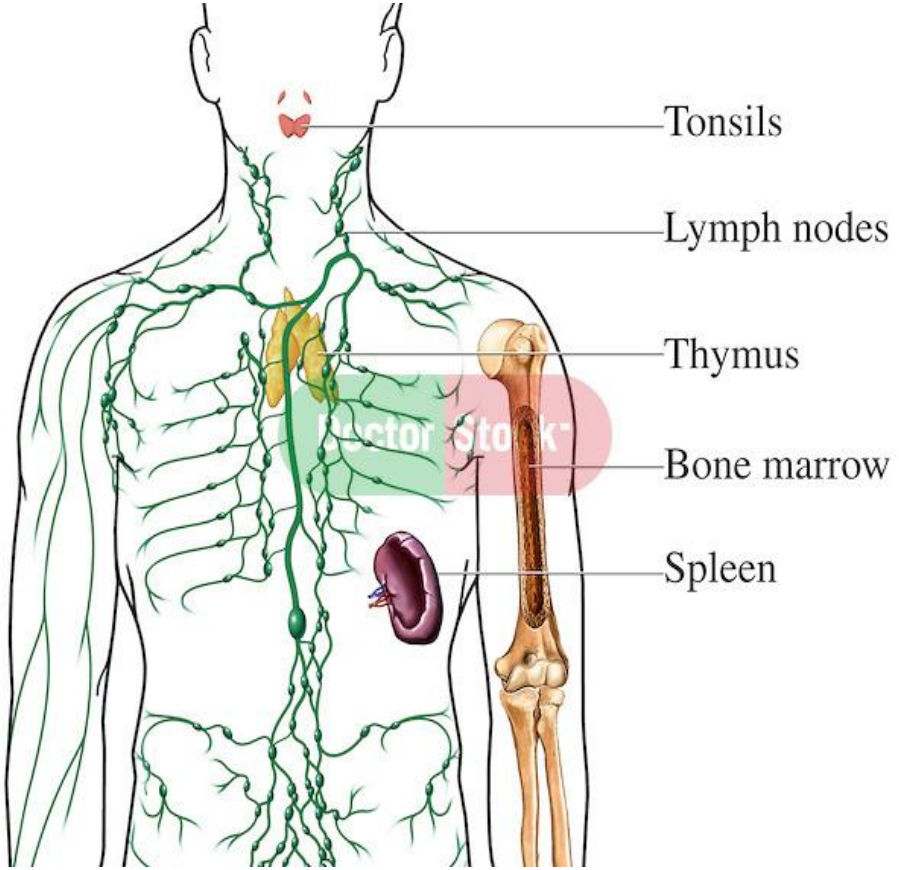
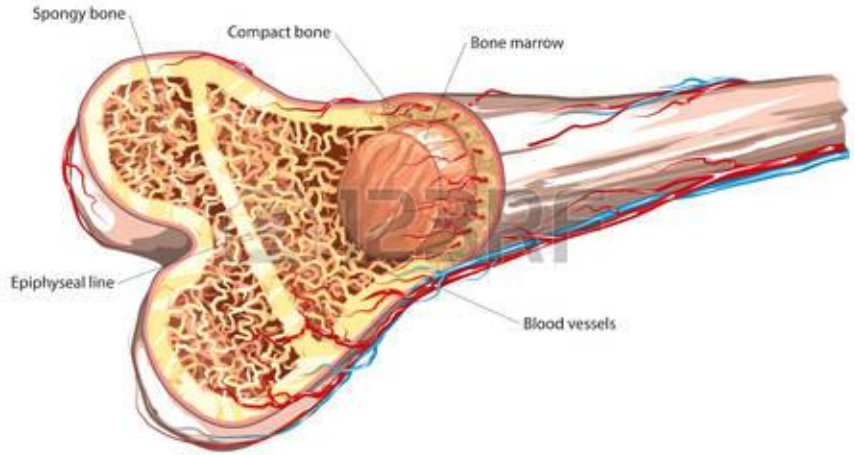
Organs of hematopoiesis and immune defense

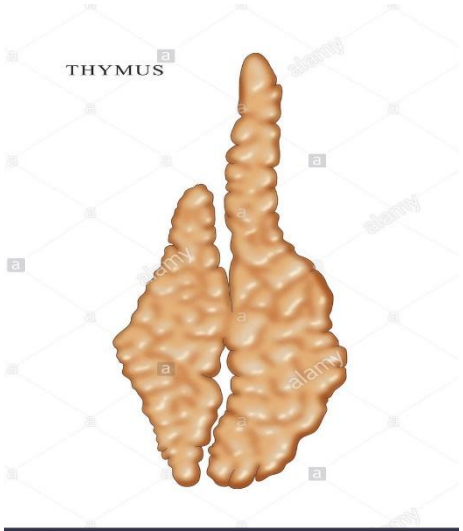


Central organs of hematopoiesis and immune defense

- Red bone marrow



- Thymus



Red bone marrow

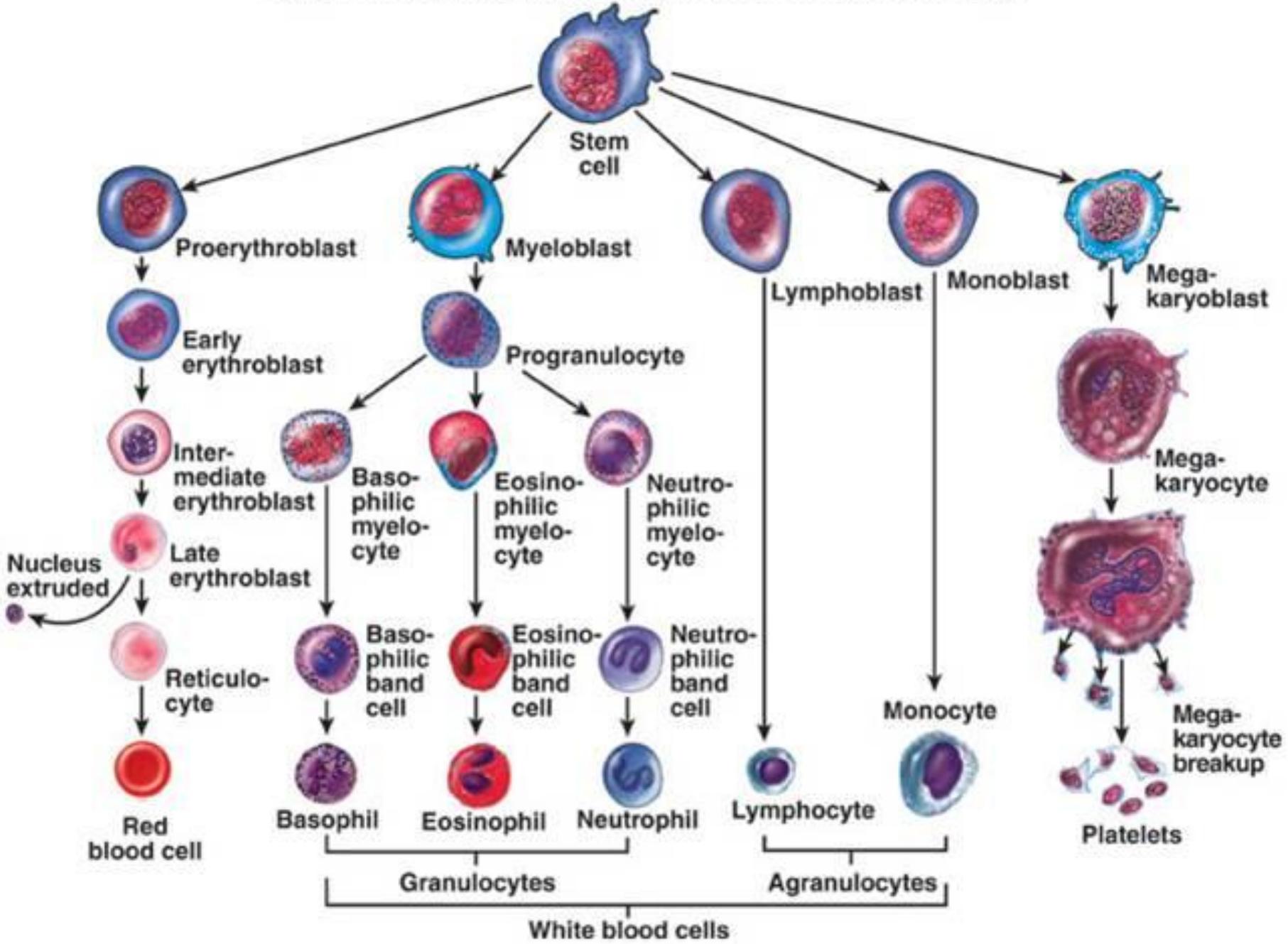
- Localization: epiphyses of long bones and spaces of spongy bones
- Function: formation of **mature** erythrocytes, thrombocytes, granulocytes, B-lymphocytes, and **precursors** of T-lymphocytes

