Lymphatic system

Introduction

Lymphocytes are the major cellular component of the lymphatic system. These cells acquire immunogenicity and differentiate into central lymphoid organs: the thymus (for T cells), bone marrow and GALT (for B cells). Then the lymphocytes enter through the lymphatic or blood vessels to inhabit the peripheral lymphatic tissues such as: lymph nodes, spleen and lymph nodes such as: tonsils - appendix - and lymphoid tissue aggregations in the respiratory tract (BALT) and urinary tract (MALT). The function of lymphoid tissue is to monitor and defend the body's immunity, so it is collectively referred to as the immune system.

Lymphatic system

The lymph system is a network of vessels and lymph nodes that carry a fluid called lymph. The lymph system is part of the immune system, which defends the body against infection and cancer.

Major components of the lymph system

1- Lymph.
2- Lymphatic vessels.
3- Lymphoid organs that contain lymphoid tissue.

Lymph

Lymph is a fluid that oozes from the smallest blood vessels in the body. The fluid travels between cells carrying nutrients, damaged cells, cancer cells, and bacteria out of the tissue.

It is a transparent, watery liquid that resembles the composition of blood (except for red blood cells and large proteins) and contains white cells (especially lymphocytes and macrophages). There are also the same blood proteins and some ions, but in lower concentrations.

Lymphatic vessels

Lymphatic vessels are tiny tubes that carry lymph from the tissues to the lymph nodes, and then from the lymph nodes to the blood vessels.

Lymphatic vessels are structures that absorb fluids that spread from blood vessels into the surrounding tissues. The smallest lymphatic vessels are called lymph capillaries. Lymphatic capillaries unite to form larger lymphatic vessels. Then lymphatic vessels from different regions of the body merge to form larger vessels called lymph stems.

- It connects all parts of the organ and lymph nodes.
- It has valves like those found in blood vessels, allowing the lymph to move in one direction only.

lymphoid organs

(nodes and lymph nodes, Spleen, thymus gland, bone marrow, Appendix, Tonsils.)

1- Lymph nodes

Lymph nodes are collection points filled with specialized white blood cells that filter bacteria and cells from the lymph. They are bean-like structures that line the lymphatic vessels. They purify the lymphatic fluid (lymph) and filter waste, bacteria and damaged cells, including cancer cells. Therefore, they are very important for the defense of the body.

- 4 afferent lymphatic vessels enter it and 1 efferent lymphatic vessel exits.
- Lymph nodes are spread in many areas of the body, where they are found at
  - The entrance to the digestive tract (tonsils).
  - The ureters, armpits, neck, chest, lungs, thymus gland, esophagus, Between the thigh, the pelvis and at the major joints
  - Some of which are located in the chest wall and others with the heart.

2- Spleen

It is the largest of the lymphatic organs, red in color, flattened in shape, and reaches a length of 12 cm, depending on the size of the body. It is located on the left side of the body under the stomach, but it has no digestive function.

3- Thymus gland

The thymus is a small gland located in the chest, between the lungs, above the heart. It is made up of two main lobes, each of which is composed of many small lobes (each composed of cortex and medulla).

- It is full of lymphocytes, especially in the cortex layer.
- They are usually large and prominent in children, but they gradually get smaller at full maturity.
- main source of lymphocytes.

4- Bone marrow

- It is the inner spongy retinal part of the bones of the ribs, spine, thigh and humerus.
- It is composed of fibrous reticular connective tissue responsible for the formation of all types of blood cells (red and white) and lymphocytes in the adult.
- The formation of B lymphocytes is completed in the bone marrow, while the semi-mature T lymphocytes migrate to the thymus gland to complete their formation.
- Bone marrow contains special cells to form macrophages.

