Dedication

To Michelle with love.
— Paul Insel

To Donna and Mackinnon for their sustenance of love, support, and patience.
— Don Ross

To my parents for their constant support and love.
— Kimberley McMahon

To my family with all my love.
— Melissa Bernstein
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Welcome to the sixth edition of Nutrition. Changes in nutrition-related information have never been more exciting or important than they are today. Nutrition takes students on a fascinating journey beginning with curiosity and ending with a solid knowledge base and a healthy dose of skepticism for the endless ads and infomercials promoting “new” diets and food products. We want students to learn enough about their nutritional and health status to use this new knowledge in their everyday lives.

The new standards emerging in the science of nutrition inspire us to provide comprehensive, current, and accurate information on the most pressing issues. For example, you will find a focus on “the obesity epidemic” and the challenges the nutrition community is taking on to help resolve this chronic problem. You should find the overall content, organization, and features remain, but, within this framework, key topics and issues have been updated with new features and the most recent information available. Our goals in writing this book can be stated simply:

- To present science-based, accurate, up-to-date information in an accessible format
- To involve students in taking responsibility for their nutrition, health, and well-being
- To instill a sense of competence and personal power in students

The first of these goals means making expert knowledge about nutrition available to the individual. Nutrition presents current information to students about topics and issues that concern them—a balanced diet, nutritional supplements, weight management, exercise, and a multitude of others. Current, complete, and straightforward coverage is balanced with user-friendly features designed to make the text appealing.

Our second goal is to involve students in taking responsibility for their nutrition and health. To encourage students to think about the material they’re reading and how it relates to their own lives, Nutrition uses innovative pedagogy and unique interactive features. We invite students to examine the issues and to analyze their nutrition-related behaviors.

Our third goal in writing Nutrition is the most important: to stimulate a sense of competence and personal power in the students who read this book. Everyone has the ability to monitor, understand, and affect his or her own nutritional behaviors.

Accessible Science

Nutrition makes use of the latest in learning theory and balances the behavioral aspects of nutrition with an accessible approach to scientific concepts. You will find this book to be a comprehensive resource that communicates nutrition both graphically and personally.

We present technical concepts in an engaging, non-intimidating way with an appealing parallel development of text and annotated illustrations. Illustrations in all chapters use consistent representations. For example, each type of nutrient has a distinct color and shape. Icons of an amino acid, a protein, a triglyceride, and a glucose molecule represent “characters” in the nutrition story and are instantly recognizable as they appear throughout the book.

This book is unique in the field of nutrition and leads the way in depicting important biological and physiological phenomena, such as emulsification, glucose regulation, digestion and absorption, and fetal development. Extensive graphic presentations make nutrition and physiological principles come alive.

Dietary Guidelines for Americans, 2015–2020

The Dietary Guidelines for Americans, 2015–2020 reflects advances in the scientific understanding of the importance of improving diets and increasing physical activity, two of the most important factors reducing obesity and preventing chronic diseases in Americans. Eating a healthy balance of nutritious foods continues as a central point in the Dietary Guidelines, which serves to provide Americans with the information they need in order to make informed choices about their diet. Focused on science-based recommendations on food and nutrition, the Dietary Guidelines for Americans, 2015–2020 empowers the American public to make shifts in what they eat and drink diet in favor of good health. As you read this text, look for key recommendations of the Dietary Guidelines highlighted in the margins.
Food Labeling

The Food and Drug Administration announced a new and redesigned Nutrition Facts label that will be required on most packaged food by July 2018. In an effort to encourage consumers to make more informed decisions, changes on the new label include such things as highlighting calories per serving and serving sizes more prominently, featuring a separate line showing how much sugar has been added to the food, and including updated Dietary Value information. The new label is discussed in Chapter 2, “Nutrition Guidelines and Assessment,” and has been incorporated into all Label to Table features found throughout the text.

New to this Edition

For this edition, the latest scientific evidence, recommendations, and national standards have been incorporated throughout each chapter.

