Histological architecture BY Dr.Elham M.Mahmood

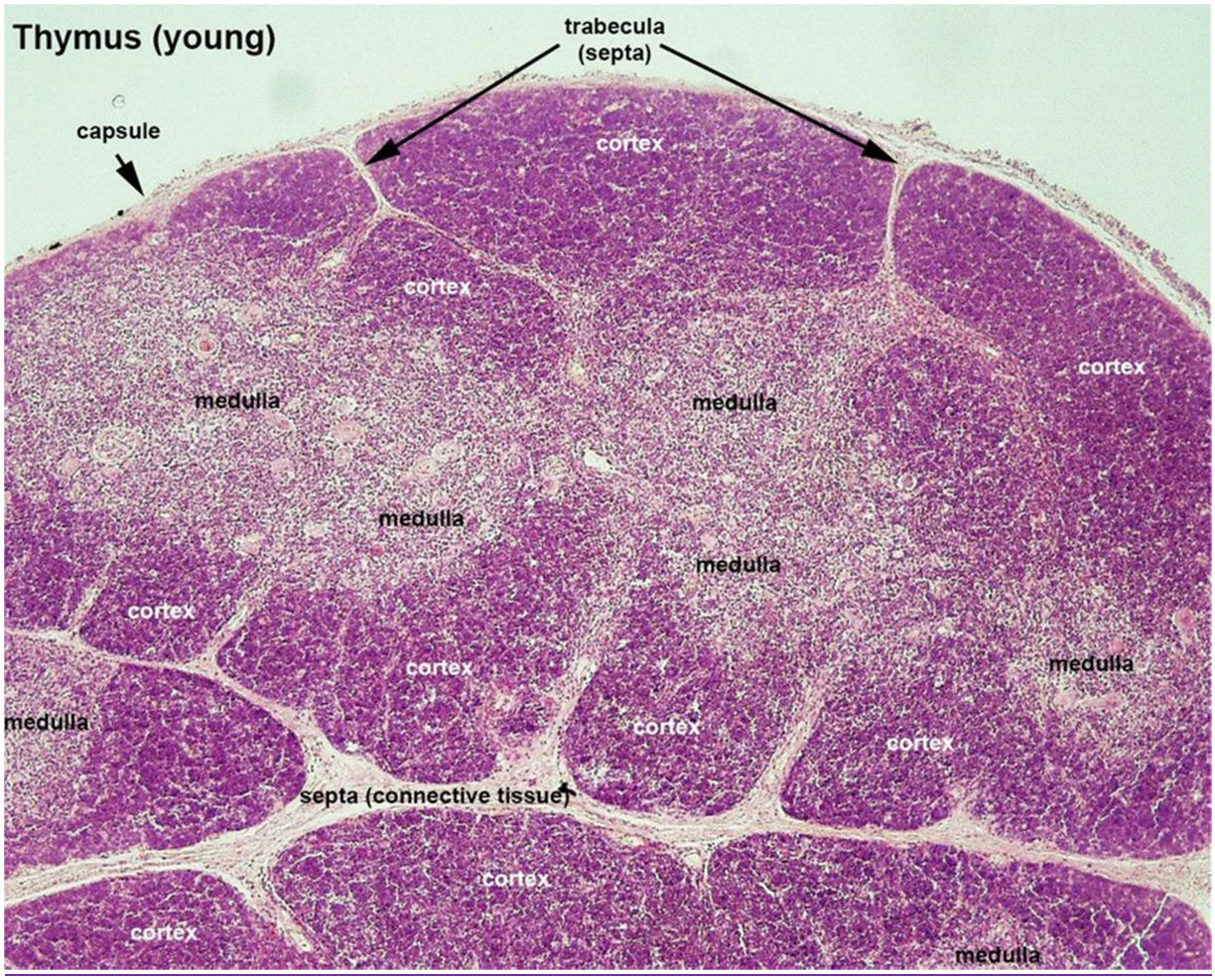
The bi-lobar **thymus is a primary lymphatic endocrine gland found in the** anterior **mediastinum. It is enclosed by a** capsular membrane **that also fuses with the connective tissue that joins the left and right lobes.**

Histologically, it is divided into cortical and medullary regions within each lobule, created by the intervening connective tissue septa extending from the capsule
Gross cross sectional dissection of the thymus reveals a darker cortical region that is more peripheral to the lighter medullary compartment. The variation in color intensity is attributed to the density of the thymocytes in each respective area. Therefore, the darker cortex has more T – lymphocytes when compared to the lighter medulla.
There are two major categories of cells within the thymus. These are the thymic epithelial cells and thymocytes. The thymic epithelial cells also called(reticular epithelial cells) are endodermal derivatives of the third pharyngeal pouch that further differentiates into specialized epithelium within the cortex and medulla. Overall, these cells are characterized by an eosinophilic cytoplasm containing intermediate filament bundles with pale, ovoid nuclei Thymocytes are also referred to as T-lymphocytes .They enter the thymus during intrauterine life. Premature T-cells or small thymocytes are primarily found in the cortex and are tightly packed between the cytoreticulum. In addition to the squamous thymic epithelial cells that occupy the subcapsular zone, there are also mitotic lymphoblasts and thymic stem cells residing in this area as well. Lymphoblasts are mononuclear, large and agranular. They differentiate into prolymphoblasts, which eventually form lymphocytes

