Part IV Maintenance of the Body

11 Blood

Chapter Outline

Composition of Blood
- Red Blood Cells (Erythrocytes)
- White Blood Cells (Leukocytes)
- Platelets (Thrombocytes)
- Hematopoiesis
- Plasma

Functions of Blood
- Transport
- Blood Clotting

Blood Groups and Typing
- ABO System
- Rh System
- Blood Typing

Learning Objectives

1. Describe, in general, the composition of blood.
2. Describe the structure and function of red blood cells, white blood cells, and platelets.
3. Explain the hematopoietic role of stem cells in the red bone marrow.
4. Describe, in general, the composition of plasma.
5. Describe the functions of blood.
6. Discuss the transport function of blood, and describe capillary exchange within the tissues.
7. Describe the blood clotting process and how it is associated with thromboembolism.
8. Explain the ABO and Rh systems of blood typing.
9. Describe how each person's blood type is determined for transfusion purposes.

Medical Terminology

Medical Term	Meaning
-cyte	cell
erythro-	red
hem-, heme-	blood
leuko-	clear

1. Where is hemoglobin found?
2. What is an erythrocyte?
3. What is a leukocyte?

New Terms

Basic Key Terms

agglutination
deoxyhemoglobin
fibrin
fibrinogen
formed elements
gamma globulin
globin
hematocrit
heme
hemoglobin
oxyhemoglobin
plasma
platelet plug
platelets
prothrombin
prothrombin activator
red blood cell count
red blood cells (RBCs)
Rh factor
serum
thrombin
white blood cell count
white blood cells (WBCs)

Clinical Key Terms

acute lymphoblastic leukemia
anemia
aplastic anemia
differential white blood cell count
embolus
hemarthrosis
hemolytic anemia
hemolytic disease of the newborn
hemophilia A
hemorrhage
iron deficiency anemia
leukemia
leukocytosis
leukopenia
mononucleosis
pernicious anemia
polycythemia
sickle-cell disease
sublingual hematoma
thrombocytopenia
thromboembolism
thrombus
transfusion

Study Questions

I. Composition of Blood (pp. 208–13)

Red Blood Cells (Erythrocytes) (p. 208)

The underlined words in the following statements make the statements false. In the space provided, rewrite each statement to make it true.

1. The cellular portion of the blood normally contributes <u>about 60%</u> to the total blood volume.

2. Oxyhemoglobin is normally a <u>dark purple</u> color.

3. Red blood cells are destroyed <u>in the red bone marrow.</u>

4. <u>Globin</u> is the iron-containing portion of the molecule hemoglobin.

5. <u>Aplastic</u> anemia develops from a vitamin B_{12} deficiency.

6. <u>Iron deficiency anemia</u> is an inherited condition.

White Blood Cells (Leukocytes) (p. 208)

A. The underlined words in the following statements make the statements false. In the space provided, rewrite each statement to make it true.

1. White blood cells are involved <u>in the process of blood clotting.</u>

2. The neutrophil is <u>an agranular leukocyte.</u>

3. Phagocytosis refers to <u>the stationary role of neutrophils.</u>

4. <u>Eosinophils</u> are the most abundant leukocyte.

5. B lymphocytes carry out <u>cell-mediated</u> immunity.

6. T lymphocytes carry out <u>antibody-mediated</u> immunity.

Platelets (Thrombocytes)/Hematopoiesis/Plasma (p. 212)

A. Complete each of the following statements.

1. Platelets are formed from the fragmentation of large cells called _____ .
2. The site of platelet formation is the _____ .
3. As red blood cells pass through their stages of development, they lose their nuclei and gain _____ .
4. _____ is the growth factor that stimulates stem cells to become red blood cells.
5. Plasma is 92% _____ .
6. _____ are plasma protein antibodies that fight infection.
7. The protein albumin in the plasma is mainly responsible for creating an _____ pressure, drawing water into the blood.

B. Match the descriptions on the left with the terms on the right. Place the correct letters in the blanks on the left. Each letter can be used more than once.

____ 1. about 55% of whole blood volume
____ 2. counted in the millions per cubic millimeter
____ 3. initiate the process of blood clotting
____ 4. life span of about 120 days
____ 5. contain hemoglobin
____ 6. plasma
____ 7. range from 5,000 to 11,000 per cubic millimeter
____ 8. range from 150,000 to 300,000 per cubic millimeter
____ 9. transport gases

a. erythrocytes
b. leukocytes
c. thrombocytes
d. noncellular portion of the blood

II. Functions of Blood (pp. 214–16)

Transport

Choose the answers that best complete the sentences. Place the correct letters in the blanks on the left.

____ 1. From the intestine, blood mainly transports
- a. hydrogen ions.
- b. nitrogen wastes.
- c. nutrients.
- d. oxygen.

____ 2. The substance added to blood by the liver is
- a. carbon dioxide.
- b. hydrogen ions.
- c. starch.
- d. urea.

____ 3. At the end where blood enters the capillary, each of the following normally leaves this vessel except
- a. amino acids.
- b. glucose.
- c. plasma proteins.
- d. water.

____ 4. At which end of the capillary is blood pressure normally lower?
- a. arterial
- b. venous

____ 5. Osmotic pressure tends to
- a. draw water into the capillary.
- b. push water out of the capillary.

Blood Clotting (pp. 215–16)

A. Use the terms that follow to fill in the blanks of the paragraph.

fibrinogen
plasmin
platelets
plug
red blood cells
thrombin

To initiate the clotting process, 1. _____ and damaged tissues release prothrombin activator. Prothrombin activator converts prothrombin to 2. _____. This substance, in turn, enzymatically converts 3. _____ to fibrin. This threadlike molecule winds around the platelet 4. _____. 5. _____ are also trapped in this framework to form the clot. Clots formed can eventually disappear by the enzymatic action of 6. _____.

B. Indicate the correct statement in each of the following pairs. Place the correct letters in the blanks on the left.

____ 1. a. A clot flowing toward the heart is an embolus.
- b. A thrombus moves with the flow of blood.

____ 2. a. Serum normally contains fibrinogen.
- b. Serum normally does not contain fibrinogen.

____ 3. a. Tissue fluid normally contains plasma proteins.
- b. Tissue fluid normally does not contain plasma proteins.

III. Blood Groups and Typing (pp. 217–18)

Answer with the correct ABO blood types in statements 1 through 8. Answer with the correct Rh blood types in statements 9 and 10. Each statement has one or two answers.

1. Antibodies A and B are found together in type _____ .
2. The most common ABO blood type is type _____ .
3. Type A blood can be safely donated to types _____ .
4. Type B blood can be safely donated to types _____ .
5. Type O blood can safely accept type _____ .
6. Type B blood can safely accept types _____ .
7. Only antibody B is in type _____ .
8. Only antibody A is in type _____ .
9. If exposed to the Rh factor, the human body makes anti-Rh antibodies if it has the blood type _____ .
10. Hemolytic disease of the newborn can develop in a child who is _____ and whose mother is _____ .

IV. Effects of Aging (p. 219)

Indicate whether each of the following statements is true (T) or false (F).

____ 1. Iron deficiency anemia frequently develops from a poor diet.
____ 2. Leukemia is a form of cancer.
____ 3. The development of plaque in arteries decreases the chance to develop a thromboembolism.