

Haematology Lectures

Reticuloendothelial System & Spleen

Dr Sitelbanat

Lecture content

- 1. Reticuloendothelial system definition**
- 2. Reticuloendothelial system component**
- 3. Function of RES**
- 4. Direct role in body protection**
- 5. Indirect role in immune reaction**
- 6. Spleen structure and Functions**
- 7. Splenectomy indication and risk**

Reticuloendothelial system (RES)

Mononuclear phagocyte system

Reticuloendothelial system is an older term for the mononuclear phagocyte system.

The reticuloendothelial system (RES)

- **It is a network of connective tissue fibers
Inhabited by phagocytic cells such as
macrophages ready to attack and ingest
microbes that passed the first line of defense**
- **Is an essential component of the immune
system.**

Cellular component of RES

- 1. Monocytes**
- 2. Macrophage Located in all tissues such as skin (histocytes), liver (kupffer), spleen, bone marrow, lymph nodes, lung**
- 3. Endothelial cells some of endothelial can present antigen (bone marrow, spleen, lymph node)**

Macrophages

- **Often remain fixed to their organs. They mostly filter and destroy objects which are foreign to the body, such as bacteria, viruses.**
- **Some macrophages are mobile, and they 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.
 - Kupffer cellsin the liver.
 - Microglia.....in the brain
 - Reticular cellsin the lymph nodes, bone marrow, spleen.
 - Tissue histocytes (fixed macrophages)in subcutaneous tissues,
 - alveolar cells.....in the lungs

Formation of Macrophages

- 1. Begin by Stem cell in Bone Marrow proliferate to monoblast maturing to promonocyte and mature monocytes released into blood**
- 2. Stay for 10-20 hours in circulation**
- 3. Then leave blood to tissues transforming into larger cells macrophage,**
- 4. Macrophage life span is longer up to few months in tissues**

Transformation of monocytes to macrophage

Characterized by an increase in:

- **Cell size**
- **Number and complexity of intracellular organelles Golgi, mitochondria, lysosomes**
- **Intracellular digestive enzymes**

