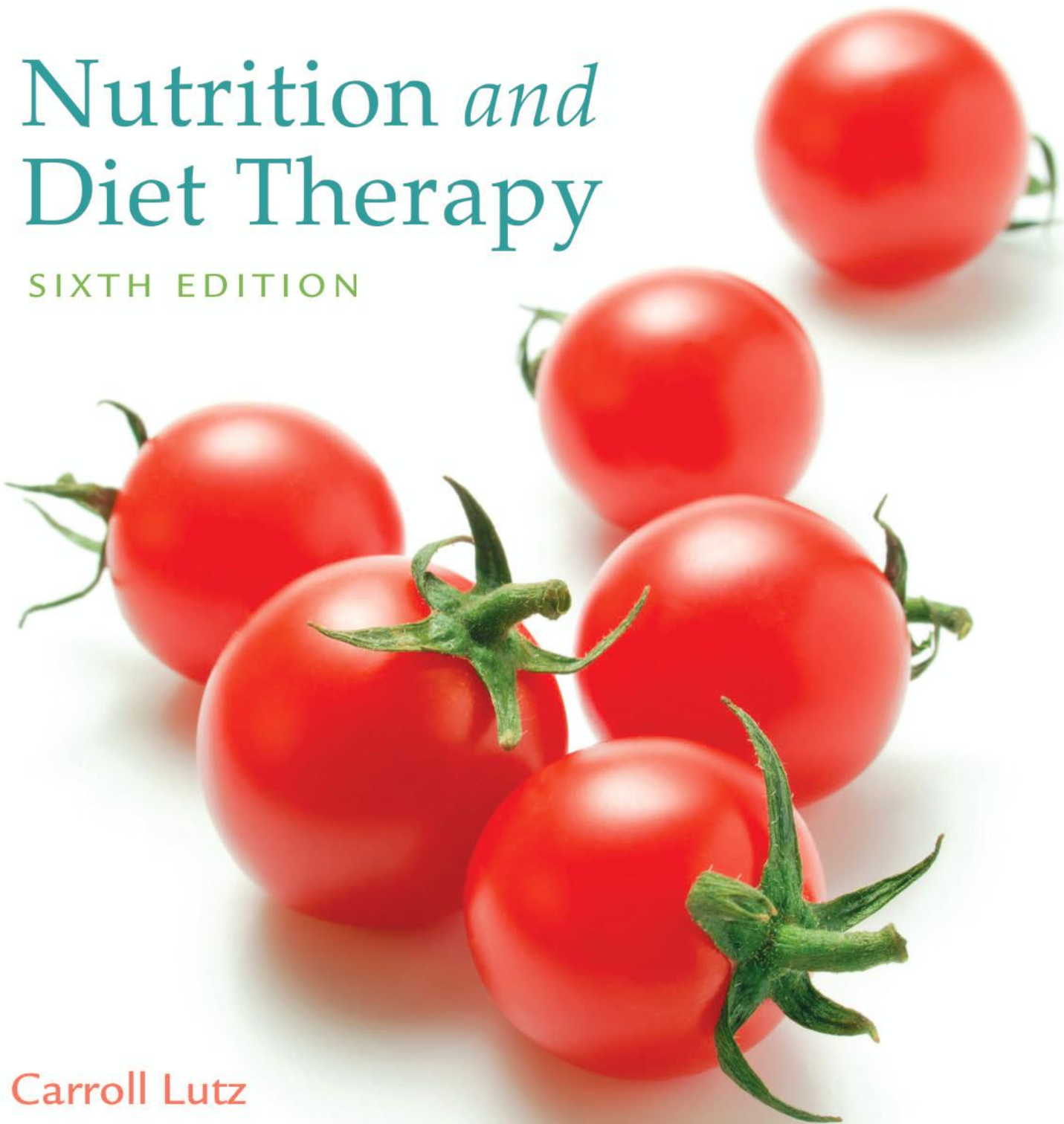


# Nutrition *and* Diet Therapy

SIXTH EDITION



Carroll Lutz

Erin Mazur

Nancy Litch



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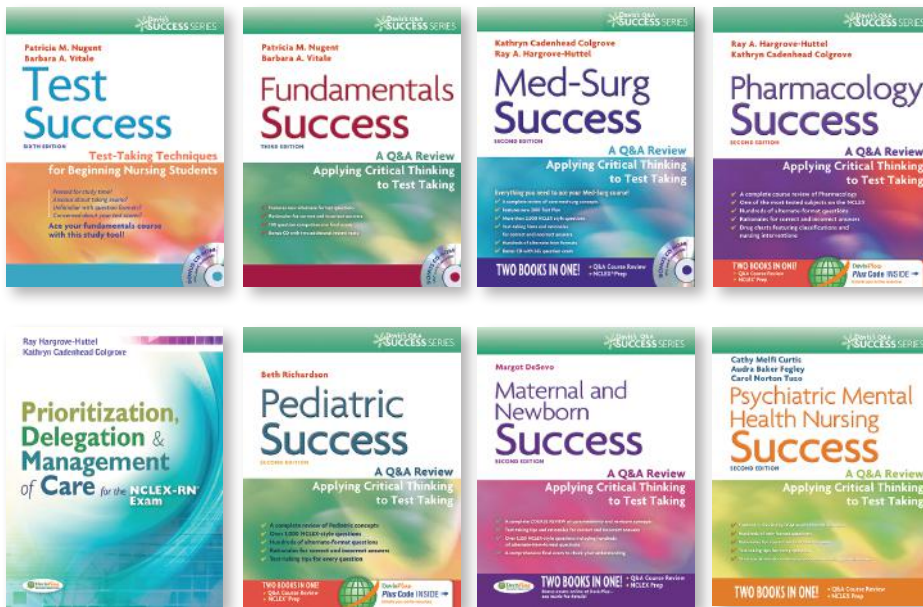
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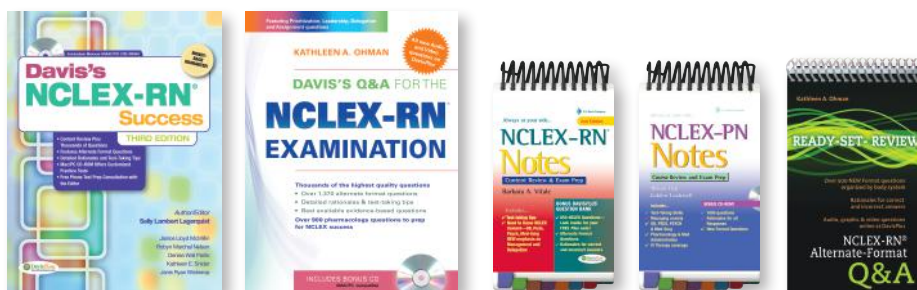
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# Nutrition *and* Diet Therapy

SIXTH EDITION

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# *D*edications

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To my coauthor of 22 years, Karen R. Przytulski, RD, an exceptional and steadfast colleague throughout the first five editions of this text, to Gail Ladwig, RCV, who recommended me to F. A. Davis company in 1989 and led me to Nancy in 2011, and to my nephew, Bob Weber, my trusted source of information and encouragement for all six editions.

—*Carroll A. Lutz*

To Carroll, thank you for your guidance and wisdom throughout this process. To Jeff, Spencer, and Carter, thank you for your encouragement and patience; you are loved!

—*Erin E. Mazur*

To Carroll, for your wealth of knowledge and experience, thank you for this opportunity. To Paul and Evan, thank you for your support and understanding.

—*Nancy A. Litch*





# Preface

---

The sixth edition of *Nutrition and Diet Therapy* is designed to provide the beginning student with knowledge of the fundamentals of nutrition related to the promotion and maintenance of optimal health. Practical applications and treatment of pathologies with nutritional components are stressed. In addition, basic scientific information is introduced to enable students to begin to understand nutritional issues reported in the mass media. The sequential introduction of material continues to be a unique feature of this text. The authors resist the temptation to introduce concepts and examples of applications before the underlying basic science and vocabulary have been covered. The sixth edition has been extensively updated with new information (the FODMAP diet) incorporating new illustrations and tables (a more detailed vitamin K-controlled diet). Increased attention is paid to feeding the hungry and global issues involving nutrition. Within the boundaries of a beginning course, enough specific information is included to enhance understanding of the “why” of nutritional care, not only the “what.”

This book was written to meet the educational needs of nursing students, dietetic assistants, diet technicians, and others. Support materials for the student include case studies with examples of care plans, including referrals to other members of the health-care team, followed by Critical Thinking Questions designed to provoke imaginative thought and to foster discussion. Each chapter has review questions and clinical analysis study questions. Additional student study aids listed in this Preface are available online through DavisPlus.

