**CHAPTER 1**

**THE BASICS OF NUTRITION**

**OVERVIEW**

In Chapter 1, students will learn about the six classes of nutrients and their general roles in the body, such as supplying energy and regulating cellular growth, repair, and maintenance. Essential nutrients are discussed as well as phytochemicals, which are not dietary essentials but may have health benefits. Trends in eating habits are explored and the nutrition-related objectives of *Healthy People 2020* are presented. The chapter introduces core terminology and fundamental calculations involved in the study of nutrition. The basics of nutrition are presented as 10 key nutrition concepts. These concepts promote the importance of eating a variety of minimally-processed, nutrient-dense foods to support health rather than relying on dietary supplements to meet nutrient needs. Balance, variety, and moderation in diet planning are emphasized throughout the discussion of basic nutrition. In the last section of the chapter (“Nutrition Matters: Undernutrition—A Worldwide Concern”), the causes and consequences of worldwide undernutrition as well as the possible solutions for this serious problem are examined.

**TEACHING STRATEGIES**

1. Have students review Figure 1.2 and prepare a family tree that covers at least 3 generations. The “tree” should show year of birth (and death, if applicable) for each family member, various serious chronic diseases experienced by the relatives, and causes of death, if known. As a result of preparing the tree, do students think they are at risk of serious chronic diseases? What lifestyle changes (e.g., diet and exercise) can students adopt to reduce these risks?
2. Have students identify their favorite foods. Ask them to consider why these foods are their favorites and relate whether the foods have any emotional, cultural, or social significance to them personally.
3. Have students visit the website for *Healthy People 2020* (<https://www.healthypeople.gov/2020/topics-objectives>) and access the objectives under the *Nutrition and Weight Status* topic area (<https://www.healthypeople.gov/2020/topics-objectives/topic/nutrition-and-weight-status/objectives>). Each student should choose one of these objectives and report information concerning the population’s current status regarding the objective. Each student should report the extent to which Americans are reaching the objective’s target.
4. To demonstrate the concept of energy density, the instructor shows examples of various foods that contain equal amounts of kilocalories. For approximate 100-Calorie examples, have 1 tablespoon of butter, 2 doughnut holes (from glazed, raised doughnuts), 1 cup of green grapes (151 g), and 1 large head of iceberg lettuce (755 g) on separate plates for students to view. Ask students which nutrients contribute to the energy density of these foods?
5. Have students visit *World Hunger Organization* at <http://www.worldhunger.org/learn-about-hunger/> and take the “Hunger Quiz“ (<http://www.worldhunger.org/hunger-quiz/>). At <http://www.worldhunger.org/hunger-news/united-states/> , students can learn about efforts to reduce hunger in the United States. Students can present what they learned about worldwide hunger after visiting these sites.
6. At the beginning of the course, students should form a team of interested members who will contact a local food pantry to see which canned foods are needed and whether the pantry will accept donated canned foods. Then, the team of students should prepare a proposal that includes the date or dates of a campus-based food drive. The plan should also describe ways the members of the team will promote the drive, collect canned goods, and provide the items to the pantry. Before submitting the proposal to campus administrators, the instructor should meet with the students to review the proposal and determine whether there will be costs incurred. After campus administrators approve the proposal and agree to find funding (if necessary), the team of students should organize the drive and manage the collection and distribution of the food products.
7. Have students complete the Personal Dietary Analysis activity at the end of the chapter or in Connect.

**CHAPTER OUTLINE**

1. Nutrition: The Basics
   1. A person’s diet is his or her usual pattern of food choices.
   2. Nutrients are life-sustaining substances in foods (and beverages).

1. People eat food for more reasons than just to satisfy hunger. Figure 1.1 shows some major factors that influence an individual’s food choices.

2. People are not born with the ability to choose a healthful diet. They need to learn about nutrition and the effects that foods can have on health.

* 1. Why learn about nutrition?

