NUTRITION ESSENTIALS

THIRD EDITION

A Personal Approach

WENDY J. SCHIFF

Mc Graw Hill

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NUTRITION ESSENTIALS: A PERSONAL APPROACH, THIRD EDITION

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Brief Contents

Meet the Author

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Wendy J. Schiff, MS, RDN, received her BS in biological health/medical dietetics and MS in human nutrition from The Pennsylvania State University. She has taught introductory food and nutrition courses at the University of Missouri–Columbia, as well as nutrition, human biology, and personal health courses at St. Louis Community College–Meramec. She has worked as a public health nutritionist at the Allegheny County Health Department (Pittsburgh, Pennsylvania) and State Food and Nutrition Specialist for Missouri Extension at Lincoln University in Jefferson City, Missouri. In addition to authoring *Nutrition Essentials: A Personal Approach,* she is author of *Nutrition for Healthy Living* and coauthor of *Human Nutrition: Science for Healthy Living*. Wendy has authored or coauthored many other nutrition- and health-related educational materials as well. She is a registered dietitian nutritionist and a member of the Academy of Nutrition and Dietetics.

To Kevin and Bill

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A Note from the Author

Pixtal/age fotostock

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A few years ago, I decided that none of the college-level personal nutrition textbooks available was "right" for most students who wanted to learn about nutrition but weren't interested in majoring in the field of nutrition and dietetics.

My goal was to create a fresh approach and prepare a personal nutrition book that was less rigorous but would still cover the essentials of nutrition science. This book would be written in a style that was engaging and easy to read and understand. To facilitate learning, the text would include relevant and interesting photos and other visuals as well as superb illustrations to help explain basic but often challenging concepts. The textbook would also include personal perspectives about diets, foods, and nutrition from real college students, and practical food and nutrition tips to help students become more informed consumers.

Nutrition Essentials: A Personal Approach

- *has a consumer-oriented focus, providing practical tips for applying concepts such as ways to prepare foods to make them safer and healthier, and ways to become a savvy consumer of nutrition-related information; and*
- *provides non-nutrition majors with the basic scientific principles of nutrition in a highly visual, engaging context. For example, the major steps involved in complex physiological processes, such as protein digestion and glucose regulation, are realistically illustrated and featured as Essential Concepts.*

As I prepared the third edition of **Nutrition Essentials: A Personal Approach,** *new blood pressure guidelines and physical activity recommendations were introduced. The third edition has been extensively updated to reflect these and other significant advances in the constantly changing field of nutrition.*

The previous editions of **Nutrition Essentials: A Personal Approach** *met all of my goals for a personal nutrition textbook. Now, the instructors who teach and the students who take personal nutrition courses have a new edition of this textbook to enjoy!*

Best wishes,

Wendy Schiff

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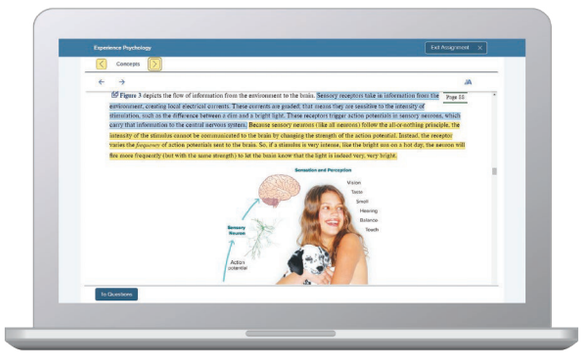

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>
> - Jordan Cunningham, Eastern Washington University

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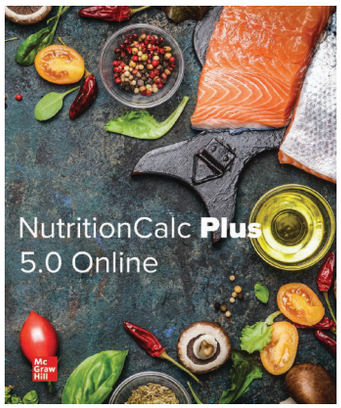

vicushka/123RF

McGraw Hill NutritionCalc Plus

NutritionCalc Plus is a **powerful dietary analysis tool** featuring more than 30,000 foods from the reliable and accurate ESHA Research nutrient database, which is comprised of data from the latest USDA Standard Reference database, manufacturer's data, restaurant data, and data from literature sources. NutritionCalc Plus allows users to track food and activities, and then analyze their choices with a robust selection of intuitive reports. The interface was updated to accommodate ADA requirements and modern mobile experience native to today's students.

Dietary Analysis Case Studies in Connect®

> The case studies provide a neutral way for my students to explore dietary analysis. My students are engaged by the case study assignments and find them easy to use. The fact that they are auto-graded gives me more time to focus on content development and instruction for my course.
>
> **–Hannah Thornton, Texas State University**

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One of the challenges instructors face with teaching nutrition classes is having time to grade individual dietary analysis projects. To help overcome this challenge, assign auto-graded dietary analysis case studies. These tools require students to use NutritionCalc Plus to analyze dietary data, generate reports, and answer questions to **apply their nutrition knowledge to real-world situations**. These assignments were developed and reviewed by faculty who use such assignments in their own teaching. They are designed to be relevant, current, and interesting!

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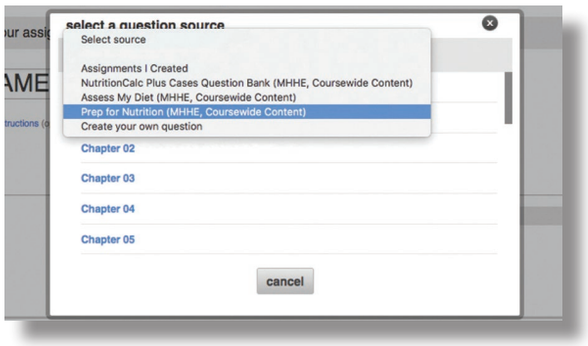
Source: Jill Paisley

Assess My Diet

Auto-graded personalized dietary analysis. Students are using NutritionCalc Plus to analyze their own dietary patterns. But how can instructors integrate that information into a meaningful learning experience? With Assess My Diet, instructors can now assign auto-graded, personalized dietary analysis questions within Connect. These questions refresh their memory on the functions and food sources of each nutrient and prompt the students to evaluate their own eating behaviors. Students can evaluate their own nutrient intakes compared to current Dietary Reference Intakes and demonstrate their ability to perform calculations on their own data, such as percent of calories from saturated fat. They can compare the nutrient density of their own food selections to see which of their food choices provides the most fiber or iron. A benefit of the Assess My Diet question bank is that it offers assignable content that is personalized to the students' data, yet still auto graded. It **saves time** and keeps all assignments in one place.



Prep for Nutrition

To help you **level-set your classroom**, we've created Prep for Nutrition. This question bank highlights a series of questions, including Basic Chemistry, Biology, Dietary Analysis, Mathematics, and Student Success, to give students a refresher on the skills needed to enter and be successful in their course! By having these foundational skills, you will feel more confident your students can begin class, ready to understand more complex concepts and topics. Prep for Nutrition is **course-wide for ALL nutrition titles** and can be found in the Question Bank dropdown within Connect.

Campus

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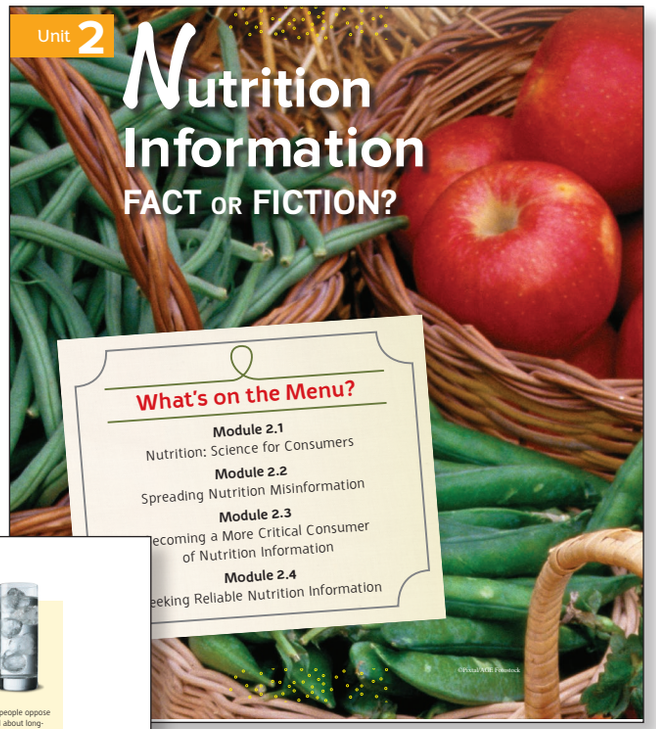
A Visual Approach

Highly visual; designed with today's college students in mind.

Nutrition Essentials: A Personal Approach was developed with a magazine-like design and today's student in mind. The many photos and appealing page layouts entice students to explore and read further. Furthermore, the highly visual nature of the book's layout reduces anxiety sometimes associated with large blocks of text.




240 Unit 9 Key Minerals, Water, and the Nonnutrient Alcohol

Figure 9.8 Stained teeth due to dental fluorosis.

Diets that lack fluoride don't cause a deficiency disease. However, long-term consumption of too much fluoride can cause *fluorosis*. In cases of skeletal fluorosis, excess fluoride builds up in bones, causing joint stiffness and bone pain. Skeletal fluorosis rarely occurs in the United States. Dental fluorosis often affects young children who drink well water that contains high amounts of fluoride, but it also can occur in children who routinely swallow fluoride-containing toothpaste and dental rinses. Children with severe fluorosis develop permanently stained teeth that don't resist decay as do healthy teeth (**Figure 9.8**). Parents should teach their children to place a "pea-sized" amount of toothpaste on their brush, rinse with water, and spit out the excess fluid. Table 9.3 summarizes information about fluoride.

9.2b The Fluid Balancers: Potassium and Sodium

Major minerals potassium and sodium play a vital role in maintaining normal body fluid balance. The typical American diet supplies far more sodium than potassium. This mineral imbalance may lead to high blood pressure, a serious long-term health problem. However, you may lower the risk that excess sodium poses to your health by reducing your intake of sodium and consuming more foods that supply potassium.[9]

Potassium

Potassium (K) is the major positively charged ion in the fluid that's inside cells. Fresh fruits, fruit juice, and vegetables are good dietary sources of potassium. Milk, whole grains, dried beans, and meats are also major contributors of potassium to American diets.

Many Americans, particularly adult men, don't consume recommended amounts of potassium.[1] According to the *Dietary Guidelines for Americans*, potassium is a nutrient of public health concern. You can raise your potassium intake by eating more fruits, vegetables, whole-grain breads and cereals, and low-fat and fat-free dairy foods. **Table 9.4** provides information about the potassium content of a few selected foods. **Figure 9.9** indicates food groups that are naturally good sources of potassium.

People who experience excessive body fluid losses through sweating, vomiting, or diarrhea are at risk for electrolyte depletion. Symptoms of low blood potassium levels generally include muscle cramps, confusion, and constipation. In severe cases, the lack of potassium causes muscular weakness and abnormal heartbeat. Therefore, it's important to seek medical treatment when potassium depletion is suspected.

Teeth: Centers for Disease Control and Prevention; Glass of iced water: filadge fotostock; Kiwi fruit, Coconut water: Wendy Schiff

TASTY Tidbits

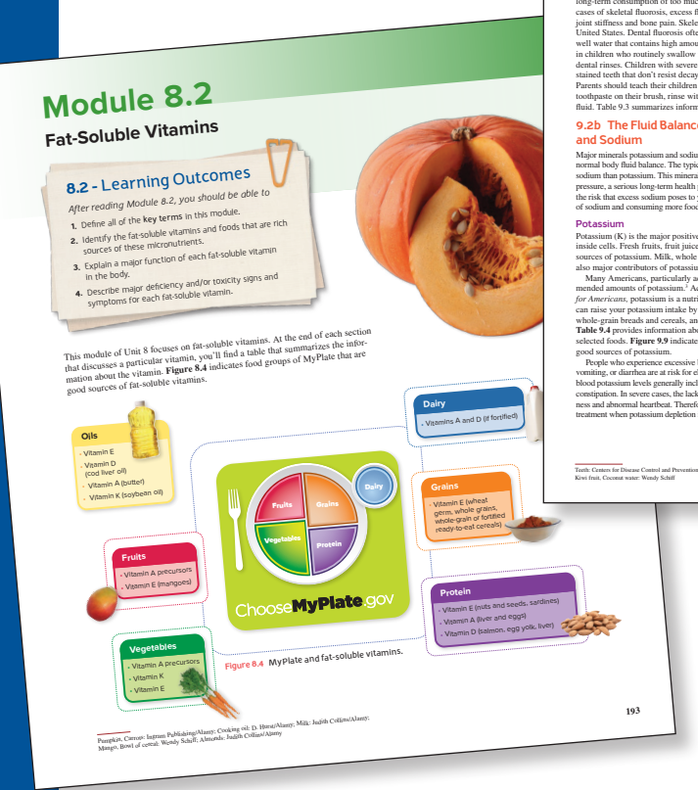
The majority of the U.S. population served by community water systems has access to drinking water that contains optimal fluoride levels.* Some Americans oppose fluoridation for a variety of reasons, including the belief that the practice is a form of involuntary medication. Other people oppose fluoridation because they're concerned about long-term risks of drinking the treated water. For more information about fluoridation, visit www.cdc.gov/fluoridation/index.html

TABLE 9.4 Potassium Content of Selected Foods (Approximate)

Food	Potassium (mg)
Beet greens, boiled, drained, 1 cup	1309
Baked potato, including skin, 6 oz	952
Spinach, cooked, drained, 1 cup	839
Coconut water, 1 cup	600
Kiwi, sliced, 1 cup	562
Banana, sliced, 1 cup	537
Sweet potato, canned, mashed, 1 cup	536
Orange juice, frozen, reconstituted, 1 cup	443
Yogurt, non-fat, plain, 6 oz	434
Cantaloupe, cubes, 1 cup	427
Milk, fluid, 1% fat, 1 cup	397
Corn, canned, yellow, 1 cup	389
Peaches, raw, sliced, 1 cup	293
Salmon, pink, canned, 3 oz	292
Grapes, raw, red, 1 cup	288
Papaya, raw, 1" pieces, 1 cup	264
Tuna, white, canned in water, drained, 3 oz	201

AI for adults = 2600 mg/day for women; 3400 mg/day for men

Source: U.S. Department of Agriculture, Agricultural Research Service: *USDA National Nutrient Database for Standard Reference Legacy Release, April 2018.* https://ndb.nal.usda.gov/ndb/search/list?home=true Accessed: September 2018


Module 8.2

Fat-Soluble Vitamins

8.2 - Learning Outcomes

After reading Module 8.2, you should be able to

1. Define all of the **key terms** in this module.
2. Identify the fat-soluble vitamins and foods that are rich sources of these micronutrients.
3. Explain a major function of each fat-soluble vitamin in the body.
4. Describe major deficiency and/or toxicity signs and symptoms for each fat-soluble vitamin.

This module of Unit 8 focuses on fat-soluble vitamins. At the end of each section that discusses a particular vitamin, you'll find a table that summarizes the information about the vitamin. **Figure 8.4** indicates food groups of MyPlate that are good sources of fat-soluble vitamins.

Oils · Vitamin E · Vitamin D (cod liver oil) · Vitamin A (butter) · Vitamin K (soybean oil)

Dairy · Vitamins A and D (if fortified)

Grains · Vitamin E (wheat germ, whole grains, whole-grain or fortified ready-to-eat cereals)

Fruits · Vitamin A precursors · Vitamin E (mangoes)

Protein · Vitamin E (nuts and seeds, sardines) · Vitamin A (liver and eggs) · Vitamin D (salmon, egg yolk, liver)

Vegetables · Vitamin A precursors · Vitamin K · Vitamin E

ChooseMyPlate.gov

Figure 8.4 MyPlate and fat-soluble vitamins.

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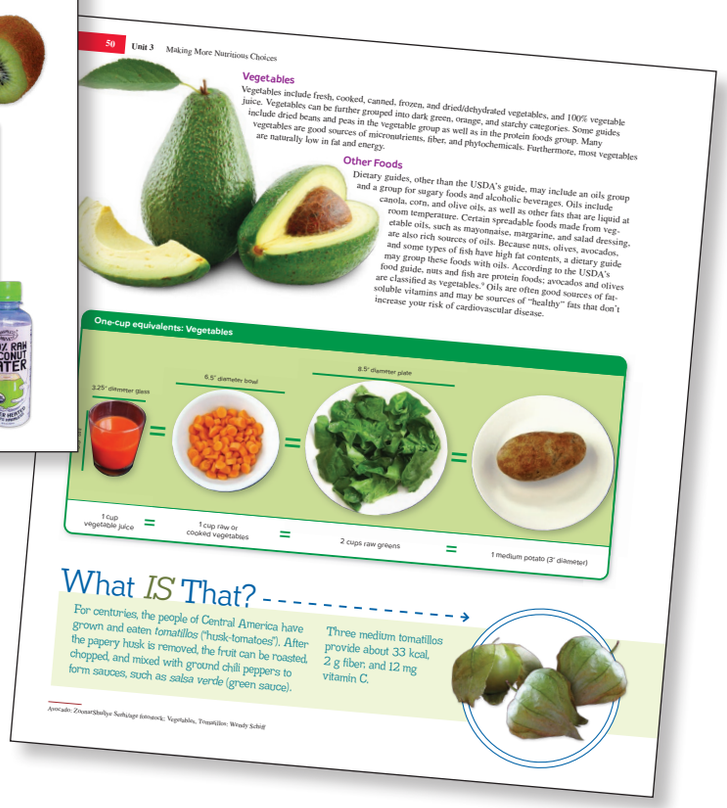
Pumpkin, Carrots: Ingram Publishing/Alamy; Cooking oil: D. Hurst/Alamy; Milk: Judith Collins/Alamy; Mango, Bowl of cereal: Wendy Schiff; Almonds: Judith Collins/Alamy


50 Unit 3 Making More Nutritious Choices

Vegetables

Vegetables include fresh, cooked, canned, frozen, and dried/dehydrated vegetables, and 100% vegetable juice. Vegetables can be further grouped into dark green, orange, and starchy categories. Some guides include dried beans and peas in the vegetable group as well as in the protein foods group. Many vegetables are good sources of micronutrients, fiber, and phytochemicals. Furthermore, most vegetables are naturally low in fat and energy.

Other Foods

Dietary guides, other than the USDA's guide, may include an oils group and a group for sugary foods and alcoholic beverages. Oils include canola, corn, and olive oils, as well as other fats that are liquid at room temperature. Certain spreadable foods made from vegetable oils, such as mayonnaise, margarine, and salad dressing, are also rich sources of oils. Because nuts, olives, avocados, and some types of fish have high fat contents, a dietary guide may group these foods with oils. According to the USDA's food guide, nuts and fish are protein foods; avocados and olives are classified as vegetables.* Oils are often good sources of fat-soluble vitamins and may be sources of "healthy" fats that don't increase your risk of cardiovascular disease.