Red bone marrow. Structure:

- Rough stroma – trabeculae of spongy bone
- Soft stroma – reticular connective tissue
- Parenchyma – blood cells at different stages of differentiation (stem cell ⇨ mature cell)
- Capillaries – discontinuous (sinusoid)

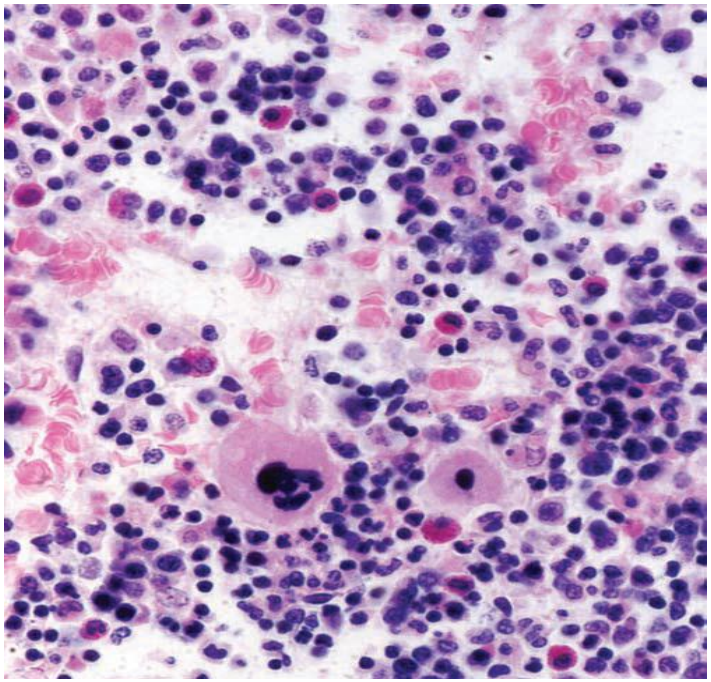
Reticular connective tissue:

- CT with special properties
- forms stroma of all hematopoietic organs, except thymus
- Consists of reticular cells and reticular fibers that form microenvironment for developing blood cells
- Produces hemopoietins (erythropoietin, leukopoietin, thrombopoietin)



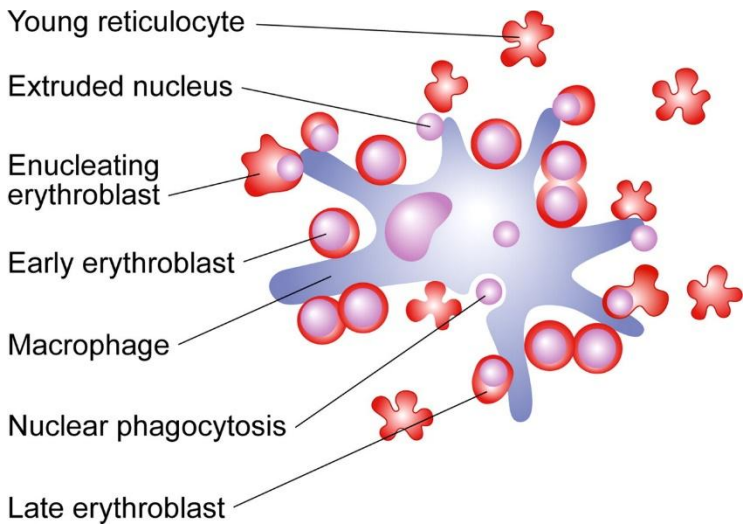
Parenchyma of red bone marrow

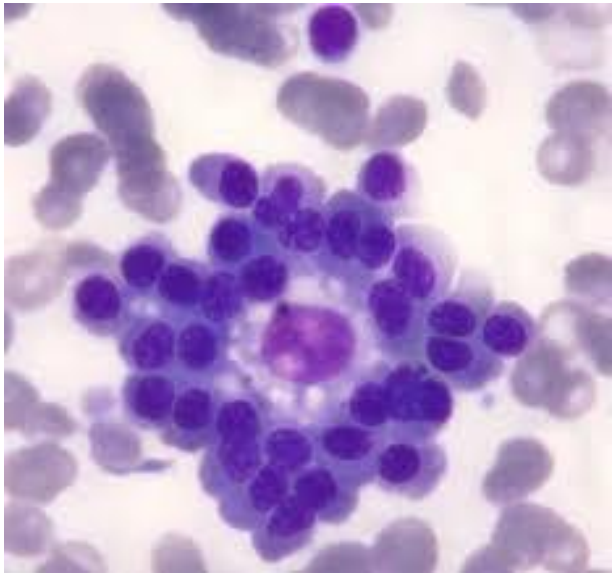
- Hematopoietic cords of blood cells at different stages of their development
- Hematopoietic cells form clusters (islets)



Erythroblastic islet

- Erythroblasts always surround macrophage (nanny-cell)
- Located near the sinusoid capillaries
- Surrounded by glycoproteins



