SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF RADIOGRAPHY AND IMAGING TECHNOLOGY

COURSE NAME : HUMAN ANATOMY AND PHYSIOLOGY

RELEVANT TO RADIOLOGY

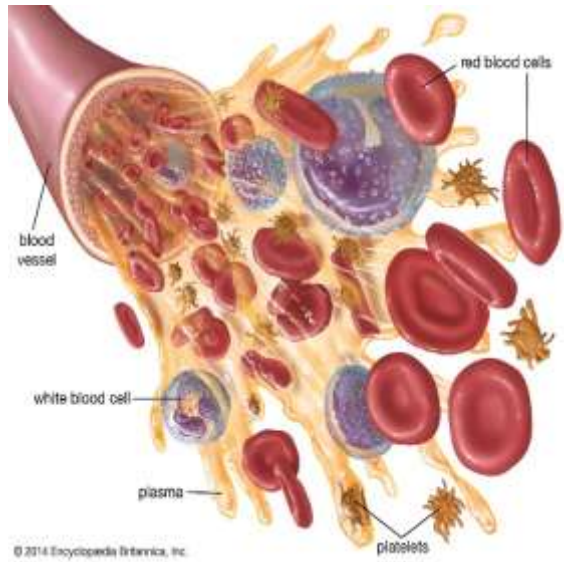
UNIT : HEMATOLOGY

TOPIC :BLOOD GROUPING,COAGULATION AND DISORDERS - RECAP

FACULTY NAME : MRS.G.HELANA JOY

INTRODUCTION (Define)

- Hematology is the study of blood, blood-forming organs, and blood diseases.
- Blood is essential for transportation, protection, and regulation in the body.



Composition of Blood

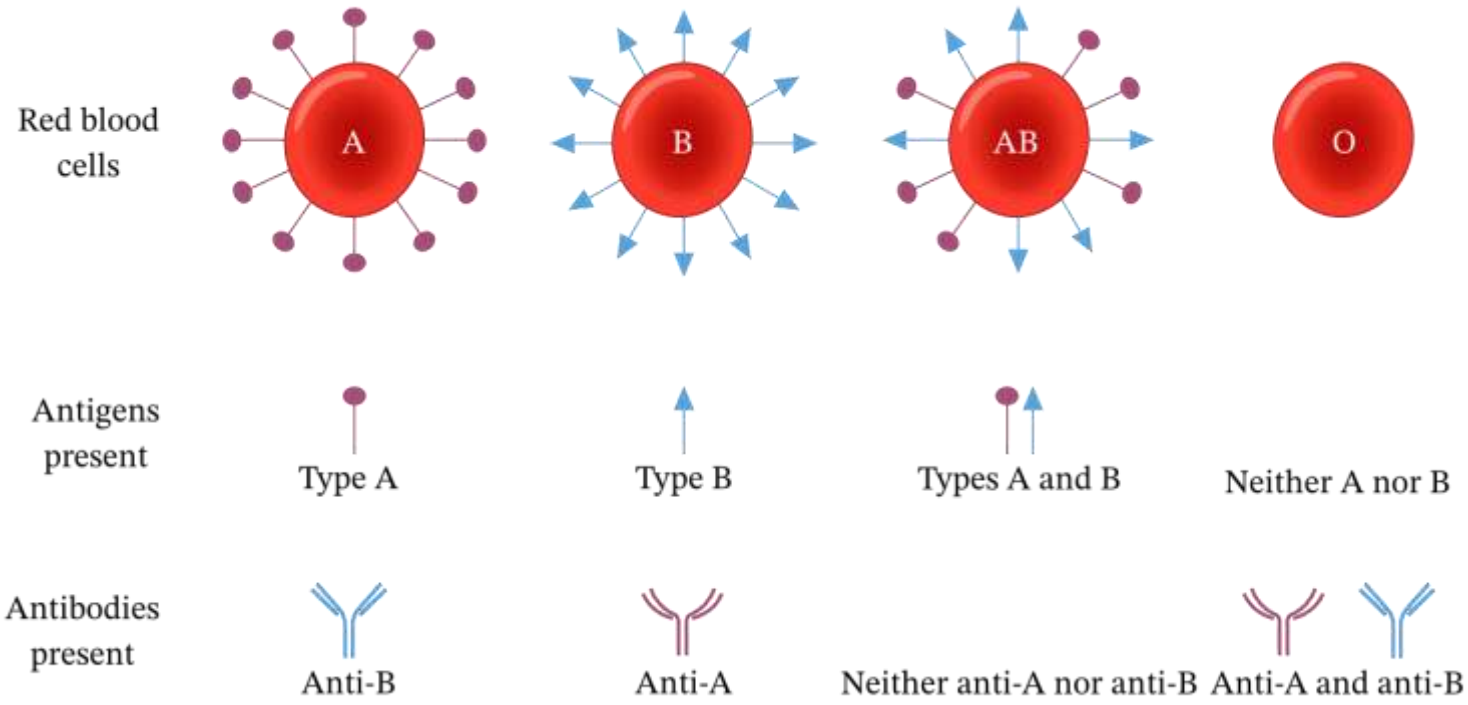
- Blood consists of plasma (liquid) and formed elements (RBCs, WBCs, platelets).
- Functions include transporting oxygen, nutrients, and waste; immune defense; and clotting

