Nutrition Tools—Standards and Guidelines

DO YOU EVER . . .

• Wonder how scientists decide how much of each nutrient you need to consume each day?
• Dismiss government dietary recommendations as too simplistic to help you plan your diet?
• Consume the portions offered in restaurants and fast-food places, believing them to be in keeping with nutrition recommendations?
• Wish that your foods could boost your health by providing substances beyond the nutrients they contain?

Keep reading . . .

Learning Objectives
To find learning objective topics in this chapter, look for text headings with a corresponding “LO” number above the heading. After completing this chapter, you should be able to accomplish the following:

LO 2.1 Explain how RDA, AI, DV, and EAR serve different functions in describing nutrient values and discuss how each is used.

LO 2.2 List the major categories of the Dietary Guidelines for Americans and explain their importance to the population.

LO 2.3 Describe how foods are grouped in the USDA Food Guide and MyPyramid.

LO 2.4 Describe the concept of the discretionary calorie allowance, and explain how it can be used in diet planning.

LO 2.5 Plan a day’s meals that follow the pattern of the USDA Food Guide within a given calorie budget.

LO 2.6 Define the term functional foods, and discuss some potential effects of such foods on human health.
Eating well is easy in theory—just choose foods that supply appropriate amounts of the essential nutrients, fiber, phytochemicals, and energy without excess intakes of fat, sugar, and salt and be sure to get enough exercise to balance the foods you eat. In practice, eating well proves harder than it appears. Many people are overweight, or undernourished, or suffer from nutrient excesses or deficiencies that impair their health—that is, they are malnourished. You may not think that this statement applies to you, but you may already have less than optimal nutrient intakes and activity without knowing it. Accumulated over years, the effects of your habits can seriously impair the quality of your life.

Putting it positively, you can enjoy the best possible vim, vigor, and vitality throughout your life if you learn now to nourish yourself optimally. To learn how, you first need some general guidelines and the answers to several basic questions. How much energy and how much of each nutrient should you consume? How much physical activity do you need to balance your energy intake from food? Which types of foods supply which nutrients? How much of each type of food do you have to eat to get enough? And how can you eat all these foods without gaining weight? This chapter begins by identifying some ideals for nutrient intakes and ends by showing how to achieve them.

**LO 2.1**

**Nutrient Recommendations**

Nutrient recommendations are sets of “yardsticks,” or standards, for measuring healthy people’s energy and nutrient intakes. Nutrition experts use the recommendations to assess intakes and to offer advice on amounts to consume. Individuals may use them to decide how much of a nutrient they need to consume and how much is too much.

**Dietary Reference Intakes**

The standards in use in the United States and Canada are the Dietary Reference Intakes (DRI). A committee of nutrition experts from the United States and Canada develops and publishes the DRI.” The DRI committee has set values for all of the vitamins and minerals, as well as for carbohydrates, fiber, lipids, protein, water, and energy. Values for other food constituents that may play roles in health maintenance are forthcoming.

Another set of nutrient standards is practical for the person striving to make wise choices among packaged foods. These are the Daily Values, familiar to anyone who has read a food label. Nutrient standards—the DRI and Daily Values—are used and referred to so often that they are printed on the inside front cover pages of this book.

**KEY POINT** The Dietary Reference Intakes are nutrient intake standards set for people living in the United States and Canada. The Daily Values are U.S. standards used on food labels.

**Goals of the DRI Committee**

For each nutrient, the DRI establish a number of values, each serving a different purpose. Most people need to focus on only two kinds of DRI values: those that set nutrient intake goals for individuals (RDA and AI, described next) and those that define an upper limit of safety for nutrient intakes (UL, addressed later). In total, the DRI include:

- **Estimated Average Requirements (EAR)**
- **Recommended Dietary Allowances (RDA)**

*This is a committee of the Food and Nutrition Board of the National Academy of Sciences’ Institute of Medicine, working in association with Health Canada.*

• A directory of recommendations:
  - DRI lists—inside front cover pages A, B, and C.
  - Daily Values—see inside front cover.
• Adequate Intakes (AI)
• Tolerable Upper Intake Levels (UL)

The following sections address the different DRI values, arranged by the goals of the DRI committee.

**Goal #1. Setting Recommended Intake Values—RDA and AI**  One of the great advantages of the DRI values lies in their applicability to the diets of individuals. The committee offers two sets of values that individuals may use for their own nutrient intake goals: Recommended Dietary Allowances (RDA) and Adequate Intakes (AI).†

The RDA form the indisputable bedrock of the DRI recommended intakes because they derive from solid experimental evidence and reliable observations—they are expected to meet the needs of almost all healthy people. AI values, in contrast, are based as far as possible on the available scientific evidence but also on some educated guesswork. Whenever the DRI committee finds insufficient evidence to generate an RDA, they establish an AI value instead. This book refers to the RDA and AI values collectively as the DRI recommended intakes.

**Goal #2. Facilitating Nutrition Research and Policy—EAR**  Another set of values established by the DRI committee, the Estimated Average Requirements (EAR), establishes nutrient requirements for given life stages and gender groups that researchers and nutrition policymakers use in their work. Public health officials may also use them to assess nutrient intakes of populations and make recommendations.

To set the EAR, the DRI committee decides on criteria for each nutrient based on its roles in the body and in reducing disease risks.‡ The EAR values form the scientific basis upon which the RDA values are set (a later section explains how).

**Goal #3. Establishing Safety Guidelines—UL**  Beyond a certain point, it is unwise to consume large amounts of any nutrient, so the DRI committee sets the Tolerable Upper Intake Levels (UL) to identify potentially toxic levels of nutrient intake. The UL are indispensable to consumers who take supplements or consume foods and beverages to which vitamins or minerals have been added—a group that includes almost everyone. Public health officials also rely on UL values to set safe upper limits for nutrients added to our food and water supplies.

Nutrient needs fall within a range, and a danger zone exists both below and above that range. Figure 2-1 on page 32 illustrates this point. People’s tolerances for high doses of nutrients vary, so caution is in order when nutrient intakes approach the UL values.

Some nutrients do not have UL values. The absence of a UL for a nutrient does not imply that it is safe to consume it in any amount, however. It means only that insufficient data exist to establish a value.

**Goal #4. Preventing Chronic Diseases**  The DRI committee also takes into account chronic disease prevention, wherever appropriate. For example, the committee set lifelong intake goals for the mineral calcium at the levels believed to lessen the likelihood of osteoporosis-related fractures in the later years.

In addition to the four basic DRI lists just named, the DRI committee also set healthy ranges of intake for carbohydrate, fat, and protein known as Acceptable Macronutrient Distribution Ranges (AMDR). Each of these three energy-yielding nutrients contributes to the day’s total calorie intake, and their contributions can be expressed as a percentage of the total. According to the committee, a diet that provides adequate energy in the following proportions can provide adequate nutrients while reducing the risk of chronic diseases:

- 45 to 65 percent of calories from carbohydrate.

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† For simplicity, this book refers to two sets of nutrient goals (AI and RDA) collectively as the DRI recommended intakes. The AI values are not the scientific equivalent of the RDA, however.

‡ Did You Know?

The DRI table on the inside front cover distinguishes the RDA from AI values, but both kinds of values are intended as nutrient intake goals for individuals.

• Tolerable Upper Intake Levels (UL) are listed on page C, inside the front cover.

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Nutrient Recommendations

Adequate Intakes (AI) nutrient intake goals for individuals; the recommended average daily nutrient intake level based on intakes of healthy people (observed or experimentally derived) in a particular life stage and gender group and assumed to be adequate. Set whenever scientific data are insufficient to allow establishment of an RDA value.

Tolerable Upper Intake Levels (UL) the highest average daily nutrient intake level that is likely to pose no risk of toxicity to almost all healthy individuals of a particular life stage and gender group. Usual intake above this level may place an individual at risk of illness from nutrient toxicity.

Acceptable Macronutrient Distribution Ranges (AMDR) values for carbohydrate, fat, and protein expressed as percentages of total daily calorie intake; ranges of intakes set for the energy-yielding nutrients that are sufficient to provide adequate total energy and nutrients while reducing the risk of chronic diseases.
The chapters on the energy-yielding nutrients come back to these ranges.

**KEY POINT** The DRI provide nutrient intake goals for individuals, supply a set of standards for researchers and public policymakers, establish tolerable upper limits for nutrients that can be toxic in excess, and take into account evidence from research on disease prevention. The DRI are composed of the RDA, AI, UL, and EAR lists of values, along with the AMDR ranges for energy-yielding nutrients.

**Understanding the DRI Intake Recommendations**

Nutrient recommendations have been much misunderstood. One young woman posed this question: "Do you mean that some bureaucrat says that I need exactly the same amount of vitamin D as every other young woman in my group? Do they really think that 'one size fits all'?

**DRI for Groups** The DRI committee acknowledges differences between individuals. It has made separate recommendations for specific groups of people—men, women, pregnant women, lactating women, infants, and children—and for specific age ranges. Children aged 4 to 8 years, for example, have their own DRI recommended intakes. Each individual can look up the recommendations for his or her own age and gender group. Within your own age and gender group, the committee advises adjusting nutrient intakes in special circumstances that may increase or decrease nutrient needs, such as illness, smoking, or vegetarianism. Later chapters provide details about which nutrients may need adjustment.

For almost all healthy people, a diet that consistently provides the RDA or AI amount for a specific nutrient is very likely to be adequate in that nutrient. On average, you should try to get 100 percent of the DRI recommended intake for every nutrient to ensure an adequate intake over time.
Other Characteristics of the DRI  The following facts will help put the DRI recommended intakes into perspective:

- The values are based on available scientific research to the greatest extent possible and are updated periodically in light of new knowledge.
- The values are based on the concepts of probability and risk. The DRI recommended intakes are associated with a low probability of deficiency for people of a given life stage and gender group, and they pose almost no risk of toxicity for that group.
- The values are recommendations for optimal intakes, not minimum requirements. They include a generous safety margin and meet the needs of virtually all healthy people in a specific age and gender group.
- The values are set in reference to certain indicators of nutrient adequacy, such as blood nutrient concentrations, normal growth, and reduction of certain chronic diseases or other disorders when appropriate, rather than prevention of deficiency symptoms alone.
- The values reflect daily intakes to be achieved, on average, over time. They assume that intakes will vary from day to day and are set high enough to ensure that the body’s nutrient stores will meet nutrient needs during periods of inadequate intakes lasting several days to several months, depending on the nutrient.

The DRI Apply to Healthy People Only  The DRI are designed for health maintenance and disease prevention in healthy people, not for the restoration of health or repletion of nutrients in those with deficiencies. Under the stress of serious illness or malnutrition, a person may require a much higher intake of certain nutrients or may not be able to handle even the DRI amount. Therapeutic diets take into account the increased nutrient needs imposed by certain medical conditions, such as recovery from surgery, burns, fractures, illnesses, malnutrition, or addictions.

KEY POINT  The DRI represent up-to-date, optimal, and safe nutrient intakes for healthy people in the United States and Canada.

