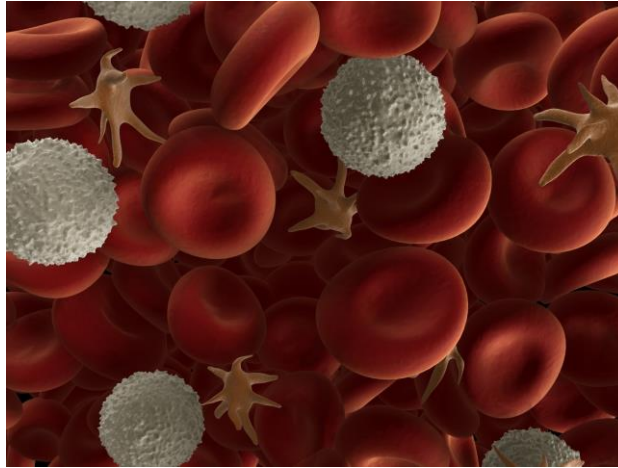
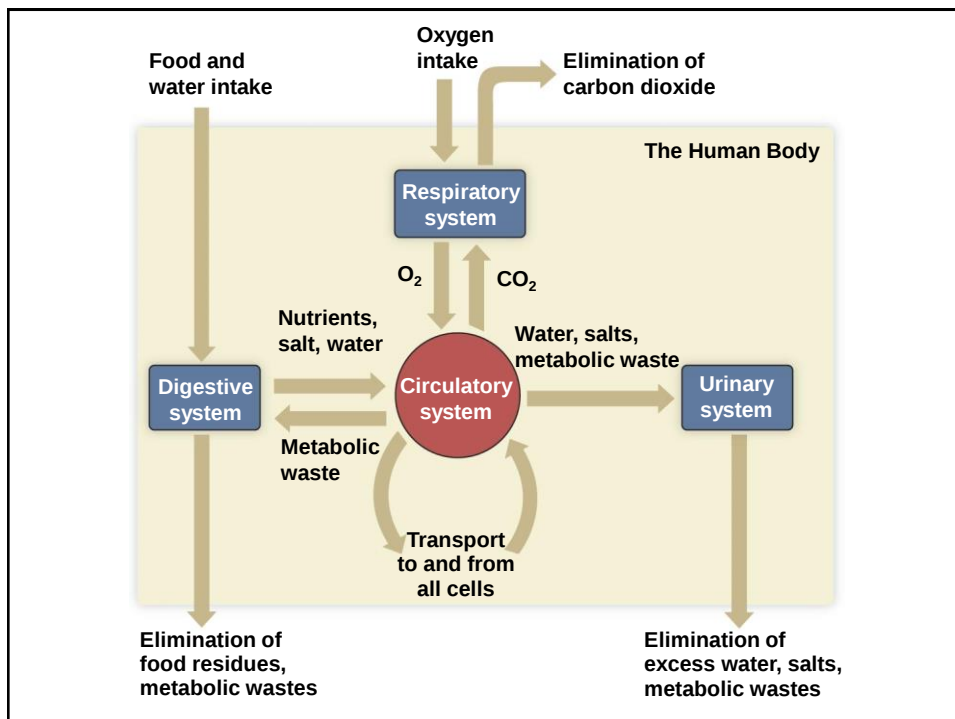


Blood



1



2

Three Primary Functions of the Blood

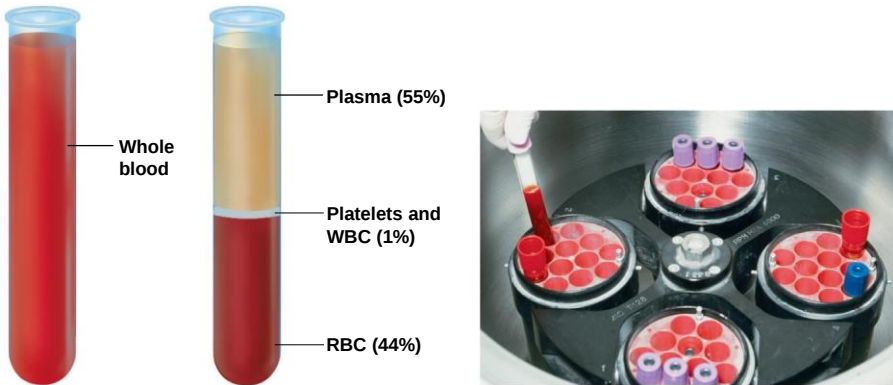
- Transportation
 - Nutrients, waste, hormones
- Regulation
 - Temperature, water volume, pH
- Defense
 - Against infections and bleeding

3

The Components of Blood

- Plasma (55%)
 - Water
 - Electrolytes
 - Proteins (albumins, globulins, clotting proteins)
 - Hormones
 - Gases
 - Nutrients and wastes
- Formed elements (45%)
 - Red Blood Cells - RBCs - (Erythrocytes)
 - White Blood Cells - WBCs - (Leukocytes)
 - Platelets (Thrombocytes)

4



a) Whole blood.

b) Blood after being spun in centrifuge.

