Nutrition for Foodservice and Culinary Professionals 10th Edition PDF

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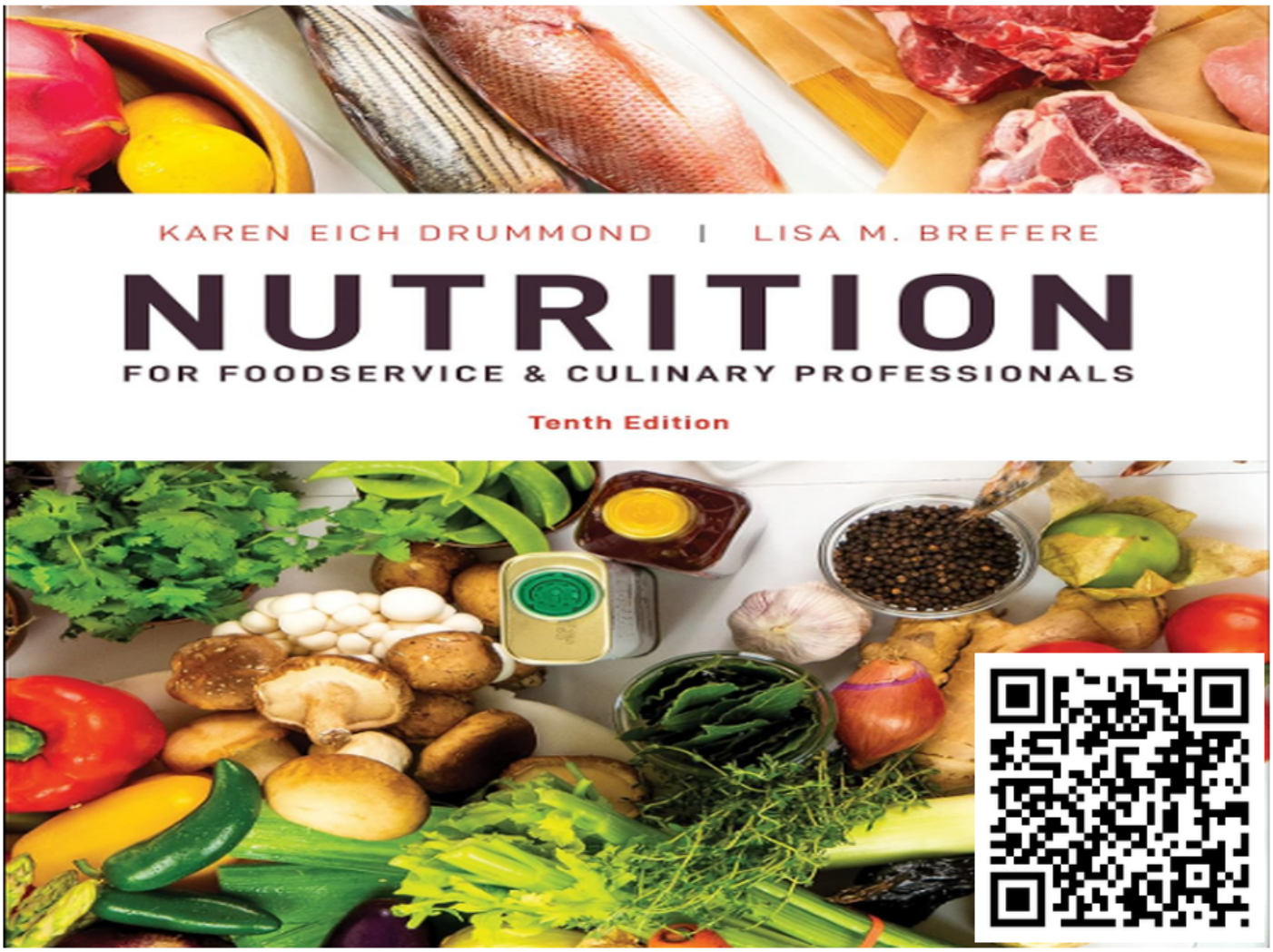

KAREN EICH DRUMMOND | LISA M. BREFERE

NUTRITION

FOR FOODSERVICE & CULINARY PROFESSIONALS

Tenth Edition

WILEY

NUTRITION

FOR FOODSERVICE AND CULINARY PROFESSIONALS

Karen Eich Drummond
Ed.D., R.D.N., L.D.N., F.A.N.D.

Lisa M. Brefere
A.A.C.

10th EDITION

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Dedication

In memory of my parents, Frank and Doris Eich.

KAREN EICH DRUMMOND

To my husband, Joe, and my four children, Joe Jr., Julia, John, and Jeremy.

Thank you for inspiring and motivating my passion for wholesome, balanced, and pure cooking through moderation in ingredients and without compromising taste, flavor, presentation, or satisfaction. The kitchen is truly the hub of our family.

LISA M. BREFERE

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Preface

Nutrition for Foodservice and Culinary Professionals, 10th Edition, is written for students in culinary programs, as well as those in hotel and restaurant management or food and beverage programs. Practicing culinary, management, and food and beverage professionals will find it useful as well. As with previous editions, this is meant to be a practical how-to book tailored to the needs of students and professionals.

Nutrition is constantly in the media, with reports on topics such as the dangers of eating too much processed meat or the benefits of eating fruits and vegetables. Hectic lifestyles force many people to eat out or get take-out meals several times a week. As a foodservice professional, you have a responsibility to your clients to understand contemporary cooking techniques that are balanced, moderate in rich ingredients, well prepared, and, of course, great tasting. You have a captive audience of people who depend on the chefs, cooks, and foodservice employees to prepare nutritious foods for them with the balance they require to maintain their current lifestyles.

This book is written to help you use nutritional principles to examine your own diet as well as evaluate and modify menus and recipes and respond knowledgeably to customers' questions and needs. As in the previous editions, coauthor Lisa Brefere, A.A.C., lends her firsthand experiences applying nutrition to selecting, cooking, and menuing balanced foods in restaurants and foodservices.

What's New for the 10th Edition

Each chapter of this book has been revised and updated using current nutrition and culinary knowledge and applications. Some major changes are noted below.

Latest nutrition news:

- The new *2020–2025 Dietary Guidelines for Americans* have been used to update chapters, along with the *Scientific Report of the 2020 Dietary Guidelines Advisory Committee.*
- Recently updated Adequate Intakes for sodium and potassium are included, along with a new DRI category for sodium (Chronic Disease Risk Reduction Intake).
- The new "Physical Activity Guidelines for Americans" are discussed for various age groups.
- The new Nutrition Facts label is displayed, and its new features discussed.

Overall changes:

- The text is more user-friendly for students.
- All tables have been updated.
- Many of the photos throughout the book have been updated.

Changes by chapter:

- Chapter 1 (Introduction): Using the new *Dietary Guidelines for Americans*, the latest information on the quality of the American diet is discussed along with the components of a healthy diet that are associated with positive health outcomes. A new discussion on ultra-processed foods is included along with expanded discussions on phytochemicals and the role of the microbiome in health. Prebiotics are now defined and discussed.

- Chapter 2 (Using Food Guides, Dietary Recommendations, and Nutrition Labels to Plan Menus): The new *Dietary Guidelines for Americans* (2020–2025) are discussed. The MyPlate section has been updated and much has expanded, including the part on kcalories for other uses, which now includes a more detailed section on alcoholic beverages. The new "Physical Activity Guidelines for Americans" are discussed for adults. The new Nutrition Facts label is illustrated and discussed.
- Chapter 3 (Carbohydrates): Sections on the effects of added sugars, whole grains, and fiber on health have been updated with the most recent research.
- Chapter 4 (Fat): This chapter contains an updated discussion on partially hydrogenated oils and trans fats and also on seafood high in omega-3 fatty acids and low in mercury. Updated fat and cholesterol dietary recommendations using the new *Dietary Guidelines for Americans* are given.
- Chapter 5 (Protein): This chapter includes a new section on plant-forward cooking with many recipe ideas.
- Chapter 6 (Vitamins): Each vitamin discussion is updated and there is expanded information on dietary supplements.
- Chapter 7 (Water and Minerals): Each mineral discussion is updated. This chapter includes new Dietary Reference Intakes for sodium and potassium, as well as the new DRI category for sodium: Chronic Disease Risk Reduction Intake. Updated beverage section includes latest on teas, smoothies, and wellness shots.
- Chapter 8 (Building Flavor and Balanced Baking): Completely updated with latest culinary trends and techniques.
- Chapters 9 (Recipe Makeovers) and 10 (Balanced Menus): No major changes.
- Chapter 11 (Customers' Nutrition Requests): Reorganized content by type of request and updated food choices.
- Chapter 12 (Weight Management): Intermittent fasting is introduced along with eating a whole foods diet to lose weight. The recommendations for an eating pattern and exercise have been updated.
- Chapter 13 (Lifespan Nutrition): Updated information and guidelines from the new *Dietary Guidelines for Americans* have been included for children, adolescents, and older adults. New "Physical Activity Guidelines for Americans" are discussed for these groups as well. The childhood obesity section has been completely updated.

Organization

The 10th Edition of *Nutrition for Foodservice and Culinary Professionals* is organized into three major parts, beginning with an introduction to nutrition and foods, then advice on developing healthy recipes and menus, and finally more on applying nutrition.

- **Part I: Fundamentals of Nutrition and Foods** (Chapters 1–7) consists of two introductory chapters, followed by five chapters on the nutrients. The first two chapters introduce basic nutrition concepts and explain how to use MyPlate, the *Dietary Guidelines for Americans* (2020–2025), and food labels when planning menus. The next chapters focus on the nutrients: carbohydrates, fats, proteins, vitamins, water, and minerals.
- **Part II: Balanced Cooking and Menus** (Chapters 8–10) begins with a chapter dedicated to the foundations of balanced cooking, including descriptions of how to use ingredients, preparation techniques, and cooking methods to create balanced, delicious dishes. In Chapter 9, Recipe Makeovers, Chef Lisa Brefere explains exactly how she accomplished each makeover, including many tips on ingredients and how to modify recipes and build flavor. These recipes include not only main dishes but also sauces, dressings, desserts, and others. Chapter 10, Balanced Menus, offers hundreds of examples of healthy menu items for meals and snacks, and includes examples of plate presentation.

- **Part III: Applied Nutrition** (Chapters 11–13) begins with a chapter that explains how to handle customers' special nutrition requests—such as low sodium or vegetarian options. Charts are given to help you determine which menu items would be appropriate for each section of the menu. Chapters 12 and 13 discuss weight management and lifespan nutrition. Chef Lisa Brefere includes many ideas on providing healthy meals to children.

