


HISTOLOGI BONE MARROW

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BAGIAN HISTOLOGI



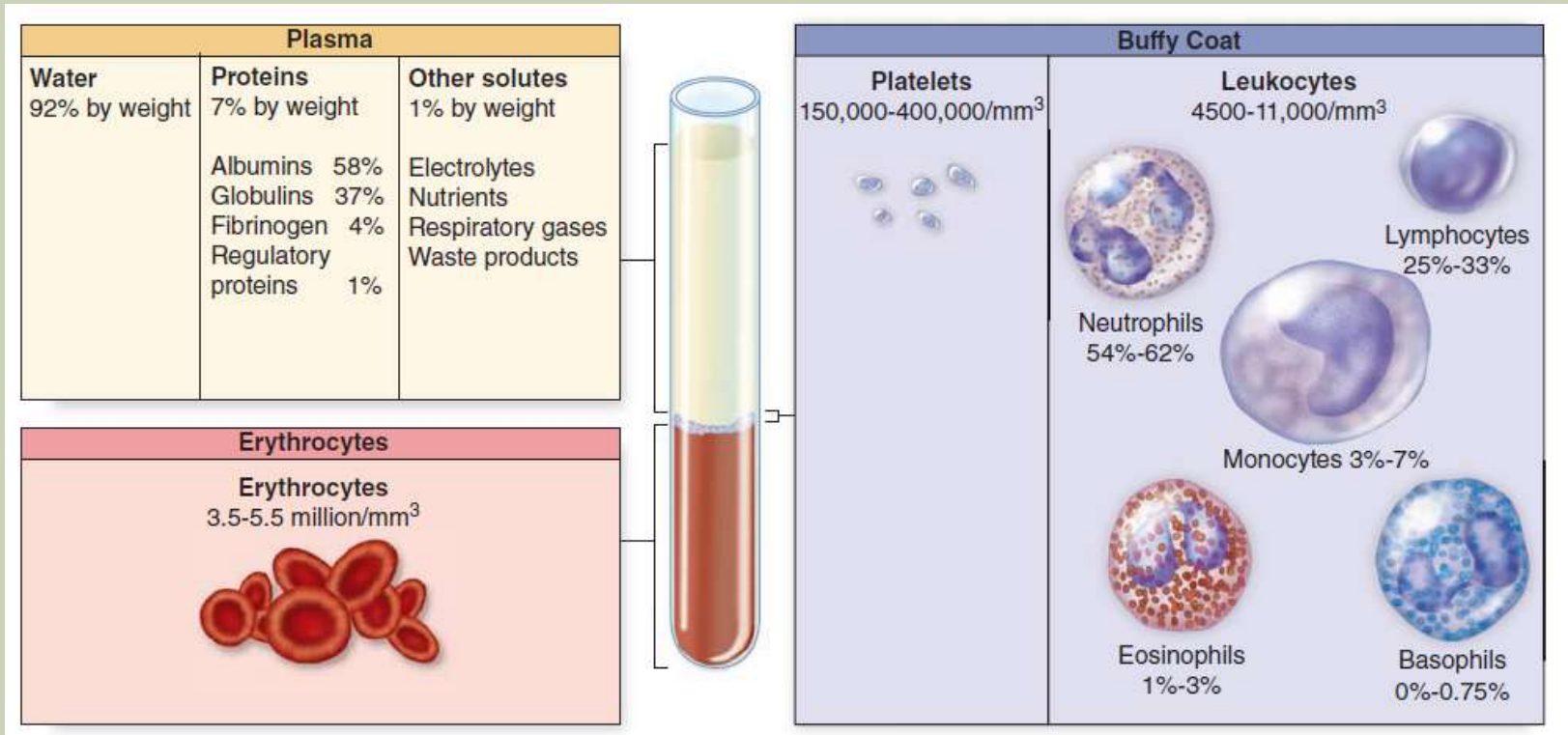
Overview of hemopoiesis

Structure of bone marrow

Microenvironment of bone marrow

Transendothelial migration

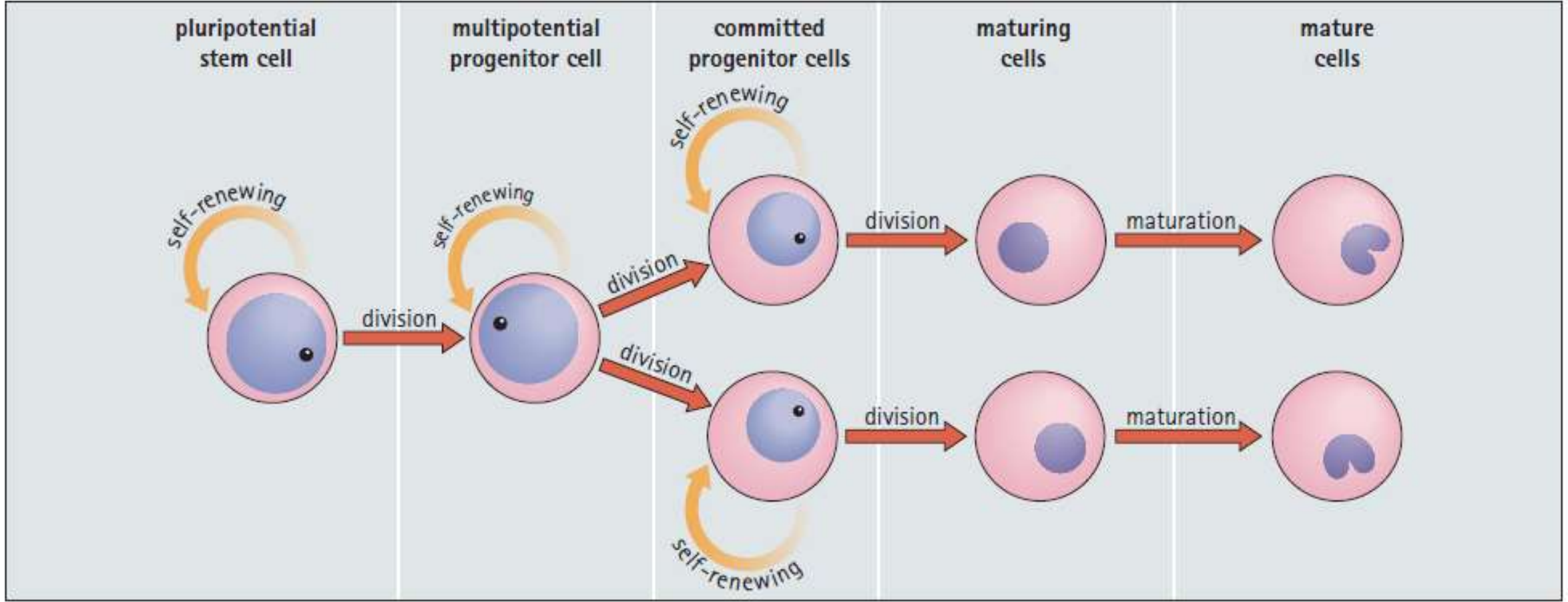
