Circulatory System

"You shall not circulate a false report. Do not put your hand with the wicked to be an unrighteous witness." Exodus 23:1

- heart and blood vessels form completely closed cardiovascular system
- heart → arteries → arterioles → capillaries → venules → veins → heart

Arteries

- thick-walled blood vessels that transport blood away from the heart
- three layers of tissue: 1) outer – tough, fibrous tissue 2) middle – thickest, made of smooth muscle fibers arranged in circular manner around 3) innermost layer – thin and smooth
- muscles allow the brain to control the diameter of the blood vessels in order to raise or lower blood pressure

Veins

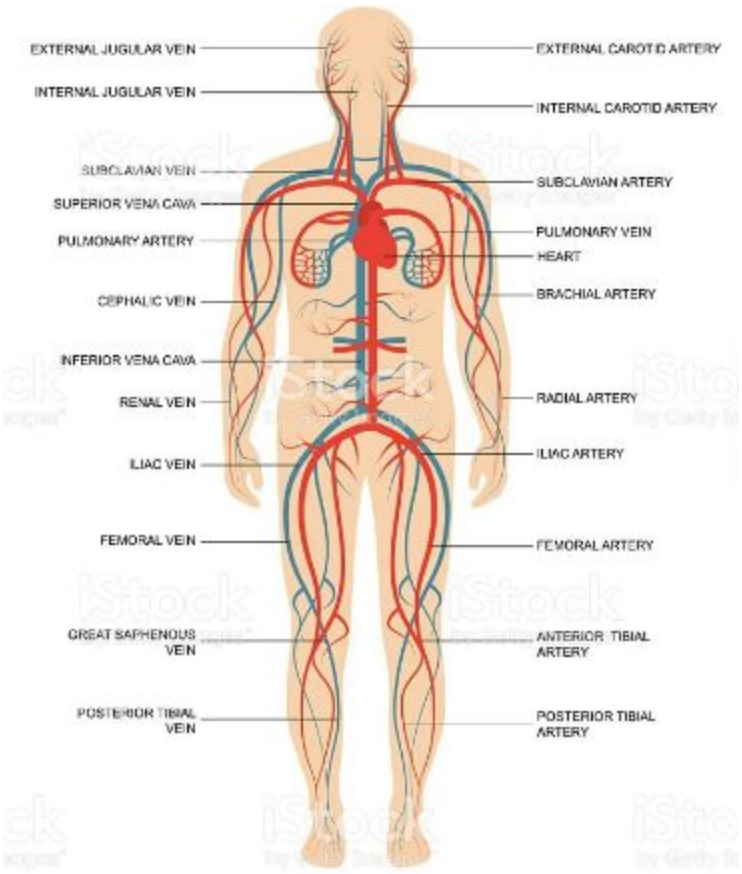
- not as thick or elastic as arteries b/c blood being pumped back to the heart is under less pressure than blood pumped into arteries from heart
- skeletal muscles squeeze veins and valves to ensure blood flows only toward the heart

Capillaries

- microscopic; walls only one layer thick
- all exchanges between cells of body and blood take place through capillaries; amount of blood in capillaries based on demand

Circulation

- systemic: movement of blood through all parts of body except lungs
- aorta leaves heart from L ventricle → aortic arch → carotid arteries carry blood to head/brain, two subclavian arteries carry blood to arms → aorta continues through thoracic cavity and abdominal cavity supplying blood to those organs → common iliac arteries → femoral arteries supply legs with blood



- arteries in organs branch to form capillaries which carry blood from the smallest organs to the smallest veins, during which the exchange of materials between blood and cells occur
- blood from body's organs:
  → superior vena cava returns blood to the heart from head, arms, upper body
  → inferior vena cava returns blood to heart from legs and lower regions
  → jugular veins drain head
  → subclavian veins drain arms
  → femoral veins drain legs

<u>Other types of circulation</u>

- pulmonary circulation: movement of blood between heart and lungs; L and R pulmonary arteries carry blood to lungs for oxygenation and return to heart via L and R pulmonary veins
- portal circulation: movement of blood from digestive organs to liver; after passing through liver, blood travels back to heart; liver cells dismantle old rbc and destroy poisons found in blood; excess glucose in blood stored in liver as glycogen
  -hepatic portal vein carries blood to the liver from digestive tract
  -hepatic vein returns blood to the inferior vena cava from the liver
- renal circulation: movement of blood from body organs through kidneys;
  -renal artery carries blood to kidneys where blood is filtered and various wastes removed
  -renal vein returns blood from kidneys to inferior vena cava

Problems with circulation

- atherosclerosis: deposits of fatty material and calcium In arteries build up to form plaque, which makes the lining rough; scar tissue forms around plaque deposits, narrowing the inside diameter of the artery
- heart must work harder to pump the same amount of blood through smaller channels
- artery can become completely blocked; can lead to hypertension (high blood pressure) and kidney failure

Blood pressure and pulse

- blood pressure: amount of force that blood exerts upon walls of blood vessels
- forces blood through vessels, helps keep vessels inflated, prevents fluids from pooling in tissues
- fills heart with blood between beats (diastole); adjusted by the medulla oblongata in brain stem, which increases or decreases tension on the walls to raise or lower blood pressure
- blood pressure highest in arteries and lowest in veins; varies with posture and activity level
- systole – ventricles contract
  diastole – heart resting between beats
- blood pressure measured in mmHg (millimeters of mercury); expressed as systole/diastole fraction
- normal = 120/80
  abnormally high: systole >130, diastole >90
- pulse: rhythmic change of pressure in arteries; easily detectable at carotid artery, radial artery and temple; pulse occurs in time with heartbeat

Cardiovascular care

- cardiovascular disease (CVD) is leading cause of death among Americans; includes htn, atherosclerosis, CHD and stroke
- factors that contribute to CVD: diabetes, obesity, inactive lifestyle, smoking
- treatment: anticoagulants, statins, beta blockers, nitroglycerin, digitalis