Lymphatic System

Blood plasma is rich in proteins, so most of the fluid remains in the capillaries because of osmotic pressure. However, every time the heart pumps, some fluids are forced out of the capillaries' thin walls. The escaped fluid collects in spaces around the body's cells. This fluid is picked up by the lymphatic system and is returned to the blood supply. The **lymphatic system,** illustrated in **Figure 8,** is made up of a network of vessels, tiny bean-shaped structures called *lymph nodes,* and lymph tissue. **The lymphatic system works with the cardiovascular system by collecting fluids that leak out of capillaries and returning those fluids to the cardiovascular system.** The lymphatic system also fights infections.

Lymphatic vessels carry leaked fluid, called *lymph,* back to two major veins in the neck. This process returns the escaped fluids to the cardiovascular system. Similar to veins, lymphatic vessels have valves that stop the backflow of lymph. Lymph is pushed through the vessels when the muscles in the arms and legs contract. Lymph tissue is located in various places throughout the body, including the thymus, tonsils, spleen, and bone marrow.

The lymphatic system also acts as a key element in the immune system. Immune cells in the lymph nodes and lymphatic organs help defend the body against bacteria, viruses, other infectious microbes, and cancer cells. Many lymph nodes are found in the armpits, neck, and groin. These nodes sometimes become tender and swell when they are actively fighting infection and are filled with white blood cells. Healthcare workers are trained to detect certain kinds of infections by feeling the lymph nodes for swellings.

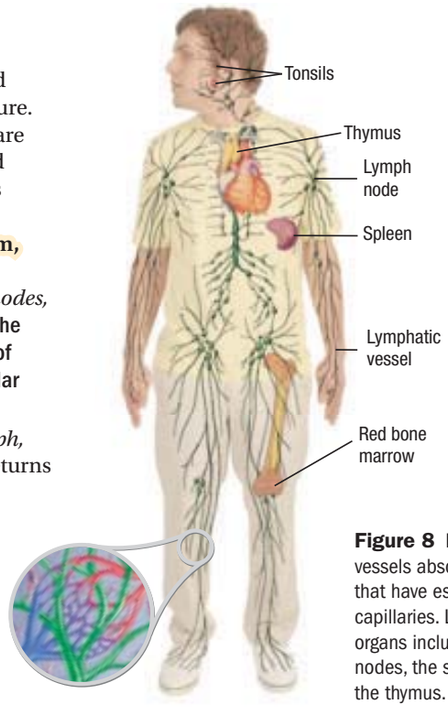


Figure 8 Lymphatic vessels absorb fluids that have escaped from capillaries. Lymphatic organs include lymph nodes, the spleen, and the thymus.

Reading Check ***What are two ways in which the cardiovascular system and the lymphatic system are related?***

lymphatic system (lim FAT ik SIS tuhm) a collection of organs whose primary function is to collect extracellular fluid and return it to the blood

Section 1 Review

KEY IDEAS

1. **Name** the two main functions of the cardiovascular system.
2. **Compare** the four chambers of the human heart in terms of their structure and function.
3. **Relate** the structure of arteries, veins, and capillaries to their functions.
4. **Describe** the functions of the four components of blood.
5. **State** how the cardiovascular and lymphatic systems relate to each other.

CRITICAL THINKING

6. **Relating Concepts** How is the heart muscle different from other muscle tissue?
7. **Predicting Outcomes** What would happen if a person with type A blood received a transfusion of type O blood?

METHODS OF SCIENCE

8. **Making a Line Graph** Predict how a student's heart rate might change as the student wakes up in the morning, goes to school, exercises in the afternoon, and goes to bed that night. Draw a line graph showing how you predict the heart rate will change.

Answers to Section Review

1. to transport materials and distribute heat
2. left atrium: thin-walled, pumps blood received from the lungs to the left ventricle; left ventricle: muscular, pumps blood from the heart to the body; right atrium: thin-walled, pumps blood received from the body to the right ventricle; right ventricle: thicker-walled, pumps blood from the heart to the lungs
3. arteries: thick, muscular, expand to receive blood forced out of the heart; veins: thin with one-way valves, carry blood at low pressure to the heart; capillaries: thin, exchange materials between blood and other tissues
4. White blood cells defend against disease, red blood cells carry oxygen, and platelets help blood to clot. Plasma carries materials.
5. After fluids leave the capillaries and from tissue fluid, the lymphatic system picks up the excess fluids and returns them to the cardiovascular system.
6. Stimulation of its cells happens in the muscle itself, and it never rests for more than a few seconds.
7. Nothing; a person with type A blood does not have antibodies against type O blood cells.
8. Heart rate will be slower in the morning, increase during the day, and then decrease during sleep.

Teaching Key Ideas

Stability and Homeostasis Point out to students that swollen lymph nodes contain large numbers of immune system cells (white blood cells) that engulf bacteria or virus particles. For this reason, the nodes become inflamed and tender when the body is fighting an infection.

Close

Formative Assessment

The antigens on the red blood cells of a person with type A blood are _____.

A. O antigens (Incorrect. There are no O antigens.)
B. A antigens (Correct! Type A blood has type A antigens.)
C. B antigens (Incorrect. B antigens are not present in type A blood.)
D. both A and B antigens (Incorrect. Only A antigens are in type A blood.)