

Lymphoid system

Is providing protection against invasion of body by microorganism and some type of endogenous cells that becomes abnormal.

Function of Lymphatic system

- 1- Defense against harmful organism and chemical (specific and nonspecific)
- 2- Specific defense (immunity)
 - a- Humoral immunity; B cell (become plasma cell when activated) it produce Ab.
 - b- Cell-mediated immunity ; T cell (direct destroy foreign cells)

The **lymphatic system** consists of:

- A.** Cells
- B.** Tissues
- C.** Organs

Lymphocytes are the definitive and effector cell type of the lymphatic system.

- **Lymphatic vessels** connect parts of the system to the blood vascular system.
- **Lymphatic tissues** serve as sites where lymphocytes proliferate, differentiate, and mature.

- In the **thymus**, **bone marrow**, and **gut-associated lymphatic tissue (GALT)**, lymphocytes are “educated” to recognize and destroy specific antigens. These can distinguish between “self” (molecules normally present within an organism) and “non-self” (foreign molecules— i.e., those not normally present).

Antigen

- Is any substance that can induce a specific immune response.
- An **immune response** generated against a specific **antigen**, which can be a soluble substance (e.g., a foreign protein or toxin) or an infectious organism, foreign tissue, or transformed tissue.
- Most antigens must be “processed” by cells of the immune system before other cells can mount the immune response.

Immune Responses to Antigens

- The initial reaction of the body to invasion by an antigen is the nonspecific defense known as the **inflammatory response**.
 - When immunocompetent cells encounter a foreign antigen, a **specific immune response** to the antigen is generated.
1. **Primary immune response** refers to the body’s first encounter with an antigen. It is characterized by a lag period of several days before antibodies (mostly IgM) or specific lymphocytes can be detected in the blood.
 2. **Secondary immune response** is usually more rapid and more intense (characterized by higher levels of secreted antibodies, usually of the IgG class) than the primary response because of the presence of specific memory B lymphocytes already programmed to respond to that specific antigen.

The lines of immune defenses

The body has two lines of immune defenses against foreign invaders and transformed cells:

1. Non-specific (innate) immunity

It represents **the first line of defense** against microbial aggression. It consists of:

- (1) **Physical** barriers (e.g., the skin and mucous membranes).
- (2) **Chemical** defenses (e.g., low pH).
- (3) Various **secretory** substances (e.g., interferons, fibronectin, and complement in serum) .
- (4) **Phagocytic cells** (e.g., macrophages, neutrophils, and monocytes).
- (5) **Natural killer** (NK) cells.

Specific (adaptive) immunity

If non-specific defenses fail, the immune system provides specific, or adaptive, defenses that target specific invaders. Two types of specific defenses have been identified:

- **Humoral response** results in the production of proteins called **antibodies** that mark invaders for destruction by other immune cells
- **Cellular immune response** targets transformed and virus-infected cells for destruction by specific “killer” cells.

Tissues

- a- **Loose or diffuse lymphoid tissue** : Lymphocyte and related cells are present in large numbers than are typically found in loose connective tissues, but there is no nodular organization of the lymphocyte and very little delineation of the lymphoid tissue from surrounding tissue.

