The Human Body Systems

I. Chapter 19 - Circulatory System

A. A **closed system** consisting of the 4 chambered heart, a network of arteries, veins, capillaries, blood and the lymph system

B. Path of the blood: vena cava → rt atrium → rt ventricle →pulmonary artery → lungs → pulmonary vein → left atrium → left ventricle → aorta → body → back to the vena cava

C. Blood flow goes from the
heart → arteries → arterioles → capillaries → venules → veins → back to the heart

D. Arteries

1. Vessels that carry blood **AWAY** from the heart
2. Thick walled vessel w/ layer of connective tissue and smooth muscle
3. Elastic: able to flex w/ each beat of the heart (pulse)
4. Branches into smaller and smaller vessels called **arterioles**

E. Capillaries

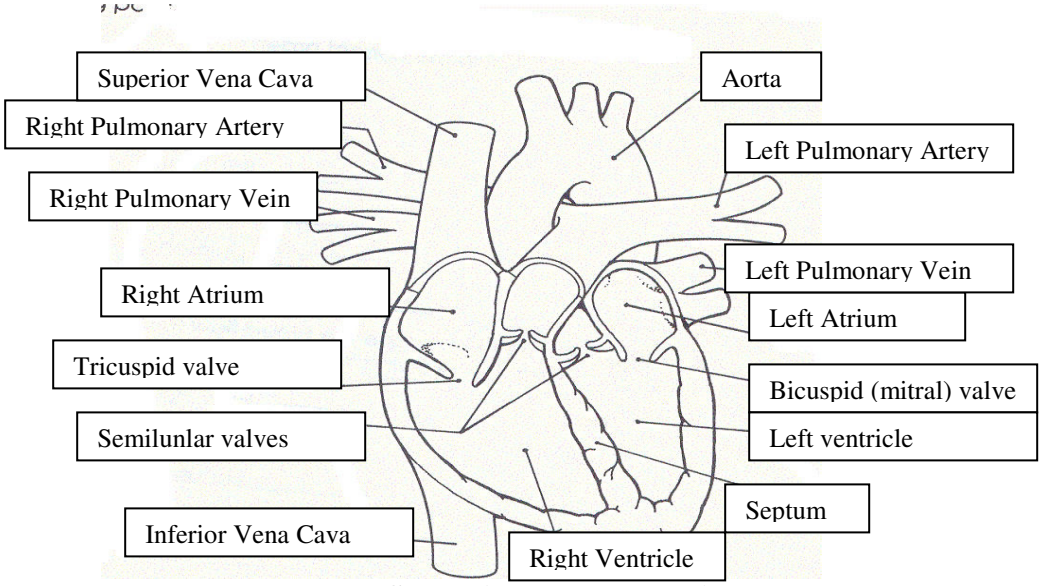
1. Arterioles and venules are connected by these microscopic vessels which are only one cell thick
2. Vessels are small enough that blood cells travel through in single file
3. Vessel walls not perfect seal and **leak** plasma into intercellular spaces (lymph)
4. Point where gas exchange (O2 and CO2), nutrients and wastes are exchanged

F. Veins

1. Vessels that carry blood **back toward** the heart
2. Thin walled w/ less connective and muscle tissue surrounding them
3. Not very flexible
4. Has "**one-way" valves** to help prevent blood from pooling in the extremities
5. Smaller branches from capillaries get larger and larger forming **venules** which then form veins

G. Heart

1. Acts as a **duel pump** (right and left)
    a) right pump: collects blood from the body and pumps to the lungs
    b) Left pump: collects blood from the lungs and pumps to the body
2. Regular **contractions** force blood through the various pathways
    a) The pacemaker of the heart is the **SA node** (sinoatrial node) located in the upper back wall of the right atrium. This triggers an impulse that travels down to the AV node (atrioventricular node) located at the bottom of the right atrium. The AV node causes both ventricles to contract.
3. **Pericardium** is a tough sac membrane around the heart covers and protects the heart in the thoracic cavity.
4. **Atrium: AKA- Auricles**: thin walled upper chambers receive blood and pump it to the ventricles
5. **Ventricles**: Thick layered lower chambers pump blood out of the heart. The Rt & lft chambers are separated by a thick wall called the **septum** that divides the heart in half.
6. Four "Flap-like" valves control the direction of blood flow through the heart
    a) **AV Valves** separate atrium from ventricle
        (1) Right side is the **tricuspid**
        (2) Left side is bicuspid or **mitral valve**
    b) **Semilunar Valves**: keep blood from falling back into ventricles



H. Pathways of the Blood: **Pulmonary, Systemic and Lymphatic**

1. **Pulmonary Circulation**
   a) carries deoxygenated blood from the right side of the heart to and through the lungs where it is oxygenated. It then goes back to the left side of the heart.
   b) **Pulmonary artery** is the only artery that carries unoxygenated blood which is also rich in carbon dioxide.
   c) **Pulmonary Vein** is the only vein which carries rich oxygenated blood.
2. **Systemic Circulation**:
   a) Takes oxygenated blood from the pulmonary veins and pumps it to the rest of the body
   b) **Coronary Circulation**: blood supplied to the heart itself
      (1) By-pass surgery, heart attack, blood vessel blockage, etc.
   c) **Hepatic-Portal Circulation**: Blood flow from digestive tract to the liver
   d) **Renal Circulation**: Circulation to and through the kidneys
   e) Body Circulation
3. **Lymphatic Circulation**
   a) Body cells bathed by intercellular fluid and aids in the transportation of gases, nutrients and wastes.
   b) Excess fluid called **Lymph** and is collected in vessels that make up the lymphatic system.
   c) like veins, **lymphatic vessels** have valves which help move lymph thru the system – moves by muscle contractions and indirect squeezing, there is no pump that moves the lymph
   d) **Lymph nodes** are collecting points usually found in the **armpit**, **groin, throat** and **Chest** regions that are filled w/ lymphocytes and are used to filter out, trap and then destroy bacteria and microorganisms that were collected.
   e) **Lymph** fluid is eventually dumped into a vein in the neck (Superior Vena Cava) where it reenters the circulatory system
4. **Blood**
   a) The blood is made up of **Plasma** and three main types of cells: **RBC** (red blood cells, **WBC** (white blood cells) and **platelets**.
      (1) **RBC:** nonnucleated cells that contain an iron containing molecule (**hemoglobin**) that carries the oxygen to the cells of the body. Anemia results

when there is not enough hemoglobin and the blood can not carry enough oxygen to the body.

(2) **WBC**: Several cell types that are involved in the immune system

(a) **Leukemia** is a cancer of the bone marrow that causes an uncontrolled growth of white blood cells

(3) **Platelets** are the RBC cell fragments involved in blood clotting. Also involved in clotting are long strands of protein called **fibrin**.

(4) Plasma is the yellowish fluid of the blood that carries all of the cells and materials which actually make up the substance we call "blood"

(a) Yellow color from dissolved proteins – 3 types

(i) **Albumins** – transport hormones and fatty acids

(ii) **Globulins** – transport vitamins & help fight viral infections

(iii) **Fibrinogens** – cause blood to clot

5. **Spleen** – Helps cleanse the blood by destroying & removing damaged RBC's cell fragments and platelets

6. **Thymus Gland** – located beneath the sternum and above the heart, main function is to "raise" T-cells until they are mature enough to work properly