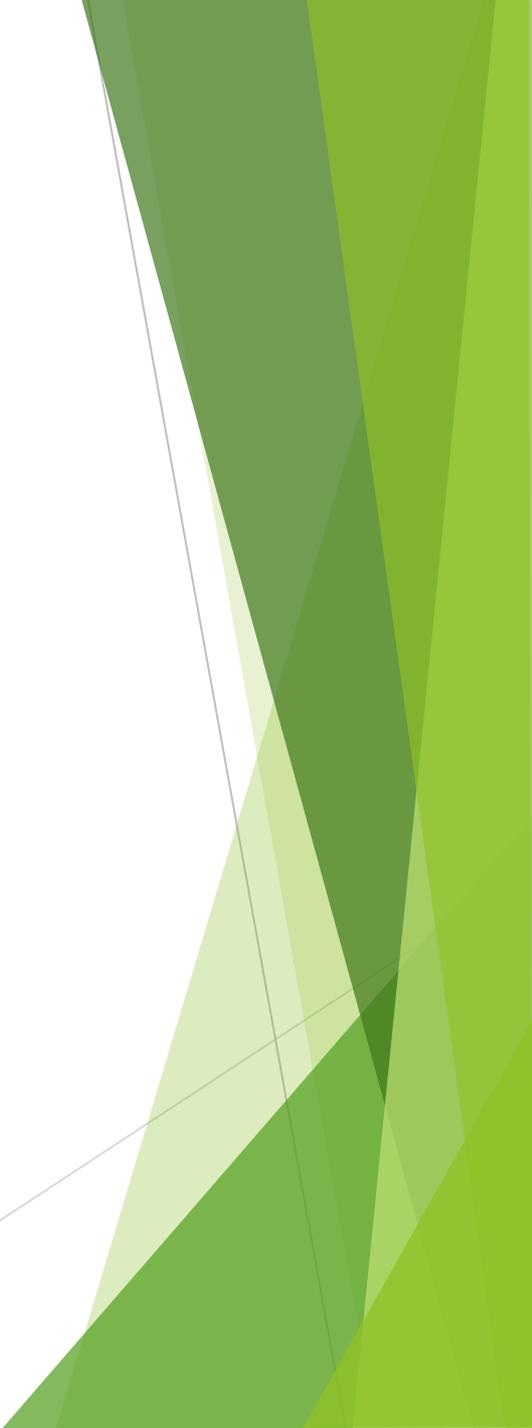
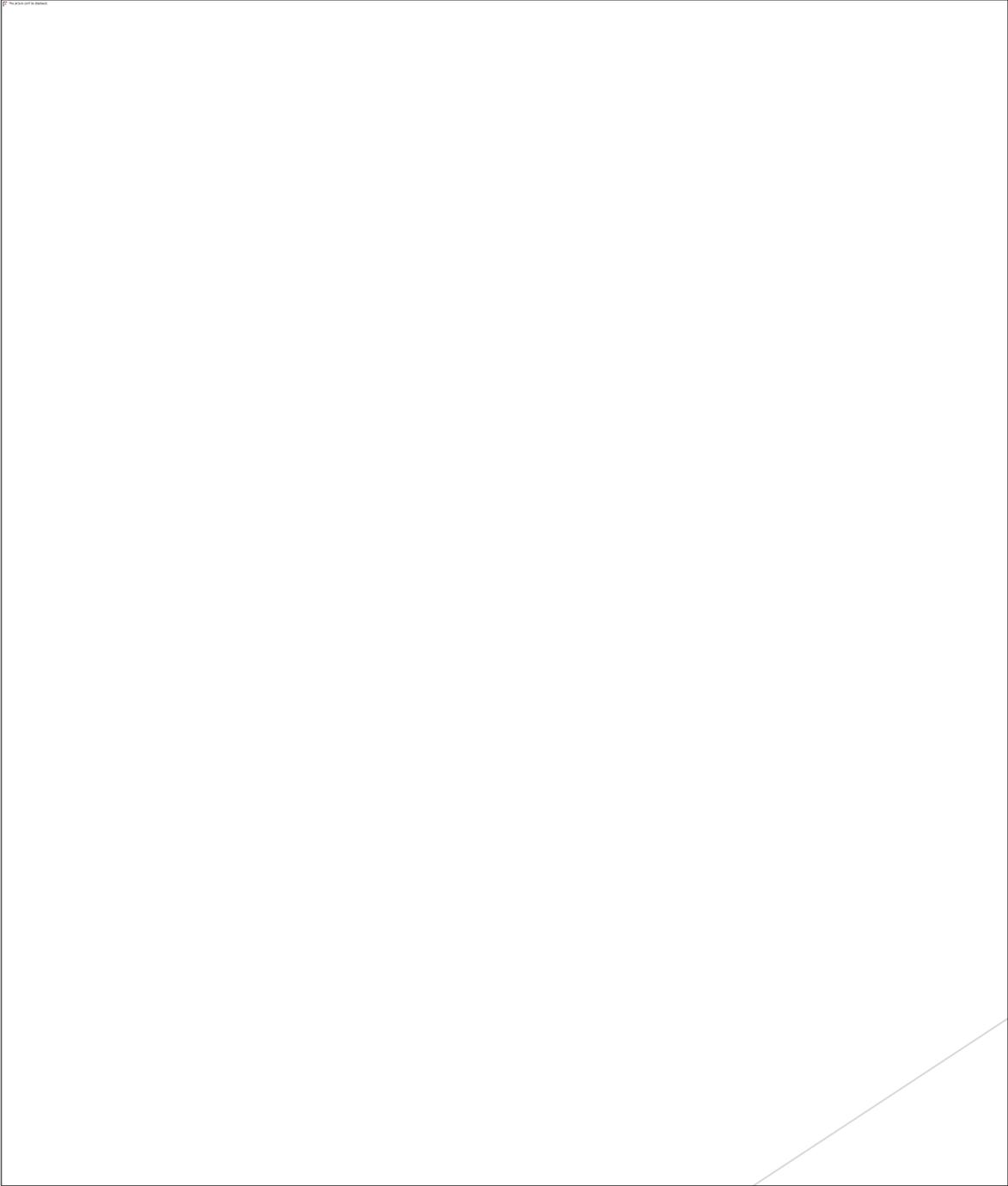