BLOOD GROUP AND ITS TYPES

- Blood groups are classifications based on specific antigens and antibodies on RBCs.
- Accurate blood typing is crucial for safe transfusions.

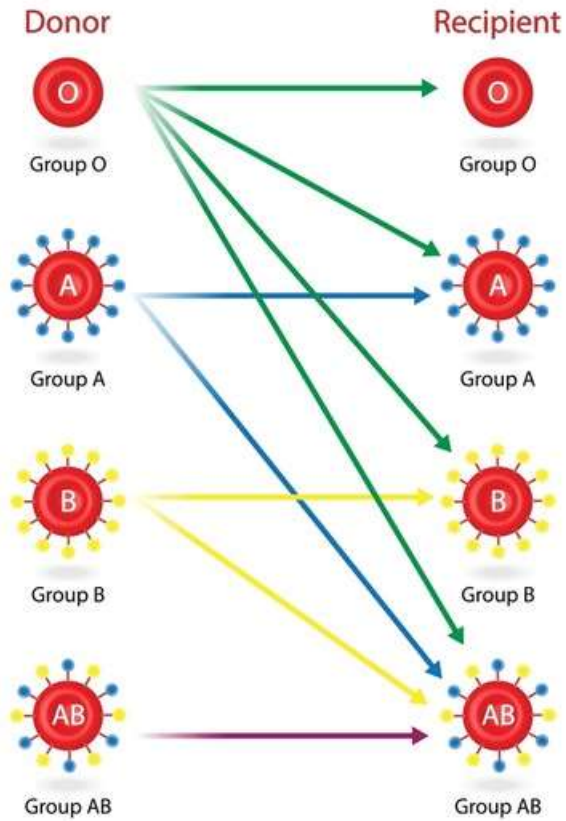
Types:

- A, B, AB, and O, depending on presence/absence of A or B antigens on RBCs.
- Antibodies in plasma are against antigens not present on RBCs.


Red blood cells
A
B
AB
O
Antigens present
Type A
Type B
Types A and B
Neither A nor B
Antibodies present
Anti-B
Anti-A
Neither anti-A nor anti-B
Anti-A and anti-B

ABO BLOOD GROUP SYSTEM

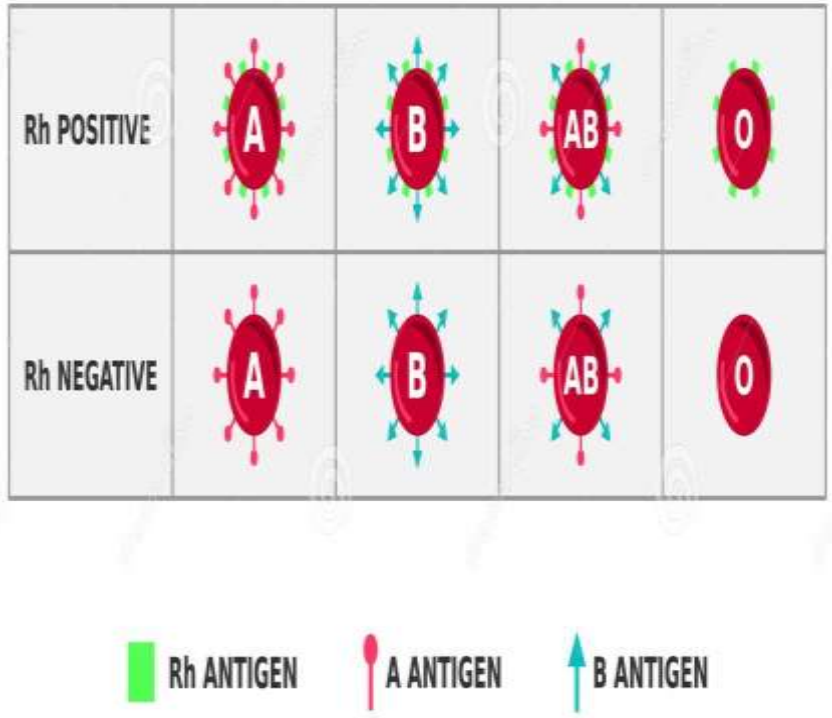
- **Type A**: A antigens, anti-B antibodies.
- **Type B**: B antigens, anti-A antibodies.
- **Type AB**: A and B antigens, no antibodies (universal recipient).
- **Type O**: No antigens, anti-A and anti-B antibodies (universal donor).

