

Chapter 17 Outline

- I. Cardiovascular Anatomy
 - a. SA Node
 - b. Types of Muscle in the body
 - i. Skeletal
 1. Unbranched, cylindrical and multinucleated myocytes, parallel myofiber bundles
 2. Stimulated by nerves neuromuscular junction
 - ii. Cardiac
 1. Branched myocytes with 1-2 nuclei
 2. Stimulated by nerves neuromuscular junction
 3. Stimulates itself with the SA node, then the AV node, and then the Bundle of Hiss and purkinje fibers
 - iii. Smooth
 1. Elongated, non striated myocytes with a single nucleus
 - c. Musculature
 - i. Sarcomere = Z Line to Z Line, the functional unit of cardiac muscle
 - ii. Actin and Myosin overlap but don't touch at the resting state
 - iii. Contraction
 1. Z Lines come towards each other
 - a. Overlap space (A band) becomes bigger, A line shrinks
 - d. Myocytes
 - i. Divided by intercalated disks, gap junctions, electro-signal from 1 myocyte to another like "the wave"
 - e. Z-Line, M Band, I Band
 - f. Sliding Filament Theory
 - i. Ca^{2+} into the SR
 - ii. Ca^{2+} binds to troponin and exposes myosin binding sites on actin filaments
 - iii. Myosin heads bind to actin, release of P initiates power stroke
 - iv. Power stroke → myosin head changes conformation, filaments slide past each other
 - v. ADP is released, ATP binds to myosin causing it to release actin
 - vi. ATP is hydrolyzed and the myosin heads returns to normal conformation
 - vii. Ca^{2+} is returned to the SR, muscle relaxes
 - g. PQRST Wave
 - i. P = atrial contraction
 - ii. QRS = ventricular contraction
 - iii. T = ventricular relaxation
 - iv. Lubdub = systole (pause between is diastole)
- II. Cardiovascular Physiology
 - a. Cardiac Cycle

- i. Echo = heart (ultrasound)
 - ii. Systole = contraction, increases pressure
 - 1. lubdub
 - iii. Diastole = relaxation
 - iv. Sounds
 - 1. 1st = closure of atrial vent, bi/tricuspid valve
 - 2. 2nd = closure of pulmonary/aortic valves
 - v. EEG
 - vi. EMG
- III. Lipid Metabolism
 - a. Dietary Fat
 - i. 98-99% triglycerides
 - ii. 102% cholesterol, phospholipids etc.
 - b. Digestion occurs mostly in the intestine via intestinal and pancreatic lipases and bile acids, where triglycerides are broken down to monoglycerides and fatty acids. These are absorbed by the intestinal mucosa, where they combine to reproduce triglycerides. These triglycerides assemble into water-soluble chylomicrons.
 - i. pancreatic lipases and bile acids → 1 monoglyceride and 3 fatty acids = 1 triglyceride
 - c. Triglycerides
 - i. Predominant form of fat in nature
 - ii. Function → provide energy to the cell
 - iii. Types of fatty acids
 - 1. Essential → cannot be synthesized by body (linoleic, linolenic, arachidonic acids) must be obtained through diet
 - 2. Nonessential → synthesized by the body
 - iv. Plasma triglycerides derived from
 - 1. Intestinal mucosa → synthesized from dietary fat
 - 2. Liver
 - a. Fasting → liver releases VLDL due to triglyceride utilization by adipose tissue for energy
 - b. Post-meal → dietary carbs taken up by liver and converted to triglycerides, then secreted as lipoproteins
 - d. Cholesterol
 - i. Sources → 15% diet, 85% synthesized from acetyl CoA by the liver
 - ii. Essential Functions
 - 1. Structural components of cell membranes
 - 2. Precursor for synthesis of bile salts, steroid hormones, and Vitamin D
 - iii. Cholesterol and triglycerides are insoluble in water. They need to be transported to and from tissue cells bound to small lipid-protein complexes called lipoproteins

1. Lipoproteins carries aldosterone/cortisol
- e. Lipoproteins
- i. Apolipoprotein → markers for lipoproteins
 - ii. Contain
 1. Triglycerides, phospholipids, cholesterol, protein
 - iii. Variable Fat
 1. Higher lipid percentage means lower lipoprotein density
 2. Higher protein percentage means higher lipoprotein density
 3. More lipids/fat = lighter
 4. More protein = heavier
 - iv. Types
 1. High density lipoprotein: HDL
 - a. Carries fat away from tissues and to the liver
 - b. Healthier
 2. Intermediate Density Lipoprotein: IDL
 3. Low Density Lipoprotein: LDL
 4. Very Low Density Lipoprotein: VLDL
 - a. The worst! No protein, very light
 - b. High amounts
 5. The best ones have high protein and low fat
- f. Chylomicrons
- i. Produced by the intestine
 1. Bind and transport dietary lipids to hepatic and peripheral tissue
 2. Enter circulation, where triglyceride and cholesterol carriers esters bound to them are hydrolyzed. This produces chylomicron remnant particles
 3. Chylomicron remnants are taken up by the liver
 - ii. Largest and least dense of lipoprotein particles
 - iii. All bad lipoproteins have Apo-B (marker for bad)
 1. Measured by blood tests