

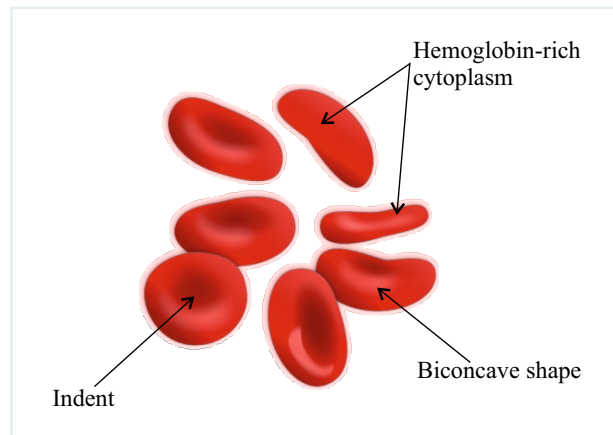


- Hematology is popularly defined as the science of study of the blood and various disorders associated with it.
- Blood consists of two elements:
  - Plasma, which is the liquid component.
  - Erythrocytes(RBC), Leucocytes(WBC) and Thrombocytes(Platelets): They are the solid components.
- The solid components are formed as a result of a process called Hematopoiesis.
- Hematopoiesis results in the formation of the solid components.

Refer Image 1.1

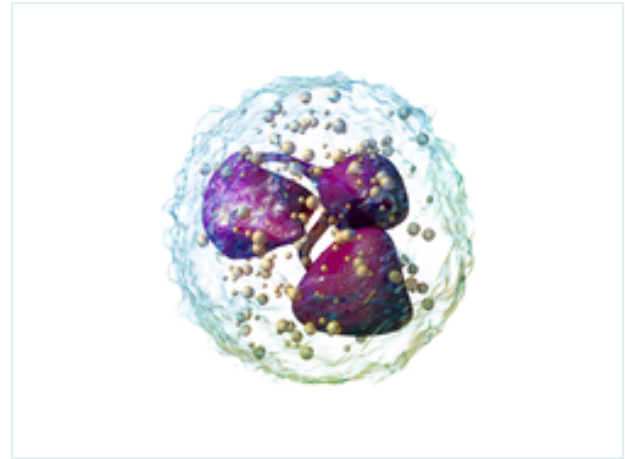
- Formation of blood cells occurs in the bone marrow.
- A pluripotent stem cell serves as the mother cell in the bone marrow.
- The mother cell is the originator of all blood cells. It has a self renewing property and create further progenitors.

### Erythrocytes



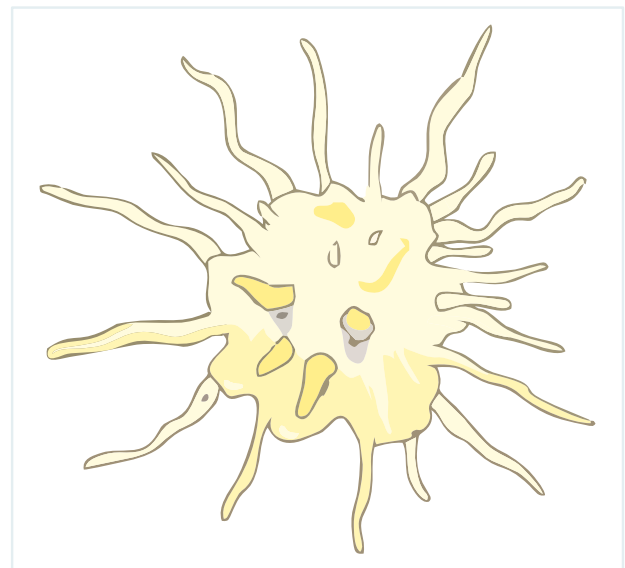
- Structure: Biconcave, anucleate cells. Organelles absent.
- Function: Transport of Oxygen to tissues and Carbon-dioxide to lungs.
- Lifespan: 120 days in healthy adults,
- Glucose is the primary source of energy for erythrocytes.
- Both increase and decrease in erythrocyte count indicates an abnormality.
- Normal range:
  - Male: 4.5 - 5.9 mil/uL
  - Female: 4.0 - 5.2 mil/uL

