

February 6, 2015

Organic Macromolecules: Carbohydrates and Lipids

**No class next wednesday**

Outline

- Carbohydrates- Structure and Function
  - o Real-World Application: Lactose Intolerance
- Lipids- Structure and function
  - o Cellular Membrane

Organic Macromolecules

- Cells make large molecules out of small molecules
  - o Monomers: small molecule, subunit of macromolecules
  - o Polymers:  $\geq 2$  monomers linked together
- Biologically important molecules
  - o Carbohydrates, proteins, lipids, and nucleic acids
  - o How do we get these molecules? (Clicker question)
    - Atmosphere
    - **Eating Food (Correct Answer)**
    - Soil
    - Drinking water
  - o There's more to eating food than just enjoying the taste
    - Need to eat food to take care of the important functions of the body

Carbohydrates

- Breads and pastas have more than just carbohydrates in them

- Complex combination of organic molecules that we need is Carbohydrate
- Glucose and Fructose both have a carbon backbone
- Monomer: monosaccharides=a single sugar
  - o Some carbohydrates exist as a monosaccharide
- Molecular formula
  - o Multiples of  $\text{CH}_2\text{O}$
  - o Glucose:  $\text{C}_6\text{H}_{12}\text{O}_6$
- Sugars end in -ose (Carbohydrates also?)
  - o Glucose, fructose, sucrose
- Monosaccharides
  - o Glucoses, fructose, galactose
    - Because they are so small and simple they can be absorbed directly into blood during digestion
    - We consume carbohydrates to fuel everything that we need to do
      - When a blood sugar drop occurs eating something with a simple sugar makes things better almost instantly
  - o Glucose: Primary energy source for cells
    - Made by photosynthesis
- Disaccharides
  - o 2 monosaccharides (simple sugars that are linked together)
  - o Joined by dehydration reaction
  - o Sucrose (Sugar): glucose + fructose
  - o Lactose: galactose + glucose

- Milk is really useful as an energy source because it has glucose that the body can absorb directly
- Lactose Intolerance
  - o Are you Lactose intolerant? (Clicker Question)
    - Yes
    - No
    - Don't Know
  - o Lactose: reaction to breakdown lactose catalyzed by enzyme lactase
    - Occurs in small intestines
    - Presence of lactase gene is what allows the sugar to be broken down
    - Production of lactase controlled by genes
  - o Lactose Intolerance: change in nucleotide sequence near lactase gene
    - Decreases production of lactase or produces a non-functional form of lactase
  - o When lactose is not broken down in the small intestines it is consumed by bacteria in the large intestines
    - Produces gas and bloating as a bi-product of the bacteria breaking down lactose
  - o Evolutionary Connection
    - Lactose Intolerance is common in people of African, Native American, and Asian descent
      - Less common in people of Northern European descent
        - o Cold climate increased dependence on animal products