One-cup equivalents: Vegetables

3.25" diameter glass · 6.5" diameter bowl · 8.5" diameter plate

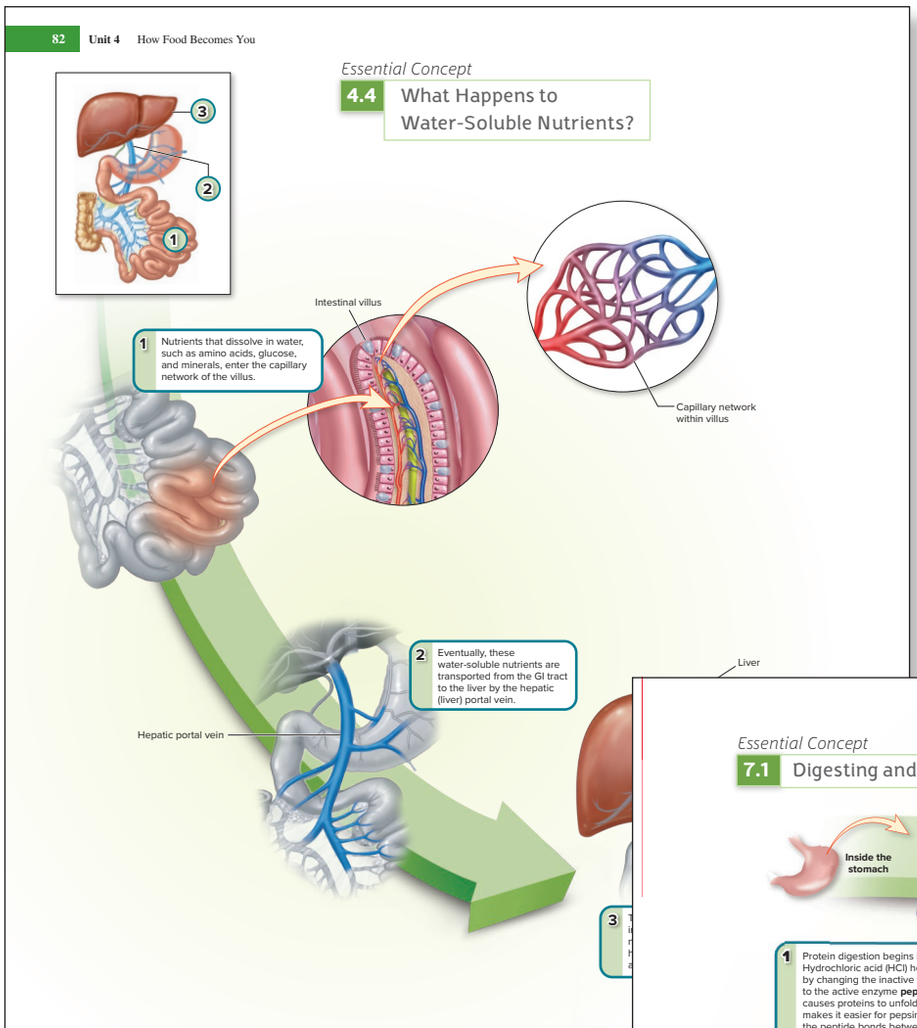
1 cup vegetable juice = 1 cup raw or cooked vegetables = 2 cups raw greens = 1 medium potato (3" diameter)

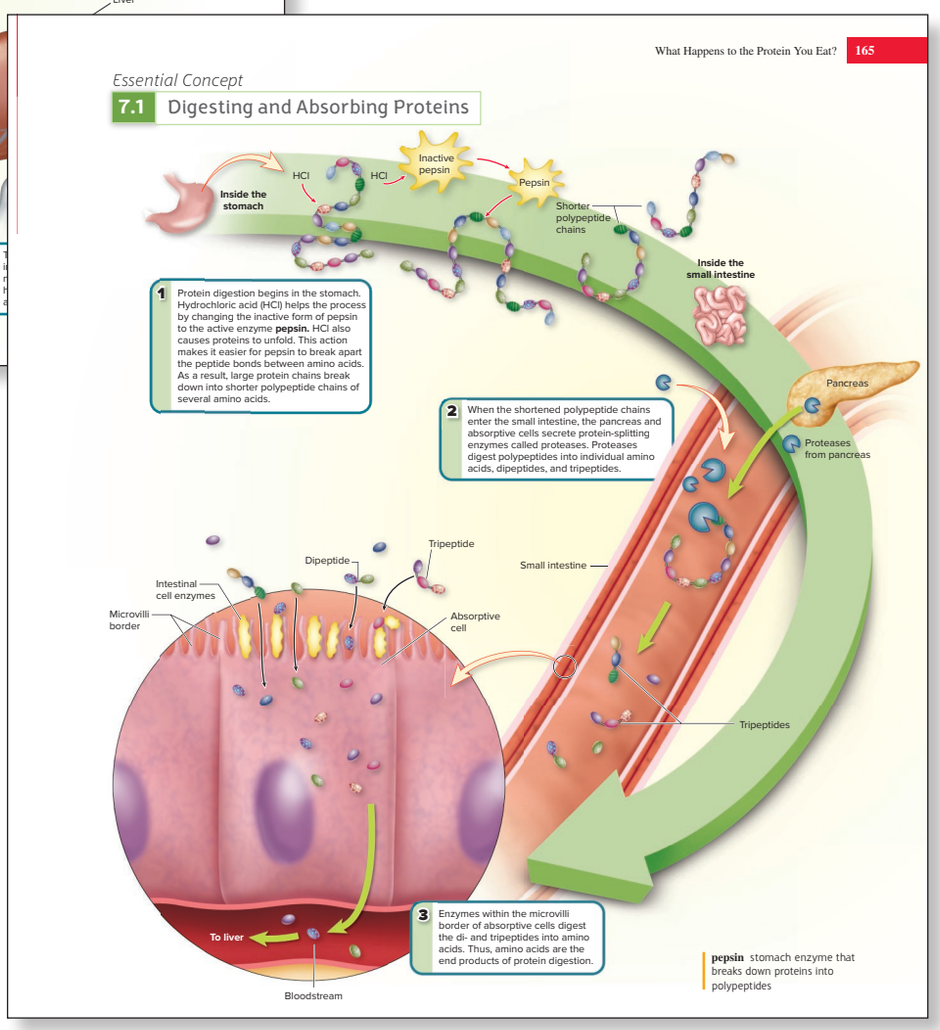
What *IS* That?

For centuries, the people of Central America have grown and eaten *tomatillos* ("husk-tomatoes"). After the papery husk is removed, the fruit can be roasted, chopped, and mixed with ground chili peppers to form sauces, such as salsa verde (green sauce).

Three medium tomatillos provide about 33 kcal, 2 g fiber, and 12 mg vitamin C.

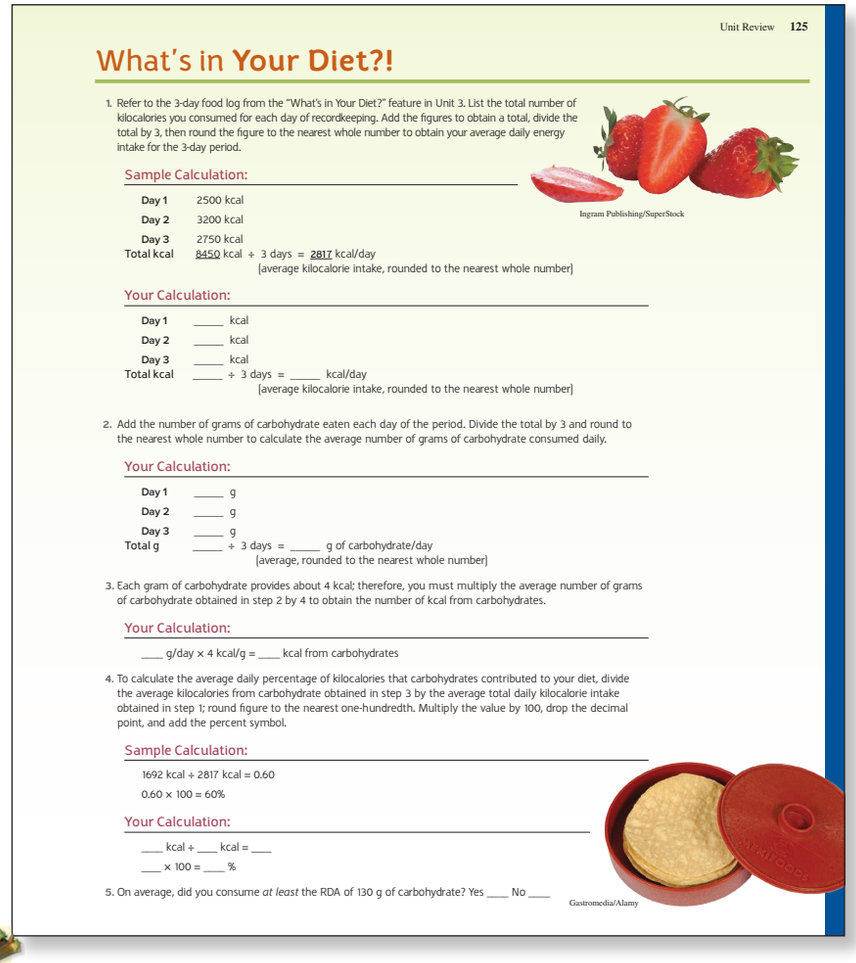
Avocado: ZoonarSbuhlyar Sothikoge fotostock; Vegetables, Tomatillos: Wendy Schiff





Essential Concept takes a complex scientific process and illustrates it in a unique, step-by-step manner to facilitate learning, especially for students who are not science majors. Topics include the scientific method, how the body digests proteins, and the role of hormones in regulating blood glucose levels. Numbered boxes contain points that relate to a particular portion of the illustration, while the large green arrows help students visualize stepping through the process.

What's In Your Diet?!, found at the end of most units, is a personal dietary analysis activity that offers many ways for students to apply nutrition-related concepts to their daily lives immediately.



Unit Review 125

What's in Your Diet?!

1. Refer to the 3-day food log from the "What's in Your Diet?" feature in Unit 3. List the total number of kilocalories you consumed for each day of recordkeeping. Add the figures to obtain a total, divide the total by 3, then round the figure to the nearest whole number to obtain your average daily energy intake for the 3-day period.

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Sample Calculation:

Day 1 2500 kcal
Day 2 3200 kcal
Day 3 2750 kcal
Total kcal 8450 kcal ÷ 3 days = 2817 kcal/day
(average kilocalorie intake, rounded to the nearest whole number)

Your Calculation:

Day 1 _____ kcal
Day 2 _____ kcal
Day 3 _____ kcal
Total kcal _____ ÷ 3 days = _____ kcal/day
(average kilocalorie intake, rounded to the nearest whole number)

2. Add the number of grams of carbohydrate eaten each day of the period. Divide the total by 3 and round to the nearest whole number to calculate the average number of grams of carbohydrate consumed daily.

Your Calculation:

Day 1 _____ g
Day 2 _____ g
Day 3 _____ g
Total g _____ ÷ 3 days = _____ g of carbohydrate/day
(average, rounded to the nearest whole number)

3. Each gram of carbohydrate provides about 4 kcal; therefore, you must multiply the average number of grams of carbohydrate obtained in step 2 by 4 to obtain the number of kcal from carbohydrates.

Your Calculation:

___ g/day × 4 kcal/g = ___ kcal from carbohydrates

4. To calculate the average daily percentage of kilocalories that carbohydrates contributed to your diet, divide the average kilocalories from carbohydrate obtained in step 3 by the average total daily kilocalorie intake obtained in step 1; round figure to the nearest one-hundredth. Multiply the value by 100, drop the decimal point, and add the percent symbol.

Sample Calculation:

1692 kcal ÷ 2817 kcal = 0.60
0.60 × 100 = 60%

Your Calculation:

___ kcal ÷ ___ kcal = ___
___ × 100 = ___ %

5. On average, did you consume *at least* the RDA of 130 g of carbohydrate? Yes ____ No ____

Gastromedia/Alamy

Tasty Tidbits, interesting bits of information about food or nutrition, provide students with practical ways to be more savvy consumers and to make healthier choices.

TASTY Tidbits

Purestock/SuperStock

Too much sun exposure may lead to skin cancer. Therefore, physicians who treat skin disorders often advise people to apply sunscreens consistently before going outdoors. When properly applied, a sunscreen with a sun protection factor (SPF) of 8 or more blocks sunlight that's needed to form vitamin D.[4] To allow your body to make some vitamin D, some health experts suggest exposing skin to the sun for 5 to 30 minutes twice a week *before* applying a commercial sunscreen.

TASTY Tidbits

Wendy Schiff

Rhubarb leaves are toxic because they contain very high amounts of oxalic acid. Although rhubarb stalks contain less oxalic acid than the leaves of the plant, the amounts aren't toxic. One-half cup of cooked, sugar-sweetened rhubarb supplies about 140 kcal, 2.4 g fiber, 175 mg calcium, 25 mcg vitamin K, and 4 mg vitamin C.

Culture & Cuisine provides a brief but intriguing discussion of traditional foods and dietary practices of various cultures from around the world.

Culture & Cuisine

Brent Hofacker/Alamy Stock Photo

Mexican street corn

Throughout the world, populations rely on three starchy foods—rice, corn, and wheat—to supply the majority of their food energy intake. Other starchy foods, especially millet, sorghum, cassava, taro, potatoes, and yams, are often consumed along with the three starchy *staple* foods. A staple food forms the foundation of a population's diet and provides a large share of their calorie and nutrient needs. Rice, for example, is a staple food for almost 50% of the world's population.

What *IS* That?

Foods that contain live and active probiotics may be beneficial to your health, particularly your intestinal health. Kefir is a "cultured" milk. Cultured milks, such as kefir and cultured buttermilk, have probiotics added to them. The probiotic bacteria ferment the natural carbohydrate in milk for energy, and produce acid and carbon dioxide as a result. The acid curdles the milk and gives it a distinctive taste; the carbon dioxide provides some "fizz," like a carbonated soft drink. A 1-cup serving of kefir that's made from 2% milk supplies about the same energy and nutrient contents as 1 cup of 2% milk.

Wendy Schiff

What *IS* That? highlights foods that are often unfamiliar to Americans and provides nutrition information about the foods. Exposing students to new food items expands their options as a consumer.

Nutrition Fact or Fiction? dispels popular food and nutrition myths such as "sugar causes hyperactivity," "the 5-second rule," and the "freshman 15."

Answer This questions give students opportunities to practice using basic skills, including math, graph reading, and critical thinking, to answer questions relating to the unit's content. The correct response to an Answer This is located on the last page of the unit.

Nutrition Fact or Fiction?

Sugar makes children hyperactive.

If you've ever attended a child's birthday party, you can understand why people often blame sugary foods for causing "hyper" behavior. The results of scientific studies, however, don't indicate that sugar is a cause of *attention-deficit/hyperactivity disorder*, also known as *ADHD*.[2] There are a few different types of ADHD, but affected children generally have difficulty paying attention, following instructions, sitting quietly, and controlling their impulses. The cause of ADHD is uncertain, but genetic factors play an important role. Other risk factors include premature birth (being born too soon), low birth weight, and brain injury. Furthermore, pregnant women who smoke or drink alcohol increase their risk of having children with ADHD.

When children attend parties, their excitement and lower self-control are

Ryan McVay/Getty Images

Q Answer This

If your total calorie intake is 2400 kcal per day and fat provides 30% of your calories, how many grams of fat do you consume? You'll find the answer on the last page of this unit.

A Answer This (Module 3.1b)

80 g

318 **Unit 10** Nutrition for a Healthy Weight and Fit Body

Consider This...

1. Why is it usually difficult to pinpoint a cause of obesity?
2. Why are most people who lose weight unable to maintain the lower body weight over time?
3. If your BMI is within the overweight or obese range, discuss your reasons for being interested or not interested in losing weight. If you want to lose weight, what lifestyle changes can you make to meet your weight-loss goal?
4. If your BMI is within the underweight range, discuss your reasons for being interested or not interested in gaining weight. If you want to gain weight, what lifestyle changes will you make?
5. If your BMI is in the healthy range, discuss steps you can take to maintain a healthy body weight as you grow older.
6. Analyze your weekly physical activity habits. Does your participation in various physical activities meet the minimum recommendations? If not, which physical activities are you willing to include in your weekly routine to improve your fitness level?

Test Yourself

Select the best answer.

1. _____ fat is in a layer under the skin.
   a. Cellulite
   b. Visceral
   c. Subcutaneous
   d. Metabolic
2. Basal metabolism includes energy needs for
   a. breathing and circulating blood.
   b. performing physical activity.
   c. digesting food.
   d. absorbing nutrients.
3. Which of the following statements is true?
   a. Women generally have higher metabolic rates than men.
   b. Thyroid hormone levels influence the metabolic rate.
   c. A person who has more muscle mass will have a lower metabolic rate than someone with less muscle tissue.
   d. When your thyroid gland produces too much thyroid hormone, your metabolic rate drops below normal.
4. A negative energy state occurs when
   a. your body needs more calories than the diet supplies.
   b. fat storage in your body increases.
   c. your energy intake is higher than your energy output.
   d. the thermic effect of your food equals NEAT.
5. _____ is a hormone that reduces hunger and inhibits fat storage in your body.
   a. Glucosamine
   b. Leptin
   c. Ghrelin
   d. Creatine
6. Members of the National Weight Control Registry tend to
   a. weigh themselves once a month.
   b. follow low-carbohydrate/high-protein diets.
   c. exercise 2 to 3 times per week.
   d. eat breakfast.

Man on bike: Realistic Reflections; Pepper: Iconotec/Glow Images; Breakfast meal: Wendy Schiff

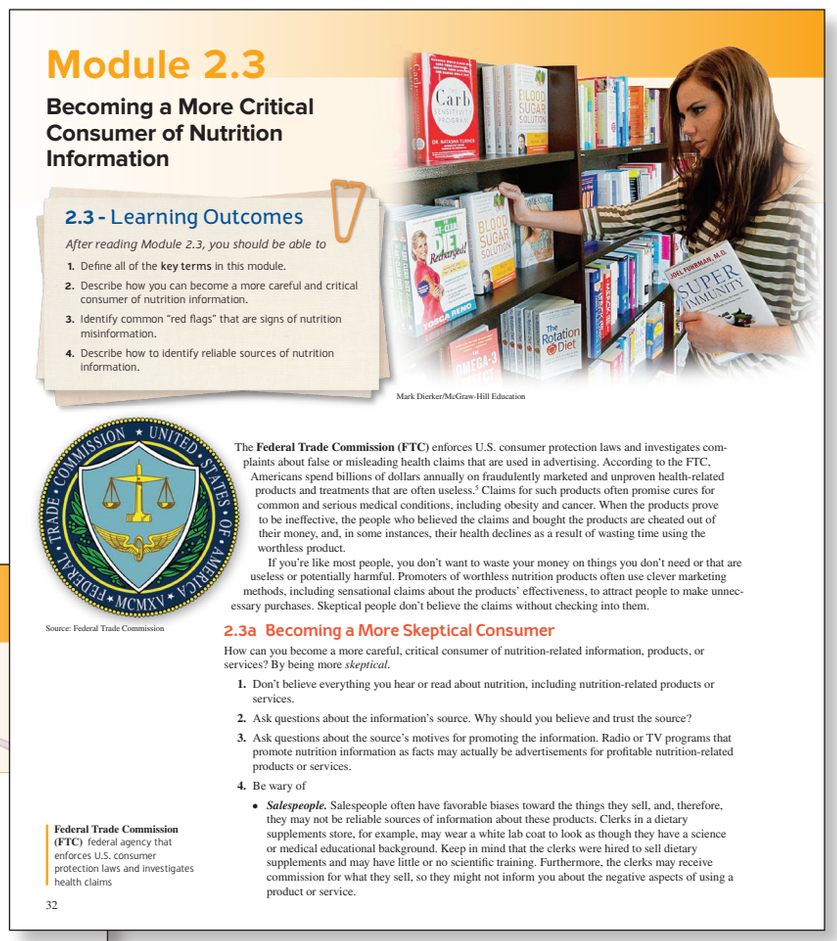
Consider This… presents critical thinking questions related to the unit's content that help students apply what they read.

Test Yourself at the end of each unit features multiple-choice questions designed to help students check their knowledge and prepare for exams. Answers are provided in small, upside-down print at the end of each test.

Consumer Focus

Teaches students how to better evaluate nutrition information for a healthier life.

Nutrition Essentials: A Personal Approach is consumer focused, providing students with ample ways to both evaluate nutrition information as well as apply practical tips for healthier living. An entire unit, Nutrition Information: Fact or Fiction? (Unit 2), is devoted to understanding the scientific method and evaluating nutrition information.



Module 2.3

Becoming a More Critical Consumer of Nutrition Information

2.3 - Learning Outcomes

After reading Module 2.3, you should be able to

1. Define all of the **key terms** in this module.
2. Describe how you can become a more careful and critical consumer of nutrition information.
3. Identify common "red flags" that are signs of nutrition misinformation.
4. Describe how to identify reliable sources of nutrition information.

Mark Dierker/McGraw-Hill Education

Source: Federal Trade Commission

The **Federal Trade Commission (FTC)** enforces U.S. consumer protection laws and investigates complaints about false or misleading health claims that are used in advertising. According to the FTC, Americans spend billions of dollars annually on fraudulently marketed and unproven health-related products and treatments that are often useless.[5] Claims for such products often promise cures for common and serious medical conditions, including obesity and cancer. When the products prove to be ineffective, the people who believed the claims and bought the products are cheated out of their money, and, in some instances, their health declines as a result of wasting time using the worthless product.

If you're like most people, you don't want to waste your money on things you don't need or that are useless or potentially harmful. Promoters of worthless nutrition products often use clever marketing methods, including sensational claims about the products' effectiveness, to attract people to make unnecessary purchases. Skeptical people don't believe the claims without checking into them.

Federal Trade Commission (FTC) federal agency that enforces U.S. consumer protection laws and investigates health claims

2.3a Becoming a More Skeptical Consumer

How can you become a more careful, critical consumer of nutrition-related information, products, or services? By being more *skeptical*.

1. Don't believe everything you hear or read about nutrition, including nutrition-related products or services.
2. Ask questions about the information's source. Why should you believe and trust the source?
3. Ask questions about the source's motives for promoting the information. Radio or TV programs that promote nutrition information as facts may actually be advertisements for profitable nutrition-related products or services.
4. Be wary of
   - ***Salespeople.*** Salespeople often have favorable biases toward the things they sell, and, therefore, they may not be reliable sources of information about these products. Clerks in a dietary supplements store, for example, may wear a white lab coat to look as though they have a science or medical educational background. Keep in mind that the clerks were hired to sell dietary supplements and may have little or no scientific training. Furthermore, the clerks may receive commission for what they sell, so they might not inform you about the negative aspects of using a product or service.

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Module 2.1

Nutrition: Science for Consumers

2.1 - Learning Outcomes

After reading Module 2.1, you should be able to

1. Define all of the **key terms** in this module.
2. List the basic steps of the scientific method as it relates to nutrition research in general.
3. Discuss ways that scientists conduct nutrition-related research that involves human subjects.
4. Explain why results of similar studies can provide different findings.

