Lymphatic System

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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

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

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

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