OVERVIEW OF HEMOPOIESIS

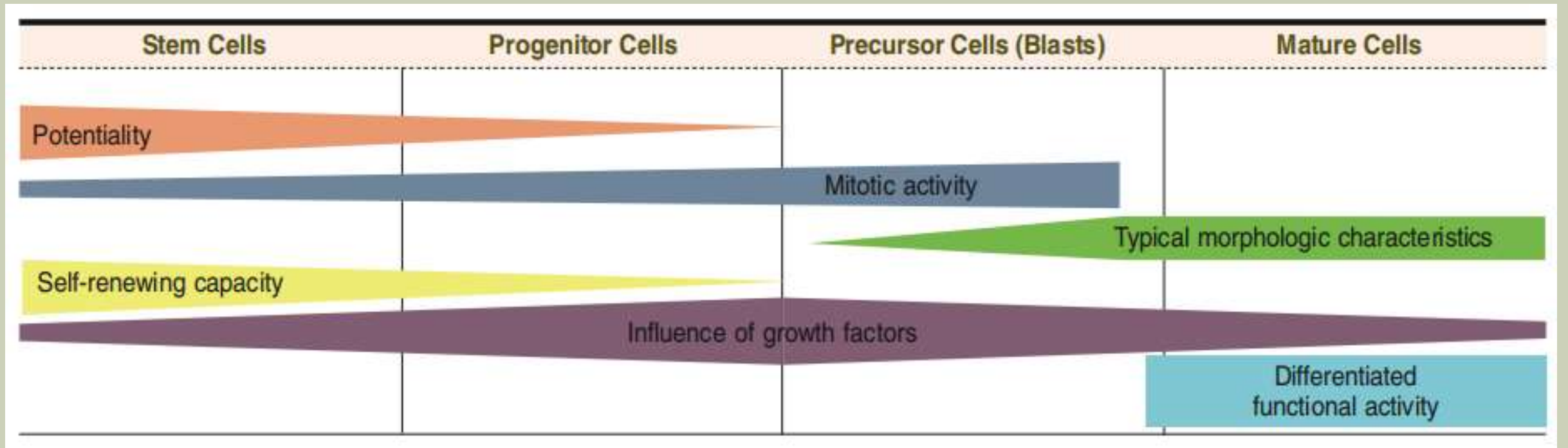


OVERVIEW OF HEMOPOIESIS

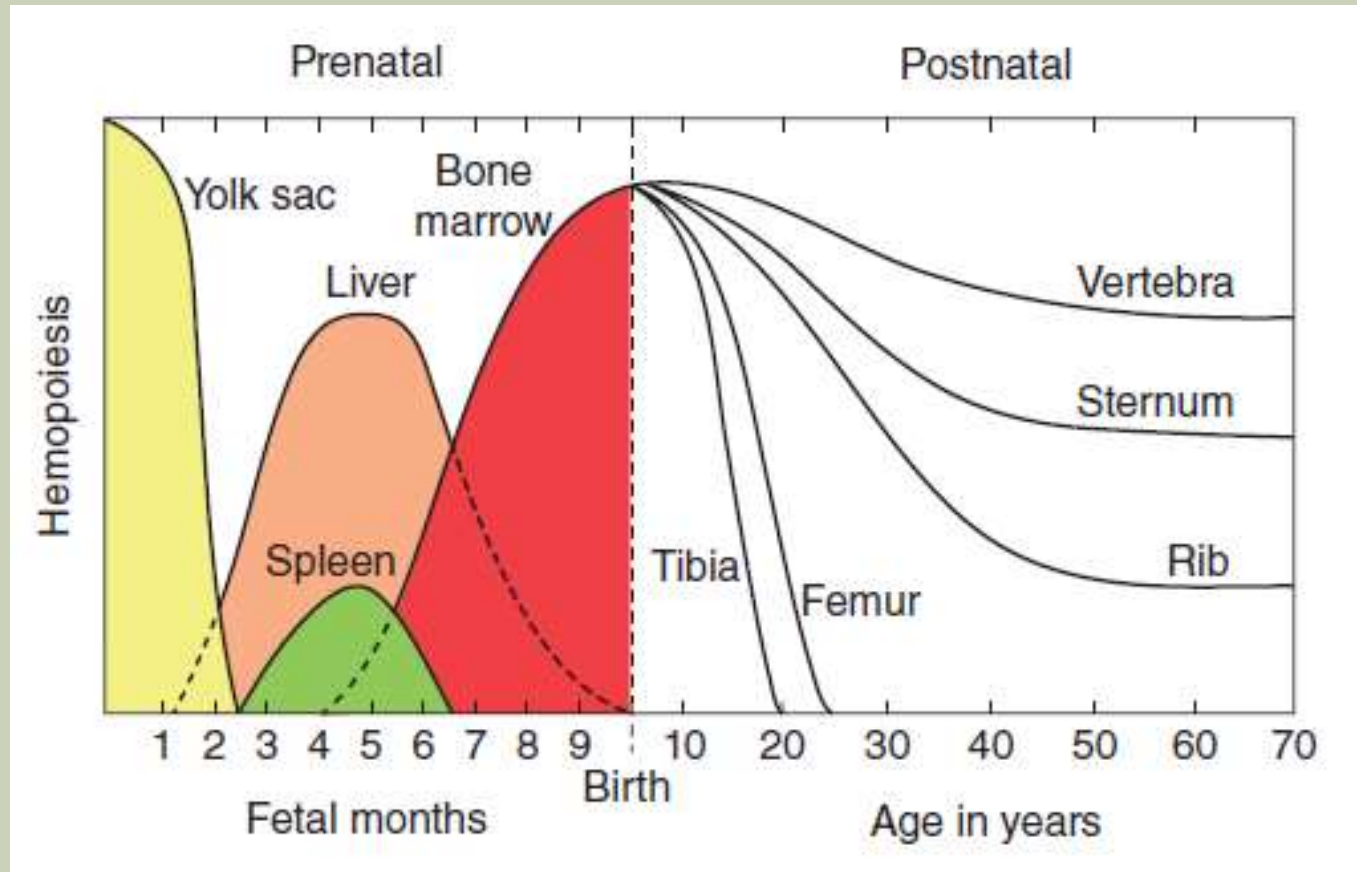
Circulating blood cells have **relatively short life spans** and must be **replaced continuously by newly formed** cells.

