Carbohydrate Basics

Carbohydrates: CHO

**SUGARS**

**STARCHES**

**FIBER**

Simple Sugars: mono & di saccharides

- Glucose
- Fructose
- Galactose
- Sucrose
- Lactose
- Maltose

Foods high in simple carbs

- Naturally present
  - fruits
  - fruit juices
  - skim milk
  - plain nonfat yogurt
- Added sugars
  - angel food cake
  - soft drinks
  - sherbet
  - syrups
  - sweetened nonfat yogurt
  - candy, cookies, frosting
  - jams, jellies
  - gelatin
  - sweetened breakfast cereals
Carbohydrate Basics

Complex Carbs: Starches

Starch (amylose)

Complex Carbs: Glycogen

Glycogen

Complex Carbs: Oligosaccharides

raffinose

Stachyose
Complex Carbs: Fiber

- Citrus fruits, oat products, beans, thickeners
  - Delays gastric emptying time; slows glucose absorption, can ↓ blood cholesterol

- Apples, bananas, oranges, carrots, kidney beans
  - Pectins, gums, mucilage, some hemicelluloses

- Wheat, rye, rice, veggies
  - ↑ fecal bulk; estrogen-like effects

- Whole grains
  - All plants
  - Wheat products, Brown rice

- Wheat bran
  - Whole grains

- Wheat products, Brown rice
  - Whole grains

Table 5-1 Classification of Dietary Fibers

<table>
<thead>
<tr>
<th>Type</th>
<th>Component(s)</th>
<th>Examples</th>
<th>Physiological Effects</th>
<th>Major Food Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insoluble (poorly fermented)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noncarb.</td>
<td>Lignins</td>
<td>Wheat bran</td>
<td>↑ fecal bulk; estrogen-like effects</td>
<td>Whole grains</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>Cellulose, Hemicellulose</td>
<td>Wheat products Brown rice</td>
<td>↑ fecal bulk ↓ intestinal transit time</td>
<td>Whole grains</td>
</tr>
<tr>
<td>Soluble (viscous)</td>
<td></td>
<td></td>
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</tbody>
</table>

Anatomy of a kernel of grain
Lactose Intolerance

Carbohydrate absorption
Carbohydrates in the Body: Regulating Blood Glucose

Blood glucose regulation

Other hormonal influences

- Epinephrine/norepinephrine
- Cortisol
- Growth hormone
Biological Functions of Carbohydrates

- Energy
- Protein sparing
- Prevention of ketosis

How much do we need?

- RDA: 130 g/day
- 45 - 65% total daily kcals

ARTIFICIAL SWEETENERS
The problem with sucrose...

http://www.scotland.gov.uk/consultations/health/coth-03.asp

Microbial Flora of the Mouth

http://oi.odont.ku.dk/basic.periodontology/bacteria.html

http://www.dentalreview.com/kids/

Why does sucrose increase risk of cavities?

- Sucrose
  - Strep mutans
    - fructose
    - glucan (glycocalyx)
    - S. mutans
      - L. acidophilus
      - A. odontolyticus
    - lactic acid
    - biofilm
Carbohydrate Basics

Defenseless

Gluconeogenesis

- Pyruvate, lactate
- Glycerol
- Some amino acids

- Ketogenesis
Key steps in ketosis

↓ carb intake
↓ insulin levels
↑ lipolysis
↑ fatty acids in bloodstream → liver
↑ Ketone body formation (ketogenesis)
CO₂ + H₂O
Ketone bodies released into blood
Body cells pick up SOME ketone bodies but many remain in blood

Why do we have to have carbs to avoid making ketone bodies?

Ketone bodies

Two molecules of acetyl CoA form one molecule of acetoacetate.

β-hydroxybutyrate → Acetoacetate → Acetyl CoA

Body cells

Acetone

oxaloacetate

CAC

Two molecules of acetyl CoA form one molecule of acetoacetate.