

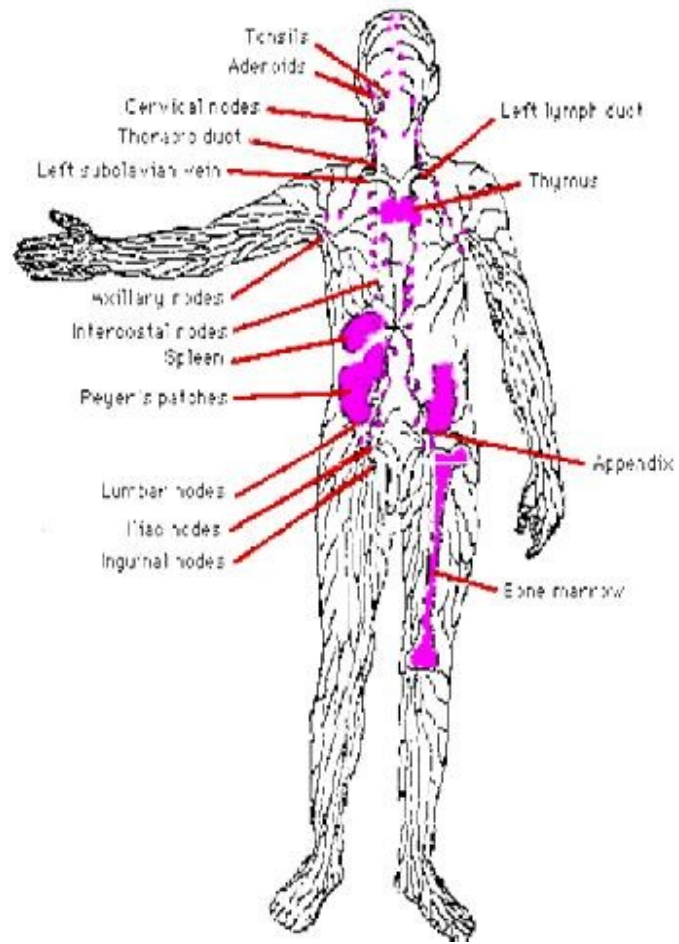


Organs of Immune system

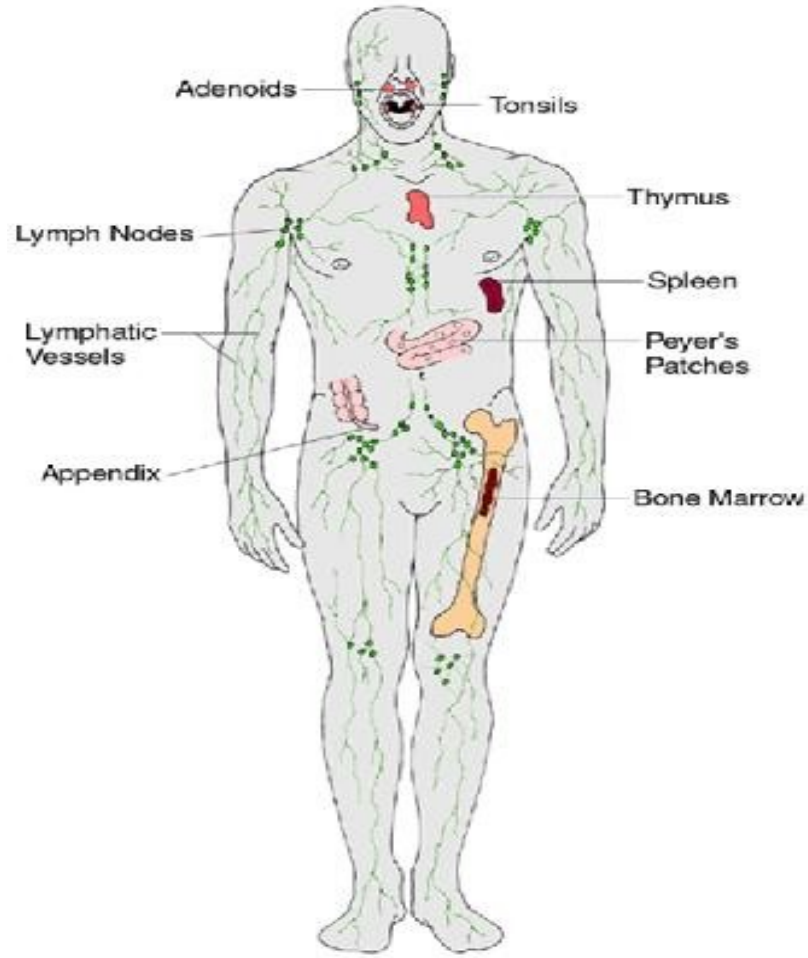
Lecture-2-

By

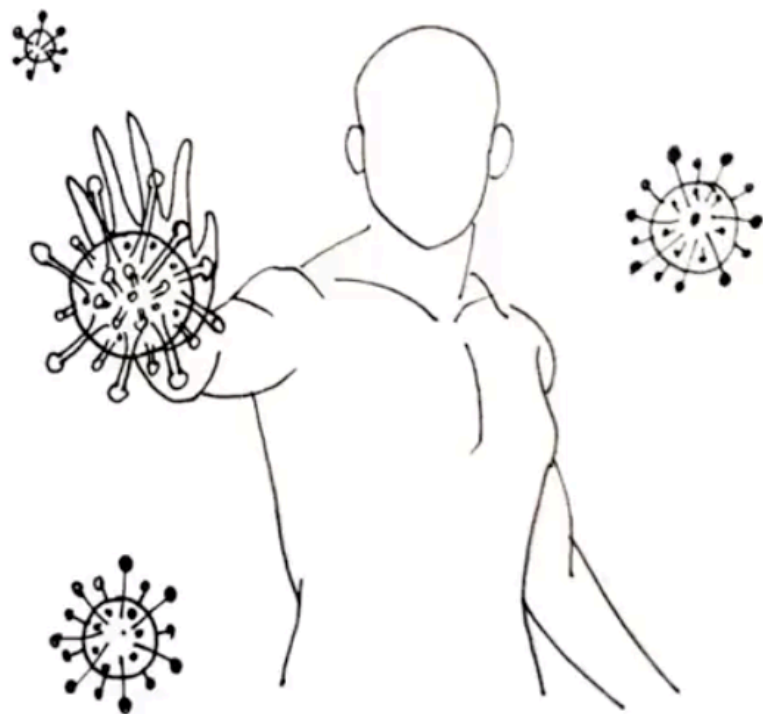
Harmand Ali



The Immune System



Immune System of our Body



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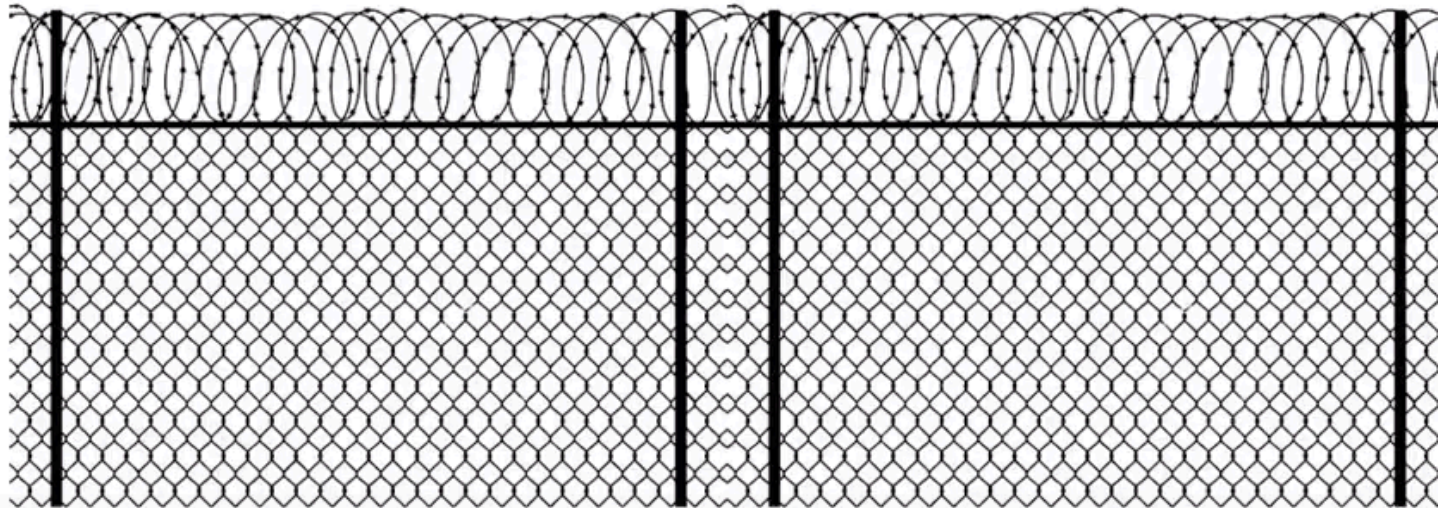