This process of blood cell replacement is known as **hemopoiesis** (hematopoiesis).





LOCATION OF HEMOPOESIS



STRUCTURE OF BONE MARROW

Bone marrow is a special form of **connective tissue**

- a highly vascularized tissue in medullary cavities of bones
- It supplied by the central longitudinal artery, derived from nutrient artery

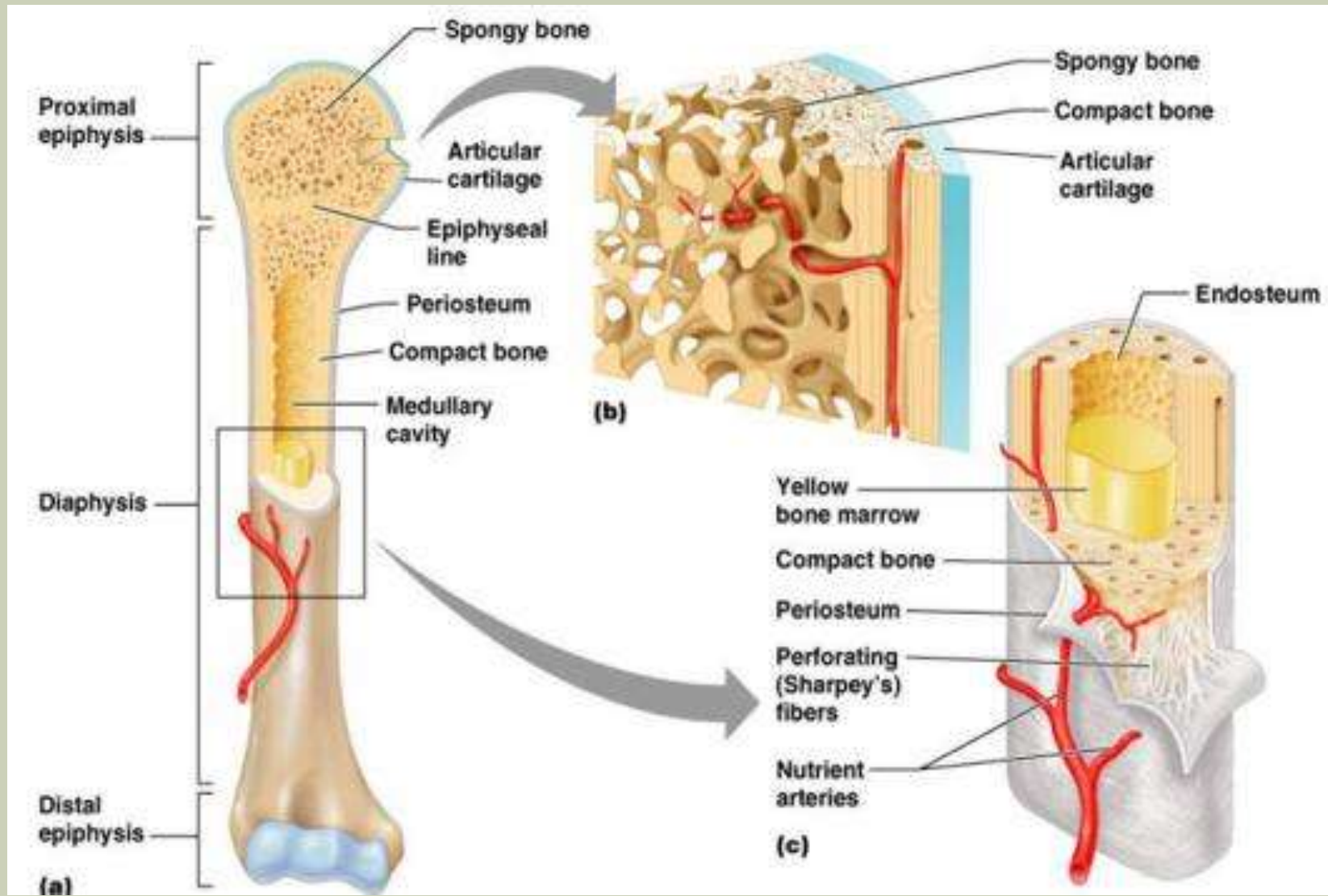
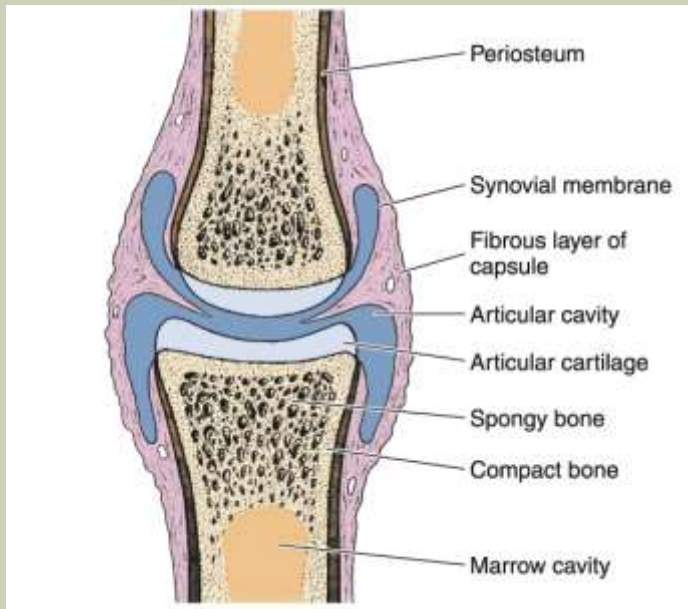
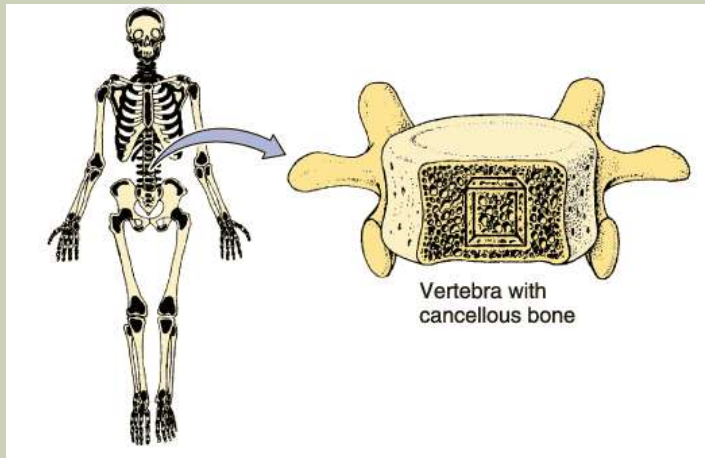
It derives embryonically from mesoderm