**Lymphatic system**

# Introduction

- ▶ The body system which is responsible for specific immunity which defends specific microbe is lymphatic system.
- ▶ It is a closed system.
- ▶ Lymph is the specialized fluid connective tissue which contains a large no of lymphocytes.
- ▶ Lymphatic system consists of lymph, lymphatic vessels, lymphatic capillaries, lymphatic tissue, lymph nodes, red bone marrow.



# Function :-

- ❑ Transports lipids and lipid soluble vitamins absorbed by git.
- ❑ Drains excess interstitial fluid from tissue space.
- ❑ Protect body against infection.
- ❑ Produce specific responses against specific microbes.
- ❑ Carries wastes from tissue to blood
- ❑ Produce lymphocytes.

# Lymph

- ❑ Lymph is clear colorless tissue fluid.
- ❑ Lymph is the specialized fluid connective tissue.
- ❑ Located inside the lymphatic system
- ❑ Formed by filtration of tissue fluid into lymphatic vessels.
- ❑ Consists of blood plasma, lymphocytes, fat, nutrients, gases, hormones.
- ❑ Volume 3ltrs/day
- ❑ Cant return back to blood because of conc. Gradient.
- ❑ Show one way movement.
- ❑ pH of lymph is 7.0 (slightly alkaline)

# Lymph production: -

Blood flow through blood vessels



Enter into interstitial space to form Interstitial fluid



Enter into lymphatic system  
(Lymphatic capillary , lymphatic vessels, lymph nodes etc.)