How the Committee Establishes DRI Values—An RDA Example

A theoretical discussion will help to explain how the DRI committee goes about setting DRI values. Suppose we are the DRI committee members with the task of setting an RDA for nutrient X (an essential nutrient).3 Ideally, our first step will be to find out how much of that nutrient various healthy individuals need. To do so, we review studies of deficiency states, nutrient stores and their depletion, and the factors influencing them. We then select the most valid data for use in our work. Of the DRI family of nutrient standards, the setting of an RDA value demands the most rigorous science and tolerates the least guesswork.

Determining Individual Requirements  One experiment we would review or conduct is a balance study. In this type of study, scientists measure the body’s intake and excretion of a nutrient to find out how much intake is required to balance excretion. For each individual subject, we can determine a requirement to achieve balance for nutrient X. With an intake below the requirement, a person will slip into negative balance or experience declining stores that could, over time, lead to deficiency of the nutrient.

We find that different individuals, even of the same age and gender, have different requirements. Mr. A needs 40 units of the nutrient each day to maintain balance; Mr. B needs 35; Mr. C, 57. If we look at enough individuals, we find that their

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3This discussion describes how an RDA value is set; to set an AI value, the committee would use some educated guesswork as well as scientific research results to determine an approximate amount of the nutrient most likely to support health.
requirements are distributed as shown in Figure 2-2—with most requirements near the midpoint (here, 45) and only a few at the extremes.

**Accounting for the Needs of the Population**

To set the value, we have to decide what intake to recommend for everybody. Should we set it at the mean (45 units in Figure 2-2)? This is the Estimated Average Requirement (EAR) for nutrient X, mentioned earlier as valuable to scientists but not appropriate as an individual’s nutrient goal. The EAR value is probably close to everyone’s minimum need, assuming the distribution shown in Figure 2-2. (Actually, the data for most nutrients indicate a distribution that is much less symmetrical.) But if people took us literally and consumed exactly this amount of nutrient X each day, half the population would begin to develop internal deficiencies and possibly even observable symptoms of deficiency diseases. Mr. C (at 57) would be one of those people.

Perhaps we should set the recommendation for nutrient X at or above the extreme, say, at 70 units a day, so that everyone will be covered. (Actually, we didn’t study everyone, and some individual we didn’t happen to test might have an even higher requirement.) This might be a good idea in theory, but what about a person like Mr. B who requires only 35 units a day? The recommendation would be twice his requirement and to follow it he might spend money needlessly on foods containing nutrient X to the exclusion of foods containing other vital nutrients.

**The Decision**

The decision we finally make is to set the value high enough so that 97 to 98 percent of the population will be covered but not so high as to be excessive (Figure 2-3 illustrates such a value). In this example, a reasonable choice might be 63 units a day. Moving the DRI further toward the extreme would pick up a few additional people, but it would inflate the recommendation for most people, including Mr. A and Mr. B. The committee makes judgments of this kind when setting the DRI recommended intakes for many nutrients. Relatively few healthy people have requirements that are not covered by the DRI recommended intakes.

**KEY POINT**

The DRI are based on scientific data and are designed to cover the needs of virtually all healthy people in the United States and Canada.

**Setting Energy Requirements**

In contrast to the recommendations for nutrients, the value set for energy, the Estimated Energy Requirement (EER), is not generous; instead, it is set at a level predicted to maintain body weight for an individual of a particular age, gender, height, weight, and physical activity level consistent with good health. The energy DRI values reflect a balancing act: enough food energy is critical to support health and life, but too much energy causes unhealthy weight gain. Because even small amounts of excess energy consumed day after day cause weight gain and associated diseases, the DRI committee did not set a Tolerable Upper Intake Level for energy.

People don’t eat energy directly. They derive energy from foods containing carbohydrate, fat, and protein, each in proportion to the others. The Acceptable Macronutrient Distribution Ranges, listed earlier, are designed to provide a healthy balance among these nutrients and minimize a person’s risk of chronic diseases. These ranges resurface in later chapters of this book wherever intakes of the energy-yielding nutrients are discussed with regard to chronic disease risks.

**KEY POINT**

Estimated Energy Requirements are energy-intake recommendations predicted to maintain body weight and to discourage unhealthy weight gain.

**Why Are Daily Values Used on Labels?**

Most careful diet planners are already familiar with the Daily Values because they appear on U.S. food labels. After learning about the DRI, you may wonder why yet
another set of nutrient standards is needed for food labels. One answer is that while DRI values vary from group to group, values appearing on food labels must apply to the “average” person—someone eating 2,000 to 2,500 calories a day.

While the Daily Values are ideal for allowing comparisons among foods, they cannot serve as nutrient intake goals for individuals. The Daily Values are set at the highest nutrient needs among all people, from children of age 4 through aging adults; for example, the Daily Value for iron, 18 mg, an amount that far exceeds a man’s RDA of 8 mg (but that meets a young woman’s high need precisely). Also, DRI values have changed over the years as new data emerged; the Daily Values have remained static. Using the Daily Values appropriately is a topic of this chapter’s Consumer Corner.

**KEY POINT** The Daily Values are standards used only on food labels to enable consumers to compare the nutrient values among foods.

**LO 2.2**

**Dietary Guidelines for Americans**

Many countries set forth dietary guidelines, striving to answer the question asked by their citizens, “What should I eat to stay healthy?” The guidelines and nutrient standards are related: if everyone followed the guidelines for individuals, most people’s nutrient needs would fall into place.

**The Guidelines Promote Health** The U.S. Department of Agriculture’s Dietary Guidelines for Americans (listed in Figure 2–4) offer science-based advice to promote health and to reduce risk of major chronic diseases through diet and physical activity.

People who balance their energy (calorie) intakes with expenditures, consume diets that meet nutrient recommendations, and engage in regular physical activity most often enjoy optimum health. The Dietary Guidelines apply to most healthy people age 2 years or older.

**Choose Nutritious Foods and Limit Some Food Components** A major recommendation of the Dietary Guidelines for Americans is to choose a healthy diet based on the diet-planning guide, the USDA Food Guide, explained next. To meet its recommendations, most U.S. consumers need to limit calorie intakes and obtain more and varied selections among fruits, vegetables, whole grains, and nonfat or low-fat milk or milk products (for reasons that will become clear as you move through this book). A basic premise of both the Dietary Guidelines and of this book is that foods, not supplements, should provide the needed nutrients whenever possible.

Another focus of the Dietary Guidelines is on limiting potentially harmful dietary constituents. A healthful diet is carefully chosen to supply the kinds of carbohydrates that the body needs, but little sugar, and to offer the needed fats and oils while limiting saturated fat, *trans* fat, and cholesterol (Chapters 4 and 5 explain these distinctions). People are also asked to consume less salt and to choose sensibly if they use alcohol. Finally, foods should be kept safe from spoilage or contamination (see Chapter 12).

Notice that the Dietary Guidelines do not require that you give up your favorite foods or eat strange, unappealing foods. With a little planning and a few adjustments, almost anyone’s diet can approach these recommendations. As for physical activity, this chapter’s Think Fitness box spells out some guidelines.

**Canada’s Guidelines** Canadian Guidelines also recommend many of the same ideals. Canadian readers can find Canada’s 2007 food group plan, Eating Well with Canada’s Food Guide, in Appendix B.

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**Estimated Energy Requirement (EER)** The average dietary energy intake predicted to maintain energy balance in a healthy adult of a certain age, gender, weight, height, and level of physical activity consistent with good health.
**Figure 2-4** *Dietary Guidelines for Americans—Key Recommendations*

These Guidelines apply to all healthy people over 2 years of age.

### ADEQUATE NUTRIENTS WITHIN ENERGY NEEDS

- Consume a variety of nutrient-dense foods and beverages within and among the basic food groups; limit intakes of saturated and trans fats, cholesterol, added sugars, salt, and alcohol.
- Meet recommended intakes within energy needs by adopting a balanced eating pattern, such as the USDA Food Guide (explained in a later section).

### FATS

- Keep saturated fat, trans fat, and cholesterol consumption low—less than 10 percent of calories from saturated and trans fats and less than 300 milligrams of cholesterol per day (Chapter 5).
- Keep total fat intake between 20 to 35 percent of calories, mostly from foods that provide unsaturated fats, such as fish, nuts, olives, and vegetable oils.
- Select and prepare foods that are lean, low-fat, or fat-free.

### WEIGHT MANAGEMENT

- To maintain body weight in a healthy range, balance calories from foods and beverages with calories expended (Chapter 9).
- To prevent gradual weight gain over time, make small decreases in food and beverage calories and increase physical activity.

### PHYSICAL ACTIVITY

- Engage in regular physical activity and reduce sedentary activities to promote health, psychological well-being, and a healthy body weight (Chapter 10).
- Achieve physical fitness by including cardiovascular conditioning, stretching exercises for flexibility, and resistance activities or calisthenics for muscle strength and endurance.

### FOOD GROUPS TO ENCOURAGE

- Consume a sufficient amount of fruits, vegetables, milk and milk products, and whole grains while staying within energy needs.
- Select a variety of fruits each day. Include vegetables from all five subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week. Make at least half of the grain selections whole grains. Select fat-free or low-fat milk products.

### FOOD SAFETY

- To avoid microbial foodborne illness, keep foods safe: clean hands, food contact surfaces, and fruits and vegetables; separate raw, cooked, and ready-to-eat foods; cook foods to a safe internal temperature; chill perishable food promptly; and defrost food properly (Chapter 12).

### CARBOHYDRATES

- Choose fiber-rich fruits, vegetables, and whole grains often (Chapter 4).
- Choose and prepare foods and beverages with little added sugars.
- Reduce the incidence of dental caries by practicing good oral hygiene and consuming sugar- and starch-containing foods and beverages less frequently.

### SODIUM AND POTASSIUM

- Choose and prepare foods with little salt (less than 2,300 milligrams sodium, or approximately 1 tsp salt). At the same time, consume potassium-rich foods, such as fruits and vegetables (Chapter 6).

### ALCOHOLIC BEVERAGES

- Those who choose to drink alcoholic beverages should do so sensibly and in moderation.
- Some individuals should not consume alcoholic beverages (Controversy 3).

### U.S. Diet and Dietary Guidelines Compared

To assess how well a diet meets the Dietary Guidelines and the USDA Food Guide (described next), researchers use the Healthy Eating Index (HEI). The HEI allows comparison between the recommendations and various aspects of a diet and yields a score. For example, a diet that provides enough grain foods with at least half from whole grains scores 10 out of 10 possible points for the category. A diet with no grains scores a 0 for grains. For diet components that must be limited, such as saturated fat, lower intakes earn higher HEI scores. The current American diet scores only 58 out of 100 possible points, and most people’s diets show room for improvement.

As a nation, Americans eat too few of the foods that supply certain key nutrients listed in the margin on the next page) and too many that are rich in calories and fats. For most people, then, meeting the diet ideals of the Dietary Guidelines requires choosing more of these foods:

- Vegetables (especially dark green vegetables, orange vegetables, and legumes).
- Fruits.
- Whole grains.
- Fat-free or low-fat milk and milk products.