### Neutrophils



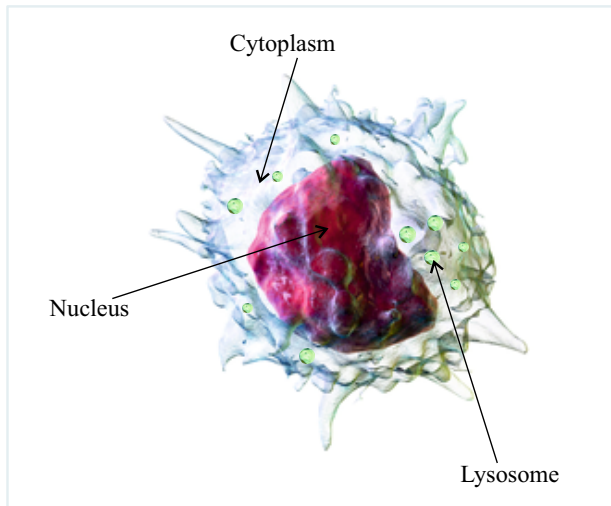
- Structure: Multi-lobed nucleus.
- Function: Participates in acute inflammatory response.
- Contains specific enzymes for inflammatory responses.

### Thrombocytes



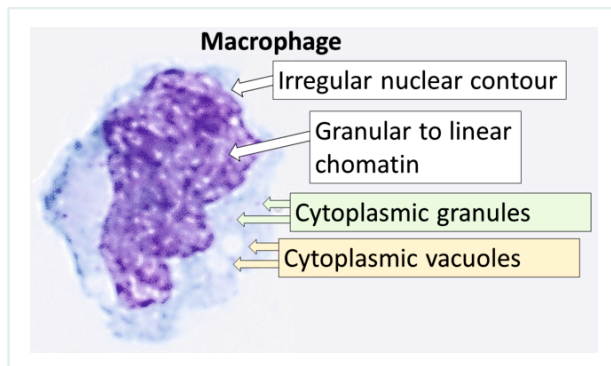
- Structure: Anucleate, Small cytoplasmic fragments
- Function: Involved in primary hemostasis.
- Lifespan: 8-10 days.

## Monocyte



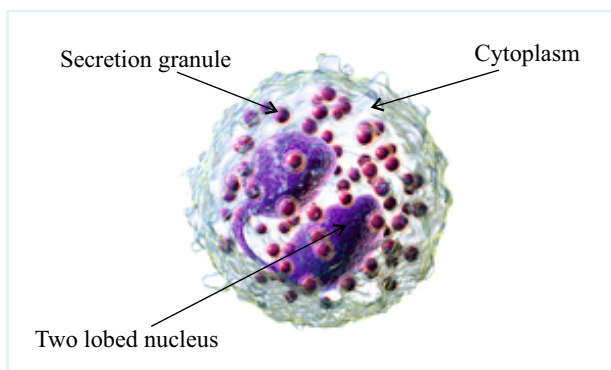
- Structure: Large kidney shaped nucleus, 'Frosted Glass' cytoplasm.
- Function: Differentiate into macrophage in tissues.

## Macrophages



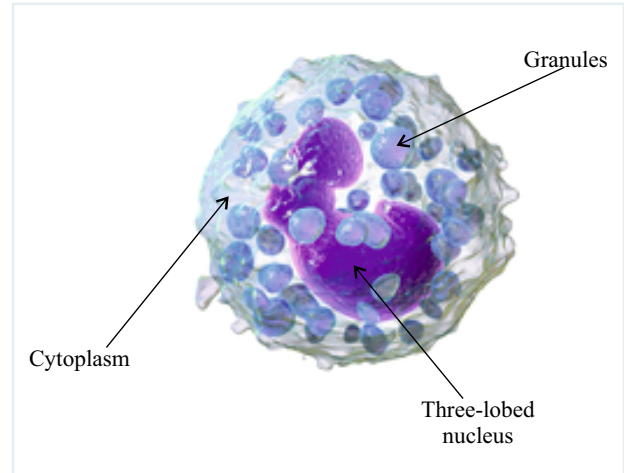
- Structure: Large, Differentiated from monocytes.
- Function: Phagocytosis.