Defense system of a country

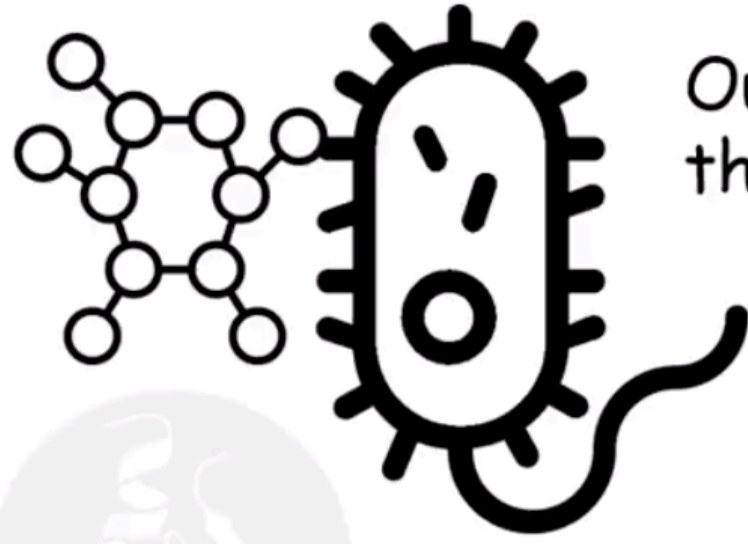


ORGANS OF THE IMMUNE SYSTEM

- Skin

Our skin works like a physical barrier



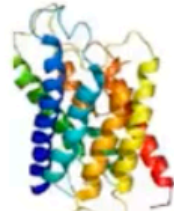


Our skin produces several proteins and peptides that help us to combat microbes and germs