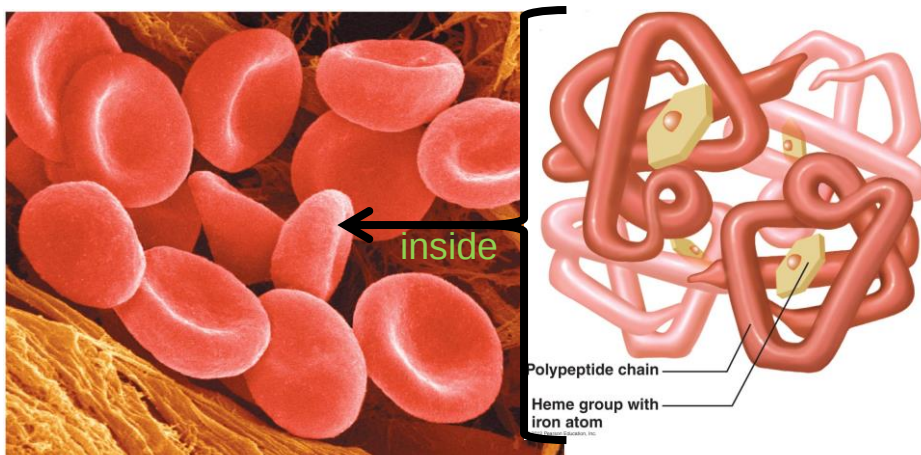
c) A table-top centrifuge.

- Centrifuge – spins at very high speed & causes particles to separate by mass (weight)

5

Red Blood Cells

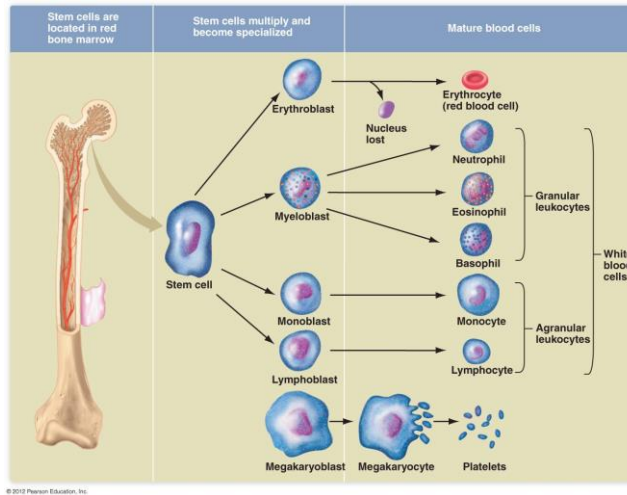
- Functions
 - transport oxygen and carbon dioxide



6

Red Blood Cells

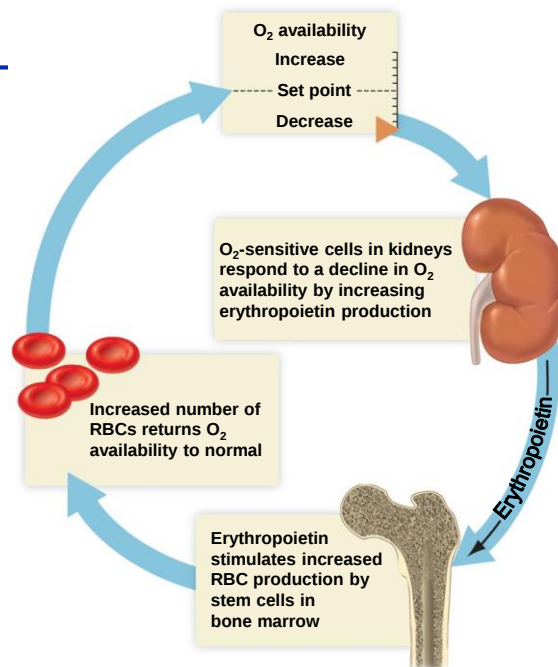
- Origin
 - stem cells in the bone marrow



7

Red Blood Cells

- Life span
 - ~120 days in humans
- Control of production
 - Erythropoietin (hormone from kidneys)