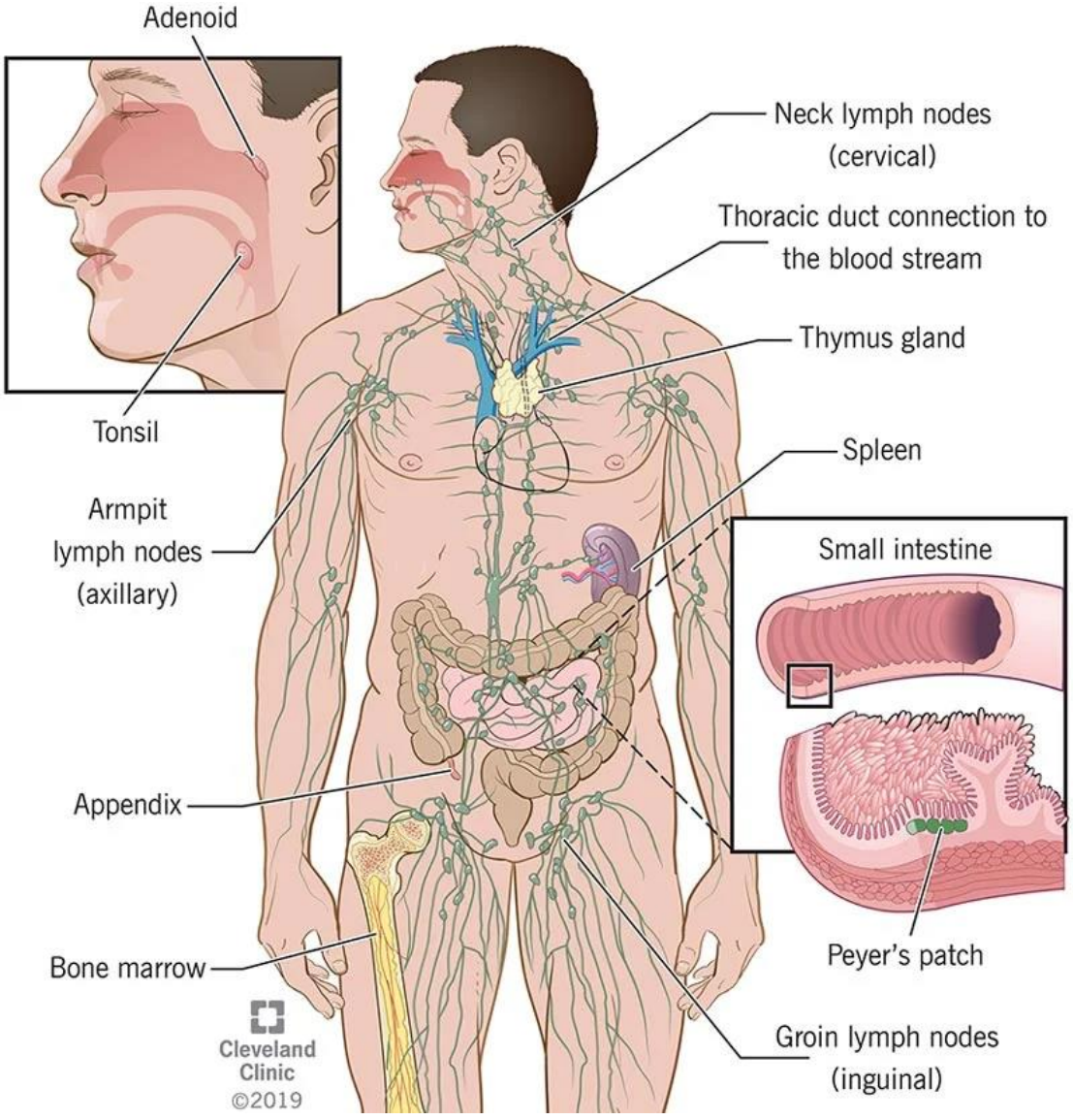
5- Appendix.

6- Tonsils.

Lymphatic system functions

- Fighting germs and foreign bodies invading the body (lymphocytes devouring germs).
- Formation of specialized antibodies to different germs.

- Collecting fluids, dead bacteria, and damaged body cells in lymph nodes as a prelude to destroying them.
- Returning protein substances that have filtered from the intercellular fluids back into the blood.
- Aiding in the transport of fats from the digestive tract (from the villi of the intestine into the blood).



How is lymph formed?

