Nutritional Recommendations for the Physically Active Person

HNF 610: Nutrition & Fitness
Dr. Melissa Olfert
The Optimal Diet

- Supplies required nutrients in adequate amounts for tissue maintenance, repair, and growth without excess energy intake
- Proper nutrition helps:
  - Improve athletic performance
  - Optimize programs of physical conditioning
  - Improve recovery from fatigue
  - Avoid injury
Energy Balance Equation

- Body mass remains constant when caloric intake equals caloric expenditure.
- 3500 kCal approximately equals 1 lb of stored body fat.
- Consume 3500 extra kCal, gain 1 pound
- Burn 3500 kCal, lose 1 pound
Principles of Good Eating

- **Variety**
  - Choosing foods from a variety of sources creates a diet that contains sufficient amounts of all required nutrients.

- **Balance**
  - Balance in one’s diet indicates the intake of nutrients from the major food groups.

- **Moderation**
  - Eating moderately requires appropriate planning to maintain a balanced nutrient intake throughout the day.
MyPyramid

- www.mypyramid.gov
- Can be personalized based on age, sex, and level of daily exercise
- Includes a figure walking up the side of the pyramid to emphasize at least 30 minutes of moderate to vigorous daily physical activity
- Based on the 2005 Dietary Guidelines for Americans
### My Pyramid

#### Grains
- Make half your grains whole
- Any food made from wheat, rice, oats, cornmeal, barley, or another cereal grain is a grain product
- Bread, pasta, oatmeal, breakfast cereals, tortillas, and grits are examples of grain products

#### Vegetables
- Vary your veggies
- Eat more dark green veggies like broccoli, spinach, and other dark leafy greens
- Eat more orange vegetables like carrots and sweet potatoes
- Eat more dry beans and peas like pinto beans, kidney beans, and lentils

#### Fruits
- Focus on fruits
- Eat a variety of fruit
- Choose fresh, frozen, canned, or dried fruit
- Drink fruit juices

#### Milk
- Get your calcium-rich foods
- Go lean with protein
- Choose low-fat or fat-free when you choose milk, yogurt, and other milk products
- If you don’t or can’t consume milk, choose lactose-free products or other calcium sources such as fortified foods and beverages

#### Meat & Beans
- For a 2,000-Calorie diet you need the amounts below from each food group. To find the amounts right for you, go to MyPyramid.gov.
- Eat 3 oz. every day
- Eat 2½ cups every day
- Eat 2 cups every day
- Get 3 cups every day; for kids aged 2 to 8, it’s 2
- Eat 5½ oz. every day
Dietary Guidelines for Americans

- Control caloric intake to manage body weight.
- Consume a variety of foods.
  - Within the basic food groups
- Increase daily intake of fruits, vegetables, whole grains, and nonfat or low-fat milk and milk products.
- Choose fats wisely for good health.
  - Limit saturated fats and *trans* fats.
Dietary Guidelines for Americans (cont.)

- Choose carbohydrates wisely for good health.
- Choose and prepare foods with little salt.
- If you drink alcoholic beverages, do so in moderation.
- Be physically active every day.
- Keep food safe to eat.
Whole Grain Seed and Its Nutritional Value

Bran
“Outer shell” protects seed
- Fiber
- B vitamins
- Trace minerals

Endosperm
Provides energy
- Carbohydrate
- Protein
- Some B vitamins

Germ
Nourishment for the seed
- B vitamins
- Vitamin E
- Trace minerals
- Phytochemicals

