

UNIT 5**LYMPHATIC SYSTEM**

The system which includes all the structures involved in the transport of lymph from the tissues to the blood stream (circulating blood) is known as lymphatic system.

Functions of Lymphatic System

1. Return protein from tissue spaces to blood:
2. Absorption of nutrients, especially fats, from the gastrointestinal tract.
3. Acts as transport mechanism to remove red blood cells that have lost into the tissues as a result of haemorrhage.
4. Supplies nutrients and oxygen to those parts where blood cannot reach.
5. Role in defense mechanism:

Components of Lymphatic System

The lymphatic system is composed of the following important components.

1. Lymph
2. Lymph vessels
3. Lymph nodes
4. Lymph organs
 - Spleen
 - Thymus glands
5. Tonsils (Lymphoid tissue)
6. Bone marrow

LYMPH

Lymph is a colourless, transparent, clear, alkaline, fluid which circulates through the lymphatic vessels. The cellular components of lymph are known as lymphocytes.

Composition of Lymph

The lymph contains:

- 96% : Water
- 4% : Solids

The solids substances of lymph are made up of proteins, lipids, carbohydrates, amino acids, electrolytes etc.

Functions of Lymph

1. It returns proteins from tissue spaces into blood.
2. It is responsible for redistribution of fluid in the body.
3. It removes bacteria, toxins and other foreign bodies from the tissue.
4. It plays an important role in immunity by transporting lymphocytes.
5. It helps in clotting.
6. It carries hormones.

LYMPH VESSELS

The vessels which transport lymph throughout the lymphatic system and freely anastomosing with one another are known as lymph vessels. It is also known as lymphatic vessels.

Types of Lymph Vessels

The lymph vessels are of two types:

1. **Lymph capillaries:** It is blind end tubes originated from interstitial spaces. It is composed of endothelial cells. The capillaries unite to form large lymphatic vessels.

2. **Large lymph vessels** : The larger lymph vessels are of two types:
- Right lymphatic duct:** It is dilated lymph vessels about 1cm long. It drains lymph from the right half of the thorax, head, neck and the right arm.
 - Thoracic duct:** It is large lymphatic duct about 40 cm long. It drains lymph from both legs, pelvic, abdominal cavities, the left half of thorax, head & neck and left arm.

Differences between Right Lymphatic Duct and Thoracic Duct

No	Right Lymphatic duct	Thoracic duct
1.	It is about 1 com long.	It is about 40 cm long.
2.	It lies in the root of neck.	It lies in the cisterna chyli.
3.	It opens into the right subclavian vein.	It opens into the left subclavian vein.
4.	It drains lymph from the right half of the thorax, head, neck and the right arm.	It drains lymph from both legs, pelvic, abdominal cavities, the left half of thorax, head & neck and left arm.

LYMPH NODES

Lymph nodes are oval or bean shaped small glandular organs located in the course of lymph vessels. It is also known as lymph glands or lymphatic nodes.

Group of Lymph Nodes

- Cervical lymph nodes:** It lies behind and below the ear, along the inferior margin of the mandible and down to the side of the neck.
- Axillary lymph nodes:** It lies from the arm, through the armpit, to the thoracic wall, breast and superior abdominal wall.
- Thoracic lymph nodes:** It lies along the abdominal aorta and mesenteric arteries.
- Pelvic lymph nodes:** It lies along the iliac arteries and veins.
- Inguinal lymph nodes:** It lies in the groin region.

Structure of Lymph Nodes

- Each lymph node is composed of masses of lymphatic tissue and covered by a dense connective tissue.
- The main substance of node consists of reticular and lymphatic tissue containing many lymphocytes and macrophages, as many as four or five afferent lymph vessels may enter a lymph node while only one efferent vessel carries lymph away from the node.