Cortex and cell types:-

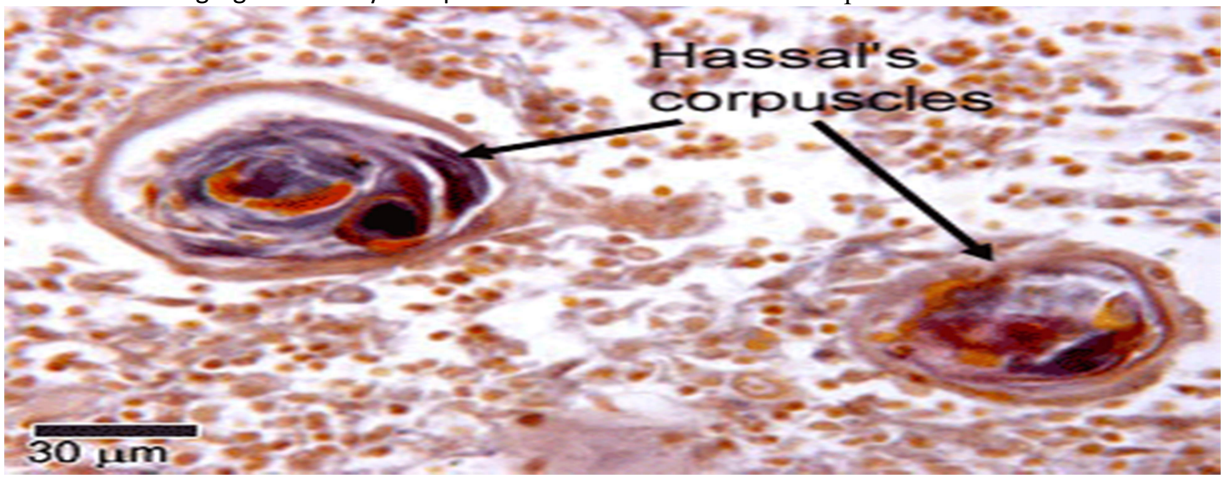
Blood-thymus barrier

The superficial subcapsular cells are arranged as a continuous squamous sheath that follows the visceral contours of the capsule; even extending within the septa into the lobules and surrounding the vascular beds within it. The cell membranes are tightly held together by desmosomes and occluding junctions. The **squamous thymic epithelial cells**, along with **pericytes** and **vascular epithelium(the lining endothelial cells)**, form the **blood thymus barrier**. With this barrier in place, the likelihood of exposing thymocytes to improper antigens is greatly reduced
Deep to this layer of cells, within the cortex, are stellate thymic epithelial cells that are anchored together by desmosomes. This architectural arrangement gives rise to the cytoreticulum of the cortex. The cytoreticulum is analogous the collagenous reticular network observed in other lymphoid tissue. They both facilitate attachment of maturing lymphocytes and surrounding macrophages.
Cytoreticular cells are antigen presenting cells (APC) ,they also release cytokines
An inner layer of squamous cortical thymic epithelial cells that extends into the lobules of the thymus and forms the corticomedullary barrier. This functional partition separates the outer cortex from the inner medulla.



medulla and cell types;-

Within the medulla, there is a second layer of squamous thymic epithelial cells that reinforces the corticomedullary barrier. The medulla also has a cytoreticulum that provides a similar microenvironment for resident dendritic cells, macrophages and more mature thymocytes. Unique to the thymic medulla is a concentric congregation of thymic epithelial cells known as Hassall corpuscles



They are responsible for the release of cytokines that regulate dendritic activity. Other theories propose that they also remove apoptotic thymocytes. This is supported by the presence of cellular debris at the center of the whorls that are particularly eosinophilic and partially keratinized. Furthermore, they program a special subset of thymocytes – the regulatory T-cells – that facilitate peripheral tolerance. Throughout the parenchyma of the thymus, as many as 50 thymocytes may be associated with large epithelial cells known as thymic nurse cells.

Other cell types:-

There are other non-thymic and non-lymphocytic cell lines that are located at different parts of the thymus based on their role within the gland. The cell line includes dendritic cells, macrophages and monocytes. Fibroblasts are found mostly around the vessels as well as in the capsule and medulla. They are responsible for the production of collagenous material and other connective tissues that provide structural support of the gland. The monocytes are predominantly seen at the corticomedullary junction. They will differentiate into mature macrophages that are seen in both the cortex and medulla. However, they are more abundant in the cortex where they remove cellular debris.
The dendritic cells are also found at the corticomedullary junction as well as in the medulla. They are the antigen presenting cells that help with the thymocytes' maturation. Large, circular cells with a centrally located nucleus and haphazardly arranged myofilament are found mostly in the medulla. These myoid cells are rarely seen, however.