It consists of :

- a **stroma** of loose reticular connective tissue
- a **parenchyma of hematopoietic cells** arranged as irregular cellular cords or islands separated by thin-walled venous **sinusoids**
 - **Adult: 1,7 L of marrow contains 10^{12} hematopoietic cells , producing 1×10^9 RBC and 1×10^8 WBC every hour**

It can be **red** (because of erytroid progenies) or **yellow** (because of adipose cells), and **interchangeable**

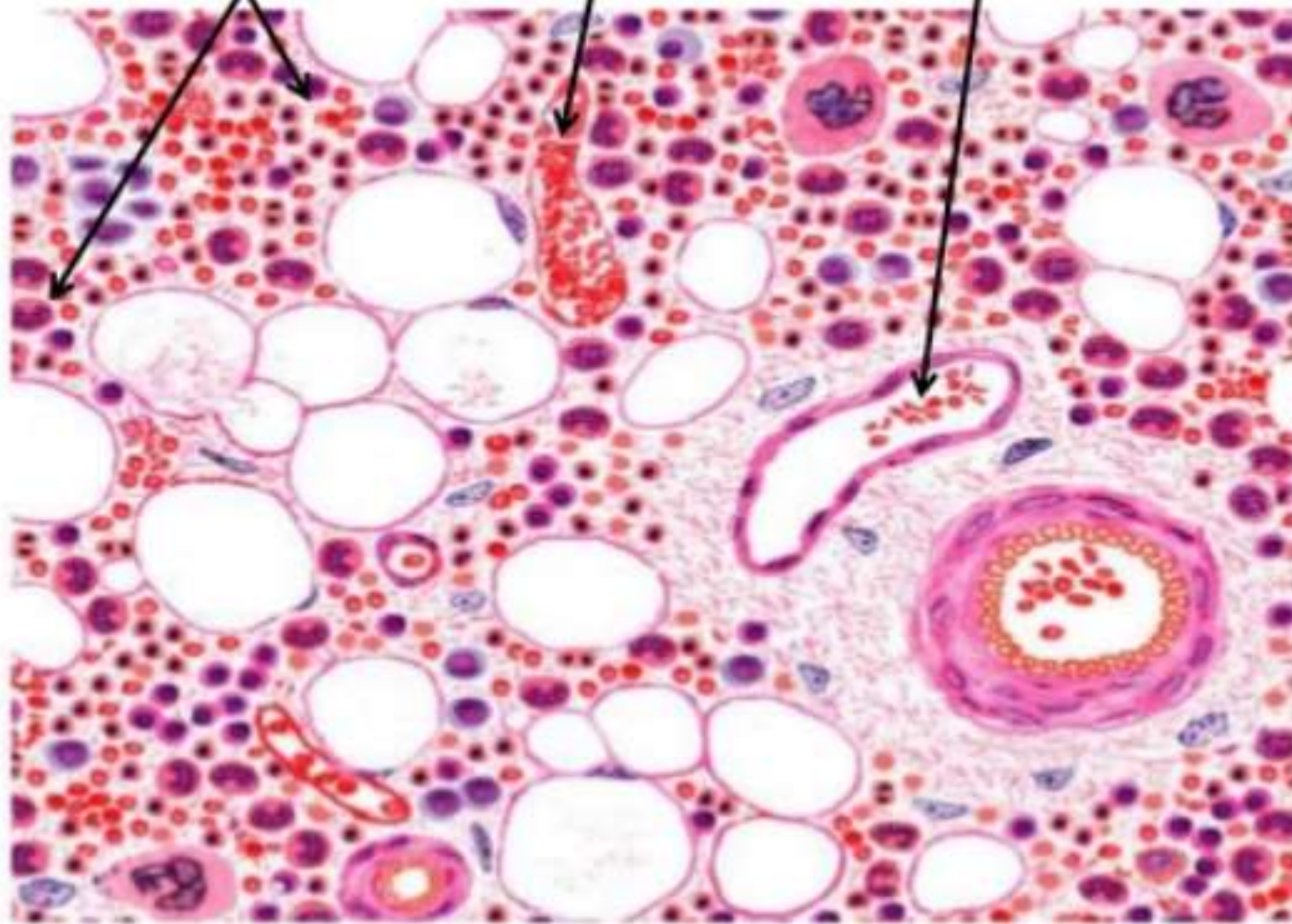




Haemopoietic cells

Sinusoid

Stroma



Bone marrow (Decalcified section)

Trabecular bone
(endosteum)

Stromal or reticular cell

Endothelial cell

Endothelial cells form a continuous layer of interconnected cells lining the blood vessels. A **basal lamina** separates endothelial cells from the branching stromal or reticular cells.

Nutrient arteriole

A branch of the nutrient artery is surrounded by hematopoietic cells.

Granulocyte progeny

Developing granulocytes are found adjacent to venous sinusoids. Mature granulocytes leave the bone marrow by **diapedesis**.

Sinusoidal lumen

Stromal or reticular cell

Branching stromal cells form a cellular network under the endothelial lining and extend into the hematopoietic tissue. Stromal cells produce **hematopoietic short-range regulatory molecules** induced by colony-stimulating factors.

Adipose cell

Megakaryocyte

A megakaryocyte lies against the outside of a venous sinusoid and discharges **proplatelets** into the lumen through an epithelial cell gap.

Macrophage

A macrophage, found near an erythroid progeny, will engulf nuclei extruded from **orthochromatic erythroblasts** before their conversion to **reticulocytes**.