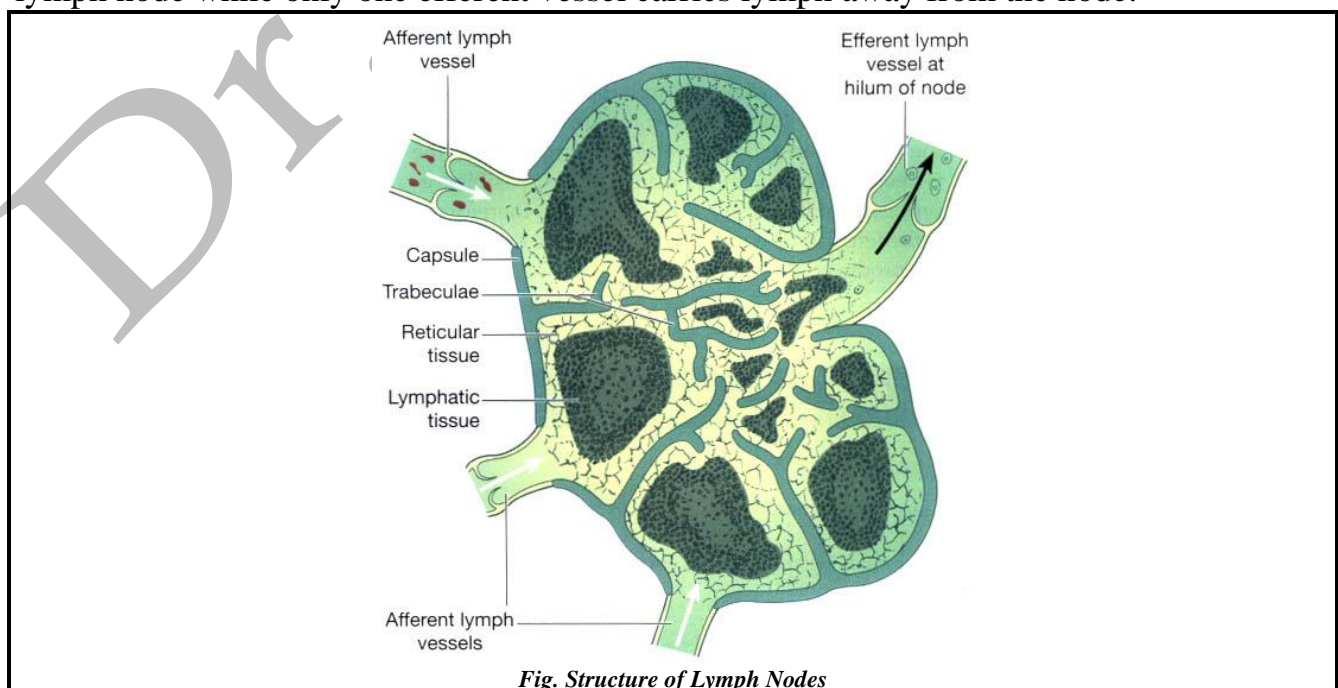


Fig. Structure of Lymph Nodes

Functions of Lymph Nodes

1. It filters lymph.
2. It destroys the bacteria and other toxic substances.
3. It helps in the development of lymphocyte.

SPLEEN

Spleen is the largest organ of lymphatic system. It is situated in left hypochondriac region of the abdominal cavity between the diaphragm and stomach. It is purple in colour about 12cm long, 7cm wide and 2.5 cm thick. It is weighed about 200gm.

Structure of Spleen

- The spleen is covered by outer surface known as serous membrane (peritoneum) and inner surface known as fibro muscular capsule.
- The spleen contains collagen fibers, elastic tissue, smooth muscle and reticular cells.
- The structures entering and leaving the spleen at the hilum are:
 - Splenic artery
 - Splenic vein
 - Lymph vessel
 - Nerves