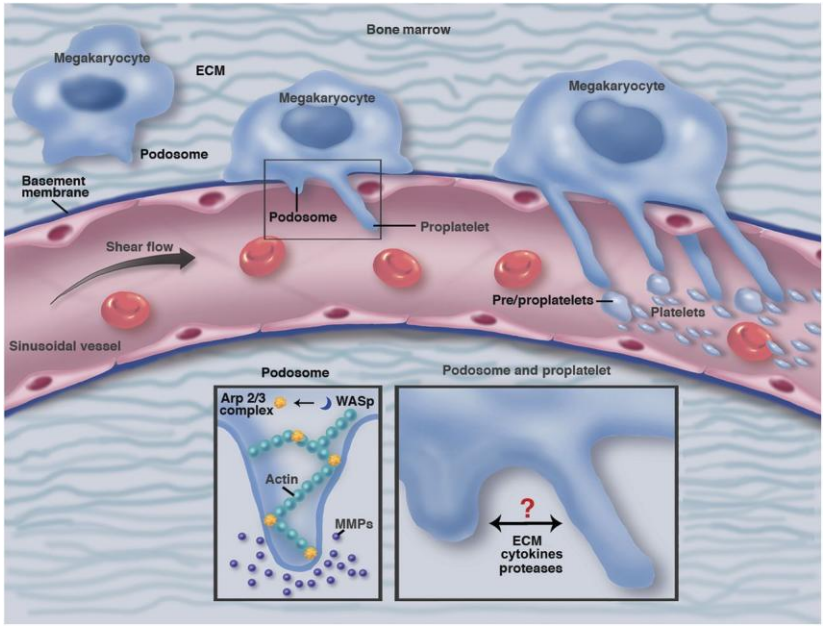


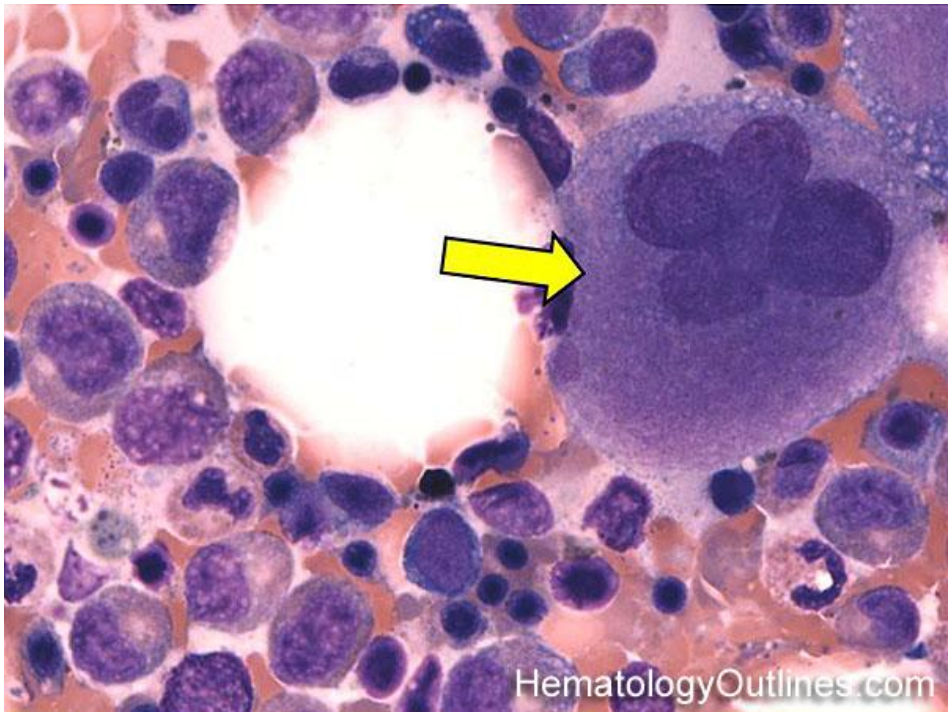
Islet of granulocytes

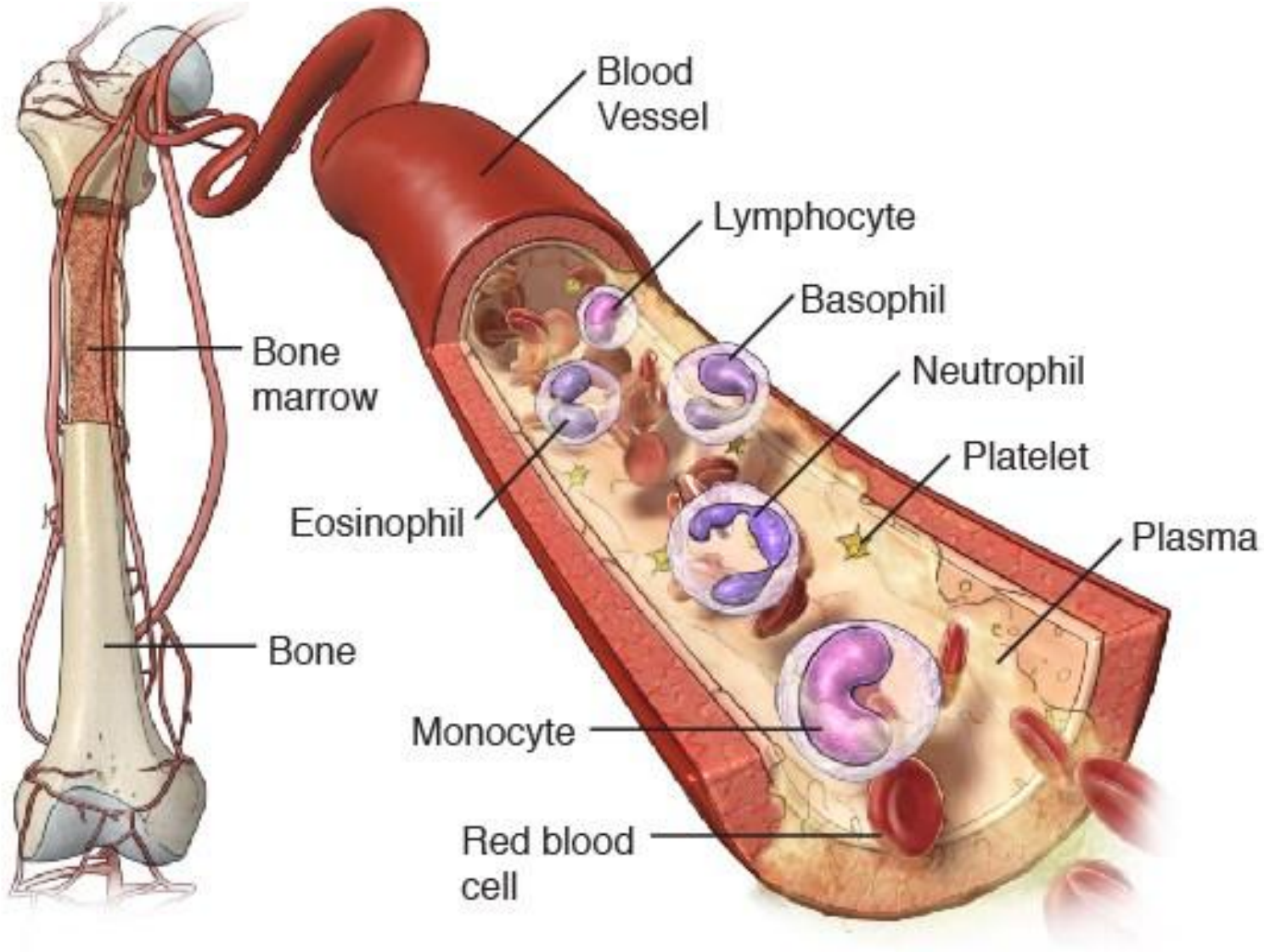
- Surrounded by proteoglycans
- Deposited in a red bone marrow
- Are not surrounded by sinusoids (motile)