Learning Tools

Nutrition for Foodservice and Culinary Professionals contains many special features that enable students to better understand concepts and extend and test their knowledge. These pedagogical tools include tables, charts, and illustrations, as well as the following:

- **Chapter Outline:** Each chapter starts with a listing of the major headings found within.
- **Learning Objectives:** Each major section within a chapter starts with a list of its learning objectives.
- **Key Terms and Concepts:** Whenever key terms and concepts are first introduced, their definitions can be found in the margin, located near the bolded term.
- **Chef's Tips:** Chef's Tips provide an experienced chef's advice on all aspects of cooking, including which foods go together, how to use foods' natural colors to create an attractive dish, and how to use culinary techniques to create healthy and delicious dishes.
- **Culinary Focus:** Culinary Focus examines various food groups from the perspective of a chef. Organized into "Chef's Tips: Preparing" and "Menus and Presentation," this feature is full of tips for you to use to produce tasty and healthy menu items. A Culinary Focus feature is found in Chapters 3–7, and each one covers foods that have the nutrients discussed in that chapter.
- **Summary:** Designed to help students focus on the important concepts within each section of the chapter, a summary is given at the end of each chapter.
- **Check-Out Quiz:** At the end of each chapter, a Check-Out Quiz allows students to check their comprehension of the chapter's concepts. Answers to odd-numbered questions are in Appendix C.
- **Glossary:** All key terms and definitions are listed in the Glossary, easily found in the back of the book.
- **Appendices:** A very useful reference for readers, the appendices include a variety of useful information, including serving sizes for MyPlate food groups and the Dietary Reference Intake charts.

Enhanced E-Textbook

The enhanced e-textbook is a reflowable ePub that can be easily adjusted for any size screen. It is not a fixed page PDF. In addition, the e-textbook has links to the following:

- Culinary videos
- In the Kitchen recipe activities
- Case studies
- Student Study Guide
- Worksheets
- Additional Recipes
- Create-A-Plate and Revise-A-Recipe exercises

Create-a-Plate interactive exercises help students create their own virtual plate of food by selecting from a menu and seeing real-time nutritional analysis based on their selections. In addition to creating balanced meals, students use

this exercise to create meals with specific guidelines such as low in kcalories or high in fiber or protein.

Through the **Revise-a-Recipe** interactivity, students are provided recipes to revise to meet a specific nutritional goal. As ingredients are adjusted or substituted, they can see how the recipe's nutritional values change and if the goal is met. Both **Revise-a-Recipe** and **Create-a-Plate** appear in every chapter and they can be saved and printed by students to hand in.

Supplementary Materials

A ***Companion Website*** provides links to both the Student and Instructor Websites. The **Student Website** includes a Study Guide, PowerPoints, and Worksheets for each chapter. The Student Website also includes Supplementary Recipes.

From the **Instructor Website**, instructors can download the Instructor's Manual as well as **PowerPoint slides**, Answer Key for the **Student Worksheets** and the Study Guide for each chapter. A selection of recipes are also available here.

An ***Instructor's Manual with Test Bank*** (available online) that includes class outlines, classroom activities, and test questions and answers is available. Please visit the instructor's website at www.wiley.com/go/drummond/nutrition10e to download a copy.

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CHAPTER 1

Introduction to Nutrition

CHAPTER OUTLINE

Introduction

For many years, nutrition has been one of the top trends noted in the "What's Hot" annual survey of chefs conducted by the National Restaurant Association. Why does nutrition continue to be a hot topic for chefs and foodservice managers? Surveys show that many Americans say they want to eat more healthfully. In the National Restaurant Association's report on the projected state of the restaurant industry in 2030, they state that nutrition and sustainability will continue to drive menus as many Americans became more concerned about their health and the state of the environment.

Consumer habits have been changing. Fresh, quality foods have become more important to different ages—from millennials to baby boomers. Locally

sourced and grown food, clean foods (not processed), organic foods, and sustainability are not only chefs' priorities but also customer priorities. Growing chains around the country—such as Tender Greens or Le Pain Quotidien—emphasize organic ingredients and are environmentally conscious. Other chains such as Seasons 52 use seasonally inspired ingredients and limit the kcalories in their menu items. Obviously, few restaurants limit kcalories, but most do offer some balanced options on their menus to bring in more customers.

As foodservice professionals, we have a responsibility to our clients to understand contemporary cooking techniques that are balanced, moderate in rich ingredients, and well prepared to possess nutrition stability. Balanced cooking encompasses an understanding of ingredients that help develop flavor. You can no longer rely on more than moderate use of salt, sugar, and butter/cream for flavor.

Why Is Nutrition Important and What Is a Healthy Diet?

LEARNING OBJECTIVES

- Explain why nutrition is important.
- Describe the components of a healthy diet.

Nutrition A science that studies nutrients found in foods and their actions in the body. Nutrition also explores the relationship between nutrients and disease, as well as why you choose the type of diet you eat.

Nutrition is a science that studies nutrients (such as protein or vitamin C) found in foods and their actions in the body. Nutrition is important because what you eat can affect your health. Almost daily you may hear or read news reports that something in the food you eat, perhaps a nutrient such as sugar, may not be good for you—that it may indeed cause or complicate conditions such as heart disease. Nutrition researchers look closely at the relationships between nutrients and disease, as well as how you choose what to eat.

Nutrients The nourishing substances in food that provide energy and promote the growth and maintenance of your body.

Nutrients are the nourishing substances in food that give you energy and allow your body to grow, maintain, and repair itself. They help regulate many processes that go on in your body, such as the beating of your heart and the digesting of food in your stomach. Examples of nutrients include carbohydrates, fats, protein, water, and vitamins.

In summary, nutrition is a science that studies nutrients and other substances in foods, and how they affect the body, especially in terms of health and disease. Nutrition also explores why you choose the foods you do—in other words, why you eat a certain type of diet.

Diet The foods and beverages you normally eat and drink.

Diet is a word that has several meanings. Anyone who has tried to lose weight has no doubt been on a diet. In this sense, diet means a weight-reducing diet and is often thought of in a negative way. But a more general definition of diet is the foods and beverages you normally eat and drink every day. Of course, your normal diet may change—for instance when you started college and had new places to eat. Nowadays, it's preferable to use the term **dietary pattern** rather than diet. A dietary pattern represents everything an individual habitually eats and drinks—the quantities, proportions, and variety or combination of different foods and drinks. Your dietary pattern may better predict overall health status and disease risk better than individual foods or nutrients because the different parts of your dietary pattern act synergistically to affect health.

Dietary pattern The totality of what individuals habitually eat and drink, and how the individual foods and nutrients act together to affect health.

So why is nutrition in the news so much? Your lifestyle choices, such as your eating pattern and exercise habits, strongly influence whether you might get diseases such as heart disease. According to the Dietary Guidelines Committee (2020), about 6 in 10 Americans have one or more chronic (long-lasting) health conditions, including overweight and obesity, heart disease, stroke, type 2 diabetes, high blood pressure, certain types of cancer, and liver disease. Two important contributing factors to these conditions are unhealthy eating patterns and a lack of physical exercise.

Unfortunately, the quality of the average American diet has only slightly improved in the last 10 years. Diet quality is higher in young children but tends to decline with age until older adulthood when the diet starts to improve somewhat. On average, the American diet can be described as follows:

- *very low* in:
  - vegetables
  - fruits
  - whole grains (such as whole-wheat bread or brown rice)
  - dairy (at least 80 percent of Americans don't meet the recommendations for any of these groups)
- *high* in:
  - kcalories
  - sodium (in salt and processed foods)
  - saturated fat (in animal fats such as in beef or cheese)
  - refined grains (white bread, crackers made with white flour)
  - added sugars (such as in sweetened soft drinks and many desserts).

Eating too much sodium, saturated fat, and/or added sugars increases the risk of the chronic diseases just mentioned. Eating too many kcalories leads to overweight and obesity which also puts you at increased risk for chronic diseases.

Our intake of fruits and vegetables is especially low, and eating more has several benefits. First, most vegetables and fruits are major contributors of a number of nutrients that Americans don't get enough of—such as fiber and potassium. Second, consumption of vegetables and fruits is associated with reduced risk of heart disease and stroke. Third, most vegetables and fruits, when prepared without added fats or sugars, are low in kcalories.

The evidence examined by the 2020–2025 Dietary Guidelines Committee identified a *healthy diet* associated with positive health outcomes as:

- *higher* in vegetables, fruits, whole grains, low- or non-fat dairy, seafood, beans and peas, unsaturated vegetable oils, and nuts;
- *moderate* in alcohol;
- *lower* in red and processed meats, high-fat dairy, and sugar-sweetened foods/drinks and refined carbohydrates.

Figure 1.1 shows components of a healthy diet.

You can combine foods in a variety of flexible ways to achieve a healthy or balanced diet, and these strategies should be tailored to meet your health needs, dietary preferences, and cultural traditions. For most people, this will mean:

- improving food and menu choices, modifying recipes, and watching portion sizes
- including more fresh vegetables and fruits (minimizing processed vegetables high in sodium and processed fruits high in added sugar)
- including more whole grains, seafood, nuts, beans and peas, and low/non-fat dairy or dairy alternatives, such as soymilk (without added sugars)
- reducing consumption of red and processed meats, refined grains, added sugars, and sodium
- replacing animal fats (such as butter or fatty beef cuts) high in saturated fat with vegetable oils and nuts (except palm or coconut oil)

Current research also strongly demonstrates that regular physical activity promotes health and reduces chronic disease risk.

Understanding good nutrition is important for you on both a personal and a professional level. This introductory chapter explores why we choose the foods we eat and then explains several important nutrition concepts that build a foundation for the remaining chapters. You will learn more about how

FIGURE 1.1 A healthy dietary pattern is higher in vegetables, fruits, whole grains, low- or non-fat dairy, seafood, beans and peas, unsaturated vegetable oils, and nuts; moderate in alcohol; lower in red and processed meats; and low in refined grains and sugar-sweetened foods and drinks. Photo by Peter Pioppo.

to recognize whole foods, processed foods, and organic foods; and understand kcalories, nutrients, and digestion.

Nutrition and Food Terms to Know

LEARNING OBJECTIVES

- Distinguish between whole foods, processed foods, and ultra-processed foods.
- Explain what an enriched food, fortified food, and organic food is.
- Define phytonutrients, including where they are found and some of their functions in the body.

Whole foods Foods as we get them from nature; some may be minimally processed.

When people talk about food, you may hear some terms that you are not familiar with or are unsure of. **Whole foods** (besides being the name of a chain of natural and organic grocery stores) are foods pretty much as we get them from nature. Examples include eggs, fresh fruits and vegetables, beans and peas, whole grains, and fish (Figure 1.2). Whole foods are generally not processed or refined and do not have any added ingredients. Some whole foods, such as milk, are minimally processed to make it safe to drink. Fresh meat is also minimally processed so that consumers can buy just what they want.

Processed foods Foods that have been prepared using certain procedures such as canning, cooking, freezing, dehydration, or milling.