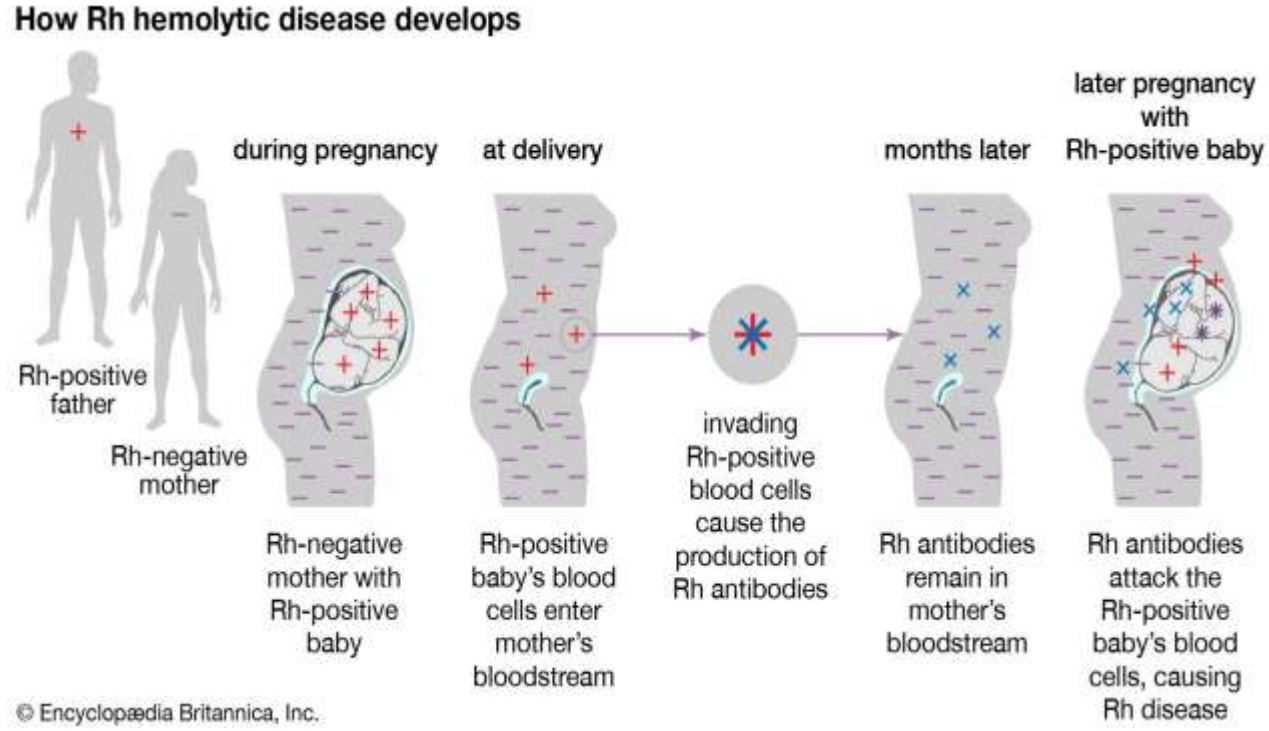


RH BLOOD GROUP SYSTEM

- Rh factor: Presence (Rh+) or absence (Rh-) of D antigen on RBCs.
- ~85% of people are Rh+; Rh- blood is rarer.
- Clinical relevance: Rh incompatibility in pregnancy (e.g., hemolytic disease of the newborn).