Vasiliy Koval/Shutterstock

In the past, nutrition facts and recommended dietary practices were often based on intuition, common sense, "conventional wisdom" (tradition), or **anecdotes** (reports of personal experiences). Today, registered dietitians and other nutrition experts discard conventional beliefs, explanations, and practices when the evidence obtained by current scientific research no longer supports them.

2.1a Collecting Science-Based Evidence

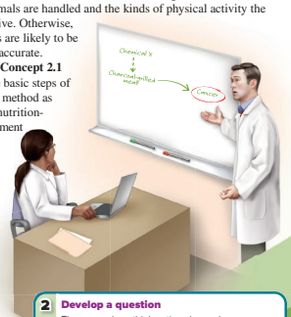
Scientists generally use the *scientific method* to answer questions about natural and physical observations. Scientists, for example, have answered questions such as: "How does the stomach break down food proteins?" "Why do babies need the mineral iron to develop normally?" and "Why is vitamin C necessary to maintain good health?"

An **experiment** is a way of testing a scientific question. Because of safety and ethical concerns, nutrition scientists often conduct experiments on small mammals before performing similar research on humans. Certain kinds of mice and rats are raised for experimentation purposes. The rodents are inexpensive to house in laboratories, and their food and other living conditions can be carefully controlled. Researchers control conditions that are not being tested, such as the ways the animals are handled and the kinds of physical activity the animals receive. Otherwise, their findings are likely to be unclear or inaccurate.

Essential Concept 2.1 describes the basic steps of the scientific method as applied to a nutrition-related experiment involving laboratory mice.

Essential Concept

2.1 Applying the Scientific Method



1 Observe
Scientists observe a group of hospitalized patients who have stomach cancer. After obtaining dietary information from all the patients, the researchers determine that the patients with stomach cancer eat more charcoal-grilled meat than other people who are the same age but don't have stomach cancer.

2 Develop a question
The researchers think eating charcoal-grilled meat increases the risk of stomach cancer. They develop a question: "Chemical X is only in meat that has been charcoal grilled. If chemical X is given to a group of laboratory mice for 6 months, will they develop more cases of stomach cancer than mice that have not eaten chemical X?"

anecdotes reports of personal experiences

experiment a way of testing a scientific question

peer review expert critical analysis of a research article before it's published

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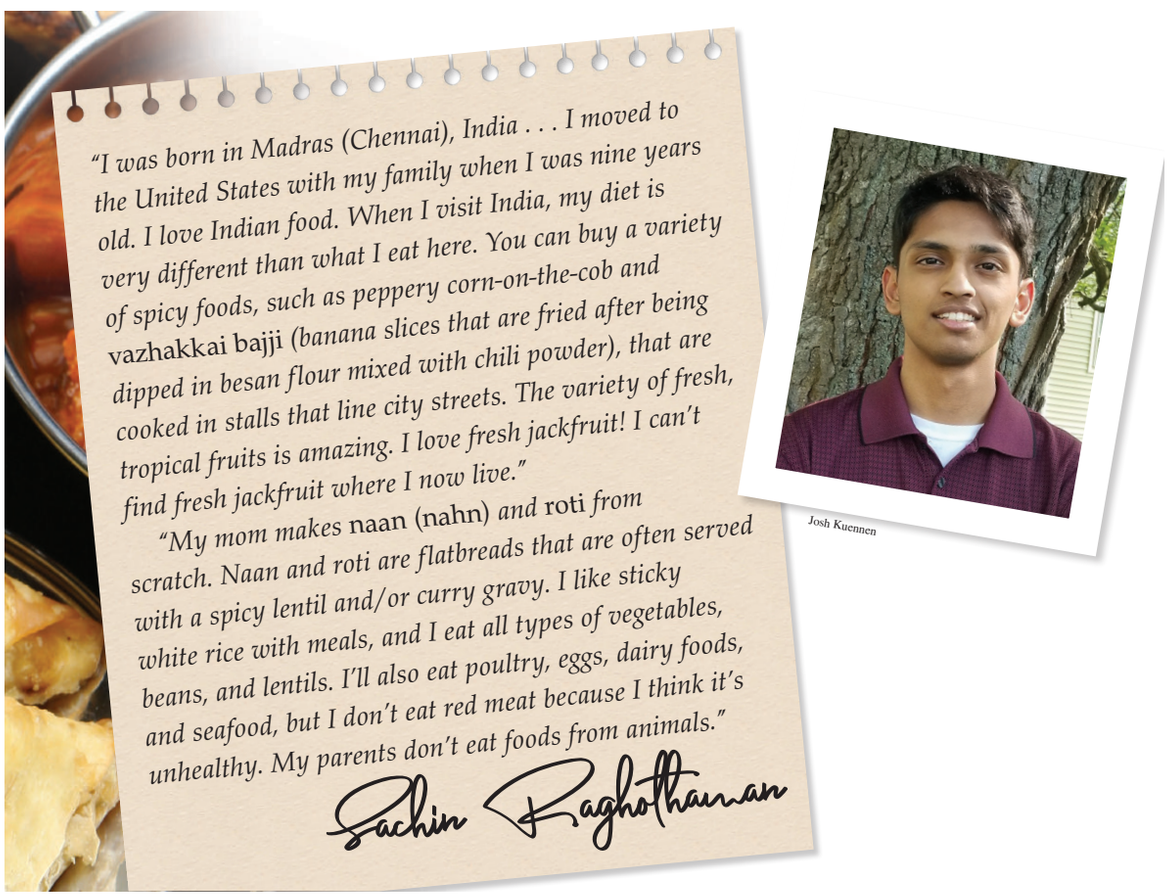
Personalized Focus

The nutrition textbook that's written for YOU!

- The personalized, consumer focus gives plenty of practical examples to help you choose and prepare nutritious foods as well as make nutrition-related decisions that are good for your health.
- The proven successful Connect for *Nutrition Essentials: A Personal Approach* digital program, including Question Bank, Test Bank, Prep for Nutrition, LearnSmart/ SmartBook adaptive reading, and NutritionCalc Plus dietary analysis, gives you access to one of the most effective and successful adaptive learning resources available on the market today.

Nutrition Essentials: A Personal Approach is uniquely designed to provide non-science majors with the basic scientific principles of nutrition in a highly visual, engaging framework focused on their personal choices and experiences. Adaptive learning resources LearnSmart and SmartBook create an individualized study plan to help you achieve success in understanding nutrition.

Each unit highlights an actual college student's or recent college graduate's nutrition concerns. These relatable accounts in a student's own words help frame the content of that unit and encourage you to think about your own dietary choices.



What's New in This Edition

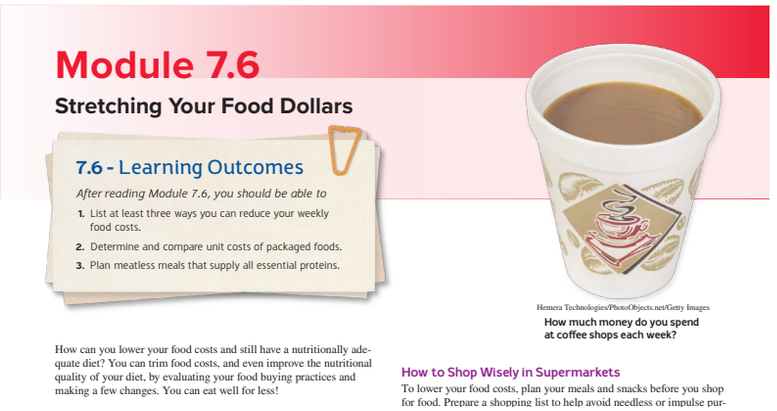
Earlier editions of this textbook included visually stimulating and creative page layouts, and beautifully rendered, pedagogically based illustrations that were designed to engage students' interest in the narrative's topics and facilitate learning. The third edition maintains this energetic, colorful, and appealing design. We have retained many of the interesting photos and replaced others. Photos help draw students' attention to the narrative and enable them to relate content to the real world. It's important to note that the use of products in photos is for example representation only and does not constitute an endorsement.

The third edition of *Nutrition Essentials: A Personal Approach* has been extensively updated with new information and its sources. The following points highlight some of the major revisions:

- Each unit has a Culture & Cuisine feature (new to this edition) that discusses traditional foods or dietary practices from around the world. Such features include information about popular Asian Indian foods, traditional Mexican foods, and the use of insects for a protein source.
- Additional Test Yourself (end-of-unit quiz) and Consider This… questions have been incorporated into most of the units.
- Many of the diagrams and illustrations throughout the textbook have been modified to increase their clarity. For example, Essential Concept 7.2 (What Can Happen to Unneeded Amino Acids?) has been revised to help students better follow steps involved in an aspect of amino acid metabolism.
- The food composition tables that contain information about amounts of specific nutrients in commonly eaten foods have been updated.
- Three of the unit openers have been revised to feature a new college student or recent college graduate who shares personal reflections about his or her dietary choices. These openers help draw readers into the unit's content.
- Answers to Test Yourself are included at the end of each quiz but upside down, so students don't need to search for them in the appendixes.

The following points highlight some significant revisions that have been made to specific units:

- The opener of Unit 4 (How Food Becomes You) features a young woman with celiac disease. The unit also includes a new Essential Concept that illustrates the process of absorbing fat-soluble nutrients from the digestive tract and transporting them to other cells in the body.
- Unit 5 (Carbohydrates: Fuel and Fiber) has a new section that's about non-alcoholic fatty liver disease (NAFLD), which affects millions of adult Americans. Furthermore, a new Essential Concept that illustrates carbohydrate digestion, absorption, and elimination has been added to replace Figure 5.3 in the previous edition. The new Figure 5.3 illustrates the fate of glucose after absorption.
- Unit 7 (Proteins: Life's Building Blocks) has a new module (7.6 Stretching Your Food Dollars).



- Unit 8 (Vitamins: Nutrients That Multitask) has a new Nutrition Fact or Fiction? that features a case study about a young man who took toxic levels of niacin. Two new Essential Concepts have been added to replace figures in the previous edition. One of the new Essential Concepts illustrates major steps in the body's use of vitamins B-12 and folate for red blood cell production. The other new Essential Concept shows major steps involved in the body's use of vitamin K for blood clotting.
- Unit 9 (Key Minerals, Water, and the Nonnutrient Alcohol) has revised blood pressure guidelines (Table 9.6) and new information about the ULs for sodium and potassium (Table 9.7).

TABLE 9.6 CLASSIFYING BLOOD PRESSURE LEVELS (ADULTS)*

Blood Pressure Classification	Systolic mm Hg	And/Or	Diastolic mm Hg
Normal	< 120	**and**	< 80
Elevated	120–129	**and**	< 80
Hypertension: Stage 1	130–139	**or**	80–89
Hypertension: Stage 2	≥ 140	**or**	≥ 90

*Key: < is "less than"; ≥ is "more than or equal to."
Source: American Heart Association: *Monitoring your blood pressure at home.* 2017. www.heart.org/en/health-topics/high-blood-pressure/understanding-blood-pressure-readings/monitoring-your-blood-pressure-at-home Accessed: July 6, 2019

- Unit 10 (Nutrition for a Healthy Weight and Fit Body) highlights recommendations of the U.S. Department of Health and Human Services' latest physical activity guidelines (2018). Information about intermittent fasting has been added to the information about weight-loss diets.
- Unit 11 has two new What *IS* That? features that discuss kiwano and bioengineered foods.
- Appendix E (Dietary Reference Intake [DRI] Tables) has been updated to reflect the 2019 DRIs for sodium and potassium.

Acknowledgments

The development of an accurate and current manuscript for *Nutrition Essentials: A Personal Approach,* Third Edition, was facilitated with the help of numerous college nutrition instructors. I offer my sincere thanks to the following colleagues who reviewed the second edition and provided a wide range of valuable feedback.

Reviewers

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Members of my McGraw-Hill Education team deserve to be recognized for their hard work and commitment to the development and production of the third edition of *Nutrition Essentials: A Personal Approach*. Lauren Vondra, Portfolio Manager, took the necessary steps to move forward with the new edition. I am grateful for her guidance and willingness to continue developing the features of this unique textbook. My Senior Content Production Manager, Vicki Krug, had one of the most difficult jobs as a member of the team. She had to make sure that production deadlines were met. Vicki also forwarded instructions for art and corrections to staff at the outside companies that prepared illustrations for and printed the textbook. Each year, she has to juggle the production of several textbooks at one time, and she did an amazing job of successfully managing the production of *Nutrition Essentials.*

Jim Connely, Marketing Director, and Kristine Rellihan, Market Development Manager, did a great job of helping me analyze the needs of students taking personal nutrition courses so I could build on the success of the first and second editions. Jim and Kristine, thanks so much! David Hash, Lead Designer, developed the amazing cover and new design features for this new edition; Abbey Jones, Content Licensing Specialist, handled the securing of permissions and releases; and Rachael Hillebrand, Assessment Content Project Manager, oversaw the digital program. Such "behind-the-scenes" staff are critical players in the production of a high-quality textbook. My special thanks also extend to David, Abbey, and Rachael.

I also want to thank Lynn Breithaupt, Executive Director, for providing the support that was necessary for developing, publishing, and marketing the new edition of this textbook. Last, but not least, my Senior Product Developer, Darlene Schueller, deserves my sincerest gratitude for the hard work, long hours, and extraordinary dedication she invested in the production of the third edition of *Nutrition Essentials: A Personal Approach* and the Connect and LearnSmart resources that support the textbook. Meeting deadlines can be very challenging for an author, but Darlene made the revision process flow smoothly. For over 20 years, I've written college-level textbooks and related educational material for different publishers. I've worked with several product developers, but there's no doubt in my mind: Darlene is the best!

Wendy J. Schiff

Contents

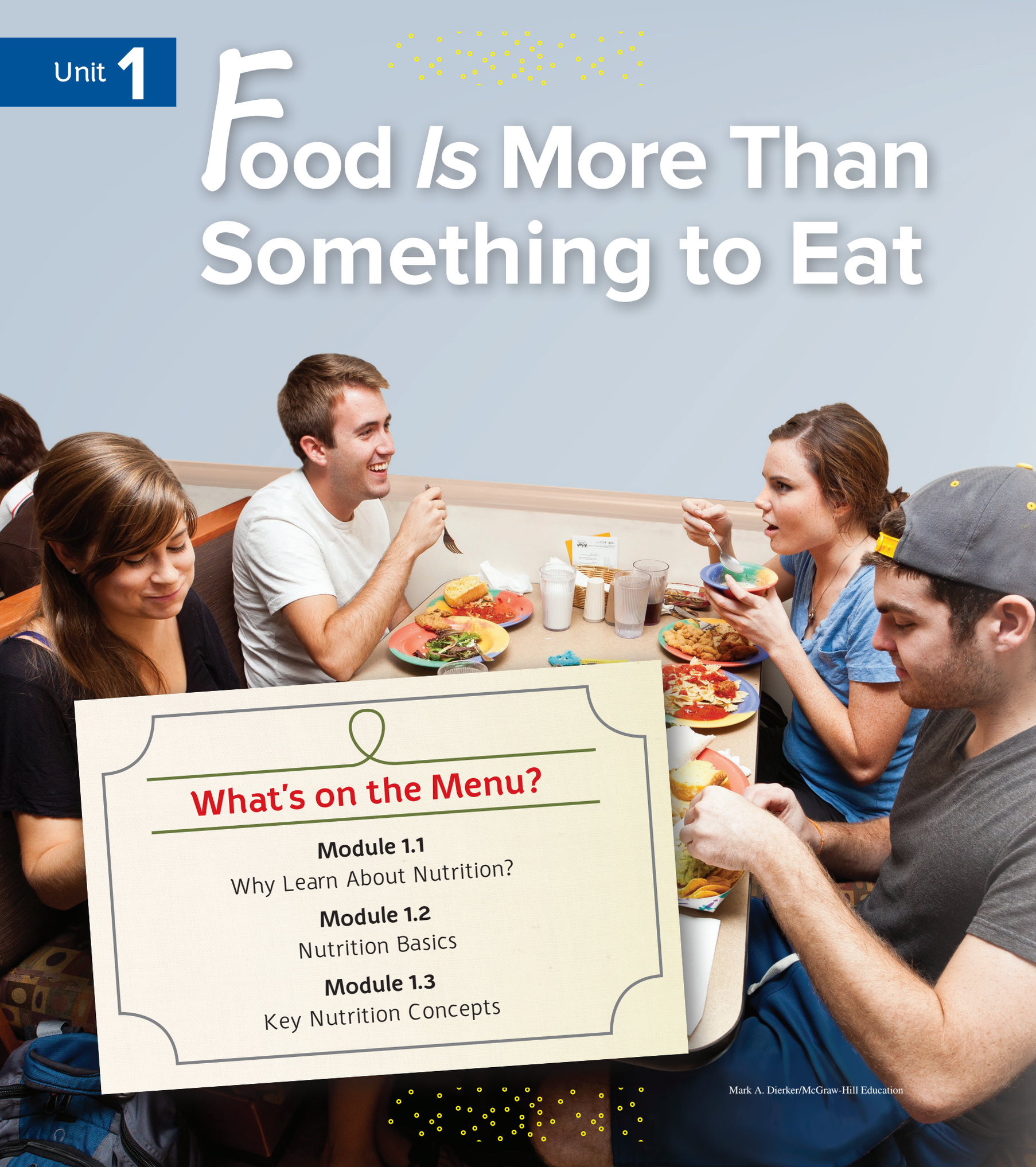
NUTRITION ESSENTIALS

Third Edition

A Personal Approach

Unit 1

Food *Is* More Than Something to Eat



What's on the Menu?

Module 1.1
Why Learn About Nutrition?

Module 1.2
Nutrition Basics

Module 1.3
Key Nutrition Concepts

Mark A. Dierker/McGraw-Hill Education

Mark A. Dierker/McGraw-Hill Education

"My family's Hispanic, and most of my family was born in Texas, so I grew up helping my mother and grandmother cook 'Tex-Mex' food, using recipes passed down generation to generation. Now my diet isn't limited to Tex-Mex, but it's still my favorite type of food. I always associate this food with family gatherings."

Marisa Moreno

Pico de gallo

Wendy Schiff

Marisa Moreno is a recent graduate of Loras College. Her Hispanic ethnic background greatly influences her favorite food choices, which she describes as "Tex-Mex." According to Marisa, "Tex-Mex dishes are similar to traditional Mexican dishes, such as tacos, tostadas, burritos, tamales, fajitas, and enchiladas, but Tex-Mex food preparation uses some different ingredients. Mexican tacos, for example, typically include crumbly white goat cheese, whereas Tex-Mex tacos have shredded yellow American cheese. Tex-Mex dishes are often served with *pico de gallo* on top. *Pico de gallo* is a salsalike topping that is made from fresh diced tomatoes, jalapeño and serrano peppers, chopped green onions and fresh cilantro (a leafy herb that looks like fresh parsley), lemon juice, and a little salt. Also, Tex-Mex recipes often incorporate sauces made with hot chili peppers that are popular in the southwestern United States. Cumin is the southwestern spice generally used in Tex-Mex dishes . . . hot chili sauce is added on nearly everything."

Regardless of your ethnic/cultural background, your body needs **nutrients,** the life-sustaining chemicals in food, to function properly. **Nutrition** is the scientific study of nutrients and how the body uses these chemicals.

Eating supplies your body with nutrients and satisfies your hunger, but it also can be comforting, especially if eating certain foods soothes your anxiety or ends your boredom. The foods you choose to eat can have social and religious meaning. For example, lobster and prime rib steak are often associated with people who have high incomes. Other foods, such as a frosted layer cake topped with lit candles, stuffed roasted turkey, and communion wafers, are associated with birthday celebrations, seasonal holidays, and religious rites. Thus, food *is* more than just something to eat.

nutrients life-sustaining chemicals in food that are necessary for proper body functioning

nutrition study of nutrients and how the body uses these substances

Module 1.1

Why Learn About Nutrition?