Erythroid progeny



MICROENVIRONMENT OF BONE MARROW

Vascular niche

Endosteal
niche

VASCULAR NICHE

Provides a microenvironment for the short-term **proliferation and differentiation** of HSC

Blood vessels surrounded by **non hematopoietic stromal cells**:

- **Mesenchymal stem cells**
- **Adipose cells**
 - Provide a local source energy
 - Synthesize growth factor
- **Endothelial cells**
 - Phagocytic activity
 - Produce growth factors that stimulate proliferation and differentiation of hematopoietic cell
- **Reticular stromal cells**
 - Produce hematopoietic growth factors and cytokines that regulate the production and differentiation of blood cell
- **Macrophages**
 - Remove apoptotic cell, residual nuclei from orthochrom

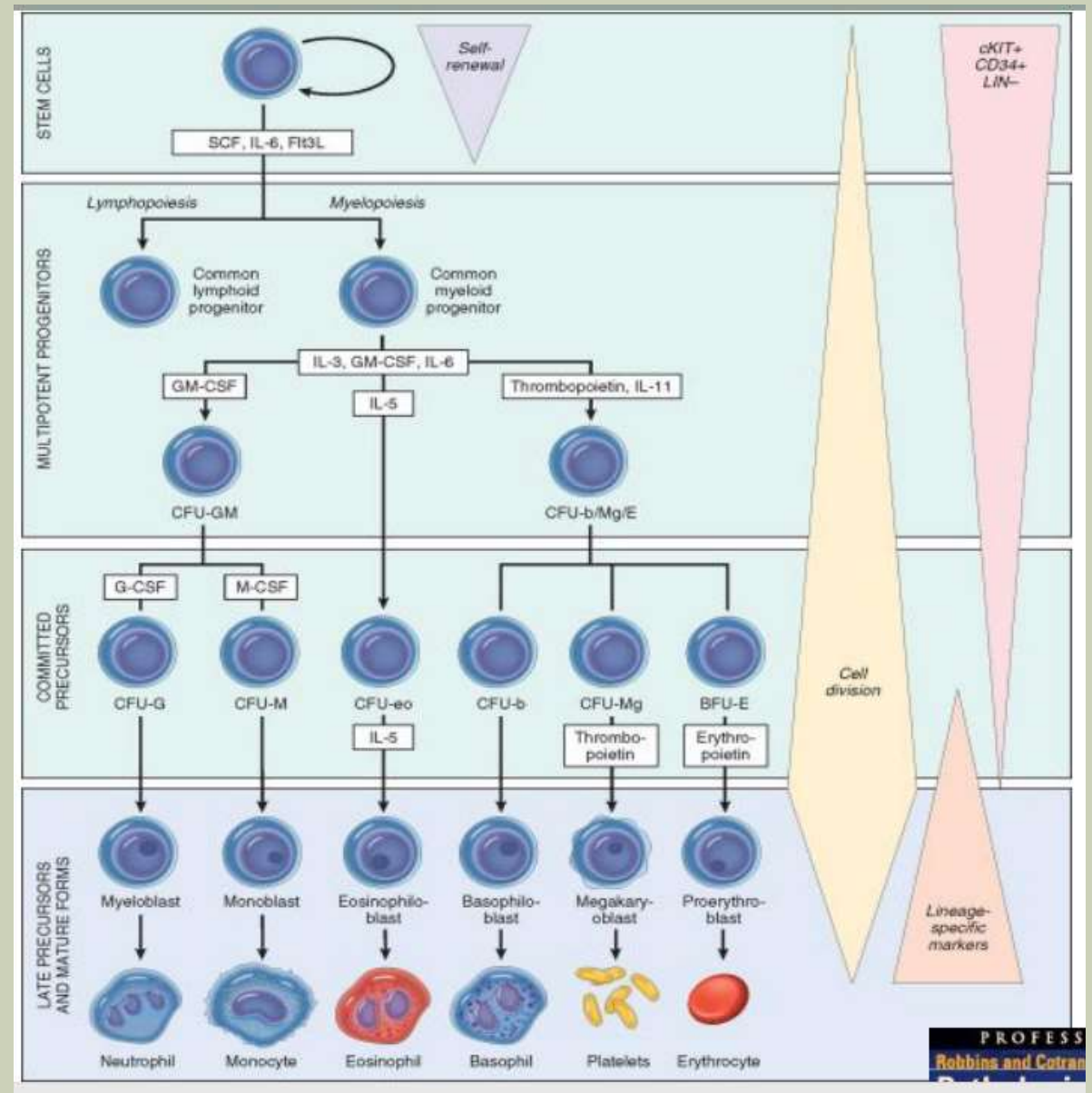
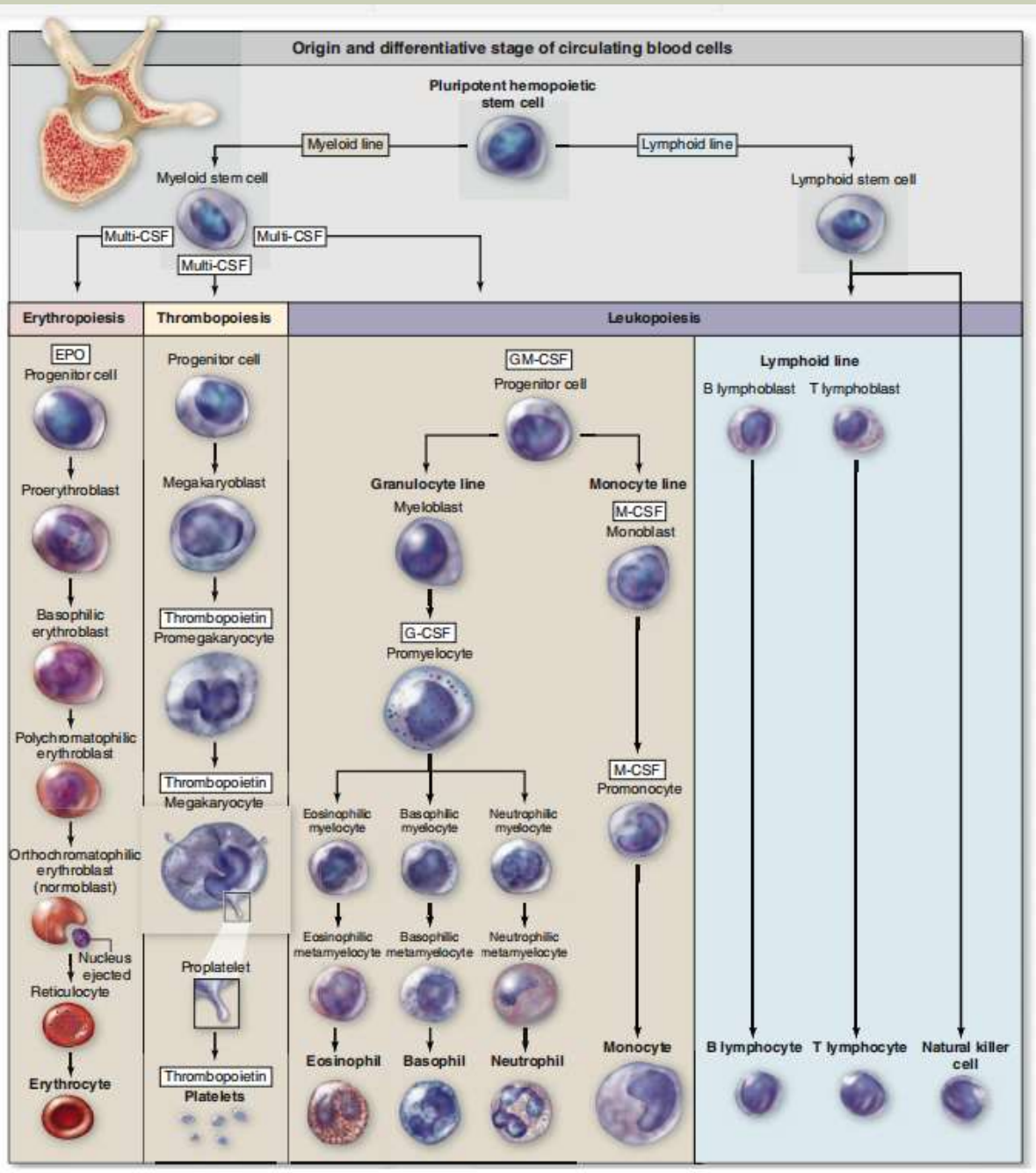
ENDOSTEAL NICHE

