Pathological Analysis Department

Title of the lecture : Hematopoiesis

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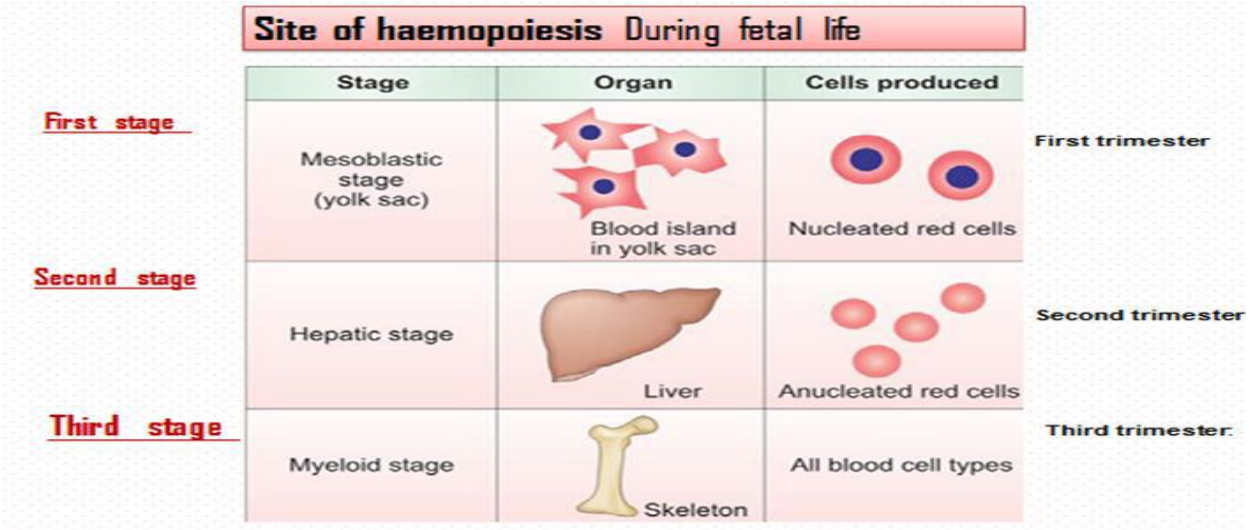
Hematopoiesis



Blood cells production called **hematopoiesis.**

1-The main organs for hematopoies in all human life are

– Liver and Spleen (prenatal period)

– And the bone marrow (BM) (adult period)

2-The secondary hematopoietic organ called the reticuloendothelia system (RES)

Haemopoietic stem and progenitor cells

Definition: They are cells which give new generation of cells, and existing in the bone marrow exclusively and they are:

1-Pluripotent stem cells (PSC) or hemohistoblast

2-Myeloid stem cell (MSC)

3-Lymphoid stem cell (LSC)

MSC and LSC also called Progenitor cells,

Hematopoiesis during infancy and up to about 4 years of age During infancy: all marrow cavities are active in erythropoiesis (almost all the bones of the body) AND CALLED "Red Marrow".

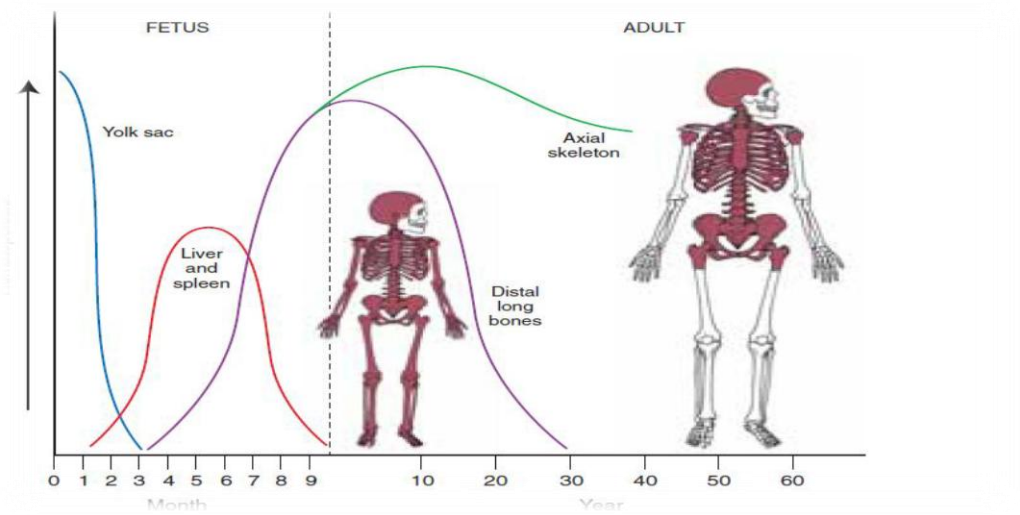
Hematopoiesis During childhood And adult life :

Erythropoiesis becomes gradually restricted to flat bones as;

– skull, vertebrae, sternum,

– Ribs and pelvic bones, in addition to ends of long bones.

The shafts of long bones become populated by fat AND CALLED **yellow marrow**



What are progenitor cells?

-They also called: hematopoietic

-They are the first cells which produce from the stem cell

-They are two, MYELOID and LYMPHOID stem cells

The myeloid stem cell - colony forming unit (CFU).