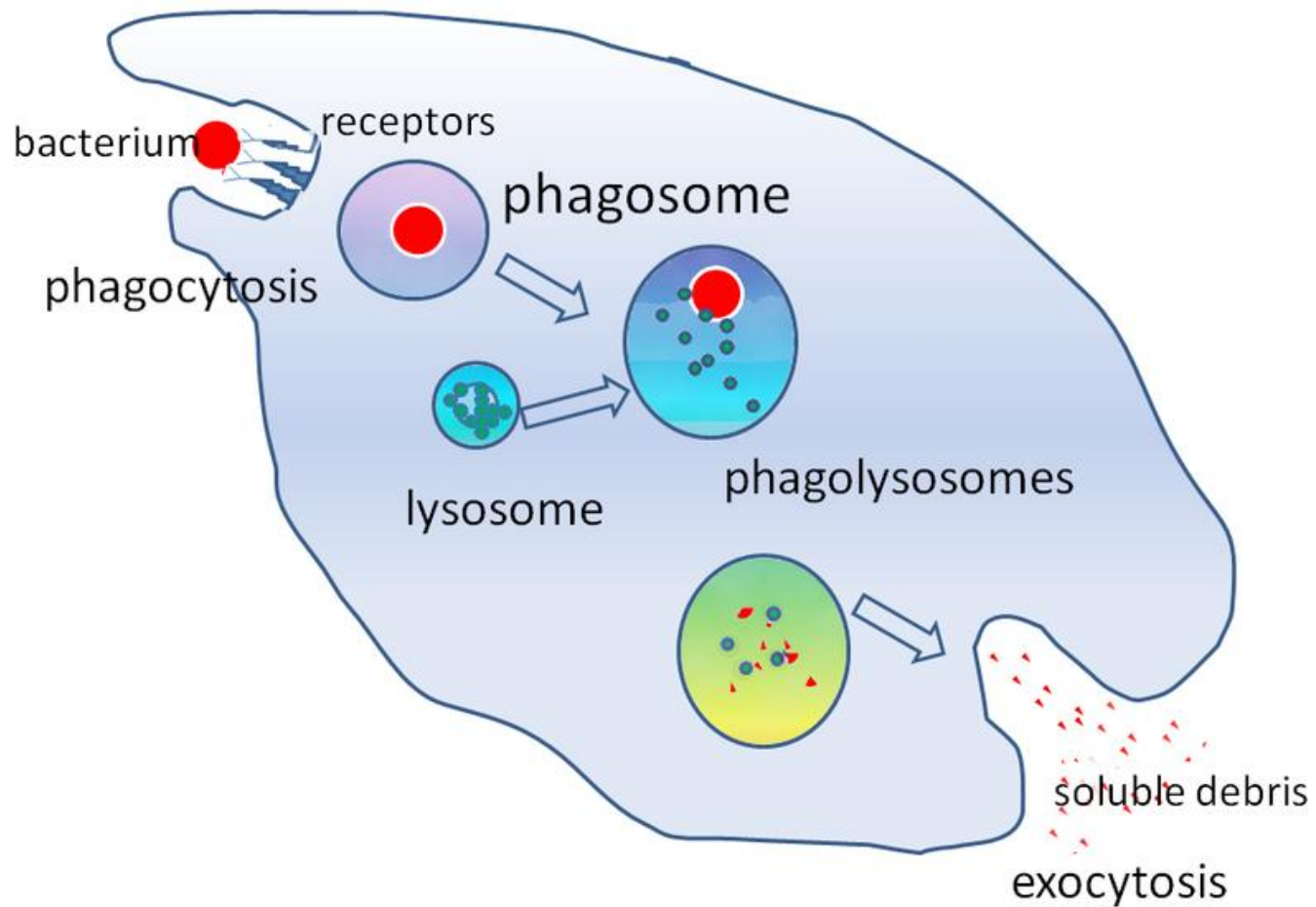
General Functions of RES

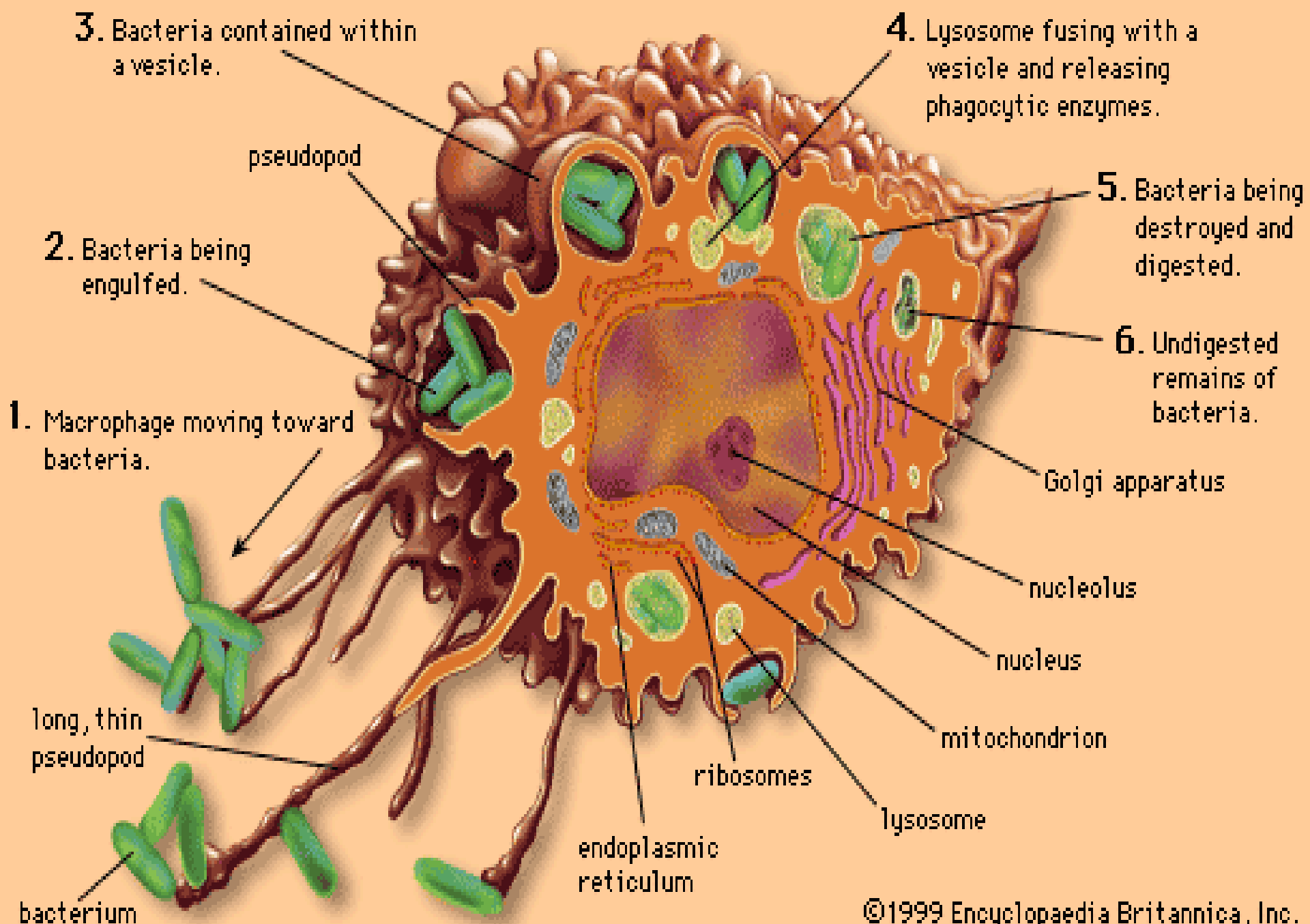
- 1. Phagocytosis: Bacterial, dead cells, foreign particles**
- 2. Immune function: processing antigen and antibodies production (indirect)**
- 3. Breakdown of aging RBC**
- 4. Storage and circulation of iron**