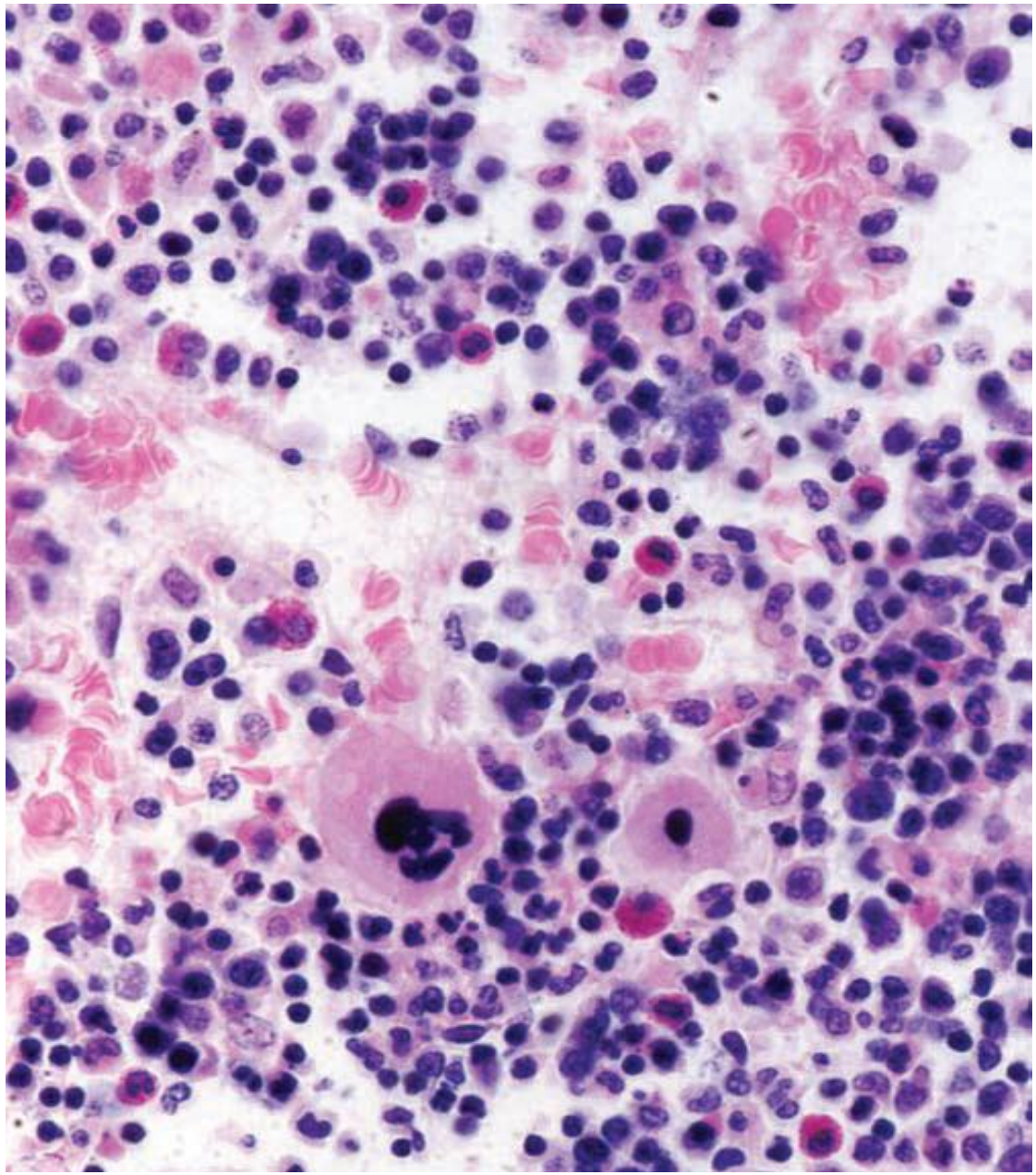
Megakaryocyte

- Thrombocytes (platelets) – are small anucleate fragments of cytoplasm of a giant cell of red bone marrow – **megakaryocyte**.





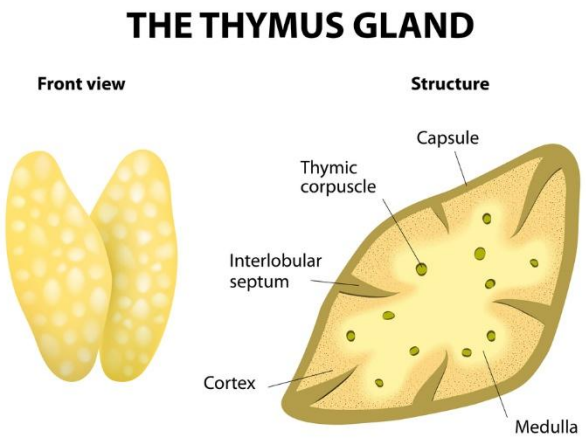

Blood Vessel
Lymphocyte
Basophil
Neutrophil
Platelet
Plasma
Bone marrow
Eosinophil
Bone
Monocyte
Red blood cell



Thymus

- Central organ of lymphopoiesis and immune defense
- Functions

1) Proliferation of T-lymphocytes
2) Antigen-independent differentiation (activation) of T-lymphocytes
3) Production of thymulin, thymosine, thymopoietin

