



Dr. M.G.R

EDUCATIONAL AND RESEARCH INSTITUTE

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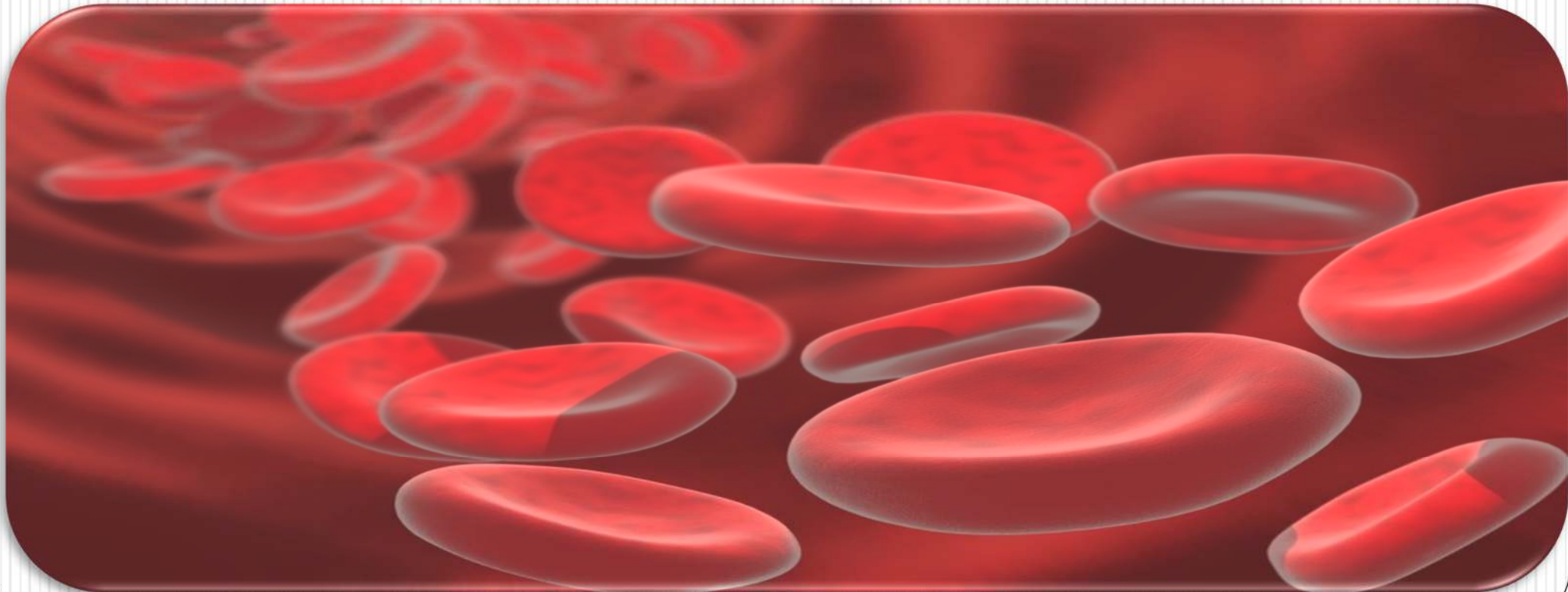
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RBC FORMATION- ERYTHROPOIESIS



INTRODUCTION

- ❑ **Red blood cell**, also called **erythrocyte**, cellular component of blood, millions of which in the circulation of vertebrates give the blood its characteristic colour and carry oxygen from the lungs to the tissues.
- ❑ The mature human red blood cell is small, round, and biconcave; it appears dumbbell-shaped in profile.
- ❑ The cell is flexible and assumes a bell shape as it passes through extremely small blood vessels.
- ❑ It is covered with a membrane composed of lipids and proteins, lacks a nucleus, and contains hemoglobin—a red iron-rich protein that binds oxygen.