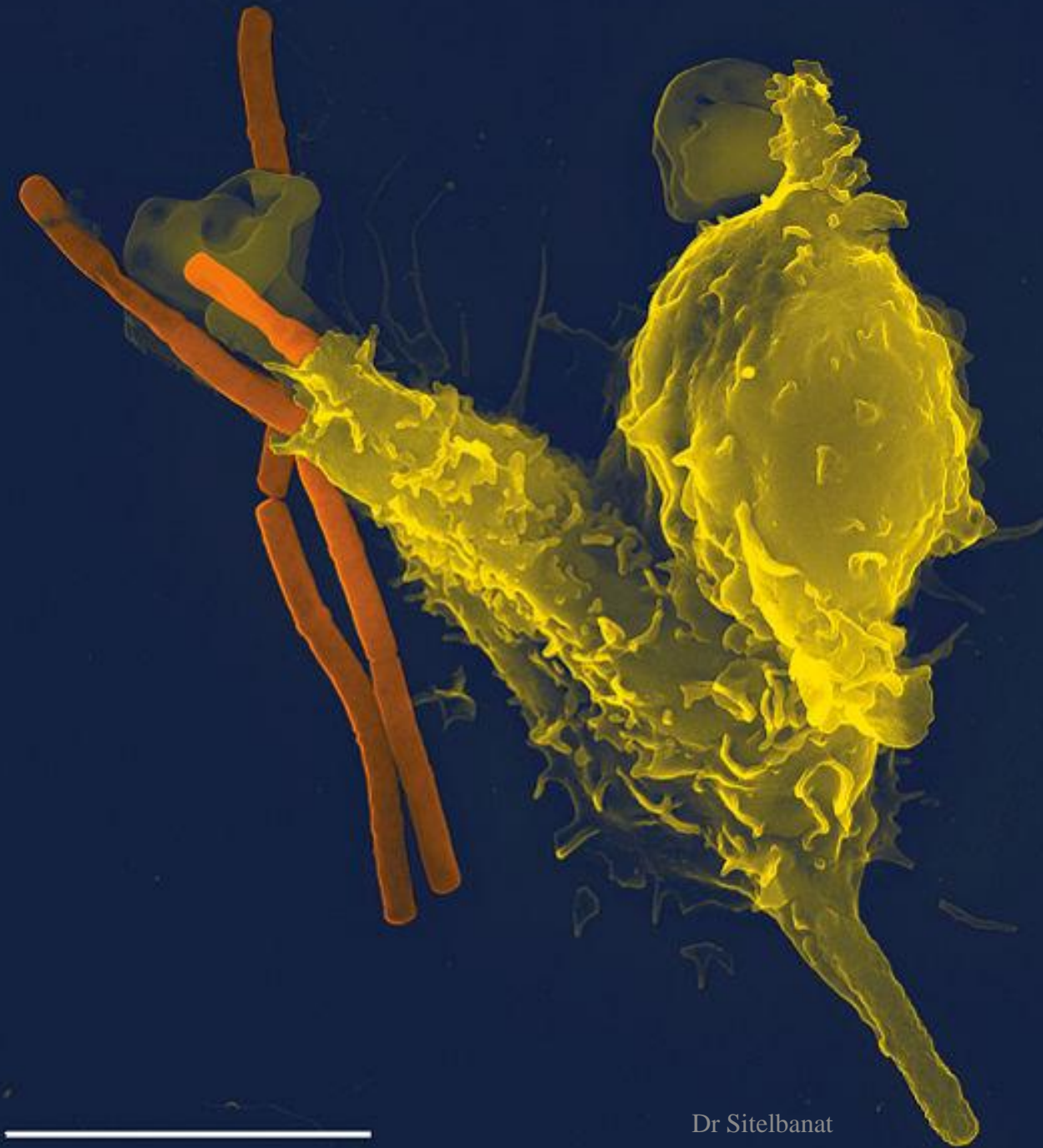
Phagocytosis

- **Phagocytosis is part of the natural, or innate, immune process, and is not an adaptive immune process**
- **Macrophages are a powerful phagocytic cells:**
 - **Ingest up to 100 bacteria,**
 - **Ingest larger particles as old RBC**
 - **Get rid of waste and survive**

