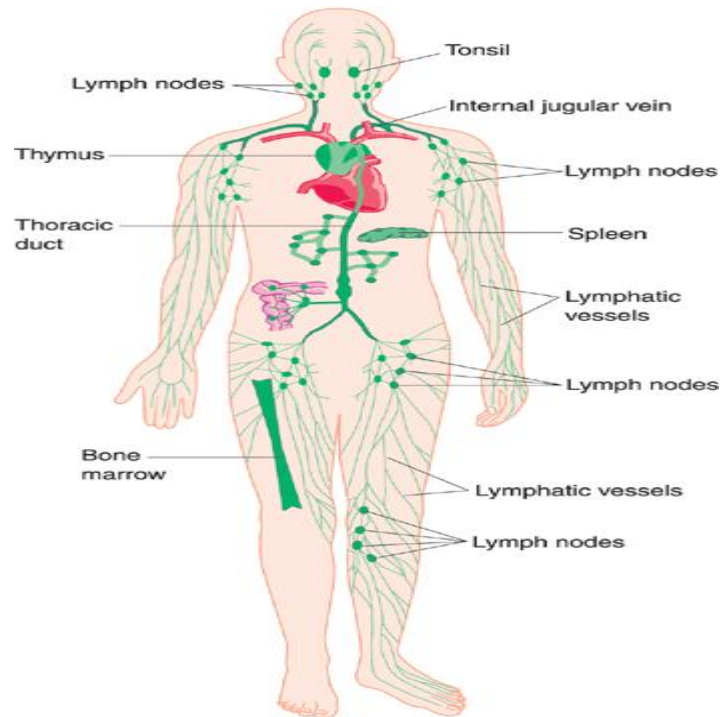


## Lecture No – 6



### Lymphoid Tissue

Lymphoid tissue is a type of connective tissue characterized by a rich supply of lymphocytes. It exists free within the regular connective tissue or is surrounded by capsules, forming the lymphoid organs. Because lymphocytes have very little cytoplasm, lymphoid tissue stains dark blue in hematoxylin and eosin-stained sections. Lymphoid tissues are basically made up of free cells; as a result, they typically have a rich network of reticular fibrils (made principally of type III collagen) that supports the cells. In most lymphoid organs, the fibrils are produced by a fibroblastic cell called a **reticular cell**, whose many processes rest on the reticular fibrils. The thymus is an exception in so far as its cells are supported by a reticulum of epithelial cells of endodermic origin.

The network of reticular fibrils of the lymphoid tissue may be relatively closed (**dense lymphoid tissue**) and is, thus, able to hold many free cells (mostly lymphocytes, macrophages, and plasma cells). Another type is **loose lymphoid tissue**, whose network has fewer but larger spaces, providing means for easy movement of the free cells. In the **nodular lymphoid tissue**, groups of lymphocytes are arranged as spheres, called **lymphoid nodules** or **lymphoid follicles**, that primarily contain B lymphocytes. When lymphoid nodules become activated as a result of the

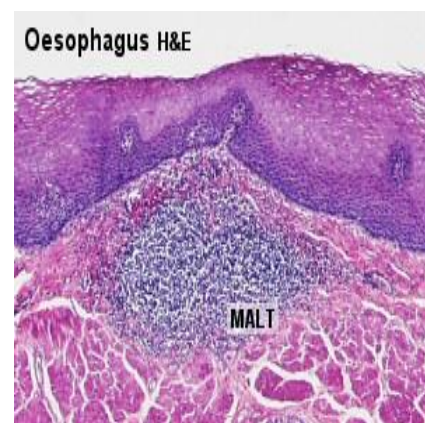
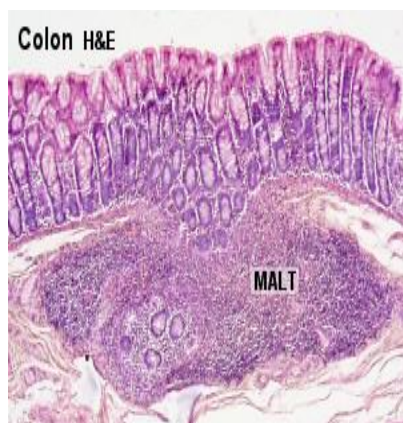


arrival of antigen-carrying APCs and recognition of the antigens by B lymphocytes, these lymphocytes proliferate in the central portion of the nodule, which then stains lighter and is called a **germinative center**. After completion of the immune response, the germinative center may disappear. The germinative centers contain a special cell, the **follicular dendritic cell** (distinct from the epithelial dendritic APCs), that has many processes that bind antigen on their surfaces, to be presented to B lymphocytes.

Lymphoid nodules vary widely in size, typically measuring a few hundred micrometers to 1 mm in diameter. They are found free in connective tissues anywhere in the body or within lymphoid organs (lymph nodes, spleen, tonsils, but not in the thymus). They are, however, never covered by a capsule. Free lymphoid nodules are commonly present in the lamina propria of several mucosal linings, where, together with free lymphocytes, they constitute the mucosa-associated lymphoid tissue (MALT).

### Mucosa-Associated Lymphoid Tissue & Tonsils

The digestive, respiratory, and genitourinary tracts are common sites of microbial invasion because their lumens are open to the external environment. To protect the organism, the mucosa and submucosa of these tracts contain a large amount of diffuse collections of lymphocytes, IgA-secreting plasma cells, APCs, and lymphoid nodules . Most of the lymphocytes are B cells; among T cells, CD4<sup>+</sup> helper cells predominate. In some places, these aggregates form conspicuous structures such as the tonsils and the Peyer's patches in the ileum. Similar aggregates are found in the appendix.



