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RETICULOENDOTHELIAL SYSTEM (RES) & SPLEEN



GIT

Objectives

- 1. Define the term Reticuloendothelial system (RES).**
- 2. Describe the cellular components of RES.**
- 3. Describe the functions of the RES.**
- 4. Define the structural function of the spleen.**
- 5. Describe the functions of the spleen.**
- 6. Understand the basic concept of the indication and risks of splenectomy.**

Reticuloendothelial system (RES)

- ❖ Or **mononuclear phagocyte system** “the new term”
- ❖ It is a network of **connective tissue fibers** inhabited by **phagocytic** cells such as **macrophages** ready to attack and ingest microbes .
- ❖ Most endothelial cells **are not** macrophages .
- ❖ RES is an **essential** component of the **immune system** .

Cellular components of RES

- 1) **Monocytes** : located in the **blood** .
- 2) **Endothelial cells**: located in bone marrow, **spleen**, lymph node.
- 3) **Macrophage** : Located in **all tissues** such as **skin, liver, spleen**, bone marrow, lymph nodes and lung.

Fixed Macrophages

more common

filter and **destroy** objects which are foreign to the body such as **bacteria, viruses**

Mobile Macrophages

Less common

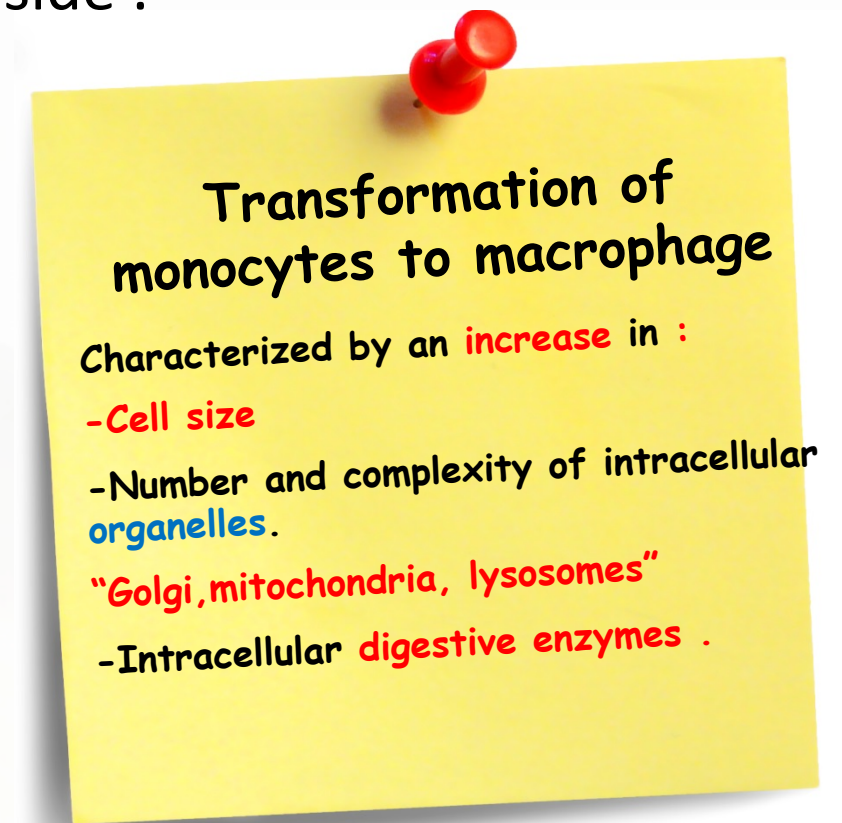
can group together to become **one big phagocytic cell** in order to ingest **larger** foreign particles

Types of Macrophages

Macrophage differ depending on the **organs** in which they reside .

liver	Kupffer cells
brain	Microglia
lymph nodes, bone marrow, spleen	Reticular cells
subcutaneous tissues	Tissue histiocytes
lungs	Alveolar cells

* All types of macrophages are derived from monocyte except kidney macrophage, derived from mesangial cell.



Formation of Macrophages

- I. Begin by **Stem cell** in **Bone Marrow**:
monoblast → **promonocyte** → mature **monocytes** released into **blood**.
- II. Stay for **10-20 hours** in **circulation**. "monocytes life span"
- III. Then leave blood to **tissues transforming** into larger cells **macrophage**.
- IV. Macrophage **life span** is longer up to few **months** in tissues.

General Functions of RES

- ❖ **Phagocytosis:** Bacterial, dead cells, foreign particles (**direct**)
- ❖ **Immune function:** processing antigen and antibodies production (**indirect**)
- ❖ **Breakdown** of aging RBC.
- ❖ **Storage** and circulation of iron.

Phagocytosis

- **Phagocytosis** is part of the natural or **innate immune** process.
- **Macrophages** are a **powerful** phagocytic cells because it capable of :
 - Ingest **up to 100** bacteria.
 - Ingest **larger particles** such as **old RBC**.
 - Get rid of **waste products**.