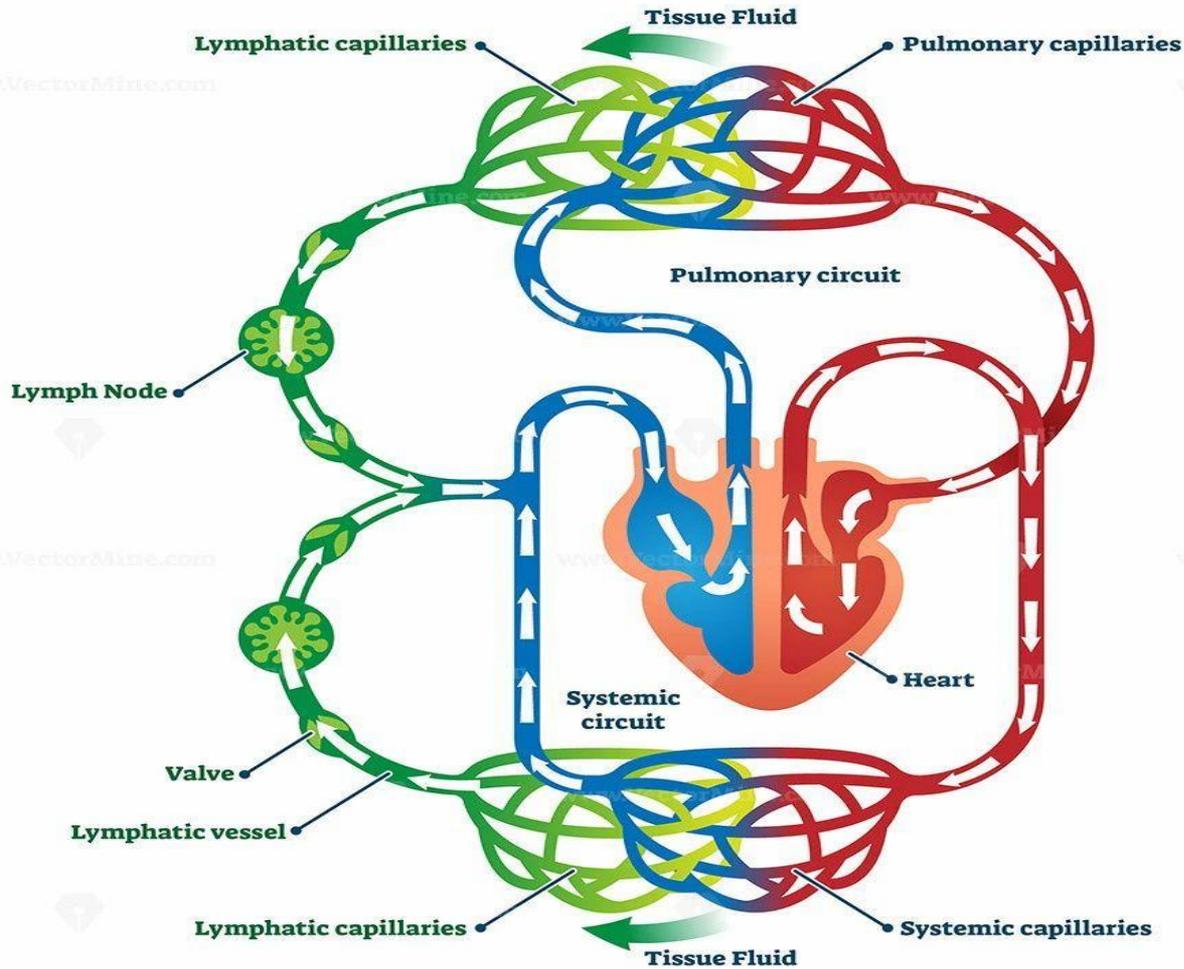


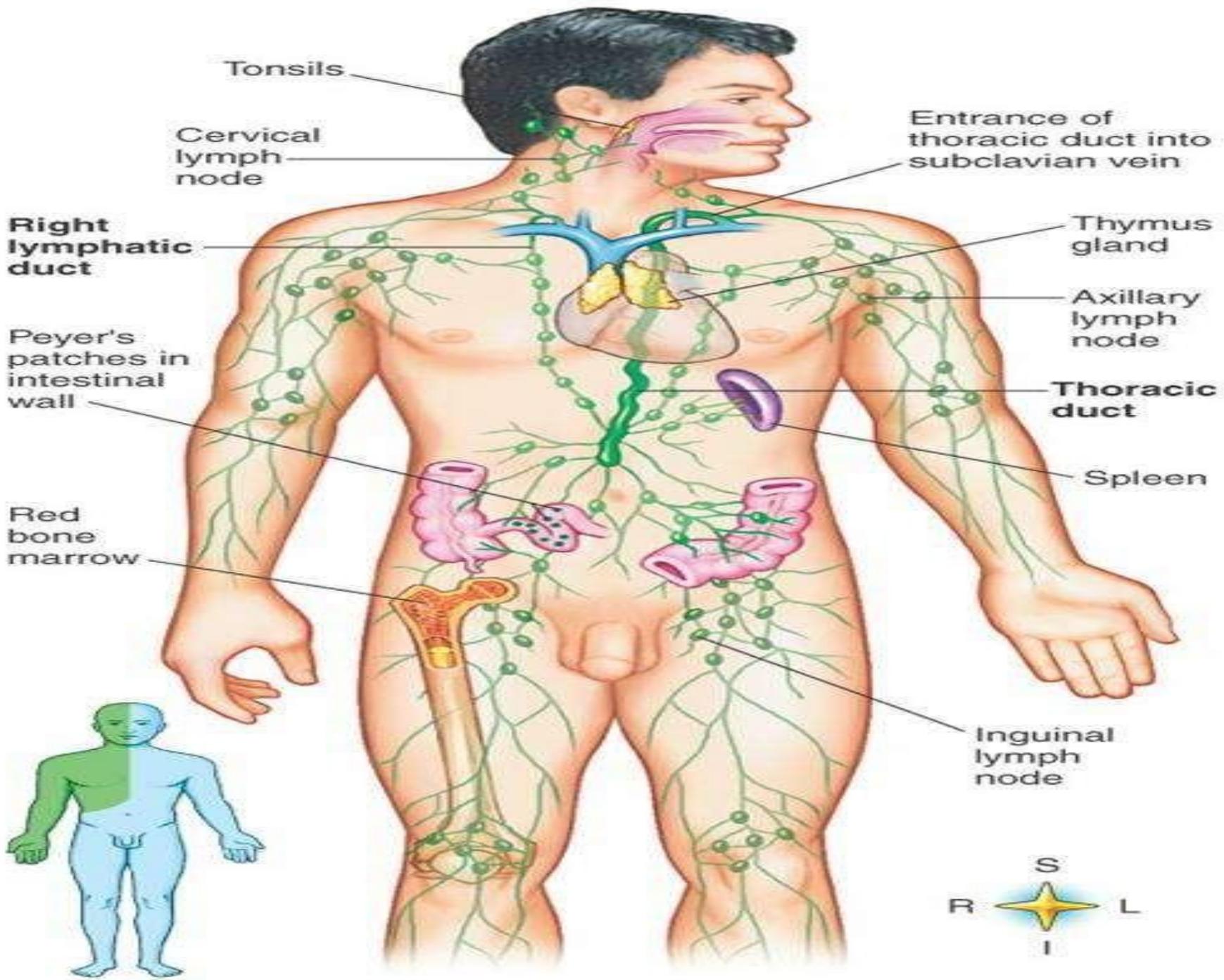
Lymph  
( blood plasma+ lymphocytes+ fat+  
nutrients+ gases+ hormones)

# Function of lymph

- ▶ Lymph transports oxygen, food materials, hormones etc., to the body cells
- ▶ And brings carbon dioxide and other metabolic wastes, from the body cells to blood.
- ▶ It keeps the body cells moist.
- ▶ It destroys the invading microorganisms and foreign particles in the lymph nodes

# LYMPHATIC CIRCULATION





# Lymph circulation

- ▶ Lymphatic capillaries (l)



- ▶ Lymphatic vessels (contains valve) (l)



- ▶ Lymph trunk (opens into ducts) (l)