It originates from the blood and returns to the blood through the lymphatic vessels

• There are three fluids associated with the formation of lymph, namely:

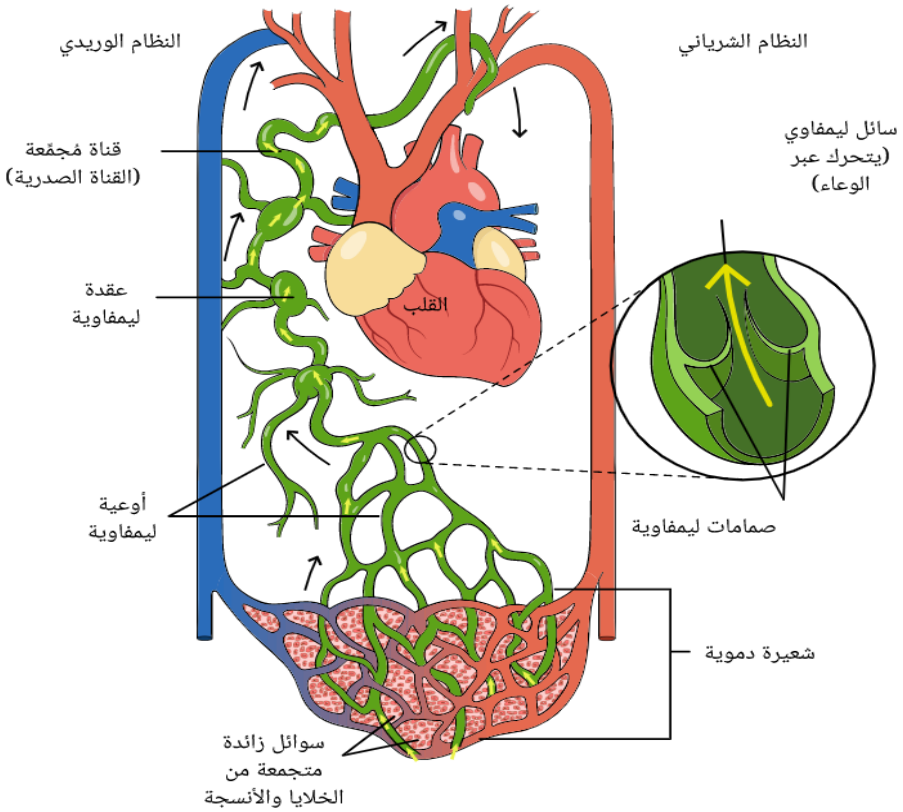
• blood plasma

• The interstitial fluid that fills the intercellular spaces

• lymph

- Lymph is formed from the fluid that leaks through the tiny walls of capillaries into the tissues of the body.
- Some of this fluid enters back into the capillaries, and some enters the lymph vessels (where its name becomes lymph). which passes through the lymph nodes
- The lymph collects from the lymphatic vessels at the bottom of the body and from the upper left part to pour into larger lymphatic vessels that unite together to form what is known as the thoracic duct.
- The thoracic duct: It begins near the lower part of the spine and collects lymph from the pelvis, abdomen, and lower chest. The thoracic duct runs up through the chest and empties into the blood through a large vein near the left side of the neck.
- The right lymphatic duct: It collects lymph from the right side of the neck, chest, and arm, and empties into a large vein near the right side of the neck.
- The thoracic duct meets the subclavian vein, bringing the lymph back into the bloodstream.

- Lymph transports foreign substances (such as bacteria), cancer cells, and damaged or dead cells that may be present in the tissues to the lymph vessels and lymph nodes for elimination. Lymph contains many white blood cells.
- All material transported by lymph passes through at least one lymph node, where it can be filtered out and destroyed by foreign material, before the fluid returns to the bloodstream.



Lymph circulation

The lymph circulates in one direction (towards the blood vessels), due to the presence of valves that prevent it from going back

- There are several factors that help move the lymph:
  - Lymphatic vessel pressure (lymph pump) and helps in muscle movement and pressure on lymphatic vessels (the role of sports activity).
  - Contractions in the walls of the lymphatic vessels.
  - Increase in chest volume during inspiration.
  - Interstitial fluid pressure (a direct relationship).
  - Some drugs and chemicals that help increase interstitial pressure such as histamine ↑ blood pressure → increase the amount of filtration into the interstitial spaces → ↑ circulating pressure in the lymphatic vessels.