

Cardiovascular System

I. Heart

- A. In the mediastinum
- B. Slightly larger than a closed fist.

II. Heart Parts

- A. The pericardium encloses the heart.
 - 1. parietal pericardium – outer layer
 - 2. visceral pericardium – inner layer
 - 3. fluid between two reduces friction
 - B. Atria receive blood returning to the heart and have thin walls.
 - C. Ventricles pump blood to the body.
 - D. A septum divides the right and left sides.
 - E. Tricuspid valve on right side
 - F. Bicuspid (mitral) on left side
 - 1. Chordae tendinae attach. (tendons)
 - 2. valves ensure one way blood flow
 - G. The superior and inferior vena cavae bring blood from the body to the right atrium.
 - H. At the base of the pulmonary trunk leading to the lungs is the pulmonary valve.
 - I. The left atrium receives blood from four pulmonary veins.
 - J. Aortic and pulmonary semilunar valves separate left and right ventricles from arteries
 - K. Aorta carries blood from left ventricle to the body.
 - L. Two Coronary arteries come from base of aorta to supply the heart
- ### III. Path of Blood through the Heart

IV. Heart Sounds

- A. Heart sounds are due to vibrations as blood rapidly changes velocity
- B. Lubb occurs as ventricles contract and the bi- and tricuspid valves close.
- C. Dubb occurs as ventricles relax and aortic and pulmonary valves close
- D. abnormal sounds are usually the result of faulty valves

V. Electrical Activity

- A. Sinoatrial (SA) node (pacemaker), located on the posterior right atrium, generates the impulses for the heartbeat.
 - 1. produces APs faster than other areas of the heart
 - 2. contracts atriums
- B. Atrioventricular node (AV) located in the septum.
 - 1. receives AP from SA node, slows it, sends it to ventricles
- C. Electrocardiogram (ECG or EKG)
 - 1. P wave - depolarization of the atria.
 - 2. QRS complex - depolarization of ventricles, hides the repolarization of atria.
 - 3. T wave -ventricular repolarization.

4. Depolarization cause contraction
5. Repolarization is relaxation

VI. Heart Actions

- A. Systole is during contraction
- B. Diastole is relaxation

VII. Blood Vessels

A. Arteries

1. carry blood away from the heart.
2. Elastic Arteries.
 - a. largest diameter
 - b. less smooth muscle, stretch when ventricles contract
 - c. helps maintain blood pressure
3. muscular arteries
 - a. more smooth muscle
 - b. vasoconstrict and vasodialate
4. arterioles – smallest arteries

B. capillaries

1. simple squamous epithelium – diffusion
2. blood cells flow in single file

C. Veins

1. Flow towards heart
2. venules – smallest
3. veins
 - a. have valves with two cusps for one way flow
 - b. varicose veins – veins dialate and cusps cannot close

completely

IV. Blood Pressure

- A. The force of blood against the walls of blood vessels
 1. systolic, highest, during ventricular contraction,
 2. diastolic, lowest, ventricles relaxing,
- B. Surge of blood that occurs with ventricular contraction is the pulse.

V. Blood

A. Functions

1. Transports substances like gases, hormones, molecules
2. Helps to maintain a homeostasis. ex. Heat
3. Immune System
4. Forms clots

B. Blood Solids

1. Red Blood Cells
 - a. RBCs(erythrocytes) are biconcave disks
 - b. Contain Hemoglobin. Contains Fe
 - c. When combined with O₂, bright red
 - d. When no O₂, dark red
 - e. No nuclei when mature
 - f. Carries CO₂ out
 - g. RBC Production

- i. in the red bone marrow.
- ii. Average life span is 120 days.
- iii. 2.5 million destroyed/sec
- iv. Stem cells (undifferentiated) give rise to cells

determined by specific growth factors

- v. production is stimulated by low O₂ levels

h. liver and spleen remove damaged cells.

2. White Blood Cells

a. White blood cells (leukocytes) defend the body against invading microorganisms, remove dead cells/debris.

b. can leave blood and move through tissues

c. Five main types of cells

3. Platelets

a. Fragments of cells.

b. Repair damage by adhering to broken edges of vessels

C. Blood Plasma -55%

1. Clear, straw-colored fluid

2. 91% water

3. transports nutrients and gases, regulate fluid and electrolyte

balance

4. Proteins -7% - albumins, globulins, and fibrinogen.

D. Hemostasis - clotting

1. Following injury to a vessel,

a. blood vessel constricts

b. platelet plug formation

c. Blood Coagulation - Fibrinogen is converted into net-like insoluble fibrin causing the blood cells to catch.

E. Blood Groups

1. Clumping of RBCs following transfusion is called agglutination.

2. antigens – molecules on cell surface

3. antibodies – proteins that bind on to certain antigens

4. ABO Blood Group

a. Type A blood has A antigens on RBCs and anti-B antibodies in the plasma.

b. B blood has B antigens and anti-A antibodies.

c. AB has both antigens, but no antibodies

d. O has none, both antibodies

5. Rh Blood Group

a. Studied in rhesus monkey.

b. + has it, - does not

c. no antibodies in the plasma unless a person with Rh - blood is transfused with Rh + blood; will then develop antibodies.