

Lymphatic System

For
Bio 250-Anatomy

The Lymphatic System

- Consists of two semi-independent parts
 - Lymphatic vessels
 - Lymphoid tissues and organs
- Lymphatic system functions
 - Transport fluids back to the blood
 - Play essential roles in body defense and resistance to disease

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Slide 12.1

Lymphatic Characteristics

- Lymph – excess tissue fluid carried by lymphatic vessels
- Properties of lymphatic vessels
 - One way system toward the heart
 - No pump
 - Lymph moves toward the heart
 - Milking action of skeletal muscle
 - Rhythmic contraction of smooth muscle in vessel walls

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Lymphatic Vessels

- Lymph Capillaries
 - Walls overlap to form flap-like minivalves
 - Fluid leaks into lymph capillaries
 - Capillaries are anchored to connective tissue by filaments
 - Higher pressure on the inside closes minivalves

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Lymphatic Vessels

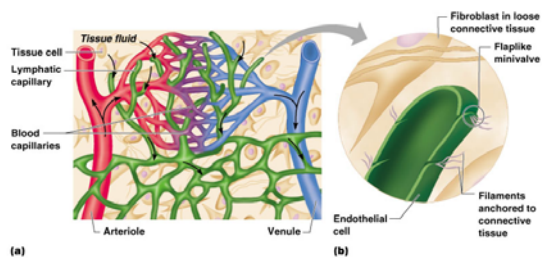


Figure 12.1

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Lymphatic Vessels

- Lymphatic collecting vessels
 - Collects lymph from lymph capillaries
 - Carries lymph to and away from lymph nodes

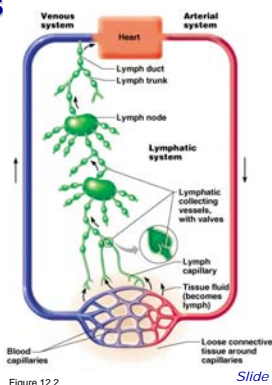


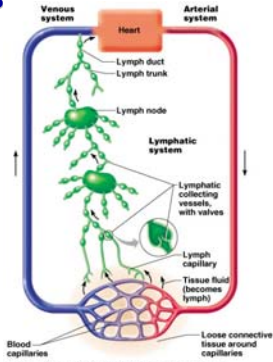
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Lymphatic Vessels

- Lymphatic collecting vessels (continued)
 - Returns fluid to circulatory veins near the heart
 - Right lymphatic duct
 - Thoracic duct



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Lymph

- Materials returned to the blood
 - Water
 - Blood cells
 - Proteins

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Lymph

- Harmful materials that enter lymph vessels
 - Bacteria
 - Viruses
 - Cancer cells
 - Cell debris

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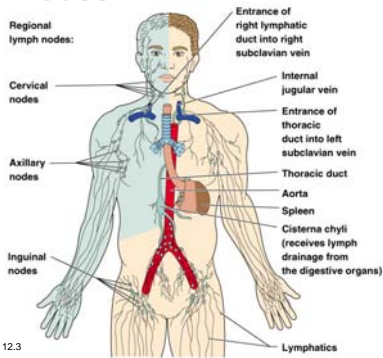
Lymph Nodes

- Filter lymph before it is returned to the blood
- Defense cells within lymph nodes
 - Macrophages – engulf and destroy foreign substances
 - Lymphocytes – provide immune response to antigens

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Lymph Nodes



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Lymph Node Structure

- Most are kidney-shaped, less than 1 inch long
- Cortex
 - Outer part
 - Contains follicles – collections of lymphocytes
- Medulla
 - Inner part
 - Contains phagocytic macrophages

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Lymph Node Structure

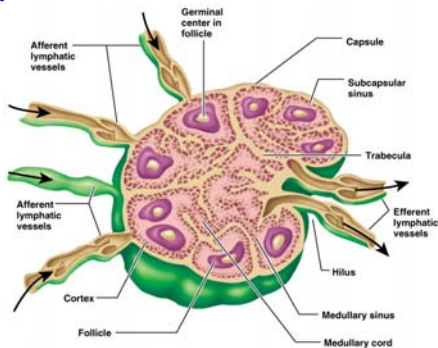


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Flow of Lymph Through Nodes

- Lymph enters the convex side through afferent lymphatic vessels
- Lymph flows through a number of sinuses inside the node
- Lymph exits through efferent lymphatic vessels
- Fewer efferent than afferent vessels causes flow to be slowed

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Other Lymphoid Organs

- Several other organs contribute to lymphatic function
 - Spleen
 - Thymus
 - Tonsils
 - Peyer's patches