Key Highlights

- The new Getting Personal feature, found in most of the end-of-chapter Learning Portfolios, encourages students to apply their nutritional knowledge to understanding their own diets.
- Revised statistics and data incorporated throughout the text reflect the current state of nutrition in America and the world.
- Revised food source charts in the vitamins and minerals chapters more clearly convey common sources for vitamins and minerals.
- Updated Position Statements from the Academy of Nutrition and Dietetics, the American Heart Association, and other organizations appear throughout the text.
- Updated references utilize the latest science in the field.
- New and updated FYI, Going Green, and Quick Bite features provide in-depth discussions of controversial issues and topics for classroom discussion.

Chapter 2—Nutrition Guidelines and Assessment

- Revised description and discussion of the Nutrition Facts label, reflecting changes announced in May 2016
- New discussion of FDA regulations regarding the labeling of gluten-free foods
- New Going Green feature: “Is the American Diet Contributing to a Warmer Planet?”
- New Quick Bite feature: “Variety is Key”
- Revised FYI feature: “Portion Distortion”

Spotlight on Dietary Supplements and Functional Foods

- New table highlights groups for whom nutritional supplementation may be recommended
- Revised FYI feature: “Defining Complementary and Integrative Health”
- Updated Position Statement from the Academy of Nutrition and Dietetics: “Functional Foods”

Chapter 3—Digestion and Absorption

- New FYI feature: “Celiac Disease and Gluten Sensitivity”
- New Quick Bite feature: “Living Without a Gallbladder”
- Updated discussion regarding the link between red meat consumption and colorectal cancer
- Updated Nutrition Science in Action feature: “Screen Time and Diet Quality”
- Updated FYI feature: “Bugs in Your Gut? Health Effects of Intestinal Bacteria”
- Streamlined description of emulsification and its role in fat digestion
- In-depth discussion of the effect of medications on food absorption
Chapter 4—Carbohydrates

- New table summarizing the effects of fiber on digestion and absorption, and the health benefits of these effects
- New comparison of soluble and insoluble fibers
- New discussion of agave sweeteners
- Streamlined discussion of artificial sweeteners, with new table summarizing nonnutritive sweeteners and sweet substances
- Expanded discussion of resistant starches
- Expanded FYI features: “The Glycemic Index of Foods: Useful or Useless?” and “Unfounded Claims Against Sugars,” with new sections on “Sugar and Type 2 Diabetes” and “High-Fructose Corn Syrup (HFCS), Obesity, and Disease”

Chapter 5—Lipids

- New sections providing recommendations for omega fatty acid intake and summarizing the health effects of omega-3 fatty acids
- New Position Statement from the Academy of Nutrition and Dietetics: “Fatty Acids for Healthy Adults”
- Streamlined section on fat replacers
- Revised Going Green feature: “Fish: Good For You and the Environment”
- Revised FYI feature: “Fats on the Health Store Shelf,” which now delves into coconut oil and grapeseed oil
- Revised table incorporating American Heart Association Diet and Lifestyle Recommendations
- Updated American Heart Association Position Statement: “Omega-3 Fatty Acids”

Chapter 6—Proteins and Amino Acids

- New discussion regarding whether eating more protein helps build more muscle
- New table providing dietary suggestions for vegetarians
- New FYI feature: “High Protein Diets and Supplements”
- New Quick Bite feature: “Eating Lower on the Food Chain is Good for the Planet”
- New Position Statement from the Academy of Nutrition and Dietetics: “Vegetarian Diets”
- Revised Going Green feature: “Send in the Proteins”
- Revised FYI feature: “Do Athletes Need More Protein?” incorporating latest information from the Academy of Nutrition and Dietetics

Chapter 7—Alcohol

- New discussion of the prehistoric origins of alcohol
- Revised description of alcohol metabolism

Chapter 8—Metabolism

- Updated information on the role of carnitine in cardiovascular efficiency during exercise

