



→ Formed partially in bone marrow and partly in lymph tissue

Bone marrow

- (1) Granulocytes
- (2) Monocytes
- (3) Few Lymphocytes

Lymph tissue

- (1) Lymphocytes
- (2) Plasma cells.

General characteristics:-

Types:-

- (1) Polymorphonuclear Neutrophils
- (2) P. eosinophils
- (3) P. basophils
- (4) Monocytes
- (5) Lymphocytes
- (6) Plasma cells (occasionally)

Concentration:-

→ About 7000 / μl or mm^3 .

→ Approx %

Neutrophils = 62%

Eosinophils = 2.3%

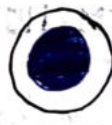
Basophils = 0.4%

Monocytes = 5.3%

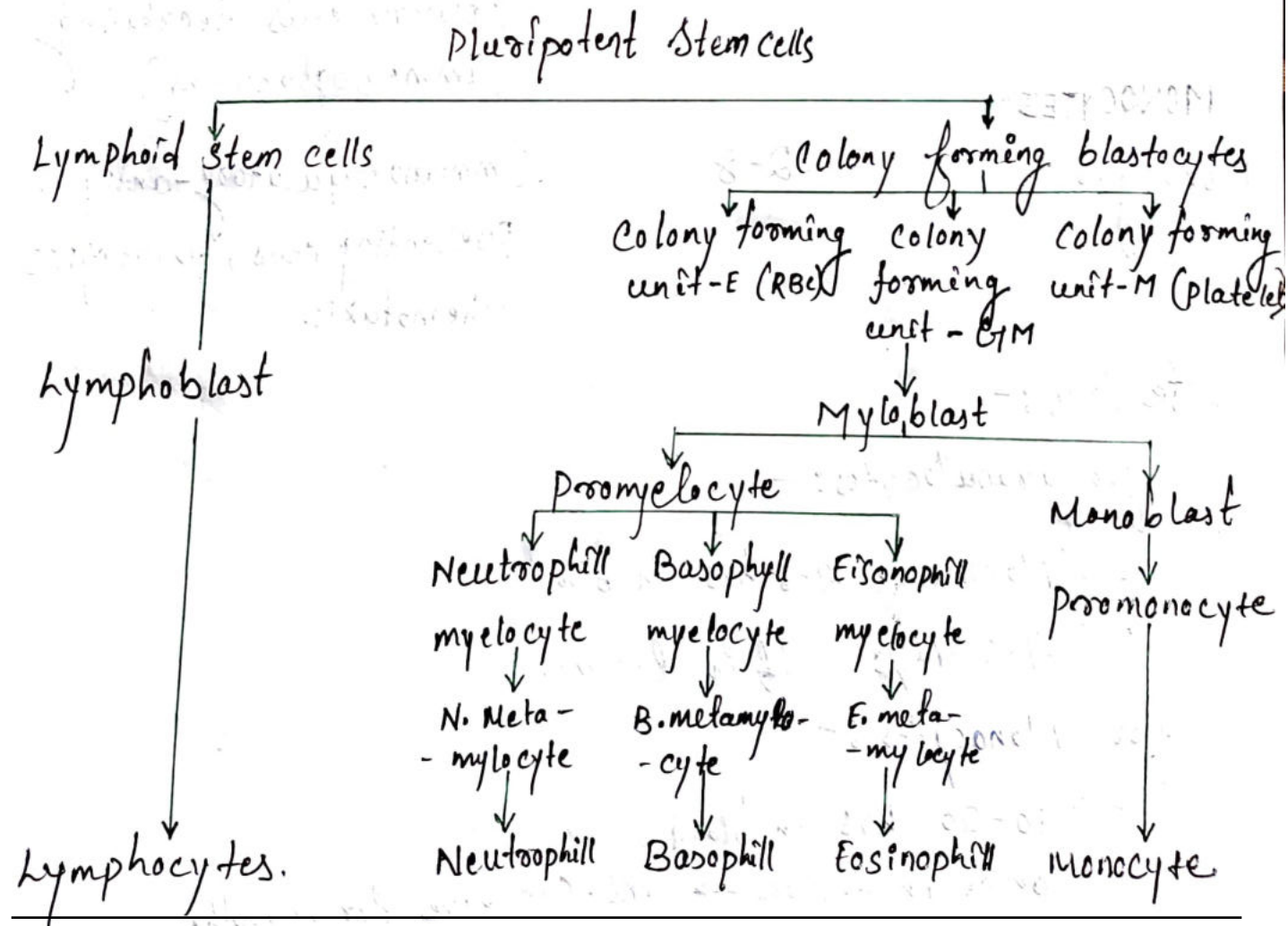
Lymphocytes = 30%

* About 3 times as many WBC are stored in the marrow as circulate in the entire blood.