RH BLOOD GROUP SYSTEM





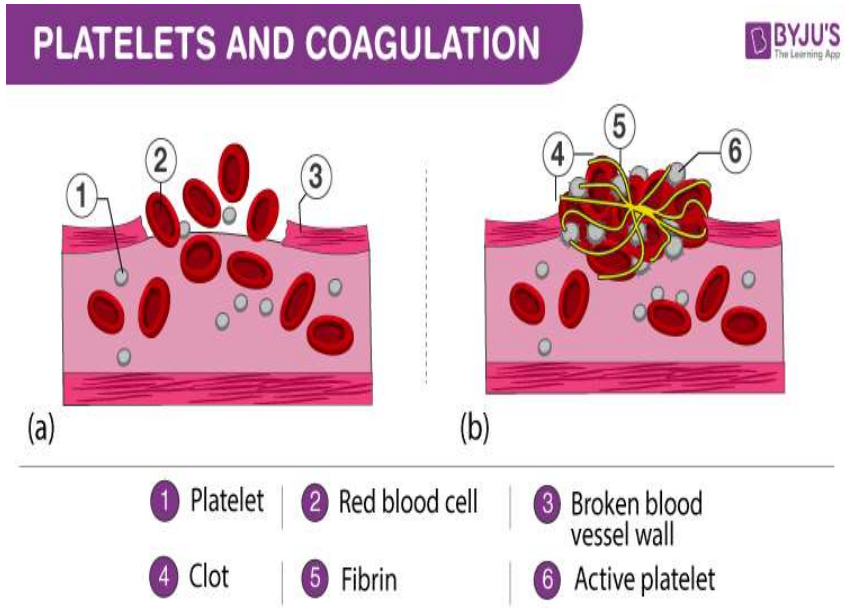
BLOOD TRANSFUSIONS AND COMPATIBILITY

- Transfusions require matching ABO and Rh types to avoid agglutination.
- Cross-matching tests ensure compatibility.
- Universal donor: O- (no antigens); universal recipient: AB+ (no antibodies).

Blood Group	Antigens	Antibodies	Can give blood (RBC) to	Can receive blood (RBC) from
AB	A and B	None	AB	AB, A, B, O
A	A	B	A and AB	A and O
B	B	A	B and AB	B and O
O	None	A and B	AB, A, B, O	O

HEMOSTASIS – THE COAGULATION PROCESS

- Coagulation (hemostasis): Process to stop bleeding via clot formation.
- Three phases: Vascular spasm, platelet plug formation, coagulation cascade.
- Involves platelets, clotting factors (proteins), and fibrin.