As researchers discover new and more effective treatments for nutrition-related disorders and health maintenance, the ability to think critically becomes increasingly important for professional growth and development. Students need not only to grasp the facts but also to apply the information in a clinical environment. This text has been developed to facilitate acquiring these skills.

The text can be used to teach a complete course in nutrition or as a desk reference for practitioners. The student using this book needs no previous grounding in anatomy, physiology, or medical terminology. Subjects are fully supported by diagrams, illustrations, figures, and tables. Depending upon the curriculum, chapters may be omitted or presented in a different sequence. We recognize that this text contains an immense amount of data

and information. We hope this rich store of information permits instructors to adapt the text to the objectives of their courses while serving as a reference and directory for students, satisfying their curiosities or completing solo or group projects whether in preclinical or in clinical courses.

The content of *Nutrition and Diet Therapy*, sixth edition, is organized into three units.

Unit 1, **The Role of Nutrients in the Human Body**, covers basic information on nutrition as a science and how this information is applied to nutritional care. All the essential nutrients are covered, including definitions and descriptions of functions, effects of excesses and deficiencies, and food sources. Nutritional standards, including the Dietary Reference Intakes, are explained and incorporated into discussions of nutrients. Information on the use of food in the body and how the body maintains energy balance completes the unit.

Unit 2, **Family and Community Nutrition**, provides an overview of topics such as nutrition throughout the life cycle covering pregnancy, lactation, infancy, childhood, adolescence, and adulthood. Lastly, issues in food management are addressed.

Unit 3, **Clinical Nutrition**, focuses on the care of clients with pathologies caused by or causing nutritional impairments. General topics include nutrient delivery via oral, enteral, and parenteral routes, and interactions among foods, nutrients, medications, and supplements. Pathological conditions include diabetes mellitus and hypoglycemia, cardiovascular disease, renal disease, digestive diseases, and cancer. Other pertinent topics include weight control, nutrition in critical care and during stress, diet affecting inflammation and infections, and care of the client with a terminal illness.

