Human Nutrition

Why Eat?

Why is it necessary to eat and drink?
- acquisition of nutrients

Nutrients from food provides:
- energy (fuel)
  - calories
- building blocks
  - making and maintaining cells
  - cellular products
- regulate body functions

Nutrients

Def: Components of food that perform physiological functions in the body

6 major classes
- Carbohydrates
- Fats (lipids)
- Proteins
- Vitamins
- Minerals
- Water
Calories

- Measure of energy capacity in food
  - Def: heat flow to raise 1 gram of water 1 degree Celsius
    - calories vs kilocalories
- Digestion
  - BIG $\rightarrow$ small
    - chemical bonds broken
      - energy released and captured for use in our body $\rightarrow$ calories
    - unused energy $\rightarrow$ stored
- Sources of calories
  - Protein and Carbohydrates $\rightarrow$ 4 kcal/gm
  - Fat $\rightarrow$ 9 kcal/gm
  - Alcohol $\rightarrow$ 7 kcal/gm
  - Water, vitamins, minerals $\rightarrow$ 0 kcal/gm
    - High fat/low water foods – high in calories (ex: peanuts)
    - Low fat/high water foods – low in calories (ex: celery)

Essential Nutrients

Def: Nutrients we must obtain from our diet because our body cannot manufacture them
- health compromised without essential nutrients

3 Classes of Essential Nutrients:
  1. most vitamins and minerals
  2. certain fatty acids (lipids)
  3. certain amino acids (proteins)

Carbohydrates

Carbo (carbon) + hydrate (water)
Functions:
  - energy production
    - use by body cells vs brain cells
    - storage
  - cellular components

Dietary sources:
  - Complex Carbohydrates
  - Simple Sugars

Homegrown sources
**Complex Carbohydrates**

- long-chain polysaccharide
- digested to glucose with amylase

**Characteristics:**
- **NOT sweet**
- contain fiber
  - insoluble fiber (wheat bran)
    - laxative effect (bulk)
  - soluble fiber (oat bran)
    - lowers cholesterol

*Ex: cereal grains (bread, pasta, rice), vegetables, potatoes, legumes (beans and peas), fleshy fruit*

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**Starch Structure**

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**Complex carbohydrates**

- provide vitamins, minerals, and fiber
- Foods such as breads, legumes, rice, pasta, and starchy vegetables contain complex carbohydrates
**Simple Sugars**

- comprised of up to three sugar units
- digested to glucose

**Characteristics:**
- sweet taste
- little or no fiber content

Ex: refined sugar (sucrose), corn syrup, dextrose, *fruit*

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**Glucose Structure**

- Chemical formula: $\text{C}_6\text{H}_{12}\text{O}_6$

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**Simple Carbohydrates**

Simple carbohydrates are found in foods such as fruits, milk, and vegetables.

Cake, candy, and other refined sugar products are simple sugars which also provide energy but lack vitamins, minerals, and fiber.
Carbohydrates and Nutrition

Healthiest → High-fiber complex carbohydrates
- Digested to sugars gradually
- Contain fiber, vitamins, and minerals
  - Whole grain vs processed
  Ex: high fiber veggies (lettuce & broccoli), whole grains

Least Healthy → Simple sugars & low fiber complex carbohydrates
- Little or no fiber, vitamins, and minerals
- Rapid digestion to sugars
  - rapid rise in blood sugar levels (GI)
  - increased fat deposition
  Ex: cereals/grains (bread/pasta), potatoes, rice, banana, candy, soda

Lipids

• fats, cholesterol and oils

Functions:
- energy source
- protection/insulation
- cell membranes
- vitamins/hormones

Sources:
• liver
  - cholesterol & phospholipids
• diet
  - essential fatty acids (FA)

Saturated Fats

• solids at room temperature

Sources:
- Primary: animal origins
  - ex: red meats, butter
- Secondary: plants
  - ex: palm & coconut oil

• starting material in synthesizing cholesterol
  - excess promotes heart disease
    - plaques
      - saturated fats & cholesterol
      - LDL/HDL cholesterol

• NO essential saturated fats
  - homegrown
    - vegetarians
Cholesterol

- precursor for sex hormones, vit D, bile, PM
  - vital functions
- plaques/atherosclerosis
- homegrown
- dietary intake:
  - saturated fat $\rightarrow$ big increase blood cholesterol
  - cholesterol $\rightarrow$ drop in cholesterol absorption

Cholesterol is produced by the liver and we consume it from meat and dairy products
Unsaturated Fats

- Tend to be liquids at room temperature (oils)
- Sources
  - Primary: plants
  - Secondary: plant-eating animals/fish
- Essential unsaturated fatty acids (FA)
  - Omega-6 FA (linoleic acid) & omega-3 FA (linolenic acid)
    - Precursor of prostaglandins
      - Omega-6: promote cell proliferation, inflammation & blood clotting
      - Omega-3: oppose effects of omega-6
    - Omega-6:omega-3 ratio
      - Cardiovascular disease & cancer with poor balance?
- Healthier than saturated fat?
  - LDL/HDL cholesterol