Purestock/SuperStock

1.1 - Learning Outcomes

After reading Module 1.1, you should be able to

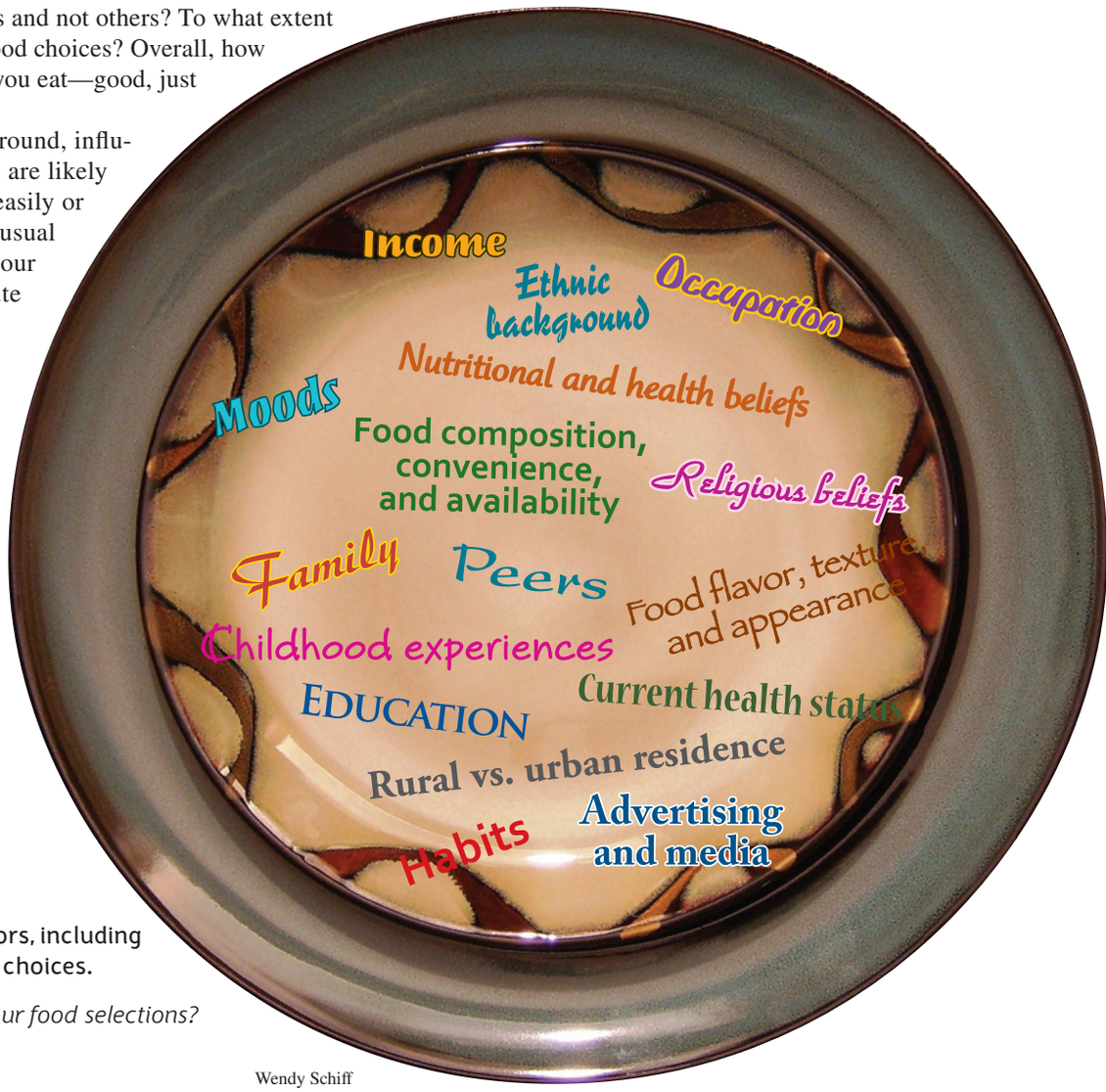
1. Define all of the **key terms** in this module.
2. Discuss various factors that can influence a person's food selections.
3. Identify the leading causes of death in the United States and lifestyle factors that contribute to the risk of these diseases.

Have you ever thought about why you eat certain foods and not others? To what extent does your ethnic/cultural background influence your food choices? Overall, how would you rate the nutritional quality of the food that you eat—good, just OK, or poor?

Many factors, including your ethnic/cultural background, influence what you eat (**Fig. 1.1**). Your usual food choices are likely to be foods that you can afford, that you can prepare easily or obtain quickly, and that taste good. Your **diet** is your usual pattern of food choices. Why should you care about your diet? In the United States, poor eating habits contribute to several leading causes of death, including heart disease, some types of cancer, stroke, and diabetes (**Fig. 1.2**). Conditions such as heart disease, cancer, and diabetes are *chronic diseases*—health problems that usually take many years to develop and have complex causes.

Unfortunately, you weren't born with the ability to select a diet with the proper mix of nutrients. To eat *well,* you need to learn about nutrition and the effects that your food selections can have on your health.

A **risk factor** is a personal characteristic that increases your chances of developing a chronic disease. Some risk factors, such as having damaged or missing genes, being an older adult, and being a biological male or female, cannot be changed. Family



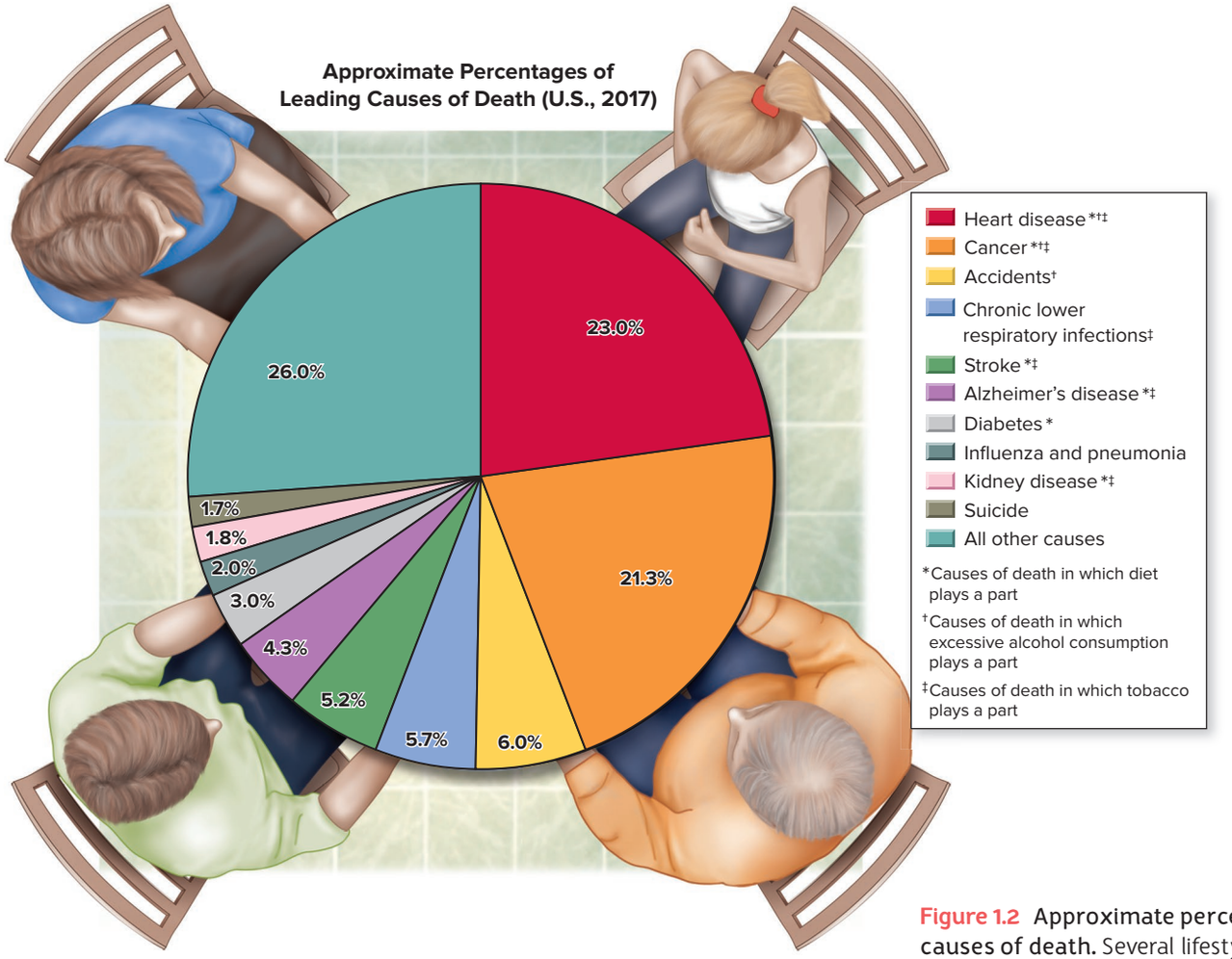
Wendy Schiff

diet usual pattern of food choices

risk factor personal characteristic that increases a person's chances of developing a disease

Figure 1.1 Many factors, including these, influence food choices.

■ *What influences your food selections?*



Source: Murphy SL and others: Mortality in the United States, 2017. NCHS Data Brief, no 328 *NCHS Data Brief*. Hyattsville, MD: National Center for Health Statistics. 2018

Figure 1.2 Approximate percentages of leading causes of death. Several lifestyle factors contribute to many of the 10 leading causes of death in the United States.

■ *Are any of these diseases in your family history?*

medical history, for example, is an important risk factor for heart disease. Your family's medical history can reveal disorders that were or can be passed down from generation to generation. Such disorders are often linked to faulty genetic information. If your father's father had a heart attack before he was 55 years old and your mother is being treated for having high blood pressure and a high blood cholesterol level (risk factors for heart disease), your family history indicates you have a higher-than-average risk of having a heart attack. For many people, however, having a family history of a chronic disease does not mean that they definitely will develop the condition. Other risk factors that contribute to health problems include age, environmental conditions, and lifestyle practices.

Lifestyle is a person's way of living that includes diet, physical activity habits, use of drugs such as tobacco and alcohol, and other typical patterns of health-related behavior. Your lifestyle may increase or reduce your chances of developing a chronic disease or delay its occurrence for years, even decades. Many people die prematurely because of their lifestyle practices. Fortunately, lifestyle-related risk factors usually can be changed to make them less risky. Smoking, for example, is a lifestyle. If you smoke, stopping can greatly reduce the likelihood that you will develop serious chronic diseases, especially lung cancer and premature heart disease. In the United States, cigarette smoking is the leading cause of preventable deaths.[1]

lifestyle way of living that includes diet, physical activity habits, use of tobacco and alcohol, and other typical patterns of behavior

Reading this textbook can help you evaluate your diet and decide if it needs to be changed. You may be able to increase your chances of living a long and healthy life by consuming more fruits, vegetables, unsalted nuts, fat-free or low-fat dairy products, seafood, dried beans and peas, and whole-grain cereals, as well as exercising regularly.[2] Furthermore, reducing your intake of fatty meats, refined grain products, and sugar-sweetened foods, particularly beverages, may also improve your health.

Module 1.2

Nutrition Basics

Ingram Publishing/Alamy

1.2 - Learning Outcomes

After reading Module 1.2, you should be able to

1. Define all of the **key terms** in this module.
2. List the six classes of nutrients, and identify a major role of each class of nutrient in the body.
3. Calculate the caloric value of a serving of food based on its macronutrient (and alcohol) contents.
4. Provide examples of essential nutrients, nonnutrients, phytochemicals, and dietary supplements.
5. Explain the importance of supplying the body with antioxidants.

1.2a Nutrients and Their Major Functions

There are six classes of nutrients: carbohydrates, fats and other lipids, proteins, vitamins, minerals, and water. Carbohydrates, lipids, proteins, and vitamins are **organic nutrients** because they have the element carbon in their chemical structures.

Table 1.1 presents major roles of nutrients in your body. Note that most nutrients have more than one function and some nutrients have similar roles in your body. In general, you need certain nutrients for energy, growth and development, and regulation of cellular functions, including the repair and maintenance of cells. In many instances, several nutrients work together to keep your body healthy.

Although average healthy young men and women have similar amounts of vitamins, minerals, and carbohydrates in their bodies, young women have less water and protein and more fat **(Fig. 1.3).**

organic nutrients nutrients that have carbon in their chemical structures

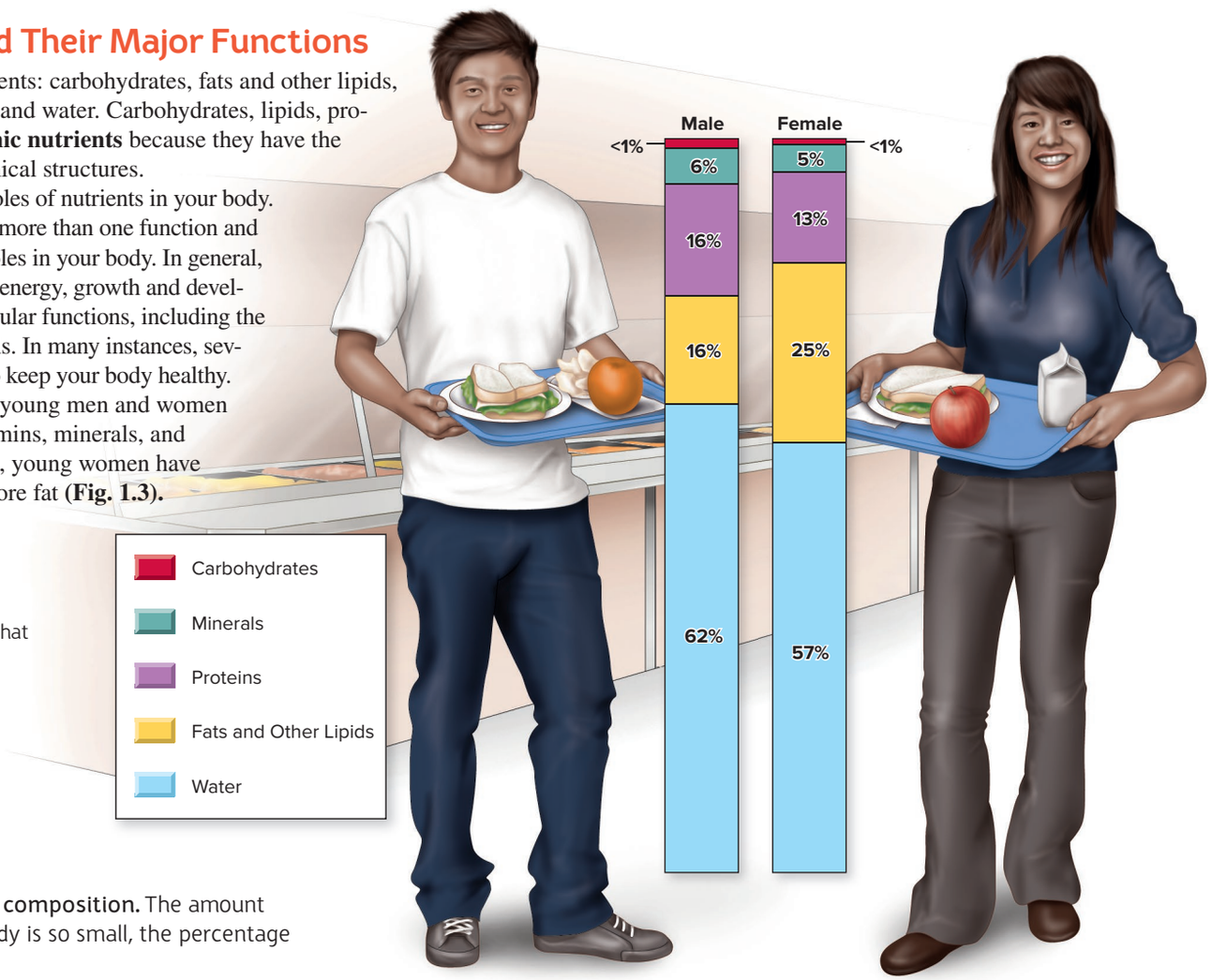


Figure 1.3 Comparing body composition. The amount of vitamins in the human body is so small, the percentage isn't shown.

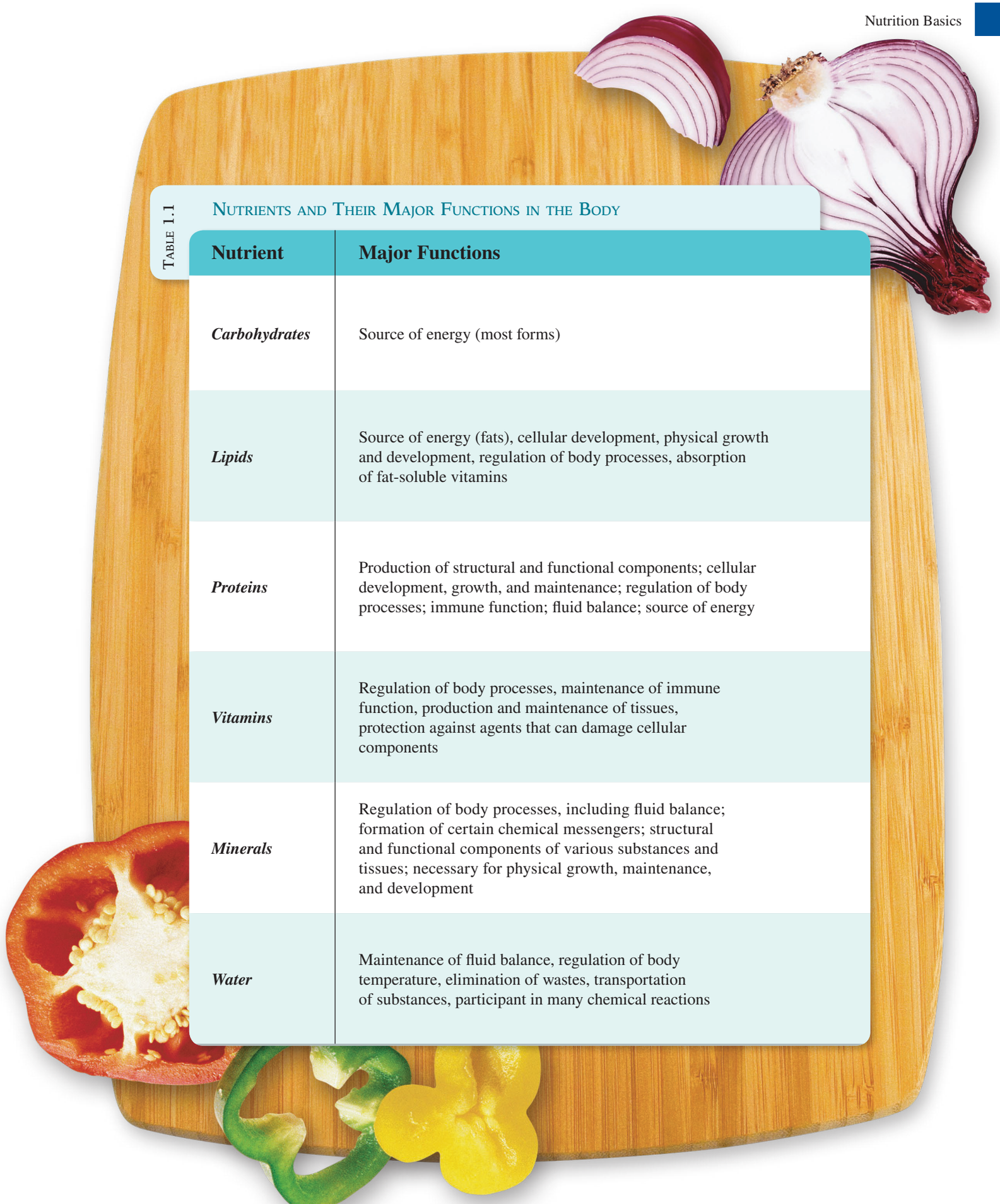


TABLE 1.1 NUTRIENTS AND THEIR MAJOR FUNCTIONS IN THE BODY

Nutrient	Major Functions
Carbohydrates	Source of energy (most forms)
Lipids	Source of energy (fats), cellular development, physical growth and development, regulation of body processes, absorption of fat-soluble vitamins
Proteins	Production of structural and functional components; cellular development, growth, and maintenance; regulation of body processes; immune function; fluid balance; source of energy
Vitamins	Regulation of body processes, maintenance of immune function, production and maintenance of tissues, protection against agents that can damage cellular components
Minerals	Regulation of body processes, including fluid balance; formation of certain chemical messengers; structural and functional components of various substances and tissues; necessary for physical growth, maintenance, and development
Water	Maintenance of fluid balance, regulation of body temperature, elimination of wastes, transportation of substances, participant in many chemical reactions

Cutting board: Mark A. Dierker/McGraw-Hill Education; Red onion: Burke Triolo Productions/Getty Images USA, Inc.; Cut peppers: I. Rozenbaum & F. Cirou/PhotoAlto

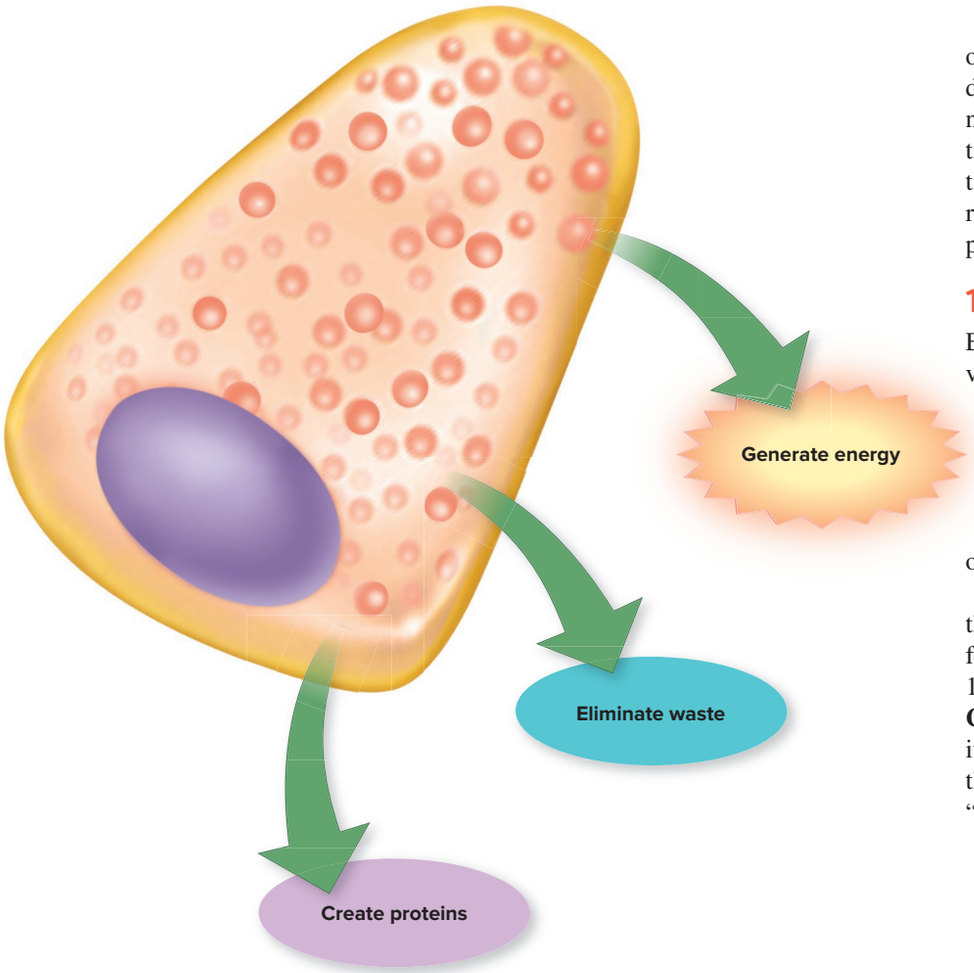


Figure 1.4 Some functions of a typical human cell.