## Eosinophils



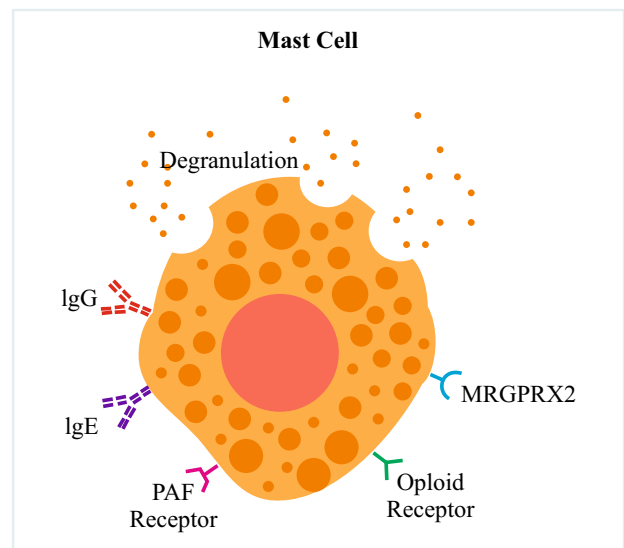
- Structure: Bilobate nucleus, Large granules.
- Function: Phagocytosis, useful especially against helminthic infection.

## Basophils



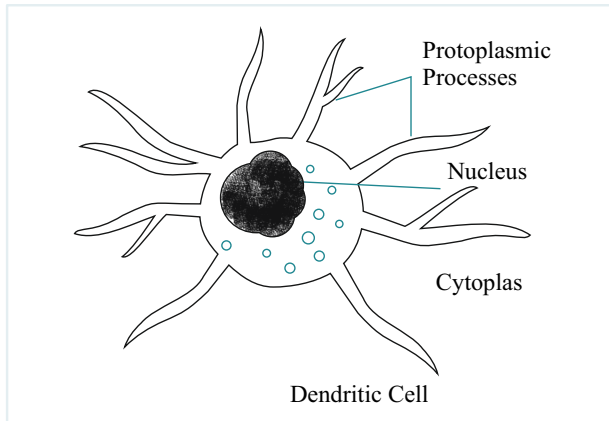
- Structure: Densely arranged basophilic granules
- Function: Mediate allergic reaction and leukotriene synthesis

## Mast Cells



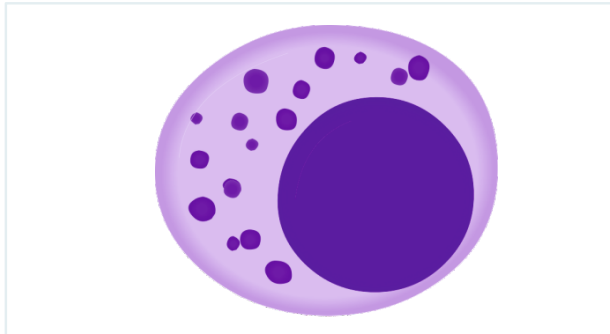
- Structure: Basophilic granules.
- Function: Mediate local tissue allergic reaction.

### Dendritic Cells



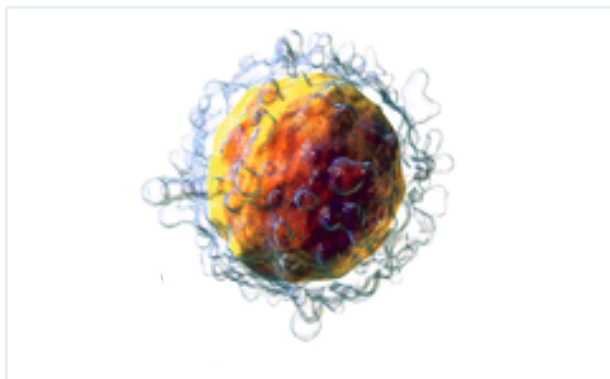
- Function: Serves as a link between innate and adaptive immune system.