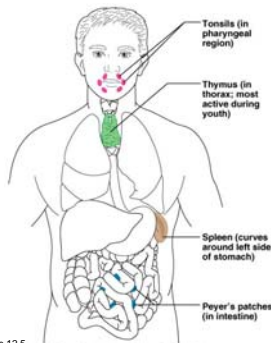


Figure 12.5

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The Spleen

- Located on the left side of the abdomen
- Filters blood
- Destroys worn out blood cells
- Forms blood cells in the fetus
- Acts as a blood reservoir

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The Thymus

- Located low in the throat, overlying the heart
- Functions at peak levels only during childhood
- Produces hormones (like thymosin) to program lymphocytes

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Tonsils

- Small masses of lymphoid tissue around the pharynx
- Trap and remove bacteria and other foreign materials
- Tonsillitis is caused by congestion with bacteria

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Peyer's Patches

- Found in the wall of the small intestine
- Resemble tonsils in structure
- Capture and destroy bacteria in the intestine

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Mucosa-Associated Lymphatic Tissue (MALT)

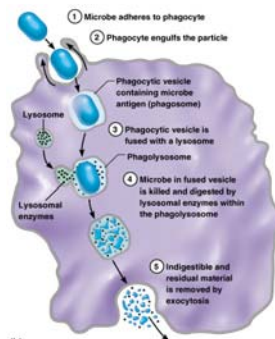
- Includes:
 - Peyer's patches
 - Tonsils
 - Other small accumulations of lymphoid tissue
- Acts as a sentinel to protect respiratory and digestive tracts

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Defensive Cells

- Phagocytes (neutrophils and macrophages)
 - Engulfs foreign material into a vacuole
 - Enzymes from lysosomes digest the material



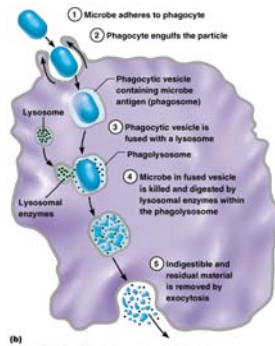
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Figure 12.6b

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Defensive Cells

- Natural killer cells
 - Can lyse and kill cancer cells
 - Can destroy virus-infected cells



(b) Figure 12.6b Slide 12.18b

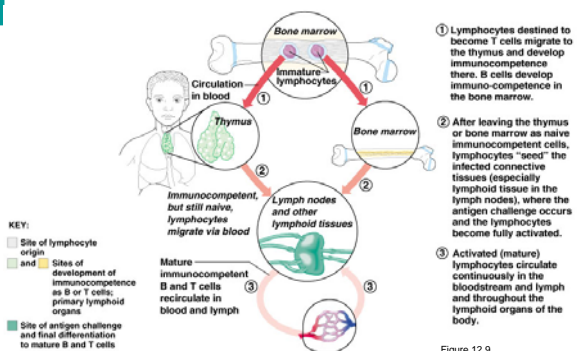
Cells of the Immune System

- Lymphocytes
 - Originate from hemocytoblasts in the red bone marrow
 - B lymphocytes become immunocompetent in the bone marrow
 - T lymphocytes become immunocompetent in the thymus
- Macrophages
 - Arise from monocytes
 - Become widely distributed in lymphoid organs

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Activation of Lymphocytes



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Humoral (Antibody-Mediated) Immune Response

- B lymphocytes with specific receptors bind to a specific antigen
- The binding event activates the lymphocyte to undergo clonal selection
- A large number of clones are produced (primary humoral response)

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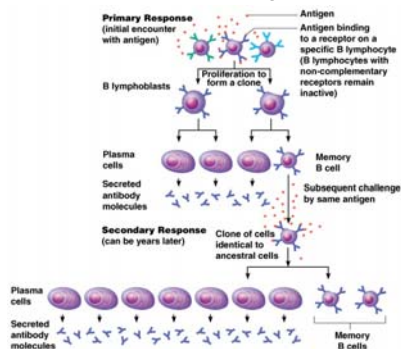
Humoral (Antibody Mediated) Immune Response

- Most B cells become plasma cells
 - Produce antibodies to destroy antigens
 - Activity lasts for four or five days
- Some B cells become long-lived memory cells (secondary humoral response)

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Humoral Immune Response



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Cellular (Cell-Mediated) Immune Response

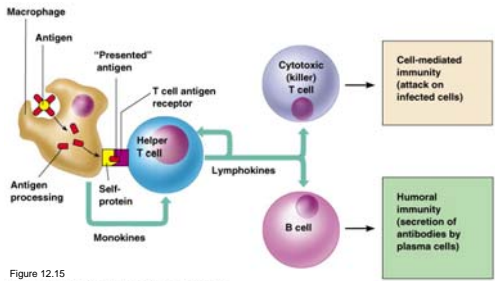


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