Direct anti Inflammatory



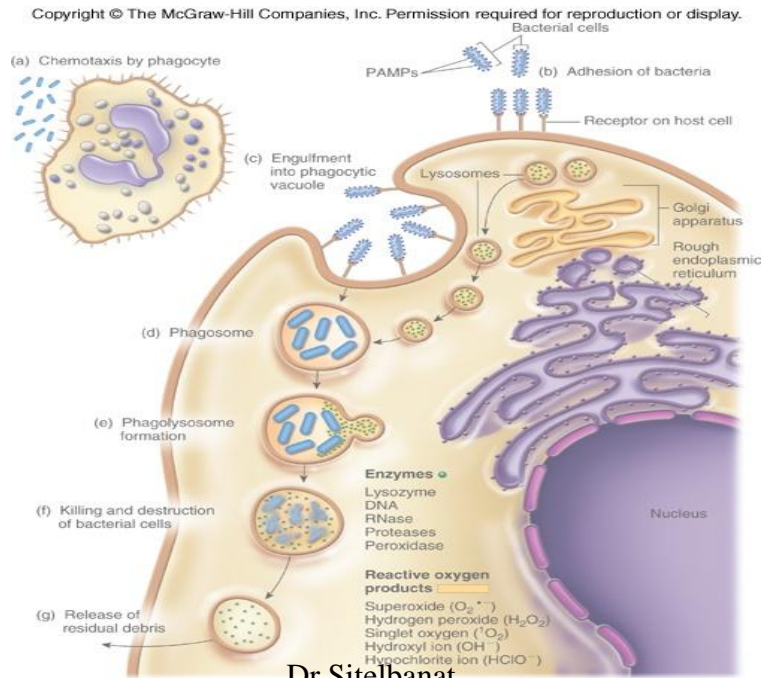




A [scanning electron microscope](#) image of a single [neutrophil](#) (yellow), engulfing [anthrax](#) bacteria (orange).

indirect Immune function Of RES

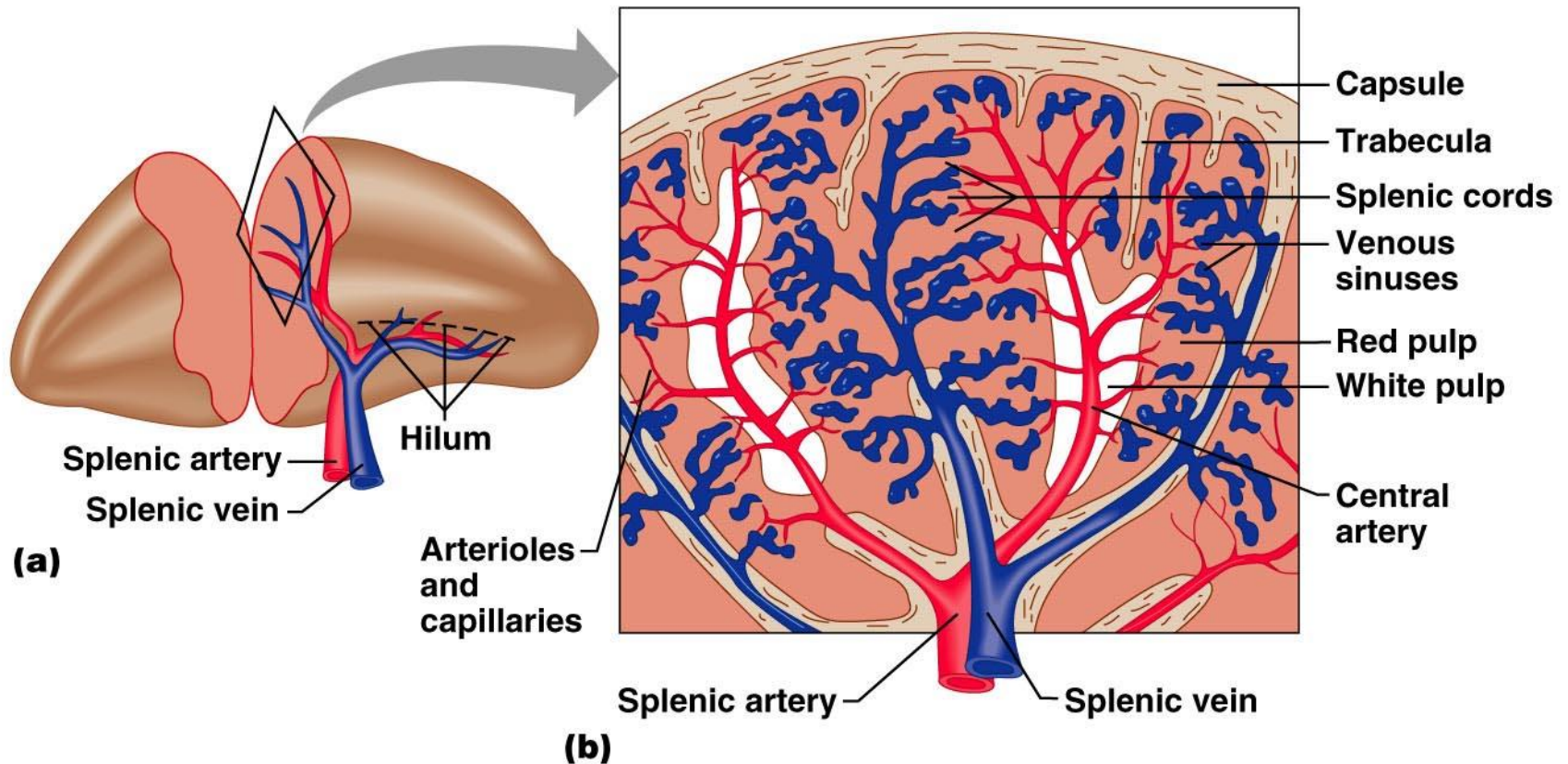
- Indirectly immunity
 - Ingest foreign body process it and present it to lymphocytes