Chapter 9—Energy Balance

- New discussion of digital private counseling programs
- New Quick Bite feature “The Raw Foods Diet”
- New description of metabolically healthy obesity
- Revised section on FDA-approved weight-loss medications
- Updated section on portion distortion phenomenon
- Updated Going Green feature: “Salad Days”
- Updated discussions regarding over-the-counter drugs, dietary supplements, and surgery for weight loss

Spotlight on Obesity

- New section on the link between gut microbiota and obesity
- New Quick Bite features: “Can You Pick Your Partners?” and “Your Microbiota and You”
- New statistics concerning obesity rates in Asia and the Middle East
- Revised FYI feature: “U.S. Obesity Trends: A Relentless Increase”

Chapter 10—Fat-Soluble Vitamins

- New table summarizes fat-soluble vitamins, their functions, and the results of deficiency and megadoses
- New table compares fat-soluble and water-soluble vitamins
- New table lists common carotenoids and their potential benefits

Chapter 11—Water-Soluble Vitamins

- New table summarizes water-soluble vitamins, their functions, and the results of deficiency and megadoses

Chapter 12—Water and Major Minerals

- New section discusses minerals in fluid balance
• Updated Going Green feature: “The Thirst for Water Resources”
• Updated FYI feature: “Tap, Filtered, or Bottled: Which Water is Best?”

Chapter 13—Trace Minerals
• New discussion of arsenic levels in rice-based products
• New reference to sea salts as sources of iodine

Chapter 14—Sports Nutrition
• New discussion of exercise intensity, muscle-strengthening exercises, and flexibility and neuromotor exercises
• New section on ephedrine
• Updated coverage of protein and hydration recommendations for athletes
• Updated discussion of nutrition supplements and ergogenic aids
• Updated section on caffeine
• Expanded discussion of the American Medical Association and American College of Sports Medicine’s Exercise is Medicine initiative

Spotlight on Eating Disorders
• New introduction of the acronym OSFED (Other Specified Feeding or Eating Disorder)

Chapter 15—Diet and Health
• New section on nutrition informatics
• New Quick Bite features: “Adaptation Gone Awry, “Smartphones Advance Artificial Pancreas,” and “What Smells in Blood Pressure?”
• Revised section delving into whether intakes of saturated and trans fat and cholesterol should be limited

Chapter 16—Life Cycle: Maternal and Infant Nutrition
• New Position Statement from the Academy of Nutrition and Dietetics: “Nutrition and Lifestyle for a Healthy Pregnancy Outcome”
• New table presenting a meal plan for a vegan pregnancy

Chapter 17—Life Cycle: From Childhood Through Adulthood
• New content discussing the increase in use of e-cigarettes among American high school students
• Updated information relating to lead toxicity
• Revised Quick Bite feature: “The Dangers of Teenage Smoking”

Chapter 18—Food Safety and Technology
• New FYI feature: “Are Nutrigenomics in Your Future?”
• New table listing food safety mistakes
• New information regarding the FDA’s voluntary plan to phase out the use of certain antibiotics for enhanced food production in farm animals
• Revised section on genetically engineered foods
• Revised table providing USDA’s labeling requirements for organic foods
• Updated Going Green feature: “Ocean Pollution and Mercury Poisoning”

Chapter 19—World View of Nutrition
• New Quick Bite features: “Urban Food Production” and “Tackling Food Insecurity”
• Expanded information on iodine deficiency disorders
• Revised section delving into whether intakes of saturated and trans fat and cholesterol should be limited
• Updated Position Statement from the Academy of Nutrition and Dietetics: “Addressing World Hunger, Malnutrition, and Food Insecurity”
The Pedagogy

Nutrition focuses on teaching behavioral change, personal decision making, and up-to-date scientific concepts in a number of novel ways. This interactive approach addresses different learning styles, making it the ideal text to ensure mastery of key concepts. Beginning with Chapter 1, the material engages students in considering their own behavior in light of the knowledge they are gaining. The pedagogical aids that appear in most chapters include the following:

**Think About It** questions at the beginning of each chapter present realistic nutrition-related situations and ask students to consider how they would behave in such circumstances.

