

HUMAN ANATOMY AND PHYSIOLOGY 1(BP101T)

UNIT: 3 LYMPHATIC SYSTEM

CLASS: 10

TOPIC: LYMPHATIC ORGANS

A. SPLEEN: The spleen is formed by reticular and lymphatic tissue and is the largest lymph organ. The spleen lies in the left hypochondriac region of the abdominal cavity between the fundus of the stomach and the diaphragm. It is purplish in colour and varies in size in different individuals, but is usually about 12 cm long, 7 cm wide and 2.5 cm thick. It weighs about 200 g.

LOCATION OF SPLEEN: Superiorly and posteriorly —diaphragm Inferiorly — left colic flexure of the large intestine Anteriorly —fundus of the stomach Medially —pancreas and the left kidney Laterally— separated from the 9th, 10th and 11th ribs and the intercostal muscles by the diaphragm.

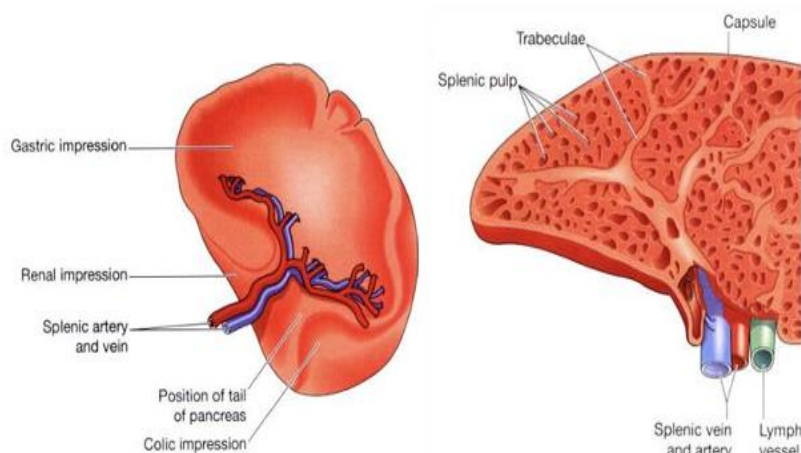
STRUCTURE: The spleen is slightly oval in shape with the hilum on the lower medial border. The anterior surface is covered with peritoneum. It is enclosed in a fibroelastic capsule those dips into the organ, forming trabeculae. The cellular material, consisting of lymphocytes and macrophages, is called splenic pulp, and it lies between the trabeculae. Red pulp is the part suffused with blood and white pulp consists of areas of lymphatic tissue where there are sleeves of lymphocytes and macrophages around blood vessels. The structures entering and leaving the spleen at the hilum are:

- Splenic artery, a branch of the coeliac artery
- Splenic vein, a branch of the portal vein
- Lymph vessels (efferent only)

- Nerves.

FUNCTION OF THE SPLEEN:

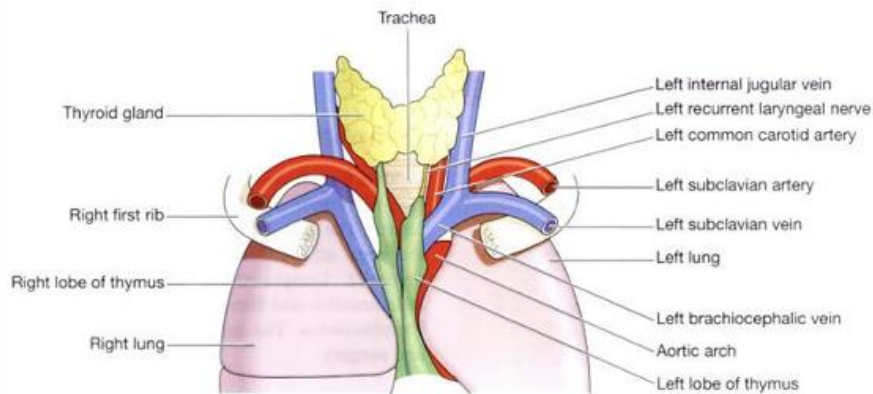
- **PHAGOCYTOSIS:** As described previously (p. 64), old and abnormal erythrocytes are destroyed in the spleen and the breakdown products, bilirubin and iron, are passed to the liver via the splenic and portal veins. Other cellular material, e.g. leukocytes, platelets and microbes, are phagocytosed in the spleen.
- **STORAGE OF BLOOD:** The spleen contains up to 350 ml of blood, and in response to sympathetic stimulation can rapidly return a large part of this volume to the circulation, e.g. in haemorrhage.
- **IMMUNE RESPONSE:** The spleen contains T- and B-lymphocytes, which are activated by the presence of antigens, e.g. in infection. Lymphocyte proliferation during serious infection can cause enlargement of the spleen (splenomegaly).
- **ERYTHROPOIESIS:** The spleen and liver are important sites of fetal blood cell production, and the spleen can also fulfil this function in adults in times of great need.
- **B. THYMUS GLAND:** The thymus gland lies in the upper part of the mediastinum behind the sternum and extends upwards into the root of the neck. It weighs about 10 to 15 g at birth and grows until the individual reaches



puberty, when it begins to atrophy. Its maximum weight, at puberty, is between 30 and 40 g and by middle age it has returned to approximately its weight at birth.