And choosing less of these:
• Refined grains.
• Total fats (especially saturated fat, trans fat, and cholesterol).
• Added sugars.
• Salt.

In addition, many people should reduce total calorie intakes. The diet planner can achieve these ideals with the help of the USDA Food Guide.

Our Two Cents’ Worth

If the experts who develop the Dietary Guidelines were to ask us, we would add one more recommendation to their lists: take time to enjoy and savor your food. The joys of eating are physically beneficial to the body because they trigger health-promoting changes in the nervous, hormonal, and immune systems. When the food is nutritious as well as enjoyable, then the eater obtains all the nutrients needed for healthy body systems, as well as for the healthy skin, glossy hair, and natural attractiveness that accompany robust health. Remember to enjoy your food.

KEY POINT The Dietary Guidelines for Americans, Nutrition Recommendations for Canadians, and other such standards address the problems of undernutrition and overnutrition. To implement them requires exercising regularly, following the USDA Food Guide, seeking out vegetables, fruits, whole grains, and low-fat milk while limiting intakes of saturated and trans fats, sugar, and salt, and moderating alcohol intake.

LO 2.3, 2.4

Diet Planning with the USDA Food Guide

Diet planning connects nutrition theory with the food on the table, and a few minutes invested in meal planning can pay off in better nutrition. To help people achieve the goals set forth by the Dietary Guidelines for Americans 2005, the USDA provides a food group plan—the USDA Food Guide. The food group plan is a diet-planning tool that sorts foods into groups based on their nutrient content and then specifies that people should eat certain minimum numbers of servings of foods from each group.

Did You Know?
The key nutrients most often lacking in the U.S. diet are:
• Fiber.
• Vitamin A.
• Vitamin C.
• Vitamin E.
• Calcium.
• Magnesium.
• Potassium.

Recommendations for Daily Physical Activity

The 2008 Physical Activity Guidelines for Americans set by the USDA and the Department of Health and Human Services suggest that to maintain good health, adults should engage in about 2½ hours of moderate physical activity each week. A brisk walk at a pace of about 100 steps per minute (1,000 steps over 10 minutes) constitutes “moderate” activity. In addition:
• Physical activity can be intermittent, 10 minutes here and there, throughout the week.
• Resistance activity (such as weight-lifting) can be included as part of the exercise total for the week.

For weight control and additional health benefit, more than the minimum amount of physical activity is required. Details are found in Chapter 10.

START NOW

Ready to make a change? Consult the online behavior-change planner to plan how you might obtain the recommended 30 minutes of daily physical activity at www.cengage.com/sso.
### Key:
- Foods generally high in nutrient density (choose most often)
- Foods lower in nutrient density (limit selections)

#### GRAINS

Make at least half of the grain selections whole grains.

These foods contribute folate, niacin, riboflavin, thiamin, iron, magnesium, selenium, and fiber.

- 1 oz grains is equivalent to 1 slice bread; \( \frac{1}{2} \) c cooked rice, pasta, or cereal;
- 1 oz dry pasta or rice; 1 c ready-to-eat cereal; 3 c popped popcorn.

- Whole grains (amaranth, barley, brown rice, buckwheat, bulgur, millet, oats, quinoa, rye, wheat) and whole-grain, low-fat breads, cereals, crackers, and pastas; popcorn.
- Enriched bagels, breads, cereals, pastas (couscous, macaroni, spaghetti), pretzels, rice, rolls, tortillas.
- Biscuits, cakes, cookies, cornbread, crackers, croissants, doughnuts, french toast, fried rice, granola, muffins, pancakes, pastries, pies, presweetened cereals, taco shells, waffles.

#### VEGETABLES

Choose a variety of vegetables each day, and choose from all five subgroups several times a week.

These foods contribute folate, vitamin A, vitamin C, vitamin K, vitamin E, magnesium, potassium, and fiber.

- 1 c vegetables is equivalent to 1 c cut-up raw or cooked vegetables;
- 1 c cooked legumes; 1 c vegetable juice; 2 c raw, leafy greens.

**Vegetable subgroups**

- 1. Dark green vegetables: Broccoli and leafy greens such as arugula, beet greens, bok choy, collard greens, kale, mustard greens, romaine lettuce, spinach, and turnip greens.
- 2. Orange and deep yellow vegetables: Carrots, carrot juice, pumpkin, sweet potatoes, and winter squash (acorn, butternut).
- 3. Legumes: Black beans, black-eyed peas, garbanzo beans (chickpeas), kidney beans, lentils, navy beans, pinto beans, soybeans and soy products such as tofu, and split peas.
- 4. Starchy vegetables: Cassava, corn, green peas, hominy, lima beans, and potatoes.
- 5. Other vegetables: Artichokes, asparagus, bamboo shoots, bean sprouts, beets, brussels sprouts, cabbages, cactus, cauliflower, celery, cucumbers, eggplant, green beans, iceberg lettuce, mushrooms, okra, onions, peppers, seaweed, snow peas, tomatoes, vegetable juices, zucchini.
- Baked beans, candied sweet potatoes, coleslaw, french fries, potato salad, refried beans, scalloped potatoes, tempura vegetables.

#### FRUITS

Consume a variety of fruits and no more than one-half of the recommended intake as fruit juice.

These foods contribute folate, vitamin A, vitamin C, potassium, and fiber.

- 1 c fruit is equivalent to 1 c fresh, frozen, or canned fruit; \( \frac{1}{2} \) c dried fruit;
- 1 c fruit juice.

- Apples, apricots, avocados, bananas, blueberries, cantaloupe, cherries, grapefruit, grapes, guava, kiwi, mango, nectarines, oranges, papaya, peaches, pears, pineapples, plums, raspberries, strawberries, tangerines, watermelon; dried fruit (dates, figs, raisins); unsweetened juices.
- Canned or frozen fruit in syrup; juices, punches, and fruit drinks with added sugars; fried plantains.
Diet Planning with the USDA Food Guide

Select the recommended amounts of oils from among these sources.

These foods contribute vitamin E and essential fatty acids (see Chapter 5), along with abundant calories.

- Liquid vegetable oils such as canola, corn, flaxseed, nut, olive, peanut, safflower, sesame, soybean, and sunflower oils; mayonnaise, oil-based salad dressing, soft trans-free margarine.

- Unsaturated oils that occur naturally in foods such as avocados, fatty fish, nuts, olives, seeds (flaxseeds, sesame seeds), and shellfish.

Limit intakes of food and beverages with solid fats and added sugars.

Solid fats deliver saturated fat and trans fat, and intake should be kept low.

- Solid fats and added sugars contribute abundant calories but few nutrients, and intakes should not exceed the discretionary calorie allowance—calories to meet energy needs after all nutrient needs have been met with nutrient-dense foods. Alcohol also contributes abundant calories but few nutrients, and its calories are counted among discretionary calories. See Table 2-2 on page 44 for some discretionary calorie allowances.

- Solid fats that occur in foods naturally such as milk fat and meat fat (see ▲ in previous lists).

- Solid fats that are often added to foods such as butter, cream cheese, hard margarine, lard, sour cream, and shortening.

- Added sugars such as brown sugar, candy, honey, jelly, molasses, soft drinks, sugar, and syrup.

- Alcoholic beverages include beer, wine, and liquor.

Make fat-free or low-fat choices. Choose lactose-free products or other calcium-rich foods if you don’t consume milk.

These foods contribute protein, riboflavin, vitamin B₁₂, calcium, magnesium, potassium, and, when fortified, vitamin A and vitamin D.

- Fat-free and fat-free milk products such as buttermilk, cheeses, cottage cheese, yogurt; fat-free fortified soy milk.

- 1% low-fat milk, 2% reduced-fat milk, and whole milk; low-fat, reduced-fat, and whole-milk products such as cheeses, cottage cheese, and yogurt; milk products with added sugars such as chocolate milk, custard, ice cream, ice milk, milk shakes, pudding, sherbet; fortified soy milk.

Make lean or low-fat choices. Prepare them with little, or no, added fat.

Meat, poultry, fish, and eggs contribute protein, niacin, thiamin, vitamin B₁₂, vitamin B₁₂, iron, magnesium, potassium, and zinc; legumes and nuts are notable for their protein, folate, thiamin, vitamin E, iron, magnesium, potassium, zinc, and fiber.

- Poultry (no skin), fish, shellfish, legumes, eggs, lean meat (fat-trimmed beef, game, ham, lamb, pork), low-fat tofu, tempeh, peanut butter, nuts (almonds, filberts, peanuts, pistachios, walnuts) or seeds (flaxseeds, pumpkin seeds, sunflower seeds).

- Bacon; baked beans; fried meat, fish, poultry, eggs, or tofu; refried beans; ground beef, hot dogs; luncheon meats; marbled steaks; poultry with skin; sausages; spare ribs.
using it wisely and by learning about the energy-yielding nutrients, vitamins, and minerals in various foods (as you will in coming chapters), you can achieve the goals of a nutritious diet first mentioned in Chapter 1: adequacy, balance, calorie control, moderation, and variety.

If you design your diet around this plan, it is assumed that you will obtain adequate and balanced amounts not only of the nutrients of greatest concern but also of the two dozen or so other essential nutrients as well as beneficial phytochemicals because all of these are distributed among the same food groups. It can also help you to limit potentially harmful dietary constituents and calories.

A different kind of planning tool, the exchange system (see Appendix D), was developed for use by those with diabetes. The exchange system focuses on controlling the carbohydrate, fat, protein, and energy (calories) in the diet. Canada’s Beyond the Basics, a similar planning system, is presented in Appendix B.

The Food Groups and Subgroups
Figure 2-5 defines the major food groups and their subgroups and specifies portions of various foods that are considered equivalents in each group. It also lists the key nutrients provided by foods within each group, information worth noting and remembering. Note also that the figure sorts foods within each group by nutrient density (as the key to Figure 2-5 explains).

Key Nutrients in Vegetable Subgroups  The foods in each group are well-known contributors of the key nutrients listed (but you can count on these foods to supply many other nutrients as well). Vegetables, for example, are sorted into subgroups according to their nutrient contents. All vegetables provide valuable fiber and the mineral potassium, but the vegetables of each subgroup reliably provide a key nutrient as well, such as vitamin A from the “orange and deep yellow vegetables,” the vitamin folate from the “dark green vegetables,” abundant carbohydrate energy from the “starchy vegetables,” and iron and protein from “legumes.” Many of the same nutrients but few calories come from “other vegetables.”

Grains and Others  Among the grains, whole grains supply nutrients and fiber lacking from refined grains. The Food Guide suggests that at least half of the grains in a day’s meals be whole grains, or at least three 1-ounce equivalents of whole grains each day.10 Spices, herbs, coffee, tea, and diet soft drinks, excluded from the USDA Food Guide, provide few if any nutrients but can add flavor and pleasure to meals. They can also provide some potentially beneficial phytochemicals, such as those in tea or certain spices—see this chapter’s Controversy section.