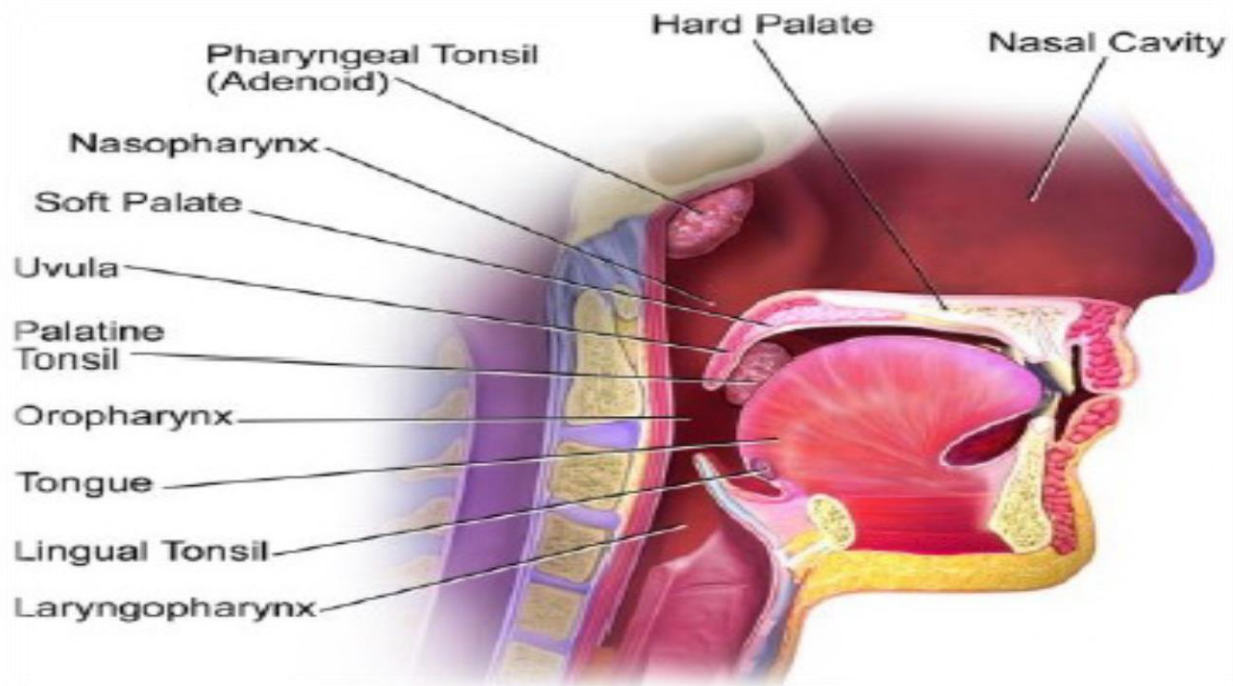
b- Dense lymphoid tissue : Cells (mostly small lymphocytes) are densely aggregated, and the tissue is usually fairly clearly recognized from surrounding tissues. Dense lymphoid tissue can be divided into 2 categories.

- (1) **Non-nodular dense lymphoid tissue**
- (2) **Nodular dense lymphoid tissues**

Tonsils

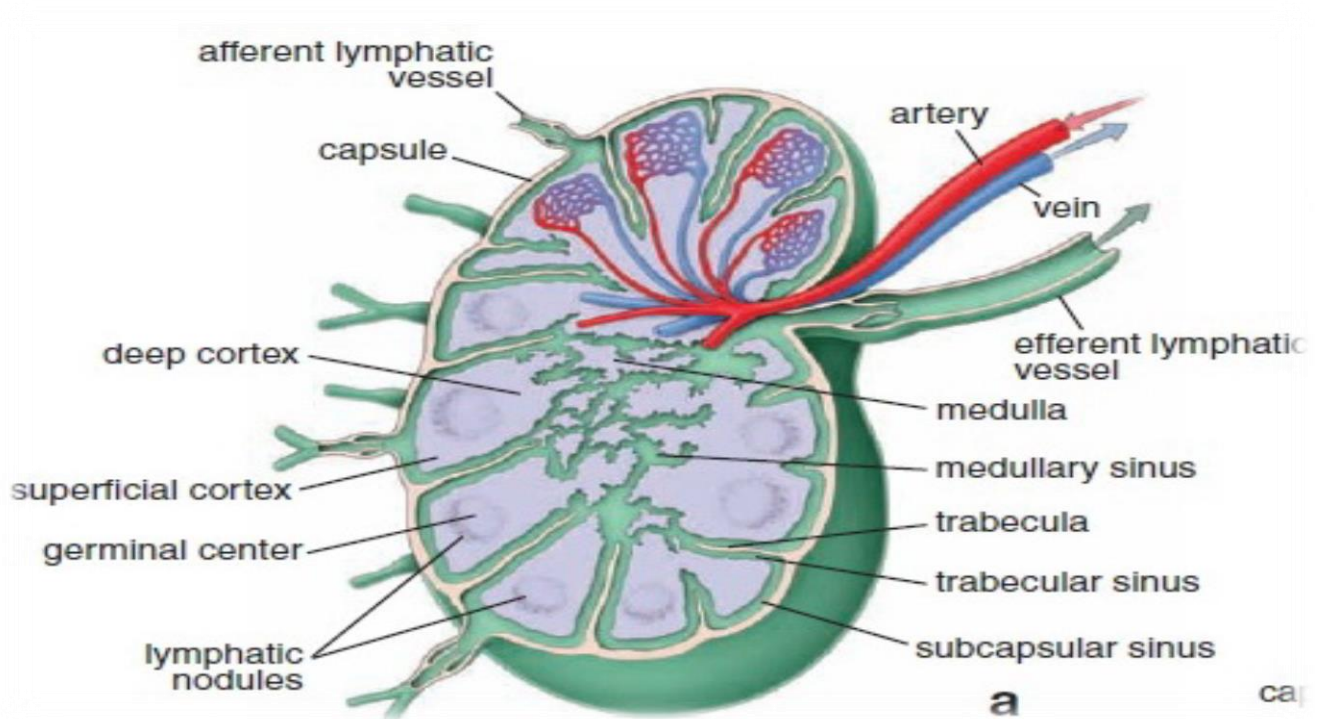
form a ring of lymphatic tissue at the entrance of the oropharynx. These include:

1. **pharyngeal tonsils** (adenoids, located in the roof of the pharynx)
2. **palatine tonsils** (or simply the tonsils)
3. **lingual tonsils** at the base of the tongue



Lymph Nodes

- Lymph nodes are small, encapsulated organs that filter lymph located along the pathway of lymphatic vessels.
- Lymph nodes are small, bean-shaped, encapsulated lymphatic organs.
- They range in size from about 1 mm to about 1 to 2 cm
- Two types of lymphatic vessels serve the lymph node:
 - 1- Afferent lymphatic vessels convey lymph toward the node
 - 2- Efferent lymphatic vessels convey lymph away from node

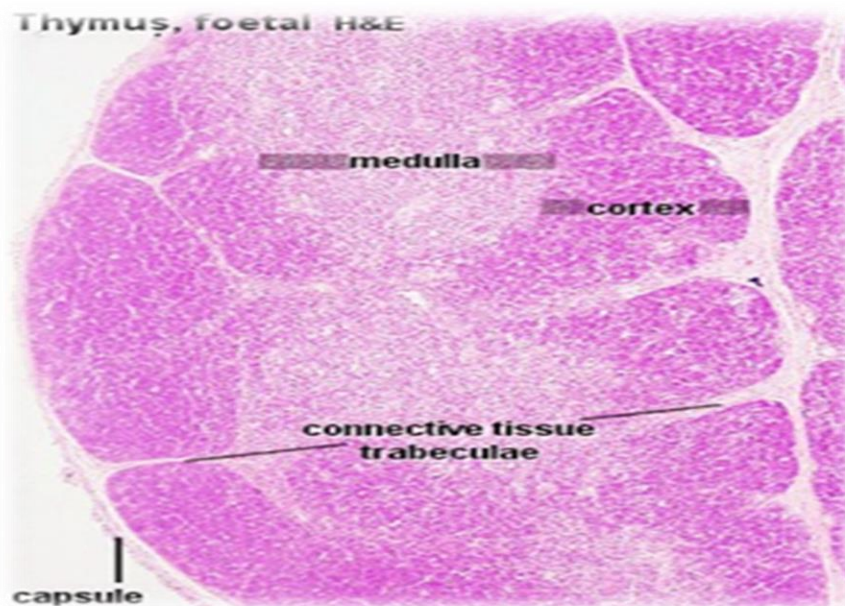


Thymus

- A bilobed organ located in the superior mediastinum, anterior to the heart and great vessels.
- Fully formed and functional at birth.
- It persists as a large organ until about the time of puberty, when T-cell differentiation and proliferation are reduced and most of the lymphatic tissue is replaced by adipose tissue (involution).

Function of thymus

- 1- Development and differentiation of T lymphocytes in thymus.
- 2- TSC secret various cytokines and thymus hormones.
- 3- thymocytes secrete various cytokines.
- 4- Immune regulation of the thymus.



Spleen:

- Largest single accumulation of lymphoid tissue
- Important organ in defense against blood born Ag.
- Main site of destruction of aged RBC

The spleen performs both immune and hemopoietic functions.

Immune system functions of the spleen include:

- Antigen presentation and initiation of immune response,
- Activation and proliferation of B and T lymphocytes,
- Production of antibodies
- Removal of macromolecular antigens from the blood.

Hemopoietic functions of the spleen include:

- Removal and destruction of senescent, damaged, and abnormal erythrocytes and platelets;
- Retrieval of iron from hemoglobin; formation of erythrocytes during early fetal life
- Storage of blood.