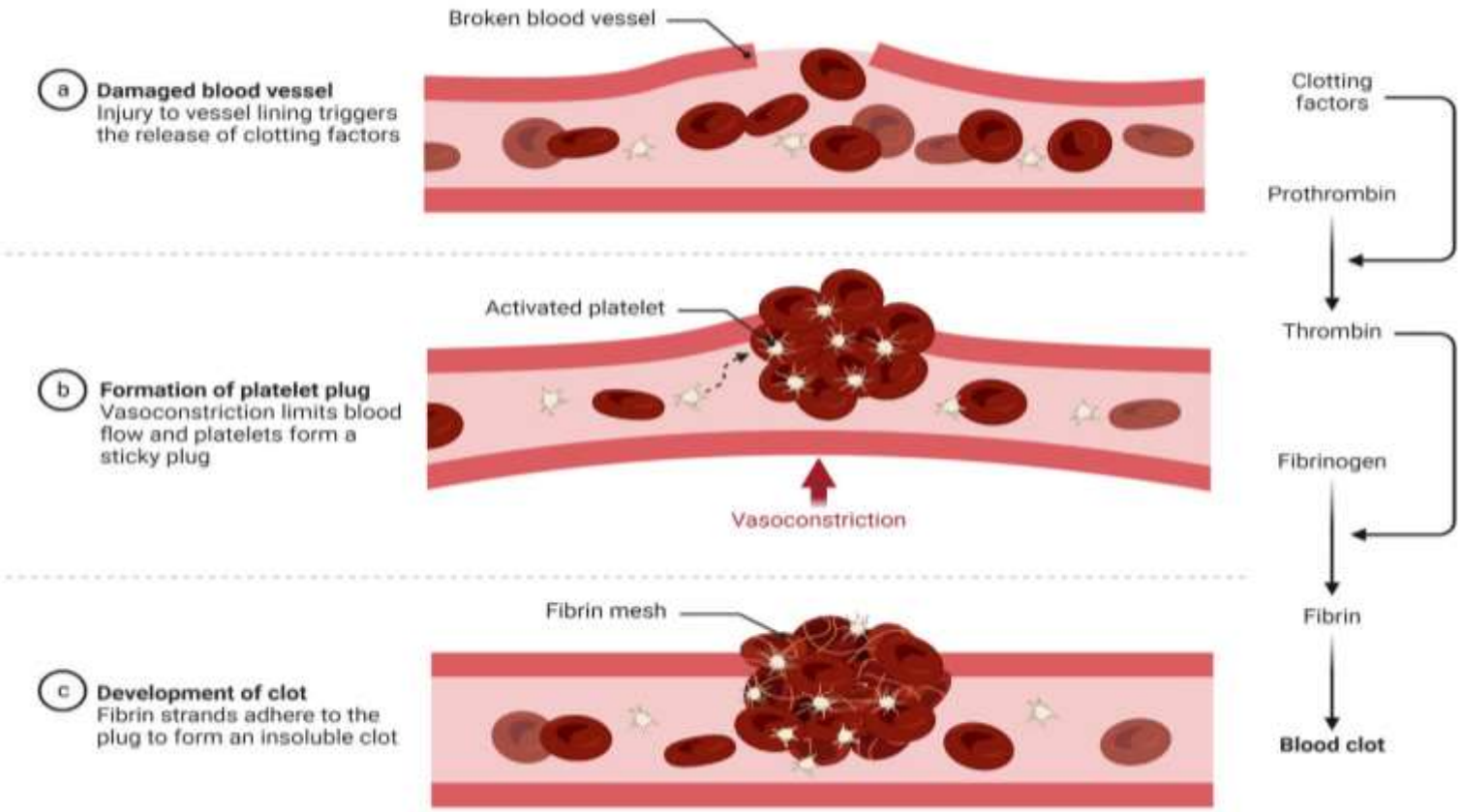


MECHANISM OF BLOOD COAGULATION

Stages of Hemostasis

- **Vascular Spasm:** Immediate constriction of the damaged blood vessel to reduce blood flow.
- **Platelet Plug Formation (Primary Hemostasis):** Platelets adhere to the exposed collagen fibers at the injury site, become activated, and aggregate to form a temporary plug.
- **Blood Coagulation (Secondary Hemostasis):** A complex cascade of enzymatic reactions involving **clotting factors** that results in the formation of a stable **fibrin clot**.

MECHANISM OF BLOOD COAGULATION



MECHANISM OF BLOOD COAGULATION

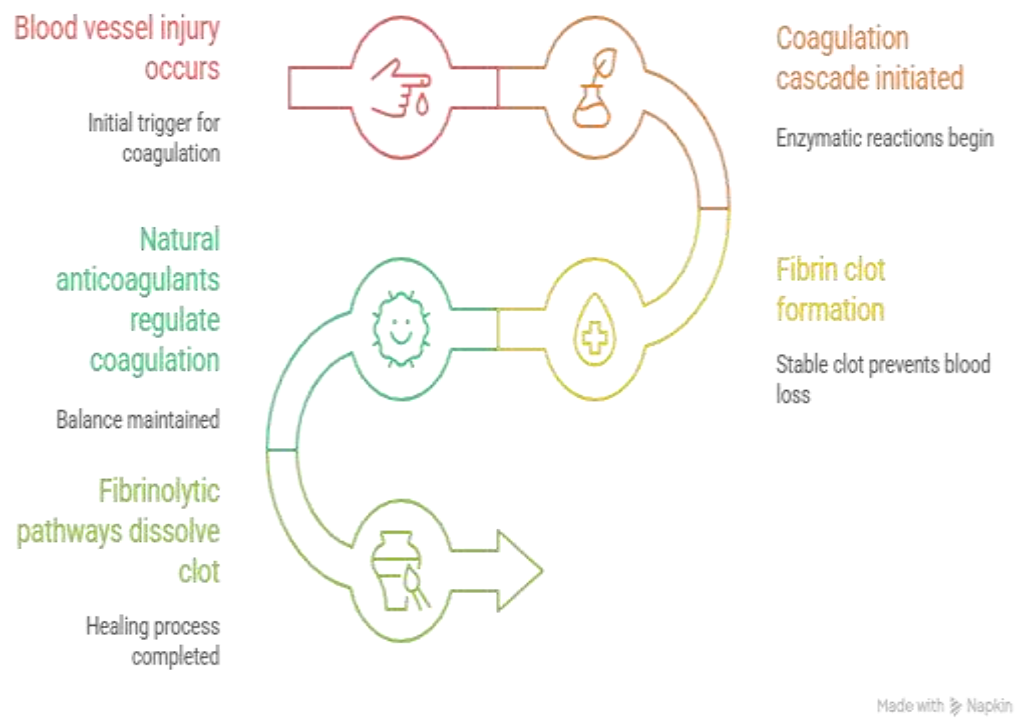
The Coagulation Cascade

The cascade involves a series of sequential activations of proteins (clotting factors, most numbered with Roman numerals), ultimately leading to the conversion of **fibrinogen** to **fibrin**.

Pathway	Triggered by	Role	Test to Monitor
Extrinsic Pathway	**Tissue Factor (Factor III)** exposed after external trauma to the vessel wall.	**Initiates** clotting.	**Prothrombin Time (PT) / INR**
Intrinsic Pathway	Factors internal to the blood (e.g., Factor XII) activated by contact with exposed **collagen** or foreign surfaces (like glass).	**Amplifies** clotting.	**Activated Partial Thromboplastin Time (aPTT)**
Common Pathway	Begins when both pathways activate **Factor X**.	Leads to **Thrombin** and **Fibrin** formation.	PT and aPTT both measure it.