Lysozyme



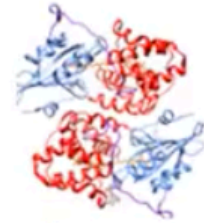
Calprotectin



Lactoferrin



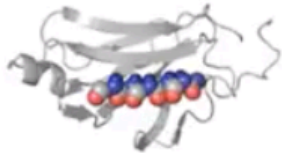
Defensine



Cathelicidine



S-100 proteins



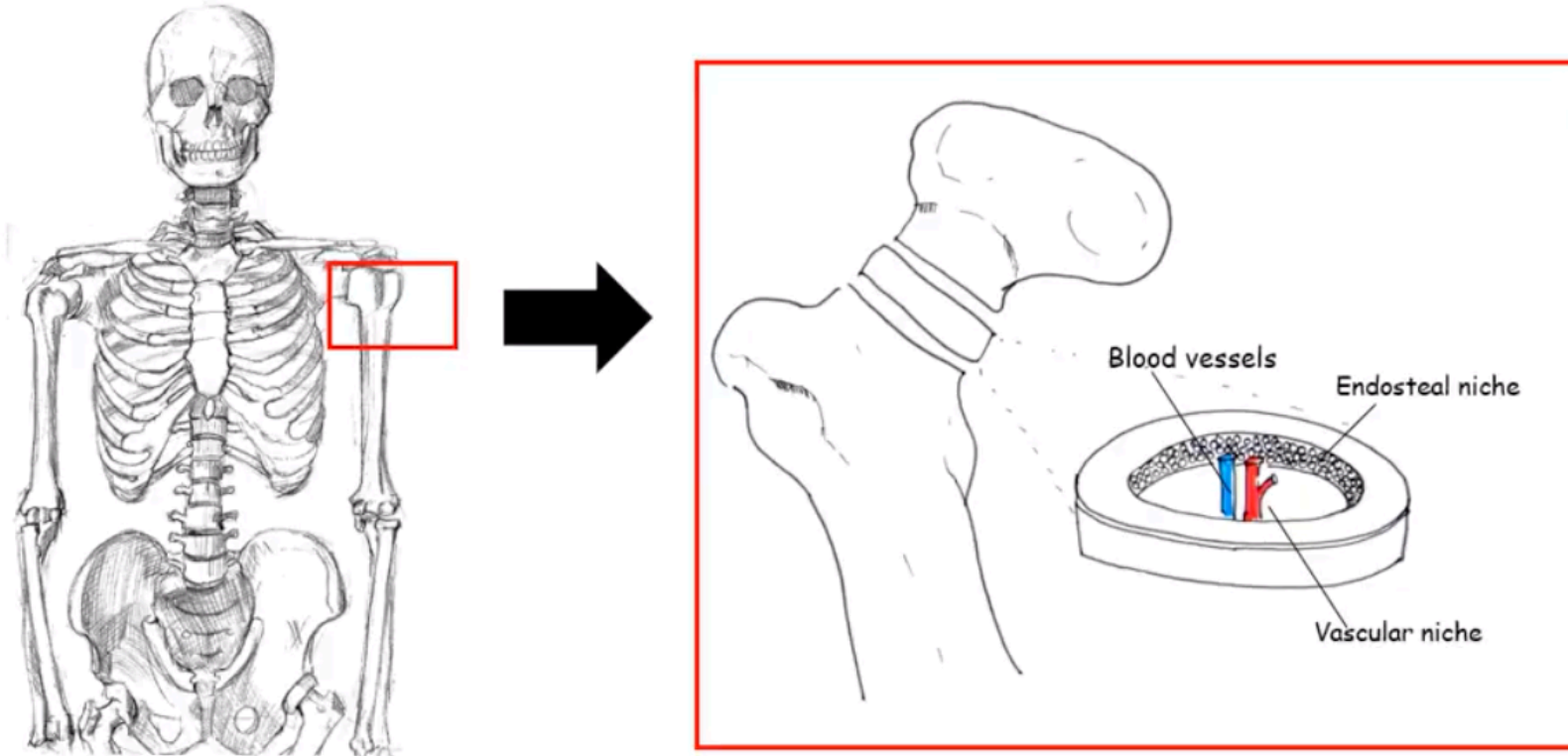
ORGANS OF THE IMMUNE SYSTEM

- **Primary lymphoid organs**

1. Bone marrow (site of hematopoiesis and B lymphocyte development) which is a loosely-organized grouping of cells located in central soft tissue portion of bones (surrounded by the calcified matrix) throughout the body

- **Reticular cells** form a matrix within which the other bone marrow cells interact.
- **Other cells** found here include hematopoietic stem cells and progenitor cells, as well as immature and mature forms of all blood cells

Primary lymphoid organs are places where immune cells develop



- Hematopoietic stem cells (HSC) present in the bone marrow are responsible for development of all blood cells.

- Lymphoid progenitor

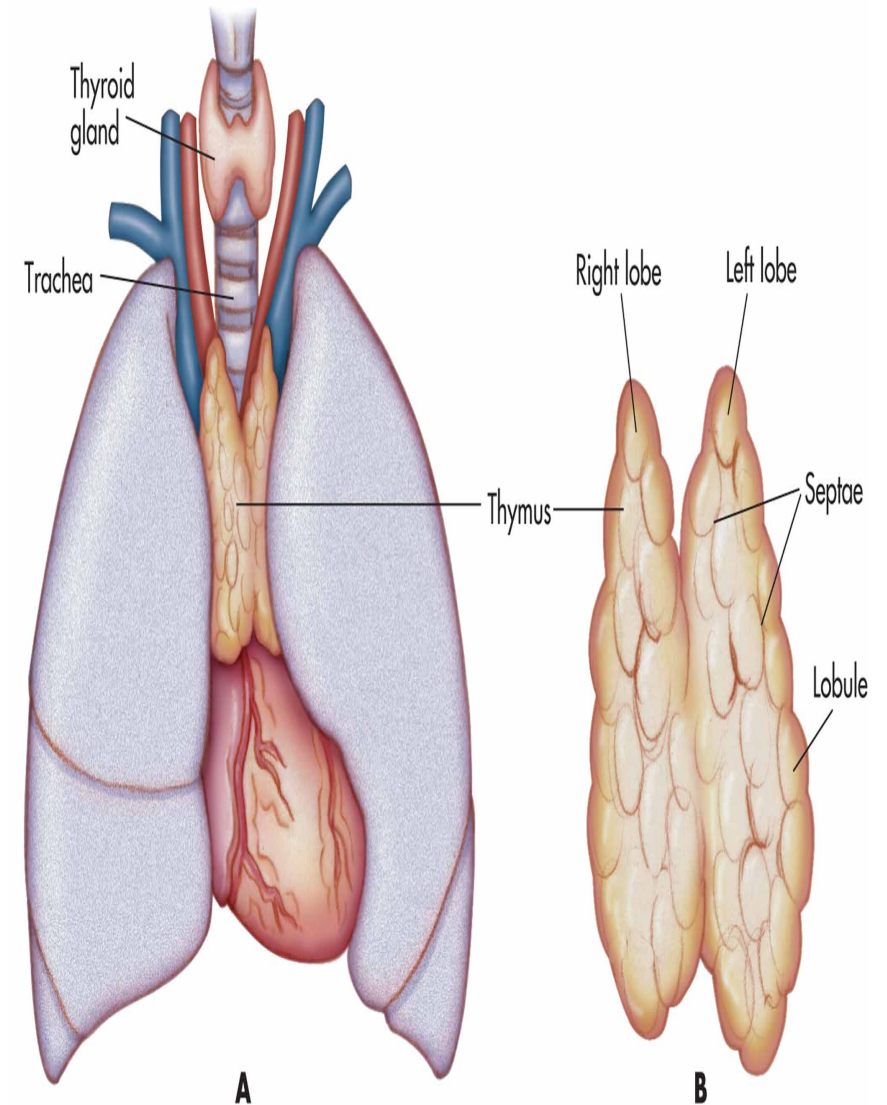
- ❖ B lymphocytes, before they are released into the bloodstream for transport to other locations in the body