**Chapter Menu** at the beginning of each chapter gives students a preview of topics that will be covered.

**Learning Objectives** focus students on the key concepts of each chapter and the material they will learn.

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Chapter 1

**Food Choices: Nutrients and Nourishment**

Revised by Kimberley McMahon

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**THINK About It**

1. Why Do We Eat the Way We Do?
2. Introducing the Nutrients
3. Applying the Scientific Process to Nutrition
4. From Research Study to Headline

**CHAPTER Menu**

- Why Do We Eat the Way We Do?
- Introducing the Nutrients
- Applying the Scientific Process to Nutrition
- From Research Study to Headline

**LEARNING Objectives**

- Define nutrition
- Identify factors that influence food choices
- Describe the typical American diet
- Identify the six classes of nutrients essential for health
- Describe the basic steps in the nutrition research process
- Recognize credible scientific research and reliable sources of nutrition information

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A group of friends goes out for pizza every Thursday night. A young man greets his girlfriend with a box of chocolates. A 5-year-old immates her parents after they salt their food. A firefighter who is asked to explain why hot dogs are his favorite food says it has something to do with going to baseball games with his father. A parent punishes a misbehaving child by withholding dessert. What do all of these people have in common? They are using food for something other than its nutrient value. Can you think of a holiday that is not celebrated with food? For most of us, food is more than nourishment. It has social, economic, cultural, and psychological implications. What do all of these people have in common? They are using food for something other than its nutrient value. Can you think of a holiday that is not celebrated with food? For most of us, food is more than nourishment. It has social, economic, cultural, and psychological implications.
Quick Bites sprinkled throughout the book offer fun facts about nutrition-related topics such as exotic foods, social customs, origins of phrases, folk remedies, medical history, and so on.

Key Concepts summarize previous text and highlight important information.

Position Statements from distinguished organizations such as the Academy of Nutrition and Dietetics, the American College of Sports Medicine, and the American Heart Association relate to the chapter topics and bolster the assertions made by the authors through showcasing concurrent opinions held by some of the leading organizations in nutrition and health.

Key Terms are in boldface type the first time they are mentioned. Their definitions also appear in the margins near the relevant textual discussion, making it easy for students to review material.

Verification mark helps assure consumers, health care professionals, and supplement retailers that a product has passed USP’s rigorous program and does the following:

- Contains the ingredients declared on the product label
- Contains the amount or strength of ingredients declared on the product label
- Meets requirements for limits on potential contaminants
- Has been manufactured properly by complying with USP and FDA standards for current good manufacturing practices (cGMPs)

Fraudulent Products

Some health advocates consider the burgeoning market of dietary supplements an unwelcome return to the “snake oil” era of the late nineteenth and early twentieth centuries, when “magic” potions and cures were sold door-to-door and at county fairs and markets. The Internet and social media marketing are changing the industry because they are a prominent vehicle for promoting and selling products, reaching millions of people worldwide instantly at any time. Most manufacturers work hard to ensure the quality of their products, yet some supplements on the market are nothing more than a mixture of inert ingredients. In recent years, the FDA has found hundreds of fraudulent products that contain hidden or deceptively labeled ingredients.

Most frequently recalled products with potentially harmful ingredients are those that are promoted for weight loss, sexual enhancement, and bodybuilding. When considering the use of dietary supplements, do your homework—make sure the product is safe and effective.

It’s always a good idea to ask your health care professional for help in distinguishing between reliable and questionable information.

Functional Foods

What do garlic, tomato sauce, tofu, and oatmeal all have in common? They aren’t in the same food group, nor do they have the same nutrient composition. Instead, all of these foods could be considered “functional foods.” Although there is not yet a legal definition for the term, a functional food is widely considered to be a food or food component that provides a health benefit beyond basic nutrition.

