Department of biology

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(animal physiology)

Stage (-3-)

LEC- ((9))

Lymphatic system

By

Dr. Nadhema Bahaa Wetwet

The Lymphatic System

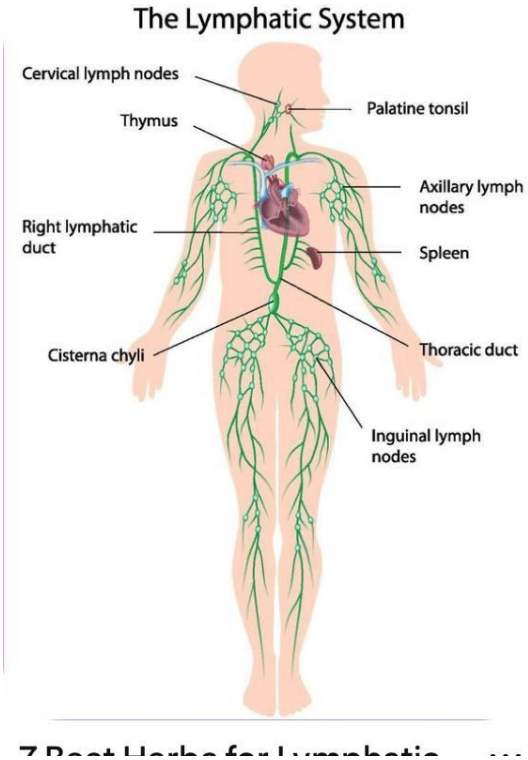
Water and plasma are forced from the capillaries into intracellular spaces; this interstitial fluid transports materials between the cells. Most of this fluid is collected in the capillaries of a secondary system which is called the **lymphatic system.** The lymphatic system consists of a fluid (lymph), lymphatic vessels that transport the lymph, and lymphatic organs.

The lymphatic system has three basic functions:

1- Removal of excess fluids from body tissues and its return to the bloodstream.

2- Absorption of fatty acids and subsequent transport to the blood.

3- Formation of white blood cells, and initiation of immunity through the formation of antibodies.



Lymphatic vessels and ducts

The lymphatic vessels are similar in structure to the cardiovascular veins, meaning they also have valves. They are dependent upon the contraction

of skeletal muscle, respiratory movements and valves that do not allow backward flow. The vessels merge before entering one of two ducts:-

- **Thoracic duct:** This duct serves the abdomen, lower extremities and the left side of the upper body.
- **Right lymphatic duct:** This duct serves all of the right side of the upper body and thoracic area.

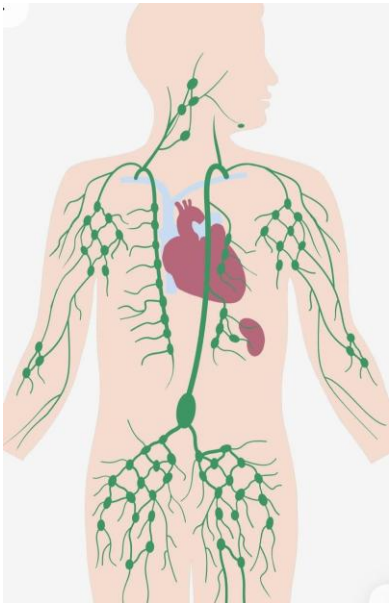
Lymphatic organs

Lymphatic organs are subdivided into primary and secondary lymphatic organs.

The **primary lymphatic organs** are the **red bone marrow** and the **thymus**. They are the site of production and maturation of **lymphocytes,** the type of white blood cell that carries out the most important work of the immune system.

The **secondary lymphatic organs** include the **lymph nodes, spleen**, **tonsils**, **Peyer's patches**, and the **appendix**.

They also play an important role in the immune system as they are places where lymphocytes find and bind with antigens.



Red bone marrow

Red bone marrow, the soft, spongy, nutrient rich tissue in the cavities of certain long bones, is the organ that is the site of blood cell production. It is also the site of maturation of **B lymphocytes**.

Thymus gland

The thymus gland is a soft organ with two lobes that is located in the upper thoracic cavity posterior to the sternum. It is divided into an outer cortex and an inner medulla. It is an organ that is more active in children, and shrinks as we get older. **T lymphocytes** mature in the thymus. Also, the thymus gland produces a hormone, **thymosin** which thought to aid in the maturation of **T lymphocytes**.

Lymph nodes

The lymph nodes are small oval shaped structures located along the lymphatic vessels. They act as filters, with an internal connective tissue filled with lymphocytes that collect and destroy bacteria and viruses. They concentrated in the neck, armpit, groin, and abdominal cavity.

The spleen

The spleen is the largest of the lymphatic organs and lies in the left part of the abdominal cavity between the stomach and the diaphragm.
It is divided into two partial compartments known as **white pulp** and **red pulp**. The white pulp contains lymphocytes and the red pulp contains venous sinuses. When blood enters the spleen and flows through the sinuses for filtration, lymphocytes react to pathogens; macrophages engulf debris and remove old, worn out red blood cells.

Tonsils

The tonsils are a group of small rounded organs in the pharynx. They are filled with lymphocytes, macrophages, and macrophage-like cells. Their

lymphocytes respond to microbes that arrive by way of ingested food as well as inspired air.

Peyer's patches : Peyer's patches are lymphoid tissues found in the wall of the small intestine, although they're more concentrated in the ileum.

Appendix: Appendix extends from the inferior end of the large intestine's cecum. The submucosa of the appendix contains many masses of lymphoid tissue. The presence of lymphoid tissue suggests that the appendix may play a role in the immune system.