### Natural Killer Cells



- Structure: Larger than B and T cells, Distinctive cytoplasmic lytic granules.
- Function: Important in immune reactions against intracellular pathogens.

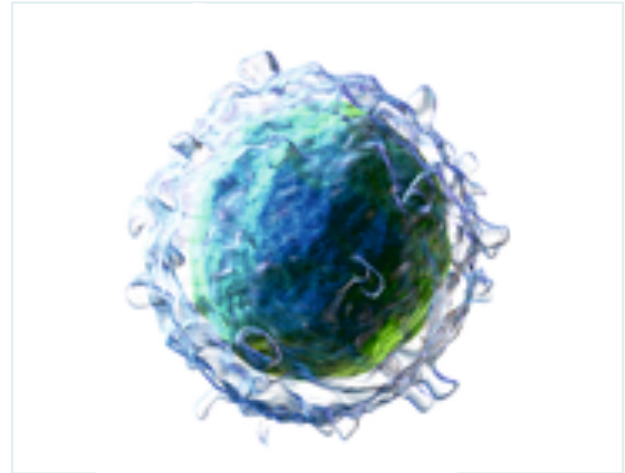
### B Cells



- Origin: Stem cell in the bone marrow.
- Matures in the Bone marrow.

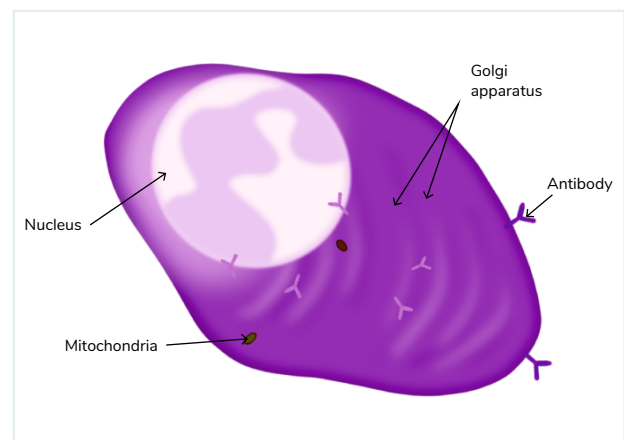
- Function: Mediate humoral immune response.
- Differentiate into plasma cells.

### T Cells



- Origin: Stem cells in the bone marrow.
- Matures in the thymus.
- Function: Mediate cellular immune response.
- Differentiates into helper T cells, cytotoxic T cells and regulatory T cells.

### Plasma Cells



- Structure: 'Clockface' chromatin, well developed golgi apparatus.
- Function: Produce antibody.

### Blood Groups

#### ABO Classification

Refer Image 1.2

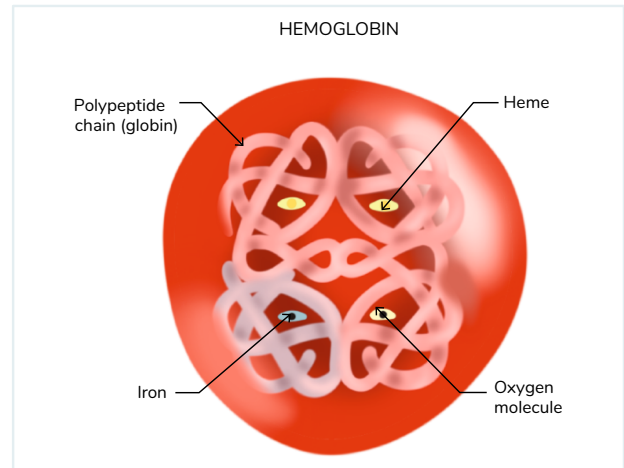
### Blood Smear Reading- Microscopic

Blood Type	Anti-A	Anti-B	Anti-D	Control
O-Positive				
O-Negative				
A-Positive				
A-Negative				
B-Positive				
B-Negative				
AB-Positive				
AB-Negative				
Invalid				

### Blood Type Compatibility

		You can receive type							
		O+	O-	A+	A-	B+	B-	AB+	AB-
If you are type	O+								
	O-								
	A+								
	A-								
	B+								
	B-								
	AB+								
	AB-								

### Hemoglobin



- Hemoglobin is a metalloprotein present in red blood cells.
- Structure: Has two  $\alpha$  subunits and two  $\beta$  subunits ( $\alpha\beta$ )<sub>2</sub>.
- Function: Hemoglobin carries Oxygen from lungs to tissues.
- Has different affinity towards different elements.