Garlic contains sulfur compounds that may reduce heart disease risk, and tomato sauce is rich in lycopene, a compound that may reduce prostate cancer risk. The soy protein in tofu and the fiber in oatmeal can help reduce the risk of heart disease. (See FIGURE SF.10) The functional food industry has grown rapidly since its birth in Japan in the late 1960s and in 2014, realized an almost $177 billion dollars of sales worldwide. In the U.S., functional food and beverage sales account for 5 percent of the overall food market.

Phytochemicals Make Foods Functional

Many functional foods get their health-promoting properties from naturally occurring compounds that are not considered nutrients but are called phytochemicals. Although the word phytochemical may sound intimidating, its
Complementary implies practices that are used in addition to conventional ones. A practice that combines both conventional and complementary therapies involves the use of medications, supplements, and lifestyle changes. For example, using acupuncture to relieve pain can be considered a complementary therapy. Alternative therapies include a broad range of healing therapies and philosophies. Several examples of alternative therapies include chiropractic care, herbal remedies, and meditation. Integrative medicine refers to the use of both conventional and complementary therapies in treating diseases. For instance, a patient with cancer may receive chemotherapy as conventional therapy and herbal supplements as alternative therapy.

One example of alternative nutrition practices is the use of special diets, which are often based on cultural factors rather than scientific evidence. For example, the Food and Drug Administration has identified that the majority of participants consumed a snack in the evening. The snacks included a variety of foods, such as fruits, vegetables, and nuts. The snacks were chosen based on their nutritional content and the preferences of the participants. The snacks were also chosen to be appealing to the participants and to be easily accessible. The snacks were also chosen to be nutritious and to complement the participants’ dietary needs.

Nutrition Science in Action is an exciting feature that walks students through science experiments involving nutrition. Each Nutrition Science in Action presents observations and hypotheses or study questions, an experimental plan, and results, conclusions, and discussions that allow students to apply their knowledge of nutrition to real-life experiments outside of the classroom.

FAI (For Your Information) offers more in-depth discussions of controversial and timely topics, such as unfounded claims about the effects of sugar, whether athletes need more protein, and the usefulness of the glycemic index.
Updated to reflect the most current environmental concerns, Going Green boxes address the nutrition community’s concern about the importance of environmental issues in our time. This environmental theme runs through each chapter and expands our nutrition focus to show that we are all citizens of an endangered planet with opportunities to reduce our environmental footprint.

**Going Green**

**Fish: Good for You and the Environment**

Fatty fish or fatty meat? What is a “good” source of fat, a lean protein high in vitamins and minerals, and does not contribute to the production of methane greenhouse gas? Fish! Methane, produced by farm animals, is a powerful greenhouse gas and is considered 20 times more powerful than carbon dioxide at trapping solar energy. In comparison, no methane is produced from harvesting salmon, and fish offers you a healthier meal than a ribeye steak. Choosing to eat fish while decreasing your beef intake not only will give you all of the health benefits associated with omega-3 fatty acids, but also will potentially decrease dangerous greenhouse gas production. An American Heart Association scientific statement on fish consumption, fish oils, omega fatty acids, and cardiovascular disease emphasizes the benefits of eating fish and recommends at least two servings of fish per week. Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are the omega-3 fatty acids found in oily fish, with mackerel, salmon, trout, sardines, and herring being excellent sources. Approximately 1 gram of EPA/DHA can be obtained from 100 grams (3.5 ounces) of oily fish.

There are many choices when it comes to incorporating healthful fats into your diet. Just remember, even though these fatty acids provide a “good” source of fat, don’t go overboard. Fat is still fat, even if it is good for you and for the environment, so make your choices wisely.

Label to Table helps students apply their new decision-making skills at the supermarket. It walks students through the various types of information that appear on food labels, including government-mandated terminology, misleading advertising phrases, and amounts of ingredients. This feature has been updated for this edition to reflect the new labeling guidelines released by the FDA in May 2016.

The **Learning Portfolio** at the end of each chapter condenses all aspects of nutrition information that students need to solidify their understanding of the material. The various formats will appeal to students according to their individual learning and studying styles.