Processing changes a food from its natural state. **Processed foods** (Figure 1.3) have been prepared using a certain procedure: milling (wheat is milled to make white flour), cooking and freezing (such as frozen pancakes), canning (canned vegetables), dehydrating (dried fruits), or culturing with bacteria (yogurt). In some cases, processing removes nutrients, as when whole wheat is milled to make white flour. In other cases, processing helps retain nutrients, as when freshly picked vegetables are frozen. Many processed foods, such as roasted and salted nuts, have added ingredients such as sugar, fat, or salt.

FIGURE 1.2 Whole foods are generally not processed or refined.
Photo by Peter Pioppo.

FIGURE 1.3 Processed foods are prepared various ways such as milling, cooking, freezing, or canning.
Photo by Peter Pioppo.

Whereas the food supply once contained mostly whole farm-grown foods, today's supermarket shelves are stocked with a lot of processed and ultra—processed foods. **Ultra-processed foods** are made from substances found in foods, such as fats and starches, and then other ingredients are added—such as artificial flavors and colors, added sugars, stabilizers, preservatives and more. Examples include hot dogs, canned or frozen soups, frozen entrées, boxed cake mix, soft drinks, cookies, candy, instant noodles, energy bars, and other snack foods. You can recognize many ultra-processed foods by their long ingredient lists and use of additives.

When processing adds nutrients, the resulting food is either an **enriched** or a **fortified** food. For example, white flour must be enriched with several vitamins and iron to make up for some of the nutrients lost during milling. A food is considered enriched when nutrients are added to it to replace the same nutrients that are lost in processing.

Milk is fortified with vitamin D because there are few good food sources of this vitamin. A food is considered fortified when nutrients are added that were not present originally or nutrients are added that increase the amount already present. For example, orange juice does not contain calcium, so when calcium is

Ultra-processed foods Foods, such as cookies, made from substances found in foods and then other ingredients (such as artificial flavors and colors, added sugars, and preservatives) are added.

Enriched A food to which nutrients are added to replace the same nutrients that were lost in processing.

Fortified A food to which nutrients are added that were not present originally or nutrients are added that increase the amount already present.

FIGURE 1.4 Fortified foods provide additional sources of nutrients.
Photo by Peter Pioppo.

added to orange juice, the product is called calcium-fortified orange juice. Many breakfast cereals are fortified with some vitamins and minerals (Figure 1.4). Probably the most notable fortified food is iodized salt, introduced in 1924 to decrease iodine deficiency in Americans.

Organic foods Food produced without antibiotic or growth hormones, most conventional pesticides, fertilizers made with synthetic ingredients or sewage sludge, bioengineering, or ionizing radiation.

U.S. Department of Agriculture-certified **organic foods** are grown and processed according to federal guidelines addressing, among many factors, soil quality, animal raising practices, pest and weed control, and use of additives. Organic producers rely on natural substances and physical, mechanical, or biologically based farming methods as much as possible. The production of organic foods can never include the use of genetically modified organisms.

Fruits and vegetables can be called organic when certified as grown on soil that had no prohibited substances applied for three years prior to harvest. Prohibited substances include most synthetic fertilizers and pesticides. If a grower has to use a synthetic substance to achieve a specific purpose, it must first be approved using criteria that examine its effects on human health and the environment.

Meat can be called organic when animals are raised in living conditions that accommodate their natural behaviors, such as grazing, and when fed 100 percent organic feed and forage, and not administered antibiotics or hormones.

Before a product can be labeled organic, a government-approved certifier inspects the farm where the food is grown to make sure the farmer is following all the rules necessary to meet USDA organic standards. Companies that handle or process organic food before it gets to your local supermarket or restaurant must be certified, too.

When it comes to multi-ingredient foods, such as organic crackers, the U.S. Department of Agriculture's standards include additional considerations. Regulations don't allow organically processed foods to contain artificial preservatives, colors, or flavors and require that their ingredients are organic, with some minor exceptions. For example, processed organic foods may contain some approved non-agricultural ingredients, like enzymes in yogurt, pectin in fruit jams, or baking soda in baked goods.

FIGURE 1.5 The USDA Organic seal signifies that the product is at least 95 percent organic.
Courtesy of the U.S. Department of Agriculture.

Products labeled "100 percent organic" must contain only organically produced ingredients. Products labeled "organic" must consist of at least 95 percent organically produced ingredients. Products meeting the requirements for "100 percent organic" and "organic" may display the USDA Organic seal (Figure 1.5).

Processed products that contain at least 70 percent organic ingredients can use the phrase "made with organic ingredients" and list up to three of the organic ingredients or food groups on the label. Processed products that contain less than 70 percent organic ingredients *cannot* use the term organic other than to identify in the ingredients statement the specific ingredients that are organically produced.

Some studies show that organic foods may be higher in certain vitamins and/or minerals compared with conventionally grown foods. However, there is no solid body of research yet. The nutrient composition of any food grown in soil will vary due to many factors, such as differences in soil quality, the amount of sunshine, and the amount of rain. Vitamins in plants are created by the plants themselves as long as they get adequate sunshine, water, carbon dioxide, and fertilizer. Minerals must come from the soil.

Many chefs feel that organic foods taste better than their conventional counterparts. Whether organic foods taste better is to some extent a matter of personal taste. Also, taste will vary among any fresh produce, depending on their freshness, the seeds used, where they were grown, and so on.

Another food term you may have heard is **superfood**. Certain foods, such as blueberries or spinach, have been advertised as superfoods because they are nutrient-rich and promote your health. Many of the health-promoting ingredients in superfoods are called phytochemicals. **Phytochemicals** are compounds found in plant foods, such as fruits and vegetables, many promote health and may even decrease your risk of certain diseases. Following are some examples of what you can think of as superfoods because they naturally contain lots of phytochemicals and have health benefits.

Superfood Nutrient-rich food that promotes your health.

Phytochemicals Phytochemicals are compounds found in plant foods, such as fruits and vegetables, and many promote health and may decrease your risk of certain diseases.

- **Nuts.** A growing number of clinical studies indicate that the beneficial effect of tree nuts may be due not only to the fact that they contain healthy types of fats—monounsaturated and polyunsaturated fats—but also that they contain phytochemicals that may be heart healthy. The phytochemicals in tree nuts have some antioxidant and anti-inflammatory properties. They also help lower blood cholesterol levels.
- **Cocoa.** Cocoa, which is used to make chocolate, is made from cacao beans. Cocoa is a rich source of antioxidants that may help protect your blood vessels and heart. Dark chocolate contains more cocoa than milk chocolate and therefore contains more antioxidants.
- **Tea.** In recent years, scientists have investigated the potential benefits of green and black tea because tea is a rich source of polyphenols, which act as antioxidants in the body. Green tea goes through a fermentation process in order to be made into black tea. Black tea also contains polyphenols, but not quite as much as green tea. Polyphenols in tea appear to be heart healthy and may have a cancer-fighting role.
- **Spinach.** Spinach contains lutein, a phytochemical that seems to help protect the eyes from cataracts and macular degeneration, a progressive condition affecting the central part of the retina that leads to the loss of sharpness in vision. Spinach is a powerhouse of antioxidants.
- **Tomatoes**. Tomatoes are good sources of carotenoids, such as lycopene, and phenols. Lycopene is a potent antioxidant and may defend against cancer and cardiovascular disease.
- **Apples**. Apples are a rich source of phytochemicals, and apple consumption is associated with less risk of cardiovascular disease and some cancers.

Figure 1.6 gives more information on four classes of phytochemicals.

Finally, let's take a look at some nutrition terms related to diet. A nutritious diet is considered to be moderate, balanced, and varied. A **moderate diet** means you avoid excessive amounts of kcalories or eating more of one food or food group than is recommended. So you choose appropriate portion sizes of different foods, and indulge occasionally in "junk foods" such as ice cream or cookies. A **balanced diet** is one in which you choose foods to provide kcalories

Moderate diet A diet that avoids excessive amounts of kcalories or any particular food/food group.

Balanced diet A diet in which foods are chosen to provide kcalories and nutrients in the right proportions.

FIGURE 1.6 The four classes of phytochemicals include carotenoids, flavonoids, indoles, and allicin. These compounds are found in fruits and vegetables of all colors.
Photo by Peter Pioppo.

Four Classes of Phytochemicals

Phytochemicals	Foods	Health Effects
Carotenoids 	Yellow, orange, and red pigmented fruits and vegetables, as well as some green vegetables such as yellow, orange, red bell peppers; carrots; pumpkin; winter squash; sweet potato; spinach; collards; kale	Act as antioxidants, possibly reducing risk of cancer. May lower heart disease risk.
Flavonoids (Phenols) 	Citrus fruits, berries, purple grapes Onions Tea (black and green) Cocoa and chocolate Legumes, soybeans, and soy products Whole wheat	Act as antioxidants and also fight inflammation, possibly reducing risk of heart disease and cancer.
Indoles 	Cruciferous vegetables such as broccoli, Brussels sprouts, cabbage, cauliflower, kale, rutabaga, horseradish	May help combat cancer cells.
Allicin 	Garlic, chives, leeks, onions, scallions, shallots	May prevent cancer, lower cholesterol and blood pressure. Stimulates the immune system.

Varied diet A diet in which you eat a wide selection of foods to get necessary nutrients.

and nutrients in the right proportions that you need. A **varied diet**, meaning you eat a wide selection of foods in each food group, helps you to eat a balanced diet. By eating a wide variety of foods, you are more likely to get the nutrients you need in the right amounts, as well as helpful phytochemicals.

Why Do You Eat the Foods You Do?

LEARNING OBJECTIVES

- Discuss five factors that influence what you eat.
- Compare and contrast flavor and taste.

Think about what you ate for your last meal yesterday. Did you eat at your job, at home, or out with friends? Were you making food choices based on cost or convenience, taste, or simply what foods were available to you? As you can see from this list, many factors influence what you eat:

- Flavor
- Other aspects of food (such as cost, convenience, nutrition)
- Demographics
- Culture and religion
- Health
- Social and emotional influences
- Marketing and the media
- Environmental concerns

Now we will look at these factors in depth.

Flavor

The most important consideration when choosing something to eat is the taste of the food (Figure 1.7). You may think that taste and flavor are the same thing, but taste is actually a component of flavor. **Flavor** is an attribute of a food that includes its taste, smell, feel in the mouth or texture, temperature, and even the sounds made when it is chewed. Flavor is a combination of all five senses: taste, smell, touch, sight, and sound. The taste buds in your mouth and the smell receptors in your nose work together to deliver signals to the brain that are translated into the flavor of food.

FIGURE 1.7 The most important consideration when choosing something to eat is taste.
Monkey Business Images/ Shutterstock.com.

Flavor An attribute of a food that includes its taste, smell, feel in the mouth, texture, temperature, and even the sounds made when it is chewed.

Taste Sensations perceived by the taste buds on the tongue.

Taste buds Clusters of cells found on the tongue, cheeks, throat, and roof of the mouth. Each taste bud houses 60 to 100 receptor cells that bind food molecules dissolved in saliva and alert the brain to interpret them.

