Lab Activity 22

Blood
Erythrocyte (RBC)

- **Count:** 4-6 million per mm$^3$
- **Function:** Transport of $O_2$ and $CO_2$
Iron Deficient RBC

- More pale and smaller

Normal Blood Smear

Iron Deficiency Anemia
Sickle Cell
Reticulocyte

- Count: 1-2% of RBC
- RBC precursor
- Increased when RBC turnover is high
- Still contains nuclear fragments
Neutrophil (Granulocyte)

- Nuclei: 2 to 5 lobes connected by thin strands (polymorphonuclear)
- Fine, pale lilac practically invisible granules
- Lifespan of about 10 hrs
Neutrophil

- **Count:** 50-70%
  3,000-7,000 per mm$^3$
- **Fastest response of all WBC to bacteria**
- **Functions:**
  - Phagocytic: engulf pathogens or debris in tissues
  - Release cytotoxic enzymes and chemicals
Neutrophilic Band Cell

- Young neutrophils are called band cells because of horseshoe shaped nucleus (band)
Eosinophil (Granulocyte)

- Nucleus with 2 or 3 lobes connected by a thin strand
- Large, uniform-sized orange-red granules
Eosinophil

- **Count:** 2-4%
  - 100-400 per mm³
- **Functions:**
  - Phagocytic: engulf antibody-labeled materials
  - Release cytotoxic enzymes
  - Reduce inflammation
Basophil (Granulocyte)

- Large, dark purple, variable-sized granules
- Obscure the nucleus
- Irregular, s-shaped, bi-lobed nuclei
Basophil

- **Count:** <1%
  - 20-50 per mm³
- **Functions:**
  - Enter damaged tissues and release histamine and other chemicals that promote inflammation
Monocyte (Agranulocyte)

• Nucleus is kidney or horse-shoe shaped
• Pale cytoplasm
Monocyte

- **Count:** 2-8%
  - 100-700 per mm³
- **Functions:**
  - Enter tissues to become macrophages
  - Engulf pathogens or debris
Lymphocyte (Agranulocyte)

- Dark, oval to round nucleus
- Cytoplasm sky blue in color
Lymphocyte

• **Count:** 20-30%
  • 1,500-3,000 per mm$^3$

• **Functions:**
  • Mount immune response by direct attack or via antibodies, mediates other cellular immune response,
  • Includes B and T cells
Platelets

- Fragments of a bone marrow cell called a megakaryocyte
- **Count:** 150-500,000 per mm$^3$
- **Function:** mediates blood clotting chemically and mechanically
Platelets
Hemoglobin Concentrations

- Normal hemoglobin concentration in females is 12-16 g/deciliter.
- Normal hemoglobin concentration in males is 13-18 g/deciliter.
- Hematocrit can be estimated from the hemoglobin concentration:
  \[ 3 \times \text{hemoglobin} = \text{hematocrit}. \]
- Normal hematocrit in females is 37-48%.
- Normal hematocrit in men is 42-52%.
Gender Differences in Hb

• Testosterone stimulates synthesis of erythropoietin which in turn stimulates erythropoiesis (red cell formation) in the red marrow.

• Lower values in women of reproductive age may also reflect their red cell losses due to menstruation.
ABO Blood Types

- RBC surfaces are marked by genetically determined glycoproteins
  - The glycoprotein determines the blood type
- Plasma contains isoantibodies or agglutinins to the A or B antigens not found on your blood cells
Type A

- Type A: Display only antigen A
- The plasma contains antibodies against Type B
Type B

• Type B: Display only antigen B

• The plasma contains antibodies against Type A
Type AB

- Type AB: Display both antigens A & B
- The plasma contains no antibodies
Type O

- Type O: Display neither antigen
- The plasma contains antibodies against A and B
Blood Transfusions

• Only RBC are donated.
• Transfusion Reactions: The recipients plasma interacts with the donors RBC
• Causes clumping then hemolysis
RH blood groups

- People with Rh agglutinogens on RBC surface are Rh\(^+\). Normal plasma contains no anti-Rh antibodies.
- Antibodies develop only in Rh\(^-\) blood type & only with exposure to the antigen
  - Transfusion of positive blood
  - During a pregnancy with a positive blood type fetus
- Transfusion reaction upon 2nd exposure to the antigen results in hemolysis of the RBCs in the donated blood
Coagulation Time

• Blood Clotting (coagulation) is a protective mechanism that minimizes blood loss when blood vessels are ruptured
• Through a series of reactions, fibrin will form a meshwork to trap the RBC, forming a clot.
• Normally blood clots within 2-6 minutes
The End