Special features are used throughout the text to facilitate the teaching and learning process. All of the chapters include the following:

**Boxes and Tables** contain summaries, assessment tools, commonly prescribed diets used in medical nutrition therapy, and research findings.

**Clinical Applications** stimulate the interest of the beginning student by showing how the information is pertinent to providing health care.

**Clinical Calculations** isolate and explain many of the mathematical calculations that are used in nutritional science.



**Dollars & Sense items** focus on costs associated with commonly used foods and supplements. Occasionally, budget-sparing recipes are given to exemplify principles in the chapters.

**Genomic Gems** highlight links between a person's genetic makeup and utilization of nutrients and dietary substances.

**Illustrations** reinforce important points in the text or graph statistical data for clarity.

**Flowcharts of physiological and pathological processes** lead the student to an understanding of the relationship between nutrition and health.

A **Case Study** with a proposed **Care Plan** allows the student to see how the nutrition principles described in the chapter are applied in a specific clinical situation. The case studies were written to incorporate elements that are likely to occur in practice.

**Teamwork** following the care plan illustrates continuing care of a client by various members of the health-care team.

**Study Aids, Chapter Review Questions, and Clinical Analysis Questions** help the student to focus on essential concepts. Answers to the Study Aids questions are printed in Appendix C.

**Critical Thinking Questions** invite the student to think holistically with compassion and creativity. They can be used as a basis for class discussion.

Appendices of Dietary Reference Intakes (Appendix A) and the Academy of Nutrition and Dietetics Exchange Lists for Diabetes (Appendix B) serve as readily available sources of information for students in class discussions or group assignments.

A **Glossary** (Appendix D) of more than 1000 entries assists the reader to recall definitions of terms bold-faced in the text.

The **Bibliography** (Appendix E) supports the text with data sources and introduces the student to the scientific literature.

In addition to the text resources, students can access online resources via DavisPlus:

**Student Study Questions** are different from the in-book questions and provide the student with additional content review. All 360 questions are broken down by chapter, include a rationale, and have print and e-mail capabilities.

**Flash Cards** developed from the book glossary provide students an online resource for key term review.

**Additional Web Resources** are compiled in one place to provide the student easy access to nutrition content, including links to MyPlate resources, U.S. Department of Agriculture resources, and nutrition management tools.

**Electronic Updates** will be added as new information becomes available. Updates will be posted under the link for "Content Updates."

Accompanying the text for instructors who adopt it for their classes are:

An **Instructors' Guide** with suggestions for course organization, classroom activities, and student assignments.

**PowerPoint Presentations** for all the chapters of the book. These presentations provide a ready source of material to select for classroom use.

An **Electronic Test Bank** containing an additional 200 questions, arranged by chapter.

We believe that *Nutrition and Diet Therapy*, sixth edition, provides the clinical information necessary for a fuller understanding of the relationship between the knowledge about nutrition and diet and its clinical application. This text balances direct explanations of the underlying science with an introduction to the clinical responsibilities of the health-care professional.

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# Contents

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Preface vii

Acknowledgments xi



## Unit 1

### *The Role of Nutrients in the Human Body* 1

---

- 1** Nutrition in Human Health 3
- 2** Carbohydrates 34
- 3** Fats 48
- 4** Protein 65
- 5** Energy Balance 84
- 6** Vitamins 97
- 7** Minerals 133
- 8** Water 173
- 9** Digestion, Absorption, Metabolism, and Excretion 197



## Unit 2

### *Family and Community Nutrition* 215

---

- 10** Life Cycle Nutrition: Pregnancy and Lactation 217
- 11** Life Cycle Nutrition: Infancy, Childhood, and Adolescence 238



- 12** Life Cycle Nutrition: The Mature Adult 269
- 13** Food Management 288



## Unit 3

---

### *Clinical Nutrition* 305

---

- 14** Nutrient Delivery 307
- 15** Interactions: Food and Nutrients Versus Medications and Supplements 330
- 16** Weight Management 364
- 17** Diet in Diabetes Mellitus and Hypoglycemia 386
- 18** Diet in Cardiovascular Disease 412
- 19** Diet in Renal Disease 436
- 20** Diet in Digestive Diseases 455
- 21** Diet and Cancer 496
- 22** Nutrition in Critical Care 516
- 23** Diet in HIV and AIDS 532
- 24** Nutritional Care of the Terminally Ill 544

## Appendices

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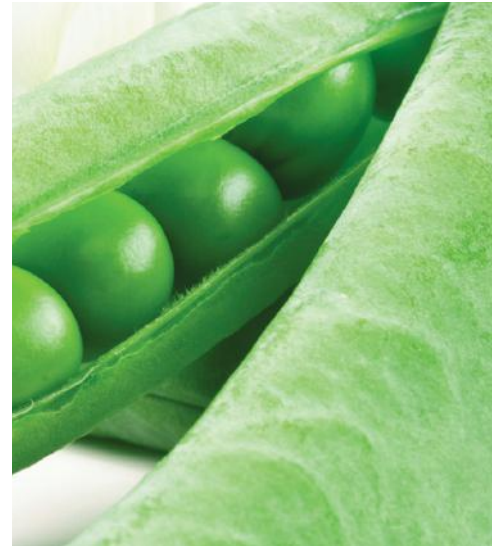
- A** Dietary Reference Intakes for Individuals 557
- B** Academy of Nutrition and Dietetics Exchange Lists for Diabetes 563
- C** Answers to Questions 576
- D** Glossary 578
- E** Bibliography 607