Variety Among and Within the Food Groups  Varying your food choices, both among the food groups and within each group, helps to ensure adequate nutrients and also protects against large amounts of toxins or contaminants from any one source, as Chapter 1 made clear.11 Achieving variety may require some effort but knowing the food groups eases the task. Figure 2-6 demonstrates that people in the United States choose too few servings of vegetables, fruits, and milk, and too many of refined grains and meats. For health’s sake, U.S. citizens are urged to more closely follow the Food Guide recommendations.

KEY POINT  The USDA Food Guide divides foods into food groups based on key nutrient contents. People who consume the specified amounts of foods from each group achieve dietary adequacy, balance, and variety. Most U.S. diets fail to achieve these amounts.

The Discretionary Calorie Concept
To help people control calories to prevent excess weight gain, the USDA developed the concept of the discretionary calorie allowance. The concept can also help people to moderate intakes of certain fats and added sugars.
**Discretionary Calorie Demonstration**  As Figure 2-7 demonstrates, a person needing 2,000 calories of energy in a day to maintain weight may need only 1,700 calories or so of the most nutrient-dense foods to supply the nutrients required for maintaining health. Additional servings of nutritious foods, some fats, or added sugars may be chosen to supply more calorie needs.

**Figure 2-6**  How Does the U.S. Diet Stack Up?

<table>
<thead>
<tr>
<th>USDA Food Groups</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains(^a)</td>
<td>140</td>
</tr>
<tr>
<td>Whole</td>
<td>120</td>
</tr>
<tr>
<td>Refined</td>
<td>100</td>
</tr>
<tr>
<td>Vegetables</td>
<td>80</td>
</tr>
<tr>
<td>Whole</td>
<td>60</td>
</tr>
<tr>
<td>Refined</td>
<td>40</td>
</tr>
<tr>
<td>Fruits</td>
<td>20</td>
</tr>
<tr>
<td>Milk</td>
<td>0</td>
</tr>
<tr>
<td>Meat and beans</td>
<td>100</td>
</tr>
</tbody>
</table>

\(^a\)At least half of the grain selections should be whole grains.

**Figure 2-7**  Discretionary Calorie Allowance in a 2,000-Calorie Diet

A well-chosen diet may leave room in the calorie budget for some discretionary calories. Additional servings of nutritious foods, some fats, or added sugars may be chosen to supply them.
the day. The difference between the calories needed to maintain weight and those needed to supply nutrients from the most nutrient-dense foods is the person's discretionary calorie allowance (in this case, 267 calories).

Physically active people use greater numbers of calories each day than do sedentary people, a fact reflected in their greater discretionary calorie allowances. People who need fewer calories to maintain their weight have fewer discretionary calories to spend.

**Discretionary Calorie Sources**  A person with a discretionary calorie allowance to spend may choose to do any of the following:

1. Eat extra servings of the same nutrient-dense foods that make up the base of the diet, for example, an extra piece of skinless chicken, a second ear of corn, or some added pieces of fruit.
2. Include some fats from two sources (within the limits recommended for health—see Chapter 5):
   - Naturally occurring fats, such as the fats in regular hamburger versus lean hamburger, and in whole milk or reduced-fat milk versus fat-free milk.
   - Added fats, including solid fats such as butter, hard margarine, lard, and shortening; or oils in amounts greater than the daily need.
3. Include some added sugars, such as jams, sugars of sweet baked goods, soft drinks and punches, or honey.
4. Consume alcohol within limits (some people should not make this choice; read Controversy 3).
5. Alternatively, a person wishing to lose weight might choose to omit the discretionary calories from the diet. This is a safe strategy because discretionary calories are not essential for delivering needed nutrients to the diet.

**Discretionary Calories Versus Calories of Nutritious Foods**  Discretionary calories are distinguished from the calories of the nutrient-dense foods of which they may be a part. A fried chicken leg, for example, provides discretionary calories from two sources: the naturally occurring fat of the chicken skin and the added fat absorbed during frying. The calories of the skinless chicken underneath are not discretionary (unless consumed in excess of need)—they are necessary to provide the nutrients of chicken. Likewise, an oatmeal cookie provides discretionary calories of sugar and shortening, but its oatmeal contributes to the day’s intake of whole grains. Table 2-1 provides additional examples.

**Nutrient-Dense Foods**  To control calories and prevent overweight or obesity, the USDA Food Guide instructs diet planners to choose the most nutrient-dense foods from each group. Unprocessed or lightly processed foods are generally best because some processes strip foods of beneficial nutrients and fiber, while others add many calories in the form of sugar or fat. Figure 2-5 identified a few of the most nutrient-dense food selections in each food group and some foods of lower nutrient density to give you an idea of which are which.

Uncooked oil is a notable exception. Oil is pure fat and therefore rich in calories, but a small amount of raw oil from sources such as avocado, olives, nuts, fish, or vegetable oil provides vitamin E and other important nutrients that other foods lack. High temperatures used in frying destroy these nutrients, however.

**KEY POINT**  The USDA Food Guide defines discretionary calorie allowances to help people meet their nutrient requirements while controlling calories. It also helps to moderate intakes of potentially harmful saturated fats.
Notice that foods providing zero discretionary calories are naturally low in fat and have no added fats or sugars. These form the base of the diet in the USDA Food Guide. When choosing foods, pay close attention to portion size. More food means more calories from all sources.

### Table 2-1: Examples of Discretionary Calorie Sources

<table>
<thead>
<tr>
<th>Food</th>
<th>Amount</th>
<th>Total Calories</th>
<th>Discretionary Calories</th>
<th>Discretionary Calorie Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Milk and Milk Products</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat-free milk</td>
<td>1 cup</td>
<td>85</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Whole milk</td>
<td>1 cup</td>
<td>145</td>
<td>65</td>
<td>Fat</td>
</tr>
<tr>
<td>Low-fat chocolate milk</td>
<td>1 cup</td>
<td>160</td>
<td>75</td>
<td>Fat, sugar</td>
</tr>
<tr>
<td>Cheddar cheese</td>
<td>1 1/2 oz</td>
<td>170</td>
<td>90</td>
<td>Fat</td>
</tr>
<tr>
<td>Ice cream, vanilla</td>
<td>1 cup</td>
<td>290</td>
<td>205</td>
<td>Fat, sugar</td>
</tr>
<tr>
<td><strong>Meat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extra lean ground beef (95% lean)</td>
<td>3 oz, cooked</td>
<td>165</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Regular ground beef (80% lean)</td>
<td>3 oz, cooked</td>
<td>230</td>
<td>65</td>
<td>Fat</td>
</tr>
<tr>
<td>Roast chicken breast (skinless)</td>
<td>3 oz</td>
<td>140</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fried chicken breast with skin &amp; batter</td>
<td>3 oz</td>
<td>245</td>
<td>105</td>
<td>Fat</td>
</tr>
<tr>
<td>Beef bologna</td>
<td>3 slices (1 oz each)</td>
<td>265</td>
<td>100</td>
<td>Fat</td>
</tr>
<tr>
<td><strong>Grains</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td>1 slice (1 oz)</td>
<td>70</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Blueberry muffin</td>
<td>1 small (2 oz)</td>
<td>185</td>
<td>45</td>
<td>Fat, sugar</td>
</tr>
<tr>
<td>Biscuit, plain</td>
<td>1 (2.5˝ diameter)</td>
<td>130</td>
<td>60</td>
<td>Fat</td>
</tr>
<tr>
<td>Chocolate chip cookies</td>
<td>2 large</td>
<td>135</td>
<td>70</td>
<td>Fat, sugar</td>
</tr>
<tr>
<td>Glazed doughnut, yeast type</td>
<td>1 medium</td>
<td>240</td>
<td>165</td>
<td>Fat, sugar</td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potato, boiled or baked</td>
<td>1 (2.5˝ diam)</td>
<td>120</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>French fries</td>
<td>1 medium order</td>
<td>460</td>
<td>325</td>
<td>Fat</td>
</tr>
<tr>
<td>Onion rings</td>
<td>8 to 9 rings</td>
<td>275</td>
<td>160</td>
<td>Fat</td>
</tr>
<tr>
<td><strong>Fruit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peach slices, fresh</td>
<td>1 cup</td>
<td>60</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Canned peaches, heavy syrup</td>
<td>1 cup</td>
<td>195</td>
<td>135</td>
<td>Sugar</td>
</tr>
<tr>
<td><strong>Extras</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diet soda</td>
<td>12 oz</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Regular soda</td>
<td>12 oz</td>
<td>155</td>
<td>155</td>
<td>Sugar</td>
</tr>
<tr>
<td>Fruit punch</td>
<td>1 cup</td>
<td>115</td>
<td>115</td>
<td>Sugar</td>
</tr>
<tr>
<td>Table wine</td>
<td>5 oz</td>
<td>115</td>
<td>115</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Beer (regular)</td>
<td>12 oz</td>
<td>145</td>
<td>145</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Butter or stick margarine</td>
<td>1 teaspoon</td>
<td>35</td>
<td>35</td>
<td>Fat</td>
</tr>
<tr>
<td>Cream cheese</td>
<td>1 tablespoon</td>
<td>50</td>
<td>50</td>
<td>Fat</td>
</tr>
</tbody>
</table>

*Estimated calories

Source: Data from USDA
**MyPyramid Recommended Daily Intakes from Each Food Group**

<table>
<thead>
<tr>
<th></th>
<th>Sedentary Women: 19–30 Yr</th>
<th>Active Women: 19–30 Yr</th>
<th>Active Women: 51+ Yr</th>
<th>Active Men: 19–30 Yr</th>
<th>Active Men: 51+ Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories(^a)</td>
<td>1,600</td>
<td>1,800</td>
<td>2,000</td>
<td>2,200</td>
<td>2,400</td>
</tr>
<tr>
<td>Fruits</td>
<td>1½ c</td>
<td>1½ c</td>
<td>2 c</td>
<td>2 c</td>
<td>2½ c</td>
</tr>
<tr>
<td>Vegetables(^b)</td>
<td>2 c</td>
<td>2½ c</td>
<td>2½ c</td>
<td>3 c</td>
<td>3½ c</td>
</tr>
<tr>
<td>Grains</td>
<td>5 oz</td>
<td>6 oz</td>
<td>6 oz</td>
<td>7 oz</td>
<td>8 oz</td>
</tr>
<tr>
<td>Meats and legumes</td>
<td>5 oz</td>
<td>5 oz</td>
<td>5½ oz</td>
<td>6 oz</td>
<td>6½ oz</td>
</tr>
<tr>
<td>Milk</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
</tr>
<tr>
<td>Oils(^c)</td>
<td>5 tsp</td>
<td>5 tsp</td>
<td>6 tsp</td>
<td>6 tsp</td>
<td>7 tsp</td>
</tr>
<tr>
<td>Discretionary calorie allowance</td>
<td>132 cal</td>
<td>195 cal</td>
<td>267 cal</td>
<td>290 cal</td>
<td>362 cal</td>
</tr>
</tbody>
</table>

Note: In addition to gender, age, and activity levels, energy needs vary with height and weight (see Chapter 9 and Appendix H).

