

The Lymphatic System 1

The **Lymphoid tissue** or “**Lymphatic Connective tissue**” is a reticular connective tissue infiltrated by lymphocytes, Lymphoid tissue can either exist as:

Diffused within the blood and tissue.

As lymphoid nodules (spherical or ovoid shaped aggregation of the lymphatic tissue), composed mainly of **B-Lymphocytes**

Whenever there is a pathogenic invasion leading to exposure to antigens the center of the lymphoid nodules lymphocytes undergo differentiation and mitosis resulting in a lightly stained area called the “**Germinal center**”, so the germinal center is the center of the lymphoid nodules where there is high mitotic activity. Germinal centers are characterized by the presence of a specific type of cell called “**Follicular Dendritic Cells**” which have the capability of binding antigens (foreign bodies) to its multiple surfaces, therefore retaining the antigens for extended periods allowing them (the antigens) to interact with B-Lymphocytes. (In other words the Germinal center has special cells called the Follicular Dendritic Cells which bind antigens to them allowing them to interact with B-lymphocytes, which makes antibodies to defend against the invading antigens).

Lymphoid nodules are present in many areas such as the mucosa associated lymphoid tissue, lymph nodes, spleen and the tonsils in addition to many other places. Images of the lymphatic tissue (histological slides) are **impregnated with Silver to stain the Reticular fibers** giving them a **Black/Dark brown** color, so these reticular fibers connect together forming a meshwork in the lymphoid tissue allowing the attachment of different cells mainly lymphocytes. In the Lymphatic tissue you can spot the **Specialized reticular cells** which produce the

reticular fibers, you can also see macrophages, plasma cells (you can recognize them by the extrinsically placed nucleus).

Lymphoid Organs:

There are of course lymph organs besides the lymphatic tissue, these organs can be split into two types:

Primary (central) lymphoid organs

Secondary (peripheral) lymphoid organs

The primary lymphoid organs are involved in the production and maturation of lymphocytes; primary lymphoid organs are the **Bone Marrow, and the Thymus. Bone marrow produces B- Lymphocytes** and the **Thymus produces T-**

Lymphocytes, true the bone marrow produces both types of lymphocytes but before the T-Lymphocytes are fully mature they migrate to the thymus to completely mature there (which is why the thymus is considered a primary lymph organ).

All other lymphoid organs are secondary lymph organs, including: spleen, tonsils, appendix, nodules, the skin, and adenoids.

As we already mentioned the thymus is involved in the production of T-lymphocytes which are then supplied to the other organs. The thymus itself reaches complete maturity at birth, and then shrink (atrophied) after reaching puberty. The thymus has dual embryonic origin, its precursors

Lymphoblasts originate in the bone marrow then they move to invade the epithelium **of the thymus which is derived from the endoderm** (embryo internal layer). The thymus is covered by a capsule composed of connective tissue, this capsule penetrated the parenchyma of the thymus dividing it into incomplete lobules, these extensions that are lowered from the capsule are called trabeculae (singular: trabicula).

Each lobule is composed of a **Cortex and a medulla**, because the lobules are incomplete the cortexes and medullas are continuous throughout the lobules.

The cortex contains cells such as the Thymocytes (T-lymphocytes), macrophages, epithelial reticular cells (the only type of reticular cell derived from the endoderm)... The cortex's capillaries and arterioles are surrounded by epithelial reticular cells, which are joined by occluding junctions, and the basement membranes of the arterioles are thicker forming what is called "**the blood thymus barrier**" which prevents circulating antigens from entering the cortex of thymus therefore protecting the maturing lymphocytes in the cortex. The medulla has less dense lymphatic tissue which has the epithelial reticular and lymphocytes. The Medulla of the thymus is characterized by having a unique cell structure found in it called "**Hassle's corpuscle**" these are *something* arranged epithelial reticular cells that are filled with keratin filaments and might undergo calcification.

In an Image of thymus you can see the connective tissue capsule, the trabeculae which divides the thymus into incomplete lobules, these lobules are composed of the cortex (darkly stained), and you can also see the central lightly stained medulla.

There are more lymphocytes in the cortex then there are in the medulla. This here, the thymic corpuscle is characterizing the thymic medulla. Cells seen in the thymic cortex of a skin section are seen as reticular epithelial cells also can see lymphocytes and other cells. Epithelial reticular cells are joined by the desmosomes.

You can see in the image of the thymic mudella, there is less dense lymphatic tissue having lymphocytes and other cells. You can also see the characterizing **Hassall corpuscle cells** which are filled with keratin and may undergo calcification. In the Mucosa associated lymphoid tissue. The lymphoid tissues are in the mucosa layer (as you will learn later) which are called **mucosa associated lymphoid tissue** .

Functions of lymphoid tissue:

For protection against pathogens so you expect this tissue to be found in areas where invasion of pathogens is common. Such areas are the digestive, respiratory and urinary tract.

Examples of the mucosa associated lymphoid tissue are the **tonsils**. There are three types of tonsils, located in different parts

Palatine

Lingual

Pharyngeal

Palatine and lingual are covered by stratified squamous epithelium. Pharyngeal covered by pseudostratified columnar epithelium.