A **cell** is the smallest functional unit in a living organism, including a human being **(Fig. 1.4).** Cells do not need food to survive, but they do need the nutrients in food to carry out their metabolic activities. **Metabolism** is the total of all chemical reactions (changes) that occur in living cells, including reactions involved in generating energy, making proteins, and eliminating waste products.

1.2b Food Energy

Every cell in your body uses energy to carry out its various activities, whether you're running, sitting, or studying, and even while you're sleeping. As long as you're alive, you're constantly using energy. Foods and beverages that contain fat, carbohydrate, protein, and/or alcohol supply energy for your body. You'll learn how your cells obtain energy in Unit 4.

You're probably familiar with the term *calorie,* the unit that describes the energy content of food. The amount of energy in food is reported in 1000-calorie units called **kilocalories** (**kcal**)**,** or **Calories.** If no number of kilocalories is specified, it's appropriate to use "calories." In this textbook, the term "kilocalories" is interchangeable with "food energy" or simply "energy."

cell smallest living functional unit in an organism

metabolism total of all chemical processes that take place in living cells

kilocalorie (kcal) or Calorie unit of measuring food energy

Your body uses energy even when you're sleeping.

Stockbyte/Getty Images

1.2c Macronutrients and Micronutrients

Carbohydrates, fats, and proteins are sometimes called **macronutrients** because the body needs relatively large amounts of these nutrients daily. Vitamins and minerals are **micronutrients** because the body needs very small amounts of them to function properly. Macronutrients supply energy (kcal) for cells, whereas micronutrients do not. Although your body requires large amounts of water, this nutrient provides no energy and isn't usually classified as a macronutrient.

Nutrition experts often use metric measurements, such as grams (g) and liters (l), instead of household measures, such as ounces and cups. An ounce of salt, for example, weighs about 28 g. **Table 1.2** provides the meaning of some commonly used metric prefixes, including *kilo-* and *milli-*. In general, a serving of food supplies grams of carbohydrate, fat, and protein and *milligram (mg)* or *microgram (mcg* or *μg)* quantities of vitamins and minerals. **Appendix A** provides information about common English-to-metric and metric-to-household unit conversions.

TABLE 1.2 COMMON METRIC PREFIXES FOR NUTRITION

kilo- (k) = one thousand (1000)
deci- (d) = one-tenth (0.1)
centi- (c) = one-hundredth (0.01)
milli- (m) = one-thousandth (0.001)
micro- (mc or μ) = one-millionth (0.000001)

A gram of carbohydrate and a gram of protein each supplies about 4 kcal; a gram of fat provides about 9 kcal **(Fig. 1.5).** Although alcohol isn't a nutrient, it does provide energy; a gram of pure alcohol furnishes 7 kcal.

If you know how many grams of carbohydrate, protein, fat, and/or alcohol are in a food, you can estimate the number of kilocalories it provides. For example, if a serving of food contains 10 g of carbohydrate and 5 g of fat, multiply 10 by 4 (the number of kcal each gram of carbohydrate supplies). Then multiply 5 by 9 (the number of kcal each gram of fat supplies). By adding the two values (40 kcal from carbohydrate and 45 kcal from fat), you'll determine that this food provides 85 kcal/serving.

A serving of food contains 30 g of carbohydrate, 10 g of fat, 5 g of protein, 60 mg of vitamin C, and 5 mg of iron. How many calories are in the serving of food? First, determine the amount of energy in each of the food's components.

30 g of carbohydrate × 4 kcal/g = 120 kcal from carbohydrate
10 g of fat × 9 kcal/g = 90 kcal from fat
5 g of protein × 4 kcal/g = 20 kcal from protein

Now, add together the calories for the three sources of energy: 120 kcal + 90 kcal + 20 kcal = 230 kcal/serving.

Figure 1.5 Energy sources for the body. Alcohol isn't a nutrient.

■ *How can you estimate the amount of calories in a serving of food?*

Answer This

Why don't you need to include vitamin C and iron in your calorie calculations? You'll find the answer on the last page of this unit.

macronutrients nutrients needed in gram amounts daily and that provide energy; carbohydrates, proteins, and fats

micronutrients nutrients needed in milligram or microgram amounts (vitamins and minerals)

Basket of bread: Wendy Schiff; Beer mug: dr3amer/iStock.com; Package of tuna: Holly Curry/McGraw-Hill Education; Stick of butter: D. Hurst/Alamy

Water is the most essential nutrient.

vm/Getty Images

1.2d What's an Essential Nutrient?

Your body can make many nutrients, such as fat and cholesterol (types of lipids), but about 50 nutrients must be supplied by food because the human body does not produce the nutrient or make enough to meet its needs. Such nutrients are **essential nutrients (Table 1.3).** Water is the most essential nutrient. You can live for months without iron or vitamin C but only a few days without water.

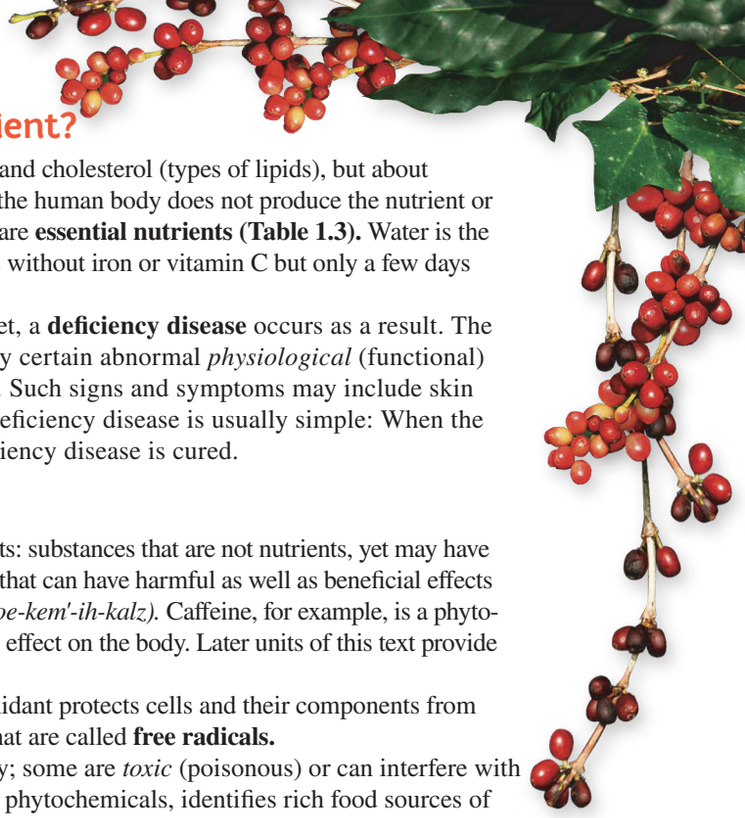
If an essential nutrient is missing from the diet, a **deficiency disease** occurs as a result. The deficiency disease is a state of health characterized by certain abnormal *physiological* (functional) changes that result in signs and symptoms of disease. Such signs and symptoms may include skin rashes, diarrhea, and loss of night vision. Treating a deficiency disease is usually simple: When the missing essential nutrient is added to the diet, the deficiency disease is cured.

1.2e What's a Nonnutrient?

Some foods, particularly those from plants, contain nonnutrients: substances that are not nutrients, yet may have healthful benefits. Alcohol is an energy-supplying nonnutrient that can have harmful as well as beneficial effects on your health. Plants make hundreds of **phytochemicals** *(fi'-toe-kem'-ih-kalz).* Caffeine, for example, is a phytochemical naturally made by coffee plants that has a stimulating effect on the body. Later units of this text provide more information about caffeine and alcohol.

Many phytochemicals function as **antioxidants.** An antioxidant protects cells and their components from being damaged or destroyed by chemically unstable factors that are called **free radicals.**

Not all phytochemicals have beneficial effects on the body; some are *toxic* (poisonous) or can interfere with the body's ability to absorb nutrients. **Table 1.4** lists several phytochemicals, identifies rich food sources of these substances, and indicates their effects on the body, including possible health benefits. Certain vitamins act as antioxidants. You'll learn more about them in Unit 8, which focuses on vitamins.



Coffee beans

Source: USDA Natural Resources

essential nutrient nutrient that must be supplied by food

deficiency disease state of health that occurs when a nutrient is missing from the diet

phytochemicals substances made by plants that are not nutrients but may be healthful

antioxidant substance that protects cells and their components from being damaged or destroyed by free radicals

free radicals chemically unstable factors that can damage or destroy cells

TABLE 1.3 ESSENTIAL NUTRIENTS FOR HUMANS

Water				
Vitamins				
A			C	
B vitamins			D*	
Thiamin	Pantothenic acid	B-6	E	
Riboflavin	Biotin	B-12	K	Choline**
Niacin	Folic acid (folate)			
Glucose (from carbohydrate-containing foods)†				
Minerals				
Calcium	Copper	Magnesium	Phosphorus	Sodium
Chloride	Iodine	Manganese	Potassium	Sulfur
Chromium	Iron	Molybdenum	Selenium	Zinc
The following components of proteins (amino acids) are generally recognized as essential:				
Histidine	Lysine	Threonine		
Isoleucine	Methionine	Tryptophan		
Leucine	Phenylalanine	Valine		
Fats that contain linoleic and alpha-linolenic acids				

*The body makes vitamin D after exposure to sunlight, but a dietary source of the nutrient is often necessary.
**The body makes choline but may not make enough to meet needs. Often classified as a *vitamin-like* substance.
†A source of glucose is needed to supply the nervous system with energy and spare protein from being used for energy.

TABLE 1.4 PHYTOCHEMICALS

Examples	Rich Food Sources	Biological Effects/ Possible Health Benefits
Alpha-carotene, beta-carotene, lutein, lycopene	Orange, red, yellow, dark green fruits and vegetables; egg yolks	Antioxidant activity, especially beta-carotene; may inhibit cancer growth The body can convert alpha- and beta-carotene into vitamin A.
Quercetin	Apples, tea, red wine, onions, olives, raspberries, cocoa	Antioxidant activity, may inhibit cancer growth, may reduce risk of heart disease
Anthocyanins	Red, blue, or purple fruits and vegetables	Antioxidant activity, may inhibit cancer growth, may reduce risk of heart disease
Resveratrol	Red wine, purple grapes and grape juice, dark chocolate, cocoa	Antioxidant activity, may inhibit cancer growth, may reduce risk of heart disease
Isoflavonoids	Soybeans and other legumes	Antioxidant activity, may inhibit cancer growth, may reduce risk of heart disease
Sulfur compounds	Garlic, onions, leeks, broccoli, cauliflower, cabbage, kale, bok choy, collard and mustard greens	Antioxidant activity, may inhibit cancer growth, may reduce risk of heart disease
Caffeine	Coffee, tea, cocoa	Stimulant effects
Saponins	Chickpeas, beans, oats, grapes, olives, spinach, garlic, quinoa	May kill certain microbes, inhibit certain cancers, and reduce risk of heart disease
Capsaicin	Chili peppers	May provide some pain relief, when applied to skin

Cutting board: Mark A. Dierker/McGraw-Hill Education; Cup of coffee: Ingram Publishing/SuperStock; Broccoli: lynx/iconotec.com/Glow Images; Chili pepper: Maks Narodenko/Shutterstock; Soybeans: Fabrizio Troiani/Alamy Stock Photo; Carrot: Clover/SuperStock; Purple grapes: lynx/iconotec.com/Glow Images; Broken egg: Photodisc/Getty Images; Bowl of blueberries: Purestock/SuperStock

1.2f What Are Dietary Supplements?

Many Americans take dietary supplements such as vitamin pills and herbal extracts to improve their health. A **dietary supplement** is a product (excluding tobacco) that contains a vitamin, a mineral, an herb or other plant product, an amino acid, or a dietary substance that supplements the diet by increasing total intake.[3] According to scientific evidence, some dietary supplements, such as vitamins, minerals, and certain herbs, can have beneficial effects on health. However, results of scientific testing also indicate that many popular dietary supplements are not helpful and may even be harmful. Information about specific dietary supplements is in Unit 3 and woven into other units of this textbook where appropriate.

1.2g What's Malnutrition?

Malnutrition is a state of health that occurs when the body is improperly nourished. Everyone must consume food and water to stay alive, yet despite the abundance and variety of nutritious foods, many Americans consume nutritionally poor diets and suffer from malnutrition as a result. Some people select nutritionally inadequate diets because they lack knowledge about nutritious foods or the importance of nutrition to health. Low-income people, however, are at risk for malnutrition because they have limited financial resources for making wise food purchases. Other people who are at risk of malnutrition include those who are frail and living in long-term care facilities, have severe eating disorders, are addicted to drugs such as alcohol, or have certain serious diseases.

Many people associate malnutrition with *under*nutrition and starvation. *Over*nutrition, the long-term excess of energy or nutrient intake, is also a form of malnutrition. Overnutrition is often characterized by unhealthy amounts of body fat (*obesity*). You may be surprised to learn that overnutrition is more common in the United States than undernutrition. Obesity is widespread in countries where most people have the financial means to buy plenty of food, have an ample food supply, and obtain little exercise. Unit 10 provides information about obesity; Unit 11 discusses the international problem of undernutrition.

Obesity is a form of malnutrition.

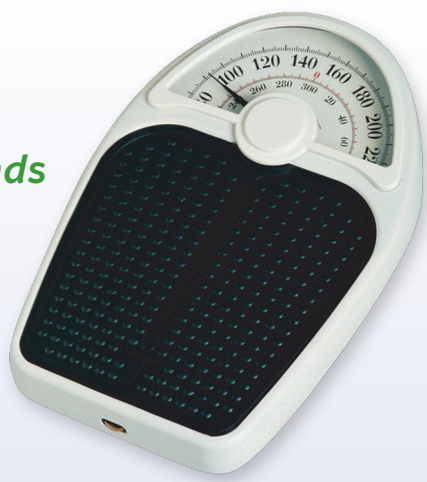
dietary supplement product that contains a vitamin, a mineral, an herb or other plant product, an amino acid, or a dietary substance that supplements the diet

malnutrition state of health that occurs when the body is improperly nourished

Nutrition Fact or Fiction?

The typical college student gains 15 pounds during his or her freshman year.

Although many college students (more than 51%) gain weight during their freshman year in college, the average weight gain is 7.6 pounds.[4] Factors that are thought to contribute to the weight gain include feeling "stressed out," eating too much unhealthy food, drinking too much alcohol, and being less physically active than before they entered college.



Supplements: Wendy Schiff; Obese woman: Lars A. Niki; Bathroom scale: Comstock Images/Getty Images USA, Inc.

Module 1.3

Key Nutrition Concepts

Design Pics Inc./Alamy

1.3 - Learning Outcomes

After reading Module 1.3, you should be able to

1. Define all of the **key terms** in this module.
2. Classify foods as nutrient dense, energy dense, or high in empty calories.
3. Identify key basic nutrition concepts, including the importance of eating a variety of foods and no naturally occurring food supplies all nutrients.

Before learning about nutrients and their roles in health, it's important to grasp some key basic nutrition concepts **(Table 1.5).** Each of the sections of this module focuses on one of these concepts. The content in the units that follow will build upon these key concepts and can help you make more informed choices concerning your dietary practices.

1.3a There Are No "Good" or "Bad" Foods

Do you refer to pizza, chips, candy, doughnuts, ice cream, and sugar-sweetened soft drinks as "bad foods" or "junk foods"? All foods have nutritional value, so no food deserves to be labeled "bad" or "junk." Although pies, doughnuts, and ice cream contain a lot of fat and sugar, these foods also supply small amounts of protein, vitamins, and minerals to diets. A chocolate doughnut, for example, provides 6 g protein, 2 mg niacin (a B vitamin), 4 mg iron, and 4 g fiber. (Most forms of fiber are classified as carbohydrates.) Even sugar-sweetened soft drinks provide two nutrients: water and the carbohydrate sugar, a source of energy. As you read this textbook, you'll learn why certain foods are healthier choices than others.

A food ***is*** bad for you if it contains toxic substances or is contaminated with bacteria, viruses, or microscopic animals that cause food-borne illness. You've probably suffered from a food-borne illness at least once. The abdominal cramps, nausea, vomiting, and diarrhea that usually accompany a food-borne illness occur within a few hours or days after a person eats the contaminated food. Unit 11 discusses food safety concerns, including major types of food-borne illnesses and how to prevent them.

TABLE 1.5 KEY NUTRITION CONCEPTS

1. There are no good or bad foods.
2. Variety, moderation, and balance are features of healthy diets.
3. Food is the best source of nutrients and phytochemicals.
4. There is no "one size fits all" approach to good nutrition.
5. Foods and nutrients are not cure-alls.

Empty Calories

Some foods and beverages, such as candies, pastries, snack chips, sugar-sweetened drinks, and some alcoholic beverages, may be described as sources of "empty calories."[5] **Empty calories** are calories from unhealthy types of fat, added sugar, and/or alcohol. Thus, a food that contains a lot of empty calories usually isn't a good source of vitamins and minerals. Eating too many foods that are high in empty calories may displace more nutritious foods from your diet. In later units of this text, you'll learn more about empty calories, including alcohol.

What's a Nutrient-Dense Food?

Certain foods provide more "key beneficial nutrients" than others. Key beneficial nutrients are protein; fiber; vitamins A, C, and E; and the minerals iron, calcium, magnesium, and potassium.[6] A **nutrient-dense** food or beverage contains more key beneficial nutrients in relation to total calories, especially calories from unhealthy fats, added sugars, and/or alcohol. Broccoli, leafy greens, fat-free milk, orange juice, lean meats, eggs, and whole-grain cereals are examples of nutrient-dense foods.

empty calories calories from unhealthy fats, added sugars, and/or alcohol

nutrient dense describes foods or beverages that supply more key beneficial nutrients in relation to total calories

Foods that contain a lot of empty calories usually aren't nutrient dense.

Africa Studio/Shutterstock

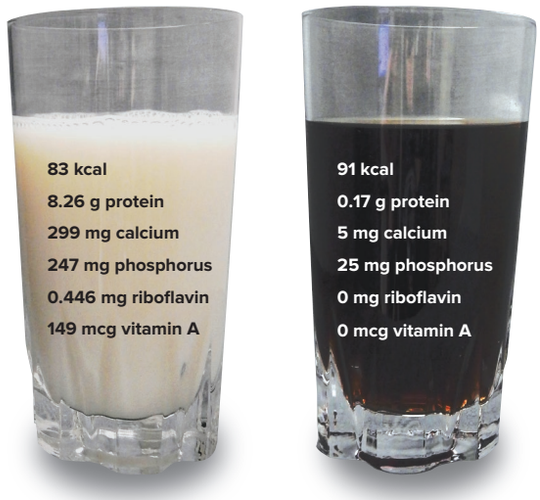


Figure 1.6 Nutrient density.

■ *What distinguishes a food that is a rich source of empty calories from a nutrient-dense one?*

Figure 1.6 compares amounts of energy and certain nutrients provided by 8-ounce servings of fat-free milk and a cola-type, sugar-sweetened ("regular") soft drink. Although the drinks supply similar amounts of calories, the milk provides far more protein and riboflavin (a B vitamin), and minerals calcium and phosphorus. A healthy diet contains a variety of nutrient-dense foods and limits empty calories.