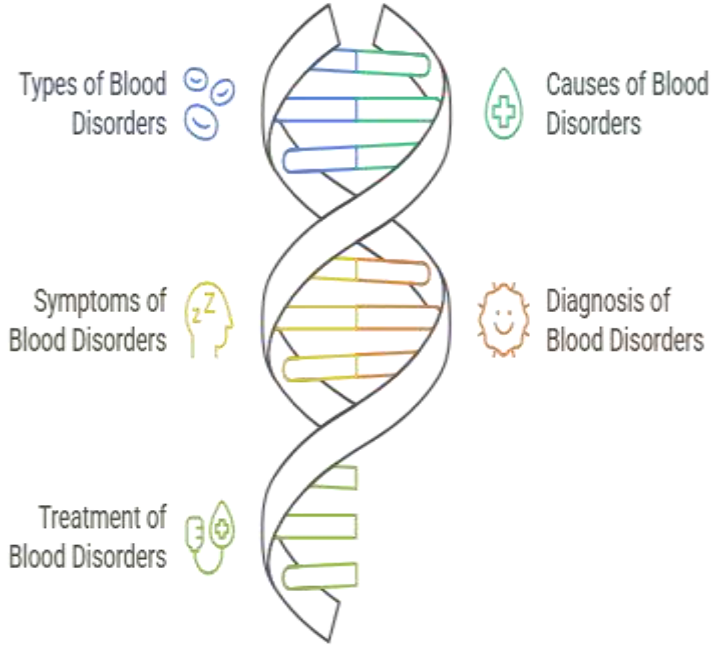
REGULATION OF COAGULATION

- Anticoagulants (e.g., heparin, protein C) prevent excessive clotting.
- Fibrinolysis: Plasmin breaks down clots after healing (via tPA).
- Balance prevents thrombosis (clots in vessels) or hemorrhage (excessive bleeding).



DISORDERS OF BLOOD

- Blood disorders affect RBCs, WBCs, platelets, or plasma components.
- Categories: Anemias, leukemias, clotting disorders, transfusion reactions.
- Diagnosed via blood tests (e.g., CBC, coagulation panels).



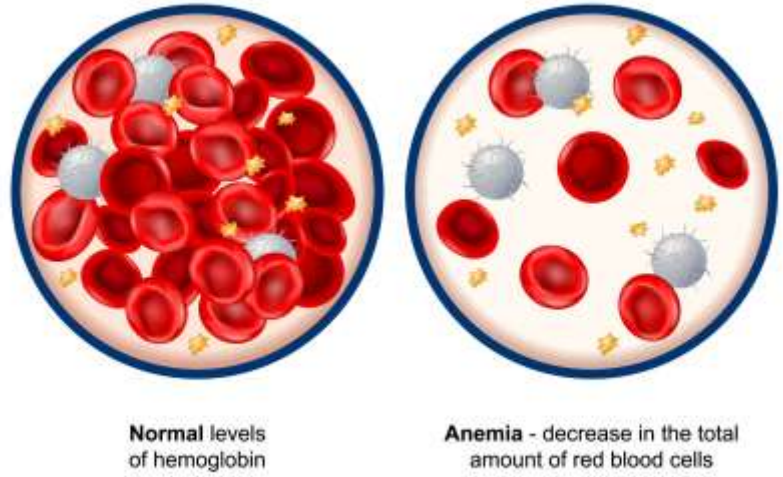
ANEMIA

Reduced RBCs or hemoglobin; causes fatigue, pallor, shortness of breath.

Types:

- **Iron-deficiency anemia**: Low iron for hemoglobin.
- **Sickle cell anemia**: Abnormal hemoglobin causes sickle-shaped RBCs.
- **Aplastic anemia**: Bone marrow failure reduces RBC production.

Treatment: Supplements, transfusions, bone marrow transplant.