- **LOCATION:** Anteriorly —sternum and upper four costal cartilages
Posteriorly —aortic arch and its branches, brachiocephalic veins, trachea
Laterally —lungs Superiorly — structures in the root of the neck Inferiorly
Structure — heart.
- **STRUCTURE OF THYMUS GLAND:** The thymus consists of two lobes joined by areolar tissue. The lobes are enclosed by a fibrous capsule which dips into their substance, dividing them into lobules that consist of an irregular branching framework of epithelial cells and lymphocytes.
- **FUNCTION OF THYMUS GLAND:**
 - Lymphocytes originate from pluripotent stem cells in red bone marrow. Those that enter the thymus develop into activated T-lymphocytes and react with specific antigens.
 - The maturation of the thymus and other lymphoid tissue is stimulated by thymosin, a hormone secreted by the epithelial cells that form the framework of the thymus gland. Involution of the gland begins in adolescence and, with increasing age, the effectiveness of the T-lymphocyte response to antigens declines.
- **MUCOSA-ASSOCIATED LYMPHOID TISSUE (MALT):** Throughout the body, at strategically placed locations, are collections of lymphoid tissue. They contain B- and T lymphocytes, which have migrated from bone marrow and the thymus, and are important in the early detection of invaders. MALT is found throughout the gastrointestinal tract, in the respiratory tract and in the genitourinary tract, all systems of the body exposed to the external environment. The main groups of MALT are the tonsils and Peyer's patches.

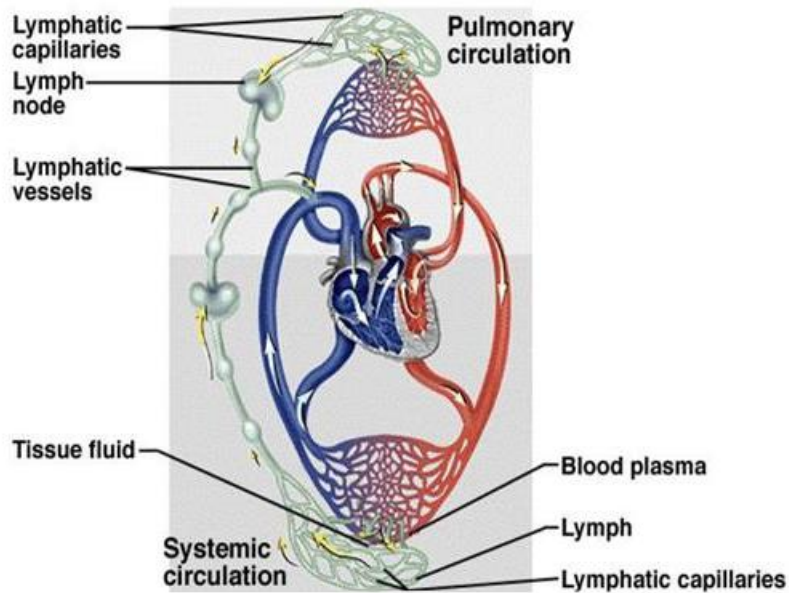
a. Tonsils: These are located in the mouth and throat, and will therefore destroy swallowed and inhaled antigens. b. Peyer's patches: These large collections of lymphoid tissue are found in the small intestine, and intercept swallowed antigens.



TOPIC: LYMPH CIRCULATION AND FUNCTIONS OF LYMPHATIC SYSTEM

Lymph flows in a closed system of vessels called the lymphatic system.

- It consists of lymph sinuses, which flows from lymphatic capillaries and lymph vessels.
- The lymphatic capillaries are situated in the intercellular spaces and their walls are formed by endothelial cells, supported by fibrous connective tissues. Lymph capillaries join to form lymph vessels.
- Lymph vessels are having superficial as well as deep penetration in the skin, blood vessels, muscle and various visceral organs.
- Various lymph vessels are linked together by free anastomosis.
- They are intervening lymphatic glands.



- The lymphatic vessels are provided with one way valves which help forward flow of lymph towards the chest.
- The intestinal villi contain the primary lymphatics called lacteals.
- Nervous system has no lymphatics, but it is not devoid of lymph, since the cerebrospinal fluid flows in the CNS.
- The lymphatic vessels then pass through the lymph nodes and gradually increase in size.

Finally, the lymph is collected from the body and into right lymphatic duct and thoracic duct or left lymphatic duct.

- The right lymphatic duct opens in to the right subclavian vein and left duct opens in the left subclavian vein.
- The thoracic duct receives lymph from cistern “receptaculum chyli” placed in the abdomen. The left cervical duct also drains its lymph in the thoracic duct.