Lymphatic System

- **Lymphatic System**
  - Made up of:
    - Lymph
    - Lymph vessels
    - Lymphocytes
    - Lymph nodules
    - Lymph nodes
    - Tonsils
    - Spleen
    - Thymus Gland
    - Red Bone Marrow
  - Functions
    - Maintains fluid balance in tissues
    - Absorbs fats from the small intestine
    - Defends against microorganisms and foreign substances
Lymphatic System

- Lymph Capillaries
  - Lack a basement membrane
  - Epithelial cells loosely overlap
- Lymph Transport
Fig. 281.—Elephantiasis of the scrotum in a native of Fiji.
Lymphatic System

- Lymph Trunks and Ducts

(a) Regional lymph nodes:
- Cervical nodes
- Axillary nodes
- Inguinal nodes
- Entrance of right lymphatic duct into right subclavian vein
- Internal jugular vein
- Entrance of thoracic duct into left subclavian vein
- Thoracic duct
- Aorta
- Cisterna chyli
- Lymphatic collecting vessels

(b) Branches:
- Right jugular trunk
- Right lymphatic duct
- Right subclavian trunk
- Right subclavian vein
- Right bronchomediastinal trunk
- Brachiocephalic veins
- Superior vena cava
- Azygos vein
- Cisterna chyli
- Right lumbar trunk
- Left jugular trunk
- Internal jugular veins
- Left subclavian trunk
- Left subclavian vein
- Left bronchomediastinal trunk
- Entrance of thoracic duct into left subclavian vein
- Esophagus
- Trachea
- Ribs
- Thoracic duct
- Hemiazygos vein
- Left lumbar trunk
- Intestine trunk
- Inferior vena cava
Lymphatic System

- Lymphoid Cells
  - Lymphocytes
    - “Main Warriors”
    - Produced where?
    - Protect against antigens
    - Two major types
      - T Cells
        » Orchestrate the immune response
        » Some are direct killers that destroy foreign antigens
      - B Cells
        » Produce plasma cells that in turn produce antibodies
Lymphatic System

- **Lymphoid Macrophages**
  - Eat and destroy foreign antigens
  - Play a role in activating T Cells

- **Dendritic Cells**
  - Function like macrophages
  - Appear spiny
  - Found in lymphoid tissues

- **Reticular Cells**
  - Produce the fibrous stroma located in lymphoid organs
Lymphatic System

• Lymphoid Tissues
  
  – Houses lymphocytes
  
  – Provides a “check point” for lymphocytes and macrophages to work
  
  – Composed of several types

• Reticular CT
  
  – Found in all lymphoid organs except the thymus gland
    » Macrophages live on the fibers
    » Lymphocytes live in the spaces between the fibers
Lymphatic System

- **Diffuse Lymphatic Tissue**
  - Scattered reticular tissue elements found in virtually all body organs
  - Larger numbers are found in mucous membranes

- **Lymphoid Follicles (nodules)**
  - Lack a capsule
  - Solid, spherical structures, with tightly packed reticular elements
  - Often have light centers (germinal centers) that contain dendritic cells and B Cells
  - Good example, Peyer’s patches in the intestines and appendix
**Lymphatic System**

- **Lymph Nodes**

(a) Diagram showing:
- Germinal center in follicle
- Capsule
- Subcapsular sinus
- Afferent lymphatic vessels
- Cortex
- Follicle
- Medullary cord
- Medullary sinus
- Efferent lymphatic vessels

(b) Image showing:
- Follicles
- Trabecula
- Subcapsular sinus
- Capsule
- Medullary cords
- Medullary sinuses
Lymphatic System

• Other Lymph Organs

- Tonsils (in pharyngeal region)
- Thymus (in thorax; most active during youth)
- Spleen (curves around left side of stomach)
- Peyer’s patches (in intestine)
- Appendix

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Lymphatic System

- Spleen
  
  • Site for lymphocytes to proliferate and do their job of surveillance
  
  • Cleans the blood (much like lymph nodes clean lymph) - removes old RBC’s and platelets
  
  • Aids in recycling RBC components
  
  • Site of erythropoiesis in the fetus
  
  • Stores blood and platelets
Lymphatic System

- **Thymus Gland** – important in early life
  - Secretes two hormones that play an important role in T lymphocytes becoming immunocompetent

- **Tonsils** – named according to location
  - Palatine – paired, on either side of the soft palate
  - Lingual – paired at the base of the tongue
  - Pharyngeal – located in the posterior portion of the nasopharynx
Lymphatic System

• Aggregates of Lymphoid Follicles
  
  – Protect both the respiratory and digestive tracts
  
  – Part of a collection of lymphoid tissues called mucosa-associated lymphatic tissue; MALT