

Introduction to Hematology

Introduction to Hematology – Study Notes

1. What is Hematology?

- **Definition:** The branch of medicine that deals with the study of blood, its components, and the organs that produce them.
- **Scope:**
 - Normal blood physiology
 - Blood-related diseases (anemia, leukemias, clotting disorders, etc.)
 - Laboratory diagnostics (CBC, coagulation tests, bone marrow examination)
 - Therapeutic interventions (transfusions, anticoagulation, stem cell transplantation)

2. Major Components of Blood

Component	Approx. % of Whole Blood	Primary Functions	Key Laboratory Parameters
Plasma	55%	Transport of nutrients, hormones, waste; clotting factor reservoir	Total protein, albumin, globulins, electrolytes, coagulation profile
Red Blood Cells (RBCs)	40-45%	Oxygen delivery (via hemoglobin), CO ₂ transport	Hemoglobin (Hb), Hematocrit (Hct), RBC count, Mean Corpuscular Volume (MCV)
White Blood Cells (WBCs)	<1%	Immune defense, inflammation, tissue repair	Total WBC count, differential (neutrophils, lymphocytes, monocytes, eosinophils, basophils)
Platelets	<1%	Primary hemostasis (clot formation)	Platelet count, mean platelet volume (MPV)

3. Hematopoiesis – Blood Cell Production

Site (developmental stage)	Cell Lineage	Key Growth Factors
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Yolk sac (embryonic)	Primitive erythrocytes	—
Fetal liver & spleen	Definitive erythrocytes, megakaryocytes, some leukocytes	Erythropoietin (EPO), thrombopoietin (TPO)
Bone marrow (postnatal)	All lineages (RBCs, WBCs, platelets)	EPO, G-CSF, GM-CSF, M-CSF, IL-3, TPO, stem cell factor (SCF)

- **Stem cell hierarchy:**

1. **Hematopoietic stem cell (HSC)** – multipotent, self-renewing.
2. **Multipotent progenitor (MPP)** – limited self-renewal, commits to myeloid or lymphoid lineages.
3. **Committed progenitors** (e.g., CFU-E for erythrocytes, CFU-G for granulocytes).
4. **Mature cells** – functional RBCs, leukocytes, platelets.

4. Basic Laboratory Tests in Hematology

Test	What It Measures	Clinical Relevance
Complete Blood Count (CBC)	RBC, WBC, platelet numbers; Hb, Hct, indices (MCV, MCH, MCHC)	Screening for anemia, infection, thrombocytopenia, leukemia
Peripheral Blood Smear	Morphology of cells	Detects sickle cells, blasts, parasites, platelet clumping
Reticulocyte Count	Young RBCs (immature)	Evaluates marrow response to anemia
Coagulation Panel (PT, aPTT, INR, fibrinogen)	Clotting factor activity	Monitors antico