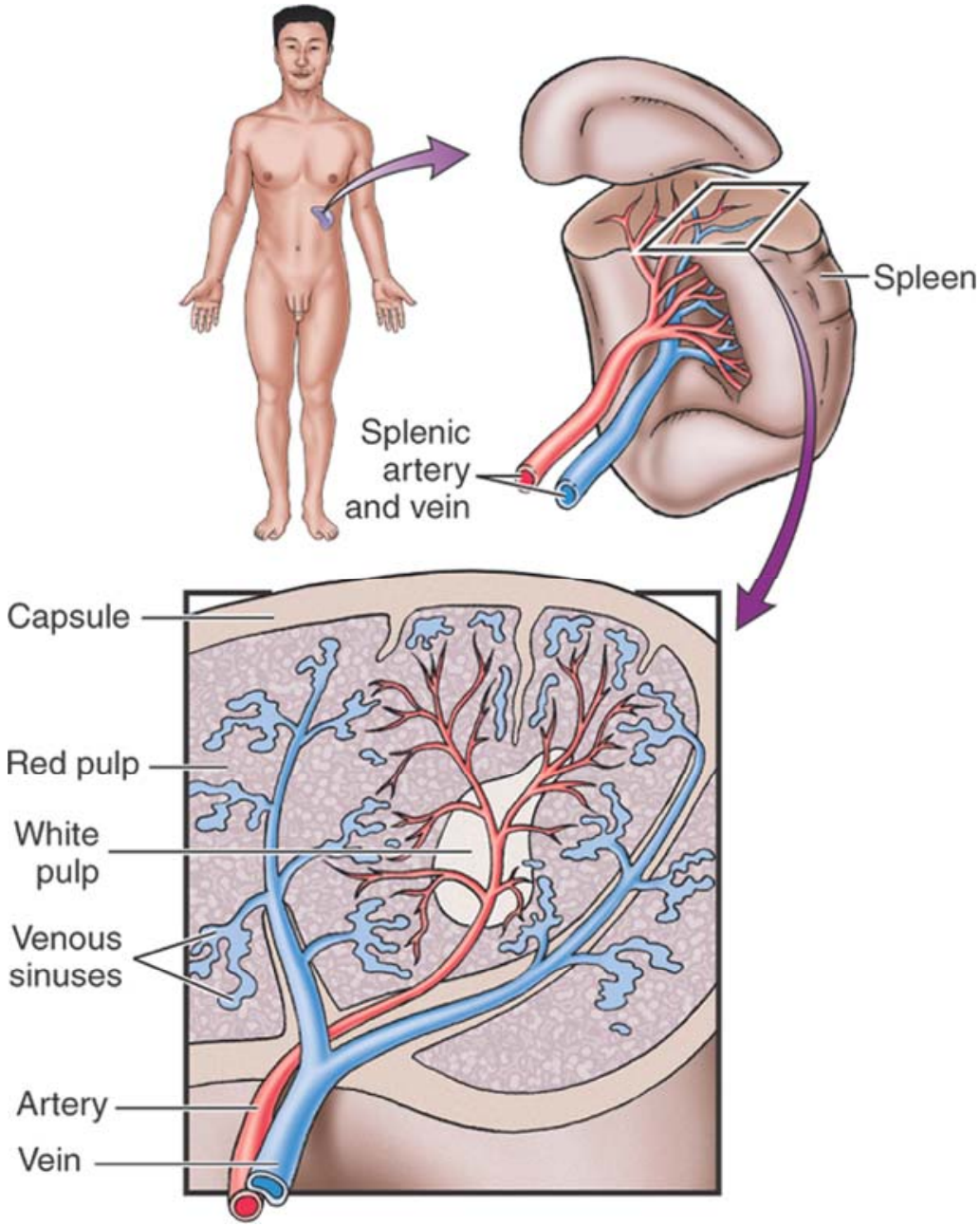
- Spleen:
  - Largest lymphoid organ in the body
  - Located in the LUQ just beneath the diaphragm
  - Filters blood rather than lymph
  - Composed of two types of tissue:
    - White pulp: lymphoid tissue consisting of primarily lymphocytes surrounding arteries
    - Red pulp: contains venous sinuses filled with blood & disease preventing cell such as lymphocytes & macrophages

Spleen

- Circulation within Spleen:
  - Blood enters the spleen through the splenic artery
  - The blood is cleansed as it slowly flows through the spleen
  - Microorganisms trapped by the spleen are destroyed by leukocytes in the spleen
  - Cleansed blood leaves the spleen through the splenic vein

Spleen

- Function:
  - Cleansing role
  - Reservoir for blood; blood stored in spleen
  - Area of phagocytosis of old RBC's
  - Area of erythropoieses before birth


Spleen
Splenic artery and vein
Capsule
Red pulp
White pulp
Venous sinuses
Artery
Vein