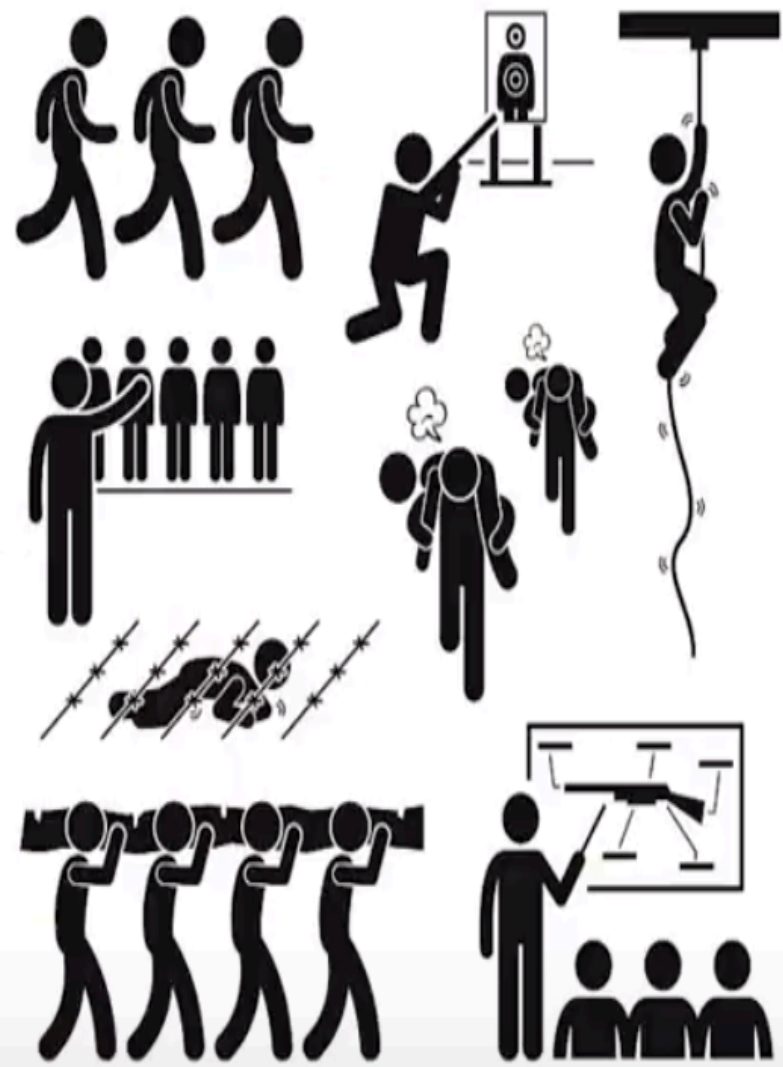
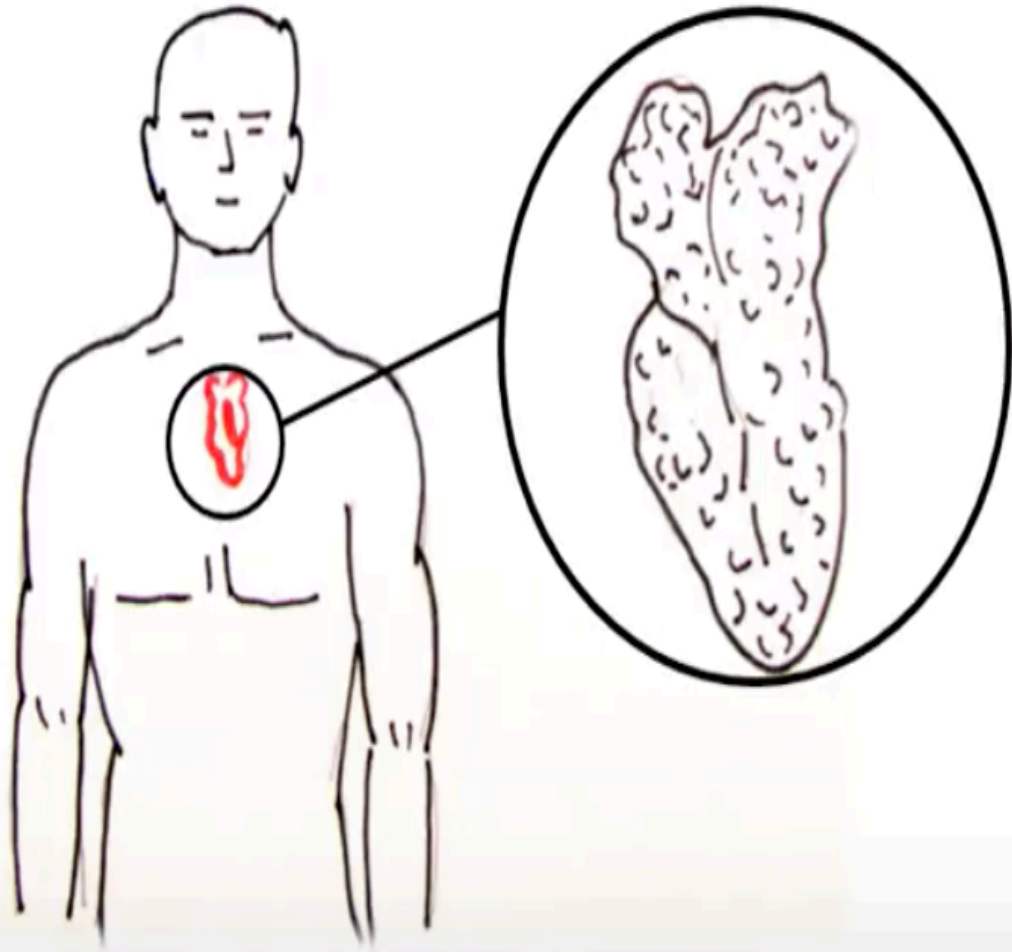
- ❖ Pro T lymphocytes (immature T cells) are released into the bloodstream before final maturation as a matter of course ... in contrast to granulocytes and erythrocytes, which may be released into the bloodstream in immature forms in times of great need

- Myeloid progenitors (RBC,WBC)