**Key Terms** list all new vocabulary alphabetically with the page number of the first appearance. This arrangement allows students to review any term they do not recall and turn immediately to the definition and discussion of it in the chapter. This approach also promotes the acquisition of knowledge, not simply memorization.

**Study Questions** encourage students to probe deeper into the chapter content, making connections and gaining new insights. Although these questions can be used for pop quizzes, they will also help students to review, especially students who study by writing out material.

**Study Points** summarize the content of each chapter with a synopsis of each major topic. The points are in the order in which they appear in the chapter, so related concepts flow together.
6. Describe the difference between LDL and HDL in terms of cholesterol and protein composition.
7. What foods contain cholesterol?
8. Name the two essential fatty acids.

Try This

The Fat = Fullness Challenge

The goal of this experiment is to see whether fat affects your desire to eat between meals. Do this experiment for two consecutive breakfasts. Each meal is to include only the foods listed here. Try to eat normally for the other meals and to eat around the same time of day. Each of these breakfasts has approximately the same calories, but one has a high percentage of them from fat, the other from carbohydrate. After each breakfast, take note of how many hours pass before you feel hungry again.

Day 1 (~420 kilocalories; 1.5 grams fat)
One 3-oz bagel with 3 Tbsp of jelly

Day 2 (~425 kilocalories; 18 grams fat)
1 medium blueberry muffin

Getting Personal

List all of the foods and drinks that you consume in a 24-hour period, ideally a day where your schedule is fairly predictable and you are eating what is considered normal for you.

1. Let’s take a look at your fat intake.
   - What percentage of your calories came from fat?
   - What percentage of your calories saturated and unsaturated fat?
   - How about your cholesterol intake? Was it above or below the guidelines?

2. Review your day of eating and make a list of the foods you know contain fat.

3. What foods could you substitute to lower your total fat intake?

4. What changes can you make to lower your trans-fat intake?

5. What would these substitutions do to the total calories in your diet?

   - Does your intake of Omega-3 and Omega-6 fatty acids meet the recommendations?

7. What foods contributed essential fatty acids to your diet?

8. Make a list of foods that would help increase your EFA intake.

9. Make a list of 2–3 cooking techniques you could use to lower your fat intake

10. Make a list of 3–5 suggestions you would consider following when eating at a restaurant that could lower your fat intake.

References


Getting Personal

Encourages students to consider their newly gained knowledge in the context of their own diets.

Try This activities provide suggestions for hands-on activities that encourage students to put theory into practice. It will especially help students whose major learning style is experimental.
The Integrated Learning and Teaching Package

Integrating the text with constructive instructor resources is crucial to deriving their full benefit. Based on feedback from instructors and students, Jones & Bartlett Learning has made the following resources available to qualified instructors:

- Test Bank, including more than 1,250 questions
- Slides in PowerPoint format, featuring more than 500 slides
- Instructor’s Manual, containing lecture outlines, discussion questions, and answers to the in-text Study Questions
- Image Bank, supplying key figures from the text
- Sample Syllabus, showing how a course can be structured around this text
- Transition Guide, providing guidance in switching from the previous edition

An interactive eBook is available with study questions that reinforce key concepts as well as 36 scientifically based animations that give students an accurate, accessible explanation of the major scientific concepts and physiological principles presented in *Nutrition*.

Diet analysis software is an important component of the behavioral change and personal decision-making focus of a nutrition course. **EatRight Analysis**, developed by ESHA Research, provides software that enables students to analyze their diets by calculating their nutrient intake and comparing it to recommended intake levels. EatRight Analysis offers dietary software online at EatRight.jblearning.com. With this online tool, you and your students can access personal records from any computer with Internet access. Through a variety of reports, students learn to make better choices regarding their diet and activity habits.
The Nutrition author team represents a culmination of years of teaching and research in nutrition science and psychology. The combined experience of the authors yields a balanced presentation of both the science of nutrition and the components of behavioral change.

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