1. Poor eating habits contribute to many of the leading causes of death in the U.S.

2. Figure 1.2 indicates the 10 leading causes of death and identifies those in which diet plays a role.

* 1. Nutrition is the scientific study of nutrients and how the body uses them
  2. Nutrients (six classes)

1. Carbohydrates

2. Fats and other lipids

3. Proteins

4. Vitamins

5. Minerals

6. Water

F. Some nutrients are used for energy, and others are involved in the regulation of body processes that support growth, repair, and maintenance of cells (summarized in Table 1.1).

G. Cells are the smallest functioning structural units of a living organism; they require nutrients from food to carry out their metabolic activities.

1. Metabolism is the sum of all chemical processes that occur in living cells.

2. Physiology is the study of how the body functions.

H. What is an essential nutrient?

1. Essential nutrients

a. Must be supplied by food because they cannot be synthesized by the body or made in amounts that are needed.

b. Approximately 50 nutrients are essential.

c. Water is the most essential nutrient.

d. Three key features of an essential nutrient:

i. Deficiency disease results from inadequate dietary intake of the nutrient.

ii. Deficiency signs and symptoms are corrected when adequate intake of the nutrient is restored.

iii. The nutrient’s biological roles in the body explain the deficiency signs and symptoms.

e. The body derives essential nutrients from a varied diet.

f. Table 1.2 lists essential nutrients for humans.

2. What are nonnutrients?

a. Substances in foods that are not nutrients but may have effects on the body.

b. Phytochemicals are chemicals made by plants, some of which may benefit health.

i. Many phytochemicals are antioxidants that protect cells and their components from damage by environmental factors.

ii. Some phytochemicals are toxic or interfere with absorption of other nutrients.

iii. Table 1.3 summarizes the health effects of many phytochemicals that are of current scientific interest.

c. Dietary supplements

i. Dietary Supplement Health and Education Act of 1994 (DSHEA) allows classification of herbal products and nutrient supplements as foods, thus limiting the regulatory control of the United States Food and Drug Administration (FDA).

ii. Dietary supplements are products that contain any vitamin, mineral, herb, or other plant product, amino acid, or dietary substance that supplements the diet by increasing total intake.

iii. Some dietary supplements can have beneficial effects on health while others can be harmful.

II. Factors That Influence Americans’ Health

A. Introduction

1. A risk factor is a personal characteristic that increases a person’s chances of developing a chronic disease. Chronic diseases generally take a long time to develop and have complex causes.

* + - 1. Genetics
      2. Lifestyle
         1. Poor diet, cigarette smoking, and excess alcohol consumption increase the likelihood of several serious chronic diseases.
         2. Obesity, a condition characterized by excess body fat, is a risk factor for many serious chronic health problems.

B. Our changing eating habits

1. Compared to Americans’ food consumption practices in 1970, the population eats more fruits and vegetables, but they generally do not consume recommended amounts.

2. Consumption of red meat, eggs, milk, and yogurt has decreased over the past 45 years.

3. Consumption of fish, chicken, turkey, grain (especially refined) products, cheese, fruit, and vegetables has increased over the past 45 years.

4. Consumption of added fats, added sugars, and total food energy has increased over the past 45 years. Refer students to Table 1.4.

5. Americans are fatter than in previous decades. Dietary practices and availability of labor-saving devices contribute to excessive amounts of body fat (obesity).

C. *Healthy People 2020*

1. *Healthy People 2020*, a report issued in 2011 by the U.S. Department of Health and Human Services, identifies national health promotion and disease prevention objectives that are to be met by 2020.

2. The main nutrition-related goal of *Healthy People 2020* is to promote good health and reduce the risk of chronic disease by consuming healthful diets and achieving and maintaining healthy body weights.