Which Foods Are Energy Dense?

energy density energy value of a food in relation to the food's weight

Energy density describes the energy value of a food in relation to the food's weight. For example, a chocolate, yeast-type frosted doughnut that weighs about 3.5 ounces and is about 4 inches in diameter provides about 400 kcal; eight medium strawberries also weigh about 3.5 ounces, but they provide only 32 kcal. You'd have to eat 100 of the strawberries to obtain the same amount of food energy that's in the chocolate doughnut **(Fig. 1.7).** Therefore, the doughnut is an energy-dense food in comparison to the berries. In general, high-fat foods such as doughnuts are energy dense because they're concentrated sources of energy. Most fruits aren't energy dense because they contain far more water than fat.

It's important to note that not all energy-dense foods are rich sources of empty calories. Nuts, for example, are high in fat and, therefore, energy dense. However, nuts are also nutrient dense because they contribute protein, vitamins, minerals, and fiber to diets. You can find information about the energy and nutrient contents of foods by using "What's in the Foods You Eat *Search Tool*" that's available at the U.S. Department of Agriculture's website: https://www.ars.usda.gov/.

TASTY Tidbits

Almonds and other nuts are nutrient and energy dense. For example, 1 ounce of plain, roasted almonds (about 23 whole nuts) supplies about 170 kcal, 6 g of protein, 15 g of fat, 6.5 mg of vitamin E, and small amounts of iron, calcium, and B vitamins. Snack on a handful of nuts or add them to your cereal.

Figure 1.7 Energy density.

■ *What distinguishes an "energy-dense" food from a food that's not energy dense?*

Milk, Soft drink, Doughnut, Strawberries: Wendy Schiff; Almonds: onair/Shutterstock

Culture & Cuisine

Traditional Mexican meals typically include some form of corn, such as tortillas made from cornmeal; beans; chili peppers; and rice. Meals may also feature eggs, pork, chicken, beef, and fish as well as a wide variety of fruits and vegetables. Main dishes, dips, sauces, and snacks often incorporate fresh avocados, tomatillos, papayas, pineapples, limes, mangoes, chayote, cherimoya, jicama, tomatoes, garlic, onions, plantains, and the fruit (*tuna*) and young stems (*nopales* or pads) of the prickly pear cactus. Cilantro; oregano; cumin; parsley; and various dried peppers, such as chile de árbol, chipotle, cascabel, and pasilla, are used to add distinctive flavors to Mexican cuisine. The traditional Mexican diet is high in fiber, vitamins C and A, potassium, magnesium, and beneficial phytochemicals.

Prickly pear cactus with fruit (tuna) and green stems (pads or nopales)

Prickly pear fruit (tuna), sliced in half to show seeds and pulp

1.3b Variety, Moderation, and Balance Are Features of Healthy Diets

Most foods are mixtures of nutrients, but no natural food is "perfect" in that it contains all nutrients in amounts that your body needs. To help ensure that your diet provides all the essential nutrients as well as beneficial phytochemicals, choose a **variety** of nutrient-dense foods and consume them in reasonable amounts (**moderation**). Furthermore, **balance** (match) your caloric intake with enough physical activity to maintain a healthy weight. Unit 3 provides more information about healthy diets, including recommendations for serving sizes.

variety including many different nutrient-dense foods in your diet

moderation consuming foods in reasonable amounts

balance matching calorie intake with enough physical activity to maintain a healthy weight

1.3c Food Is the Best Source of Nutrients and Phytochemicals

The most natural, reliable, and economical way to obtain nutrients and beneficial phytochemicals is to base your diet on a variety of "whole" and minimally processed foods. For most Americans, eating 100% raw foods isn't practical and, in some instances, it's unsafe. Many foods undergo some form of processing, such as peeling, refining, and heating, before they're eaten. Such treatments can make food safer and more convenient to eat.

Plant foods naturally contain a variety of nutrients and phytochemicals, but processing the foods often removes some of the most healthful parts. For example, a wheat kernel is stripped of its germ and outer hull (*bran*) during refinement into white flour **(Fig. 1.8).** Wheat germ is a rich source of vitamin E and beneficial ("healthy") fats. Wheat bran contains fiber and certain phytochemicals, and it's a concentrated source of several micronutrients. The endosperm is primarily starch (a form of carbohydrate) with some protein and very small amounts of micronutrients and fiber. A "whole grain" includes the bran and germ portions of the kernel along with the endosperm. By replacing refined grain products, such as white bread, with 100% whole-grain products, you can increase the likelihood of obtaining a wide variety of nutrients and phytochemicals.

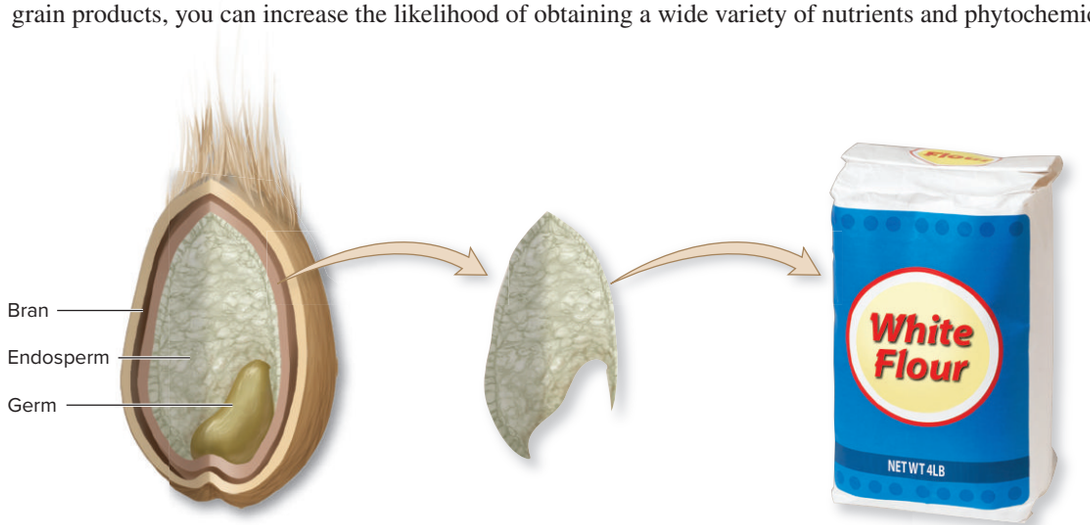


Figure 1.8 What is white flour? During refinement, a wheat kernel is stripped of its nutrient-rich germ and bran. The endosperm (white flour) that remains is mostly starch.

■ *Why is it important to choose a variety of foods, especially those that are whole or minimally processed?*

Cactus, Cactus fruit: Wendy Schiff; White flour: Michael Scott/McGraw-Hill Education

For each nutrient, there is a range of safe intake.

Should You Take Nutrient Supplements?

Your body is designed to obtain nutrients from foods, not supplements. In some instances, nutrients from food are more available—that is, more easily digested and absorbed than those in supplements.

It's important to understand that nutrient supplements don't contain everything you need for optimal nutrition. For example, they don't contain the wide variety of phytochemicals found in plant foods. Although supplements that contain phytochemicals are available, they may not provide the same healthful benefits as those obtained by consuming the plants that contain these substances. Why? Nutrients and phytochemicals may need to be consumed together to provide desirable effects in the body. Food naturally contains combinations of these chemicals in very small amounts and certain proportions. There's nothing "natural" about gulping down handfuls of supplements.

For each micronutrient, there's a range of safe intake. In their natural states, most commonly eaten foods contain safe levels of micronutrients. However, you can develop health problems by taking high doses of dietary supplements that contain vitamins and/or minerals.

1.3d There's No "One Size Fits All" Approach to Good Nutrition

By using food guides presented in Unit 3, you can individualize your diet so that it's nutritionally adequate and suits your food likes and dislikes, budget, and lifestyle. Individualizing a diet doesn't mean only eating foods that "match" your blood type, hair color, personality, or shoe size. If someone promotes a diet based on such personal traits, steer clear of the diet and the promoter. Consider this: Human beings wouldn't have survived as a species for thousands of years if their diets had to be matched to physical characteristics or personalities.

It's important to note that nutritional needs of healthy people vary during different stages of their lives. Thus, infants, children, pregnant women, and older adults often need nutrient supplements to boost their nutrient intakes. Additionally, physicians often prescribe nutrient supplements or special diets for chronically ill people.

1.3e Foods and Nutrients Aren't Cure-Alls

Although specific nutrient deficiency diseases can be cured if you eat foods that contain the nutrient that's missing or is in short supply, nutrients don't "cure" other ailments. Diet is only one aspect of yourself that influences your health. Other lifestyle factors as well as genetics and environment also play major roles in determining your health status.

Although a pregnant woman may choose nutritious foods, she still may need to take a special nutrient supplement during this stage of her life.

Vladimir Pcholkin/Getty Images USA, Inc.

What *IS* That?

Pitaya (or pitahaya) is the fruit of a night-blooming cactus that's also called "dragon fruit." Although some farmers in Florida and California grow species of cactus that produce sweet pitaya (usually *H. undatus*), most of the pitayas that are available in grocery stores have been imported from Vietnam, a country in Southeast Asia.

Depending on the variety of cactus, pitayas can have white, red, or purplish-pink pulp that's dotted with numerous tiny, black seeds. Although the seeds are edible, they're not digested by the intestinal tract, and, as a result, can have a mild laxative effect.

Before eating a fresh pitaya, wash the skin. Then, slice the fruit in half, remove the peel, and cut the pulp into bite-size pieces. Because sweet pitaya can have a bland taste (especially the fruit with white pulp), it's often blended with more flavorful fruits to make juice.

A 3.5-ounce serving of bite-size pitaya cubes supplies 60 kcal, mostly from natural sugars. Fresh pitaya isn't a nutrient-dense food, but the fruit is low in sodium and fat, and a serving adds about 3 grams of fiber and a small amount of vitamin C to diets. Varieties of pitaya that have red pulp are a rich source of plant pigments called *betalains*, which may act as antioxidants in the body. Nevertheless, there's a lack of scientific evidence that pitayas have healthful benefits for humans. If you occasionally eat large amounts of pitayas with red pulp, expect your urine and stools to become red temporarily.[7]

What Are Functional Foods?

Many foods and beverages are manufactured for specific health-related functions. Although there's no legal definition for *functional foods,* such products have health-related purposes.[8] Functional foods are often made to boost nutrient intakes or help manage specific health problems. For example, you can increase your calcium intake by purchasing orange juice that has the mineral added to it. Certain margarine substitutes contain beneficial fats and phytochemicals that may lower the risk of heart disease. Many yogurt products contain specific forms of bacteria that may relieve diarrhea. These bacteria are *probiotics*—that is, living microorganisms that can benefit human health (see Unit 4). Although some functional foods can help people improve their health in other ways, more research is needed to determine their benefits as well as possible harmful effects.

This "buttery spread" is an example of a functional food.

1.3f Some Closing Thoughts

By applying what you learn about nutrition and the role of diet in health, you may be able to live longer and healthier as a result. Furthermore, you may become a more careful consumer of nutrition-related information by studying the content of this textbook. You must eat to live, so you'll have plenty of opportunities to use the information and, in some instances, develop new food-related attitudes and habits. Enjoy!

Basic components of a healthy meal

Dragon fruit, Smart Balance, Plate of bread, fruit, vegetables: Wendy Schiff; Tablecloth: cheminsnumeriques/Getty Images USA, Inc.

In a Nutshell

Module 1.1 Why Learn About Nutrition?

- Many factors, including friends, income, and cultural/ethnic background, influence personal food choices.
- Lifestyle choices, including poor eating habits and lack of physical activity, contribute to the development of many of the leading causes of premature deaths for American adults, including heart disease, cancer, stroke, and diabetes. You may be able to live longer and be healthier by applying what you learn about nutrition and the role of diet and health.
- Chronic diseases, such as heart disease and cancer, are long-term health problems that generally have multiple risk factors. A risk factor is a personal characteristic such as family history and lifestyle practices that increases your chances of developing such diseases. There are ways you may be able to reduce your risk of developing a chronic disease, especially one that's among the leading causes of death in the United States. Such actions include modifying your diet, increasing your physical activity, and improving other aspects of your lifestyle.

Module 1.2 Nutrition Basics

Stan Sholik/Alamy

- Nutrients are chemicals in foods that the body needs for proper functioning. Nutrition is the scientific study of nutrients and how the body uses them. There are six classes of nutrients: carbohydrates, lipids, proteins, vitamins, minerals, and water.
- The body needs certain nutrients for energy, growth and development, and regulation of processes, including the repair and maintenance of cells. The human body can make many nutrients, but about 50 of these chemicals are dietary essentials that must be supplied by food because the body doesn't produce them or make enough to meet its needs.
- Plant foods naturally contain a variety of phytochemicals, substances that aren't classified as nutrients yet may have healthful benefits. Many phytochemicals are antioxidants that protect cells from being damaged or destroyed by exposure to certain environmental factors. However, some phytochemicals are toxic.

xefstock/Getty Images USA, Inc.

- Every cell needs energy. Calories or kilocalories (kcal) are used to indicate the energy value in food. A gram of carbohydrate and a gram of protein each supplies about 4 kcal; a gram of fat provides about 9 kcal. Although alcohol isn't a nutrient, a gram of pure alcohol furnishes 7 kcal.
- Carbohydrates, fats, and proteins are referred to as macronutrients because the body needs relatively large amounts of these nutrients daily. Vitamins and minerals are micronutrients because each day, the body needs very small amounts. Although the body requires large amounts of water, this nutrient provides no energy and isn't usually classified as a macronutrient.

Module 1.3 Key Nutrition Concepts

- Most naturally occurring foods are mixtures of nutrients, but no food contains all the nutrients needed for optimal health. Thus, nutritionally adequate diets include a variety of nutrient-dense foods that are consumed in moderation. It's also important to balance calorie intake with physical activity to avoid unwanted weight gain.
- Instead of classifying foods as "good" or "bad," you can focus on eating all foods in moderation and limiting foods and beverages that are sources of empty calories.
- For each nutrient, there's a range of safe intake.
- Healthy people should rely on eating a variety of foods to meet their nutrient needs instead of taking nutrient supplements.
- Although nutrients are vital to good health, foods and the nutrients they contain are not cure-alls. There's no "one size fits all" approach to planning a nutritionally adequate diet.

What's in Your Diet?!

1. If you purchase food regularly, keep your grocery store receipts for a week.
   a. How much money did you spend on the foods you purchased at these markets?
   b. Which foods were the most expensive?
   c. How much do you spend on food and beverages that supply a lot of empty calories, such as salty snacks, cookies, soft drinks, and candy?
   d. What percentage of your food dollars was spent on foods that were high in empty calories? _____ (Divide the amount of money you spent on such foods by the total cost of food for the week. Move the decimal point over 2 places to the right and place a percent sign after the number.)
   e. How much money did you spend on nutrient-dense foods, such as whole-grain products, peanut butter, eggs, fruits, and vegetables?
   f. What percentage of your food dollars was spent on nutrient-dense foods? _____ (Divide the amount of money you spent on nutrient-dense foods by the total cost of food for the week. Move the decimal point over 2 places to the right and place a percent sign after the number.)
2. For one week, keep a detailed log of your usual convenience store purchases, including the item(s) purchased and amount of money you spent for each purchase.
   a. What types of foods and beverages did you buy from the stores?
   b. How many soft drinks did you consume each day that were purchased at convenience stores?
   c. How much money did you spend on foods and beverages that were purchased at convenience stores?
   d. Based on this week's convenience store food and beverage expenditures, estimate how much money you spend on such purchases in a year.
3. For one week, keep a detailed log of the foods and beverages that you bought from fast-food restaurants and food trucks. Record when you made the purchases and the amount of money you spent on them.
   a. According to your weekly record, how often do you buy food from fast-food places?
   b. What types of foods did you usually buy?
   c. How much money did you spend on fast foods?
   d. Based on this week's expenditures, estimate how much money you spend on fast-food purchases in a year.
4. Over the past month, did you purchase dietary supplements? If your response is "Yes," which product or products did you purchase? _____
   _____
   How much did you spend on such products? _____
5. Over the past month, did you buy coffee at commercial coffee outlets? If your response is "Yes," which kinds of coffee did you purchase and how were they prepared? _____
   How much did you spend on such products? _____

Annabelle Breakey/Getty Images USA, Inc.

Michaela Stejskalov/Hemera/ Getty Images USA, Inc.

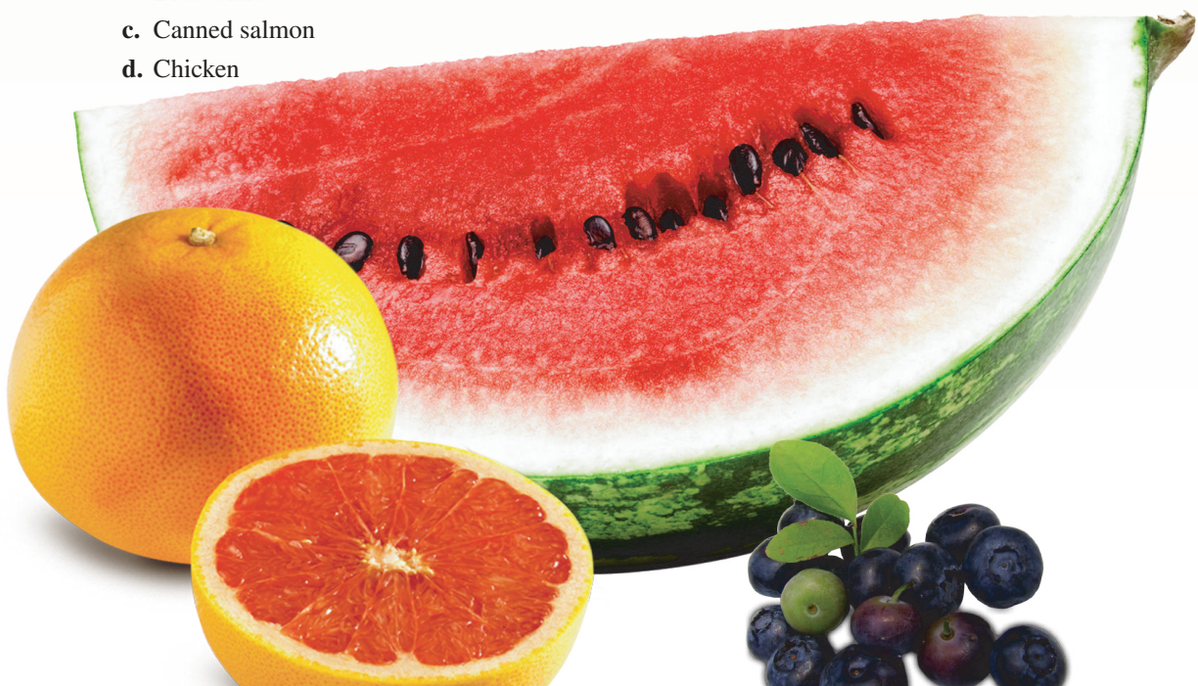
Consider This...

1. Identify at least six factors that influence your food and beverage selections. Which of these factors is the most important? Explain why.
2. "Everyone's on a diet." Explain why this statement is true.
3. Consider your current eating habits. Explain why you think your diet is or isn't nutritionally adequate.
4. If you were at risk of developing a chronic health condition that could be prevented by changing your diet, would you make the necessary changes? Explain why or why not.
5. "Everything in moderation." Explain what this statement means in terms of your diet.
6. Recall everything that you ate or drank in the past 24 hours. Identify the foods that were energy dense, nutrient dense, or high in empty calories. Are you interested in changing your intake of such foods? Explain why or why not.

Test Yourself

Select the best answer.

1. Diet is a
   - **a.** practice of restricting energy intake.
   - **b.** pattern of food choices.
   - **c.** method of reducing portion sizes.
   - **d.** technique to reduce carbohydrate intake.
2. Which of the following health conditions isn't one of the 10 leading causes of death in the United States?
   - **a.** Cancer
   - **b.** Diabetes
   - **c.** Arthritis
   - **d.** Stroke
3. Which of the following substances is a nutrient that provides energy?
   - **a.** Glucose
   - **b.** Water
   - **c.** Alcohol
   - **d.** Vitamin C
4. _____ refers to all chemical processes that occur in living cells.
   - **a.** Physiology
   - **b.** Catabolism
   - **c.** Anatomy
   - **d.** Metabolism
5. Phytochemicals
   - **a.** are essential nutrients.
   - **b.** generally have no effects on health.
   - **c.** should be avoided.
   - **d.** are in plant sources of food.
6. Which of the following foods is energy and nutrient dense?
   - **a.** Strawberries
   - **b.** Peanuts
   - **c.** Fat-free milk
   - **d.** Iceberg lettuce
7. Which of the following foods is a rich source of phytochemicals?
   - **a.** Egg whites
   - **b.** Blueberries
   - **c.** Canned salmon
   - **d.** Chicken



Watermelon: Digital Vision/Getty Images; Pink grapefruit: Purestock/SuperStock; Blueberries: Wendy Schiff

8. Which of the following conditions is a chronic disease?
   - **a.** Heart disease
   - **b.** Upset stomach
   - **c.** Broken rib
   - **d.** Common cold

9. In the United States, the primary cause of preventable deaths is
   - **a.** tobacco use.
   - **b.** auto accidents.
   - **c.** high-fat diet.
   - **d.** excessive alcohol intake.