2. Thymus ... site of T lymphocyte development

- **Bilobed organ** that lies within a fat deposit together with the periaortic lymph node just anterior to the heart in the thoracic cavity
- **Two types of tissue** (with a transitional region between them) that both contain reticular cells (stromal cells) and developing T lymphocytes (T cells) are randomly situated in clusters throughout the thymus:





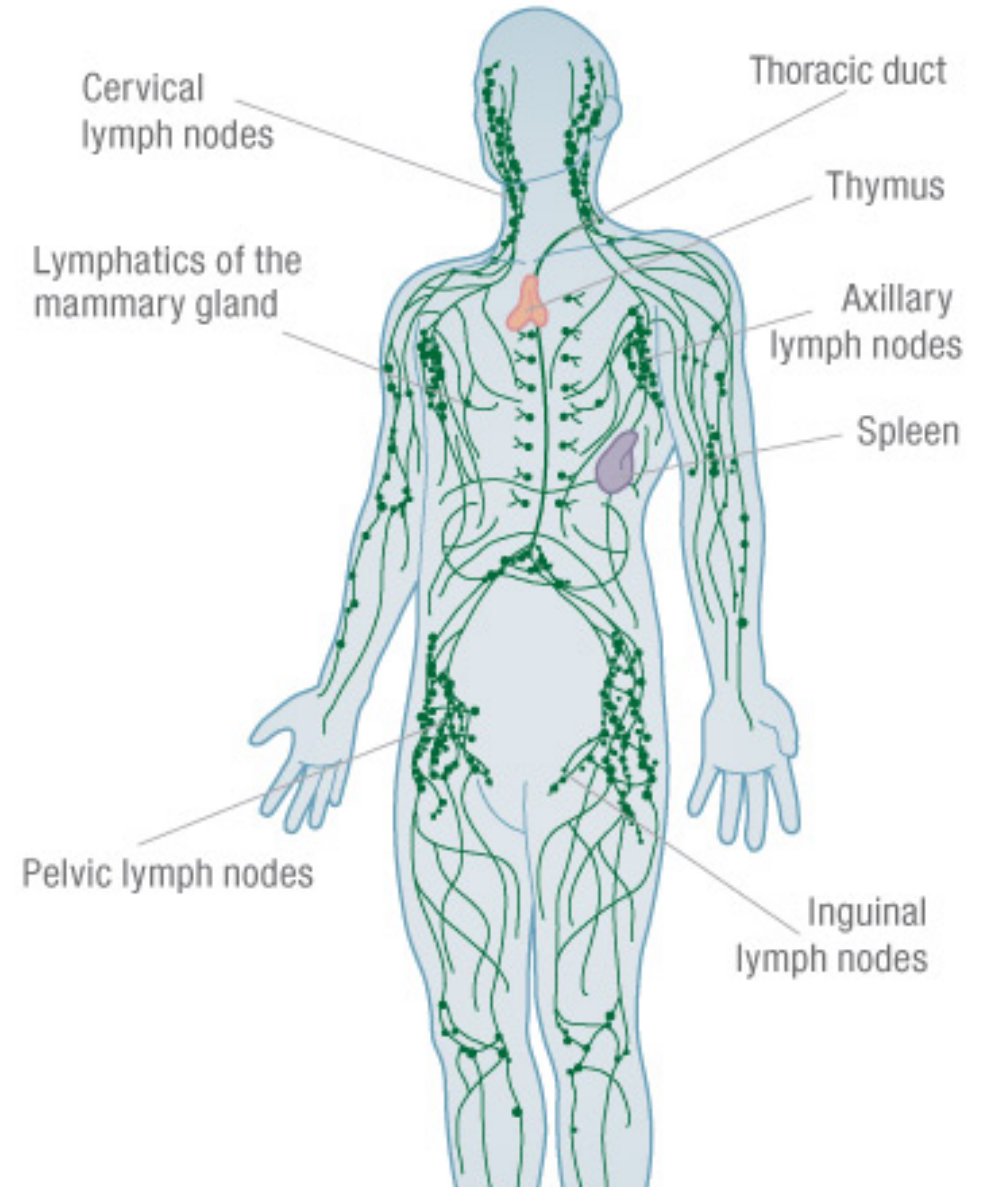
Activate Windows

- **Cortical (cortex)** is an area of intense T cell developmental activity ... this is the region where pro T cells develop their antigen-receptors (TCRs) and their (CD4 and CD 8) co-receptors to become immature "double-positive" T lymphocytes, then migrate towards the ...
- **Corticomedullary junction** is a transitional region between cortical and medullary tissue areas where self-responsive T cells are eliminated by apoptosis following interaction with antigen-presenting cells (APCs) with self-antigen fragments associated with their antigen-presenting cell receptors (APCs)
- **Medullary (medulla)** is a "staging" area where mature "single-positive" T lymphocytes migrate before being released into the bloodstream

