Chapter 11 – 10/26/2017
Ingestive Behavior: Intake of food, water, and minerals

Physiological symptoms from ingestion: Liver problems from drinking alcohol
Psychological symptoms from ingestion: Depression, not eating

Metabolic encephalopathy
Pickwickian Syndrome- metabolic problem from obesity that produces psychological symptoms

PROCESS OF REGULATION:
- System Variable- actual, something that is real that you measure (TEMPERATURE)
- Detector- Within the internal thermostat
- Set Point- desired, value that is set genetically around which you want to be
- Mechanism to change the variable- Negative feedback, trying to correct the negative in terms of temperature, eating drinking etc. fix the discrepancy

DRINKING:
- Detectors send signals to correctional mechanisms (drinking), the body does not have enough water, sends signal to drink, water goes into the stomach, goes in the stomach for a while, (have to drink for 2 hours non stop to get it directly to cells), stomach fills with water and send first signal to mechanisms that tells body you have drunk water and you should be good, few seconds- as you digest, about 20 min later, another signal goes from stomach back to body saying, you have enough water now, one fast, based on experiences, and the second longer based on physiological processes (Drinking Termination).
- There are 4 places water can go in body
  1. Intracellular Vs. Interstitial
     - TONICITY: Concentration of solutes (ions)
     - ISOTONIC: Equilibrium,
     - Solutions with more ions, water goes out to try and make it less tonic
     - Solutions with less ions, the water will try and makes less tonic, hypotonic
     - Cell membranes are permeable to sodium, not water
  2. Extra Cellular
     - Interspatial: In between cells
     - Intravascular: blood- regulated independently, really important for heart and kidney function, blood loss in called Hypovolemia, dehydration, severe burns also, too much blood you urinate, in extreme cases develop edema. In pregnancy, woman has 50
percent more blood than non pregnant women, all blood dilated in the vessels also increased cardiac output and rate

- CSF

- **Osmometric Thirst**: When interstitial tonicity increase- there are a lot of ions in between cells- potato chips, goes in between cells, need to release water inside the interstitial fluid to get equilbrium
  - Osmo Receptors: Located Near Thalamus, near 3rd ventricle- AV3V- they work when water leaves the cell, the firing rate is going to change of the neurons due to function of the volume of the cell, then brain can detect and learn that it is a signal to go drink
  - CELL VOLUME INCREASE-MEMBRANE POTENTIAL DECREASES-FIRING RATE DECREASES
  - CELL VOLUME DECREASE-MEMBRANCE POTENTIAL INCREASE-FIRING RATE INCREASE (HYPERTONIC SOLUTION)

- Inject the patient with saline with sodium chloride, hypertonic solution, immediately after injecting, you see activity in the AV3V and the Anterior Cingulate, if you wait, AC goes down: fast route, AV3V is the slow route
- Then you go to an area called MEDIAN PREOPTIC NUCLEUS (drinking trigger in the brain)

- **VOLUMETRIC THIRST**:
  - Not mechanical
  - Loss of blood
  - Detect loss, kidneys produce hormone called Renin, which triggers angiotensin, that has effects like increase in the retention of water, sodium, blood pressure, vasoconstriction, and trigger area SFO that projects to Median Preoptic Nucleus that triggers drinking

**EATING**:
- Hunger is a low energy detection signal
- Signaled when dips below as set point
- Energy, fuels, glucose, fatty acids, proteins
  - 2 fuel storage systems Fast and Slow
    - **SHORT TERM STORAGE**:
      - Carbohydrates in the form of glycogen- in the liver and muscles, short term storage, as soon as you need it, comes from here first, fast energy, glucose is the fuel, simple sugar, and glycogen which is the stored form, from glucose to glycogen by insulin in the pancreas, to break down glycogen to glucose you need glucagon, Glucose is only source of energy in CNS and PNS- detected in PET Scan
      - After glycogen storage is full than it is stored in the form of triglycerides
- Glucagon secreted in morning when glucose is low

- LONG TERM STORAGE:
  - Triglycerides, fat tissue, broken down by adrenaline into glycerol into fatty acids, used by the body as energy, the glucose goes to the brain
  - Sympathetic and hormonal control (glucagon and adrenaline)
  - Brain has first come first serve basis Brain first always
  - 85% of fuel is stored in fat cells in form of triglycerides, long term storage
  - 14% long term storage also amino acids

EXERCISE:
- Breakdown of muscle proteins (amino acids) used by the body as energy
- If you exercise too much you lose your muscles

Starting a Meal:
- Triggered by hormone- Ghrelin, and injection will trigger eating or thoughts of eating
- Can be measured in plasma, levels go down after a meal
- 2 kinds of hunger
  - Glucoprivation- issue with the consumption of glucose, lack of glucose
  - Use chemicals in PET scanners- 2DG, can trigger hunger, lesion of the vagus nerve leads to no hunger
  - Lipoprivation: Hunger is if you lack fatty acids
    - If you inject specific drug that blocks the break down of fatty acids, vagus nerve lesion takes out hunger
    - Vagus nerve and liver monitor glucose and fat levels and are the signal from the brain that there is hunger and start a meal mainly from liver to vagus nerve

- ENDING A MEAL:
  - Gastric factors-nutrient receptors in the stomach (anticipatory factors)
  - Intestinal factors- detection of fat in the duodenum- CCK (hormone), in the stomach is decreases outflow, increases bile and sends signal to brain to say stop eating (Anticipatory Factor)
  - Other one is PYY release by the duodenum, proportional to the amount of calories you ate, detector in the duodenum, enough calories have been ingested and the satiety signal is sent
  - LIVER FACTORS: Glucose receptors that send signals to brain to end eating, pancreas also, absorptive phase,
  - Cephalic or cognitive factors- coming from learning, you stop eating after you ingested certain amount of food

Long term satiety:
Leptin secreted by fat cells to break down fat, if you knock out gene for leptin that will be obese, doesn't break down fat, increase fat metabolism, hormone, if you inject it, then animal eats less, Leptin a fat related satiety signal (long term)