\(^a\)Assumes high nutrient density choices—lean, low-fat, and fat-free with no added sugars.

\(^b\)Divide these amounts among the vegetable subgroups as specified in Table 2-3.

\(^c\)Approximate measures; the gram values are 22, 24, 27, 29, 31, 34, and 36, respectively.

**Diet Planning Application**

The USDA Food Guide specifies the amounts needed from each food group to create a healthful diet for a given number of calories. Look at the top line of Table 2-2 and find yourself among the people described there (for other calorie levels, see Table E-1 of Appendix E). Then look at the column of numbers below for amounts from each food group that meet your calorie need. Table 2-2 also specifies the discretionary calorie allowance for each calorie level. Note that the more energy spent in physical activity in a day, the higher the calorie need and the greater the discretionary calorie allowance.

For vegetables, intakes should be divided among all the vegetable subgroups over a week’s time, as shown in Table 2-3. Look across the top row for your calorie level (obtained from Table 2-2)—a healthful diet includes the listed amounts of each type of vegetable each week. It is not necessary to eat vegetables from each subgroup every day.

With judicious selections, the diet can supply all the necessary nutrients and provide some luxury items, as well. A sample diet plan demonstrates how the theory of the USDA Food Guide translates to food on the plate. The USDA Food Guide ensures that a certain amount from each of the five food groups is represented in the diet. The diet planner begins by assigning each of the food groups to meals and snacks, as shown in Table 2-4. Then the plan can be filled out with real foods to create a menu. For example, the breakfast calls for 1 ounce grains, 1 cup milk, and ½ cup fruit. Here’s one possibility for this meal:

1 cup ready-to-eat cereal = 1 ounce grains.
1 cup fat-free milk = 1 cup milk.
1 medium banana = ½ cup fruit.
Then the planner moves on to complete the menu for lunch, supper, and snacks, as shown in Figure 2-8. This day’s choices are explored further as “Monday’s Meals” in the Food Feature at the end of the chapter.

**KEY POINT** Food patterns for calorie levels can guide food choices in diet planning. Some discretionary calories often fit into the diet.

**MyPyramid: Steps to a Healthier You**

For consumers with Internet access, the USDA’s MyPyramid online educational tool makes applying the Food Guide easier. Figure 2-9 explains its graphic image. MyPyramid guides users through diet planning to create a diet that more closely meets the ideals of the USDA Food Guide and the recommendations of the *Dietary Guidelines for Americans.*

---

**Table 2-3 Weekly Amounts from Vegetable Subgroups**

Table 2-2 specifies the recommended amounts (in cups) of total vegetables per day. This table shows those amounts dispersed among five vegetable subgroups per week.

<table>
<thead>
<tr>
<th>Vegetable Subgroups</th>
<th>1,600 cal</th>
<th>1,800 cal</th>
<th>2,000 cal</th>
<th>2,200 cal</th>
<th>2,400 cal</th>
<th>2,600 cal</th>
<th>2,800 cal</th>
<th>3,000 cal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark green</td>
<td>2 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
</tr>
<tr>
<td>Orange and deep yellow</td>
<td>1½ c</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
<td>2½ c</td>
<td>2½ c</td>
<td>2½ c</td>
</tr>
<tr>
<td>Legumes</td>
<td>2½ c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3½ c</td>
<td>3½ c</td>
<td>3½ c</td>
</tr>
<tr>
<td>Starchy</td>
<td>2½ c</td>
<td>3 c</td>
<td>3 c</td>
<td>6 c</td>
<td>6 c</td>
<td>7 c</td>
<td>7 c</td>
<td>9 c</td>
</tr>
<tr>
<td>Other</td>
<td>5½ c</td>
<td>6½ c</td>
<td>6½ c</td>
<td>7 c</td>
<td>7 c</td>
<td>8½ c</td>
<td>8½ c</td>
<td>10 c</td>
</tr>
</tbody>
</table>

---

**Table 2-4 Sample Diet Plan**

This diet plan is one of many possibilities for a day’s meals. It follows the amounts suggested for a 2,000-calorie diet (with an extra ½ cup of vegetables).

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Recommended MyPyramid Amounts</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Snack</th>
<th>Dinner</th>
<th>Snack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td></td>
<td>2 c</td>
<td>½ c</td>
<td>½ c</td>
<td>1 c</td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td>2½ c</td>
<td>1 c</td>
<td></td>
<td>2 c</td>
<td></td>
</tr>
<tr>
<td>Grains</td>
<td></td>
<td>6 oz</td>
<td>1 oz</td>
<td>2 oz</td>
<td>½ oz</td>
<td>2 oz</td>
</tr>
<tr>
<td>Meat and legumes</td>
<td></td>
<td>5½ oz</td>
<td>2 oz</td>
<td></td>
<td>3½ oz</td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td>3 c</td>
<td>1 c</td>
<td>1 c</td>
<td>1 c</td>
<td></td>
</tr>
<tr>
<td>Oils</td>
<td></td>
<td>5½ tsp</td>
<td>1½ tsp</td>
<td>4 tsp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discretionary calorie allowance</td>
<td>267 cal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Then the planner moves on to complete the menu for lunch, supper, and snacks, as shown in Figure 2-8. This day’s choices are explored further as “Monday’s Meals” in the Food Feature at the end of the chapter.
For many, the dietary changes required to do so may seem daunting or even insurmountable, and taken all at once they may be. However, small steps taken each day can add up to substantial dietary changes over time. If everyone would begin, today, to take such steps, the rewards in terms of less heart disease, less cancer, greater quality of life, and better overall health would prove well worth their effort.

Computer-savvy consumers will also find an abundance of MyPyramid support material and diet assessment tools on the Internet ([www.MyPyramid.gov](http://www.MyPyramid.gov)). Those without computer access can achieve the MyPyramid goals by following the USDA Food Guide principles and working with pencil and paper, as illustrated later.

**KEY POINT** The concepts of the USDA Food Guide are conveyed to consumers through the MyPyramid educational tool.

### Flexibility of the USDA Food Guide

Although it may appear rigid, the USDA Food Guide can actually be very flexible once its intent is understood. For example, the user can substitute fat-free yogurt for fat-free milk because both supply the key nutrients for the milk, yogurt, and cheese group. Legumes provide many of the nutrients of the meat group, but they also constitute a vegetable subgroup, so legumes in a meal can count as a serving of meat or of vegetables. Consumers can adapt the plan to mixed dishes such as casseroles and to national and cultural foods as well, as Figure 2-10 demonstrates.

---

**A Sample Menu**

This sample menu provides about 1,850 calories of the 2,000-calorie plan. About 150 discretionary calories remain available to spend on more nutrient-dense foods or luxuries such as added sugars and fats.

<table>
<thead>
<tr>
<th>Amounts</th>
<th>Sample Menu</th>
<th>Energy (Cal)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BREAKFAST</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 oz whole grains</td>
<td>1 c whole-grain cereal</td>
<td>108</td>
</tr>
<tr>
<td>1 c milk</td>
<td>1 c fat-free milk</td>
<td>100</td>
</tr>
<tr>
<td>½ c fruit</td>
<td>1 medium banana (sliced)</td>
<td>105</td>
</tr>
<tr>
<td><strong>LUNCH</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 oz meats, 2 oz whole grains</td>
<td>1 turkey sandwich on whole-wheat roll</td>
<td>272</td>
</tr>
<tr>
<td>1½ tsp oils</td>
<td>1½ tbs low-fat mayonnaise</td>
<td>71</td>
</tr>
<tr>
<td>1 c vegetables</td>
<td>1 c vegetable juice</td>
<td>50</td>
</tr>
<tr>
<td><strong>SNACK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ oz whole grains</td>
<td>4 whole-wheat reduced-fat crackers</td>
<td>86</td>
</tr>
<tr>
<td>1 c milk</td>
<td>1½ oz low-fat cheddar cheese</td>
<td>74</td>
</tr>
<tr>
<td>½ c fruit</td>
<td>1 medium apple</td>
<td>72</td>
</tr>
<tr>
<td><strong>DINNER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ c vegetables</td>
<td>1 c raw spinach leaves</td>
<td>8</td>
</tr>
<tr>
<td>¼ c vegetables</td>
<td>½ c shredded carrots</td>
<td>11</td>
</tr>
<tr>
<td>1 oz meats</td>
<td>¼ c garbanzo beans</td>
<td>71</td>
</tr>
<tr>
<td>2 tsp oils</td>
<td>2 tbs oil-based salad dressing and olives</td>
<td>76</td>
</tr>
<tr>
<td>½ c vegetables, 2½ oz meat, 2 oz enriched grains</td>
<td>Spaghetti with meat and tomato sauce</td>
<td>425</td>
</tr>
<tr>
<td>½ c vegetables</td>
<td>½ c green beans</td>
<td>22</td>
</tr>
<tr>
<td>2 tsp oils</td>
<td>2 tsp soft margarine</td>
<td>67</td>
</tr>
<tr>
<td>1 c fruit</td>
<td>1 c strawberries</td>
<td>49</td>
</tr>
<tr>
<td><strong>SNACK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>½ oz whole grains</td>
<td>3 graham crackers</td>
<td>90</td>
</tr>
<tr>
<td>1 c milk</td>
<td>1 c fat-free milk</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: This plan meets the recommendations to provide 45 to 65 percent of calories from carbohydrate, 20 to 35 percent from fat, and 10 to 35 percent from protein.

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* To make a start at changing your own diet, use the *Diet Analysis Plus* program on this textbook’s website to work through the questions at the end of the Food Feature section, p. 59.
The USDA Food Guide can help vegetarians in making their food choices, too. The food group that includes the meats also includes legumes, nuts, seeds, and products made from soybeans. In the food group that includes milk, soy drinks and soy milk (beverages made from soybeans) can fill the same nutrient needs, provided that they are fortified with calcium, riboflavin, vitamin A, vitamin D, and vitamin B_12_. Thus, for all sorts of careful diet planners, the USDA Food Guide provides a general road map for designing a healthful diet.

**MY TURN**

**Right Size—Supersize?**

Do you often overeat when you eat out? Listen to two students talk about making healthy choices in restaurants.

To hear their stories, log on to www.cengage.com/sso.
Vegetarians will find more tips for choosing the right foods to supply the nutrients they need in the chapters to come.

KEY POINT The USDA Food Guide can be used with flexibility by people with different eating styles.

Portion Control
To control calories, the diet planner must learn to control food portions. It’s often hard to judge portion sizes, though. Restaurants may deliver colossal helpings to ensure repeat business; a server on a cafeteria line may be instructed to deliver “about a spoonful”; fast-food burgers range from a 1-ounce mini-sized burger to a ¼-pound triple deluxe. What amount is right to choose?

