Week 13 Lecture 2

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1 Administrative drivel

- Exam booklets are here to pickup
  - mean 50.5, curve 24.5
- grade to date will be updated over the weekend to account for the new exam!

2 Digestive system

- Two parts: (review)
  - GI tract
    - main tube
  - Accessory organs
- Processes:
  - ingestion – get food into the body (gut)
    - put it in your mouth
  - mixing – mix food around and move it through tract
  - digestion – mechanical and chemical break-down
    - e.g. mechanical: stomach churning, chewing
    - e.g. chemical: converting things into molecules that can be used
  - absorption – pass food molecules into the body
    - molecules pass through the walls of the GI tract into the blood or lymphatic system to distribute the new molecules for use throughout the body
  - defecation – get rid of anything left over
    - poop.
- Organ overview – check canvas for picture!
  - the red labeled things are accessory organs, the black labeled things are GI tract organs
- Ingestion – theeth:
  - phyiscal breakdown of food – bring food into the mouth/oral cavity and mastication (grinding the foods, in other words, chewing)
  - large items are torn apart by the incisors to make smaller peices
- Ingestions – saliva:
  - salivary glands are considered accessory organs

  - lubricate food
    * saliva is slippery
    * also, adds moisture so it's more of a paste
  - Enzymes start metabolism:
    * salivary **amylase** for carbs (starch, glycogen)
    * salivary lipase for lipids
      · only really active in infants
  - lysozyme targets bacteria
    * covered in the immune section
    * lots of bacteria on the food we injest

- Ingestion – swallowing
  - Tongue moves to the roof of the mouth, forcing food into the esophogus where more muscles push the food down into the stomach
  - at the back of the throat, the trachea and esophegus meet.
    * when you swallow, there's a valve at the top of the trachea that closes by the food forcing it closed
      · valve == epiglotis
    * choking is when this goes wrong

- GI tract – **peristalsis** == wavelike muscle movements that push food along
  - all parts of the GI tract do this

- Esophagus
  - Tube
  - **Functions**: transfers food from oral cavity/mouth to stomach
  - about 2 feet long

- Stopmach
  - Expandable sac with an opening at either end
  - Sphincter – ring of muscles that acts like a valve, controls movement from one section of GI tract to next
  - 2 sphincters:
    * Esophageal – at the esophogus
      · prevents stomach acid from getting into the esophagus
    * pyloric – at the small intesstine
      · prevents acid from getting into the intestines
      · regulates the rate of food entering the intestine
  - **Functions**: 1) store and mix food, 2) break down large molecules (chemical), 3) destroy invaders, 4) regulate release of food into intestine
    * stores food for several hours, allowing for intermitant activity between eating
    * this is convinient, since it was once dangerous to go out and hunt for food
    * for us now, it just allows us to work or play between meals
    * pepsin along with acid breaks down food
      · most of digestion doesn't occur in the stomach
      · pepsin breaks down some protiens

    - amylase breakdown of carbs stops upon entering the stomach
    - the most important function is its high acidity
        - kills most pathogens
  - "Gastric juices" == 2-3 liters/day
    - produce protease to digest protiens
    - Very acidic: pH = 2
        - each intiger increase is 10 times the previous integer
    - Low pH helps kill microorganisms
  - Food + gastric juices = thin, watery – **Chyme**
  - about a foot long

- clicker q: where in the GI tract is the first place chemical digestion of food occurs? the mouth (amylase breaking down carbs)

- stomach – mixing and release:
  - waves every (about) 15 seconds slosh CHYME around
    - passes a small amount of chyme to the small intestine

- small intestine
  - one of the longest sections of the GI tract
  - on the order of 18 feet
  - parts: Duodenum, jejunum, ileum
  - Function: 1) Chemical digestion and 2) absorb nutrients, especially macro ones
    - most chemical digestion happens in the Duodenum (first foot)

- Duodenum:
  - receives bile from the liver (stored in the gal blader) and enzymes from the pancreas
  - pancreatic secretions also neutralize low pH of chyme exiting the stomach
  - chyme needs to be neutralized before it can be chemically digested, otherwise proteins will denature
    - this is done with bicarbonate
  - RE Wierd Al's song about the pancreas: flow flow flow pancreatic juice, flow flow, into the duodenum

- Pancreas
  - secrete enzymes that digest macronutrients:
    - carbs broken by – sucrase and amylase
    - proteins broken by – trypsin
    - lipids broken by – lipase

- Liver and gallbladder
  - **Bile** – produced by the liver as a byproduct of hemoglobin and cholesteroll breakdown and stored in the gallblader
    - attacks lipids
  - Bile salts released into duodenum when high lipid content detected
  - Bile emulsifies fats, makes the molecules accessible to lipase
    - rate of lipase break down of lipids is a function of the surface area to volume ratio of fat chunks, so smaller chunks are broken down faster