Umami A taste often referred to as "savory" that is characteristic of monosodium glutamate and is associated with meats, mushrooms, tomatoes, Parmesan cheese, and other foods. It is a basic taste along with sweet, sour, salty, and bitter.

Taste **Taste** comes from 10,000 **taste buds**—clusters of cells that resemble the sections of an orange. Taste buds, found on the tongue, cheeks, throat, and roof of the mouth, house 60 to 100 receptor cells each. The body regenerates taste buds about every three days.

These taste cells bind food molecules dissolved in saliva and alert the brain to interpret them. Although the tongue is often depicted as having regions that specialize in particular taste sensations—for example, the tip is said to detect sweetness—researchers know that taste buds for each sensation (sweet, salty, sour, bitter, and umami) are actually scattered around the tongue. In fact, a single taste bud can have receptors for all five sensations. We also know that the back of the tongue is more sensitive to bitter, and that food temperature can influence taste. For example, sugar seems sweeter at warmer temperatures whereas salt tastes stronger at colder temperatures.

Taste buds are most numerous in children under age six, and this might explain why youngsters are such picky eaters (Figure 1.8). We know that many children do not like bitter taste, thereby interfering with vegetable consumption. However, their heightened sensitivity to bitter tastes will decrease with age and they will eventually eat more vegetables as long as they are presented with them. As for older adults, it is normal for smell and taste to gradually decline. By age 50, the number of taste buds begins to decrease, which may explain why some older people like saltier and spicier foods. Smoking and some medications also reduce the ability to taste food normally.

Umami, the fifth basic taste, differs from the traditional sweet, sour, salty, and bitter tastes by providing a savory, sometimes meaty sensation. *Umami* is a Japanese word and the taste is evident in many Japanese ingredients and flavorings, such as seaweed, dashi stock, soy sauce, and mushrooms, as well as other foods. The umami taste receptor is very sensitive to glutamate, an amino acid found in protein that occurs in foods such as meat, fish, and milk, and it is often added to processed foods in the form of the flavor enhancer monosodium glutamate (MSG). MSG is an inexpensive, intensely umami ingredient with no off-flavors. Despite the frequent description of umami as meaty, many foods, including mushrooms, tomatoes, and Parmesan cheese, have more glutamate than an equal amount of beef or pork. This explains why foods cooked with mushrooms or tomatoes seem to have a fuller, rounder taste than when cooked alone.

Umami flavor is strengthened when sodium is present, which explains why tomatoes have a strong taste after adding salt. Many popular sauces for cooking combine savory and salty tastes—think of ketchup, soy sauce, or fish sauce.

When incorporating umami ingredients such as Parmesan cheese and tomato products into recipes, chefs can reduce the fat and salt content of foods without sacrificing flavor. Chefs can also build umami flavor through cooking techniques. Any process that breaks down protein—such as drying, aging, curing, and slow cooking—increases umami because glutamate is released from protein.

If you like to eat hot chili peppers, you may wonder what kind of taste they have. The heat of chili peppers is not felt by the taste buds. The substance that makes a chili so hot is called capsaicin. Capsaicin actually binds with pain receptors in the mouth and throat that are responsible for sensing heat (Figure 1.9). When you eat, you perceive heat or cooling in the food.

FIGURE 1.8 Taste buds are most numerous in children under age six, which might explain why they can be picky eaters.
TY Lim/Shutterstock.

FIGURE 1.9 The heat of hot peppers is felt not by the taste buds but by pain receptors in the mouth that sense heat.
taboga/Shutterstock.

FIGURE 1.10 The sense of smell and detecting the aromas in wine is the way wine is tasted.
sirtravelalot/Shutterstock.com.

Smell If you could only taste sweet, salty, sour, bitter, and umami, how could you taste the flavor of cinnamon, chicken, or any other food? This is where smell comes in. Your ability to identify the flavors of specific foods requires the sense of smell.

The ability to detect the strong scent of a fish market, the antiseptic odor of a hospital, the aroma of a ripe melon or a glass of wine, and thousands of other smells comes from a yellowish patch of tissue the size of a quarter high up in your nose (Figure 1.10). This patch is actually a layer of 12 million specialized cells, each sporting 10 to 20 hairlike growths that bind with the smell and send a message to the brain. Our sense of smell may not be as refined as that of dogs, which have billions of olfactory cells, but we can distinguish among about 10,000 scents.

Of course, if you have a bad cold and mucus clogs up your nose, you lose some sense of smell and everything tastes bland. With a cold, you can still taste salty and sweet, but you will have a hard time distinguishing the difference between flavors.

You can smell foods in two ways. If you smell coffee brewing while you are getting dressed, you smell it directly through your nose. But if you are drinking coffee, the smell of the coffee goes to the back of your mouth and then up into your nose. To some extent, what you smell (or taste) is determined by your genetics and also your age.

Texture Those physical properties of food that can be felt with the tongue, mouth, teeth, or fingers—such as tender, juicy, or firm.

Mouthfeel How the texture of a food is perceived in the mouth.

Touch All foods have **texture**—think of a tender cookie or a smooth soup. The human body is very adept at evaluating a food's texture. We use not only the sense of feeling in our mouths—or **mouthfeel**, as food professionals refer to it—but also our other senses to evaluate the texture of foods. Textures can range from moist to dry, tender to tough, fluid to solid, thick to thin, gritty/rough to smooth, coarse to fine, hard to soft, crunchy to soggy. Even carbonated drinks have texture—they tingle in your mouth as you drink them.

Textures that most people like include crispy, crunchy, juicy, creamy, tender, and firm. Consumers generally don't like foods that are tough, crumbly, lumpy, soggy, or watery. Whichever the texture, it influences whether you like the food and also can tell you whether the food is fresh. Think about eating a crispy cracker—when it is stale, it loses its crispness and has less appeal. Green beans that are overcooked lose their al dente texture and become floppy and undesirable.

The natural texture of a food may not be the most desirable texture for a finished dish, and so a cook may create a different texture. For example, a fresh apple may be too crunchy to serve at dinner, so it is baked or sautéed for a softer texture. Or a cream soup may be too thin, so a thickening agent is used to increase the viscosity of the soup or, simply stated, make it harder to pour.

Sight and Sound Appearance creates the first impression of food and strongly influences which foods you choose to eat. Color is very important—think of the eye appeal of a juicy red tomato or a nicely browned loaf of bread. Color gives us a clue about the quality of a food as well as its flavor. We make decisions about foods before we actually eat them. For example, if the skin of an apple looks wrinkly, then the apple has probably lost its crunchy bite. Qualities such as color, size, shape, consistency, and arrangement all contribute to eye appeal. Eye appeal is especially important for cold foods because they lack the appeal of an appetizing aroma (Figure 1.11). Just the sight of something delicious to eat can start your digestive juices flowing. It is certainly true that "you eat with your eyes."

The sound made when a food is eaten, such as the snap of a carrot, is also part of the enjoyment of eating. Think of the sizzle of fajitas or the crunch of a crispy cookie. These sounds also help stimulate appetite.

Other Aspects of Food

Food cost is a major consideration in what foods you eat. Cost is a factor in many purchasing decisions, whether one is buying dry beans at $1.99 per pound or fresh salmon at $17.99 per pound at the supermarket, or choosing where to eat out. We continually feel the pinch at the grocery store as food prices go up for a wide variety of reasons, such as drought, tight supplies, or fuel costs.

Convenience is also a major consideration. You may not have the time or inclination to prepare meals from scratch. Instead, you can choose ready-to-eat foods, frozen dinners, precut fruits and vegetables, and baked goods. Of course, convenience foods are more expensive than their raw counterparts, and not every budget can afford them. Take-out meals are also more expensive, but very popular.

Your food choices are also affected by availability, familiarity, and habits. Whether you have a wide choice of foods at an upscale supermarket or a choice of only two eating places within walking distance of where you work or go to school, you can eat only what is available. Fresh fruits and vegetables are perfect examples of foods that are most available (and at their lowest prices) when in season. Of course, you are more likely to eat fruits and vegetables, or any food for that matter, with which you are familiar and have eaten before and enjoyed. So what are some of your food habits? Do you eat cold cereal for breakfast, pizza out with friends, and popcorn at the movies? Do you love ramen noodles? These are some typical eating habits of college students. Yours might be similar or very different.

FIGURE 1.11 **Eye appeal is important for all menu items.**
Photo by Peter Pioppo.

The nutritional content of a food can be an important factor in deciding what to eat. You probably have watched people reading nutrition labels on a food package, or perhaps you have read nutrition labels yourself. Some consumers are looking out for kcalories, others for sodium or saturated fat content. Current estimates show that about 60 to 70 percent of Americans read and use nutrition information labels. Older people tend to read labels more often than younger people do.

Demographics

Demographic factors that influence your food choices include age, gender, educational level, income, and cultural background (discussed next). Women and older adults tend to consider nutrition more often than men or young adults when choosing what to eat. Older adults are probably more nutrition-minded because they have more health problems, such as heart disease and high blood pressure, and are more likely to have to change their diet for health reasons. Older adults also have more concerns with poor dental health, swallowing problems, and digestive problems. People with higher incomes and educational levels tend to think about nutrition more often when choosing what to eat.

Culture and Religion

Culture The behaviors and beliefs of a certain social, ethnic, or age group.

Culture can be defined as the behaviors and beliefs of a certain social, ethnic, or age group. A culture strongly influences the eating habits of its members. Each culture has norms about which foods are edible, which foods have high or low status, how often foods are consumed, what foods are eaten together, when foods are eaten, and what foods are served at special events and celebrations (such as weddings).

In short, your culture influences your attitudes toward and beliefs about food. For example, some French people eat horsemeat, but Americans do not consider horsemeat acceptable to eat. Likewise, many common American practices seem strange or illogical to persons from other cultures. For example, what could be more unusual than boiling water to make tea and adding ice to make it cold again, sugar to sweeten it, and then lemon to make it tart? When immigrants come to live in the United States, their eating habits gradually change, but they are among the last habits to adapt to the new culture.

For many people, religion affects their day-to-day food choices. For example, many Jewish people abide by the Jewish dietary laws, called the Kashrut. They do not eat pork, nor do they eat meat and dairy products together. Muslims also have their own dietary laws. Like Jews, they will not eat pork. Their religion also prohibits drinking alcoholic beverages. For other people, religion influences what they eat mostly during religious holidays and celebrations. Religious holidays such as Passover are observed with appropriate foods. Table 1.1 explains the food practices of different religions.

Health

Have you ever dieted to lose weight? Most Americans are trying to lose weight or keep from gaining it. You probably know that obesity and overweight can increase your risk of heart disease, diabetes, and other health problems. What you eat influences your health. Even if you are healthy, you may base food choices on a desire to prevent health problems and/or improve your appearance.