TYPES OF ANAEMIA

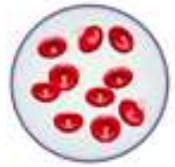
Iron Deficiency Anaemia

Vitamin Deficiency Anaemia

Aplastic Anaemia

Sickle Cell Anaemia

Hemolytic Anaemia



Thalassemia

Anaemia Caused by Other Disease

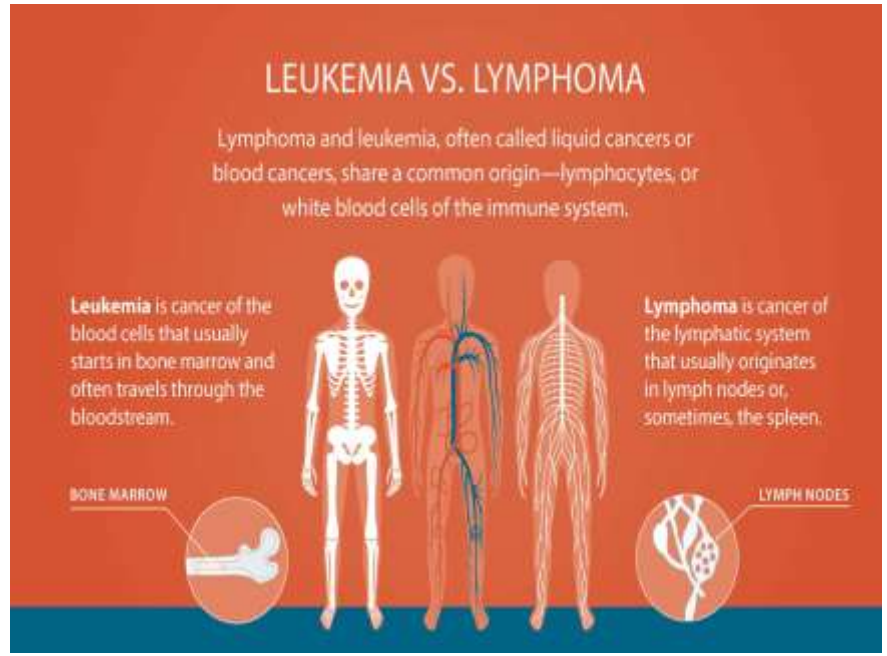
LEUKEMIAS AND LYMPHOMAS

Leukemia: Cancer of WBCs; uncontrolled production in bone marrow.

- Types: Acute (fast, immature cells), chronic (slower, mature cells).
- Symptoms: Fatigue, infections, bruising.

Lymphoma: Cancer of lymphocytes in lymph nodes (e.g., Hodgkin’s, non-Hodgkin’s).

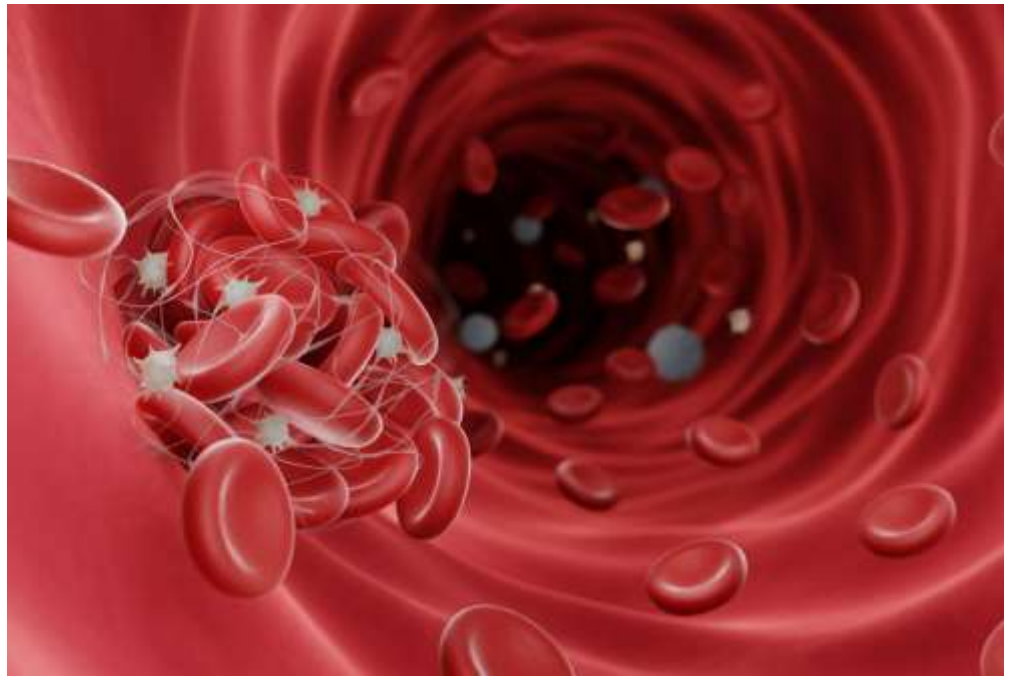
- Treatment: Chemotherapy, radiation, stem cell transplant.



