Chapter 3

Optimal Nutrition for Exercise
Recommended Nutrient Intake

- Average values for young adults:
  - 2000 kCal for women
  - 3000 kCal for men

- A variety of food sources supply the extra energy demands for physical activity
Protein

- Recommended Daily Allowance is equal to 0.83 g per kg of body mass
- Athletes who train intensely can increase their intake to 1.2-1.8 g per kg body mass
Lipids

- No standards for optimal lipid intake exist
- Varies depending on:
  - Personal taste
  - Money spent on food
  - Geographic influences
  - Availability of lipid-rich foods
- For good health lipid intake should ≤30%
  - ≥70% of total intake should be unsaturated fatty acids
Carbohydrate

- Prominence of dietary carbohydrates varies depending on availability and relative cost of lipid-rich and protein-rich foods
- Recommendations for carbohydrate intake should be 6-10 g per kg of body mass per day
- Varies with an individual’s daily energy expenditure and type of exercise performed
  - The diet of physically active individuals should contain ≥55-60% carbohydrates, predominantly from fiber-rich, unprocessed grains, fruits, and vegetables
Essentials of Good Nutrition

- Key principles of good eating
  - Variety
  - Balance
  - Moderation

- MyPyramid
  - Color-coded with vertical bands of varying widths depending on how much individuals should consume
  - Based on the 2005 *Dietary Guidelines for Americans*
  - Advises consuming a varied but balanced diet
Food Guide Pyramids

GRAINS
- Whole grains
- Bread, pasta, rice, and other grains

VEGETABLES
- Variety and quantity

FRUITS
- Focus on fruits

MILK
- Dairy products

MEAT & BEANS
- Lean and protein

For a 2000-Calorie diet, you need the amounts below from each food group. To find the amounts right for you, go to www.MyPyramid.gov.

Red meat (to 26 oz. per month)

Sweets, eggs, poultry, and fish (to 6 oz. per day)

Breads, pasta, rice, and other grains (to 6 oz. per day)

Eggs and dairy (to 8 oz. per day)

Exercise (daily)

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Review

Which of the following is not a key principle of good eating?

a. Variety
b. Balance
c. Consistency
d. Moderation
Answer

• Which of the following is not a key principle of good eating?
  a. Variety
  b. Balance
  c. **Consistency**
  d. Moderation
Exercise and Energy Intake

- Energy balance:
  - Optimizes physical performance
  - Maintains lean body mass, training responsiveness, and immune and reproductive function

- Level of physical activity represents the most important factor that impacts daily energy expenditure

- The daily caloric needs of athletes in strenuous sports do not consistently exceed 4000 kCal
Precompetition Meal

- Should include foods high in carbohydrates (150-300 g) and relatively low in lipids and proteins
- Should be consumed three hours prior to event
- Individualize the meal by considering:
  - Athlete’s food preference
  - “Psychological set” of competition
  - Digestibility of foods
Liquid Meals

- Offer well-balanced nutritive value, contribute to fluid need, absorb rapidly and leave little residue in the digestive tract
- Practical approach to supplementing caloric intake during the high-energy–output phase of training
- Can be used by athletes to maintain or gain weight
Nutrition Bars

- Contain a relatively high protein content that ranges between 10 and 90 g per bar
- Often include vitamins and minerals and dietary supplements
- Composition varies with their purpose
**Nutrition Powder and Drinks**

- Contain 10-50 g of protein per serving
- Contain vitamins, minerals, and other dietary supplement ingredients
- Marketed as meal replacements, dieting aids, energy boosters, or concentrated protein sources
- Athletes in training should not use powders and drinks to substitute for regular food
Review

Which of the following is not an element of the ideal precompetition meal?

a. Be consumed 3 to 4 hours before exercising
b. Contain 150 to 300 g of carbohydrate
c. Contain relatively little fat and fiber
d. Contain 35 to 45 g of protein
Answer

Which of the following is not an element of the ideal precompetition meal?