10. A serving of food contains 20 g carbohydrate, 6 g protein, and 9 g fat. Based on this information, a serving of this food supplies ____ kcal.
    - **a.** 64
    - **b.** 124
    - **c.** 162
    - **d.** 185

11. Which of the following items is high in empty calories?
    - **a.** Cottage cheese
    - **b.** Chocolate chip cookie
    - **c.** Green grapes
    - **d.** Egg yolk

12. Which of the following foods is the most nutrient dense?
    - **a.** 15 French fries
    - **b.** 1 celery stalk
    - **c.** 1 tablespoon butter
    - **d.** 1/2 cup raspberries

13. Which of the following substances isn't a dietary supplement?
    - **a.** Iron
    - **b.** Alcohol
    - **c.** Vitamin A
    - **d.** Calcium

14. Which of the following foods supplies all of the essential nutrients for human beings?
    - **a.** Whole milk
    - **b.** Lean meat
    - **c.** Whole eggs
    - **d.** None of these is correct.

15. Which of the following statements is false?
    - **a.** A healthy diet can be individualized to suit a person's budget and lifestyle.
    - **b.** For each nutrient, there is a range of safe intakes.
    - **c.** Vitamin and mineral supplements contain every substance needed for optimal nutrition.
    - **d.** Food processing can make raw foods safer to eat.

Fuse/Getty Images

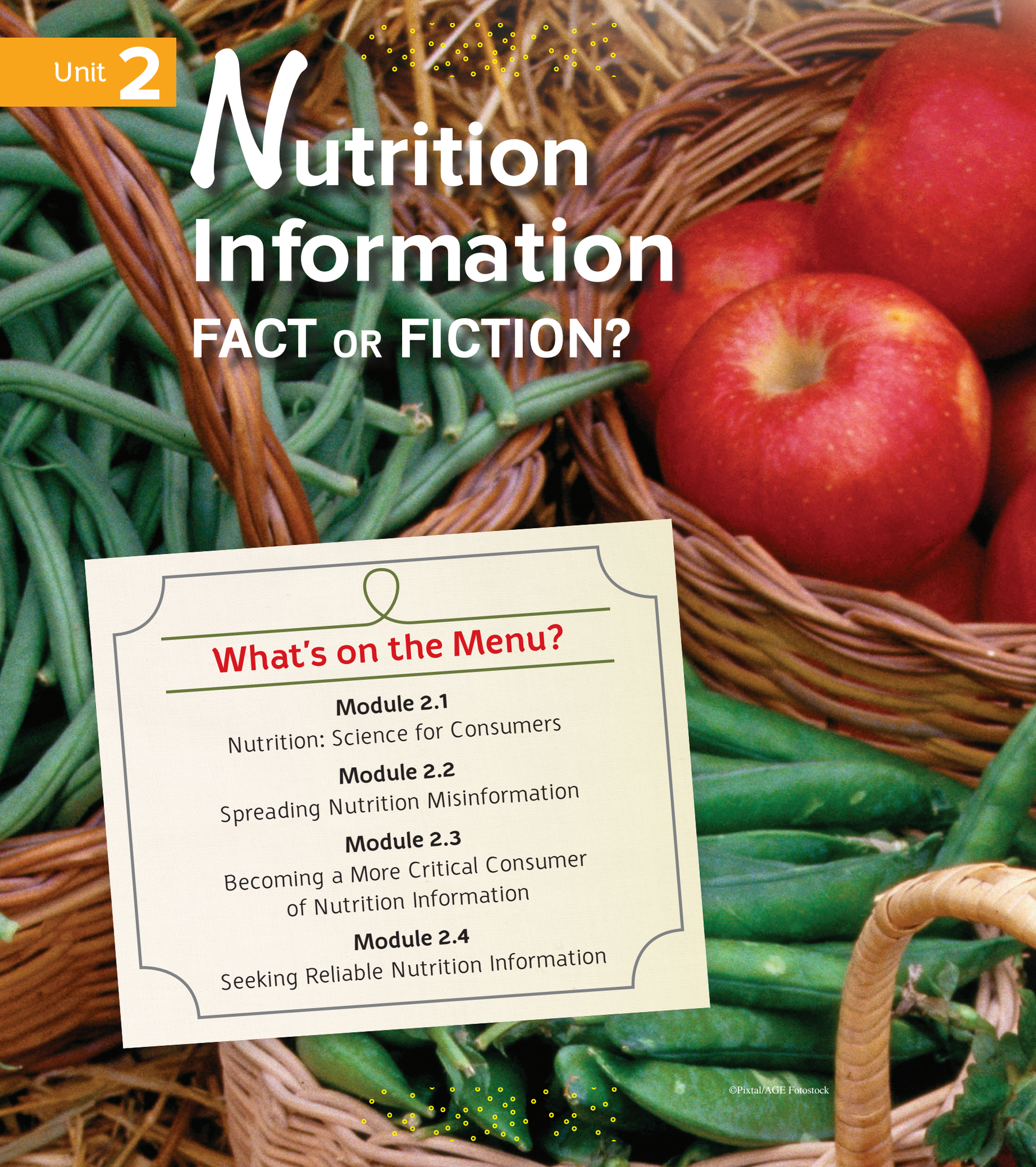
Answers: 1. b 2. c 3. a 4. d 5. d 6. b 7. b 8. a 9. a 10. d 11. b 12. d 13. b 14. d 15. c

Answer This (Module 1.2c)

Iron and vitamin C are micronutrients; they provide no calories.

References

See Appendix D.



Unit 2

Nutrition Information

FACT OR FICTION?

What's on the Menu?

Mary Wester

"I believe in taking care of myself, because I want to be as healthy as possible and live a long life. My diet is healthy . . . I eat mostly whole foods, including lean meats, fruits, and vegetables, but I also take a supplement. It's not a pill; it's a green 'superfood' supplement powder that has the nutritional benefits of several fruits and vegetables. Sometimes I mix the powder with flavored water to hide the taste. You honestly have to plug your nose and chug the stuff."

"Drinking a serving of the green superfood supplement is equal to eating servings of 11 different fruits and vegetables. I really think it helps me, especially my skin. Before I used the supplement, I had a lot of skin blemishes. Since I've been taking it, my skin is clearer, and I have more energy and feel better."

Mary Wester

Wendy Schiff

Mary Wester is a senior majoring in nursing at the University of South Dakota. As a nursing major, she's learned about foods and the importance of following a healthy diet, but she sometimes finds it's difficult to take the time to prepare and eat nutrient-dense foods. She's busy taking college classes, training and participating in competitive athletics (track and field), and working part time. To help maintain her good health, she uses the green superfood supplement as dietary "insurance."

Mary's positive experience with the green superfood supplement is intriguing, but it's an anecdote. Anecdotes are reports of one's personal experiences. Although they can be interesting, anecdotes aren't scientific evidence. Would you buy the green superfood supplement and regularly consume the unpleasant-tasting beverage made with it because Mary thinks it improves her health? How can you find out whether the product is safe to use and actually provides health benefits?

We consume food, and we consume nutrition information. Magazines, books, ads, the Internet, and even family members and friends contribute to the "flood" of nutrition information. Unfortunately, much of this information isn't supported by scientific evidence. The challenge is learning how to be a skeptical consumer who questions the reliability of nutrition-related information, including anecdotes and manufacturers' health claims. This unit takes a closer look at how scientists collect information that relates to nutrition. The unit also provides practical tips for judging the honesty and reliability of popular sources of nutrition information, such as Internet sites and magazine articles.

Module 2.1

Nutrition: Science for Consumers

2.1 - Learning Outcomes

After reading Module 2.1, you should be able to

1. Define all of the **key terms** in this module.
2. List the basic steps of the scientific method as it relates to nutrition research in general.
3. Discuss ways that scientists conduct nutrition-related research that involves human subjects.
4. Explain why results of similar studies can provide different findings.

Vasiliy Koval/Shutterstock

In the past, nutrition facts and recommended dietary practices were often based on intuition, common sense, "conventional wisdom" (tradition), or **anecdotes** (reports of personal experiences). Today, registered dietitians and other nutrition experts discard conventional beliefs, explanations, and practices when the evidence obtained by current scientific research no longer supports them.

2.1a Collecting Science-Based Evidence

Scientists generally use the *scientific method* to answer questions about natural and physical observations. Scientists, for example, have answered questions such as: "How does the stomach break down food proteins?" "Why do babies need the mineral iron to develop normally?" and "Why is vitamin C necessary to maintain good health?"

An **experiment** is a way of testing a scientific question. Because of safety and ethical concerns, nutrition scientists often conduct experiments on small mammals before performing similar research on humans. Certain kinds of mice and rats are raised for experimentation purposes. The rodents are inexpensive to house in laboratories, and their food and other living conditions can be carefully controlled. Researchers control conditions that are not being tested, such as the ways the animals are handled and the kinds of physical activity the animals receive. Otherwise, their findings are likely to be unclear or inaccurate.

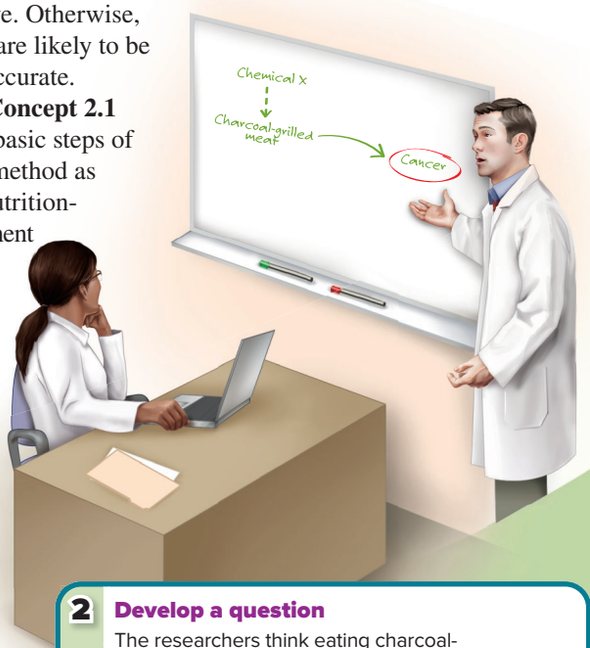
Essential Concept 2.1 describes the basic steps of the scientific method as applied to a nutrition-related experiment involving laboratory mice.

Essential Concept

2.1 Applying the Scientific Method

1 Observe

Scientists observe a group of hospitalized patients who have stomach cancer. After obtaining dietary information from all the patients, the researchers determine that the patients with stomach cancer eat more charcoal-grilled meat than other people who are the same age but don't have stomach cancer.



2 Develop a question

The researchers think eating charcoal-grilled meat increases the risk of stomach cancer. They develop a question: "Chemical X is only in meat that has been charcoal grilled. If chemical X is given to a group of laboratory mice for 6 months, will they develop more cases of stomach cancer than mice that have not eaten chemical X?"

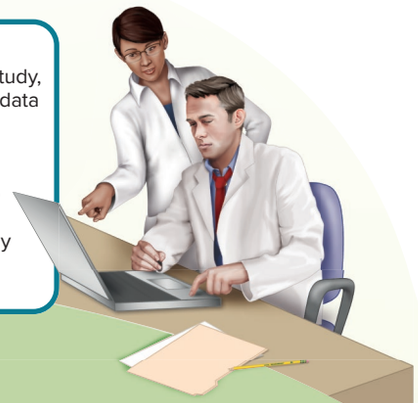
anecdotes reports of personal experiences

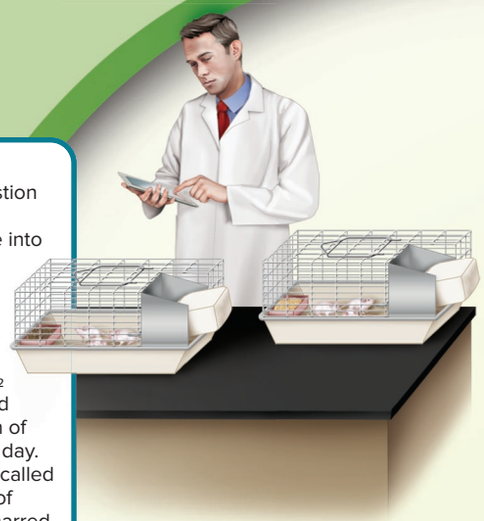
experiment a way of testing a scientific question

peer review expert critical analysis of a research article before it's published

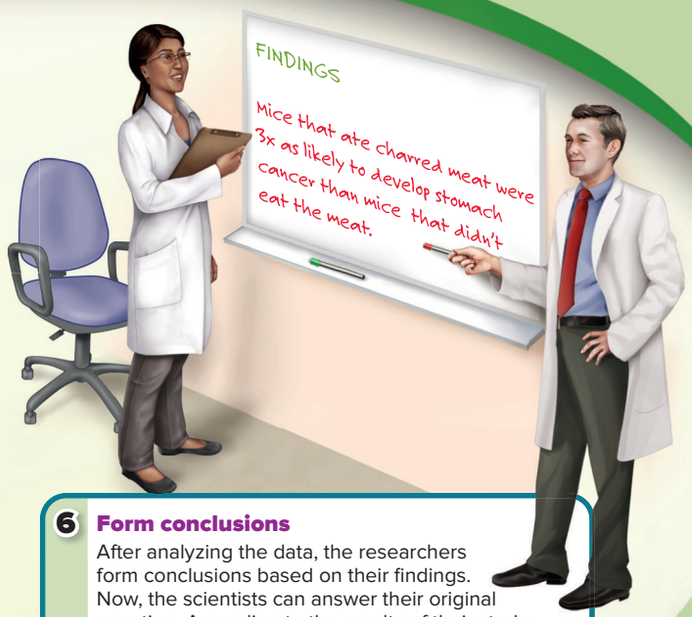
4 Collect information
Every month the researchers collect information (*data*) about each mouse.

5 Analyze the findings
At the end of the 6-month study, the scientists review all the data and use statistical tests to analyze the findings. The researchers are particularly interested in comparing the health of the two groups of mice, especially whether any of the mice developed stomach cancer.



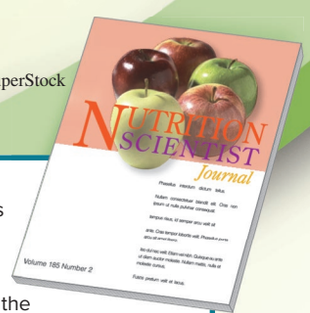


3 Test
The scientists test the question by dividing a group of 100 3-week-old laboratory mice into two groups that have 50 mice in each group. One group of mice in the study (subjects) is the treatment (or experimental) group. Each of these mice is fed ½ teaspoon of charcoal-grilled meat along with their ration of regular mouse chow every day. The other group of mice is called the control group. Instead of receiving ½ teaspoon of charred meat, mice in the control group only eat the mouse chow.



6 Form conclusions
After analyzing the data, the researchers form conclusions based on their findings. Now, the scientists can answer their original question. According to the results of their study, the mice that consumed the charred meat were more likely to develop stomach cancer, compared to the mice that didn't eat the charred meat.

Purestock/SuperStock



7 Share the results
The team shares the results of their findings, usually by preparing an article that describes the study and its findings. The team submits the article to the editor of a scientific journal. The article undergoes **peer review**—that is, the editor sends copies of the article to a group of peer reviewers—scientists who are qualified to judge the findings presented in the article. The researchers don't know the identities of the peer reviewers. If the peer reviewers accept the study's findings as being scientifically reliable, the journal's editor agrees to publish the article.

8 Conduct more research
After reading the article in the journal, other researchers conduct more research to examine the original question. Scientists do not accept the results of the study until the findings are supported by evidence from more studies, especially those conducted by different researchers.

TASTY Tidbits

Placebos can produce beneficial results, particularly in subjects who have conditions that involve pain.[1] Because participants in the control group believe they are receiving a real treatment, their faith in the "treatment" can stimulate the release of chemicals in the brain that alter pain perception, reducing their discomfort. Therefore, when people report that a treatment was helpful, they may not have been imagining the positive response, even when they were taking a placebo. This is because the chemicals released in the brain actually relieved the pain.

double-blind study experimental design in which neither the participants nor the researchers are aware of each participant's group assignment

treatment group group being studied that receives a treatment

Human Intervention Studies

Researchers must be careful when applying the results of laboratory experiments involving animals to people because of the many differences between people and "lab" animals. Nutrition scientists, however, do conduct experimental (intervention) studies using humans to obtain information about health conditions (outcomes) that can result from specific dietary practices. In such instances, scientists often design a double-blind study. In a **double-blind study,** the researchers and subjects don't know which participants are assigned to the **treatment** and **control groups.** Maintaining such secrecy is important during the course of a study because researchers and subjects may try to predict their group assignments. If the investigators who interview the participants are aware of their individual group assignments during the study (a single-blind study), they may convey clues to each subject. For example, a researcher's tone of voice or body language could influence a subject's belief about being in the experimental or control group. Subjects who think they're in the control group may report no changes in their condition. Ideally, subjects shouldn't be able to figure out their group assignment during the study.

When conducting double-blind studies, researchers provide all study participants with the same instructions and a "treatment," such as a dietary supplement or experimental food. However, only members of the treatment group actually receive the treatment. Subjects in the control group are given a placebo.

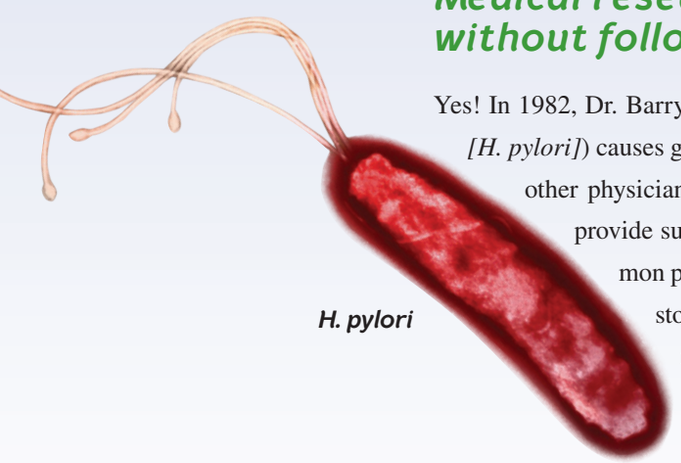
Placebos are not simply "sugar pills"; they are a fake treatment, such as a sham pill, injection, or medical procedure. If the treatment is a pill, the placebo pill looks, tastes, and smells like the pill that contains the active ingredient that is given to the subjects in the treatment group. The placebo pill, however, contains substances that don't produce any measurable physical changes. Providing placebos to members of the control group enables scientists to compare the extent of the treatment's response with that of the placebo.

What Is the Placebo Effect? People often report positive or negative reactions to a treatment even though they received the fake treatment. If a patient believes a medical treatment will improve his or her health, the patient is more likely to report positive results for the therapy. Such wishful thinking is called the **placebo effect.**

At the present time, there is little scientific evidence to support claims that dietary supplements are "superfoods" with exceptional health benefits. For example, people who drink a "green" superfood dietary supplement may believe their health has improved as a result. Such positive beliefs may be the result of the placebo effect. On the other hand, the people who use the green supplement might be experiencing positive effects that have not been considered or measured by researchers. As more people consume green superfood dietary supplements, scientists are likely to conduct studies to determine whether the products actually have any effects on health, including negative ones.

Nutrition Fact or Fiction?

Medical researchers can make important discoveries without following the scientific method.



H. pylori

Yes! In 1982, Dr. Barry Marshall and Dr. Robin Warren proposed that a type of bacterium (*Helicobacter pylori [H. pylori]*) causes gastritis, inflammation of the stomach lining.[2] Gastritis can lead to stomach ulcers. Initially, other physicians were skeptical about this notion because it challenged traditional medical beliefs. To provide support for his idea, Marshall experimented on himself, which is very risky and not a common practice among scientists. He actually swallowed some of the bacteria and developed severe stomach inflammation as a result. Because of Dr. Marshall's daring experiment, physicians now accept the notion that *H. pylori* is a primary cause of gastritis and stomach ulcers. Today, people who have ulcers and *H. pylori* in their stomachs are treated with antibiotics that kill the bacterium. Unit 4 has more information about stomach ulcers.

Single purple pill, Pill and bottle: Wendy Schiff; *Helicobacter pylori* bacterium: Heather Davies/Science Source

What *IS* That?

Wendy Schiff

Pomegranate (*Punica granatum*) is a leathery-skinned fruit that is filled with pockets of edible, juicy seeds that have a sweet, tangy taste. In the United States, pomegranates are grown mostly in California, but the plant is native to northern India, the Mediterranean region, and certain Middle Eastern countries. Pomegranate seeds are often crushed and strained to collect their juice. People from countries that have grown and eaten pomegranates for centuries may use a syrup (pomegranate "molasses") made from the fruit to flavor meat marinades and add to desserts. You may be able to find pomegranate syrup in markets that specialize in selling global food products.