A knowledge of nutrition and a positive attitude toward nutrition may or may not translate into nutritious eating practices. Just knowing that eating lots of fruits and vegetables may prevent heart disease does not mean that someone will automatically start eating more of those foods. For most people, knowledge is not enough and change is difficult. Many circumstances and beliefs prevent change, such as a lack of time or money to eat right. But some people manage

TABLE 1.1 Food Practices of World Religions

Religion	Dietary Practices
Judaism	Kashrut: Jewish dietary law of keeping kosher. 1. Meat and poultry. Permitted: Meat of animals with a split hoof that chew their cud (includes cattle, sheep, goats, deer); a specific list of birds (includes chicken, turkey, goose, pheasant, duck). Not permitted: Pig and pork products, mammals that don't have split hooves and chew their cud (such as rabbit), birds not specified (such as ostrich). All animals require ritual slaughtering. All meat and poultry foods must be free of blood, which is done by soaking and salting the food or by broiling it. Forequarter cuts of mammals are also not eaten. 2. Fish. Permitted: Fish with fins and scales. Not permitted: Shellfish (scallops, oysters, clams), crustaceans (crab, shrimp, lobster), fishlike mammals (dolphin, whale), frog, shark, and eel. Do not cook fish with meat or poultry. 3. Meat and dairy are not eaten or prepared together. Meals are dairy or meat, not both. It is also necessary to have two sets of cooking equipment, dishes, and silverware for dairy and meat. 4. All fruits, vegetables, grains, and eggs can be served with dairy or meat meals. 5. A processed food is considered kosher only if the package has a rabbinical authority's name or insignia.
Roman Catholicism	1. Abstain from eating meat on Fridays during Lent (the 40 days before Easter). 2. Fast (one meal is allowed) and abstain from meat on Ash Wednesday (beginning of Lent) and Good Friday (the Friday before Easter).
Eastern Orthodox	Numerous feast days and fast days. On fast days, no fish, meat, or other animal products (including dairy products) are allowed. Also abstain from wine and oil, except for certain feast days that may fall during a fasting period. Shellfish are allowed. Wednesdays and Fridays are also fast days throughout the year.
Protestantism	1. Food on religious holidays is largely determined by a family's cultural background and preferences. Some churches within Protestantism prohibit alcohol. 2. Fasting is uncommon.
Mormonism	1. Prohibit tea, coffee, and alcohol. Some Mormons abstain from anything containing caffeine. 2. Eat only small amounts of meat and base diet on grains. 3. Some Mormons fast once a month.
Seventh-Day Adventist	1. Many members are lacto-ovo vegetarians (eat dairy products and eggs but no meat or poultry). 2. Avoid pork and shellfish. 3. Prohibit coffee, tea, and alcohol. 4. Drink water before and after meals, not during. 5. Avoid highly seasoned foods and eating between meals.
Islam	1. All foods are permitted (halal) except for swine (pigs), four-legged animals that catch prey with the mouth, birds of prey that grab prey with their claws, animals (except fish and seafood) that have not been slaughtered according to ritual, and alcoholic beverages. Use of coffee and tea is discouraged. 2. Celebrate many feast and fast days. On fast days, do not eat or drink from sunup to sundown.
Hinduism	1. Encourages eating in moderation. 2. Meat is allowed, but the cow is sacred and is not eaten. Also avoided are pork and certain fish. Many Hindus are vegetarian. 3. Many Hindus avoid garlic, onions, mushrooms, and red foods such as tomatoes. 4. Water is taken with meals. 5. Some Hindus abstain from alcohol. 6. Hindus have a number of feast and fast days.
Buddhism	1. Dietary laws vary, depending on the country and the sect. Many Buddhists do not believe in taking life, and so they are lacto-ovo vegetarians (eat dairy products and eggs but no meat or poultry). 2. Celebrate feast and fast days.

to change their eating habits, especially if they take small, realistic steps toward their goal and feel that the advantages (such as losing weight or preventing diabetes) outweigh the disadvantages.

Social and Emotional Influences

Your food choices are influenced by the social situations you find yourself in, such as when you are eating with others. Peer pressure no doubt influences many of your food choices. Have you ever noticed that there are a lot of college students who become vegetarians? Perhaps social influences during the college years have something to do with that. Even as adults, we tend to eat the same foods that our friends and neighbors eat. This is due to cultural influences as well.

Food is often used to convey social status. For example, getting your morning coffee beverage from Starbucks is certainly more upscale than picking up coffee at a convenience store. Social class, and how much money you have, definitely can influence what you choose to eat.

Emotions are closely tied to some of our food selections. As a child, you may have been given something sweet to eat, such as cake or candy, whenever you were unhappy or upset. As an adult, you may gravitate to those kinds of foods, called comfort foods, when in a stressful situation such as studying and taking final exams. Carbohydrates, such as those in cake or candy, tend to have calming effects. Eating in response to emotions can lead to overeating and overweight.

Marketing and the Media

The food industry very much influences what you choose to eat. After all, the food companies decide what foods to produce and where to sell them. They use traditional media (television, magazines, newspaper, and radio) as well as newer media such as social media, websites, emails, and text messages to promote their products. On a daily basis, the media portray food in many ways: paid advertisements, articles on food in magazines and newspapers, foods eaten on television shows, or simply a tweet on Twitter that gives you the location of your favorite food truck. In addition, food companies use in-store promotions and placement to entice potential customers.

Much research has been done on the impact of television food commercials on children. Quite often, the commercials succeed in getting children to eat foods such as cookies, candies, and fast food. Television commercials are likely contributing to higher kcalorie and fat intakes.

Environmental Concerns

There is growing concern about the environmental impacts of our food. Conventional farming/food production and transportation use considerable amounts of energy and create undesirable waste. Consumers are clamoring for sustainable food choices and environmentally friendly restaurants, and indeed the restaurant industry is responding to this with practices such as purchasing locally, using organic produce and sustainable seafood, growing gardens, and implementing green practices in the facility. At the end of this chapter, there is more information on some of the environmental concerns of commercial food production and how it influences food choices.

Now that you have a better understanding of why we eat the foods we do, we can look at some basic nutrition concepts and terms.

Kcalories and Nutrients

LEARNING OBJECTIVES

- Explain the concept of kcalories.
- Identify factors that influence how many kcalories you burn each day,
- Describe the functions and kcalories of each class of nutrients.
- Discuss what the Recommended Dietary Allowance and Adequate Intake represent.
- Explain Tolerable Upper Intake Levels.
- Give the importance of using Acceptable Macronutrient Distribution Ranges.

Kcalories

Food energy, as well as the energy needs of the body, is measured in units of energy called kilocalories. The number of kilocalories in a particular food can be determined by burning a weighed portion of that food and measuring the amount of heat (or kilocalories) produced. A kilocalorie raises the temperature of 1 kilogram of water by 1 degree Celsius.

When you read in a magazine that a cheeseburger has 350 calories, understand that it is actually 350 kilocalories. The American public has been told for years that an apple has 80 calories, a glass of regular milk has 150 calories, and so on, when the correct term is not calories but kilocalories. This has been done in part to make the numbers easier to read and to ease calculations. Imagine adding up your calories for the day and having most numbers be six digits long, such as 350,000 calories for a cheeseburger. This book uses the term **kilocalorie** and its abbreviations, kcalorie and kcal, throughout.

Kilocalories A unit of measure used to express the amount of energy found in different foods.

The number of kcalories you need is based on three factors: your energy needs when your body is at rest and awake (referred to as basal metabolism), your level of physical activity, and the energy you need to digest and absorb food. For every 100 kcalories you eat, about 10 are used for digestion, absorption, and metabolism of nutrients, our next topic.

Basal metabolic needs include energy needed for vital bodily functions when the body is at rest but awake. For example, your heart is pumping blood to all parts of your body, your cells are making proteins, and so on. Your **basal metabolic rate (BMR)** is basically the number of kcalories you would burn if you just sat down and did nothing. Whether your BMR is fast, slow, or just average depends in part on genetics and the following factors:

Basal metabolic rate The minimum energy needed by the body for vital functions when at rest and awake.

- **Gender.** Men have a higher BMR than women do because men have a higher proportion of muscle tissue (muscle requires more energy for metabolism than fat does).
- **Age.** As you get older, your BMR decreases and you gain fat tissue and lose muscle tissue.
- **Growth.** Children, pregnant women, and lactating women have higher BMRs.
- **Height.** Tall people have more body surface than shorter people and lose body heat faster. Their BMR is therefore higher.
- **Temperature.** BMR increases in both hot and cold environments, to keep the temperature inside the body constant.
- **Fever and stress.** Both of these increase BMR. The body reacts to stress by secreting hormones that speed up metabolism so that the body can respond quickly and efficiently.
- **Exercise.** Exercise increases BMR for several hours afterward.
- **Smoking and caffeine.** Both cause your BMR to increase.
- **Sleep.** Your BMR is at its lowest when you are sleeping.

The BMR also decreases when you diet or eat fewer kcalories than normal. The BMR accounts for most of the energy you burn—about two-thirds of your energy if you are not very active.

Your level of physical activity strongly influences how many kcalories you need. The number of kcalories burned depends on the type of activity, how long and how hard it is performed, and your size (Figure 1.12). The larger your body is, the more energy you use in physical activity. Aerobic activities such as walking, jogging, cycling, and swimming are excellent ways to burn kcalories if they are brisk enough to raise heart and breathing rates. Physical activity accounts for 25 to 40 percent of your total energy needs (Figure 1.13).

P03

MOVE!®

Calories Burned during Physical Activities

The following table gives the number of calories you burn doing 10 minutes of each physical activity listed. The calories will vary depending on a number of factors including weight, age, and environmental conditions. The figures given are for men ranging in weight from 175–250 lbs. and women ranging from 140–200 lbs. If you weigh more than this, you will burn more calories per minute.

CALORIES BURNED IN 10 MINUTES

LIGHT ACTIVITY	*MALE*	*FEMALE*
Ballroom Dancing	35–50	28–40
Cleaning, Sweeping at moderate effort	26–38	21–30
Washing Dishes	29–42	23–30
Tai Chi	35–50	28–40
MODERATE ACTIVITY		
Bicycling at <10 miles per hour	46–66	37–53
Step Aerobics	64–91	51–73
Cleaning Gutters	58–83	46–66
Mowing the Lawn	64–91	51–73
Raking Leaves	44–63	35–50
Walking at 4 miles per hour	58–83	46–66
Shoveling Snow	61–88	49–70
Bowling	44–63	35–50
Golf, Walking and Pulling Clubs	61–88	49–70
Slow Lap-Swimming	63–90	54–72
VIGOROUS ACTIVITY		
Jogging (9 min/mile)	149–213	119–170
Basketball	75–108	60–86
Carrying Groceries Upstairs	87–125	70–100

FIGURE 1.12 Kcalories burned during common physical activities.
Physical Activity Handouts, US Department of Veteran affairs.
Source: www.move.va.gov.

FIGURE 1.13 Chef John Brefere enjoys outdoor physical activities when not creating delicious balanced, wholesome dishes. These activities account for 25 to 40 percent of total energy needs.
Photo by Lisa Brefere (Author).

