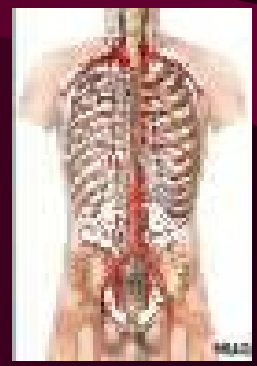
The Human Body

Circulatory System

Functions

- Distribution of food, water, salt, enzymes, hormones, oxygen, and antibodies
- removal of wastes (carbon dioxide, nitrogen)
- MAINTAIN HOMEOSTASIS

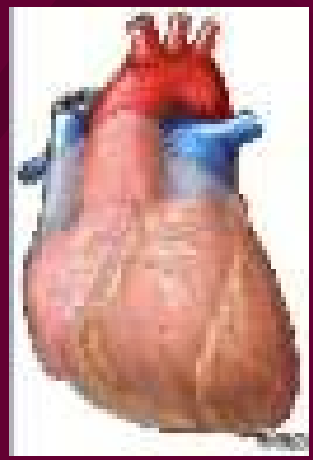
MAKE UP OF SYSTEM



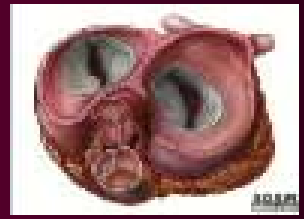
- Blood
- blood vessels - arteries, veins, capillaries
  - arterioles- small branched arteries
  - venules- small branched veins
- heart

Heart

- Located between lungs under sternum, slightly to left side
- cardiac muscle
- enclosed in a sac called the pericardium



Valves of Heart



- 2 sets
  - atrioventricular set (AV): one way from atria to ventricle
  - semilunar set (SL): tricuspid, located at openings of arteries; prevents back flow of blood when ventricles empty
- one way only
- maintains pressure in arteries

Phases of the Heart Beat

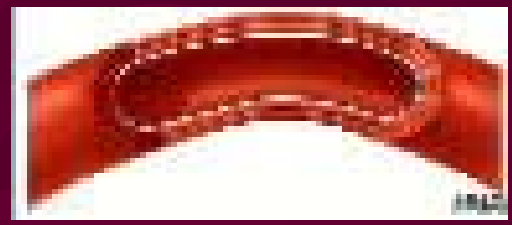
- 2 phases
  - systole: ventricles contract and force blood into arteries
  - diastole: ventricles relax and receive blood from atria
- sounds like lub-dup, lub-dup, ….
  - Lub: heart begins systole; AV valves close
  - Dup: heart begins diastole; SL valves close

Control of the Heart Beat

- Sinoatrial node (SA node): starts the heart beat by contracting the atria
  - located in the right atria
- Atrioventricular node (AV node): causes the ventricles to contract
  - located in the right atria also
- rate is controlled by nerves, but affected by smoking, drugs, alcohol, emotional state, etc.

BLOOD VESSELS

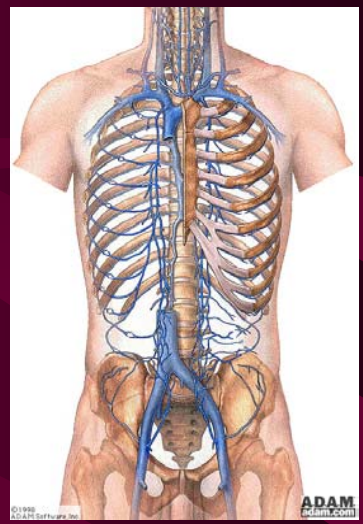
- ARTERIES
  - thick walled
  - 3 layers
    - connective tissue, smooth muscle, endothelium
  - ventricles contract - forces blood into arteries, and the arteries expand. The blood flows in spurts
  - the pulses are felt at pulse points due to systolic pressure



BLOOD VESSELS CONT.

- Capillaries:
  - tiny vessels only one blood cell thick
  - thin walled
  - gas exchange occurs through the walls

BLOOD VESSELS CONT.



- Veins:
  - close to surface of skin
  - tubes returning to the heart
  - thin walled, less muscle
  - larger internal diameter than arteries
  - many contain valves to keep the blood going back to the heart

BLOOD FLOW

- HEART-ARTERIES-ARTERIOLES-CAPILLARIES-VENULES-VEINS-HEART

- SPECIFICALLY: You should be able to trace the flow of blood from one part of the heart back to the heart

Blood Pressure

- Systole/diastole
- pressure is different in different vessels
  - high pressure in arteries close to heart
  - low pressure in veins
- factors
  - volume of blood (~4.5 liters)
  - output of blood
  - elasticity of arterties
    - increase elasticity = less pressure
    - increase age = decrease elasticity
  - changing vessel diameter

Composition of Blood

- Blood
  - liquid connective tissue
  - carries oxygen to the body, carbon dioxide and nitrogen away from the cells
  - 12 pints of blood = average total
  - 9% of body weight
  - contains: plasma, red corpuscles, white corpuscles, and platelets
    - liquid: 55% (plasma)
    - solid: 45% (cells and platelets)

Plasma

- 90% water
- light red colored
- contains
  - fibrinogen: helps in clotting blood
  - Serum albumin (A): regulates osmotic pressure between plasma and tissue
  - Serum Globulins: includes antibodies
  - digested foods: glucose, fatty acids, glycerol, amino acids
  - minerals: salts important in clotting and teeth and bone maintenance
  - nitrogenous waste: by products of metabolism

Red Corpuscles

- Also called red blood cells and erythrocytes
- formed in red marrow from flat bones
- very small, but numerous (4.8-5.4 million)
- contain hemoglobin
  - pigment in corpuscle containing Fe which carries oxygen and carbon dioxide
- donut shaped
- no nuclei in mammals

White Corpuscles

- Also called white blood cells and leucocytes
- larger than red blood cells
- contain nuclei
- fewer in number (1-600)
- formed in red marrow, lymph nodes, tonsils, and the spleen
- go from blood to tissue in capillary walls
- invade foreign microorganisms by phagocytosis

Platelets

- Pieces of larger cells
- formed in bone marrow
- no nuclei
- small in size
- important in clotting
  - release factors which produce an enzyme called prothrombinase which triggers the following reactions
    - prothrombin => thrombin
    - fibrinogen (soluble) => fibrin (insoluble)

Blood types

BLOOD TYPE	ANTIGEN	ANTIBODY	RECEIVES FROM	GIVES TO
A	A	B	O, A	A, AB
B	B	A	O, B	B, AB
AB	AB	NONE	A, B, AB, O	AB
O	NONE	A AND B	O	A, B, AB, O

- Antigens on the red blood cells determine the type
- Universal donor: type O
- Universal recipient: type AB
- If improper mixing occurs - AGGLUTINATION occurs

Rh factor in blood

- Rh factor: another protein found in blood
  - 85% of people have it; 15% do not
  - Rh+ = protein present; Rh- = protein absent
- Problems occur with mixing also
  - usually with women in their 2nd pregnancy
    - Rh- female + Rh+ male = child with Rh+
      - during second pregnancy the mom will have Rh+ antibodies build up that would attack a Rh+ child