Type of Hb	Levels	Indication
Hemoglobin A1	12.1-16.3g/dL, 90% of total hemoglobin	Low levels indicate anemia or blood loss.
Hemoglobin A2	1.5%-3.5% of total hemoglobin	High levels may indicate thalassemia
Hemoglobin F	50-90% in neonates, 0%-1% of total hemoglobin in adults	Normally high in neonates, long term elevations may indicate a thalassemia
Hemoglobin S	Presence is abnormal	Indicative of sickle cell disease
Plasma	5mg/dL	High levels may indicate a hemolytic anemia.

Image 1.1

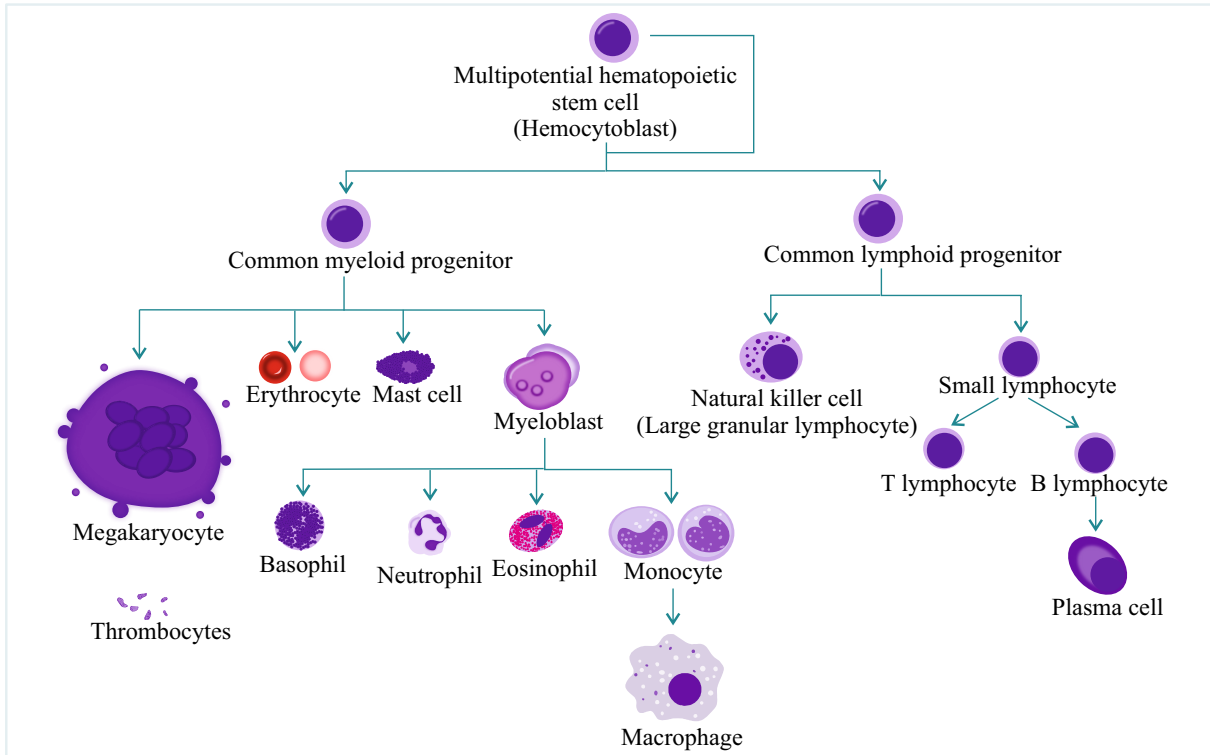


Image 1.2

	Group A	Group B	Group AB	Group O
Red blood cell type				
Anti Bodies in plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Anti Bodies in red blood cell	 A antigen	 B antigen	 A and B antigen	None