Nutrient Value of Whole Wheat Versus Refined Flour

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Whole Wheat</th>
<th>Refined Flour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin E</td>
<td>7%</td>
<td>100%</td>
</tr>
<tr>
<td>Vitamin B₆</td>
<td>13%</td>
<td>100%</td>
</tr>
<tr>
<td>Magnesium</td>
<td>16%</td>
<td>100%</td>
</tr>
<tr>
<td>Riboflavin (B₂)</td>
<td>19%</td>
<td>100%</td>
</tr>
<tr>
<td>Niacin (B₃)</td>
<td>20%</td>
<td>100%</td>
</tr>
<tr>
<td>Fiber</td>
<td>22%</td>
<td>100%</td>
</tr>
<tr>
<td>Zinc</td>
<td>24%</td>
<td>100%</td>
</tr>
<tr>
<td>Potassium</td>
<td>26%</td>
<td>100%</td>
</tr>
<tr>
<td>Thiamin (B₁)</td>
<td>27%</td>
<td>100%</td>
</tr>
<tr>
<td>Iron</td>
<td>30%</td>
<td>100%</td>
</tr>
<tr>
<td>Copper</td>
<td>38%</td>
<td>100%</td>
</tr>
<tr>
<td>Selenium</td>
<td>48%</td>
<td>100%</td>
</tr>
<tr>
<td>Folate</td>
<td>59%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Percentage

- Yellow: Nutrients in refined flour
- Green: Nutrients in whole wheat

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Serving Size Versus Portions

- The USDA defines a standard serving of pasta as one-half cup.
- The FDA, which regulates food labels, claims a standard serving is 1 cup.
- Typical restaurant pasta portion averages about 3 cups.
  - Equal to 6 servings according to MyPyramid
AHA Recommendations

- Guidelines for the general public over the age of 2 years
- Achieve and maintain a healthful body weight.
- Increase the level of regular physical activity.
- Eliminate all tobacco.
Mediterranean and Vegetarian Diet Pyramids

- Mediterranean
  - Emphasizes fruits, nuts, vegetables, legumes, all manner of unrefined grains, and protein derived from fish, beans, and chicken
  - High monounsaturated fatty acid content
- Vegetarian
  - Consists of foods from the plant kingdom
Diet Quality Index (DQI)

- The DQI provides a general indication of the “healthfulness” of one’s diet.
- A simple scoring schema based on the risk gradient associated with diet and the major diet-related chronic diseases
- A score of 4 or less reflects a more healthful diet.
- A score of 10 or higher reflects a less healthful diet needing improvement.
### The Diet Quality Index

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Score</th>
<th>Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce total fat intake to 30% or less of total energy</td>
<td>0</td>
<td>&lt; 30%</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>30-40%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&gt;40%</td>
</tr>
<tr>
<td>Reduce saturated fatty acid intake to less than 10% of total energy</td>
<td>0</td>
<td>&lt;10%</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>10-13%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&gt;13%</td>
</tr>
<tr>
<td>Reduce cholesterol intake to less than 300 mg daily</td>
<td>0</td>
<td>=&lt;300 mg</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>300-400 mg</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&gt;400 mg</td>
</tr>
<tr>
<td>Eat 5 or more servings daily of vegetables and fruits</td>
<td>0</td>
<td>=&lt;5 servings</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3-4 servings</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0-2 servings</td>
</tr>
<tr>
<td>Increase intake of starches and other complex carbohydrates by eating 6 or</td>
<td>0</td>
<td>=&lt;6 servings</td>
</tr>
<tr>
<td>more servings daily of breads, cereals and legumes</td>
<td>1</td>
<td>4-5 servings</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0-3 servings</td>
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<tr>
<td>Maintain protein intake at moderate levels</td>
<td>0</td>
<td>100% RDA</td>
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<tr>
<td></td>
<td>1</td>
<td>100-150% RDA</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&gt;150% RDA</td>
</tr>
<tr>
<td>Limit total daily intake of sodium to 2400 mg or less</td>
<td>0</td>
<td>=&lt;2400 mg Na</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2400-3400 mg Na</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&gt;3400 mg Na</td>
</tr>
<tr>
<td>Maintain adequate calcium intake (approximately the RDA)</td>
<td>0</td>
<td>=&lt;100% RDA</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>67-99% RDA</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&lt;67% RDA</td>
</tr>
</tbody>
</table>
The Healthy Eating Index (HEI)

- Designed by the USDA for nutrition promotion activities and to monitor changes in diet quality over time
- A poor diet = HEI score 65
- A good diet = HEI score >85
- HEI scores for each component of the index are defined as “poor” (score, <5), “needs improvement” (score, 5-8), and “good” (score, >8)
Protein Intake among the Physically Active