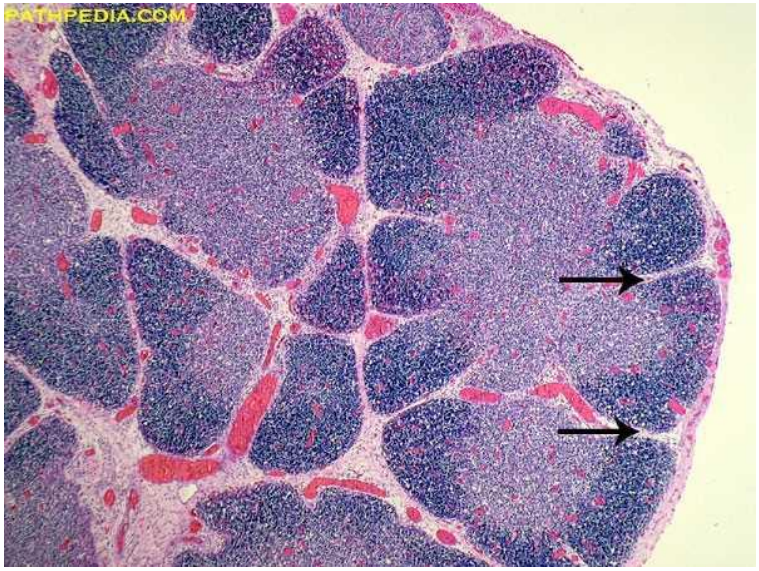


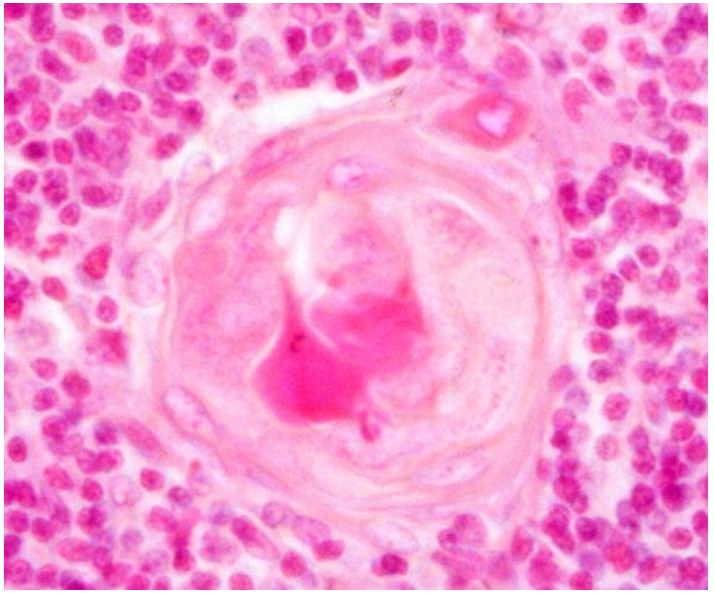
Thymus. Structure:

- Rough stroma – connective tissue capsule, from which trabeculae extend and divide parenchyma into lobules
- Between capsule and parenchyma – basal lamina
- Soft stroma – epithelial tissue (epithelioreticular cells)
- Parenchyma – precursors of T-lymphocytes
- Structural and functional unit – **thymic lobule**

Thymic lobule:

- Cortex (dark): **T-lymphocytes, macrophages (dendritic cells), epithelioreticular cells (nannies)**
- Medulla (light): **T-lymphocytes (recirculating pull), epithelioreticular cells, macrophages, Hassal's bodies**





Blood-thymus barrier

- Endothelium
- Basal lamina
- Perivascular space (lymphocytes, macrophages)
- Basal lamina and epithelioreticular cell

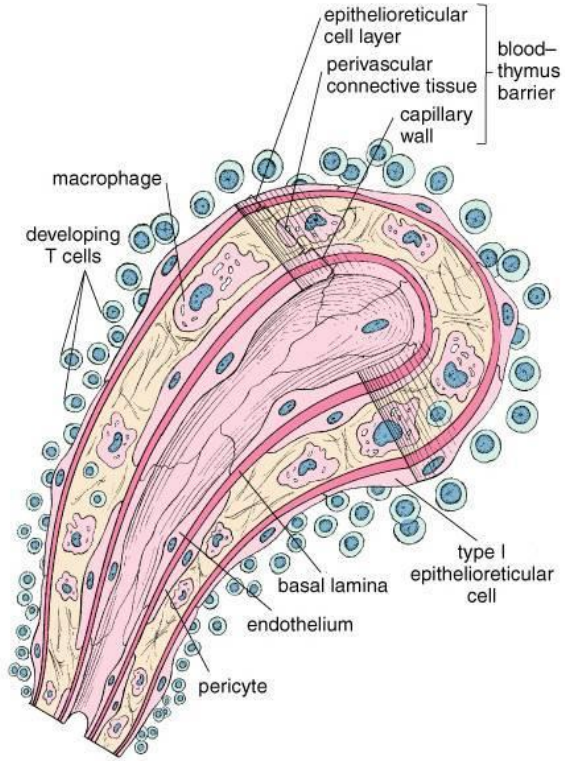


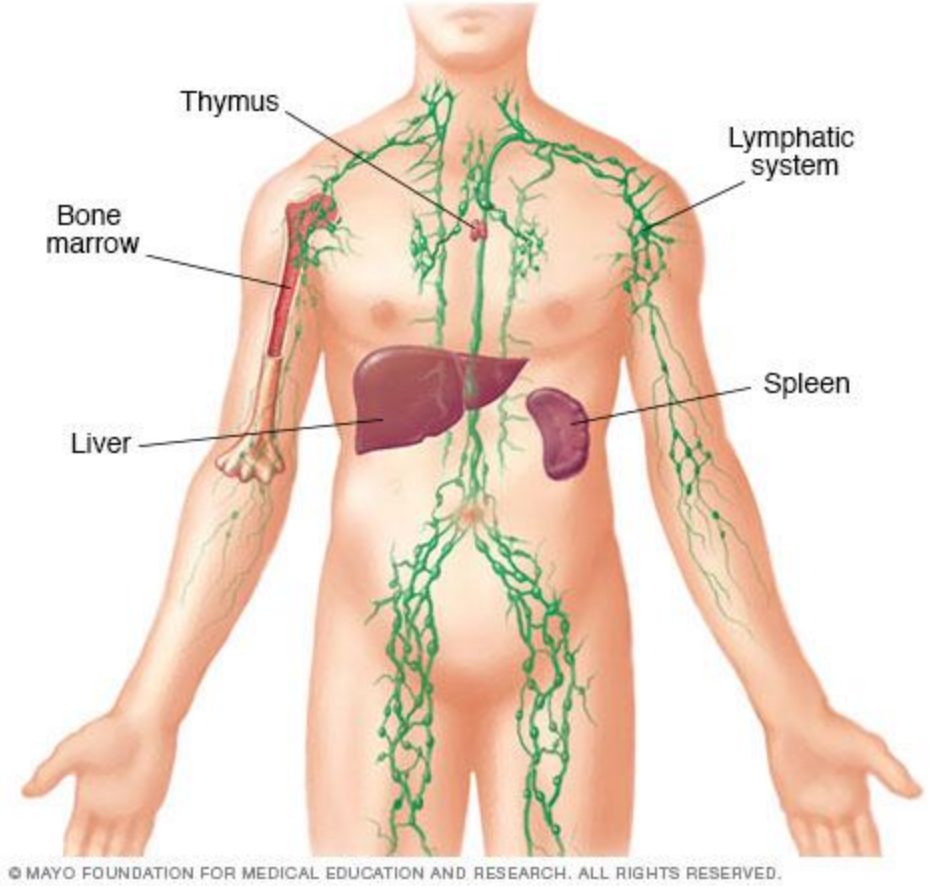
Figure 13.27. **Schematic diagram of the blood-thymus barrier.**

Antigen-independent or dependent activation ???