*The Role of  
Nutrients in the  
Human Body*



# Nutrition in Human Health



## LEARNING OBJECTIVES

*After completing this chapter, the student should be able to:*

- Describe the relationship between nutrition and health.
- Identify the six classes of nutrients, their functions, and their essentiality.
- Recognize the possible relationship of genetics to the adequacy of nutrition.
- Compare dietary intakes in the United States with the U.S. Department of Agriculture Dietary Guidelines.
- Discuss issues related to food insecurity on local and global levels.
- List and describe the steps in providing nutritional care.
- Explain the intended use of the Dietary Reference Intakes.
- Relate the underlying concept of the Exchange Lists to overall healthful eating.
- Give an example of a provider's use of, and respect for, cultural beliefs having a favorable impact on a health outcome for a client.
- State the preferences and dietary restrictions of several cultural and religious groups.

*F*ood is essential to life. Choosing food wisely can contribute to a healthy, satisfying life. This chapter introduces concepts and practices that underlie the nourishment of human beings as well as some barriers to achieving optimal nutrition. Information on the influence of culture on nutrition concludes the chapter.

## The Language of Nutrition

**Nutrition** is the science of food and its relationship to health. Nutrition involves the processes of taking in and utilizing nourishment. It includes natural and artificial feeding.

According to the World Health Organization, **health** is the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. How nutrition influences human health is the subject of this textbook.

That food or its lack affects physical health is readily seen. For example, both motor and mental development are suboptimal in young children with iron deficiency **anemia** (Stoltzfus, 2011). On occasion, social well-being may be developed to the detriment of physical well-being as when social occasions are accompanied by foods that may not contribute to the best possible health.

Certainly, human beings should take nourishment daily. What an individual chooses to eat may affect his or her health that day but also well into the future.

## Disease Prevention

The general prevention of disease is categorized on three levels: primary, secondary, and tertiary. Application of the principles of nutrition can contribute to prevention of disease on each of these levels.

**Primary prevention** is the implementation of practices that are likely to avert the occurrence of disease. Many nutritional changes have been promoted to thwart particular diseases, but most, with the exception of actual vitamin deficiency diseases, lack solid evidence of effectiveness. Excessive body weight is clearly related to heart disease, stroke, type 2 diabetes mellitus, some cancers, joint diseases, and some fertility disorders. The difficulty lies in motivating people to change behavior today for possible benefits in the perhaps distant future. Maintaining a healthy body weight is a primary prevention strategy.

**Secondary prevention** is the institution of monitoring techniques to discover incipient diseases early enough to enhance the opportunity to control their effects. If a person's risk for diabetes is found in the prediabetes stage by testing blood sugar levels, noninvasive treatments such as weight loss and diet modification can successfully derail or delay the development of the disease.

**Tertiary prevention** is the use of treatment techniques after a disease has occurred to prevent complications or to promote maximum adaptation. For example, clients with various diseases that cause swallowing disorders can be helped to maintain nourishment and to avoid choking incidents with nutritional interventions (see Chapter 14).

## Nutrients

Historically, the science of nutrition has been based on the nutrients in food. **Nutrients** are the chemical substances supplied by food that the body needs for growth, maintenance, and repair.

### Classes and Essentiality

Nutrients are divided into six classes, each of which is discussed in subsequent chapters:

1. Carbohydrates (often abbreviated as CHO for carbon, hydrogen and oxygen; these elements are also those in lipids but an abbreviation is not used for lipids.)
2. Fats (lipids)
3. Proteins
4. Minerals
5. Vitamins
6. Water

Nutrients are considered essential, nonessential, or conditionally essential, depending on whether the body can or cannot manufacture them.

- An **essential nutrient** is one that the human body requires but cannot manufacture in sufficient amounts to meet bodily needs. Thus, essential

nutrients must be supplied by foods in the diet. Vitamin C, vitamin A, and calcium are three of the more than 40 essential nutrients.

- **Nonessential nutrients** are not needed in the diet because the body can make them from other substances. For example, the amino acid alanine is a nonessential nutrient because the body can manufacture it from other raw materials.
- **Conditionally essential nutrients** are those that, under most circumstances, a healthy body can manufacture in sufficient quantities. In certain situations of physiological status or disease, the body cannot produce optimal amounts. The amino acid tyrosine is an example of a conditionally essential nutrient (see Chapter 4).

### Functions

All nutrients perform one or more of the following functions:

1. Serve as a source of energy or heat
2. Support the growth and maintenance of tissue
3. Aid in the regulation of basic body processes

These three life-sustaining functions collectively are part of **metabolism**, the sum of all physical and chemical changes that take place in the body. Nutrients have specific metabolic functions and interact with one another to maintain the body.

### SOURCE OF ENERGY

**Energy** is defined in the physical sciences as the capacity to do work. Energy exists in a variety of forms: electric, thermal (heat), chemical, mechanical, and others.

All food enters the body as chemical energy. The body processes the chemical energy of food and converts it into other energy forms. For example, chemical energy is transformed into electric signals in nerves and into mechanical energy in muscles.