The cells which produced from the MSC and existing in the peripheral blood are CFU-myeloid stem cell include the following cells

1. CFU-E -- Eryhtrocytes

2. CFU-GM

a. Granulocytes (neutrophils, basophils, eosinophils)

b. Monocytes and macrophages

3. CFU-M -- Megakaryocytes (Platelets)

The cells which produced from the MSC and existing in the peripheral blood as the end product of MSC are

1. Erythrocytes (Red blood cells)
2. Granular cells
3. Monocytes
4. Platelets or Thrombocytes

Colony-forming unit lymphocyte (CFU-L)

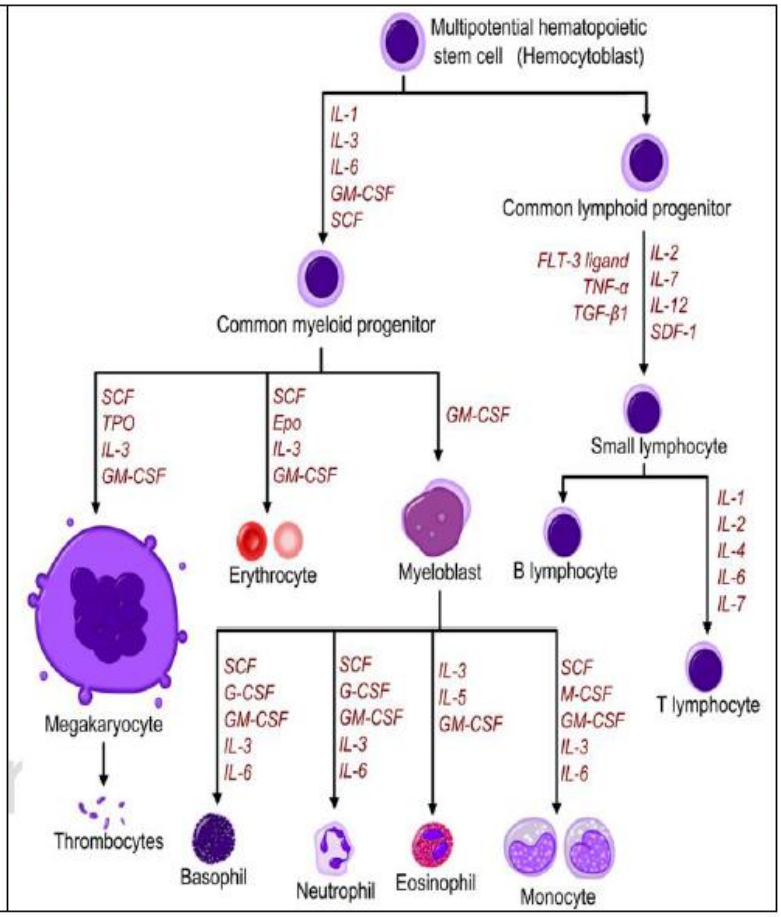
The cells which produced from the **LSC** and **existing** in the peripheral blood are

1. T Lymphocytes
2. B Lymphocytes
3. N-Killer cells

The cells which produced from the LSC and existing in the peripheral blood are**Lymphocytes**

Haemopoietic growth factors
These factors have the capacity to **stimulate the proliferation** of their target progenitor cells when used as a sole source of stimulation The most important are

- **SCF**=Stem Cell Factor --**Act on pluripotential stem cells**
- **Tpo**= Thrombopoietin → platelets
- **Epo**= Erythropoietin→ Erythrocytes
- **IL**= Interleukin
- **GM-CSF**= **Granulocyte Macrophage**-colony stimulating factor
- **M-CSF**= Macrophage-colony stimulating factor --. Monocytes
- **G-CSF**= Granulocyte-colony stimulating factor



Regulation of hematopoiesis

For blood cells production needs regulation and control to produce adequate cells and no more than the normal needs,

for that there are many factors do that.

They called

– Hemopoietic growth factors

– colonies stimulated factors (CSF)

– or cytokines

Haemopoietic growth factors

1. **Chemical nature:** glycoprotein **hormones**

2. **Source:** from all the body cells (**T** –lymphocytes, monocytes, kidney, liver, hematopoietic cells)

3. **Action: stimulate, regulate** and **maintain** the blood cells **Proliferation, Differentiation , Maturation and function**

Growth factor	Abbrev.	Site of action
• Stem Cell Factor	**SCF**	Act on pluripotential stem cells
• Granulocyte-colony stimulating factor	**G-CSF**	Neutrophils
• Macrophage-colony stimulating factor	**M-CSF**	Monocytes
• Granulocyte Macrophage-colony stimulating factor	**GM-CSF**	Granulocytes, monocytes
• Interleukin	**IL 3, 5 6**	B and T cells, Eosinophils, Hematopoietic stem cells
• Thrombopoietin → platelets	**Tpo**	Platelets
• Erythropoietin→ Erythrocytes	**Epo**	RBC

Action: stimulate, regulate and maintain the blood cells

1. **Proliferation,**
2. **Differentiation ,**
3. **Maturation**
4. **and functional activation**