- a. Be consumed 3 to 4 hours before exercising
- b. Contain 150 to 300 g of carbohydrate
- c. Contain relatively little fat and fiber
- d. Contain 35 to 45 g of protein
Carbohydrate Intake Pre-, During, and Post-Exercise

- Pre-exercise: Should be ingested ≥60 minutes before
- During exercise: 60 g carbohydrates each hour to enhance high-intensity endurance
- Post-exercise: Consuming carbohydrate-rich, high-glycemic foods immediately following intense training or competition speeds glycogen replenishment
  - Glycogen stores replenish 5-7% per hour with optimal carbohydrate intake
  - Replenishment takes ~20 hours
**Glycemic Index**

- Measure of blood glucose increase after consuming a specific carbohydrate food
- Foods with a low glycemic index digest and absorb at a slow rate to provide a steady supply of slow-release glucose during prolonged exercise
- 50-75 g moderate- to high-glycemic index carbohydrates should be consumed each hour post-exercise
Glycemic index of food sources of carbohydrates

High glycemic
- Glucose 100
- Carrots 93
- Honey 87
- Corn flakes 80
- Whole-meal bread 72
- White rice 72
- New potatoes 70
- White bread 69
- Shredded wheat 67
- Brown rice 66
- Beets 64
- Raisins 64
- Bananas 62

Moderate glycemic
- Corn 59
- Sucrose 59
- All-Bran 51
- Potato chips 51
- Peas 51
- White pasta 50
- Oatmeal 49
- Sweet potatoes 48
- Whole-wheat pasta 42
- Oranges 40

Low glycemic
- Apples 39
- Fish sticks 38
- Butter beans 36
- Navy beans 31
- Kidney beans 29
- Lentils 29
- Sausage 28
- Fructose 20
- Peanuts 13

High GI Diet

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<thead>
<tr>
<th>CHO Contribution to Total GI</th>
<th>CHO Contribution to Total GI</th>
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<tbody>
<tr>
<td>Breakfast</td>
<td>Breakfast</td>
</tr>
<tr>
<td>30 g Corn flakes</td>
<td>30 g All-Bran</td>
</tr>
<tr>
<td>1 banana</td>
<td>1 sliced peach</td>
</tr>
<tr>
<td>2 tbsp margarine</td>
<td>1 whole grain bread</td>
</tr>
<tr>
<td>1 tsp jelly</td>
<td>1 tsp margarine</td>
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<td>1 tsp jelly</td>
<td>1 tsp margarine</td>
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<tr>
<td>Lunch</td>
<td>Lunch</td>
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<tr>
<td>2 slices whole meal bread</td>
<td>2 slices grain bread</td>
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<td>2 tsp margarine</td>
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<tr>
<td>25 g cheese</td>
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<tr>
<td>1 cup of baked beans</td>
<td>1 apple</td>
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<td>8 tsp salad dressing</td>
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<tr>
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<td>Snack</td>
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<tr>
<td>4 g plain wafers</td>
<td>200 g low-fat fruit yogurt</td>
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<tr>
<td>2 tsp margarine</td>
<td>20 tsp margarine</td>
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<tr>
<td>Dinner</td>
<td>Dinner</td>
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<tr>
<td>120 g lean steak</td>
<td>120 g lean minced beef</td>
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<tr>
<td>1 cup of mixed potatoes</td>
<td>1 cup of tomato and onion sauce</td>
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<tr>
<td>1/2 cup of carrots</td>
<td>1 cup of tomato and onion sauce</td>
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<tr>
<td>1/2 cup of green beans</td>
<td>1/2 cup of green beans</td>
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<tr>
<td>50 g broccoli</td>
<td>2 g broccoli</td>
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<tr>
<td>295 g watermelon</td>
<td>1 orange</td>
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<td>1 cup of reduced fat milk</td>
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<tr>
<td>Total</td>
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<tr>
<td>212 g Total</td>
<td>212 g Total</td>
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For each diet, the carbohydrate choices are maximized for differences between the two diets.
Rehydration

- Optimal gastric emptying occurs by consuming 400-600 mL of fluid immediately before exercise followed by regular fluid ingestion during exercise (250 mL every 15 minutes)

- Ideal oral rehydration solution to maintain fluid balance during exercise and heat stress contains 5-8% carbohydrates

- A moderate amount of sodium added to rehydration fluid stabilizes plasma sodium concentrations to minimize risk for hyponatremia
Ideal Oral Rehydration Beverage

- Tastes good
- Absorbs rapidly
- Causes little or no gastrointestinal distress
- Maintains extracellular fluid volume and osmolality
- Offers the potential to enhance exercise performance
Review

- With optimal carbohydrate intake, glycogen stores replenish at a rate of about ____________ per hour.
  a. 2-3%
  b. 5-7%
  c. 9-11%
  d. 12-15%
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