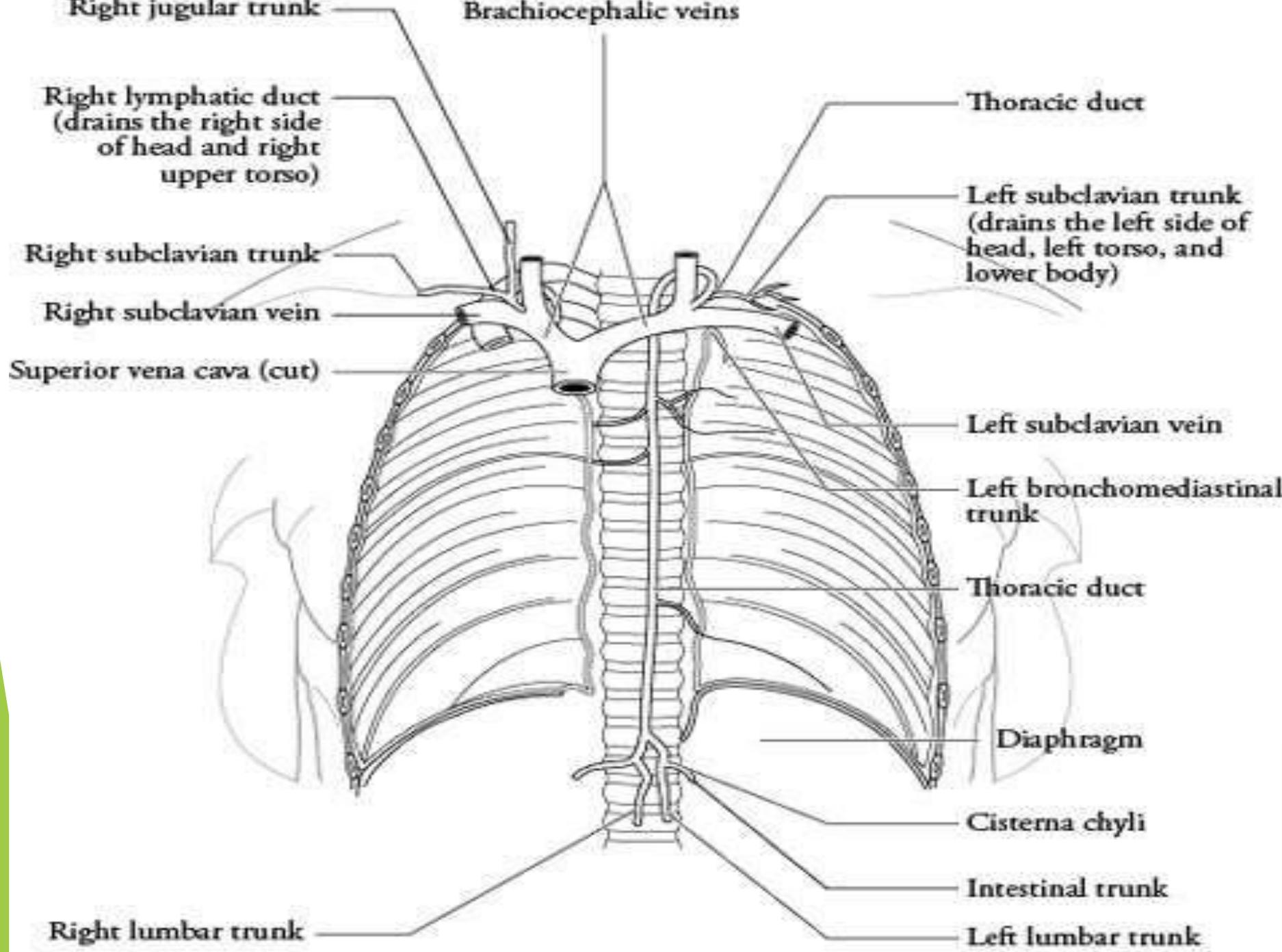


- ▶ Lymphatic duct (l)

- ▶ LLD & RLD



- ▶ junction of jugular vein & subclavian vein (b)



## ▶ Lymphatic capillaries

- ▶ The capillaries in which lymph flows i.e. more permeable than blood capillaries. Larger proteins, lipids can be absorbed.

## ▶ Lymphatic vessels

- ▶ The vessels begin with lymphatic capillaries. lymphatic vessel contains valves, so that lymph shows one way movement.

## ▶ Lymph trunk

- ▶ The lymphatic vessels unite to form lymph trunks which opens into 2 main ducts.