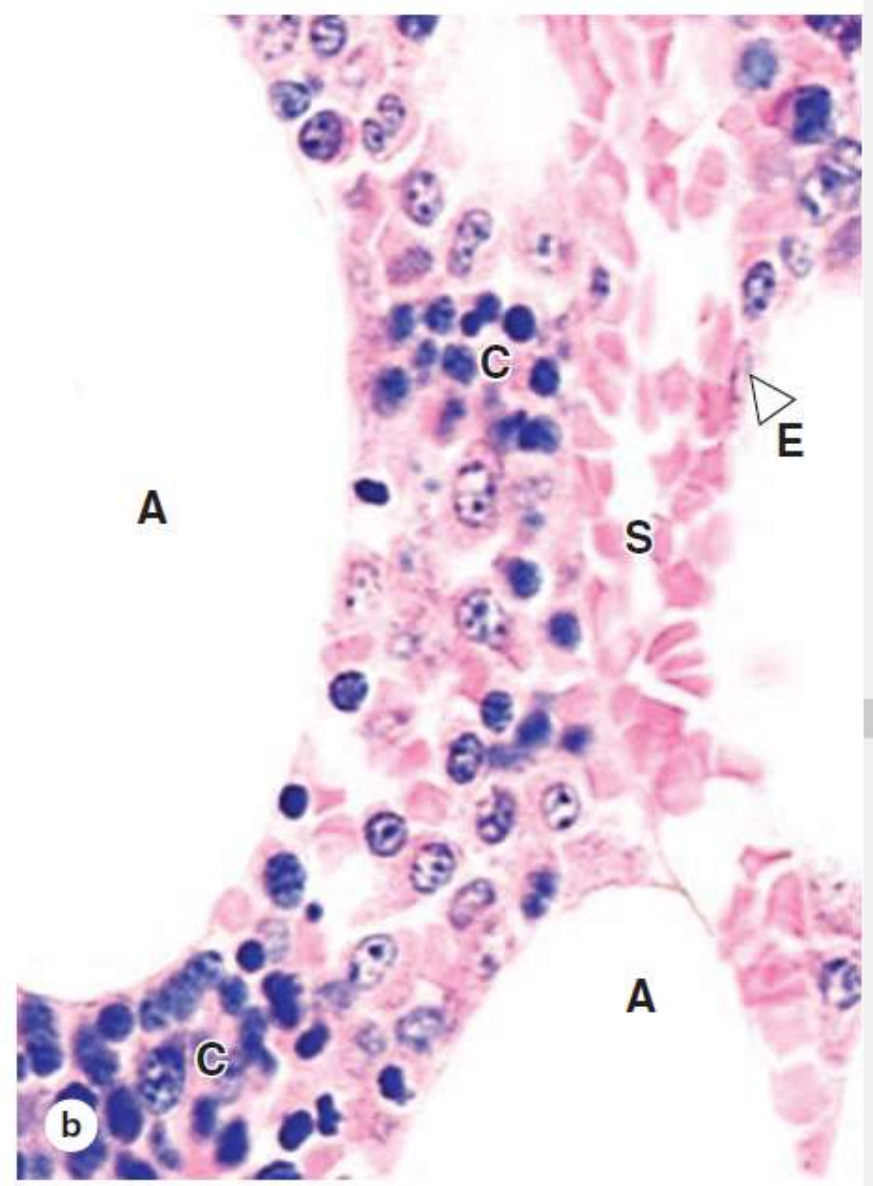
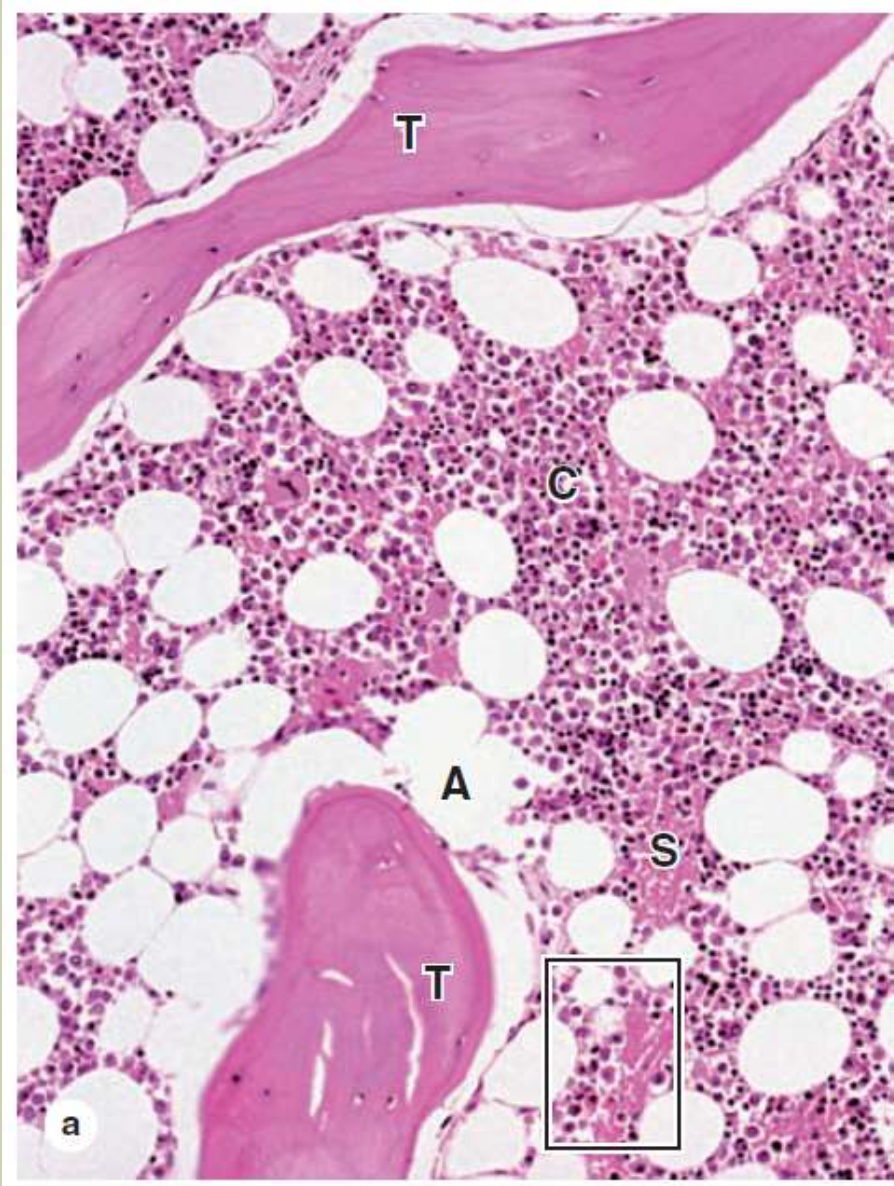
Located at the **endosteum-bone marrow interface**