Lymphoid Organs

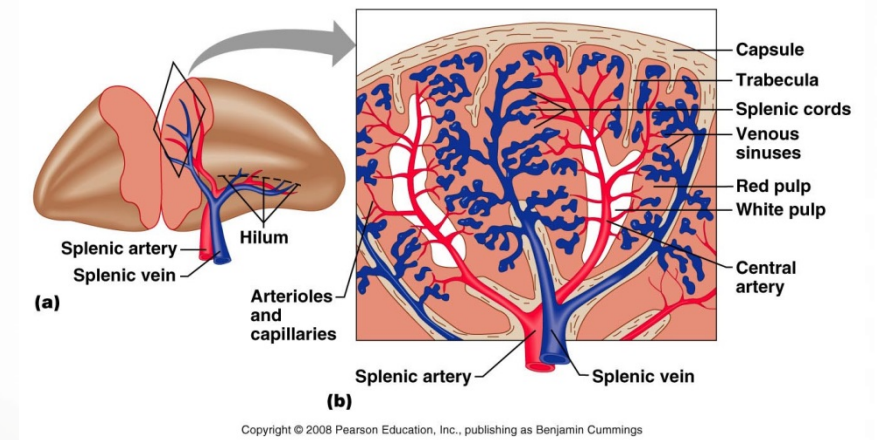
- **Thymus:** site of **T-cell maturation**. **high rate** of growth and activity until **puberty**.
- **Lymph nodes:** small, encapsulated, bean-shaped organs **stationed** along **lymphatic channels** and large blood vessels of the thoracic and **abdominal** cavities.
- **Spleen:** structurally **similar** to lymph node, it **filters** circulating blood to remove **worn out RBCs** and **pathogens**.

Spleen

- Is soft **purple gray** in color located in the **left upper quadrant** of the abdomen.
- It is a **highly vascular** lymphoid organ.
- It plays an **important** roles in: **red blood cells integrity** and has **immune function**.
- It holds a **reserve** of **blood** in case of **hemorrhagic shock**.
- It is one of the **centers** of activity of the **RES** and its **absence** leads to a **predisposition** toward certain **infections**.
- Despite its importance, there are **no tests specific** to splenic function.

Structural Function of Spleen

- ❖ **White pulp:** Thick sleeves of lymphoid tissue, that provides the immune function of the spleen.
- ❖ **Red pulp:** surrounds white pulp, composed of Venous sinuses filled with whole blood and Splenic cords of reticular connective tissue rich in macrophages.



Functions of Spleen

- ✓ **Haematopoiesis** (Hemopoiesis): fetal life.
- ✓ Spleen is a main site for **destruction of RBCs** specially old and abnormal .
- ✓ Blood is **filtered** through the spleen.
- ✓ **Reservoir** of thrombocytes and immature erythrocytes.
- ✓ **Recycles** of iron.

Immune Functions of Spleen

1. Because the organ is **directly** connected to **blood circulation**, it responds **faster** than other **lymph nodes** to **blood-borne antigens**.
2. **Destruction and processing** of **antigens**.
3. **Reservoir of lymphocytes** in **white pulp**.
4. Site for **Phagocytosis** of **bacteria** and **worn-out** blood cells (**Slow blood flow** in the **red pulp** cords allows foreign particles to be phagocytosed)
9. Site of **B cell maturation** into **plasma cells**, which synthesize antibodies in its **white pulp** and **initiates humoral response**.
10. Removes **antibody-coated bacteria** along with **antibody-coated blood cells**.
11. It contains (in its **blood** reserve) half of the body **monocytes** within the **red pulp**, upon moving to **injured** tissue **turn** into **dendritic cells** and **macrophages** that promoting **tissue healing**.

Splenectomy

Indications

1. **Hypersplenism:** enlargement of the spleen (**splenomegaly**) with **defects** in the blood cells count.
2. **Primary** spleen **cancers**.
3. **Haemolytic anaemias:** Sickle cell anaemia, Thalassemia, hereditary spherocytosis (HS) and elliptocytosis .
4. Idiopathic thrombocytopenic purpura (**ITP**).
5. Trauma.
6. Hodgkin's disease.
7. Autoimmune **hemolytic** disorders.

Risks & complications

- I. Overwhelming **bacterial infection** or **post splenectomy sepsis**.
- II. Patient **prone** to **malaria**.
- III. Inflammation of the **pancreas** and collapse of the **lungs**.
- IV. Excessive **post-operative bleeding** (surgical) because of the spleen is a highly vascular organ .
- V. * **Post-operative thrombocytosis** and **thrombosis**.

* لأنه الطحال يعد مخزن للصفائح الدموية فإذا تمت إزالته , الصفائح الدموية لا تجد مكان تخزين فيه فيزيد عددها في الدم وهذا يسبب جلطات .



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GOOD LUCK