Carbohydrates, fats, and proteins, the nutrients that supply energy, are referred to as the **energy nutrients**. The energy both in foods and in the body is measured in **kilocalories**, abbreviated kcal (see Glossary). Because energy cannot be seen, heard, or felt, it is one of the most difficult biological concepts to understand. For this reason, it warrants its own chapter (see Chapter 5).

### GROWTH AND MAINTENANCE OF TISSUES

Some nutrients provide the raw materials for building body structures, and they participate in the continued growth and maintenance of necessary tissues. Water, proteins, fats, and minerals are the nutrient classes that contribute in a major way to building body structures.



## REGULATION OF BODY PROCESSES

Some nutrients control or regulate chemical processes in the body. For example, certain minerals and proteins help regulate how water is distributed in the body. Vitamins are necessary in the series of reactions involved in generating energy. Vitamins themselves are not energy sources, but if the body lacks a particular vitamin, it will not produce energy efficiently.

## Functional Foods

In addition to the nutrients listed above, foods contain other physiologically active substances from plant (**phytochemical**), animal, and microbial sources, some of which reputedly promote health. Phytochemicals identified thus far number in the tens of thousands, including 8000 polyphenolic compounds (Gropper and Smith, 2013). It is small wonder that pinning down the health effect of one component in a food is daunting. Therefore, the amount and quality of evidence for the usefulness of functional foods varies.

Definitions of functional foods are equally varied by source and are not officially recognized as a food category by the U.S. Food and Drug Administration (FDA). One of the simplest definitions is as follows:

**Functional foods** are foods or food ingredients that have additional health or physiological benefits over and above the normal nutritional value they provide (Nicoletti, 2012).

The Academy of Nutrition and Dietetics (formerly the American Dietetic Association) categorizes functional foods as indicated in Table 1-1. Several examples of functional foods being studied appear in Table 1-2. Bear in mind that a given food may contain thousands of phytochemicals that differ under divergent cultivation and storage methods. The extent to which foods

**TABLE 1-1 ■ Functional Foods**

CATEGORY	SELECTED EXAMPLES
Conventional foods (whole foods)	Blueberries Cranberry juice (see Chapter 21) Cruciferous vegetables: broccoli, cabbage, cauliflower, Brussels sprouts (see Chapter 21) Green tea Mushrooms Some nuts Oatmeal as part of heart healthy diet Tomatoes (see Chapter 21)
Modified foods, fortified	Omega-3 fatty acids in eggs and margarines (For definition, see Chapter 6.)
Synthesized food ingredients	Oligosaccharides functioning as prebiotics (see Chapter 20)

Adapted from Crowe and Francis, 2013; Milner, Toner, and Davis, 2014.

**TABLE 1-2 ■ Selected Functional Foods, Bioactive Components, and Reported Health Benefits**

FUNCTIONAL FOODS	BIOACTIVE COMPONENTS UNDER STUDY	REPORTED HEALTH BENEFIT
Apples, tea, onions	Flavonoids	Prevention of cardiovascular disease
Berries	Polyphenols	Protection against cancer through abilities to counteract, reduce, and repair damage from oxidative stress and inflammation
Cruciferous vegetables (broccoli, cauliflower, cabbage)	Isothiocyanates	Reduction of prostate cancer risk
Green Tea	Polyphenols	Inhibition of cancer initiation and blockage of cancer progression
Oats	Beta-glucan (soluble fiber)	Reduction of blood cholesterol levels
Purple grape juice or red wine	Resveratrol	Reduction of heart disease risk by decreasing blood platelet aggregation
Soy products	Isoflavones	Reduction in incidence of hormone-related cancers

Sources: American Dietetic Association, 2009; Kanwar, Taskeen, Mohammad, Huo, et al, 2012; Li, Kong, Bao, Ahmad, et al, 2011; Liu, Mao, Cao, and Xie, 2012; Majewska-Wierzbicka and Czczot, 2012; Othman, Moghadasian, and Jones, 2011; Seeram, 2008; Zhang, 2012.

may be labeled with a health claim is discussed in Chapter 15. Specific examples of functional foods with the best **efficacy** are provided as the subject matter dictates in other chapters.

## Nutritional Genomics

In April 2003, the Human Genome Project announced that the actual sequence of the human genetic code had been transcribed. In simple terms, the genetic code is the human body's software instructions for manufacturing proteins (see Genomic Gem 1-1). It is now possible to cheaply and quickly sequence the parts of genes that encode **amino acids** of all 22,000 human genes (Brunner, 2012).

A subfield of nutritional genomics, **nutrigenetics**, detects **gene** variants within an individual to identify environmental factors that trigger dysfunction or disease. Examples of gene variants conveying susceptibility for dysfunction include those for food allergies and celiac disease (Gropper and Smith, 2013). The trigger in food allergy is the offending food (see Chapter 11). In celiac disease, it is the gluten in wheat, rye, or barley (see Chapter 20).

Another subfield of nutritional genomics is **nutrigenomics**, the study of the interaction between one's diet and his or her genes, which can markedly influence digestion, absorption, and elimination as well as influence their sites of actions (Riscuta and Dumitrescu, 2010). A



## Genomic Gem 1-1

### Genetic Code as Software

To visualize the relationships among the human body, genetic code, and diet, think of the body as a machine similar to a personal computer. Software provides directions to the computer; a person's genetic code provides instructions to the body. Just as a personal computer cannot operate without software, the human body cannot operate without instructions from the genetic code. Think of data input by the operator as much like food that is taken in or eaten.

