Chapter 20 - Lymphatic System

functions of lymphatic system:
- prevents edema
- immune surveillance (cells in lymph nodes monitor lymph for pathogens and cancer cells)

components of lymphatic system:
- lymphatic vessels - transport fluid from tissues back to blood
- lymph - excess tissue fluid (ECF) and proteins
- lymphoid tissues and organs - provide immunity to disease

A. vessels

1. lymph capillaries
   - smallest lymph vessels
   - found in loose c.t. near vascular capillaries except in the CNS or bone marrow
   - single layer of endothelial cells, loosely connected

   - blind-ended
   - fluid enters lymph capillaries when tissue fluid pressure is high
   - fluid cannot leave lymph capillaries
   - pathogens and cancer cells also enter lymph capillaries and are transported to the blood

2. lymphatic collecting vessels
   - found beside veins and arteries
   - walls similar to blood vessels but thinner
   - have many valves to prevent backflow

3. lymph trunks
   - drain large areas of the body
4. lymph ducts = largest lymphatic vessels
   a. right lymphatic duct drains right arm, head and neck
      o enters the junction of the right internal jugular and subclavian veins
   b. thoracic duct drains rest of body
      o enters the junction of the left internal jugular and subclavian veins

B. lymphoid organs (lymph nodes, spleen, MALT)

lymphoid tissue functions:
   • activation of most lymphocytes
   • generation of memory cells

lymphoid tissue components:
   • reticular cells (fibroblasts) and reticular fibers
   • T and B lymphocytes
   • macrophages
   • lymphatic nodules or follicles are found in lymphoid tissue:
     o clusters of lymphocytes derived from an activated B cell
     o germinal centers are regions of cloning (mitosis)
     o B cells that differentiate into plasma cells leave the nodule

1. lymph node or gland

   a. location - clusters are found in some areas of the body and all along lymphatic collecting vessels

   b. structure
      • 1 to 25 mm in diameter
      • fibrous capsule and trabeculae
      • hilus
• outer cortex contains follicles or nodules
• inner medulla contains medullary cords (B and T cells)
• afferent lymphatic vessels enter on convex side
• lymph sinuses (large lymphatic capillaries)
• efferent lymphatic vessels exit at hilus

c. function
• monitor lymph
• destroy infectious microorganisms and cancer cells
• store memory cells

2. spleen
• located posterior and lateral to the stomach
• outer fibrous capsule
• splenic artery branches into central arteries
• white pulp = lymphoid tissue that surrounds arteries, destroys blood-borne antigens
• red pulp surrounds white pulp and contains venous sinuses and splenic cords (reticular tissue rich in macrophages that remove old blood cells)
• other function: to store platelets

3. MALT (mucosa associated lymphoid tissue) - aggregated lymph nodules found in mucosa of the respiratory, digestive, urinary and reproductive tracts

a. tonsils
• consist of lymphatic tissue in the mucosa of the pharynx
• surface covered by epithelium that invaginates to form crypts that trap bacteria
• generate memory lymphocytes
• palatine tonsils are on lateral sides of the opening from the mouth into the pharynx
• lingual tonsils are on the posterior surface of the tongue
• pharyngeal tonsil is in the nasopharynx on the back wall
• tubal tonsils surround openings of auditory tubes in nasopharynx

b. GALT (gut)
• Peyer’s patches in ileum

• vermiform appendix

c. BALT (bronchioles)
C. thymus - does not contain lymphoid tissue or B cells

a. location
   - posterior to sternum
   - superior to heart

b. structure
   - lobes and lobules
   - cortex generates antigen specific T lymphocytes
   - medulla involved in immune tolerance (destroys T cells that would attack normal body cells)
   - epithelial reticular cells secrete thymic hormones (thmosin and thymopoietin) that cause T cells to become immunocompetent
   - most active during childhood
   - begins to atrophy in adolescence
   - replaced by fibrous and fatty tissue
   - protected by a thymus-blood barrier that keeps antigens out

c. function
   - programs lymphocytes to become immunocompetent T cells
   - has no direct immune function