8

White Blood Cells

- Functions
 - Protection from infection
 - Regulation of the inflammatory reaction
- Two Types
 - Granular
 - neutrophils, eosinophils, and basophils
 - Agranular
 - lymphocytes and monocytes

9

Granular Leukocytes

- **Neutrophils**
 - Most common of WBCs
 - First on the scene to fight infection by engulfing microorganisms (especially bacteria)
- **Eosinophils**
 - Defend against large parasites (worms)
 - Reduce severity of allergic reactions
- **Basophils**
 - Rarest of WBCs
 - Histamine in granules – role in inflammation

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Agranular Leukocytes

- **Monocytes**
 - Leave the blood and transform into macrophages
 - Macrophages – eat particles / microorganisms
- **Lymphocytes**
 - Play a large role in the immune response
 - Two types
 - B lymphocytes – eventually lead to antibodies
 - T lymphocytes – coordinate immune response

11

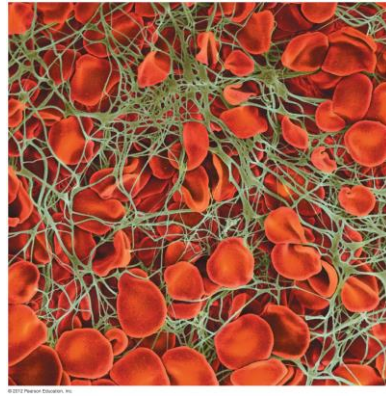
Platelets

- Small cell fragments derived from megakaryocytes
- Important role in hemostasis (blood clotting)

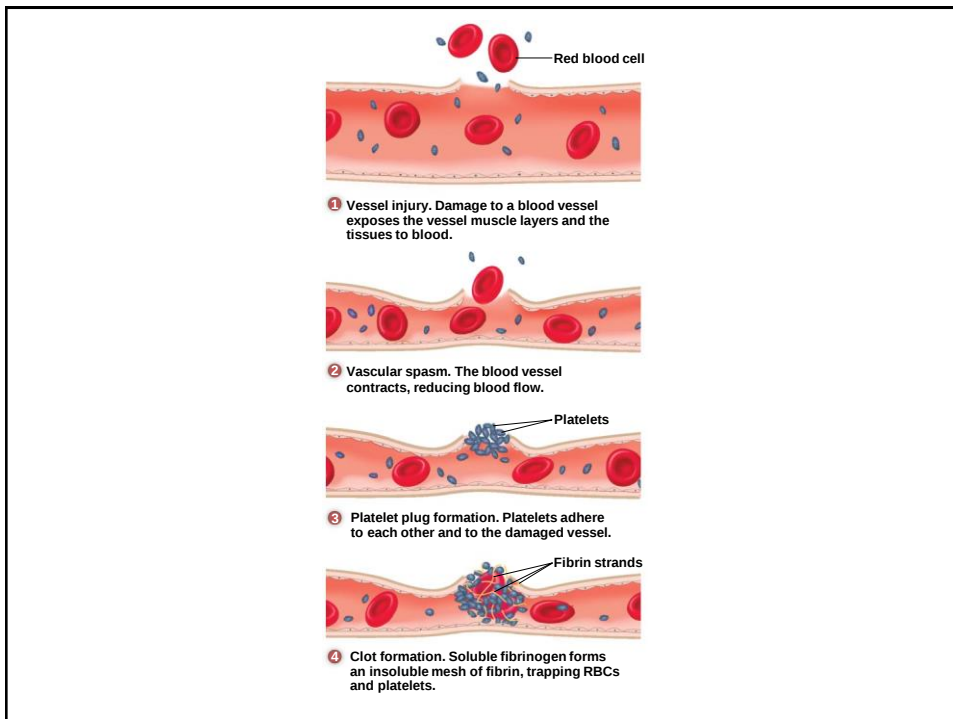
12

Hemostasis

- Three stages
 - Vascular spasm
 - constriction of blood vessels to reduce blood flow
 - Platelet plug formation
 - sealing of the ruptured blood vessel
 - Coagulation
 - formation of a blood clot through series of reactions