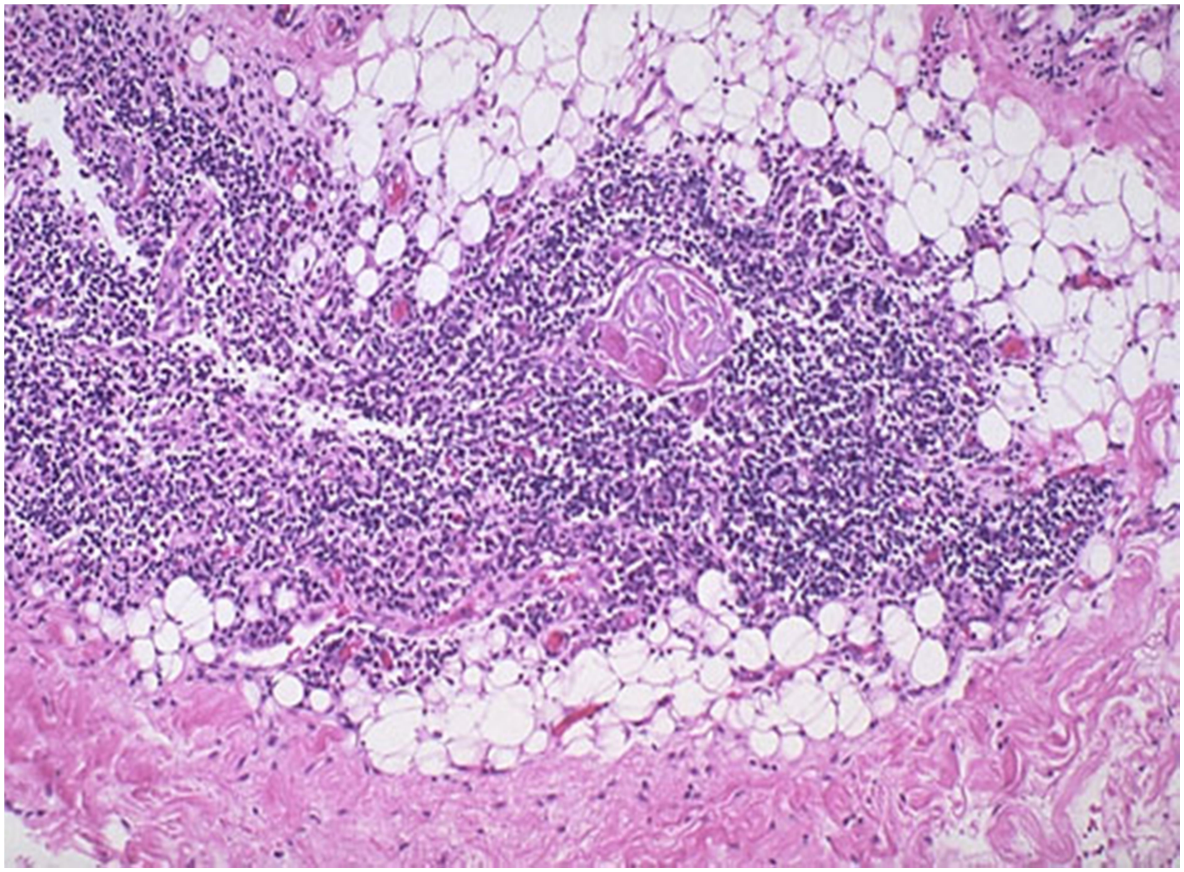
Thymus function

Thymosin is the hormone of the thymus, and it stimulates the development of disease-fighting T cells. The thymus gland will not function throughout a full lifetime, but it has a big responsibility when it's active—helping the body protect itself against autoimmunity, which occurs when the immune system turns against itself. Therefore, the thymus plays a vital role in the lymphatic system (your body's defense network) *and* endocrine system.
Before birth and throughout childhood, the thymus is instrumental in the production and maturation of T-lymphocytes or T cells, a specific type of white blood cell that protects the body from certain threats, including viruses and infections. The thymus produces and secretes thymosin, a hormone necessary for T cell development and production.

Thymus involution.

The thymus is special in that, unlike most organs, it is at its largest in children. Once you reach puberty, the thymus starts to slowly shrink and become replaced by fat.

The thymus reaches its maximum weight (about 1 ounce) during puberty. The thymus is special in that, unlike most organs, it is at its largest in children. Once you reach puberty, the thymus starts to slowly shrink and become replaced by fat. By age 75, the thymus is little more than fatty tissue. Fortunately, the thymus produces all of your T cells by the time you reach puberty.



Adult thymus ,replacement of lymphoid tissue by fibrous connective tissue mainly fat cells.

THANK YOU