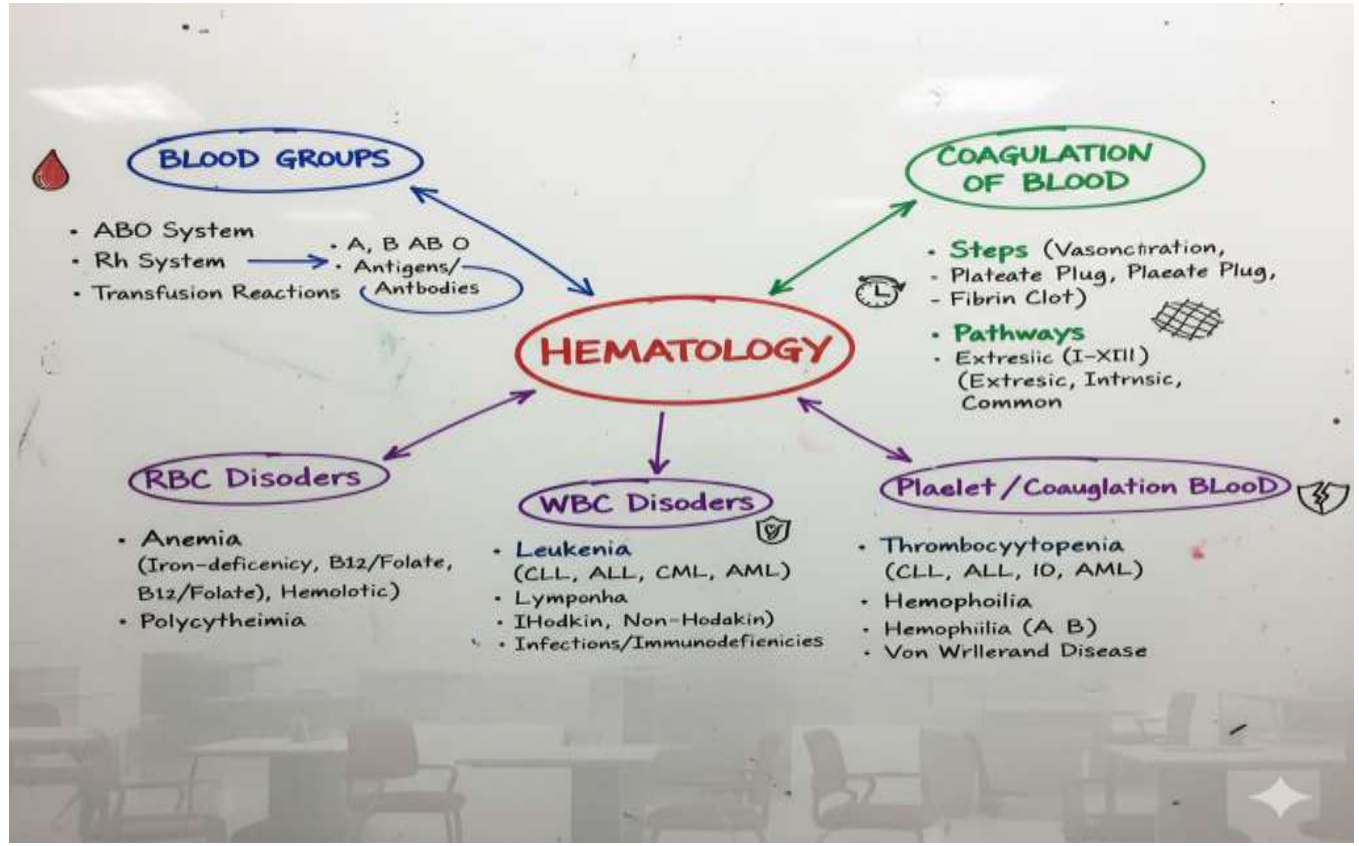
CLOTTING DISORDERS

- **Hemophilia**: Genetic lack of clotting factors (e.g., Factor VIII or IX); causes severe bleeding.
- **Thrombophilia**: Excessive clotting (e.g., Factor V Leiden); risks DVT, stroke.
- **Thrombocytopenia**: Low platelets; causes bruising, bleeding.

Treatment: Factor replacement, anticoagulants, platelet transfusions.



SUMMARY


BLOOD GROUPS
• ABO System
• Rh System
• Transfusion Reactions
• A, B AB O
• Antigens/
Antbodies
COAGULATION OF BLOOD
• Steps (Vasonctiration,
- Plateate Plug, Placate Plug,
- Fibrin Clot)
• Pathways
• Extresiic (I-XII)
(Extresic, Intrnsic,
Common
HEMATOLOGY
RBC Disoders
• Anemia
(Iron-deficenicy, B12/Folate,
B12/Folate), Hemolotic)
• Polycytheimia
WBC Disoders
• Leukenia
(CLL, ALL, CML, AML)
• Lymponha
• IHodkin, Non-Hodakin)
• Infections/Immunodefienicies
Plaelet/Coauglation BLooD
• Thrombocyytopenia
(CLL, ALL, ID, AML)
• Hemophoilia
• Hemophiilia (A B)
• Von Wrllerand Disease

References

- https://egyankosh.ac.in/bitstream/123456789/81724/3/Unit-2.pdf
- https://www.medicalnewstoday.com/articles/322260
- https://www.ncbi.nlm.nih.gov/books/NBK2263/