ERYTHROPOIESIS

- ❖ **Red blood cells are formed** in the red bone marrow of bones. The formation of RBC is also known as **Erythropoiesis**.
- ❖ Stem cells in the red bone marrow are called hemocytoblasts.
- ❖ They give rise to all of the **formed** elements in blood.
- ❖ If a stem cell commits to becoming a cell called a proerythroblast, it will develop into a new **red blood cell**.
- ❖ **Erythropoiesis** (from Greek 'erythro' meaning "red" and 'poiesis' meaning "to make") is the process which produces red blood cells (erythrocytes), which is the development from erythropoietic stem cell to mature red blood cell.

SITE OF ERYTHROPOIESIS

❖ IN FETAL LIFE :

Erythropoiesis occurs in three stages:

1. **Metabolic stage:** 2 months of intrauterine life, produces from Mesenchyme of yolk sac.
2. **Hepatic stage:** 3 month of intrauterine life, liver, spleen and lymphoid organs are involved in erythropoiesis.
3. **Myeloid stage:** RBCs produced from the red bone marrow and liver.

❖ **UP TO THE AGE OF 20 YEARS :**

RBCs are produced from the red bone marrow of all the bones (long bones and flat bones).

❖ **AFTER THE AGE OF 20 YEARS :**

RBCs are produced from vertebrae, sternum, ribs, scapula, iliac bones and from the end of long bones.

Through bone marrow is the site of production of all blood cells, comparatively 75% of the bone marrow is involved in the production of leukocytes and only 25% is involved in the production of erythrocytes.

STAGES OF ERYTHROPOIESIS

➤ Various stages of erythropoiesis are :

1. Pro-Erythroblast: First cell derived from CFU-E, Size 20 microns, two or more nucleoli, does not contain Hemoglobin, cytoplasm basophilic in nature.

2. Early-Erythroblast: 15 microns size, condensation of chromatin network occurs, basophilic in nature, nucleoli starts disappear.

3. Intermediate-Normoblast: size 10-12 microns in diameter, hemoglobin starts to appear.

4. Late-Normoblast: Size 8-19 microns, cytoplasm acidophilic in nature, nucleus disintegrates and disappears this process is known as pyknosis.