3. Various nutrition and weight status objectives are listed in Table 1.5.

4. More information about these nutrition-related objectives is available at: <https://www.healthypeople.gov/2020/topics-objectives/topic/nutrition-and-weight-status>

III. Metrics for Nutrition

A. Common prefixes

1. Micro = one-millionth

2. Milli = one-thousandth

3. Centi = one-hundredth

4. Deci = one-tenth

5. Kilo = one thousand

B. Common units

1. Meter (m)

2. Gram (g)

3. Liter (l or L)

C. Useful conversion factors

1. 2.54 cm = 1 inch

2. 28 g = 1 ounce

3. 454 g = 1 pound

4. 2.2 pounds = 1 kg

D. What is a calorie?

1. A calorie is the heat energy needed to raise the temperature of 1 g (1 ml) of water 1°C.

2. A calorie is such a small unit of energy, food energy is usually reported in kilocalories (kcal), also known as Calories (1000 calories).

3. Approximate energy yield of nutrients

a. 1 g carbohydrate = 4 kcal

b. 1 g protein = 4 kcal

c. 1 g fat = 9 kcal

d. 1 g alcohol = 7 kcal

E. Macronutrients and micronutrients

1. Macronutrients are needed in relatively large amounts (grams); supply energy for cells.

a. Carbohydrates

b. Fats

c. Proteins

2. Micronutrients are needed in relatively small amounts (milligrams and micrograms); they do not supply energy.

a. Vitamins

b. Minerals

3. Water is needed in large amounts, but the nutrient supplies no energy. It is not classified as a macronutrient.

4. Dietary analysis software and food composition tables report average amounts of nutrients in foods.

IV. Key Nutrition Concepts

A. Concept 1: Most naturally occurring foods are mixtures of nutrients.

1. Water is often the main nutrient in foods. Refer students to Figure 1.6.

2. Processed foods usually contain a mixture of nutrients.

B. Concept 2: Variety can help ensure the nutritional adequacy of a diet.

1. No natural food supplies all nutrients needed by the body.

2. People need to choose a variety of foods from all food groups. Refer students to Figure 1.7. Chapter 3 discusses food groups in detail.

C. Concept 3: There are no “good” or “bad” foods.

1. All foods have some nutritional value.

2. A “bad” food contains dangerous microbes or toxins.

a. Foods and beverages that supply a lot of calories from added fats, added sugars, and/or alcohol are sources of “empty” calories. Such items displace more nutritious foods and beverages from diets.

b. According to some nutrition experts, a nutrient-dense food contains a lot of key beneficial nutrients (e.g., potassium and iron) in a serving in relation to the serving’s caloric value. A nutritious diet contains a variety of nutrient-dense foods.

c. Energy density refers to the energy value (calorie content) of a serving of food in relation to its weight. High-fat foods are energy dense.

D. Concept 4: Enjoy eating all foods in moderation.

1. Dietary moderation involves eating enough food to meet one’s nutrient needs, while balancing the energy intake from the foods with one’s energy expenditures, primarily by being physically active.

E. Concept 5: For each nutrient, there is a range of safe intake.

1. The physiological dose of a nutrient refers to the amount that is within the range of safe intake and enables the body to function properly.

2. A megadose of a nutrient is an amount that far exceeds the recommended amount.

a. Consuming more than recommended amounts of a nutrient can cause toxicity.

F. Concept 6: Food is the best source of nutrients and phytochemicals.

1. The recommended way to obtain nutrients is to choose “whole” or minimally processed foods.

a. Dietary supplements do not contain every substance needed for good health.

G. Concept 7: There is no “one size fits all” approach to planning a nutritionally adequate diet.

1. A healthy diet should be individualized to meet a person’s food preferences, budget, and lifestyle.

H. Concept 8: Foods and the nutrients they contain are not cure-alls.

1. Nutrients do not cure diseases, unless the diseases are caused by nutrient deficiencies. Diet is only one aspect of an individual that influences his or her health.

2. Functional foods are often manufactured to boost nutrient intakes or benefit health.

I. Concept 9: Malnutrition includes *under*nutrition as well as *over*nutrition.

1. Malnutrition is a state of health that occurs when the body is improperly nourished.

J. Concept 10: Nutrition is a dynamic science.

1. As scientists learn more about the complex relationships between diet and health, nutrition information changes. As a result of the new information, dietary recommendations change.