## Tonsils

Tonsils belong to the MALT, but because they are incompletely encapsulated, they are considered organs and will be studied apart from the MALT. The tonsils constitute a lymphoid tissue that lies beneath, and in contact with, the epithelium of the initial portion of the digestive tract. Depending on their location, tonsils in the mouth and pharynx are called palatine, pharyngeal, or lingual.

### Palatine Tonsils

The two palatine tonsils are located in the lateral walls of the oral part of the pharynx . They are lined with a squamous stratified epithelium that often becomes so densely infiltrated by lymphocytes that it may be difficult to recognize . The lymphoid tissue in these tonsils forms a band that contains free lymphocytes and lymphoid nodules, generally with germinal centers . Each tonsil has 10–20 epithelial invaginations that penetrate the tonsil deeply, forming **crypts**, whose lumens contain desquamated epithelial cells, live and dead lymphocytes, and bacteria. Crypts may appear as purulent spots in tonsillitis. Separating the lymphoid tissue from subjacent structures is a band of dense connective tissue, the **capsule** of the tonsil . This capsule usually acts as a barrier against spreading tonsillar infections.

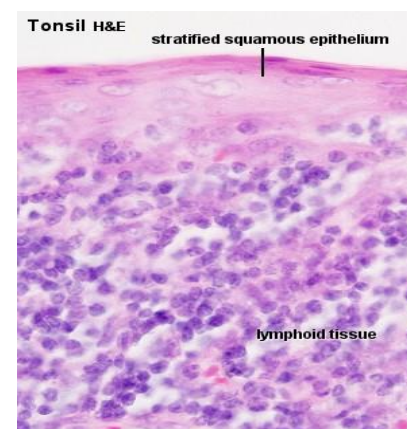
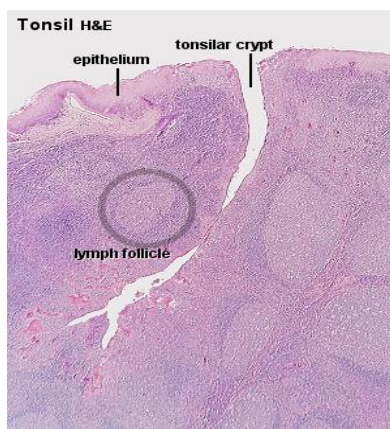
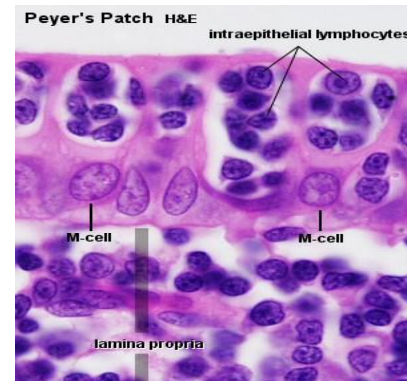
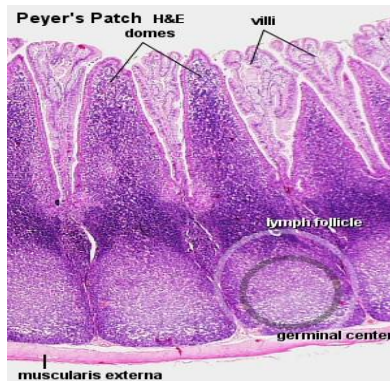
### Pharyngeal Tonsil

The pharyngeal tonsil is a single tonsil situated in the superior— posterior portion of the pharynx. It is covered by ciliated pseudostratified columnar epithelium typical of the respiratory tract, although areas of stratified epithelium can also be observed. The pharyngeal tonsil is composed of pleats of mucosa and contains diffuse lymphoid tissue and lymphoid nodules. It has no crypts, and its capsule is thinner than the capsule of the palatine tonsils. Hypertrophied pharyngeal tonsils resulting from chronic inflammation are called **adenoids**.

### Lingual Tonsils

The lingual tonsils are smaller and more numerous than the palatine and pharyngeal tonsils. They are situated at the base of the tongue , and are covered by stratified squamous epithelium , Each lingual tonsil has a single crypt.





## Thymus

The thymus is a lymphoepithelial organ located in the mediastinum; it attains its peak development during youth. Whereas the other lymphoid organs originate exclusively from mesenchyme (mesoderm), the thymus has a dual embryonic origin. Its lymphocytes arise in the bone marrow from cells of mesenchymal origin that invade an epithelial primordium that has developed from the endoderm of the third and fourth pharyngeal pouches.

The thymus has a connective tissue capsule that penetrates the parenchyma and divides it into incomplete lobules, so that there is continuity between the cortex and medulla of adjoining lobules. Each lobule has a peripheral dark zone known as the **cortex** and a central light zone called the **medulla** (L. *medius*, middle).

The **cortex** is composed of an extensive population of T cell precursors (also called **thymocytes**), dispersed epithelial reticular cells, and macrophages. Because the cortex is richer in small lymphocytes than the medulla, it stains more darkly. The epithelial reticular cells are stellate





cells with light-staining oval nuclei. They are usually joined to similar adjacent cells by desmosomes . Bundles of intermediate keratin filaments (tonofibrils) in their cytoplasm are evidence of the epithelial origin of these cells. A subpopulation of epithelial reticular cells present in the cortex consists of **thymic nurse cells (TNCs)**, which contain many (20–100) maturing lymphocytes in their cytoplasm.

The **medulla** contains epithelial reticular cells, many differentiated T lymphocytes, and structures called **thymic corpuscles** or **Hassall corpuscles**, which are characteristic of this region, although their function is unknown . These corpuscles contain flattened epithelial reticular cells that are arranged concentrically and are filled with keratin filaments. They sometimes calcify.

