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# PART SEVEN :

# LYMPHOID

# SYSTEM

# Lymphoid Tissue

- **Function:** immunological defence of the body.

## 1. Cells of the immune system:

- 1- **Lymphocytes:** (B cells, T cells: "memory, TH1, TH2, TC, TS", Natural Killer Cells).
- 2- **Plasma cells.**
- 3- **Mast cells.**
- 4- **Neutrophils.**
- 5- **Eosinophils.**
- 6- **Antigen presenting cells.**

## 2. Lymphoid System:

**A) Diffuse Lymphoid tissue:** Not encapsulated.

- Mucosa-associated lymphoid tissue "MALT": lymphocyte infiltration, solitary lymphoid nodules and aggregated lymphoid nodules.
- Under the wet epithelial membranes.
- Loose C.T is infiltrated with lymphoid cells (lymphocytes, plasma cells, macrophages, reticular cells).
- Lymphoid Nodules

**B) Encapsulated lymphoid organs:**

- 1- **Lymph nodes.**
- 2- **Spleen.**
- 3- **Tonsils** (are incompletely encapsulated)
- 4- **Thymus.**

**N.B.** Both Red Bone marrow & Thymus are considered 1ry, lymphoid organs.

### 2.1 Lymph Nodes:

- |   |                        |                   |
|---|------------------------|-------------------|
| 1- Capsule.                                     | 2- Trabeculae (septa). | 3- Reticular C.T. |
| - Parenchyma: (lymphoid tissue + lymph sinuses) |                        |                   |
| 1- Cortex.                                      | 2- Paracortex.         | 3- Medulla.       |

### **CORTEX OF L.N.:**

**1- Lymphatic nodules (follicles):**

- a- 1ry: without germinal center
- b- 2ry: is formed of:
  - Corona (mantle): Dark, Mostly B-lymphocytes.
  - Germinal center: Lighter, mostly activated B-lymphoblasts with macrophages & dendritic

reticular cells.

2- **Subcapsular & Cortical** (paratrabecular) lymph sinuses.

### **PARACORTEX OF L.N.:**

- It is the thymus-dependent zone of L.N.
- It is composed mostly of T-lymphocytes.
- It contains high endothelial vessels (postcapillary venules):  
A- PCV are lined with cuboidal endothelium.  
B- PCV are the site of entry of lymphocytes to L.N.

### **MEDULLA OF L.N.:**

(1) **Medullary cords:** are formed mainly of lymphoid cells ( B & T lymphocytes, plasma cells, macrophages).

(2) **Medullary sinusoids** ( or medullary sinuses).

N.B. Efferent lymphatic vessels drain lymph with B & T lymphocytes.

### **Main Cells of L.N.:**

- 1- B & T lymphocytes.
- 2- Plasma cells.
- 3- Macrophages.
- 4- Dendritic reticular cells.

### **Functions of L.N.:**

- 1- Production of immunocompetent cells.
- 2- Filtration of lymph.

## **2.2 Spleen:**

- 1- Capsule: is covered by visceral layer of peritoneum; mesothelium. occasionally contains SMCs.
- 2- Trabeculae.
- 3- Reticular C.T.

### **PARENCHYMA OF SPLEEN:**

(A) White pulp. (B) RED pulp. (C)  
Marginal zone.  
N.B. No cortex, no medulla.  
No afferent lymphatic vessel.

#### **(A) White pulp:**

- 1- Periarterial lymphatic sheaths: housing **T** lymphocytes.
  - 2- Lymphoid nodules ( with germinal centers): housing **B** lymphocytes.
- N.B. Both 1&2 have the acentrally located central artery

#### **(B) Red pulp:**

- 1- Pulp (splenic) cords (of Billroth): Extravasated blood cells, plasma cells, Macrophages &

reticular cells and fibers.

2- Blood sinusoids: Are lined with elongated fusiform endothelial cells with large intercellular spaces & supported by discontinuous, hoop-like basement membrane.

### **(C) Marginal zone:**

- Between white and red pulps.
- Rich in vascular channels (marginal sinuses), especially surrounding the lymphoid nodules.
- Rich in avidly phagocytic macrophages.
- Contains plasma cells, T & B cells, macrophages, interdigitating dendritic cells.
- It houses B cells that are specialized to recognize thymic-independent antigens.
- Site of first entry of B & T lymphocytes from blood stream to parenchyma of spleen.

### **FUNCTIONS OF SPLEEN:**

- 1- Filtration of blood.
- 2- Phagocytosis of old RBCs & old blood platelets & invading microorganisms.
- 3- Production & proliferation of immunocompetent B & T lymphocytes.
- 4- Production of antibodies.

### **2.3 Tonsils:**

1- Palatine Tonsils.  
Tonsils.

2- Pharyngeal Tonsil.

3- Lingual

#### **Palatine Tonsils :**

- 1- Epithelium
- 2- Tonsillar crypts: 10-12
- 3- Lymphatic nodules
- 4- Capsule

#### **Pharyngeal Tonsil:**

- 1- Epithelium
- 2- Pleats: Longitudinal infoldings (instead of tonsillar crypts).
- 3- Lymphatic nodules & diffuse lymphoid tissue.
- 4- Capsule.
- 5- Ducts of seromucous glands.

#### **Lingual Tonsils:**

- 1- Epithelium.
- 2- Crypt: a single crypt for each lingual tonsil.
- 3- Lymphatic nodules.
- 4- Capsule.
- 5- Glands: ducts of mucous minor salivary glands open into the base of a single crypt of each lingual tonsil.

**Function of tonsils:** Production of antibodies.

## **2.4 Thymus:**

A) Stroma: "Capsule and Interlobular trabeculae: incomplete".

B) Thymic lobules: "Cortex and Medulla".

### **Cortex of thymic lobule:**

- It contains developing (immature) thymocytes.

98% of thymocytes die? Whose TCRs recognize self-proteins **OR** Whose CD4 or CD8 molecules cannot recognize MHC I or MHC II molecules.

- Epithelial reticular cells.
- Macrophages.
- No lymphatic nodules.
- No plasma cells.
- **N.B.** Tingible body macrophages (resident macrophages with apoptotic bodies).

### **Medulla of thymic lobule:**

#### **1-Hassall's (thymic) corpuscles:**

- Centrally arranged epithelial reticular cells in the medulla.
- Whose number increases with aging.

#### **2-Virgin (naive) mature small T lymphocytes.**

#### **3- Macrophages.**

#### **4-Epithelial reticular cells.**

**N.B.** Medulla of adjacent thymic lobules are interconnected- Why? Incomplete Trabeculae.

**Function of thymus:** Formation, Maturation & Destruction of T lymphocytes.

Maturation: Immunoincompetent T cells → Immunocompetent T cells.

### **General notes about thymus:**

- No lymphoid nodules.
- No reticular fibers.
- No sinuses or sinusoids.

### **Development and Involution of the thymus:**

- It attains its greatest development shortly after birth.
- It involutes after puberty and becomes infiltrated by adipose tissue.
- Remnants of thymus remain in adult to form T lymphocytes.