(Representing a ready supply)

Eosinophils	2 to 4	150 to 300	10 to 14	7 to 12	
Basophils	0 to 1	0 to 100	8 to 10	12 to 15	
Monocytes	2 to 6	200 to 600	14 to 15	2 to 5	
Lymphocytes	20 to 30	1500 to 3,000	7 to 12	1/2 to 1	

Leukopoiesis:- aka Genesis of leukocytes.
 → The development and maturation of leukocytes.



MYELOIDS

Neutrophils

50-70

Endothelial adhesion, chemotaxis, phagocytosis, antibac. Comp. in granules

Eosinophils

1-4

Interaction with T lymphocytes in allergy, helminth land

Basophils

<0.5

Inflammation, initiation of repair after injury.

LYMPHOID

T lymphocytes

20-40

cellular immunity (cell memory and cytotoxic T cells)

B lymphocytes

Humoral immunity (plasma cells secreting immunoglobulins)

MONOCYTES

Monocytes

2-8

Immuno regulatory - antigen presenting cells, phagocytosis, Chemotaxis.

Life Span:-

for granulocytes:-

- Normally 4-8 hrs in blood.
- 4-5 days if in tissue

for Monocytes:-

- 10-20 hrs in blood
- once in tissue → cell can live for months

(Then cell becomes macrophage)



→ life span of weeks or months.

variations:-

- (I) Age : Infant → $20,000/\text{mm}^3$
Children → $10,000 - 15,000/\text{mm}^3$
Adult → $4000 - 11,000/\text{mm}^3$
- (II) Sex : Males → Females (slightly)
- (III) Diurnal: Max in afternoon
min in early morning
- (IV) Exercise: Slightly ↑
- (V) Sleep : ↓
- (VI) Emotional condition (anxiety): ↑
- (VII) Pregnancy: ↑
- (VIII) Menstruation: ↑
- (IX) Parturition: ↑

Pathological:-

- (I) Leukopenia: ↓ below $4000/\text{mm}^3$
 - Anaphylactic shock
 - Cirrhosis
 - Disorders of spleen
 - Pernicious Anemia
 - Typhoid & paratyphoid
 - Viral infection.

- Infestation
- Allergy
- Common cold
- Tuberculosis
- Glandular fever.

- (3) Granulocytosis: Abnormal $\uparrow$ in no. of granulocytes.
- (4) Granulocytopenia: Abnormal $\downarrow$ in granulocytes.
- (5) Agranulocytosis / Agranulosis / Granulopenia:-
Acute pathological cond. characterised by absolute lack of granulocytes particularly Neutrophils.
- (6) Leukemia:-

Defⁿ:- Leukemia is a type of blood cancer characterized by production of large number of leukocytes including immature and abnormal leukocytes.

Types:-

- (1) Acute lymphocytic or lymphoblastic leukemia, which is characterised by rapid $\uparrow$ in No. of lymphocytes.
- (2) Chronic lymphocytic or lymphoblastic leukemia, which is characterised by gradual $\uparrow$ in No. of lymphocytes.
- (3) Acute myeloid or myelogenous leukemia, characterised by rapid $\uparrow$ in No. of myeloid cells (granulocytes & monocytes).
- (4) Chronic myeloid or myelogenous leukemia:
Characterised by gradual $\uparrow$ in No. of myeloid cells.

Risk factors:-

- Previous chemotherapy or radiation therapy.
- Exposure to nuclear radiations.
- Long-term exposure to chemicals.
- Smoking
- Genetic disorder (Down Syndrome)

Common Signs & Symptoms:-

(1) Persistent tiredness or weakness.

(2) weight loss.

(3) Pain in bones or joints

(4) Lymph node swelling

(5) Frequent infections

(6) Anemia

(7) Bleeding

(8) Bruising (skin discolouration due to injury of underlying soft tissue resulting in rupture of minute blood vessel and leakage of blood).

Properties of WBC:-

(1) Diapedesis

(2) Ameboid movement

(3) Chemotaxis

(4) Phagocytosis (Neutrophils & Monocytes)

(Neutrophils, monocytes and lymphocytes)