Blood

Chapter 13

Blood

Plasma – water (92%) with plasma proteins (7%) and 1% = nutrients, wastes, hormones and gases

Formed Elements – blood cells and cell fragments

Erythrocytes = RBC – Transport gases, 99.9% of blood cells

Leucocytes = WBC – body defense, 0.1% of blood cells

Blood Platelets – cell fragments, blood clotting

Erythrocytes: biconcave disc shaped, no nucleus, most blood cells

Leucocytes: Neutrophils – 50-70%, main phagocytes, multilobed nucleus

Eosinophils: 2-4%, detoxify, ↑ in parasitic infection/ allergies,

Basophils: < 1%, initiate inflammatory response, prominent blue grains

Monocytes: largest blood cells with notched nucleus, → macrophages

Lymphocytes: small cells, prominent nucleus, B and T cells

Blood Platelets: cell fragments, 250,000/mm³, blood clotting role

Sickle-cell-anemia is caused due to a single N-base substitution in its gene. Normal life span of 120 days
but sickle-cell-anemia RBC’s can live for a fraction of full span and body cannot replace them at this rate.

Recycling of Hemoglobin

Reticuloendothelial System has spleen, liver and bone marrow.

Macrophages in liver, spleen and bone marrow eat worn out RBC’s by phagocytosis. Enzymes in
macrophages break hemoglobin into Home (iron containing part) and globin (protein part).

Enzymes break globin into amino acids and biliverdin (green pigment). Enzymes then change biliverdin
into bilirubin (orange-yellow pigment) which is released into blood or bile.

ABO blood groups

Blood groups are determined by glycolipids present on the surface of erythrocytes. These act as antigens
and can evoke immune reaction. Antigens differ only in 3-4 terminal sugars in the glycolipids.

Antibodies are Y-shaped gamma globulin proteins produced in response to specific antigens.

Blood group A: Antigen A and antibody B

Blood group B: Antigen B and antibody A

Blood group AB: Antigen A and B and no antibody

Blood group O: No Antigen and antibodies A and B

Blood group O is universal donor and blood group AB is universal recipient.

Hemopoiesis-formation of blood cells

All blood cells develop from stem cells – hemocytoblasts. Hemocytoblasts divide into Myeloid stem cells
and Lymphoid stem cells.

Lymphoid stems cells give rise to lymphocytes

Myeloid stem cells produce all remaining formed elements.

Blood platelets develop from large amoeboid bone marrow cells called Megakaryocytes.

RBC’s are produced in spongy bone marrow from erythroblasts – the last nucleated cells; these change
to reticulocytes – non-nucleated that change finally change into RBC’s.

Hemopoiesis – formation of blood cells

Erythropoiesis-formation of RBC

Leukopoiesis – formation of leukocytes

Hemopoietic stem cell → Colony-forming unit → Precursor cells → Mature cell

HSC → Erythrocyte CFU → Erythroblast → Reticulocyte → Erythrocyte

Kidneys when note a fall in oxygen supply in blood, secrete Erythropoietin. It is a hormone that
stimulate stem cells to divide faster and add more RBC = erythrocytes.
Hemostasis is technical term for blood clotting. Fig 13.09 shows you the intrinsic, extrinsic and common pathways. Intrinsic pathway is initiated by release of blood platelet factor. Extrinsic pathway is initiated by release of injured tissue factor. Common pathway starts with activation of factor 10 and involves activation of prothrombin to thrombin, and fibrinogen to form fibrin – a network that traps RBC’s in it to form the clot.