V. Nutrition Matters*:* Undernutrition: A Worldwide Concern

A. Introduction

1. In 2016, an estimated 800 million people in the world were chronically undernourished.

B. Undernutrition results when long-term energy and nutrient intakes are inadequate to meet a person’s needs.

1. Many factors contribute to undernutrition (see Figure 1.13), especially poverty, lack of access to nutritious foods, and food shortages that may stem from traditional dietary practices, crop failures, civil unrest, and government corruption.

2. Over 660 million people use drinking water that is unsafe to drink because it contains bacteria and viruses that cause diarrhea, cholera, and polio. Every year, an estimated 502,000 people die as a result developing diarrhea after consuming unclean water.

C. Undernutrition during periods of growth

1. In undernourished children, nutrient deficiencies are responsible for stunted physical growth, impaired physical and intellectual development, blindness, and premature death.

a. Vitamin A deficiency is a major cause of blindness among young undernourished children.

2. The vast majority of childhood deaths related to undernutrition occur in sub-Saharan Africa and parts of Asia.

D. Undernutrition during pregnancy

1. Undernutrition during pregnancy increases the risk of the pregnant woman’s death.

a. Babies born to women who were undernourished during pregnancy are more likely to be premature, have low birth weight, breathing problems, and die during their first year of life.

E. Undernutrition during infancy

1. This state of child health is often caused by improper preparation of infant formula. In developing countries, caregivers may use excessive water when preparing the formula.

a. This practice decreases the formula’s nutritional value and increases risk of the infant’s exposure to polluted water supplies.

b. The diarrhea that often results from drinking polluted water can lead to dehydration and death of affected infants.

2. Exclusive breastfeeding is generally recommended for infants up to six months of age, with continued breastfeeding, in addition to solid foods, through the second year of life.

a. Each year, over 800,000 infants die before the age of five because they did not consume adequate amounts of breast milk during their first 2 years of life.

F. Undernutrition during the preschool years

1. Undernutrition during the first five years of life has negative consequences for the rapid brain growth that occurs during this time.

a. Can lead to learning disabilities

2. Physical effects include stunted physical growth (short stature), delayed physical development, and premature death.

3. Undernutrition among preschool children also increases risk of death from infectious diseases, especially measles. Measles can occur in children who have not been vaccinated against the virus.

G. Undernutrition in the United States

1. In developed countries, undernutrition is almost always the result of poverty. Other factors include:

a. Eating disorders

b. Substance abuse, particularly alcoholism

2. Food insecurity is concern about running out of food or not having money to buy more food.

a. Unemployment, underemployment, excessive medical or housing expenses, and fixed incomes contribute to food insecurity.

b. Help (especially for children) is available from food pantries and federal food assistance programs.

H. Major U.S. food assistance programs

1. Refer students to Table 1.9.

I. Solutions

1. UNICEF and the World Food Program provide food for undernourished populations.

2. Ready-to-use therapeutic foods (RUTFs) have been developed to treat severely undernourished young children in developing countries.

3. Biotechnology uses living things to manufacture improved products and improve food production.

a. Genetic engineering and genetically modified organisms (GMOs)

J. Feeding the world while protecting natural resources

1. Sustainable agriculture involves farming methods that can meet the demand for food without depleting or harming natural resources or harming the environment.

2. Farming needs to be profitable for farmers and ranchers to switch from conventional to sustainable agricultural methods.

a. Universal policies recommended to solve problems created by conventional farming include reducing food waste, finding ways to increase food production, and stopping the expansion of agricultural activity into regions that need to be preserved, such as tropical rainforests.

3. Taking action involves:

* + - 1. Making social, political, economic, and agricultural changes to reduce chronic hunger.
      2. Using food aid as a short-term solution.
      3. Helping farmers in underdeveloped countries learn efficient methods of growing, processing, preserving, and distributing food products.
      4. Promoting breastfeeding and foods that have been fortified with critical nutrients (e.g., vitamin A).
      5. Encouraging population control efforts that would help sustain the Earth’s resources.