Formation of RBC's.

formation of blood cells (RBC, WBC, platelets)
Hematopoiesis (Hemopoiesis)

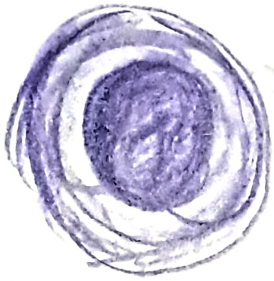
- Erythropoiesis - RBC
- leucopoiesis - WBC.
- Thrombopoiesis - platelets

Erythropoiesis.

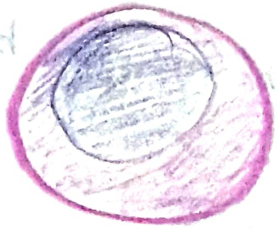
definition: the entire process by which red cells are formed in the body.

Includes: Origin, development & maturation of red cells

Haemato poetic stem cells.



Committed stem cells



poonormoblast.

Early normoblast.

late normoblast.

reticulocyte

mature RBC.

Sites of erythropoiesis.

- **Intrauterine life:**

Mesoblastic phase

- 3rd week to 8th month of IUL
- mesoderm of yolk sac.
- Intravascular erythropoiesis.

Hepatic phase.

from 3rd month (2nd trimester)

liver (mainly) & spleen.

Myeloid phase.

from last trimester onwards.

- Bone marrow chief site
- Medullary erythropoiesis

After Birth: Red bone marrow alone.

- upto 5 years : all bone marrow red.
- after 20 years : axial skeleton (sternum vertebrae, ribs, skull, pectoral girdle, pelvis); proximal ends of long bones (humerus, femur).

Haemopoeitic sum cell.

pluripotent HSC. {uncommitted}

Committed HSC { progenitor cells}

myeloid SC (CFU)

- CFU - E.
  erythrocytes.
- CFU - GM
  Granulocytes ← basophil, neutrophil, eosinophil.
  monocytes
- CFU - M.
  Megakaryocytes.

lymphoid SC.

lymphocytes.

Stages of Erythropoiesis

- pluripotent hematopoietic stem cells (HSC)
- Uncommitted cells.
- properties of stem cells :-
  - Self renewed - stem cell reserve.
  - differentiation - into progenitor cell.

Progenitor cells - committed stem cells.

lymphoid progenitor cells : lymphocytes.

- myeloid progenitor cells : RBC & rest of WBC

  also called CFU-S : Colony forming unit - stem cells.

STAGES OF ERYTHROPOIESIS.

- PHSC, CFU-S, CFU-E
- erythroid precursors - blast cells - mature cells.

Blast cells.

1. pronormoblast / proerythroblast.
2. Early Normoblast {Basophilic Normoblast}.
3. Intermediate normoblast {Polychromatophillic}
4. Late Normoblast {orthochromatic}.

MATURE CELLS.

5. Reticulocyte.
6. Mature erythrocyte.

1. Pronomoblast. (proerythroblast)

- first identifiable cells of erythrocyte series.
- large round or oval cell. ① 15-20 um size.
- ② large nucleus with multiple nucleoli.
- ③ A thin rim of Basophilic cytoplasm (ribosomes plenty).
- ④ Haemoglobin is absent.
- ⑤ Mitosis present.

{5-points must}.

2. EARLY NORMOBLAST

{Basophilic erythroblast}.

- Round cell, 12-16 um size
- Nucleus smaller, nucleoli absent.
- scanty basophilic cytoplasm } lesser basophilic than pronormoblast.
- Hemoglobin is absent.
- mitosis persists.

3. Intermediate Normoblast. {polychromatic erythroblast}.

- 10 - 14 um size.
- very small nucleus - cartwheel appearance.
- cytoplasm polychromatic - both blue & pink.
- Haemoglobin appears.

Mitosis stops - due to Inactivation of chromosomes

4. Late Normoblast. { Orthochromatic erythroblast }.

- last nucleated cell of erythroid series.
- 8 - 12 um size.
- small shrunken nucleus (pyknotic) eccentric, finally ejected out.
- Pink (acidophilic) cytoplasm, Hb content ↑

5. Reticulocyte

- Flat disc shaped cell
- slightly larger than mature RBC (8 µm)
- Immediate precursor of RBC.
- cytoplasm - small amount of RNA - slight basophilic hue.
- Nucleus absent.
- Haemoglobin content ↑.
- Supravital staining - Brilliant cresyl Blue.
  deep blue reticulum of RNA
  {remnants of degraded organelles}

Maturation of reticulocyte.

Takes about 1-2 days {1 day in Bone marrow & 1 day in peripheral blood}

- Organelles - mitochondria & ribosome disappear.
- Only RBC precursor found in peripheral blood normally.
- Normal reticulocyte count: 0.5 - 2% of RBC count
- Infants - 2 - 6%

Reticulocytosis - Increase in reticulocyte count.

- Increased erythropoiesis in marrow.
- Hemolytic anaemia, treatment of deficiency anaemia, high altitude.

Reticulopenia - decrease in reticulocyte count.

→ aplastic anaemia.

6. Mature erythrocyte.

- Biconcave disc shaped with central pallor.
- No nucleus, 7.5 um size.
- deeply acidophilic cytoplasm (max Hb)

Changes during Erythropoiesis.

Duration of Erythropoiesis = 7 days.

- 5 days till reticulocyte stage
- 2 days to mature red cell.

- Cell size - decreases.

Nucleus - condenses: becomes pyknotic: then disappears.

- Haemoglobin content: increases
- cytoplasm: basophilic: polychromatophilic: acidophilic