Peripheral organs of hematopoiesis and immune defense

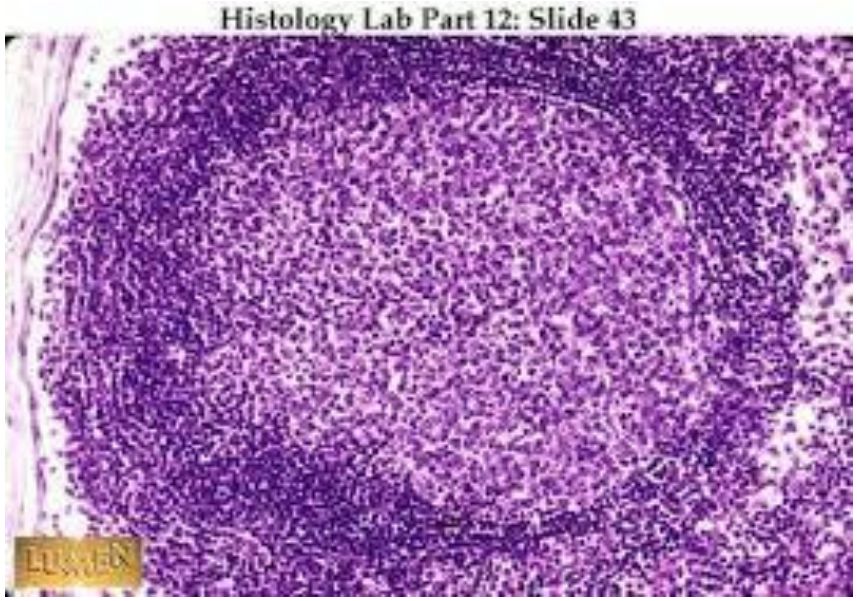
- Lymph nodes

- Spleen



Lymph nodules

- Rounded clusters of T-and B-lymphocytes
- Localization – loose connective tissue of lamina propria



Zones:

-Light germinal center

-Peripheral mantle zone

Lymph nodes

- Bean-shaped structures accompanying lymphatic vessels
- Functions : Antigen-dependent activation of T-and B-lymphocytes, purification of lymph

Lymph node. Strucure:

- Rough stroma - CT capsule and trabeculae
- Soft stroma – reticular CT
- Parenchyma: T- and B-lymphocytes, macrophages, dendritic cells, smooth muscle cells

Lymph node. Parenchyma:

- **Cortex**: lymphatic nodules (follicles) – B-dependent zone

Function: antigen-dependent activation of B-lymphocytes

- **Paracortical zone** (deep cortex) – thymus-dependent zone (T-lymphocytes, interdigitating cells (macrophages))

Function: differentiation of T-lymphocytes (helpers, killers, suppressors), antigen-dependent activation of T-lymphocytes

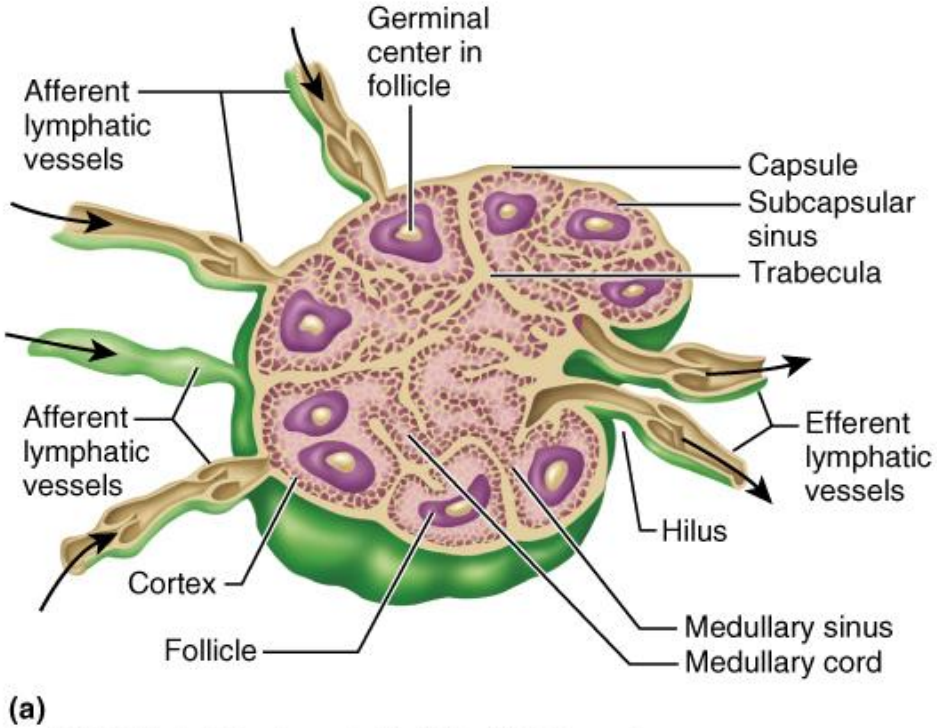
- **Medulla**: medullar cords (aggregation of B-lymphocytes).