5. Reticulocyte: immature RBC, Cytoplasm contains reticular network, slightly larger than matured RBC.

6. Matured Erythrocyte: Reticular network disappears, without nucleus, 7.2 Micron diameter.

Proerythroblast

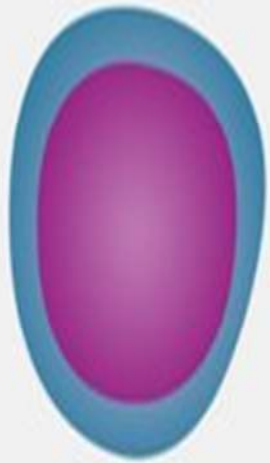
Basophilic
erythroblast

Polychromatophilic
erythroblast

Acidophilic
erythroblast

Reticulocyte

Erythrocyte

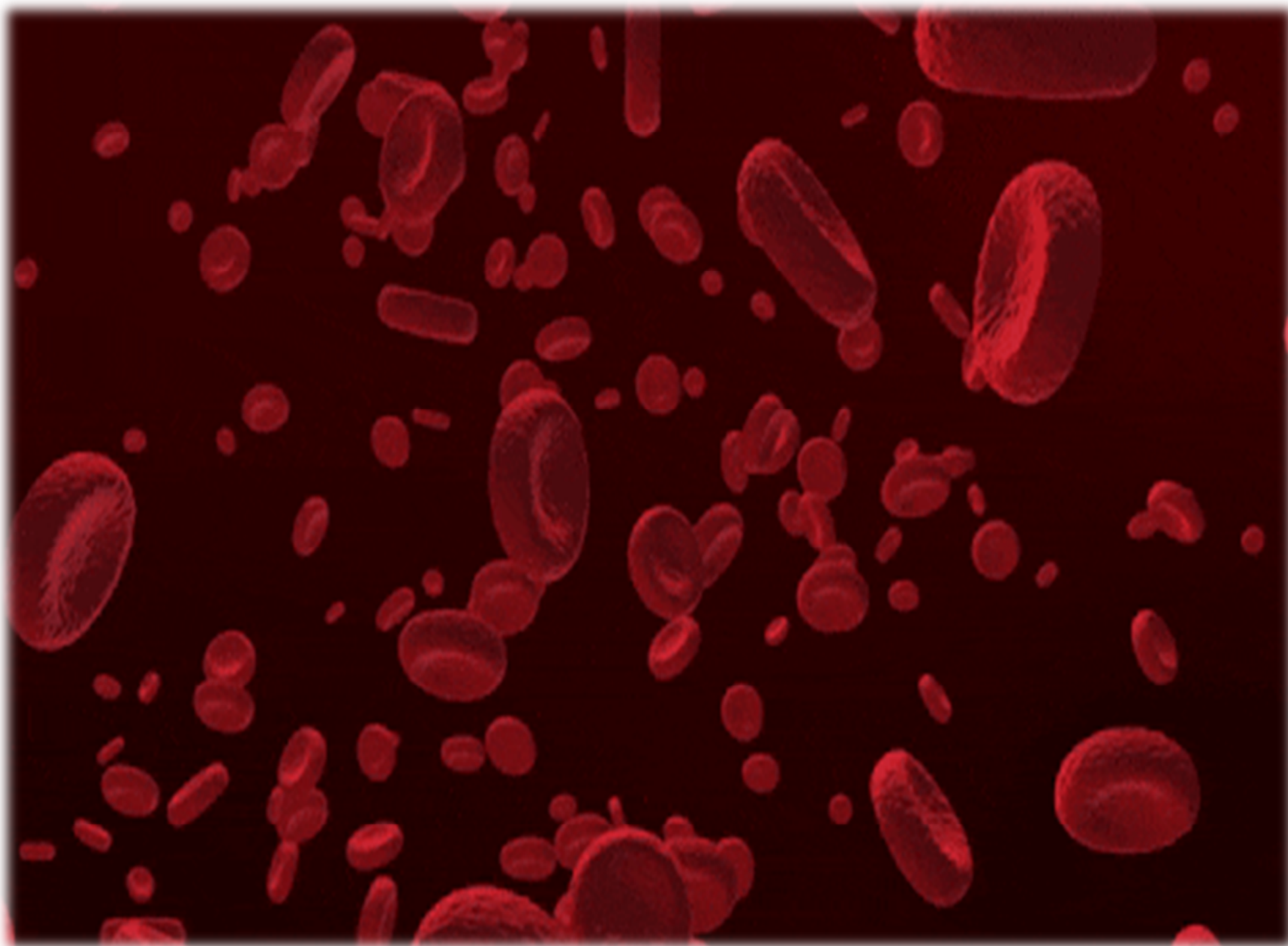


REGULATION OF ERYTHROPOIESIS

- ❑ Erythropoiesis is mainly driven from the Hormone Erythropoietin (EPO), which is a glycoprotein cytokine.
- ❑ EPO is secreted by kidney.
- ❑ It is also regulated by some other hormones and vitamins. Vitamin-B12(Cynocobalamine) and Vitamin B9 (Folic acid).

Testosterone, ADH, Thyroxine-increases Erythropoitin mechanism.

Oestrogen-decreases Erythropoitin mechanism.



FACTORS AFFECTING ERYTHROPOIESIS

- ❑ Oxygen supply to the tissue-High Altitude, increased demand for oxygen in atheletes, COPD, Anemia, Prolonged Heart failure.
- ❑ Healthy bone marrow.
- ❑ Healthy liver.
- ❑ Hormones.
- ❑ Diet
Contains Proteins, Minerals such as Iron, Copper, Cobalt, Vitamin C, Vitamin B12, Vitamin B9

A hand wearing a white latex glove holds a red-capped test tube filled with red liquid. The hand is positioned over a medical form with various test names and checkboxes. The text "THANK YOU" is overlaid on the image in a light blue box with a vertical line pattern. The word "THANK" is in yellow and "YOU" is in green.

THANK YOU



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