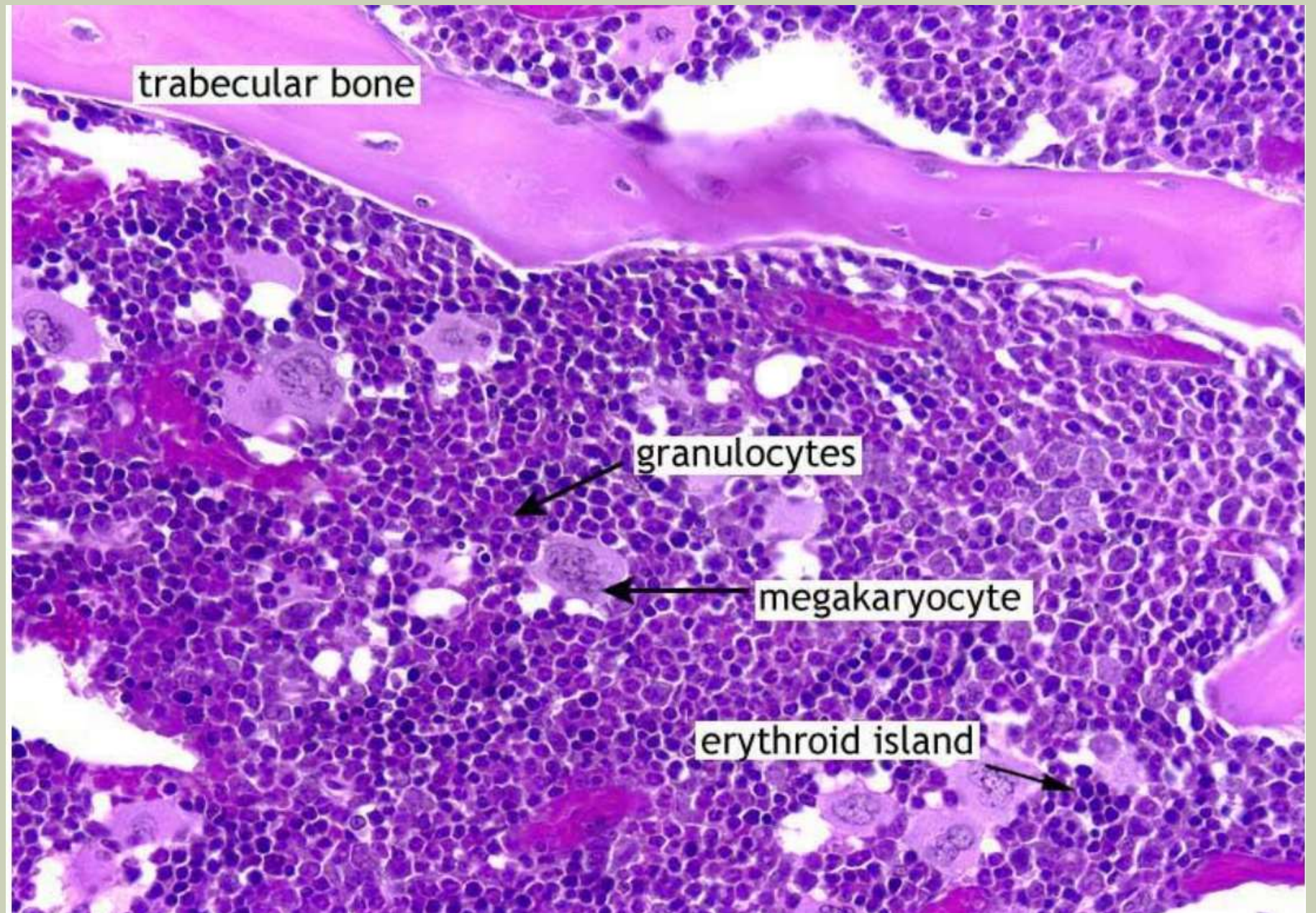
Consist of: preosteoblasts, osteoblasts, osteoclasts and collagen type I

Osteoblasts produce:

- Hematopoietic cytokines : G-CSF, M-CSF, GM-CSF, IL-1, IL-6, IL-7
- CXC – chemokine ligand 12 (CXCL12) with binding affinity to CXCR4
 - CXCL12 – CXCR4 → regulator of migration and localization of HSC in bone marrow
- thrombopoietin







