Chapter 3.3 Carbohydrates

So what was all this talk about carbs?

Atkin’s diet & South Beach diet reduces carbohydrate intake.

Carbohydrates
- Carbohydrates are composed of C, H, O
  - Carbo - hydr - ate
  - CH₂O
  - (CH₂O)ₓ → CₓH₁₂O₆
- Function:
  - Energy
  - Energy storage
  - Raw materials
  - Structural
- Monomer: sugars
- Ex: sugars & starches

Sugars
- Most names for sugars end in -ose
- Classified by number of carbons
  - Hexose (glucose)
  - Pentose (fructose, ribose)
  - Triose (glyceraldehyde)

What functional groups?
- Carbonyl
- Aldehyde
- Ketone
- Hydroxyl

Sugar Structure
- 5C & 6C sugars form rings in aqueous solutions
  - In cells!

Carbon atoms are numbered!
### Numbered Carbons

\[
\begin{align*}
C_1' & \quad C_2' \\
C_3' & \\
C_4' & \quad C_5' \quad C_6'
\end{align*}
\]

### Simple & Complex Sugars

- **Monosaccharides**
  - Simple 1 monomer sugars
  - Glucose
- **Disaccharides**
  - 2 monomers
  - Sucrose
- **Polysaccharides**
  - Large polymers
  - Starch

### Building Sugars

- **Dehydration synthesis**
  - Monosaccharides
  - Disaccharide
  - Glucose → Glucose → Maltose via glycosidic linkage

### Polysaccharides

- **Polymers of sugars**
  - Costs little energy to build
  - Easily reversible = release energy
- **Function:**
  - Energy storage
  - Starch (plants)
  - Glycogen (animals)
  - Building materials = structure
  - Cellulose (plants)
  - Chitin (arthropods & fungi)

### Branched vs. Linear Polysaccharides

- **Amphollose**
  - Starch
- **Glycogen**
  - Mitochondria
  - Glycogen granules
Polysaccharide Diversity

- Molecular structure determines function
- Isomers of glucose
- How does structure influence function...

Digesting Starch vs. Cellulose

- Starch: 1→4 linkage of α glucose monomers
- Cellulose: 1→4 linkage of β glucose monomers

Cellulose

- Most abundant organic compound on Earth

Glycemic Index

- Ranking of carbohydrates based on their immediate effect on blood glucose (blood sugar) levels
- Carbohydrate foods that breakdown quickly during digestion have the highest glycemic indices. Their blood sugar response is fast & high.

Glycemic Index

- Which food will get into your blood more quickly?
  - apple
  - rice cakes
  - corn flakes
  - bagel
  - peanut M&M