- **Secondary lymphoid organs**

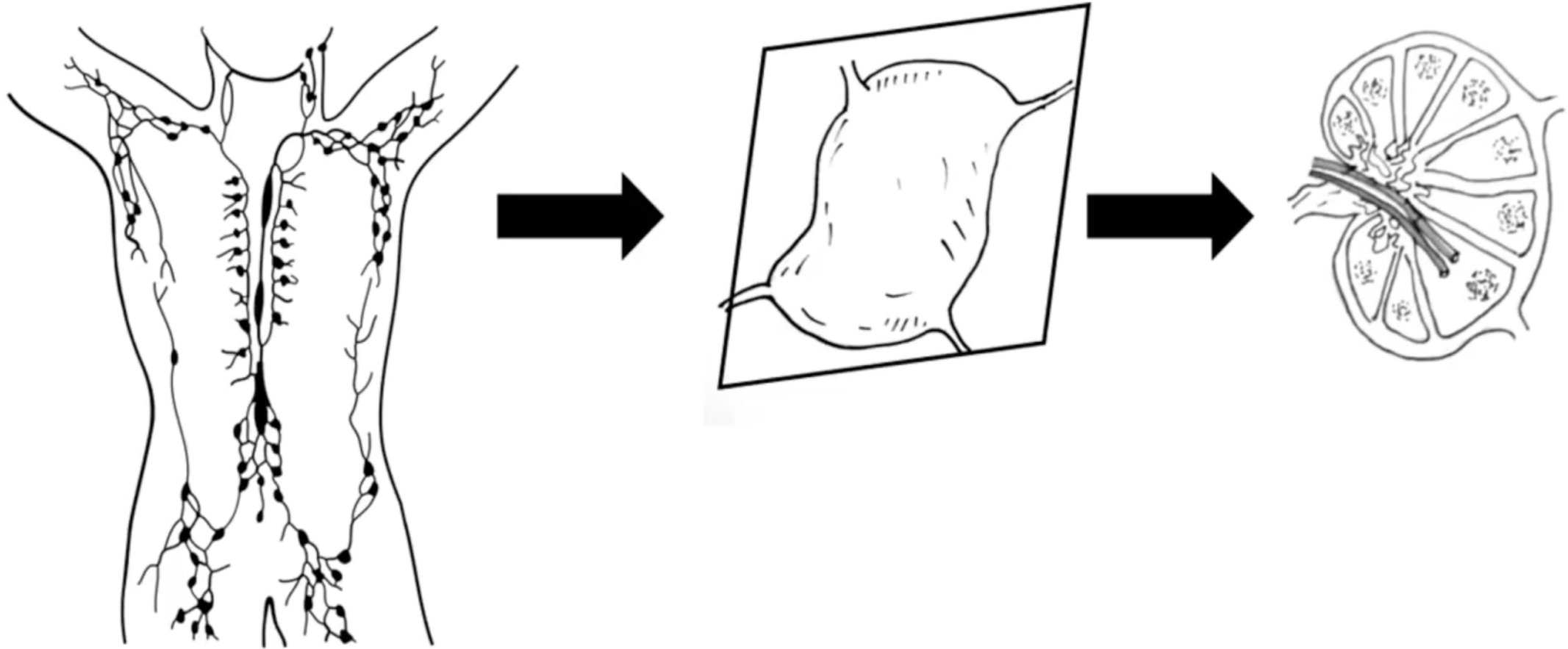
- 1. **Lymph nodes**

- **Bean-shaped, encapsulated nodules located at junctions of lymphatics at strategic areas of the body**
 - **Three types of tissue (in addition to the ubiquitous reticular cells that form the tissue matrix along with trabecular connective tissue) are found in lymph nodes:**

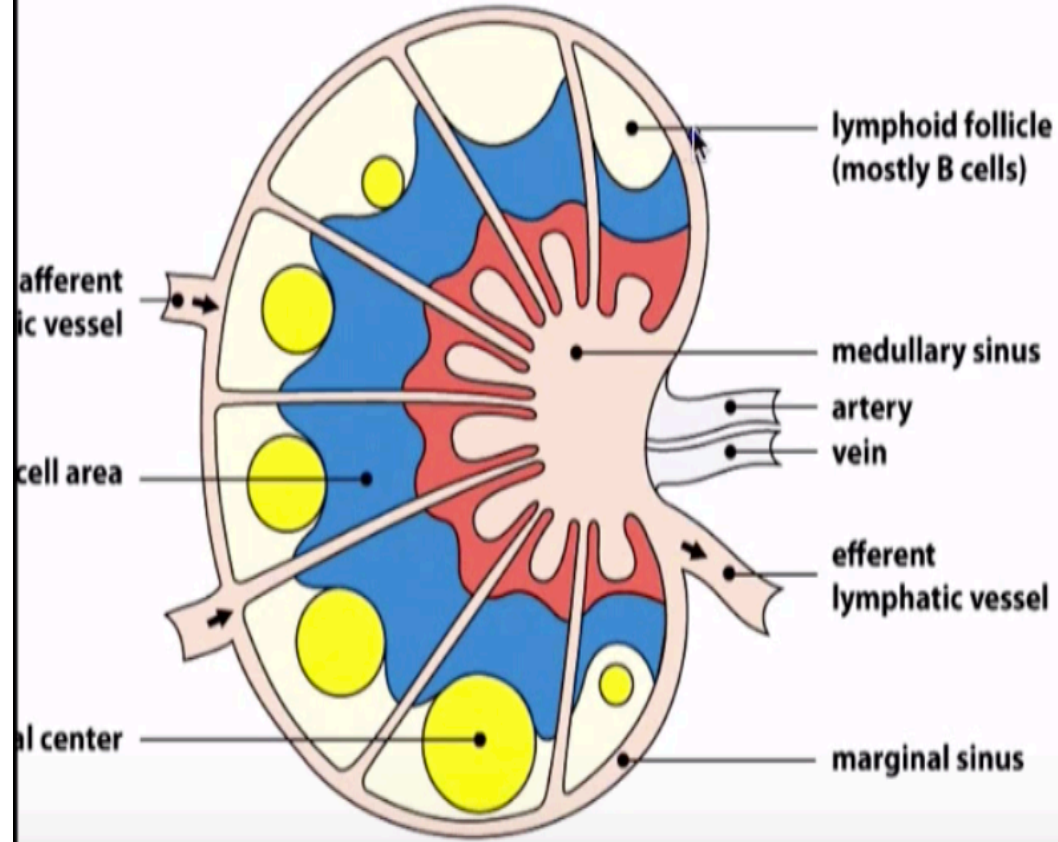


Secondary lymphoid organ (Lymph node)