Omega-3 Fatty Acids

- Form of polyunsaturated fat that the body derives from food
- Essential fatty acids (EFAs)
- Sources:
  - Cold-water fish
    - Salmon, sardines, herring, anchovies, mackerel (1:7) and tuna
  - Algae
  - A few seeds and nuts
    - Flax (1:3), hemp, pumpkin, pumpkin and walnuts
  - Certain vegetable oils
    - Canola and soy
  - Chicken eggs & meat and cheese from grass-fed animals
    - Dark leafy greens (chia, purslane, perilla)
- Benefits
  - Anti-inflammatory
  - Anti-blood clotting
  - Reduces blood pressure & beneficial for heart
  - May also reduce the risks and symptoms of
    - Diabetes, stroke, rheumatoid arthritis, asthma, inflammatory bowel disease, ulcerative colitis, some cancers, and mental decline

Omega-3 fatty acids

Omega-3 fatty acids are found in oily fish like salmon and flaxseed and canola oils.
Trans Fats

- hydrogenated unsaturated (cheaper) fats
- act like saturated fats
  - better for manufacture
    - solid at room temp
    - longer shelf life
    - higher cooking temperature
- WORST offender
  - defective PM
    - increase risk of cancer and CV disease

Kraft Oreos

Old recipe Oreos contained 2.5 grams of trans fats in a three cookie serving

Trans fat-free Golden Oreos were introduced in 2005

Proteins

- Complex organic molecules digested to amino acid (AA) building blocks

More roles than fats & carbohydrates:

- structural building blocks
  - Ex: muscle, keratin for skin, hair & nails, cytoskeleton, collagen (CT)
- regulate body processes
  - Ex: enzymes, hormones
- Plasma membrane proteins
  - Ex: insulin binds to PM receptors
    - → glucose into cell
- energy source
  - Carbs and fats preferred
Amino Acids
- polypeptides digested to individual AA
  - translation

Essential Amino Acids
- 8 essential amino acids (20 common)
  - no storage
    - conversion of excess
  - Complete proteins
    - animal and soy
  - Incomplete proteins
    - most plants

Vitamins & Minerals

Vitamins
- organic substances
  - sensitive to heat & light
- required to help regulate functions within cells
  - Ex: vision, bones, teeth, blood clotting
- most essential
  - Some synthesized (ex: Vit D, K, B₁₂)

Minerals
- inorganic substances (from the earth)
  - unaffected by heat
- help with many body functions
  - Ex: bones, heart, nerves, muscles
    - Ex: calcium, sodium, potassium, iodine
Costco Vitamins

Water and Cancer
Drinking 10 glasses of fluid a day, the bulk of them water—may help reduce your risk of dying from cancer, according to a study from the National Cancer Institute. The study found 11% fewer deaths due to cancer in those who drank at least six glasses of water a day, regardless of what else they drank.

Water and Workouts
Which is better, drinking water before, during or right after exercising? Actually, all three are experts. Whether you’re running, doing a weights session or just getting your heart rate up, it’s important to drink plenty of water before, during and after. This will help you avoid dehydration and keep your body running smoothly. The more active you are, the more water you need. After a workout, aim for eight to ten glasses of water, and continue to drink plenty of water throughout the day.

--- Stuart Spahn

Water

<table>
<thead>
<tr>
<th>Serving Size</th>
<th>Calories</th>
<th>Protein</th>
<th>Carbohydrates</th>
<th>Vitamin C</th>
<th>Vitamin E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 oz.</td>
<td>90</td>
<td>20%</td>
<td>20%</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>8 fl. oz.</td>
<td>110</td>
<td>20%</td>
<td>20%</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>1.4 fl. oz.</td>
<td>130</td>
<td>20%</td>
<td>20%</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>1.1 fl. oz.</td>
<td>140</td>
<td>20%</td>
<td>20%</td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td>1 fl. oz.</td>
<td>150</td>
<td>20%</td>
<td>20%</td>
<td>140</td>
<td>140</td>
</tr>
</tbody>
</table>

--- Kelly Bell
Food Labels

Description of nutrient content of foods

Contents:
- Serving size/Servings per package
  - quantity of food analyzed (tricky?)
- Calories (kilocalories)
- % Daily Value
  - % government recommended daily consumption
- Vitamins & Minerals
  - % DV
- Ingredients
  - Listed in descending order of weight (tricky?)
  - ex: sugar, honey, high fructose corn syrup
2% vs Nonfat Milk

2% Milkfat
Reduced Fat Milk

Nonfat Milk
Skim Milk
Nutritional Guidelines

- set by US government (USDA)

Food Pyramid

- 1992
  - “Fat is bad” and “Carbs are good”
  - problems → fats and carbs not all bad/good

- 2003
  - distinguishes between healthy/unhealthy fat/carbs
  - lowers dairy recommendation

- 2005
  - MyPyramid.gov
    - personalization
    - age, sex, physical activity
The End