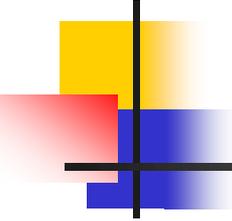


Lymphatic system

- Lymphatic system is a closed system of vessels which draw the tissue fluid into the blood vascular system.



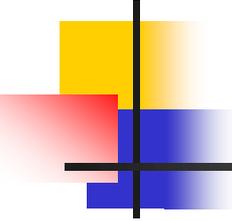
Components of lymphatic system

- **Lymph and lymph vessels**

- a) Lymph
- b) Lymph capillaries
- c) Lymph vessels proper
- d) Terminal lymph ducts

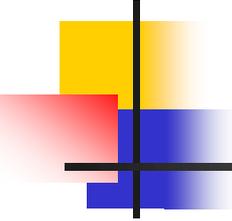
- **Lymphoid organs**

- a) Lymph nodes
- b) Spleen
- c) Thymus
- d) Tonsils



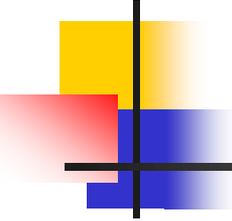
Lymph

- When tissue fluid enters the lymphatic system it is known as lymph. The protein concentration of lymph is equal to tissue fluid but lower than the plasma.
- Lymph carries particulate material, colloids and macromolecules from tissue fluid. This lowers the protein concentration of the tissue fluid.
- Lymph carries excess proteins back to the circulatory system.



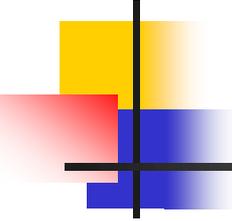
Lymph capillaries

- These begin blindly in the extracellular spaces and communicate freely with adjacent lymph capillaries.
- They are valveless.
- Flap valves are formed due to overlapping of edges of endothelial cells.



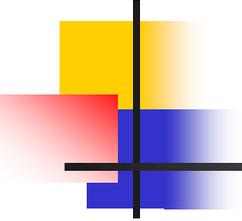
Lymph vessels proper

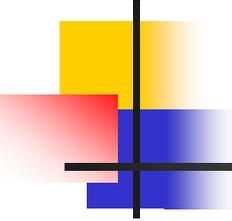
- They are formed by convergence of lymph capillaries.
- Valves are present that give them a beaded appearance.
- Interconnected along the lymph vessels are the lymph nodes.
- Lymph flows in one direction only.
- Retrograde flow may occur if the vessels are obstructed.



Terminal lymph ducts

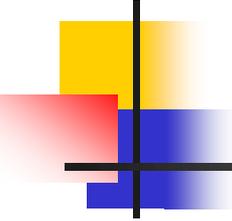
- They are formed by convergence of lymph vessels.
- 1. Cisterna chyli – It is a dilated sac located between the diaphragmatic crura opposite the L1 vertebra. It can vary in size and location. It receives the lumbar lymphatics.
- 2. Thoracic duct – It originates from the upper end of the cisterna chyli and drains at the junction of left subclavian and the left internal jugular veins into the circulation.
- 3. Right lymphatic duct – It drains into the right brachiocephalic vein.

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- Thoracic duct drains the lymphatics from the entire body except the right side of head and neck, right upper limb, right lung, right thoracic wall, right half of heart and the convex surface of the liver.
 - Infestation of the lymphatics by microfilaria parasites is called filariasis. It may block the lymphatic channels causing edema of the limbs.



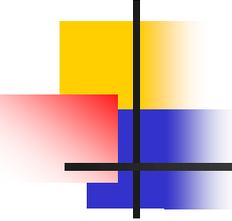
Lymphoid tissue

- It is a part of reticuloendothelial system. Reticular fibres form a framework of tissues of this system. Inside the reticular network two types of cells are present.
 1. Reticular cells - These are free or stem cells which give rise to free cells.
 2. These are lymphoblasts, lymphocytes and plasma cells.



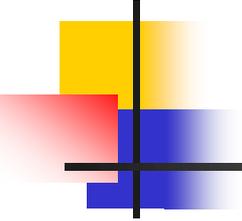
Primary lymphatic follicle

- It consists of T and B lymphocytes supported by reticular fibres.
- Centre of the follicle is known as germinal centre which is occupied by lymphoblasts and plasma cells.
- Periphery of follicle consists of free lymphocytes
- Primary lymph follicles are present in respiratory, alimentary and urinary tracts.
- Follicles are also present in spleen lymph nodes and tonsils.



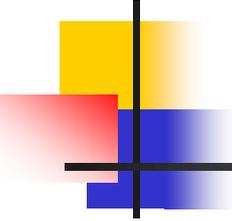
Lymph node

- Each lymph node is bean shaped and presents with a hilum which gives attachment to a single efferent lymph vessel.
- Each lymph consists of capsule and the gland substance.
 1. **Capsule** – It invests the entire node and is separated from the gland substance by a subcapsular space called as **subcapsular sinus**.
 2. **Gland** – Gland substance is made up of an outer **cortex** and an inner **medulla**. Cortex contains lymph follicles and medulla is occupied by irregular cords of lymphocytes called as **medullary cords** and blood vessels.



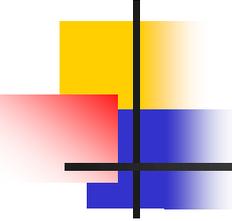
Functions of lymph nodes

- Filter lymph and remove particulate matter and noxious substances.
- They produce lymphocytes.
- Plasma cells produce antibodies.



Spleen

- Largest lymphoid organ of the body.
- It consists of an outer thick capsule made of fibro-elastic components. This gives rise to trabeculae in the substance of the spleen and divides it into lobules.
- Each lobule contains red and white pulp.
- Red pulp is arranged in the form of irregular cords of cells called as cords of Billoth's. It consists of network of reticular fibres supporting cells like erythrocytes, lymphocytes, monocytes and macrophages.
- White pulp is made up of collection of lymphoid nodules each of which is characterized by an eccentric arteriole. Such lymphatic nodules are called as malphigian corpuscles.
- Spleen is a haemal node as it filters blood by taking out worn out RBC's, leucocytes, platelets and microbes from the circulation.



Thymus

- It lies in the superior mediastinum. It is prominent after birth and rapidly diminishes after puberty.
- It is made up of two lobes. Each is covered by a fibrous capsule.
- Fibrous septae extend into the substance of the gland and divide it into lobules.
- Each lobule has an outer cortex and an inner medulla.
- In the cortex scattered lymphocytes are present but typical lymphoid nodules are not seen.
- In the medulla Hassal's corpuscles are seen. Each corpuscle has a central core formed by the epithelial cells that have undergone degeneration. These cells are seen as a pink hyaline mass. This mass is surrounded by concentrically arranged epithelial cells. Besides Hassal's corpuscles some lymphocytes are also seen.
- Thymus does not receive any lymph vessels but gives off efferent vessels.