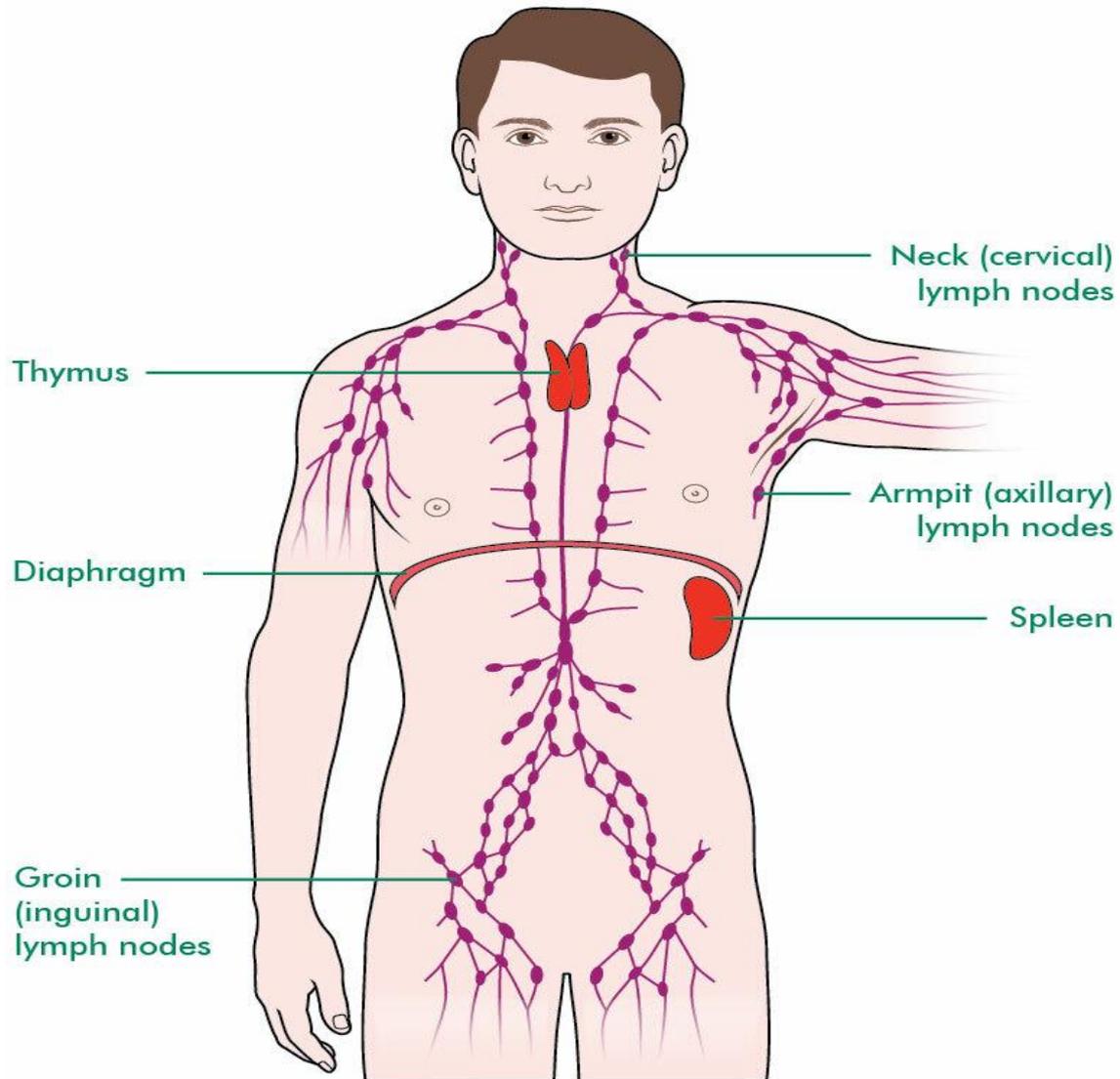
## ▶ Lymphatic duct

- ▶ Those 2 ducts where the trunk drains lymph are:

- ▶ Left lymphatic duct & right lymphatic duct
- ▶ LLD receives lymph from left side of head, neck, chest & entire inferior portion of body & drains at junction of left jugular vein & left subclavian vein.
- ▶ RLD receives lymph from upper right side of body & drains at junction of right jugular vein & right subclavian vein.