For years, scientists have studied the effects of nutrients and phytochemicals on our body's hardware, or structure. Only recently have researchers begun the study of nutrients and phytochemicals on the body's software, or genetic code. Almost everyone has software on their computers that is never used. The human body also has instructions that are similarly never used.

What causes a software program or gene in the human body to be turned on or expressed? Some scientists are beginning to understand that the activation is partly due to the food we eat or do not eat. The premise underlying nutrigenomics is that diet's influence on health depends on an individual's genetic makeup, thereby suggesting that not all individuals respond identically to a given diet. Thus, one person would be more susceptible to the negative effects of a suboptimal diet than another person would be. More research is needed to identify those who will benefit most from dietary change and those who might be placed at risk because of an adjustment (Riscuta and Dumitrescu, 2010).

possible application of nutrigenomics in a person susceptible to chronic inflammation is to ensure adequate omega-3 fatty acids intake (see Chapter 3) to reduce the expression of genes that encode for inflammatory **cytokines** (Gropper and Smith, 2013).

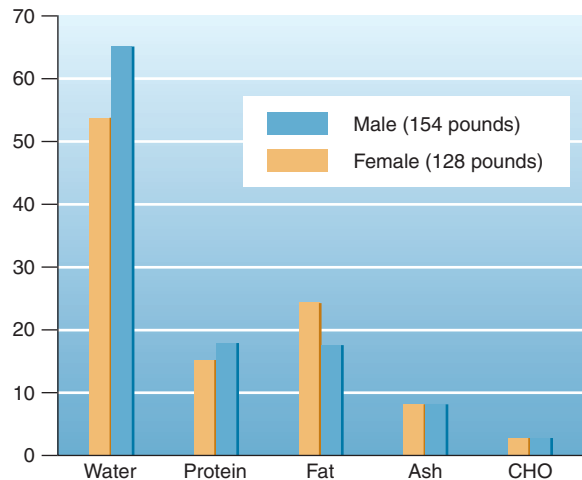
## Body Composition

Nutrient intake can affect body composition, which in turn can affect health. The human body is composed of five types of substances:

1. Water
2. Protein
3. Fat
4. Ash (mineral content as in the skeleton)
5. Carbohydrate

Figure 1-1 shows these substances as a percentage of body weight in young adults. Because of its increased muscle, the male body contains more protein than the female body. With age, body composition typically becomes higher in fat and lower in protein.

Health-care providers are often concerned that their clients retain their muscle, particularly when



**FIGURE 1-1** Approximate body composition as a percent of body weight of a 25-year-old man weighing 154 pounds and woman weighing 128 pounds. Note that the typical woman has more fat and less protein than the man because of differences in muscle. The percentage of ash content is equal in both sexes. The human body has minimal carbohydrate content.

losing weight (see Chapter 16). When the body loses protein, it is losing muscle tissue, organ mass, the protein stored in body substances, or combinations thereof. Preservation of body protein is necessary for optimal health.

A person's body fat and protein content can be modified by food intake, exercise, or both. Exercise increases body protein content by increasing muscle. Eating too much food increases the fat content of the body because fat is stored for future use as energy. Excessive body fat, both in amount and location, has health consequences.

## Food Choices

Often unconscious and automatic, more than 220 food decisions may be made daily with emotional cues, habit, and peer pressure playing major roles in food choices. A French study found that price was most often cited as the primary factor influencing food choice decisions followed by eating habits, and taste (Jacquier, Bonthoux, Baciou, and Ruffieux, 2012). Note the lack of attention to nutritional composition. Undoubtedly, the French are not unique in ranking nutritional composition tenth of the most frequently cited factors used in food choice decisions.

Despite the complexity of food decisions, many governments worldwide have published well-researched, rational, and practical dietary and food guidelines. This text discusses only the U.S. recommendations, which are revised periodically to incorporate new research findings into advice promoting healthy dietary behaviors.

## What We Should Eat

Poor diet and physical inactivity are the most important factors producing the **epidemic** of overweight and **obesity** in this country that affects men, women, and children in all segments of society. Even in persons of normal weight, poor nutrition and physical inactivity are associated with heart disease, diabetes, thinning bones, and some forms of cancer. In addition, certain racial and ethnic groups have disproportionate rates of excessive body weight and associated **chronic illnesses**. Current dietary advice from the U.S. government attempts to remedy that unhealthy state of affairs. The *Healthy People 2020* Web site has a section on Nutrition and Weight Status at [www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=29](http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=29).

### Dietary Guidelines

Every 5 years since 1980, the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (HHS) have published *Dietary Guidelines for Americans* based on the latest scientific and medical information. Traditionally, the focus has been on *healthy individuals* aged 2 years and older. In 2010, the *Guidelines* were also aimed at *those at risk for chronic disease* to encourage proper dietary habits to promote health and reduce risk for major chronic diseases. These recommendations accommodate the

food preferences, cultural traditions, and economic resources of many diverse groups who live in the United States.

The *Guidelines* are intended to evaluate several days' intake of food, not to rate individual food items or a single meal or 1 day's intake. Government policymakers, nutrition educators, and health providers are expected to use the advice to improve the health of the nation. For example, the *Guidelines* would be used to create menus for school lunch programs, nursing home residents, and prisoners.