Large fenestrations

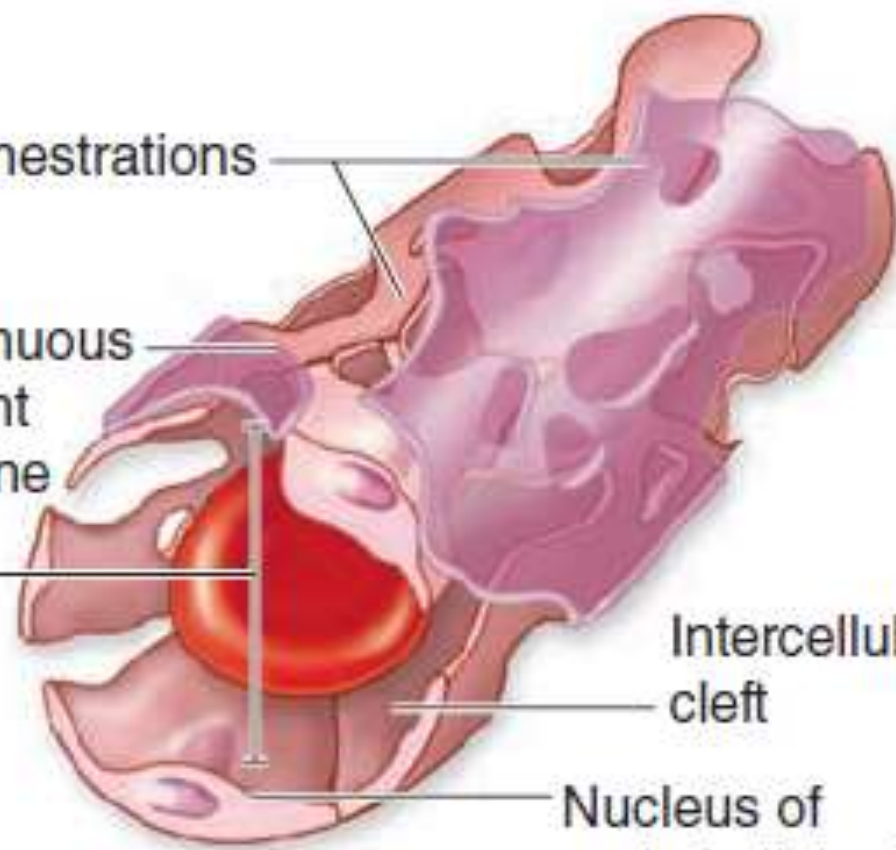
Discontinuous
basement
membrane

Lumen

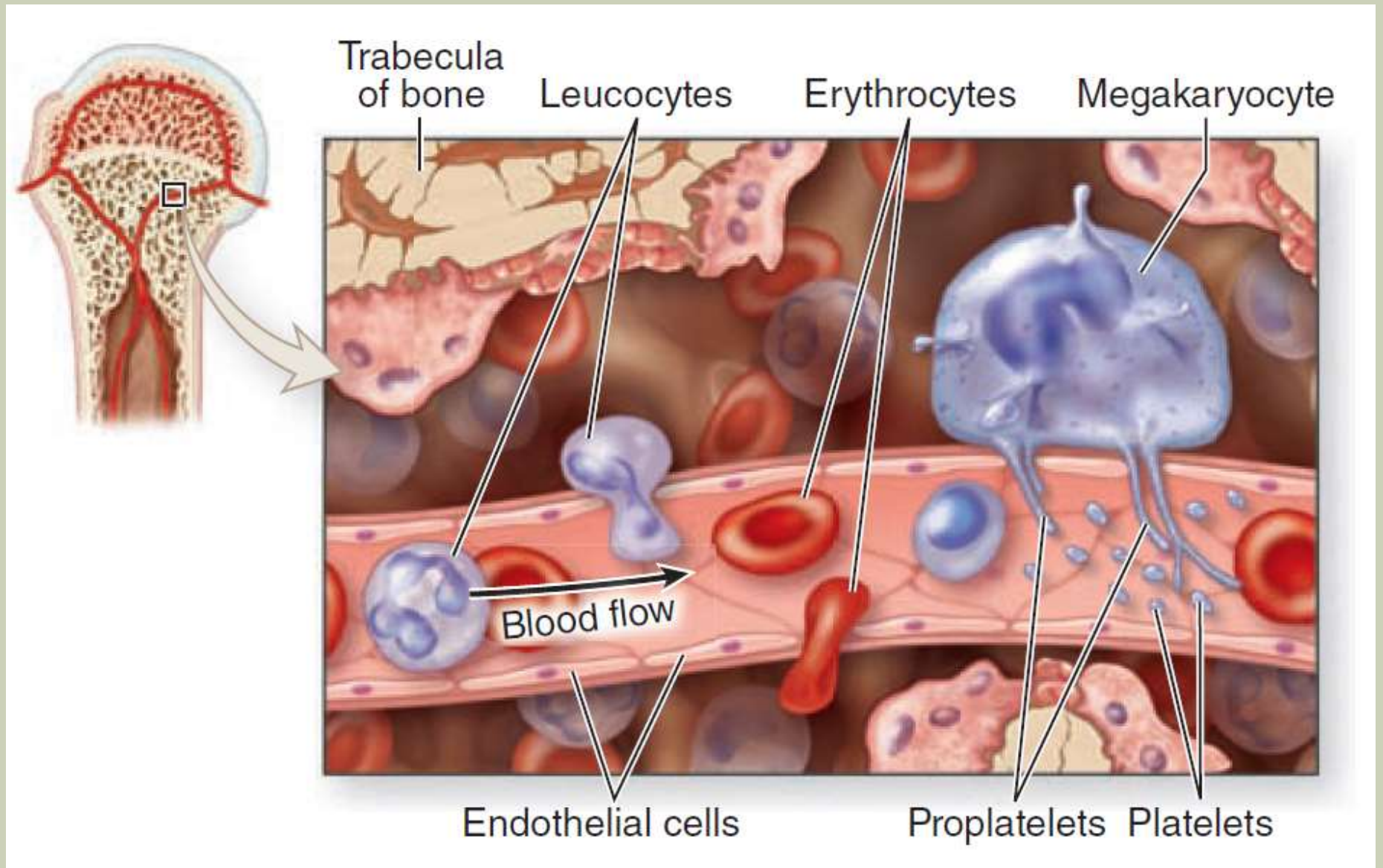
Intercellular
cleft

Nucleus of
endothelial cell

c Sinusoid



TRANSENDOTHELIAL MIGRATION



QUIZ

Jelaskan struktur bone marrow!

Apa perbedaan red bone marrow dan yellow bone marrow?

Sebutkan 2 macam microenvironment pada bone marrow!

Bagaimanakah cara tranlokasi sel darah matur ke lumen sinusoid?

REFERENSI

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