- RDA = 0.8 g/kg of body mass
- Eating a high-carbohydrate diet with adequate energy intake conserves muscle protein in individuals who engage in protracted intense training.
- Those in endurance training = 1.2 to 1.4 g of high-quality protein per kg of body mass daily
- Those who resistance train may benefit from 1.6 g/kg of body mass.
Simple Amino Acids

- Some athletes supplement with simple amino acids.
- Advocates believe the body absorbs the simple amino acid molecule more readily.
- The healthy intestine absorbs amino acids rapidly when they exist in more complex di- and tripeptide molecules, not just in simple amino acid form.
Lipid Intake among the Physically Active

- To promote good health, lipid intake should probably not exceed 30% of the diet’s energy content.
  - Of this, at least 70% should come from unsaturated fatty acids.
- Significant reductions in dietary lipid compromise exercise performance.
- Lipids are necessary to obtain essential fatty acids and fat-soluble vitamins.
Carbohydrate Intake among the Physically Active

- A low-carbohydrate diet rapidly compromises energy reserves for vigorous physical activity or regular training.
- Physically active individuals should consume at least 55-60% of calories as carbohydrates, predominantly starches from fiber-rich, unprocessed grains, fruits, and vegetables.
- Endurance training = 10 g of carbohydrate per kg of body mass per day
Vitamin-Mineral Deficiencies

- Most often occur in:
  - Vegetarians or groups with low energy intake
  - Those who eliminate one or more food groups from their diet
  - Individuals who consume large amounts of processed foods and simple sugars with low micronutrient density
Vitamin Supplements

- 50 years of research fail to support the use of vitamin supplements to improve aerobic and anaerobic exercise performance.
- Daily supplements of 500-1500 mg of vitamin C per day may confer some benefit to individuals engaged in strenuous exercise who experience frequent viral infections.
Megavitamins

- Contain doses at least 10 and up to 1000 times the RDA
- Excess vitamin C = kidney stones
- Excess vitamin B<sub>6</sub> = liver disease and nerve damage
- Excess riboflavin (B<sub>2</sub>) = impaired vision
- Excess niacin = vasodilatation and inhibition of fatty acid mobilization during exercise
- Folate = trigger an allergic response
- Excess vitamin E = headache, fatigue, blurred vision, gastrointestinal disturbances, muscular weakness, and low blood sugar
- Excess vitamin A = toxic to the nervous system
- Excess vitamin D = damages kidneys
Antioxidants

- Aerobic exercise metabolism increases the production of free radicals.
- Antioxidants:
  - β-Carotene
  - Vitamin C
  - Vitamin E
  - Selenium, copper, manganese, and zinc
  - Coenzyme Q$_{10}$
Exercise Immunology

- Innate immune system includes anatomic and physiologic components.
  - Skin, mucous membranes, body temperature, and specialized defenses such as natural killer cells, diverse phagocytes, and inflammatory barriers
- Acquired immune system consists of specialized B- and T-lymphocyte cells.
Exercise Intensity and the Immune System

- **Moderate exercise**
  - A bout of moderate exercise boosts natural immune functions and host defenses for up to several hours.

- **Exhaustive exercise**
  - A prolonged period of exhaustive exercise (and other forms of extreme stress or increased training) severely impairs the body’s first line of defense against infection.
Minerals

- Excessive sweating during exercise causes loss of body water and related minerals.
- Mineral loss should be replaced following exercise through well-balanced meals.
- Single-mineral supplementation is ill advised unless prescribed because of potential adverse consequences.
Trace Minerals and Exercise

- Strenuous exercise may increase excretion of the following four trace elements:
  - Chromium
  - Copper
  - Manganese
  - Zinc
Exercise and Food Intake

- Energy intake needs to be balanced with energy expenditure.
- Individuals who engage regularly in moderate-to-intense physical activity eventually increase daily energy intake to match their higher level of energy expenditure.
- Many athletes, particularly females, do not meet energy intake recommendations.
Daily Energy Intake

kCal

Female

6000

Male

Tour de France

Tour de L’avenir

4800

Triathlon

Cycling, amateur

Water polo

Skating, swimming

3600

Rowing, soccer

Hockey, body building

Running

Weight lifting

Cycling

Judo

Rowing

Volleyball

Hockey, handball

Running, swimming

Sub-top gymnastics

Top gymnastics

Body building

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