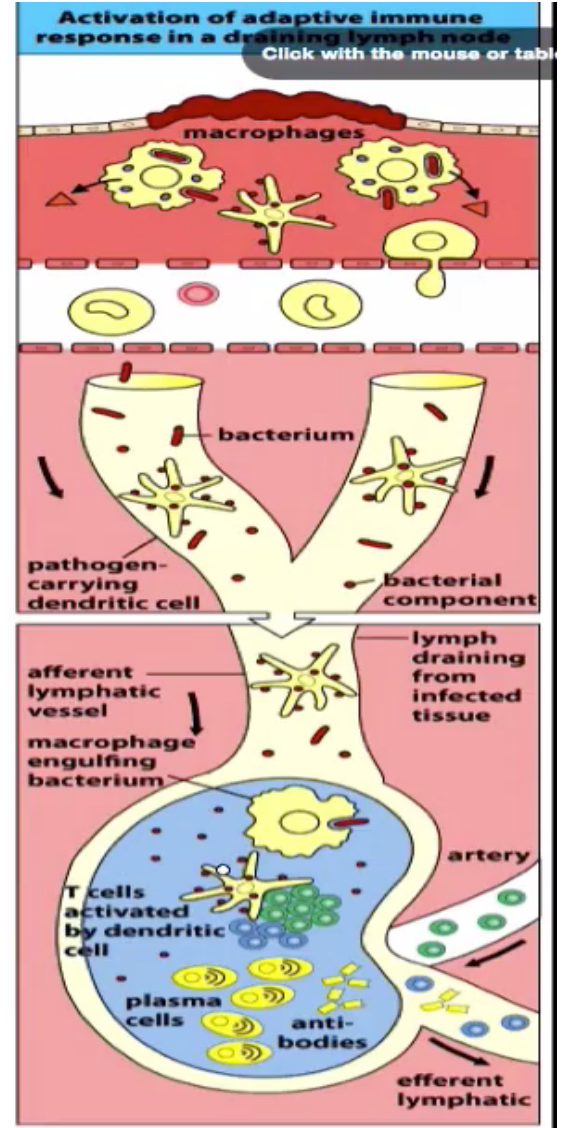
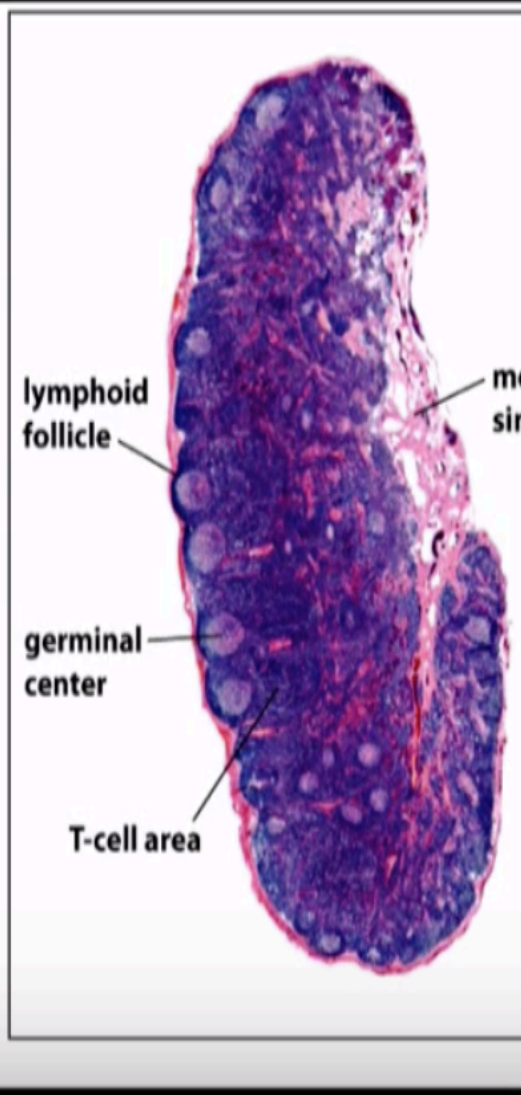
Lymph node is like a army base camp where T cells and B cells resides .Also lymph node plays important role in maturation of B cells



The lymph node



The Immune System, 3ed. (© Garland Science 2009)



–Cortical (cortex) tissue:

- » Located in the outer region of lymph nodes, just inside the subcapsular sinus (into which lymph drains from afferent lymphatics)
- » B cells are the primary lymphoid cells here (but there are some T cells and follicular dendritic cells present as well)
 - lymphoid follicles (loosely-organized clusters of lymphoid cells) characterize the cortical region of lymph nodes
 - germinal centers develop within lymphoid follicles as a result of antibody responses that occur here

– **Paracortical (paracortex) tissue:**

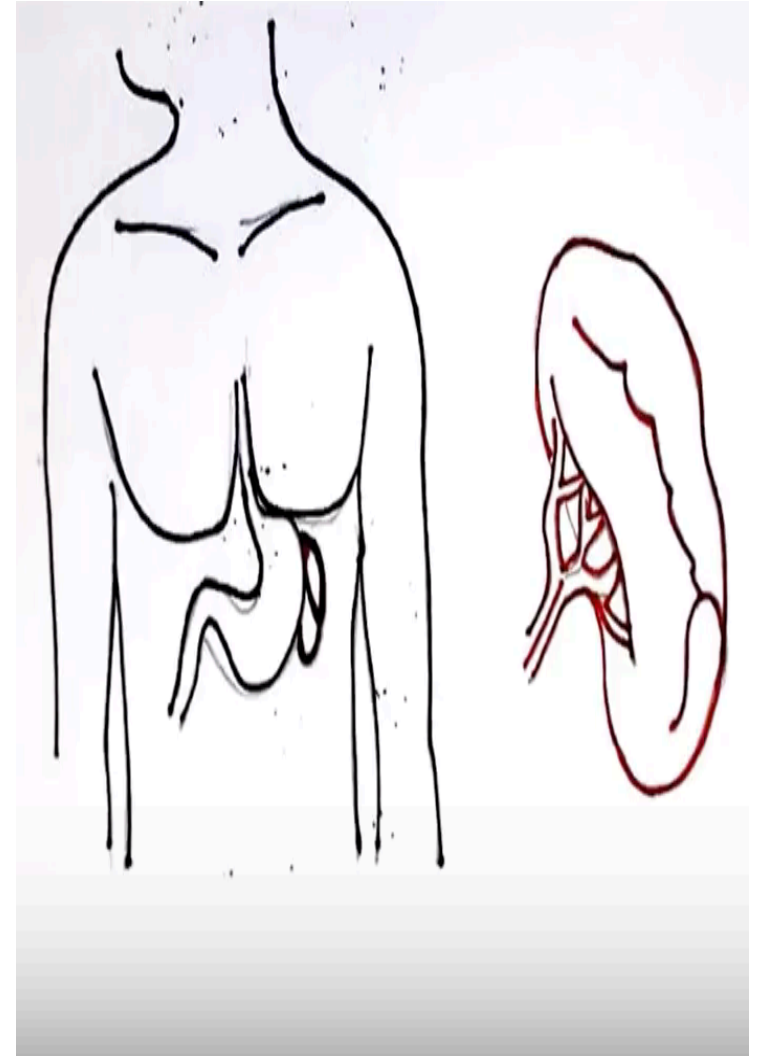
- » **Located in the intermediate region** of lymph nodes and partially surrounding lymphoid follicles (on the medullary side of the cortex)
- » **T cells** are the primary lymphoid cells here (but there are some macrophages and dendritic cells present as well) but they **migrate** in and out of this tissue:
 - **migrate into lymphoid follicles** following antigenic stimulation by APCs ... to better "deliver" cytokines to B cells responding to immunogens present
 - **migrate from lymph into blood and from blood into lymph** (via high endothelial venule cells in lymph nodes in both cases)

