Ch. 13 Lecture 3

Veins

- Have a lower pressure than arteries
- Return blood to the heart
    - Skeletal Muscle Pumps: Muscles surrounding the veins help pump blood
- Venous Valves: Ensure one directional flow of blood
    - Can lead to abnormalities for people that stand up a lot. Results in varicose veins
- Breathing
    - Flattening of the diaphragm at inhalation increases abdominal cavity pressure in relation to thoracic pressure and moves blood towards the heart

Athersclerosis

- Responsible for 50% of the deaths due to heart attack and stroke
    - You build up plaques that occlude the lumen of the blood vessel and restrict blood flow
    - Mostly happens in the arteries, not veins
- Forms in response to damage to the endoghelium of a blood vessel
- Caused by smoking, high bp, high cholesterol
- Lipid filled macrophages/lymphocytes accumulate in the region and engulf lipids
- Layers of smooth muscle are added
- Then connective tissue caps the cmooth muscle, lipids, and cellular debris
- High Cholesterol
    - LDLs, Low density lipoproteins, carry cholesterol to arteries
    - People who consume or produce a lot of cholesterol have more LDLs
        - High LDL is associated with increased atherosclerosis
    - HDLs carry cholesterol away from the arteries to the liver to be metabolized
        - Takes cholesterol away from sources of plaque development
        - Statin drugs elevate HDL levels
        - Diet and exercise also help
    - Inflammation
        - Arthlerosclerosis is thought to be an inflammatory disease
        - C-reactive protein might be a good predictor for atherosclerosis
        - Antioxidants might be future treatments bc oxidized LDL might be high risk
- Ischemic Heart Disease
    - Condition due to inadequate oxygen due to reduced blood flow
    - Mostly caused by atherosclerosis
    - Associated with increased production of lactic acid and resulting pain
    - Associated with increased production of lactic acid and resulting pain: **Angina Pectoris**
    - Eventually, Necrosis of some areas of the heart occurs, causing a:

        - **Myocardial infarction (Heart Attack)**
    - Detecting Ischemia
        - Depression of the S-T segment of an EKG
        - Plasma concentration of blood enzymes
            - Creatine phosphokinase, lactate dehydrogenase, troponin I and T
- Heart Arrhythmias
    - Abnormal Heart rhythms
    - Bradycardia: Slow heart rate, below 60bpm
    - Tachycardia: Fast heart rate, above 100bpm
        - Abnormal tachycardia can occur due to drugs or fast ectopic pacemakers
        - These HR are normal if someone is active, but not at rest
    - Ventricular tachycardia occurs when pacemakers in the ventricles make them contract out of sync with the atria
        - Very dangerous. Can lead to ventricular fibrillation and sudden death
        - Heart isn't really beating, just vibrating
    - Flutter
        - Extremely fast
        - 200-300bp
        - Still coordinated contractions, but some issues in efficiency
    - Fibrillation
        - Completely uncoordinated between atria/ventricles
        - Each cardiac cell acting independently
    - Atrial Fibrillation
        - Can result from atrial flutter
        - Often from an ectopic pacemaker
        - Atrial muscles can't effectively contract.
        - AV Node can't keep pace with speed of atrial contractions but some stimulation is passed on
        - Reduces cardiac output by 15%
        - Associated with increased risk of stroke and heart failure
    - Ventricular Fibrillation
        - Ventricles can't pump blood and victim dies
        - Need CPR or **Electrical Defibrillation** to reset the rhythm
            - Brings all the cells to the same membrane potential in hopes of getting them back in sync
    - AV Node Block
        - AV node allows the delay between atrial and ventricular contraction
        - Can be seen in changes in the PR interval of an ECG
            - 1st Degree: Impulse conduction exceeds .2 seconds
            - 2nd Degree: Not every p wave has a QRS complex.
                - Not every electrical wave passes to the ventricles

- 3rd Degree: No stimulation gets through the AV node
    - Pacemaker in the Purkinje fibers takes over but is slow (20-40bpm)

Functions of the Lymphatic System

- Transports excess lymph from tissues to veins
- Produces and houses lymphocytes for immune response
- Transports absorbed fats from intestines to blood
- Lymphatic Capillaries
    - Smallest, found within most organs
    - Picks up Interstitial fluids, proteins, microorganism and fat
- Lymph Ducts
    - Formed from merging capillaries
    - Similar to veins in structure
    - Lymph is filtered through the lymph nodes
- Thoracic Trunk and Right Lymphatic Trunk
    - Form merging lymphatic ducts
    - Deliver lymph into right and left subclavian veins
- Organs of Lymphatic System
    - Tonsils, thymus, spleen
    - Sites of lymphocyte production
    - These can be used to move cancer around