Nutrients

As stated, nutrients provide energy or kcalories, promote the growth and maintenance of the body, and/or regulate body processes. The approximately 50 nutrients can be arranged into six groups:

1. Carbohydrates
2. Fats
3. Protein
4. Vitamins
5. Minerals
6. Water

Foods rarely contain just one nutrient. Most foods provide a mix of nutrients. For example, bread often is thought of as providing primarily carbohydrates, but it is also an important source of certain vitamins and minerals. Food contains more than just nutrients. Depending on the food, it may contain colorings, flavorings, caffeine, phytochemicals, and other substances.

Carbohydrates, fats, and protein are called **energy-yielding nutrients** because they can be burned as fuel to provide energy for the body. They provide kcalories as follows:

- Carbohydrates: 4 kcalories per gram
- Fats: 9 kcalories per gram
- Protein: 4 kcalories per gram

Energy-yielding nutrients Nutrients that can be burned as fuel to provide energy for the body, including carbohydrates, fats, and proteins.

A gram is a unit of weight in the metric system; there are about 28 grams in 1 ounce. Vitamins, minerals, and water do not provide energy or kcalories. Alcohol, although not considered a nutrient because it does not promote growth or maintenance of the body, does yield energy: seven kcalories per gram.

The body needs vitamins and minerals in small amounts, and so these nutrients are called **micronutrients** ("micro" means small). In contrast, the body needs large amounts of carbohydrates, fats, and protein, and so they are called **macronutrients** ("macro" means large).

Micronutrients Nutrients needed by the body in small **amounts, includi**ng vitamins and minerals.

Macronutrients Nutrients needed by the body in large amounts, including carbohydrates, fats, and proteins.

Carbohydrates include sugars, starches, and fibers that function as the body's primary source of energy. You are probably most familiar with sugar in its refined forms, such as the sugars used in soft drinks, cookies, cakes, pies, candies, jams, jellies, and other sweetened foods. You also find sugar in its natural form in fruits and milk (even though milk does not taste sweet). Starch is found in breads, breakfast cereals, pastas, potatoes, and beans. Both sugar and starch are important sources of energy for the body.

Carbohydrates A large class of nutrients, including sugars, starch, and fibers, that function as the body's primary source of energy.

Good sources of fiber include legumes (dried beans and peas), fruits, vegetables, nuts and seeds, and whole-grain foods such as whole-wheat bread and cereal. Fiber can't be broken down in your digestive tract, and so it is mostly excreted. It therefore does not provide energy for the body. However, fiber does a number of good things in the body, such as improve the health of the digestive tract.

Fats provide a rich source of energy to cells. Familiar fats and oils are found in butter, margarine, vegetable oils, mayonnaise, and salad dressings. Fats are also found in the fatty streaks in meat, the fat under the skin of poultry, the fat in milk and cheese (except fat-free milk and products made with them), baked goods such as cakes, fried foods, nuts, and many processed foods, such as microwave popcorn and frozen dinners. Most breads, cereals, pasta, fruits, and vegetables have little or no fat.

Fats A nutrient that provides a rich source of energy to the body and makes food tasty.

Most of the kcalories we eat come from carbohydrates or fats. Only about 15 percent of total kcalories come from protein. This doesn't mean that protein is less important. On the contrary, **protein** is part of every cell, tissue, and organ in the body. Besides its role as an important part of cells, protein regulates processes in your body and can be burned to provide energy (although the body prefers to burn carbohydrates and fat so protein can be used to build new cells). You probably know some of the good sources of protein, which are typically animal foods such as beef, pork, poultry, fish, eggs, milk, and cheese. Protein appears in plant foods, such as grains, beans, and vegetables, but in smaller quantities. Fruits contain only very small amounts of protein.

Protein Major structural parts of the body's cells that are made of amino acids assembled in chains; performs many functions in the body; especially rich in animal foods.

There are 13 different vitamins in food. **Vitamins** are found in a wide variety of foods. They are essential in small quantities to regulate body

Vitamins Noncaloric organic nutrients found in a wide variety of foods that are essential in small quantities to regulate body processes, maintain the body, and allow growth and reproduction.

processes, maintain the body, and allow growth and reproduction. Instead of being burned to provide energy for the body, vitamins work as helpers. They assist in the processes of the body that keep you healthy. For example, vitamin A is needed by the eyes for vision in dim light. Vitamins are found in fruits, vegetables, grains, meat, dairy products, and other foods. Unlike other nutrients, many vitamins are susceptible to being destroyed by heat, light, and other agents.

Minerals Noncaloric nutrients found in a wide variety of foods; needed to regulate body processes, maintain the body, and allow growth and reproduction.

Minerals are also required by the body in small amounts and do not provide energy. Like vitamins, they regulate body processes, maintain the body, and allow growth and reproduction. Some minerals, such as calcium and phosphorus, become part of the body's structure by building bones and teeth. Unlike vitamins, minerals are indestructible.

Although deficiencies of energy or nutrients can be sustained for months or even years, a person can survive only a few days without water. Experts rank water second only to oxygen as essential to life. Water plays a vital role in all bodily processes and makes up just over half the body's weight. It supplies the medium in which various chemical changes of the body occur and aids digestion and absorption, circulation, and lubrication of body joints. For example, as a major component of blood, water helps deliver nutrients to body cells and removes waste to the kidneys for excretion.

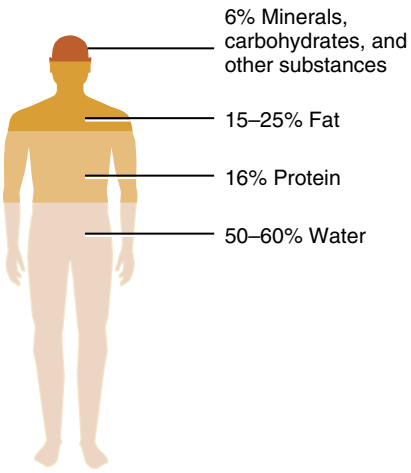

FIGURE 1.14 Your body is 50 to 60 percent water and 15 to 25 percent fat.
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It's been said many times, "You are what you eat." This is certainly true; the nutrients you eat can be found in your body. As mentioned, water is the most plentiful nutrient in the body, accounting for about 50 to 60 percent of your weight. Protein accounts for about 15 percent of your weight, fat for 15 to 25 percent, and carbohydrates for only 0.5 percent. The remainder of your weight includes minerals, such as calcium in bones, and traces of vitamins (Figure 1.14).

The functions of the six nutrients are summarized in Figure 1.15. Most, but not all, nutrients are considered **essential nutrients**. Essential nutrients either cannot be made in the body or cannot be made in the quantities needed by the body; therefore, we must obtain them from food.

Essential nutrients Nutrients that either cannot be made in the body or cannot be made in the quantities needed by the body; therefore, we must obtain them from food.

Dietary Reference Intakes (DRIs)

The **Dietary Reference Intakes (DRIs)** estimate how much you need daily of various nutrients as well as when you might be taking in too much of a nutrient. The DRI is only useful for healthy individuals, and was developed for use in the United States and Canada. They include the following:

- **Recommended Dietary Allowance (RDA) and Adequate Intake (AI).** The RDAs represent how much of a nutrient you should be getting on a daily basis. If there is not enough scientific evidence to set an RDA, an Adequate Intake is given.
- **Tolerable Upper Intake Level (UL).** The UL is the maximum you should take in of a nutrient—if you take more than the UL, you risk side effects that can be bad for your health. For most nutrients, the UL includes how much you take in from foods and supplements. A UL cannot be established for some nutrients, due to inadequate research.

Dietary Reference Intakes (DRIs) Nutrient standards set for healthy Americans and Canadians that estimate how much you need daily of various nutrients, as well as when you might be taking in too much of certain nutrients.

Recommended Dietary Allowance (RDA) The dietary intake value that represents what you need to take in on a daily basis.

Adequate Intake (AI) The dietary intake that is used when there is not enough scientific research to support an RDA.

Tolerable Upper Intake Level (UL) The maximum intake level of a nutrient above which you may feel adverse health effects.

The DRIs (see Appendix B) vary, depending on age and gender, and there are separate DRIs for pregnant and lactating women. The DRIs are meant to help healthy people maintain health and prevent disease. They are not designed for seriously ill people, whose nutrient needs may be much different.

Carbohydrates—A large class of nutrients including sugar, starches, and fibers that are the body's primary source of energy.

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Lipids (Fats)—A group of fatty substances including triglycerides and cholesterol that are not soluble in water and that provide a rich source of energy and structure to the body's cells.

Elena Elisseeva/Shutterstock.com

Proteins—A nutrient that is the major structural part of the body's cells and is found in large quantities in animal foods.

Africa Studio/Shutterstock.com

Vitamins and Minerals—Nutrients with no kcalories that are found in a wide variety of foods (especially fruits and vegetables). They are essential in small amounts to maintain the body, regulate body processes, and allow for growth and reproduction.

Serg64/Shutterstock.com

Water—The most vital nutrient that plays a role in all bodily processes and makes up just over half of your weight.

Mariyana M/Shutterstock.com

FIGURE 1.15 Nutrients are classified into six groups.

Another important concept related to the DRIs is **Acceptable Macronutrient Distribution Ranges (AMDR)**. As you recall, macronutrients are carbohydrates, fats, and proteins—the only nutrients that provide kcalories. AMDR is simply the percent of kilocalories you should eat from carbohydrates, fats, or proteins to reduce your risk of chronic disease while providing adequate intake and nutrients. For example, adults (and children over 1 year old) should obtain 45 to 65 percent of their total kcalories from carbohydrates (Table 1.2). The

Acceptable Macronutrient Distribution Ranges (AMDR) The percent of total kilocalories coming from carbohydrates, fats, or proteins that is associated with a reduced risk of chronic disease while providing adequate intake.

TABLE 1.2 Acceptable Macronutrient Distribution Ranges

Age	AMDR for Carbohydrates	AMDR for Fats	AMDR for Proteins
1 to 3 years old	45–65%	30–40%	5–20%
4 to 18 years old	45–65%	25–35%	10–30%
Over 18 years old	45–65%	20–35%	10–35%

AMDR for adults is 20 to 35 percent of total kcalories from fat and 10 to 35 percent of total kcalories from protein. The wide range allows for more flexibility in dietary planning for healthy people.

What Happens When You Eat?

LEARNING OBJECTIVES

- Describe how food is digested and absorbed in the gastrointestinal tract.
- Explain the concept of microbiota and why it is important to your health.
- Give an example of a probiotic and a prebiotic, and explain what they do in the body.

Digestion The process by which food is broken down into its components in the mouth, stomach, and small intestine with the help of digestive enzymes and fluids.

Enzymes Compounds that speed up the breaking down of food so that nutrients can be absorbed. Enzymes also perform other functions in the body.

Absorption The passage of digested nutrients through the walls of the intestines or stomach into the body's tissues. Nutrients are then transported through the body to the cells in the blood.