Lymphoid Organs

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

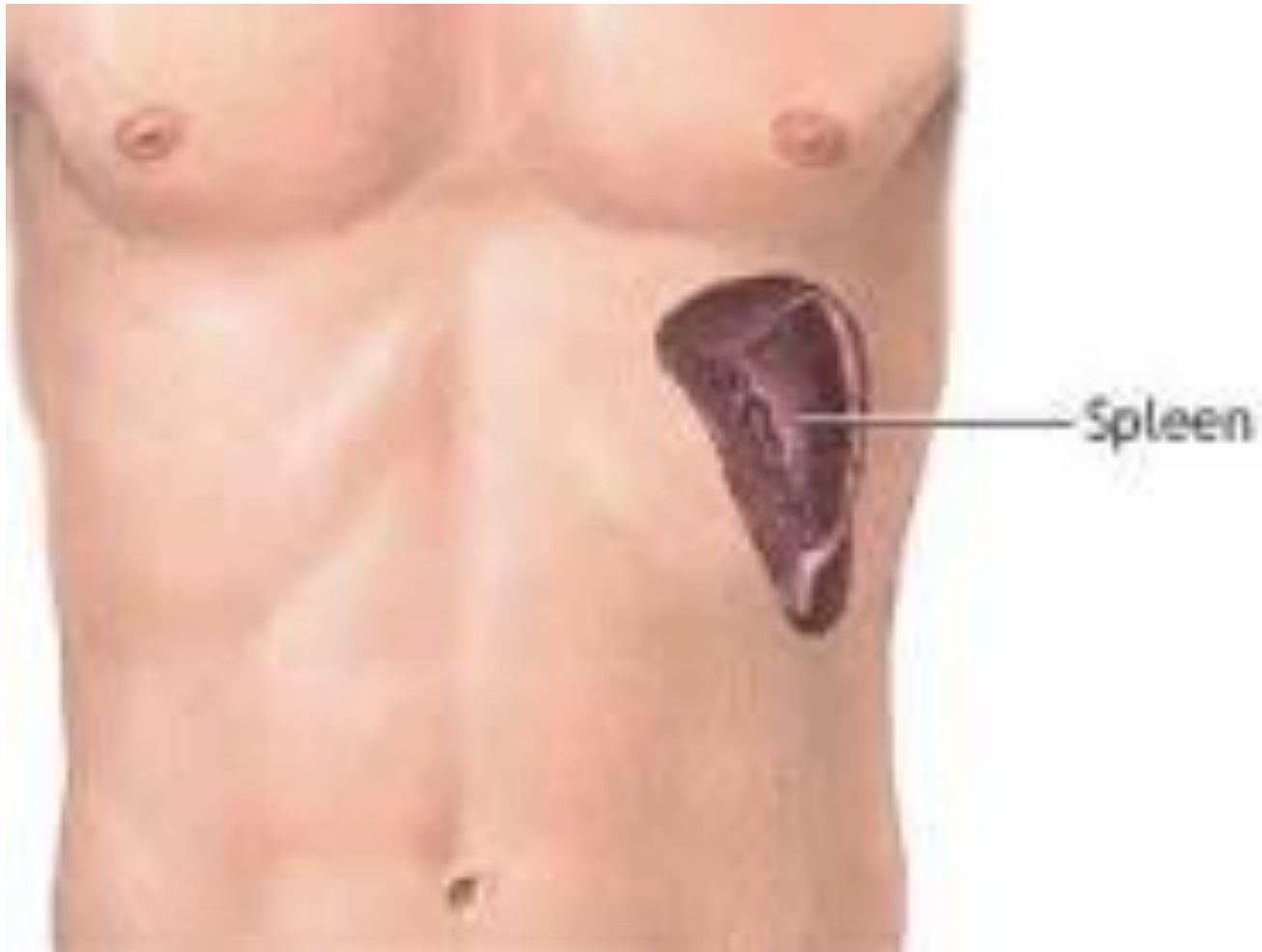
Spleen



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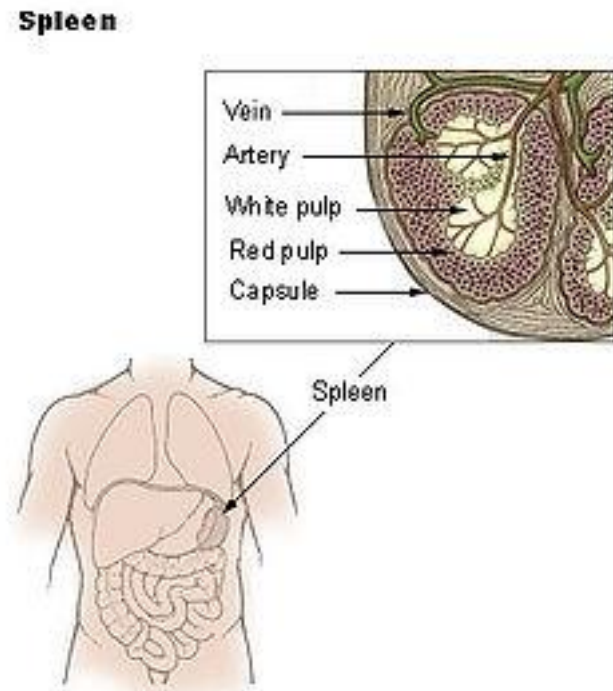
Spleen

- **Is soft purple gray in color located in the left upper quadrant of the abdomen.**
- **It is a highly vascular lymphoid organ**
- **It play an important roles in: red blood cells integrity and an immune system.**
- **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, 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

1. Haematopoiesis (Hemopoiesis) (fetal life)
2. Spleen is a main site for destruction of RBCs specially old and abnormal e.g. spherocytosis
3. Blood is filtered through the spleen.
4. Reservoir of thrombocytes and immature erythrocytes
5. Recycle 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. Reservoir of lymphocytes in white pulp**
- 3. Destruction and processing of antigens**
- 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)**

Immune Functions of Spleen

- 5. Site of B cell maturation into plasma cells, which synthesizes antibodies in its white pulp and initiation of humoral response**
- 6. Removes antibody-coated bacteria along with antibody-coated blood cells.**
- 7. It contain in its blood reserve half of the body's monocytes within the red pulp, upon moving to injured tissue (such as the heart), turn into dendritic cells and macrophages while promoting tissue healing.**

Splenectomy

- **Indication:**

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

Risks of Splenectomy

- **Overwhelming bacterial infection or post splenectomy sepsis.**
- **Patient prone to malaria**
- **Inflammation of the pancreas and collapse of the lungs.**
- **Excessive bleeding after the operation**
- **Post operative thrombosis**

Objectives

At the end of this lecture the student is expected to be able to:

- 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**