The *Dietary Guidelines for Americans, 2010* also recognizes that in recent years, nearly 15% of American households have been unable to acquire adequate food to meet their needs. This dietary guidance can help them maximize the nutritional content of their meals. Many other Americans consume less than optimal intake of certain nutrients even though they have adequate resources for a healthy diet. Published materials encompass printed and electronic versions of *Dietary Guidelines for Americans*, and interactive Internet materials are available at [www.choosemyplate.gov/print-materials-ordering.html](http://www.choosemyplate.gov/print-materials-ordering.html).

Of note, the guidelines do not apply to individuals who have diseases or conditions that alter normal nutritional requirements. Clinical Application 1-1 summarizes the key recommendations for the general population and certain subsets of the population. Many of the terms may be unfamiliar but will become so in later chapters.

## Clinical Application

1-1

### Key Recommendations of 2010 Dietary Guidelines

#### BALANCING CALORIES TO MANAGE WEIGHT

- Prevent and/or reduce overweight and obesity through improved eating and physical activity behaviors.
- Control total calorie intake to manage body weight. For people who are overweight or obese, this will mean consuming fewer calories from foods and beverages.
- Increase physical activity and reduce time spent in sedentary behaviors.
- Maintain appropriate calorie balance during each stage of life—childhood, adolescence, adulthood, pregnancy, breastfeeding, and older age.

#### FOOD AND FOOD COMPONENTS TO REDUCE

- Reduce daily sodium intake to less than 2300 milligrams (mg) and further reduce intake to 1500 mg among persons aged 51 and older and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease. The 1500 mg

recommendations applies to about half of the U.S. population, including children, and the majority of adults.

- Consume less than 10% of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids.
- Consume less than 300 mg per day of dietary cholesterol.
- Keep *trans* fatty acid consumption as low as possible by limiting foods that contain synthetic sources of *trans* fats, such as partially hydrogenated oils, and by limiting other solid fats.
- Reduce the intake of calories from solid fats and added sugars.
- Limit the consumption of foods that contain refined grains, especially refined grain foods that contain solid fats, added sugars, and sodium.
- If alcohol is consumed, it should be consumed in moderation—up to one drink per day for women and two drinks per day for men—and only by adults of legal drinking age.

(Continued)

## Clinical Application—cont'd

### FOODS AND NUTRIENTS TO INCREASE

Individuals should meet the following recommendations as part of a healthy eating pattern while staying within their caloric needs.

- Increase fruit and vegetable intake.
- Eat a variety of vegetables, especially dark-green and red and orange vegetables and beans and peas
- Consume at least half of all grains as whole grains. Increase whole grain intake by replacing refined grains with whole grains.
- Increase intake of fat-free or low-fat milk, and milk products, such as milk, yogurt, cheese, or fortified soy beverages.
- Choose a variety of protein foods, which include seafood, lean meat and poultry, eggs, beans and peas, soy products, and unsalted nuts and seeds.
- Increase the amount and variety of seafood consumed by choosing seafood in place of some meat and poultry.
- Replace protein foods that are higher in solid fats with choices that are lower in solid fats and calories and/or sources of oils.
- Use oils to replace solid fats where possible.
- Choose foods that provide more potassium, dietary fiber, calcium, and vitamin D, which are nutrients of concern in American diets. These foods include vegetables, fruits, whole grains, and milk and milk products.

### RECOMMENDATIONS FOR SPECIFIC POPULATION GROUPS

*Women capable of becoming pregnant:*

- Choose foods that supply heme iron, which is more readily absorbed by the body, additional iron sources, and enhancers of iron absorption such as vitamin C-rich foods.

- Consume 400 micrograms (mcg) per day of synthetic folic acid (from fortified foods and/or supplements) in addition to food forms of folate from a varied diet.

*Women who are pregnant or breastfeeding:*

- Consume 8 to 12 ounces of seafood per week from a variety of seafood sources.
- Because of their high methyl mercury content, limit white (albacore) tuna to 6 ounces per week, and do not eat the following four types of fish: tilefish, shark, swordfish, and king mackerel.
- If pregnant, take an iron supplement, as recommended by an obstetrician or other health-care provider.

*Individuals aged 50 years and older:*

- Consume foods fortified with vitamin B<sub>12</sub>, such as fortified cereals, or dietary supplements.

### BUILDING HEALTHY EATING PATTERNS

- Select an eating pattern that meets nutrient needs over time at an appropriate calorie level.
- Account for all foods and beverages consumed and assess how they fit within a total healthy eating pattern.
- Follow food safety recommendations when preparing and eating foods to reduce the risk of foodborne illnesses.

SOURCE: *Dietary Guidelines for Americans, 2010*. [www.cnpp.usda.gov/DietaryGuidelines.htm](http://www.cnpp.usda.gov/DietaryGuidelines.htm)