Metabolism All the chemical processes by which nutrients are used to support life.

Gastrointestinal tract A hollow tube running down the middle of the body in which digestion of food and absorption of nutrients take place.

Saliva A fluid secreted into the mouth from the salivary glands that contains important digestive enzymes and lubricates the food so that it may readily pass down the esophagus.

Pharynx A passageway that connects your mouth to the esophagus.

Esophagus The muscular tube that connects the pharynx to the stomach.

Peristalsis Involuntary muscular contraction that forces food through the entire digestive system.

To become part of the body, food must be digested and absorbed. **Digestion** is the process by which food is broken down into its components in the mouth, stomach, and small intestine, with the help of digestive **enzymes** and fluids. For example, when you eat a hamburger, the bun and meat are broken apart by your teeth and stomach acid, which helps to release nutrients and other components. Nutrients such as carbohydrates, fats, and proteins must be broken down into their components before they can be absorbed from the stomach or small intestines into the body. Water, vitamins, and minerals do not need to be broken down any further.

Before the body can use any nutrients that are present in food, the nutrients must pass through the walls of the stomach or intestines into the body's tissues, a process called **absorption**. Much digestion occurs in the small intestine, so that nutrients such as carbohydrates, fats, and proteins can be absorbed. Nutrients are then transported in the blood through the body to the cells.

Within each cell, **metabolism** takes place. Metabolism refers to all the chemical processes by which nutrients are used to support life. Metabolism has two parts: the building up of substances and the breaking down of substances. Within each cell, nutrients such as glucose are split into smaller units to release energy. The energy is used to make heat to maintain body temperature or perform work within the cell. Substances such as protein are built from their building blocks in every cell.

Once we have smelled and tasted food, our meal goes on a journey through the **gastrointestinal tract** (also called the digestive tract), a hollow tube that runs down the middle of your body (Figure 1.16). The top of the tube is your mouth, which is connected, in turn, to your pharynx, esophagus, stomach, small intestine, large intestine, rectum, and anus, where solid wastes leave the body. The gastrointestinal tract is such a busy place that the cells lining it are replaced every few days.

The digestive system starts with the mouth. Your tongue and teeth help with chewing. The tongue, which extends across the floor of the mouth, moves food around the mouth during chewing. Your 32 permanent teeth grind and break down food. Chewing is important because it breaks up the food into smaller pieces so that it can be swallowed. **Saliva**, a fluid secreted into the mouth from the salivary glands, contains important digestive enzymes and lubricates the food so that it may pass readily down the esophagus. Digestive enzymes help break down food into forms of nutrients that can be used by the body. The tongue rolls the chewed food into a ball to be swallowed.

When you swallow, food enters the **pharynx** (just 5 inches long) and then the **esophagus**, a muscular tube about 10 inches long that leads to the stomach. Food is propelled down the esophagus by **peristalsis**, rhythmic contractions of muscles in the wall of the esophagus. You might think of this contraction that forces food through the entire digestive system as squeezing a marble through a rubber tube. Peristalsis also helps break up food into smaller and smaller particles.

The digestive system consists of the organs of the digestive tract—mouth, pharynx, esophagus, stomach, small intestine, and large intestine—plus four accessory organs—salivary glands, liver, gallbladder, and pancreas.

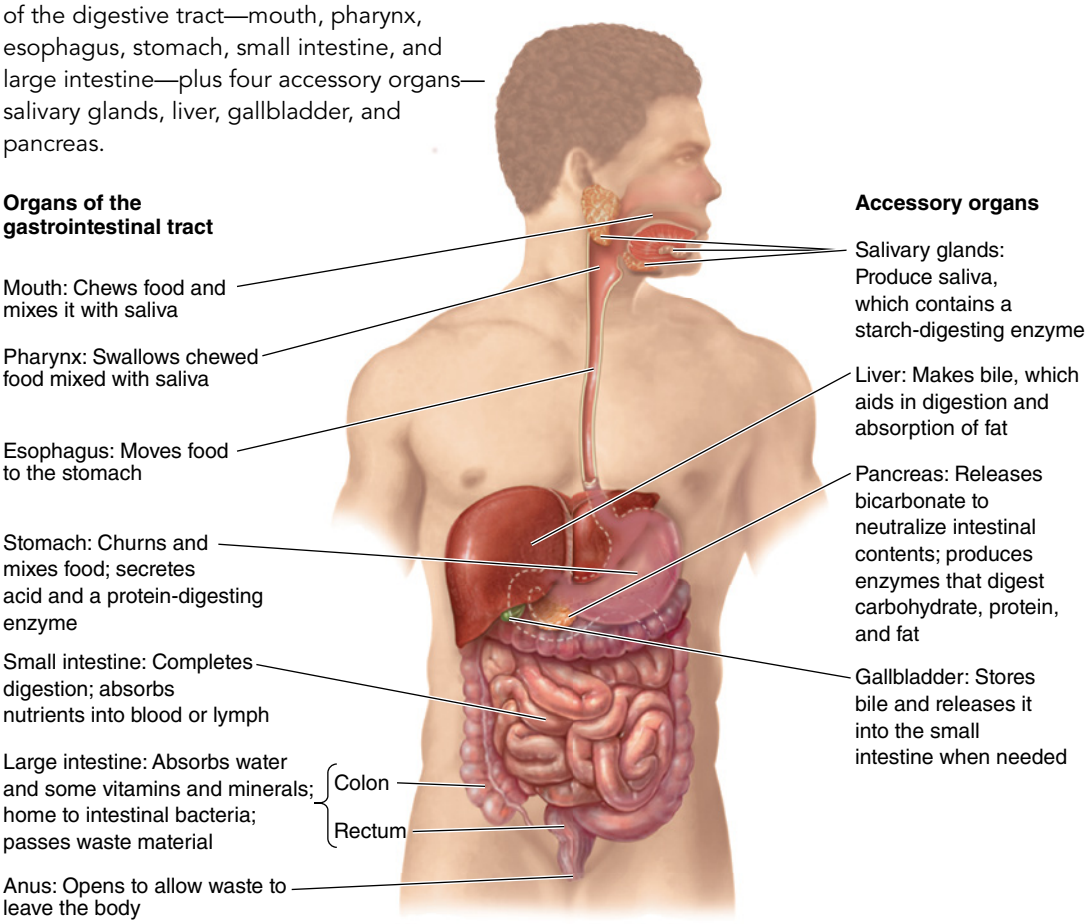

FIGURE 1.16 The human digestive tract digests and absorbs nutrients and removes solid wastes.

Food passes from the esophagus into the **stomach**. The stomach, a muscular sac, holds about 4 cups (1 liter) of food when full. The stomach makes an enzyme that helps in protein digestion and an acid that destroys harmful bacteria.

The stomach has the strongest muscles and thickest walls of all the organs in the gastrointestinal tract. The food now has a semiliquid consistency and is passed into the first part of the small intestine in small amounts (the small intestine can't process too much food at one time). Liquids leave the stomach faster than solids do, and carbohydrate or protein foods leave faster than fatty foods do. The stomach absorbs few nutrients, but it does absorb alcohol. It takes 1.5 to 4 hours after you have eaten for the stomach to empty.

Stomach A muscular sac that holds about 4 cups of food when full and helps in digestion. Some alcohol is absorbed through the stomach.

The **small intestine** receives the digested food from the stomach as well as enzymes from other organs in the body, such as the pancreas. The small intestine itself produces digestive enzymes, and the liver makes bile to break down fat.

Most digestion and absorption are completed in the first half of the small intestine. On the folds of the intestinal wall (and throughout the entire small intestine) are tiny, fingerlike projections called **villi**. Nutrients are absorbed across the villi into the body where they are transported to your cells through the blood.

Small intestine The digestive tract organ that extends from the stomach to the opening of the large intestine.

Villi Tiny fingerlike projections in the wall of the small intestines that are involved in absorption.

The **large intestine** (also called the **colon**) is located between the small intestine and the rectum. One of the functions of the large intestine is to receive the waste products of digestion and pass them on to be eliminated. Waste products are the materials that were not absorbed into the body. The large intestine does absorb water, some minerals, and a few vitamins made by bacteria residing there. Bacteria are normally found in the large intestine and are necessary for

Large intestine (colon) The part of the gastrointestinal tract between the small intestine and the rectum. It absorbs some water, vitamins, and minerals, as well as passes on waste products.

Rectum The last section of the large intestine, in which feces, the waste products of digestion, are stored until elimination.

Anus The opening of the digestive tract through which feces travel out of the body.

Microbiota All the microorganisms found within the digestive tract. Mostly composed of bacteria in the large intestine.

a healthy intestine. The waste products are stored in the **rectum** until they are released as solid feces through the **anus**, which opens to allow elimination.

The digestive tract is far more than just a hollow tube that digests and absorbs food. The digestive tract is also home to small, living organisms (called microorganisms) such as bacteria and yeast. Scientists refer to all the microorganisms found within the digestive tract, as the **microbiota**. In the digestive tract, the microbiota is composed mostly of bacteria, and most of them are in the large intestine. While many bacteria are helpful, some can promote disease (they are in smaller numbers). In a healthy body, the microorganisms coexist and get along. However, when the balance is disturbed, for example, if you have to take antibiotics, one or more microorganisms may grow into large numbers and cause health problems such as diarrhea.

The microbiota is important because it helps digest food, regulate our immune system, protect against toxins as well as bacteria that cause disease, and produce vitamins. The microbiota digests some types of carbohydrates, such as fiber, that we eat but our digestive tract can't digest into its components. More recent research shows that your gut microbiota appears to play a role in the development and progress of diseases such as obesity, cancer, and cardiovascular disease.

Diet, along with other factors such as age and sex, plays a large role in determining which kinds of microorganisms live in your large intestine. The richer and more diverse the microbiota is, the lower your risk of disease and allergies. A healthful plant-based diet improves the health and diversity of your gut microbes, and is associated with a lower risk of developing conditions such as obesity, Type 2 diabetes, and cardiovascular disease.

Prebiotics Nondigestible parts of foods that actually feed the healthy bacteria in your intestines.

Probiotics Live bacteria and yeasts that are called the "good" microorganisms because they keep the digestive system healthy.

For a healthy microbiome, pick prebiotic-rich foods and probiotic foods. **Prebiotics** are nondigestible parts of foods that actually feed the healthy bacteria in your intestines. When you eat, you are not only nourishing your body, but you are also feeding your microorganisms. Good sources of prebiotics are onions, garlic, leeks, whole wheat, spinach, beans, bananas, oats, soybeans, and chicory root.

Probiotics are live bacteria and yeasts found in some foods and supplements. Yogurt and fermented foods are sources of "good" bacteria. Examples of fermented foods include sauerkraut; kimchi, a Korean dish made from fermented vegetables—often cabbage and radish; and soy sauce.