When compared to other fruits, pomegranate juice has very high contents of phytochemicals with antioxidant activity. Nevertheless, results of scientific studies fail to provide good evidence that the juice is useful for reducing the risk of serious health problems such as heart disease. Pomegranate juice, however, may help prevent infections and reduce inflammation in people who have kidney disease.[3]

Although pomegranate is high in phytochemicals, it's not a good source of most vitamins and minerals. A ½-cup serving of 100% pomegranate juice supplies 67 kcal and 265 mg of potassium.

Population Studies

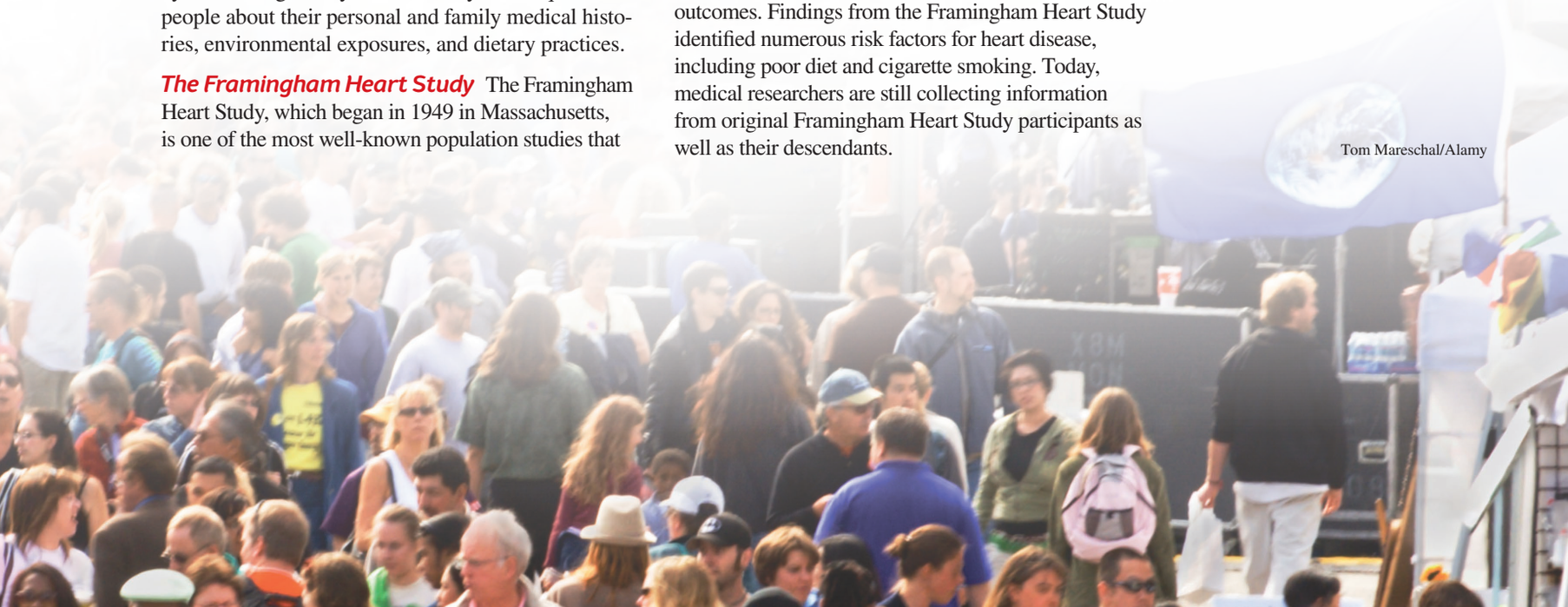
For decades, nutrition scientists have noted differences in rates of chronic diseases and causes of death among various populations. To understand why these differences exist, researchers rely on physical examinations, such as height and weight measurements, of large numbers of people to obtain health data. Additionally, they may collect information about a specific population's health and food-related practices by conducting surveys. Such surveys often question people about their personal and family medical histories, environmental exposures, and dietary practices.

The Framingham Heart Study The Framingham Heart Study, which began in 1949 in Massachusetts, is one of the most well-known population studies that relates to nutrition. At the beginning of the study, the over 5000 healthy participants underwent physical examinations and were questioned about their family and personal medical histories as well as their dietary and other lifestyle practices. Over the following years, a group of medical researchers periodically collected information concerning each participant's health and, if the person died, the cause of death. The scientists analyzed this information and found relationships among a variety of personal characteristics and health outcomes. Findings from the Framingham Heart Study identified numerous risk factors for heart disease, including poor diet and cigarette smoking. Today, medical researchers are still collecting information from original Framingham Heart Study participants as well as their descendants.

control group group being studied that does not receive a treatment

placebo fake treatment, such as a sham pill, injection, or medical procedure

placebo effect response to a placebo



Tom Mareschal/Alamy

2.1b Confusion and Conflict

Getty Images

One day, the news media highlight research about the health benefits of eating garlic, dark chocolate, brown rice, or cherries. A few weeks later, the media report the results of new scientific investigations that don't support the earlier findings. Consumers often become confused and disappointed when they learn about conflicting results generated by nutrition studies. As a result, some people think nutrition scientists don't know what they are doing. Why can't scientists agree and provide proof that eating specific foods benefits health?

Conflicting findings often result from differences in the ways that various studies are designed. Even when investigating the same question, different groups of scientists often conduct their studies and analyze the results differently. For example, the numbers, ages, and physical conditions of people who participate in each study (*subjects*), the type and length of the study, the amount of the treatment provided, and the methods used to analyze results typically vary among studies. Furthermore, situational, genetic, behavioral, and environmental differences among individuals account for much of the variation in the ways they respond to a treatment. Not only are people genetically different, they also have different lifestyles, and they typically recall or report dietary information and follow instructions concerning health care practices differently. These and other factors can influence the results of nutrition research involving human subjects. This is why dietary recommendations shouldn't be made from the results of a single study. The popular media, however, often report the findings of a study if they're sensational, that is, they grab your attention.

What's Research Bias?

Scientists expect other researchers to avoid relying on their personal attitudes and biases ("points of view") when collecting and analyzing data, and to evaluate and report their results objectively and honestly. However, the funding sources of scientific research may have certain expectations or biases about research outcomes. As a result, such groups are more likely to finance studies of scientists whose research efforts support their interests. The beef industry, for example, might not fund scientific investigations to find connections between high intakes of beef and the risk of certain cancers. On the other hand, the beef industry might be interested in supporting a team of scientists whose research indicates that a high-protein diet that contains plenty of beef is beneficial for people who are trying to lose weight.

Peer-reviewed journals usually require authors of articles to *disclose* (mention) their affiliations and sources of financial support. (Peer review is discussed in Essential Concept 2.1.) Such disclosures might appear either on the first page or at the end of the article. By having this information, readers can decide whether research bias may have influenced the researchers. For example, you read an article in what appears to be a scientific journal that describes a study about the numerous health benefits of drinking apple cider vinegar. The article provides the names of the researchers who authored the article and their disclosure statement. According to the disclosure, all of the authors work for the same company. While searching for information about the company, you discover it manufactures apple cider vinegar. How reliable or biased would you rate the researchers' findings? Although peer review helps ensure that the scientists are as ethical and objective as possible, it's impossible to eliminate all research bias.

What kinds of nutrition-related research are likely to be funded by the beef industry?

Carson Ganci/Design Pics

Cause and Effect

Population studies involving people and their eating practices generally cannot establish *cause and effect*—that is, whether a practice is responsible for an outcome. When two different natural events occur simultaneously within a population, it doesn't necessarily mean they're related to each other. For example, when a population's intake of sugar-sweetened soft drinks increases, the percentage of overweight people in the population also increases. Does this prove that drinking sugary soft drinks causes weight gain? Not necessarily. What appears to be a relationship between a dietary practice and a physical outcome could be a coincidence—that is, a chance happening.

In cases involving chronic diseases such as heart disease and cancer, it is difficult to prove that a single factor is responsible for the development of the condition. Multiple risk factors, including your *genetic susceptibility* (inherited proneness) to develop the disease, usually influence whether you'll develop a chronic disease. Other factors that play a role in the development of heart disease include high blood pressure, age, tobacco use, and intake of certain fats. Unit 6 provides more information about heart disease.

Bottle of soft drink: scanrail/Getty Images; Sugar: Wendy Schiff

Q Answer This

Lemonade consumption increases in the summer, and drowning deaths also increase in the summer. Does this prove that drinking lemonade increases the risk of drowning? This answer is on the last page of this unit.

What *IS* That?

Wendy Schiff

For centuries, people in Asia have used the *rhizomes* (*rye'-zhomes*), fleshy underground stems, of the tropical plant ginger (*Zingiber officinale*) to treat stomach pain, nausea, and diarrhea.[4] Popular forms of ginger include fresh or candied rhizomes, ginger extracts, and the dried, powdered seasoning that many Americans enjoy in pies and cakes.

Eating small amounts of ginger for a short time may be a safe way to relieve "morning sickness"—the nausea and vomiting that often accompany early pregnancy. However, pregnant women should always check with their physicians before taking dietary supplements. If you consume ginger, particularly the powdered form of the herb, you may experience side effects, including intestinal gas and heartburn.

Culture & Cuisine

During the first 350 years after the discovery of the New World, most of the people who immigrated to North America (excluding African slaves) were from western European countries. Western European immigrants generally followed a "meat-and-potatoes" diet. Main meals typically included a large portion of fatty red meat (beef, pork, or mutton [flesh of adult sheep]) served with boiled or mashed white potatoes, gravy, white breads, and butter. Salt was used as a seasoning and preservative. Today, the mainstream American diet, which is sometimes referred to as the "Western" diet, still provides large amounts of fatty red meat (primarily beef or pork) and white potatoes (usually peeled and fried), but the diet also contains generous amounts of processed meats, such as sausage, ham, and bacon; salt; sugar; and refined (white) flour products. The mainstream American diet lacks fruit, whole grains, nuts, and a variety of vegetables. Populations that follow this food pattern generally have high rates of certain chronic diseases, particularly heart disease, cancer of the large intestine, and type 2 diabetes, which are discussed in later units of this textbook.

Ernie Friedlander/Cole Group/Getty Images

Module 2.2

Spreading Nutrition Misinformation

2.2 - Learning Outcomes

After reading Module 2.2, you should be able to

1. Define all of the **key terms** in this module.
2. Explain the difference between an anecdote and a testimonial.
3. Explain why there is so much nutrition misinformation.

If you think you already know a lot of nutrition facts, what were your sources of the information? Did you rely on magazines or the Internet? Why did you think these sources were trustworthy? In many instances, such popular sources of nutrition information are not reliable. Let's take a closer look at why you need to be careful when seeking nutrition information and advice.

2.2a Anecdotes and Testimonials

The host of a popular TV program interviews an attractive, young actress who claims to have lost a lot of weight after she started taking weight-loss pills made from a rare type of cactus. A few days later, a friend mentions that she's lost 3 pounds since she began taking this product a week ago. You'd like to lose a few pounds without restricting your food intake or exercising. Should you take this dietary supplement? It's promoted by the TV show host and helped the actress and your friend. Perhaps it will help you.

Although the TV show host is a likable person who seems to be honest and the personal experiences of the actress and your friend seem to provide evidence that the weight-loss supplement is effective, can you trust their judgment?

The actress's information is a **testimonial,** a personal endorsement of a product. People are usually paid to provide their testimonials for advertisements; therefore, their remarks might be biased in favor of the product. Your friend's experience with the weight-loss product is an anecdote, as is Mary's experience with a green superfood dietary supplement (see this unit's opener). When your source of nutrition information is a testimonial or an anecdote, it's not scientific. If the nutrition information is in an advertisement, you cannot be sure that the information is based on scientific facts. Thus, testimonials, anecdotes, and ads aren't reliable sources of nutrition information.

testimonial personal endorsement of a product

2.2b A Matter of Mistrust

Although people's lives have improved as a result of scientific advancements in medicine, many Americans mistrust the motives of scientists, dietitians, and other medical professionals. Promoters of nutrition misinformation use this mistrust to sell their products. For example, they may claim that physicians are more interested in making money than doing what's best for their patients, such as recommending dietary supplements. Are physicians driven by the desire to make money from their patients' illnesses? Do they hide information about natural cures from them?

It's true that physicians need incomes to support themselves and their families. However, people who tell you that the "medical/scientific establishment is hiding information about natural cures from you just to make money from your misery" are using *scare tactics* to build your mistrust in the medical establishment. Consider this: If your physician makes a mistake, you can sue him or her for malpractice. If you purchase a nutrition-related product or service, then your money enters the promoter's pockets. If the product or service doesn't live up to the promoter's claims or is harmful, what can you do?

As a group, physicians strive to diagnose and treat diseases using techniques that are scientifically tested for safety and effectiveness. Physicians have nothing to gain from concealing a cure from the public, but they have much to gain from treating their patients kindly and effectively. If you follow a physician's advice and have positive results, how likely are you to be that doctor's patient for a long time and recommend the practitioner to others?

TASTY Tidbits

You can often distinguish a peer-reviewed scientific journal from a popular magazine simply by looking at their covers and skimming their pages. Compared to scientific journals, popular magazines typically have

- More colorful, attractive covers and photographs;
- Articles that are shorter and easier for the average person to read; and
- Advertisements for products mentioned in articles.

Mark Dierker/McGraw-Hill Education

If your car breaks down, you probably would want people who have the best training, tools, and equipment to determine the problem and repair it. If you think something is wrong with your body, it's wise to seek information and opinions from medical professionals who have the best scientific training and experience to diagnose and treat health disorders.

2.2c Why Is There So Much Nutrition Misinformation?

People may think they've learned facts about nutrition by reading popular magazine articles or best-selling books, by visiting Internet websites, or by watching television news, commercials, infomercials, or home shopping network programs. In many instances, however, they've been misinformed. To be a careful consumer, you shouldn't assume that all nutrition information presented in the popular media is reliable. Why?

First Amendment Freedoms

The First Amendment to the U.S. Constitution guarantees freedom of the press and freedom of speech. As a result, people can provide nutrition information that's not true. Thus, the First Amendment doesn't protect consumers with freedom from nutrition misinformation or false nutrition claims.

The **U.S. Food and Drug Administration (FDA)** can regulate nutrition- and health-related claims on product labels, but the agency cannot prevent the spread of health and nutrition misinformation published in books or pamphlets or presented in television or radio programs. People who promote nutrition misinformation often profit from these freedoms. As a consumer, you are responsible for questioning and researching the accuracy of nutrition information as well as the credentials of the people making nutrition-related claims.

U.S. Food and Drug Administration (FDA) federal agency that regulates claims on product labels

larry1235/Shutterstock

Module 2.3

Becoming a More Critical Consumer of Nutrition Information

2.3 - Learning Outcomes

After reading Module 2.3, you should be able to

1. Define all of the **key terms** in this module.
2. Describe how you can become a more careful and critical consumer of nutrition information.
3. Identify common "red flags" that are signs of nutrition misinformation.
4. Describe how to identify reliable sources of nutrition information.

Mark Dierker/McGraw-Hill Education

The **Federal Trade Commission (FTC)** enforces U.S. consumer protection laws and investigates complaints about false or misleading health claims that are used in advertising. According to the FTC, Americans spend billions of dollars annually on fraudulently marketed and unproven health-related products and treatments that are often useless.[5] Claims for such products often promise cures for common and serious medical conditions, including obesity and cancer. When the products prove to be ineffective, the people who believed the claims and bought the products are cheated out of their money and, in some instances, their health declines as a result of wasting time using the worthless product.

If you're like most people, you don't want to waste your money on things you don't need or that are useless or potentially harmful. Promoters of worthless nutrition products often use clever marketing methods, including sensational claims about the products' effectiveness, to attract people to make unnecessary purchases. Skeptical people don't believe the claims without checking into them.

Source: Federal Trade Commission

Federal Trade Commission (FTC) federal agency that enforces U.S. consumer protection laws and investigates health claims

2.3a Becoming a More Skeptical Consumer

How can you become a more careful, critical consumer of nutrition-related information, products, or services? By being more *skeptical.*

1. Don't believe everything you hear or read about nutrition, including nutrition-related products or services.
2. Ask questions about the information's source. Why should you believe and trust the source?
3. Ask questions about the source's motives for promoting the information. Radio or TV programs that promote nutrition information as facts may actually be advertisements for profitable nutrition-related products or services.
4. Be wary of
   - ***Salespeople.*** Salespeople often have favorable biases toward the things they sell and, therefore, they may not be reliable sources of information about these products. Clerks in a dietary supplements store, for example, may wear a white lab coat to look as though they have a science or medical educational background. Keep in mind that the clerks were hired to sell dietary supplements and may have little or no scientific training. Furthermore, the clerks may receive commission for what they sell, so they might not inform you about the negative aspects of using a product or service.

- ***Nutrition "experts."*** Anyone can call him- or herself a "nutritionalist" to appear to be a "nutrition expert." What is the person's educational background? Are his or her nutrition degrees from accredited institutions? What is the person's professional experience? Is it limited to the industry that's marketing nutrition-related products?
- ***Claims that the product was "scientifically tested" or "clinically tested at a major university."*** Where can you read the article about the study? Which university was involved in the clinical tests? Is it an accredited university? How was the testing done?
- ***Citations to what appear to be scientific journal articles.*** Promoters often make up journal citations or cite "journals" that were created by the products' manufacturers to provide the appearance of scientific credibility.
- ***Scientific-sounding terms,*** such as "enzymatic therapy," "nutritionals," or "colloidal chelated extract." Promoters typically use such vague or meaningless terms when presenting false or misleading information as factual and obtained by scientific methods. Such terms are designed to convince people without science backgrounds that the nutrition-related information is true.
- ***Popular sources of nutrition information,*** such as magazines and the Internet, because such sources generally don't subject articles or blogs to expert review before publishing the information. A reliable source has information about research that supports claims of a product's effectiveness as well as scientific studies that don't support its usefulness. Furthermore, reliable sources of information will alert consumers to possible health risks linked to using the products.

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quackery practicing medicine without the proper training and licensing

2.3b Look for "Red Flags" of Misinformation

A *red flag* is a term or expression that draws your attention. For consumers of nutrition information, red flags are clues or signals of misinformation in media, advertising, and personal communications. Common red flags include

1. **Promises of quick and easy health remedies,** such as: "Our product helps you lose weight fast, *without* exercising or dieting."
2. **Claims that sound too good to be true,** such as: "You can eat everything you like and still lose weight" and "Garlic pills cure heart disease." These claims are rarely true. Remember, if the claim sounds too good to be true, it probably isn't true.
3. **Scare tactics,** such as: "Your liver is loaded with toxins and needs cleansing" and "There are chemicals in your food!" Such statements are meant to frighten people. The truth: Your liver can't be "cleansed," and everything in your environment is chemical in nature.

Dollar bills: Wendy Schiff

4. **"Money back" guarantees,** such as: "No risk. Just return the partially empty container and pay only shipping and handling." Or "You have nothing to lose!" You *lose* money on worthless, ineffective, and potentially unsafe dietary supplements. Furthermore, you may lose valuable time trying to diagnose and treat a serious health problem on your own, rather than seeking more conventional and, usually, more effective medical care.
5. **Statements about the superiority of unconventional medical practices,** such as: "Russian scientists have discovered the countless health benefits of taking Siberian ginseng" or "Herbal tea is the only cure for intestinal cancer."
6. **Testimonials and anecdotes as evidence of effectiveness,** such as: "I lost 50 pounds in 30 days using this product" or "I rubbed this vitamin E–containing lotion on my scar and it disappeared in days." As mentioned earlier, testimonials and anecdotes are not scientific.
7. **Information that promotes a product's benefits while overlooking its risks:** "Our all-natural supplement boosts your metabolism naturally so it won't harm your body." Beware of any source of information that fails to mention the possible side effects of using a dietary supplement or nutrition-related treatment. Anything you consume, even natural substances such as water and minerals, can be toxic in high doses.
8. **Recommendations based on a single study:** "Research conducted at our private health facility proves coffee enemas can cure cancer." Results of such research are likely to be biased.
9. **Information concerning nutrients or the human body that's not supported by reliable scientific evidence:** "This book explains how to combine certain foods based on your blood type" or "Most diseases are caused by undigested food that gets stuck in your guts" or "People with alkaline bodies don't develop cancer."
10. **Disclaimers, usually in small or difficult-to-read print:** "Results may vary," "Results not typical," or "This product is not intended to diagnose, cure, or prevent any disease." Disclaimers are often clues that the product probably won't live up to your expectations or the manufacturer's claims.

2.3c The Internet

You can find abundant sources of information about nutrition and the benefits of dietary supplements on the Internet. Before trusting the information, you must be careful and consider the sources. The same critical consumer tools for evaluating nutrition information from other sources can be applied to judging the reliability of information on the Internet (see Modules 2.3a and 2.3b).

A careful consumer of nutrition information

- Uses multiple sites, especially government agency sites (*.gov), such as the Centers for Disease Control and Prevention (www.cdc.gov) and the Food and Drug Administration (www.fda.gov).

This disclaimer may be a red flag that this product has little or no effectiveness.