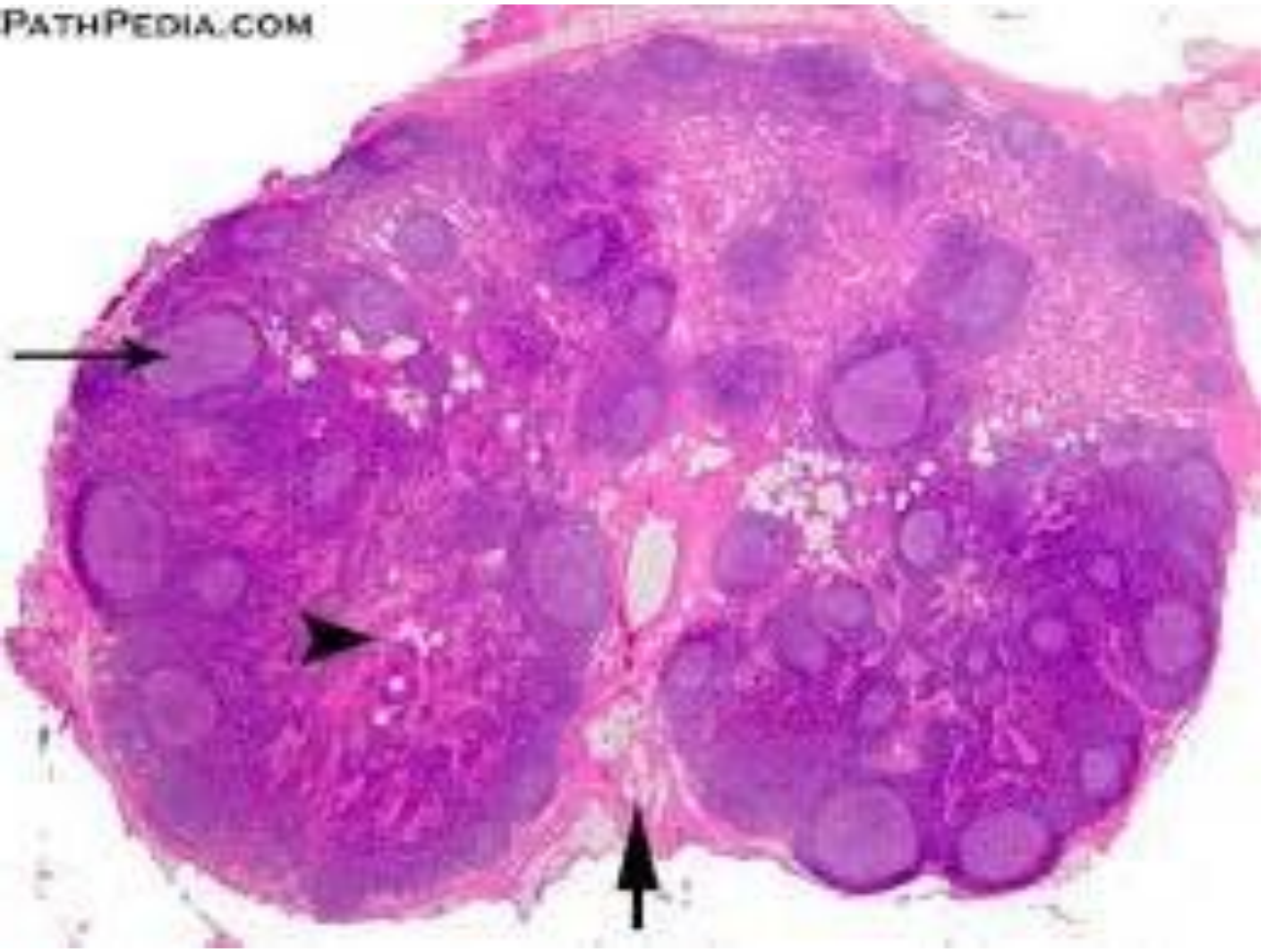
Function: B-lymphocytes ⇨ plasma cells,

monocytes ⇨ macrophages

Sinuses of lymph node

- Marginal – between capsule and follicles
- Parafollicular – between follicle and trabecula
- Medullar – between medullar cords and trabeculae
- Hillus sinus

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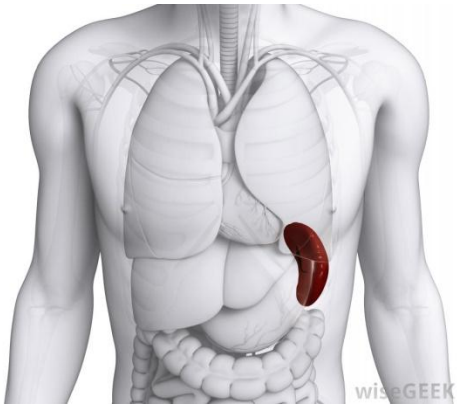
Spleen. Functions



- Proliferation and antigen-dependent activation of lymphocytes
- Elimination or RBCs and platelets
- Deposition of blood and iron
- Production of biologically active substances (splenin)
- In embryonic period – hematopoietic organ

Spleen. Structure:

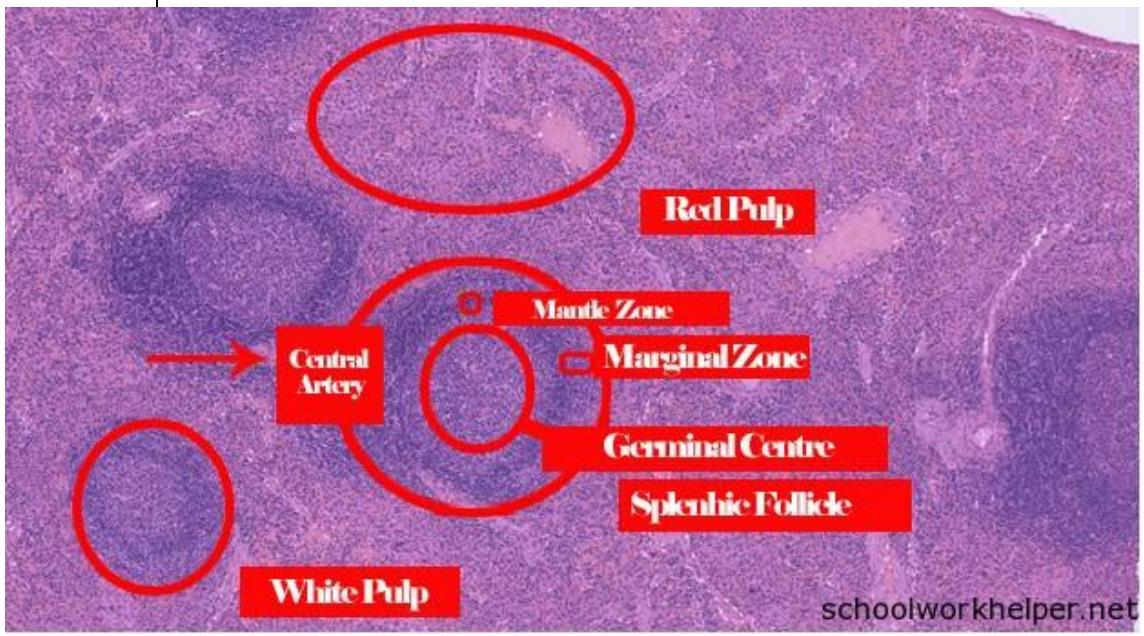
- Rough stroma – CT capsule and trabeculae
- Soft stroma – reticular CT
- Parenchyma:

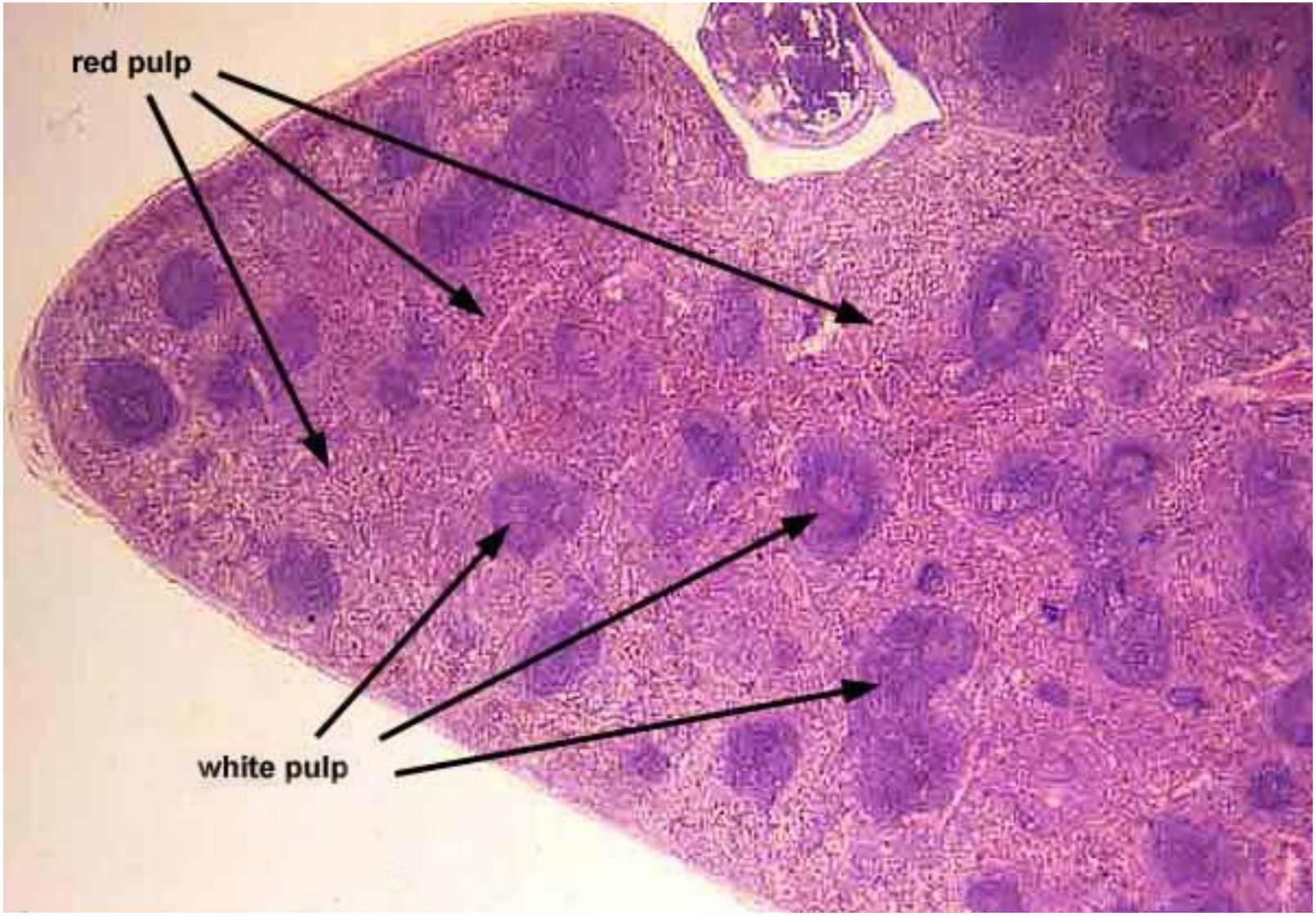
- White pulp: lymphatic nodules
- Red pulp : forming elements of blood, pulp cords (B-lymphocytes ⇨ plasma cells,
  monocytes ⇨ macrophages)

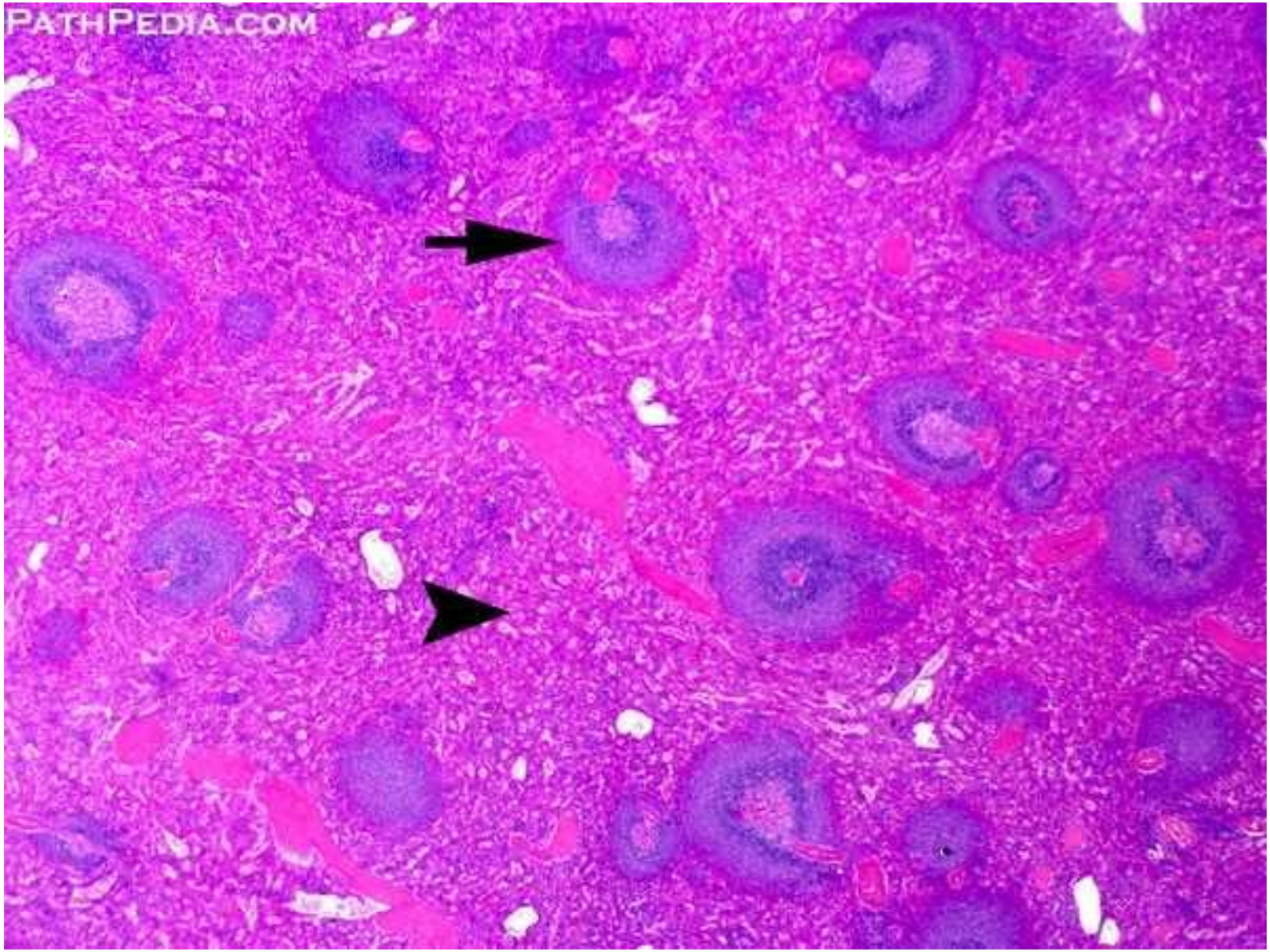
Zones of white pulp of spleen (lymphatic nodule)

- Periarterial – T-dependent
- Germinal center
- Mantle zone
- Marginal zone

B-dependent




red pulp
white pulp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Thank you for attention!
and take care of your immune system ☺