– **Medullary (medulla) tissue:**

- » Located in the central region of lymph nodes as a loosely- organized aggregate of predominantly phagocytic cells
- » **Macrophages and dendritic cells** (both are APCs) are the primary lymphoid cells here (but there are variable numbers of **plasma cells**, especially during active immune responses)
- **APCs migrate into the paracortical region** of lymph nodes when they have processed antigen and are presenting immunogen fragments on their ACRs ... so they can stimulate T cells to initiate immune responses

2.Spleen

- Lumpy, rather amorphous encapsulated lymphoid organ (much larger than a normal lymph node) located ventral to the stomach in the abdominal cavity
- Filters particulate and soluble molecules out of blood ... thus capturing immunogens for immune system stimulation
- Trabecular connective tissue forms the splenic matrix, which contains two major types of tissue:



- **Red pulp** consists of a network of **sinusoids** containing **reticular macrophages** and **erythrocytes** plus the other elements of blood being filtered at the time of organ examination
- **White pulp** consists of splenic **lymphoid cells** and is organized into **two major regions** that form **concentric sheaths** around each of the **arterioles** that deliver the blood into the sinusoids:

3. Periarteriolar lymphatic sheath (PALS) areas surround each of the arterioles and contain many **T cells** admixed with **interdigitating dendritic cells**

- **Marginal zone** surrounds the PALS and contains numerous **B cells**, some of which are loosely organized to form **primary lymphoid follicles** ... these primary follicles develop into **secondary lymphoid follicles** with **germinal centers** as antibody responses occur in the spleen

4. Mucosal-associated lymphoid tissue (MALT) generally consists of rather loosely-organized lymphoid cells that are associated with mucosal tissues that line the:

- **Digestive tract, including:**

- Tonsils ... lingual, palatine and pharyngeal (adenoids)

- Lamina propria and submucosal lymphoid follicles of the small intestine ... including Peyer's patches

- Appendix

Gut-associated lymphoid tissue

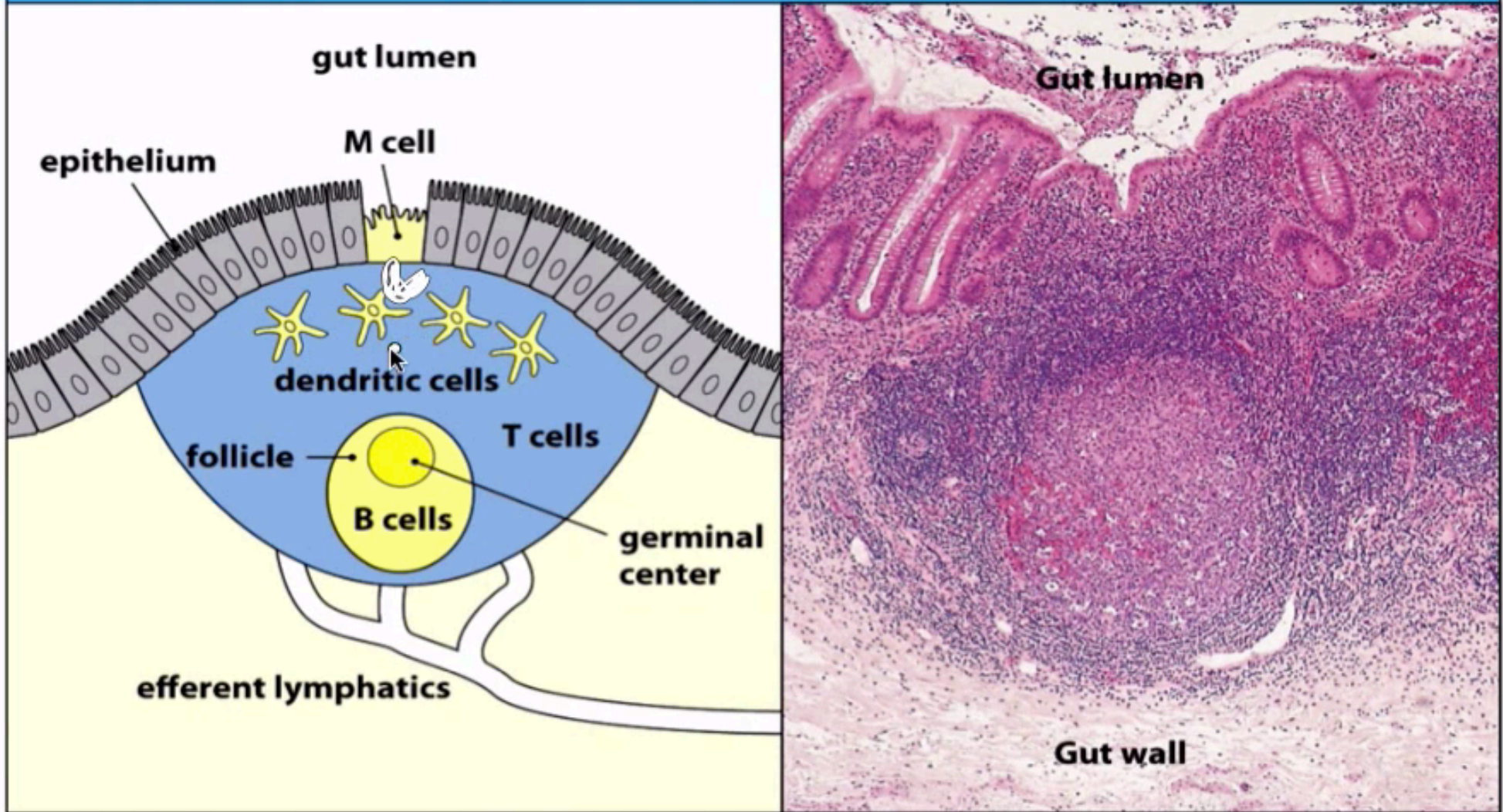


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MALT