Colossal Cuisine In the United States, the trend has been toward consuming larger and larger food portions, especially of foods rich in fat and sugar (see Figure 2-11). At the same time, body weights have been creeping upward, suggesting an increasing need for portion control. Consumers need more helpful guidance about portion sizes, and the margin note offers some notable comparisons among portion sizes and everyday objects.

Tips on Weights and Measures Among volumetric measures, 1 "cup" refers to an 8-ounce measuring cup (not a teacup or drinking glass) filled to level (not heaped up, or shaken, or pressed down). Tablespoons and teaspoons refer to measuring spoons (not flatware), filled to level (not rounded or heaping). Ounces signify weight, not volume. Two ounces of meat, for example, refers to ½ of a pound of cooked meat. One ounce (weight) of crispy rice cereal measures a full cup (volume), but take care: 1 ounce of granola cereal measures only ¼ cup.

Also, some foods are specified as "medium," as in "one medium apple," but the word medium means different things to different people. When college students are asked to bring medium-sized foods to class, they reliably bring bagels weighing from 2 to 5 ounces, muffins from about 2 to 8 ounces, baked potatoes from 4 to 9 ounces, and so forth. The Table of Food Composition, Appendix A, can help in determining serving sizes because it lists both weights and volumes of a wide variety of foods.

Did You Know?
You can use an ice cream scoop to serve mashed potatoes, pasta, vegetables, rice, cereals, or other foods. Most scoops hold ¼ cup. Test the size of your scoop—fill it with water and pour the water into a measuring cup.
KEY POINT People wishing to avoid overconsuming calories must pay attention to the size of their food portions.

A Note About Exchange Systems

Exchange systems, defined earlier, can be useful to careful diet planners, especially those wishing to control calories (weight watchers), those who must control carbohydrate intake (people with diabetes), and those who should control their intakes of fat and saturated fat (almost everyone). An exchange system, presented in Appendix D (Appendix B for Canada), lists the estimated carbohydrate, fat, saturated fat, and protein contents of food portions, as well as their calorie values. The values in the exchange lists differ from the exacting values given for individual foods in Appendix A because exchange lists estimate values for whole groups of foods. With these estimates, exchange system users can make an informed approximation of the nutrients and calories in almost any food they might encounter.

The exchange system also highlights a fact pointed out by the USDA Food Guide: most foods provide more than just one energy nutrient. Meat, for example, is famous for protein, but meats like bacon and sausage deliver many more calories from fat than from protein. A slice of bread provides most of its calories as carbohydrate, but biscuits provide many of their calories as fat, and so on. This focus on energy-yielding nutrients leads to some unexpected food groupings in the exchange lists. The high-fat meats mentioned here and also many cheeses are listed together as "high-fat meats" because fat constitutes the predominant form of energy in these foods, followed by protein. Potatoes and other vegetables high in starch are listed with the breads because one serving of bread and one serving of a starchy vegetable contain about the same amount of carbohydrate. To explore the usefulness of this powerful aid to diet planning, spend some time studying Appendix D (or B).

KEY POINT Exchange lists facilitate calorie control by providing an understanding of how much carbohydrate, fat, and protein are in each food group.
A potato is a potato and needs no label to tell you so. But what can a package of potato chips tell you about its contents? By law, its label must list the chips’ ingredients—potatoes, fat, and salt—and its Nutrition Facts panel must also reveal details about their nutrient composition (see Table 2-5). If the oil is high in saturated fat, the label will tell you so (more about fats in Chapter 5). A label may also warn consumers of a food’s potential for causing an allergic reaction (Chapter 14 provides details). In addition to required information, labels may make optional statements about the food being delicious, or good for you in some way, or a great value. Some of these comments, especially some that are regulated by the Food and Drug Administration (FDA), are reliable. Many others are based on less convincing evidence.

This Consumer Corner introduces food labels and points out the accurate, tested, regulated, and therefore helpful information that consumers need to make wise food choices. It then turns the spotlight on claims whose purpose is to attract consumer dollars by treading beyond established nutrition science into the realm of pure marketing. Consumers must acquire some tools for digging out the truth from among the rubble and then hone their skills by comparing actual labels. This Consumer Corner provides the tools; Chapter 5 presents an opportunity to compare some labels, and for those with Internet access, more practice can be gained at the USDA’s Make Your Calories Count website.*

**WHAT FOOD LABELS MUST INCLUDE**

The Nutrition Education and Labeling Act of 1990 set the requirements for certain label information to ensure that food labels truthfully inform consumers about the nutrients and ingredients in the package. This information remains reliable and true today. According to the law, every packaged food must state the following:

- The common or usual name of the product.
- The name and address of the manufacturer, packer, or distributor.
- The net contents in terms of weight, measure, or count.
- The nutrient contents of the product (Nutrition Facts panel).

*USDA’s Make Your Calories Count website is available at www.cfiaac.fda.gov/~ear/whm/hwmintro.html.

Then the label must list the following in ordinary language:

- The ingredients in descending order of predominance by weight.

Not every package need display information about every vitamin and mineral. A large package, such as the box of cereal in Figure 2-12, must provide all of the information just listed. A smaller label, such as the label on a can of tuna, provides some of the information in abbreviated form. A label on a roll of candy rings provides only a phone number, which is allowed for the tiniest labels. The Canadian version of a food label can be found in Appendix B.

**The Nutrition Facts Panel**

Most food packages are required to display a Nutrition Facts panel, like the one shown in Figure 2-12. Grocers also voluntarily post placards or offer handouts in fresh-food departments to provide consumers with similar sorts of nutrition information for the most popular types of fresh fruits, vegetables, meats, poultry, and seafoods.

When you read a Nutrition Facts panel, be aware that only the top portion of the panel conveys information specific to the food inside the package. The bottom portion is identical on every label—it stands as a reminder of the Daily Values.

The highlighted items in this section correspond with those of Figure 2-12, which shows the location of the items that follow.

- **Serving size.** Common household and metric measures to allow comparison of foods within a food category. This amount of food constitutes a single serving and that portion containing the nutrient amounts listed. A serving of chips may be 10 chips, so if you eat 50 chips, you will have consumed five times the nutrient amounts listed on the label. When you compare nutrients or calories in two or more brands of the same food, check the serving size—it may differ.

- **Servings per container.** Number of servings per box, can, package, or other unit.

---

**TABLE 2-5 Food Label Terms**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>health claims</td>
<td>Claims linking food constituents with disease states; allowable on labels within the criteria established by the Food and Drug Administration.</td>
</tr>
<tr>
<td>nutrient claims</td>
<td>Claims using approved wording to describe the nutrient values of foods, such as a claim that a food is “high” in a desirable constituent or “low” in an undesirable one.</td>
</tr>
<tr>
<td>Nutrition Facts</td>
<td>On a food label, the panel of nutrition information required to appear on almost every packaged food. Grocers may also provide the information for fresh produce, meats, poultry, and seafoods.</td>
</tr>
<tr>
<td>structure-function claim</td>
<td>A legal but largely unregulated claim permitted on labels of dietary supplements and conventional foods.</td>
</tr>
</tbody>
</table>

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This cereal label maps out the locations of information needed to make wise purchases. The text provides details about each label section. Labels may also warn consumers of potential allergy risks (see Chapter 14 for details).

**Nutrition Facts**

The serving size and number of servings per container.

Calorie information and quantities of nutrients per serving, in grams (g) and milligrams (mg).

Quantities of nutrients as “% Daily Values” based on a 2,000-calorie energy intake.

Daily Values reminder for selected nutrients for a 2,000- and a 2,500-calorie diet.

Calorie per gram reminder.

The ingredients in descending order of predominance by weight.

---

**Figure 2-12 Animated! What’s on a Food Label?**

- **Calories/calories from fat:** Total food energy per serving and energy from fat per serving.
- **Nutrient amounts and percentages of Daily Values:** This section provides the core information concerning these nutrients:
  - **Total fat.** Grams of fat per serving with a breakdown showing grams of saturated fat and trans fat per serving.
  - **Cholesterol.** Milligrams of cholesterol per serving.
  - **Sodium.** Milligrams of sodium per serving.
  - **Total carbohydrate.** Grams of carbohydrate per serving, including starch, fiber, and sugars, with a breakdown showing grams of dietary fiber and sugars. The sugars include those that occur naturally in the food plus any added during processing.
  - **Protein.** Grams of protein per serving.

In addition, the label must state the contents of these nutrients expressed as percentages of the Daily Values:

- **Vitamin A.**
- **Vitamin C.**
- **Calcium.**
- **Iron.**

Other nutrients present in significant amounts in the food may also be listed on the label. The percentages of the Daily Values (see the inside front cover) are given in terms of a 2,000-calorie diet.

- **Daily Values and calories-per-gram reminder:** This portion lists the Daily Values for a person needing 2,000 or 2,500 calories a day and provides a calories-per-gram reminder as a handy reference for label readers.

**Ingredients List**

An often neglected but highly valuable body of information is the list of:

- **Ingredients:** The product’s ingredients must be listed in descending order of predominance by weight.

Knowing how to read an ingredients list puts you many steps ahead of the naive buyer. Consider the ingredients list on an orange drink powder whose first three entries are “sugar, citric acid, orange flavor.” You can tell that sugar is the chief ingredient. Now consider a canned juice whose ingredients list begins with “water, orange juice concentrate, pineapple juice concentrate.” This product is clearly

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**Diet Planning Application**

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made of reconstituted juice. Water is first on the label because it is the main constituent of juice. Sugar is nowhere to be found among the ingredients because sugar has not been added to the product. Sugar occurs naturally in juice, though, so the label does specify sugar grams; details are in Chapter 4.

Now consider a cereal whose entire list contains just one item: “100 percent shredded wheat.” No question, this is a whole-grain food with nothing added. Finally, consider a cereal whose first three ingredients are “puffed milled corn, sweeteners (sugars: corn syrup, sucrose, honey, dextrose), salt.” If you recognize that sugar, corn syrup, honey, and dextrose are all different versions of sugar (and you will after Chapter 4), you might guess that this product contains close to half its weight as sugar.

More About Percentages of Daily Values

Some of the Daily Values are printed on each label in the Nutrition Facts panel. (The entire list can be found on the inside front cover of this text.) The calculations used to determine the “% Daily Value” figures for nutrient contributions from a serving of food are based on a 2,000-calorie diet. For example, if a food contributes 13 milligrams of vitamin C per serving and the Daily Value is 60 milligrams, then a serving of that food provides about 22 percent of the Daily Value for vitamin C.

The Daily Values are of two types. Some, such as those for fiber, protein, vitamins, and most minerals, are akin to other nutrient intake recommendations. They suggest an intake goal to strive for; below that level, some people’s needs may go unmet. Other Daily Values, such as those for cholesterol, total fat, saturated fat, and sodium, constitute healthy daily maximums.

