

The Lymphatic System

Objectives

Lymphatic Vessels

1. Describe the function of the lymphatic system.
2. Explain the structure, distribution, and adaptations of the lymph vessels.

Lymphoid Cells and Tissues

3. Identify the different types of lymphoid cells found in the body.
4. Describe lymphoid tissue.

Lymph Nodes

5. Examine the structure and function of the lymph nodes.

Other Lymphoid Organs

6. List the additional lymphoid organs and explain their structure and function.

Developmental Aspects of the Lymphatic System

7. Trace the development of the lymphatic system in the developing fetus, and indicate the structures that are fully formed and functional at birth.

Lecture Outline

I. Lymphatic Vessels (pp. 774–777; Figs. 20.1–20.2)

- A. The lymphatic vessels form a one-way system in which lymph flows only toward the heart.
 1. The lymphatic transport system starts with the lymph capillaries, found between the tissue cells and blood capillaries, in the loose connective tissue.
 2. The lymph capillaries flow into the lymphatic collecting vessels and carry the lymph to the lymphatic trunks.
 3. The lymphatic trunks drain fairly large areas of the body and eventually empty the lymph back into the circulatory system via the thoracic duct or the right lymphatic duct.
- B. Lymphatic vessels are low-pressure vessels that use the same mechanisms as veins to return the lymph to the circulatory system.

II. Lymphoid Cells and Tissues (p. 777; Fig. 20.3)

- A. Lymphoid Cells
 1. Lymphocytes arise in the red bone marrow and mature into one of two immunocompetent cells: T lymphocytes (T cells) or B lymphocytes (B cells).
 2. Macrophages play an important role in body protection and in activating T lymphocytes.
 3. Dendritic cells, found in lymphoid tissue, also play a role in T lymphocyte activation.
 4. Reticular cells produce the stroma, which is the network that supports the other cell types in the lymphoid tissue.
- B. Lymphoid tissues house and provide a proliferation site for lymphocytes, and furnish an ideal surveillance site for lymphocytes and macrophages.

III. Lymph Nodes (pp. 778–779; Fig. 20.4)

- A. The principle lymphoid organs in the body are the lymph nodes, which act as filters to remove and destroy microorganisms and other debris for the lymph before it is transported back to the bloodstream.
- B. Each lymph node is surrounded by a dense fibrous capsule with an internal framework, or stroma, of reticular fibers that supports the lymphocytes.
- C. Lymph enters the convex side of a lymph node through afferent lymphatic vessels, and exits via a fewer number of efferent vessels after passing through several sinuses.

IV. Other Lymphoid Organs (pp. 779–782; Figs. 20.5–20.9)

- A. The spleen is the largest lymphoid organ, located in the left side of the abdominal cavity directly below the diaphragm.
 - 1. The spleen's main function is to remove old and defective RBCs and platelets as well as foreign matter and debris from the blood. It also provides a site for lymphocyte proliferation and immune surveillance.
 - 2. The spleen is surrounded by a fibrous capsule and contains both lymphocytes found in white pulp, and macrophages found in red pulp.
- B. Thymus
 - 1. The thymus secretes hormones that cause T lymphocytes to become immunocompetent.
 - 2. The thymus is made up of thymic lobules containing an outer cortex and an inner medulla.
- C. Tonsils are the simplest lymphoid organs and form a ring of lymphoid tissue around the opening to the pharynx. They appear as swellings of the mucosa that gather and remove many of the pathogens entering the pharynx in food or inhaled air.
- D. Clusters of lymphoid follicles are found in the wall of the distal portion of the small intestine, Peyer's patches, and in the appendix.

V. Developmental Aspects of the Lymphatic System (p. 783)

- A. By the fifth week of embryonic development, the beginnings of the lymphatic vessels and the main clusters of lymph nodes are apparent and develop from the budding of lymph sacs from the developing veins.
- B. The thymus is an endodermal derivative, while the rest of the lymphoid organs derive from the mesoderm.
- C. Except for the spleen and the tonsils, the lymphoid organs are poorly developed at birth.

Cross References

Additional information on topics covered in Chapter 20 can be found in the chapters listed below.

- 1. Chapter 3: Interstitial fluid
- 2. Chapter 4: Reticular connective tissue
- 3. Chapter 16: Thymus gland and hormone production
- 4. Chapter 17: Agranulocytes; granulocytes; leukocyte production and life span
- 5. Chapter 19: Blood capillaries; hydrostatic and osmotic pressure related to fluid movement; factors that aid venous return
- 6. Chapter 21: Function of lymphatic organs in immunity; relationship of the thymus to cell-mediated immunity

7. Chapter 22: Tonsils
8. Chapter 23: Lacteal function; palatine tonsils; lymphatic tissue related to the digestive system (Peyer's patches)

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- Slide 93 Lymph Node.
- Slide 94 Lymph Node and Lymph Vessel.