

11 Blood

Chapter Summary

The blood performs numerous functions including: transportation of gases, wastes, nutrients, and hormones; regulation of body temperature; protection against infection; and clotting. Blood consists of a fluid called plasma and formed elements. The plasma contains dissolved proteins called plasma proteins. The formed elements include red blood cells (erythrocytes), which contain the protein hemoglobin but do not contain nuclei; platelets (thrombocytes), which are fragments of cells and are involved in blood clotting; and white blood cells (leukocytes), which fight infection. Leukocytes are classified as granular or agranular. The granular leukocytes are the phagocytic neutrophils, the eosinophils, and the basophils. The agranular leukocytes are the monocytes, which can differentiate into larger, phagocytic macrophages, and the lymphocytes. There are T lymphocytes, which mature in the thymus and are responsible for cell-mediated immunity; and B lymphocytes, which mature in the bone marrow and are responsible for antibody-mediated immunity. Hematopoiesis, which is the production of red blood cells, occurs in the red bone marrow and is under the influence of erythropoietin, a growth factor released by the kidneys. Homeostasis, or the cessation of bleeding results from the activities of platelets and plasma proteins involved in coagulation, or blood clot formation. Disorders of homeostasis are discussed. The exchanges between tissue fluid and blood that occur as blood flows through a capillary are driven by three processes: blood pressure. The nature of capillary exchange along the length of a capillary is described. The two primary blood typing systems are discussed in the text. The ABO system classifies blood types (A, B, AB, O) according to the presence or absence of two plasma membrane proteins (A and B). Individuals lacking a particular protein on their red blood cells produce antibodies (anti-A and anti-B) against that protein. When these antibodies encounter cells bearing foreign proteins (antigens) agglutination will occur and the cells will be destroyed. The Rh system classifies blood according to the presence or absence of a single antigen called the Rh factor. The problem of Rh sensitization of Rh-negative mothers is discussed as is blood typing in the laboratory.

Chapter Outline

- I. The Composition and Functions of Blood
 - A. Functions of Blood
 1. Transport
 2. Defense
 3. Regulation
 - B. Plasma
 1. The Plasma Proteins
- II. The Blood Cells
 - A. Red Blood Cells
 1. Hemoglobin
 2. Production of Red Blood Cells
 3. Destruction of Red Blood Cells
 4. Abnormal Red Blood Cells
 - B. White Blood Cells
 1. Types of White Blood Cells
 - a. Granular Leukocytes
 - b. Agranular Leukocytes
 2. Abnormal White Cell Counts

- III. Platelets and Hemostasis
 - A. Platelets
 - B. Hemostasis
 - 1. Coagulation
 - C. Disorders of Hemostasis
- IV. Capillary Exchange
 - A. Blood Capillaries
 - 1. Arterial End of Capillary
 - 2. Midsection of Capillary
 - 3. Venous End of Capillary
 - B. Lymphatic Capillaries
 - 1. Edema
- V. Blood Typing and Transfusions
 - A. ABO Blood Groups
 - B. Rh Blood Groups
- VI. Effects of Aging

Suggested Student Activities

1. Examine a drop of blood under the microscope and identify the different cells.
2. Outline the steps in blood clotting.
3. Explain the cause of erythroblastosis fetalis.

Answers to Objective Questions

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. plasma 2. oxygen, fight infection 3. oxyhemoglobin 4. nucleus, 120 5. neutrophil 6. antibodies, destroy 7. water, oxygen, nutrient molecules, water, waste molecules 8. fibrin 9. A, B, neither 10. Rh negative, Rh positive 11. c 12. b 13. a 14. d | <ol style="list-style-type: none"> 15. a. tissue cell b. arterial end c. plasma protein d. tissue fluid e. carbon dioxide f. wastes g. venous end h. blood pressure i. osmotic pressure j. oxygen k. amino acids l. glucose m. blood pressure n. osmotic pressure |
|--|---|

Answers to Medical Terminology Reinforcement Exercise

1. hemat/emesis - vomiting blood
2. erythro/cyto/metry - measurement or counting red (blood) cells
3. leuko/cyto/genesis - formation of white (blood) cells
4. hemo/phobia - abnormal fear of blood
5. a/fibrino/gen/emia - absence of fibrinogen (clotting factor) in blood
6. lympho/sarcoma - a malignant tumor of lymphatic tissue
7. phago/cyt/osis - condition of cell eating (white blood cells destroy microorganisms by ingestion)
8. phleb/otomy - incision into a vein
9. hemo/cyto/blast - cell that produces red blood cells

10. megaloblastic anemia – decreased blood oxygen transport capability characterized by high numbers of abnormally large red blood cell precursor cells
11. microcytic hypochromic anemia – decreased blood oxygen transport capability characterized by small red blood cells with decreased hemoglobin content
12. hematology – study of blood
13. lymphedema – swelling due to blockage of lymphatic vessel or lymph node
14. anti-thrombin – chemical that prevents thrombin action

Audiovisual Materials

1. Video - Your Blood: Liquid Tissues (Career Aids)
2. Filmstrip - (Set of 4) Blood: The Inside Story (69530-C)(Concept Media)