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Bleeding Disorder

- Hemophilia
 - Genetic disorder
 - Missing one or more of clotting factors



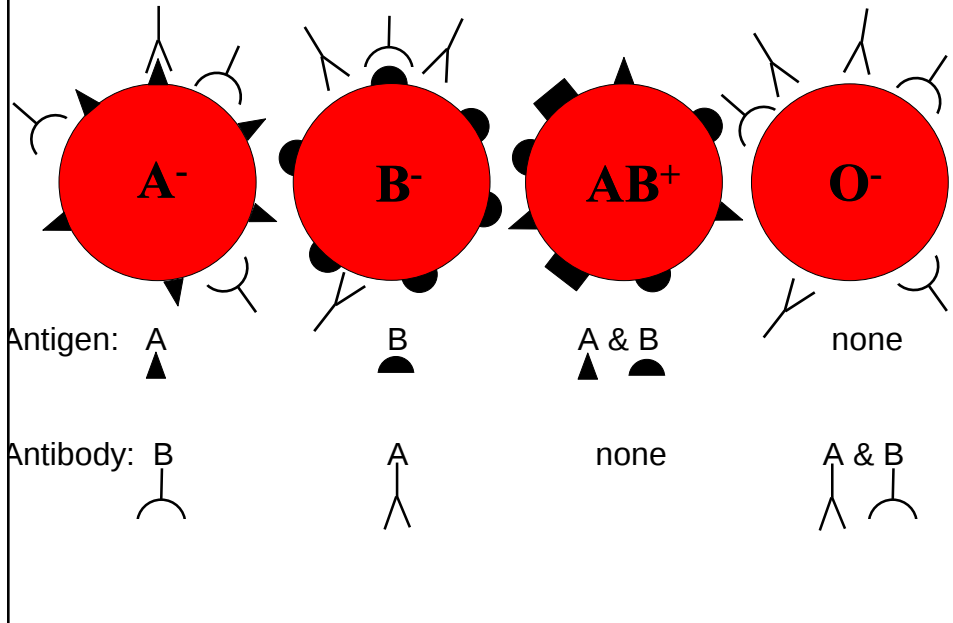
15

Blood Typing Concepts

- Antigen vs. antibody
 - A and B antigens
 - surface markers on red blood cells
 - Antibodies
 - immune system protein, detects antigens
- ABO system
- Rh system
 - Give + / - blood

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Blood Typing



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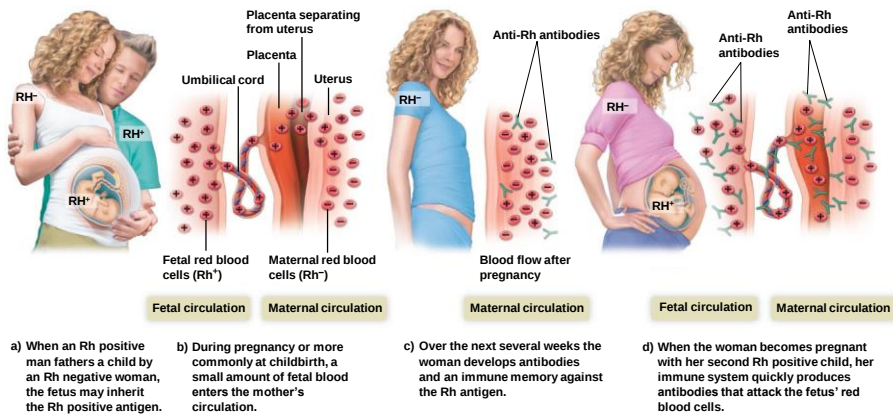
	Type A	Type B	Type AB	Type O
Red blood cells	Antigen A 	Antigen B 	Antigens A and B 	Neither A nor B antigens
Plasma antibodies	 B	 A	Neither A nor B	 A and B

Blood being tested	Antibodies	
	Anti-A	Anti-B
Type A (Contains antigen A)		
Type B (Contains antigen B)		
Type AB (Contains antigens A and B)		
Type O (Contains neither A nor B antigens)		

Agglutinated blood

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Hemolytic Disease of the Newborn



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Blood Disorders – Red Blood Cells

• Anemia

– reduction in oxygen-carrying capacity due to inadequate number of red blood cells or inadequate hemoglobin

- **Iron-deficiency anemia:** caused by inadequate intake or malabsorption of dietary iron
- **Hemorrhagic anemia:** caused by blood loss
- **Pernicious anemia:** caused by Vitamin B12 deficiency
- **Hemolytic anemia:** caused by destruction of red blood cells

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Blood Disorders – White Blood Cells

- **Leukemia**
 - Forms of cancer due to proliferation of white blood cells
- **Mononucleosis**
 - Contagious Epstein-Barr virus infection of lymphocytes

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Blood Disorders

- **Septicemia** (blood poisoning)
 - Bacteria proliferating in blood, overwhelming body's defenses
- **Thrombocytopenia**
 - Reduction in platelet number
 - Unusual bruising and bleeding

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