# Lymph nodes

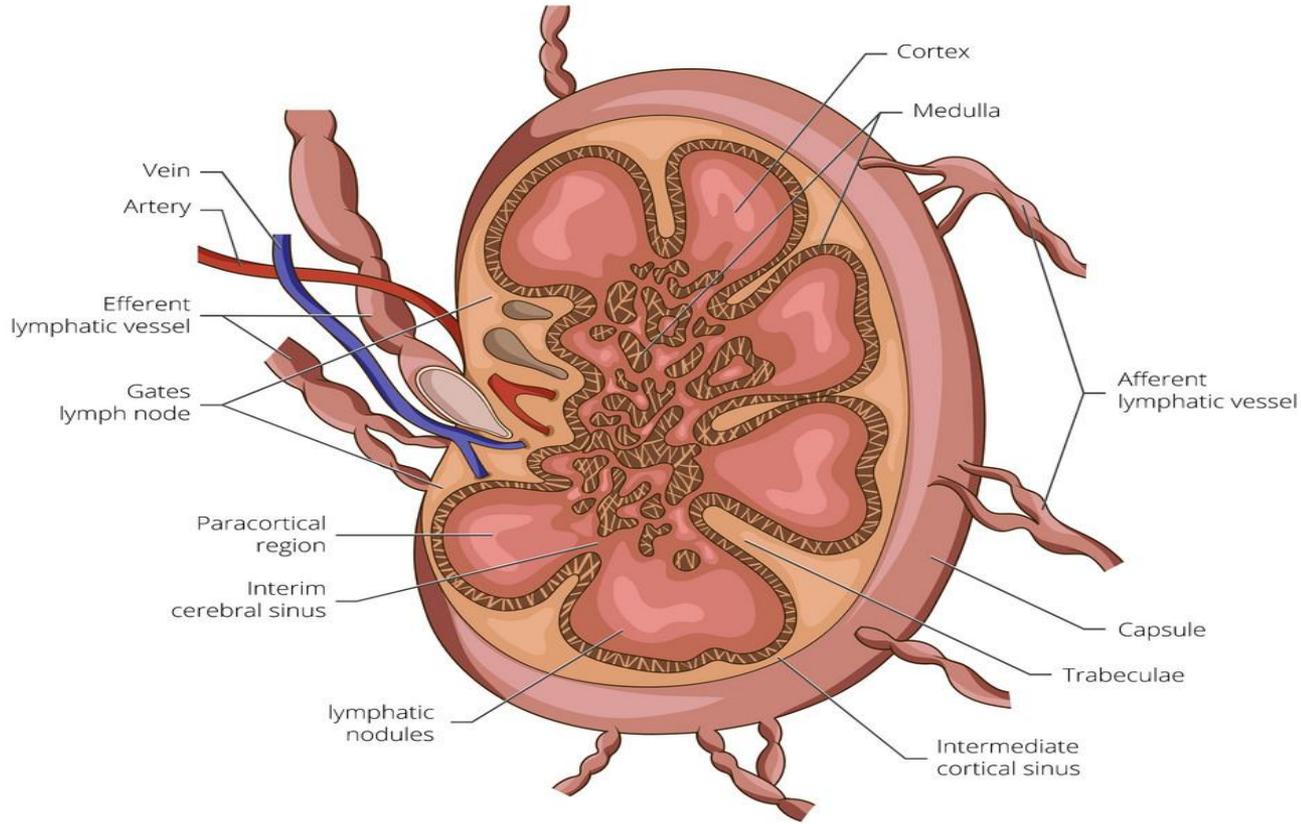
- ▶ Small bean shaped glands
- ▶ Located along with lymphatic vessels
- ▶ Present about 600 no's
- ▶ They occur in groups.
- ▶ Usually scattered throughout the body but larger groups are found near mammary glands, axillae, groin
- ▶ Length 1-25mm



# Structure of lymph node

- ▶ Covered by dense connective tissue i.e. capsule
- ▶ Capsular extensions that divides it into compartments i.e. trabeculae
- ▶ It is divided into 2 regions i.e. superficial cortex & medulla.
- ▶ Egg shaped B cells aggregates inside the cortex i.e. lymphatic nodules.
- ▶ Lymphatic vessels emerge with lymph node at a slight depression i.e. hilum.
- ▶ Lymph enters into the lymph node through afferent lymphatic vessels & drains through efferent lymphatic vessels which contains valve that opens according to flow path.

# Lymph node structure



# Function of lymph node

- ▶ Produce plasma proteins.
- ▶ Filter solid particles from lymph
- ▶ Separates foreign substances from lymph.
- ▶ Produce lymphocytes
  - ▶ T-cells produced in cortex region
  - ▶ B-cells produced in medulla region.