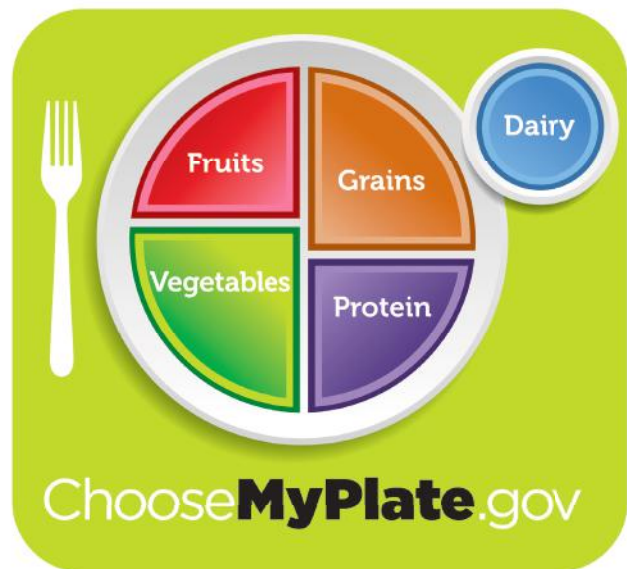
## MyPlate

The latest educational food guidance system promoted by the USDA is called MyPlate, available online at [www.choosemyplate.gov/print-materials-ordering/getting-started.html](http://www.choosemyplate.gov/print-materials-ordering/getting-started.html) (Fig. 1-2). The intent of the MyPlate icon is to reduce risks for obesity, diabetes, cardiovascular disease, cancer, and other chronic diseases by helping consumers to eat correct proportions of healthy foods meal by meal.

The interactive Web site offers sections for consumers and professionals, sample menus and recipes, tips for vegetarians, and many links to other resources. A page to personalize goals and record progress is located at [www.choosemyplate.gov/SuperTracker](http://www.choosemyplate.gov/SuperTracker).

## What We Actually Eat

The government periodically surveys food intake of the population to monitor progress toward meeting dietary goals. Information from two such investigations is discussed next.



**FIGURE 1-2** The MyPlate icon shows relative proportions of five food groups to permit consumers to more easily visualize an ideal meal. The ChooseMyPlate.gov interactive Web site offers dietary assessment tools, nutrition education resources, and clear actionable information about how to make better food choices. (From U.S. Department of Agriculture, 2011, with permission.)

## The What We Eat in America Survey

Each year, more than 5000 U.S. residents are interviewed about what they ate and drank for 24-hour periods on 2 nonconsecutive days. The data is part of the HHS National Health and Examination Survey (NHANES) that also includes physical examinations.

Among the recent findings concerning foods consumed by Americans are the following:

1. Most people reported eating less than 2 ounces of whole grains per day compared with the 1.5 to 5 ounces recommended according to age and gender.
2. Grain-based desserts (cakes, cookies, pies, cobblers, sweet rolls, pastries, and doughnuts) accounted for a greater proportion of daily kilocalories than did any other food group.
3. Average intake of fluid milk in persons 9 years of age and older was about three-quarters of a cup compared with the recommended amount of 3 cups. Adolescents reporting milk consumption on a given day was 49% compared with 76% 30 years ago.
4. Snacks provided 32% of all daily kilocalories from solid fats and added sugars for women and 31% for men (Bliss, 2012).

Thus, eating healthier foods to maintain a healthy weight is still an unachieved goal for most Americans. Much more information on this topic appears in Chapter 16.

## State-Specific Trends in Fruit and Vegetable Consumption

Reflecting the importance of fruit and vegetable intake to a healthy diet (encompassing one-half of the MyPlate graphic), the Centers for Disease Control (CDC) monitors dietary intake through a telephone survey. Results show that much behavior change will be needed to increase to 75% of the population those who consume two or more servings of fruit daily and to 50% those who consume three or more servings of vegetables daily. In the 2009 survey:

1. An estimated 32.5% of U.S. adults consumed fruit two or more times per day with the highest percentage in Washington, DC (40.2%) and the lowest in Oklahoma (18.1%).
2. Above average consumption of fruit was reported by women, adults over the age of 55 years, Black and Hispanic people, and college graduates.
3. An estimated 26.3% of adults consumed vegetables three or more times per day with the highest percentage in Tennessee (33.0%) and the lowest in South Dakota (19.6%).
4. Above average consumption of vegetables was reported by women; adults over the age of 45 years; White, non-Hispanic people; and individuals who

had attended or graduated from college (Centers for Disease Control, September 10, 2010).

## Effectiveness of Policy

Nutritional public policies have had a limited impact on consumer behavior probably because the mechanisms of food choice decisions are poorly understood. Decision-making not only involves rationality but also feelings, emotions, and memories (Jacquier et al, 2012).

Analysis of the effectiveness of policy interventions in the European Union found that although diet quality had improved across countries, it still fell short of the World Health Organization dietary guidelines. This review divided interventions into measures providing information and those targeting the market environment.

*Information measures* included

1. Reduced or banned unhealthy food advertisements—generally produced a weak positive effect on improving diets.
2. Public information campaigns—raised awareness of unhealthy eating but failed to translate the message into action.
3. Nutritional labeling—allowed for informed but not necessarily healthier choices.

*Interventions targeting the market environment* included

1. Fiscal measures and
2. Nutrient, food, and diet standards.

The last two are rarer and generally more effective than information measures, although admittedly more intrusive (Brambila-Macias, Shankar, Capacci Mazzocchi et al, 2011).

## Unbalanced Nutrition

Ingesting too much or too little of a nutrient can interfere with health and well-being. Each nutrient has a beneficial range of intake; an intake below or above that range is incompatible with optimal health.

## Malnutrition

**Malnutrition** (faulty nutrition) can be caused by inadequate or unbalanced intake of food or nutrients or to ineffective processing by the body due to malfunction or disease. The result in the body's cells is an excess or deficiency of one or more nutrients that can lead to physical abnormalities and possibly mental dysfunction.