Of course, though the Daily Values are based on a 2,000-calorie diet, people’s actual calorie intakes vary widely; some people need fewer calories and some need many more. This makes the Daily Values most useful for comparing one food with another and less useful as nutrient intake targets for individuals. Still, by examining a food’s general nutrient profile, you can determine whether the food contributes “a little” or “a lot” of a nutrient, whether it contributes “more” or “less” than another food, and how well it fits into your overall diet. Consumers may soon see updated Daily Values based on current DRI recommendations—revisions are underway.1

WHAT FOOD LABELS MAY INCLUDE

So far, this Consumer Corner has presented the accurate and reliable facts on nutrition labels. This section looks at reliable claims and also describes the unreliable but legal claims that can be made on food labels.

Nutrient Claims on Food Labels

If a food meets specified criteria, the label may display certain approved nutrient claims, descriptive terms concerning the product’s nutritive value. The Daily Values serve as the basis for claims that a food is “low” in cholesterol or a “good source” of vitamin A. Table 2-6 provides

<table>
<thead>
<tr>
<th>TABLE 2-6 Reliable Nutrient Claims on Food Labels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Terms</strong></td>
</tr>
<tr>
<td>• low calorie 40 calories or fewer per serving.</td>
</tr>
<tr>
<td>• reduced calorie at least 25% lower in calories</td>
</tr>
<tr>
<td>• calorie free fewer than 5 calories per serving.</td>
</tr>
</tbody>
</table>

| **Fat Terms (Meat and Poultry Products)**       |
| • extra leana less than 5 g of fat and          |
| • lean a less than 10 g of fat and              |
| • low fat less than 2 g saturated fat and        |
| • cholesterol freeb less than 2 mg of cholesterol|
| • fat free less than 0.5 g of fat per serving.  |
| • less saturated fat 25% or less saturated fat  |
| • low cholesterol 20 mg or less of cholesterol  |
| • low fat 3 g or less fat per serving.          |

(continued)

aThe word lean as part of the brand name (as in “Lean Supreme”) indicates that the product contains fewer than 10 grams of fat per serving.
bFoods containing more than 13 grams total fat per serving or per 50 grams of food must indicate those contents immediately after a cholesterol claim.
## Reliable Nutrient Claims on Food Labels (continued)

### Fat and Cholesterol Terms (continued)

- **low saturated fat**: 1 g or less saturated fat and less than 0.5 g of trans fat per serving.
- **percent fat free**: may be used only if the product meets the definition of low fat or fat free. Requires disclosure of grams of fat per 100 g food.
- **reduced or less cholesterol**: at least 25% less cholesterol than a reference food and 2 g or less saturated fat per serving.
- **reduced saturated fat**: at least 25% less saturated fat and reduced by more than 1 g saturated fat per serving compared with a reference food.
- **saturated fat free**: less than 0.5 g of saturated fat and less than 0.5 g of trans fat.
- **trans fat free**: less than 0.5 g of trans fat and less than 0.5 g of saturated fat per serving.

### Fiber Terms

- **high fiber**: 5 g or more per serving. (Foods making high-fiber claims must fit the definition of low fat, or the level of total fat must appear next to the high-fiber claim.)
- **good source of fiber**: 2.5 g to 4.9 g per serving.
- **more or added fiber**: at least 2.5 g more per serving than a reference food.

### Sodium Terms

- **low sodium**: 140 mg or less sodium per serving.
- **reduced sodium**: at least 25% lower in sodium than the regular product.
- **sodium free**: less than 5 mg per serving.
- **very low sodium**: 35 mg or less sodium per serving.

### Other Terms

- **free, without, no, zero**: none or a trivial amount. **Calorie free** means containing fewer than 5 calories per serving; **sugar free** or **fat free** means containing less than half a gram per serving.
- **fresh**: raw, unprocessed, or minimally processed with no added preservatives.
- **good source**: 10 to 19% of the Daily Value per serving.
- **healthy**: low in fat, saturated fat, trans fat, cholesterol, and sodium and containing at least 10% of the Daily Value for vitamin A, vitamin C, iron, calcium, protein, or fiber.
- **high in**: 20% or more of the Daily Value for a given nutrient per serving; synonyms include “rich in” or “excellent source.”
- **less, fewer, reduced**: containing at least 25% less of a nutrient or calories than a reference food. This may occur naturally or as a result of altering the food. For example, pretzels, which are usually low in fat, can claim to provide less fat than potato chips, a comparable food.
- **light**: this descriptor has three meanings on labels:
  1. A serving provides one-third fewer calories or half the fat of the regular product.
  2. A serving of a low-calorie, low-fat food provides half the sodium normally present.
  3. The product is light in color and texture, so long as the label makes this intent clear, as in “light brown sugar.”
- **more, extra**: at least 10% more of the Daily Value than in a reference food. The nutrient may be added or may occur naturally.

---

The word lean as part of the brand name (as in “Lean Supreme”) indicates that the product contains fewer than 10 grams of fat per serving.

Foods containing more than 13 grams total fat per serving or per 50 grams of food must indicate those contents immediately after a cholesterol claim.

---

**Health Claims:**

**The Reliable and Less Reliable**

In the past, the FDA held manufacturers to the highest standards of scientific evidence before allowing them to place **health claims** (defined on p. 50) on food labels. When a label stated “Diets low in sodium may reduce the risk of high blood pressure,” for example, consumers could be sure that the FDA had substantial scientific support for the claim. Such reliable health claims still appear on food labels and they have a high degree of scientific validity (see Table 2-7).

Today, however, the FDA also allows other claims backed by weaker evidence to be made on labels. These are “qualified” claims in the sense that labels bearing them must also state the strength of the scientific evidence backing them up. Unfortunately, most people cannot distinguish between scientifically reliable claims and those that are best ignored.2

**Structure/Function Claims**

A label-reading consumer is much more likely to encounter a **structure-function claim** on either a food or supplement label than the more heavily regulated health claims just described. For the food manufacturer, printing a health claim stating that a product prevents or cures a disease involves acquiring

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1 The word lean as part of the brand name (as in “Lean Supreme”) indicates that the product contains fewer than 10 grams of fat per serving.

2 Foods containing more than 13 grams total fat per serving or per 50 grams of food must indicate those contents immediately after a cholesterol claim.
These claims of potential health benefits are well-supported by research, but other similar-sounding claims may not be.

- Calcium and reduced risk of osteoporosis
- Sodium and reduced risk of hypertension
- Dietary saturated fat and cholesterol and reduced risk of coronary heart disease
- Dietary fat and reduced risk of cancer
- Fiber-containing grain products, fruits, and vegetables and reduced risk of cancer
- Fruits, vegetables, and grain products that contain fiber, particularly soluble fiber, and reduced risk of coronary heart disease
- Fruits and vegetables and reduced risk of cancer
- Folate and reduced risk of neural tube defects
- Sugar alcohols and reduced risk of tooth decay
- Soluble fiber from whole oats and from psyllium seed husk and reduced risk of coronary heart disease
- Soy protein and reduced risk of coronary heart disease
- Whole grains and reduced risk of coronary heart disease and certain cancers
- Plant sterol and plant stanol esters and reduced risk of coronary heart disease
- Potassium and reduced risk of hypertension and stroke

...scientific evidence and submitting it in advance to petition the FDA for permission, a process costing much effort and expense. Instead, the manufacturer can use a similar-looking structure/function claim requiring no prior approval. Notification of the FDA is sufficient.

A problem is that, to a reasonable consumer, the two kinds of claims may seem to be identical:
- "Lowers cholesterol."
- "Helps maintain normal cholesterol levels."

The first, because it claims to reverse a disease-related condition (high cholesterol), requires FDA evaluation and approval before printing. The second structure/function claim refers only to a healthy body state, and so can be printed without prior approval.

A required disclaimer (often found in tiny print) states that the FDA has not evaluated the claim and that the product is not intended to diagnose, treat, cure, or prevent any disease. Often, however, structure/function claims stretch the truth.

Unfortunately, the presence of valid-appearing but unreliable label claims diminishes the usefulness of all health-related claims. Until laws require solid scientific backing for all claims on labels, consumers should ignore health-related claims and rely on the Nutrient Facts and Supplement Facts panels for nutrient information, directions, and warnings. Figure 2-13 provides a demonstration of a supplement label.

**CONSUMER EDUCATION**

Because labels are valuable only if people know how to use them, the FDA has designed several programs to educate consumers. Consumers who understand how to read labels are best able to apply the information to achieve and maintain healthful dietary practices.

By design, the nutrition messages from the Dietary Guidelines for Americans, the USDA Food Guide/MyPyramid, and food labels coordinate with each other, as Table 2-8 demonstrates. For example, a person striving to improve “Weight Management” (one of the Dietary Guidelines) can “select nutrient-dense foods” (USDA Food Guide advice) by searching for the words “low calorie” or “calorie-reduced” on food labels. Label information about fats and sugars can provide more insight into the nutrient density of foods that bear labels. Our informed consumer can then make meaningful comparisons among the Nutrition Facts panels of selected foods. By making good use of food labels, our consumer can be confident that the foods going home in grocery sacks will help to meet the chosen Dietary Guideline, in this case, weight management.
### From Guidelines to Groceries

Dietary Guidelines for Americans set goals for nutritional health. The USDA Food Guide/MyPyramid offers a meal pattern to meet them. Food labels can then assist consumers in choosing among packaged foods with these goals and patterns in mind. (Don’t forget that unlabeled fresh fruits, vegetables, and meats often excel in meeting nutrient needs and goals.)

<table>
<thead>
<tr>
<th>Dietary Guidelines</th>
<th>USDA Food Guide/MyPyramid</th>
<th>Food Labels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain adequate nutrients within energy needs</td>
<td>Select the recommended amounts from each food group at the energy level appropriate for your energy needs.</td>
<td>Look for foods that describe their vitamin, mineral, or fiber contents as a good source or high.</td>
</tr>
<tr>
<td>Weight management</td>
<td>Select nutrient-dense foods and beverages within and among the food groups. Limit high-fat foods and foods and beverages with added fats and sugars. Use appropriate portion sizes.</td>
<td>Look for foods that describe their calorie contents as free, low, reduced, light, or less.</td>
</tr>
<tr>
<td>Food groups to encourage</td>
<td>Select a variety of fruits each day. Include vegetables from all five subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week. Make at least half of the grain selections whole grains. Select fat-free or low-fat milk products.</td>
<td>Look for foods that describe their fiber contents as good source or high. Look for foods that provide at least 10% of the Daily Value for fiber, vitamin A, vitamin C, iron, and calcium from a variety of sources.</td>
</tr>
<tr>
<td>Fats</td>
<td>Choose foods within each group that are lean, low-fat, or fat-free. Choose foods within each group that have little added fat.</td>
<td>Look for foods that describe their fat, saturated fat, trans fat, and cholesterol contents as free, less, low, light, reduced, lean, or extra lean. Look for foods that provide no more than 5% of the Daily Value for fat, saturated fat, and cholesterol.</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>Choose fiber-rich fruits, vegetables, and whole grains often. Choose foods and beverages within each group that have little added sugars.</td>
<td>Look for foods that describe their sugar contents as free or reduced. A food may be high in sugar if its ingredients list begins with or contains several of the following: sugar, sucrose, fructose, maltose, lactose, honey, syrup, corn syrup, high-fructose corn syrup, molasses, evaporated cane juice, or fruit juice concentrate.</td>
</tr>
<tr>
<td>Sodium and potassium</td>
<td>Choose foods within each group that are low in salt or sodium. Choose potassium-rich foods such as fruits and vegetables.</td>
<td>Look for foods that describe their salt and sodium contents as free, low, or reduced. Look for foods that provide no more than 5% of the Daily Value for sodium. Look for foods that provide at least 10% of the Daily Value for potassium.</td>
</tr>
<tr>
<td>Alcoholic Beverages</td>
<td>Use sensibly and in moderation (no more than one drink a day for women and two drinks a day for men).</td>
<td>Light beverages contain fewer calories and less alcohol than regular versions.</td>
</tr>
<tr>
<td>Food Safety</td>
<td>Follow the safe handling instructions on packages of meat and other safety instructions, such as keep refrigerated, on packages of perishable foods.</td>
<td></td>
</tr>
</tbody>
</table>