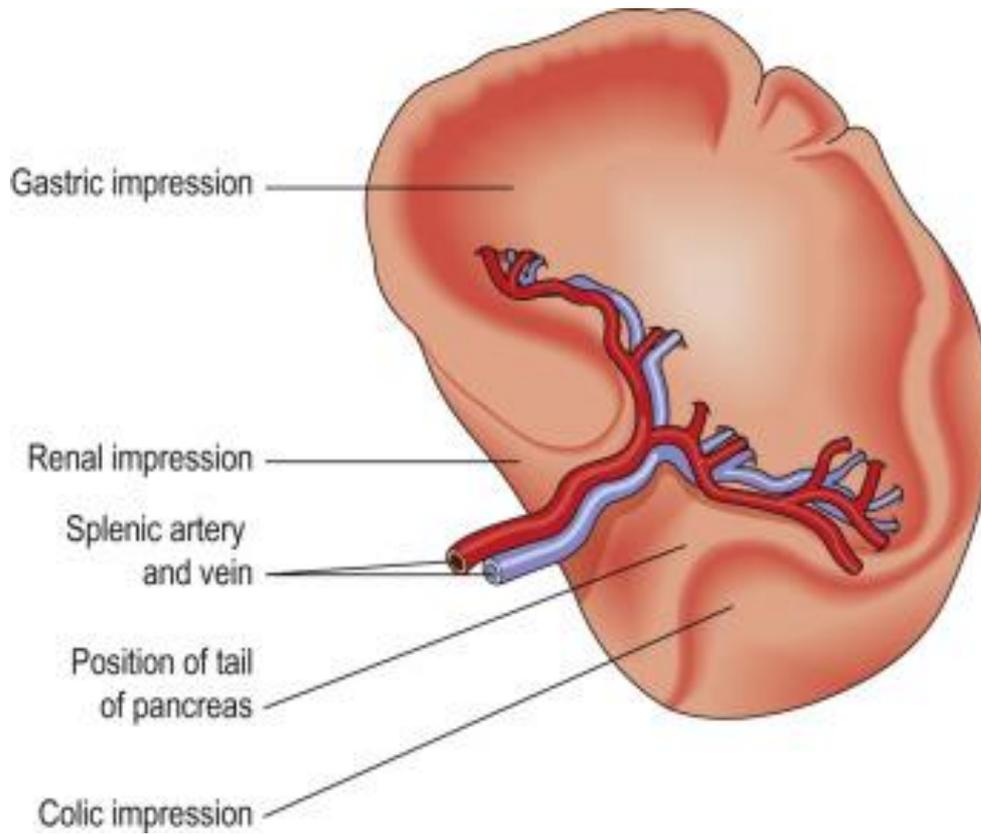
# Thymus

- ▶ Bilobed organ
- ▶ Located between sternum & aorta
- ▶ Reddish in appearance because of high content of lymphoid tissue & rich blood supply.
- ▶ In infant - 70gms
- ▶ After maturity - 3gms
- ▶ Helps in production & proliferation of T-cells.

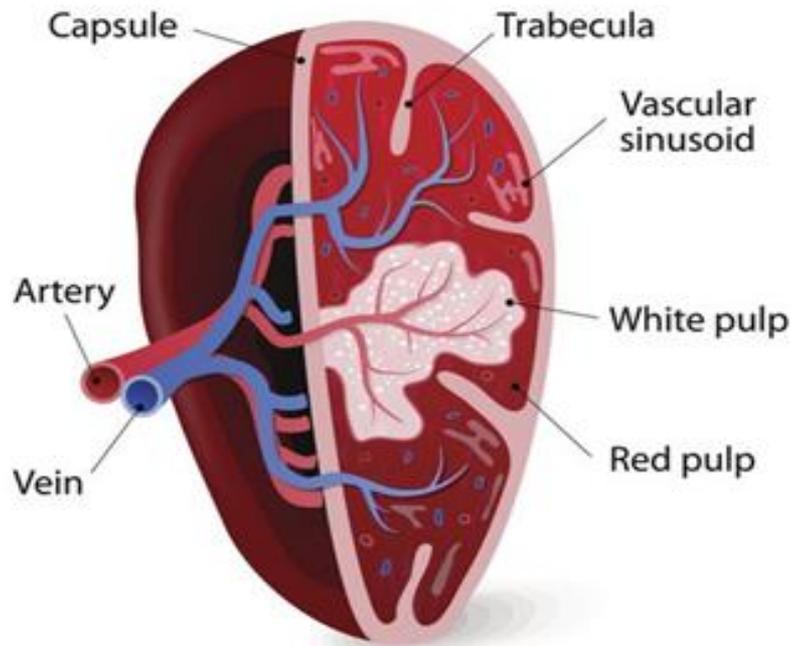
# Spleen

- ▶ Largest oval shaped organ.
- ▶ Highly vascular
- ▶ Located between stomach & diaphragm
- ▶ Neighboring organs make indentations
  - ▶ Gastric impression
  - ▶ Renal impression
  - ▶ Colic impression
- ▶ At hilum, splenic artery, splenic vein & efferent lymphatic vessels pass.
- ▶ Covered by dense connective tissue i.e. capsule
- ▶ Capsular extension inwards forms trabeculae.
- ▶ Consists of 2 types of tissues i.e.
  - ▶ White pulp- contains lymphocytes & macrophages
  - ▶ Red pulp- contains rbc & splenic tissues

# Spleen



# SPLEEN ANATOMY



# Function of Spleen

- ▶ Produce antibodies
- ▶ Produce blood cells during fetal growth.
- ▶ Fixed macrophages destroy blood borne pathogens & rbc
- ▶ Storage of platelet & blood cells.
- ▶ Removes ruptured, worn out, defective blood cells & platelets.