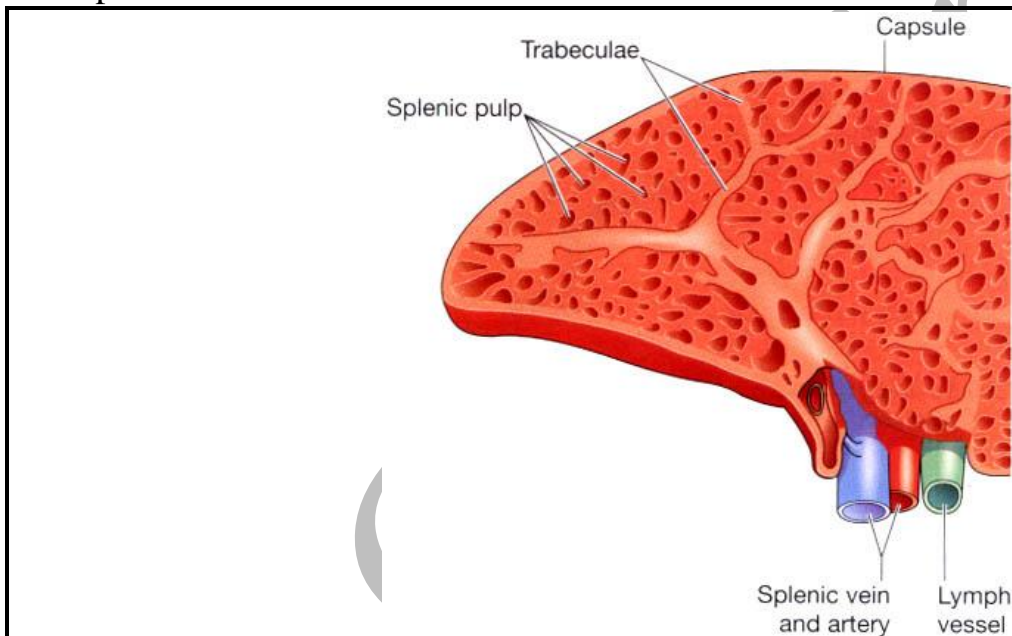


Fig. Structure of spleen

Functions of Spleen

1. **Formation of blood cells:** Spleen is a site of blood cell formation in embryo.
2. **Destruction of blood cells:** The older red blood cells (after 120 days), lymphocytes and thrombocytes are destroyed in the spleen.
3. **Storage of blood:** Spleen stores large number of red blood cells and released from spleen into circulation during the emergency conditions like hypoxia and hemorrhage.
4. **Immune response:** Spleen contains T and B lymphocytes which are activated by the presence of antigen.

THYMUS GLAND

Thymus gland is an organ of lymphatic system and also endocrine gland of the body. It is situated in the upper part of the mediastinum behind the sternum and extends upwards into the root of the neck. It weight is about 10-15 gm at birth and grows until puberty weight about 30-40 gm.

Functions of Thymus gland

The thymus gland has two functions:

1. Thymus gland plays an essential role in the development of immunity by processing of the T lymphocytes.
2. The thymus gland secretes two hormones such as Thymosin and Thymin.

TONSIL

The mass of lymphoid tissue located in the mouth and throat (pharynx) is known as tonsil.

Types of Tonsil

1. **Nasopharyngeal tonsil (adenoids):** It is near at the opening of nasal cavity into the pharynx.
2. **Palatine tonsil:** It is located near the opening of the oral cavity in the pharynx.
3. **Lingual tonsil:** It is located on the posterior surface of the tongue.
4. **Tubal tonsil:** It is located near the nasopharyngeal tonsil.
5. **Lateral pharyngeal tonsil:** It is located at lateral side of oral cavity.
6. **Nodules:** It is located on the posterior pharyngeal wall.

Functions of Tonsil

1. It protects body against infection.
2. It destroys swallowed and inhaled antigens.

BONE MARROW

See the Unit: 7 Skeletal System

IMMUNITY

Immunity is defined as the state of resistance exhibited by the host towards injury, toxic molecules caused by microorganism, foreign cell and their product.

Types of Immunity

1. **Natural immunity:** This type of immunity is present in the body since birth during the development of embryo, some antibodies from mother pass through the placenta to the fetus. These antibodies can protect the young from number of diseases like measles, polio etc. It is also known as innate immunity.
2. **Acquired immunity:** The immunity acquired after birth or during the lifetime of an individual is known as acquired immunity.

Types of acquired immunity

- a. **Active immunity:** The acquired immunity developed by the entrance of any foreign body or a vaccine is known as active immunity.
- b. **Passive immunity:** The acquired immunity developed by transferring antibodies, serum of lymphocyte from an immune individual is known as passive immunity.

Difference between Active & Passive immunity

No.	Active immunity	Passive immunity
1.	It is developed by an individual's own cells in response to an infection or a vaccine.	It is developed when ready-made antibodies are inoculated from outside.
2.	It has no side effects.	It may cause reaction.
3.	It provides relief only after long period.	It provides immediate relief.
4.	It is long lasting.	It is short lived.

ANTIGENS

Antigens are the substances, which induce specific immune reaction in the body. The antigen stimulates lymphocytes to produce antibodies or to attack the antigen directly (antibody immunity).

IMMUNOGLOBULINE (ANTIBODIES)

The protein substance present in the blood serum, produced in response to a reaction with a specific antigen is known as antibody.