Fermented foods were some of the first "processed" foods produced and consumed by humans. This was not because humans planned to create fermentation, but with no refrigeration or other means to keep food safe, fermentation helped preserve foods that would otherwise spoil. Other methods such as salting and smoking were also important, but fermentation, discovered by mistake, became the preferred method due to the pungent flavors and textures, not to mention altering effects of fermented grapes and fruits. Over thousands of years and perfection of the process, we now have the many food products we love and enjoy today such as the following.

- Milk fermentations—Yogurt, buttermilk, sour cream, and kefir.
- Meat fermentation—Salami and pepperoni.
- Fermented vegetables—Sauerkraut, kimchi, olives, and some pickles.
- Fruit fermentation—Wine and some vinegars.
- Tea fermentation—Kombucha.
- Legume fermentation—Miso, tempeh, and natto (from soybeans).

Fermented foods often begin as whole foods, and with the help of microorganisms, their sugars and starches are converted into compounds like lactic acid (which is a great preservative and also gives pickles and sauerkraut their signature sour taste) or alcohol (which gives wine and beer their flavor). The process also turns these foods into probiotic powerhouses that boost levels of good bacteria in your digestive tract. This helps to improve the health and balance of your body's microbiome.

Fermented foods have been known to aid in digestion and support your intestinal health as well as your immune system. Eating fermented foods is associated with reduced risk of heart disease and improved weight management. Additionally, fermented foods are easier to digest because they're already partially broken down by bacteria.

Sustainable Food Systems

LEARNING OBJECTIVE

- Give examples of how a chef may run a sustainable restaurant, particularly in terms of purchasing food.

Our current method of producing food is not sustainable. In other words, at some point the damage being done to the environment will make it impossible to continue to farm. These harmful environmental consequences will become yet more worrisome as the world's population grows and demand for food increases. One answer to this dilemma can be found in sustainable agriculture.

Sustainable agriculture The production of food using farming techniques that protect the environment, animal welfare, and public health.

Sustainable agriculture produces food without depleting the Earth's resources (water, soil, and fuel) or polluting its environment. It is agriculture that follows the principles of nature to develop systems for raising crops and livestock that are, like nature, self-sustaining. In recent decades, sustainable farmers and researchers around the world have used a variety of techniques, such as those found in organic farming, to farm with nature. Sustainable practices lend themselves to smaller farms. These farms, in turn, tend to find their best niches in local markets, within local food systems, often selling directly to consumers in farmers' markets or to local restaurants. Some farms offer consumers the possibility of buying shares of the harvest ahead of time. Then the consumers are entitled to pick up a bag or box of produce at certain time intervals, such as weekly, from the farm during the growing season. This is referred to as community-supported agriculture. You can find a farm in your area that offers shares at the Local Harvest website.

Sustainable agriculture is part of a sustainable food system. Sustainable food systems involve not only growing crops and producing livestock in a sustainable manner but also processing, packaging, and distributing foods without depleting the Earth's resources or causing excessive pollution. In a sustainable food system, food should be affordable and workers, such as farm workers, should make a living wage.

Commercial farming, although producing an abundance of relatively inexpensive food, depletes natural resources such as topsoil and water. In addition, pesticides enter groundwater systems and fertilizers threaten ecosystems. Emissions from nitrogen fertilizers add to greenhouse gas emissions and chemical runoff from farms cause algae blooms in freshwater lakes and rivers.

As you drive by many farms across the United States, you might be inclined to think that we eat a lot of corn, soybeans, and grains. However, it is not Americans who are eating most of these foods: it is our livestock such as beef cattle, dairy cattle, hogs, chickens, and turkeys. Eventually, these livestock (except dairy cattle, which give us milk) will be slaughtered to produce meat and poultry. The typical American eats a lot more beef, poultry, and fish than the global average.

Producing large quantities of meat in America uses many resources and has serious environmental consequences, such as the following:

1. When forests have been cut down to create pastures for livestock, there are negative effects. The trees help balance the oxygen–carbon dioxide balance of the earth by absorbing carbon dioxide from the environment and releasing oxygen. Fewer trees lead to the accumulation of greenhouse gases, such as carbon dioxide and methane, in the atmosphere. The accumulation of these greenhouse gases leads to global warming. Trees also absorb rainfall

by soaking up moisture through their roots, thus preventing runoff and the accompanying soil erosion and flooding.

2. Livestock farms are major air and water polluters. Cattle naturally produce methane, a strong greenhouse gas that contributes to global climate change. Livestock production systems also produce other greenhouse gases such as nitrous oxide and carbon dioxide. People who live near or work at these farms breathe in hundreds of gases, which are formed as manure decomposes. The stench can be unbearable. And, of course, there is the problem of what to do with millions of tons of manure each year.
3. Enormous quantities of water, fuel, fertilizers, and pesticides are required to grow the feed for livestock, utilizing many acres of farmland. In drier climates, huge amounts of irrigation water are used to produce feed grains such as corn. Fertilizers require a lot of energy to produce, and along with pesticides, they often wind up polluting waterways and drinking water.

To produce 100 kcalories of plant foods requires only about 50 kcalories from fossil fuels, but to get the equivalent amount of kcalories from beef requires many times more kcalories from fossil fuels. Basically, the money you use to purchase a hamburger in the United States doesn't even start to cover the environmental costs of producing it.

So what are restaurants doing to embrace sustainable food systems? Lots! Let's take a look at what chefs are doing in the kitchen.

1. **Sourcing local foods, farm-to-table.** When chefs such as Daniel Humm, chef/co-owner of Eleven Madison Park and The NoMad in New York City (Figure 1.17), source local foods, less fuel is used to transport food to the restaurant. The average distance food travels from farm to plate—referred to as "food miles"—is 1500 miles, but it is less than 100 miles for locally produced items. Although food miles account for about 10 percent of the food system's greenhouse gas emissions, buying local and choosing efficient modes of transportation do help save fuel and reduce emissions.
2. **Buying organic foods.** Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. Organic meat, poultry, eggs, and dairy products come from animals with outdoor access and that are given no antibiotics or growth hormones. Organic food is produced without

FIGURE 1.17 **On the right, Daniel Humm, Chef/Co-Owner of Eleven Madison Park Restaurant and also NoMad (NYC), shares time with Alex Paffenroth, of Paffenroth Farms, Warwick, NY (specializing in local root vegetables).**
Courtesy of Daniel Humm.

using most conventional pesticides, fertilizers made with synthetic ingredients or sewage sludge, genetic engineering, or irradiation. Before a product can be labeled organic, a government-approved certifier inspects the farm where the food is grown to make sure the farmer is following all the rules necessary to meet U.S. Department of Agriculture organic standards. Companies that handle or process organic food before it gets to your local supermarket or restaurant must be certified, too.

3. **Buying sustainable fish.** Chef Rick Moonen is a pioneer in sustainable seafood (Figure 1.18). Fishing practices worldwide are depleting fish populations, destroying habitats, and polluting the water. Sustainable seafood comes from species of fish that are managed in a way that provides for today's needs without damaging the availability of the species to future generations. Most fish and shellfish caught in U.S. federal waters are harvested under fishery management plans that must meet standards to ensure fish stocks are maintained. Unfortunately, more than 75 percent of the seafood eaten in the U.S. is imported, and some U.S. seafood is overfished or caught or farmed in ways that harm the environment.
   - For information on specific seafood to purchase, visit the websites of the Monterey Bay Aquarium Seafood Watch (United States) or SeaChoice (Canada).
   - Green Chefs, Blue Ocean is a comprehensive, interactive online sustainable seafood training program and resource center.
   - The FishChoice website helps seafood buyers source sustainable seafood.
4. **Starting a garden to grow herbs, vegetables, and other foods.** More chefs, such as Rich Rosendale, CMC, are growing some of their own produce and herbs (Figure 1.19).

FIGURE 1.18 Fresh-caught dinner in Alaska. Chef Rick Moonen, an advocate of sustainable fish and seafood, serves a thoughtful selection of seafood on his menus, illustrating his commitment.
Courtesy of Chef Rick Moonen.

FIGURE 1.19 Rich Rosendale, Certified Master Chef, is an advocate of locally sourced products and ingredients. He spends time with his two sons, Laurence and Liam, tending to their garden and visiting local farms every chance he gets.
Courtesy of Richard Rosendale, CMC.

5. **Serving meals that are lower on the food chain.** An animal-based diet requires more fertilizer, water, energy, and pesticides than a vegetarian diet. Recent studies show that changing from beef to chicken, fish, eggs, or vegetable-based entrees can reduce greenhouse gases. Beef is more costly to produce than any other meat or poultry. Chefs have been adding more vegetarian options to the menu and using smaller portions of meat.
6. **Buying coffee and tea from sustainable operations.** To keep up with demand, some growers have been using mass-production methods involving excessive chemicals and pesticides. Several certification programs exist, such as from Rainforest Alliance, and you can also buy organic coffee.
7. **Reducing bottled beverages.** Encourage the use of reusable cups and "bottleless" beverage options, and source bottles from companies that use less plastic or glass in their bottles.

Table 1.3 gives definitions for many terms used in sustainable food purchasing. Table 1.4 lists the fruits and vegetables that are most likely to be having pesticide residue and those that are unlikely to have pesticide residue.

TABLE 1.3 Glossary for Sustainable Food Purchasing

Antibiotic claims—The USDA does not allow "antibiotic free" to be put on meat or poultry labels. It does allow "raised without antibiotics" or "no antibiotics administered" as long as no antibiotics were ever administered to the animal.

Cage free—This is a claim made by the producer that the poultry were raised without cages. There is usually no independent verification of "cage-free" claims. This does not guarantee that birds were raised on grass or had access to the outdoors. Birds may simply live in flocks in barns.

Certified Humane Raised & Handled®—The Certified Humane Raised & Handled® program is the only farm animal welfare and food labeling program in the United States dedicated to improving the welfare of farm animals in food production and include all stages of the animal's life including handling and slaughter. Humane Farm Animal Care's Animal Care Standards require that animals have ample space, shelter, and gentle handling to limit stress and additionally require that:

- The use of growth hormones and antibiotics is prohibited.
- Animals must be free to move and not be confined—Cages, crates, and tie stalls are prohibited. This means that chickens are able to flap their wings and dust bathe, and pigs have the space to move around and root.
- Livestock have access to sufficient, clean, and nutritious feed and water.
- They must have sufficient protection from weather elements and an environment that promotes well-being.
- Managers and caretakers must be thoroughly trained, skilled, and competent in animal husbandry and welfare, and have good working knowledge of their system and the livestock in their care.
- Farmers and ranchers must comply with food safety and environmental regulations.

Conventionally grown—Foods grown using chemical fertilizers, pesticides, and herbicides (in the case of farmed products) or hormones and antibiotics (in the case of animals).

Ecologically grown—An uncertified label that signifies that a crop is grown without using chemical fertilizers or herbicides. Products with this label can be grown using integrated pest management practices, which minimizes but does not rule out the use of chemical pesticides.

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