### CONCLUSION

The Nutrition Facts panels and ingredients lists on labels provide reliable information on which consumers can base their food choices. Regrettably, more and more of the health-related claims printed on labels are based on less-than-convincing scientific evidence. In the world of food and supplement marketing, label rulings put the consumer on notice: “Let the buyer beware.”
Figures 2-14 and 2-15 illustrate a playful contrast between two days’ meals. “Monday’s Meals” were selected according to the recommendations of this chapter and follow the sample menu of Figure 2-8, shown earlier (page 46). “Tuesday’s Meals” were chosen more for convenience and familiarity than out of concern for nutrition.

COMPARING THE NUTRIENTS
How can a person compare the nutrients that these sets of meals provide? One way is to look up each food in a table of food composition, write down the food’s nutrient values, and compare each one to a standard such as the DRI recommended intakes for nutrients, as we’ve done in Figures 2-14 and 2-15. By this measure, Monday’s meals are the clear winners in terms of meeting nutrient needs within a calorie budget. Tuesday’s meals oversupply calories and saturated fat while undersupplying fiber and critical vitamins and minerals.

Another useful exercise is to compare the total amounts of foods provided by a day’s meals with the recommended amounts from each food group. A tally of the cups and ounces of foods consumed is provided in both Figures 2-14 and 2-15. The totals are then compared with MyPyramid recommendations in the tabular portion of the figures. The tables also identify whole grains and vegetable subgroups and tally discretionary calories from solid fats and sugars to complete the assessment.

MONDAY’S MEALS IN DETAIL
Monday’s meals provide the necessary servings from each food group along with a small amount of oil needed for health, while the energy provided falls well within the 2,000-calorie allowance. A closer look at Monday’s foods reveals that the whole-grain cereal at breakfast, whole-grain sandwich roll at lunch, and whole-grain crackers at snack time meet the recommendation to obtain at least half of the day’s grain servings from whole grains.

For the vegetable subgroups, dark green vegetables, orange vegetables, and legumes are represented in the dinner salad, and “other vegetables” are prominent throughout. To repeat: it isn’t necessary to choose vegetables from each subgroup every day, and the person eating this day’s meals will need to include vegetables from other subgroups throughout the week. In addition, Monday’s eating plan has room to spare in the discretionary calorie allowance for additional servings of favorite foods or for some sweets or fats.

TUESDAY’S MEALS IN DETAIL
Tuesday’s meals, though abundant in oils, meats, and enriched grains, completely lack fruit and whole grains and are too low in vegetables and milk to provide adequate nutrients. Tuesday’s meals supply too much saturated fat and sugar, as well as excessive meats and refined grains, pushing the calorie total well above the day’s allowance. A single day of such fare poses little threat to the eater, but a steady diet of “Tuesday meals” presents a high probability of nutrient deficiencies and weight gain and greatly increases the risk of chronic diseases in later life.

COMPUTER—OR NOT?
If you have access to a computer, it can be a time saver—diet analysis programs perform all of these calculations at lightning speed. This convenience may make working it out yourself, using paper and a sharp pencil with a big eraser, seem a bit old-fashioned. But there are times when using a laptop or PDA (personal digital assistant) may not be practical—such as standing in line at the cafeteria or at a fast-food counter—where real-life food decisions must be made quickly.

People who work out diet analyses for themselves on paper and those who put extra time into studying, changing, and reviewing their computer results often learn to “see” the nutrients in foods (a skill you can develop by the time you reach Chapter 10). They can quickly assess their food options and make informed choices at mealtimes. People who fail to develop such skills must wait until they can access their computer programs to find out how well they did after the fact.
Before heading off to class, a student eats breakfast:
- 1 c whole-grain cold cereal
- 1 c fat-free milk
- 1 medium banana (sliced)

Then goes home for a quick lunch:
- 1 roasted turkey sandwich on 2-oz whole-grain roll with 1/2 tsp low-fat mayonnaise
- 1 c low-salt vegetable juice

While studying in the afternoon, the student eats a snack:
- 4 whole-wheat reduced-fat crackers
- 1 apple

That night, the student makes dinner:
A salad:
- 1 c raw spinach leaves, shredded carrots, 1/4 c garbanzo beans
- 5 lg olives and 2 tbs oil-based salad dressing
A main course:
- 1 c spaghetti with meat sauce
- 1/2 c green beans
- 2 tsp soft margarine
And for dessert:
- 1 c strawberries

Later that evening, the student enjoys a bedtime snack:
- 3 graham crackers
- 1 c fat-free milk

Intakes Compared with MyPyramid Amounts

**Foods**
- **MyPyramid Amounts**
- **Energy (cal)**
- **Saturated Fat (g)**
- **Fiber (g)**
- **Vitamin C (mg)**
- **Calcium (mg)**

**Before heading off to class, a student eats breakfast:**
- 1 c whole-grain cold cereal
- 1 c fat-free milk
- 1 medium banana (sliced)

**Then goes home for a quick lunch:**
- 1 roasted turkey sandwich on 2-oz whole-grain roll with 1/2 tsp low-fat mayonnaise
- 1 c low-salt vegetable juice

**While studying in the afternoon, the student eats a snack:**
- 4 whole-wheat reduced-fat crackers
- 1/2 oz low-fat cheddar cheese
- 1/2 apple

**That night, the student makes dinner:**
A salad:
- 1 c raw spinach leaves, shredded carrots, 1/4 c garbanzo beans
- 5 lg olives and 2 tbs oil-based salad dressing
A main course:
- 1 c spaghetti with meat sauce
- 1/2 c green beans
- 2 tsp soft margarine
And for dessert:
- 1 c strawberries

**Totals:**
- **Calorie allowance**
- **Recommended MyPyramid Amounts**

**Intakes Compared with MyPyramid Amounts**

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Snack</th>
<th>Dinner</th>
<th>Snack</th>
<th>Monday’s Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>1/2 c</td>
<td>1/2 c</td>
<td>1 c</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1 c</td>
<td>2 c</td>
<td>3 c</td>
<td>2 1/2 c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grains</td>
<td>1 oz</td>
<td>2 oz</td>
<td>1/2 oz</td>
<td>2 oz</td>
<td>6 oz</td>
<td>6 oz</td>
</tr>
<tr>
<td>Meat and legumes</td>
<td>2 oz</td>
<td>3 1/2 oz</td>
<td>5 1/2 oz</td>
<td>5 1/2 oz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>1 c</td>
<td>1 c</td>
<td>1 c</td>
<td>3 c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oils</td>
<td>1 1/2 tsp</td>
<td>4 tsp</td>
<td>5 1/2 tsp</td>
<td>5 1/2 tsp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calorie allowance</td>
<td>1,857 cal</td>
<td></td>
<td></td>
<td></td>
<td>2,000 cal</td>
<td></td>
</tr>
</tbody>
</table>

*2,000 cal = 2,000 reasonable kilocalorie level (RKL) for a sedentary woman between ages 19 and 30. Other DRI values are listed on the inside front cover.
*<20 mg = maximum allowable saturated fat for a 2,000-calorie diet. The DRI recommends consuming less than 10 percent of calories from saturated fat.
Tuesday’s Meals—Less Nutrient-Dense Choices

### Today’s Meals

#### Breakfast

- 1 c coffee
- 1 English muffin with egg, cheese, and bacon
- 1 c milk

#### Between classes

- 1 peanut butter and jelly sandwich on white bread
- 1 c whole milk

#### While studying

- 12 oz diet cola
- Bag of chips (14 chips)

#### That night for dinner

- A salad:
  - 1 c lettuce
  - 1 tbsp blue cheese dressing
- A main course:
  - 6 oz steak
  - 1/2 baked potato
  - 1 tbsp sour cream
- And for dessert:
  - 4 sandwich-type cookies

#### Later on, a bedtime snack

- 2 cream-filled snack cakes
- 1 c herbal tea

### Totals

<table>
<thead>
<tr>
<th>Foods</th>
<th>MyPyramid Amounts</th>
<th>Energy (cal)</th>
<th>Saturated Fat (g)</th>
<th>Fiber (g)</th>
<th>Vitamin C (mg)</th>
<th>Calcium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 c coffee</td>
<td></td>
<td>2 oz grains</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>1 English muffin with egg,</td>
<td></td>
<td>2 oz meat</td>
<td>436</td>
<td>9</td>
<td>2</td>
<td>266</td>
</tr>
<tr>
<td>cheese, and bacon 1 c milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 peanut butter and jelly</td>
<td></td>
<td>2 oz grains</td>
<td>426</td>
<td>4</td>
<td>3</td>
<td>93</td>
</tr>
<tr>
<td>sandwich on white bread 1 oz</td>
<td></td>
<td>legumes</td>
<td>156</td>
<td>6</td>
<td>4</td>
<td>290</td>
</tr>
<tr>
<td>whole milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 oz diet cola</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bag of chips (14 chips) a</td>
<td>105</td>
<td>2</td>
<td>4</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A salad:</td>
<td></td>
<td>1/2 c vegetables</td>
<td>84</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1 c lettuce</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 tbsp blue cheese dressing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A main course:</td>
<td></td>
<td>6 oz meat</td>
<td>349</td>
<td>6</td>
<td>—</td>
<td>27</td>
</tr>
<tr>
<td>1/2 baked potato</td>
<td></td>
<td>1/2 c vegetables</td>
<td>161</td>
<td>—</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>1 tbsp butter</td>
<td></td>
<td></td>
<td>102</td>
<td>7</td>
<td>—</td>
<td>3</td>
</tr>
<tr>
<td>1 tbsp sour cream b</td>
<td></td>
<td></td>
<td>31</td>
<td>2</td>
<td>—</td>
<td>17</td>
</tr>
<tr>
<td>12 oz diet cola</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>And for dessert:</td>
<td></td>
<td>1 c grains</td>
<td>158</td>
<td>2</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Later on, a bedtime snack:</td>
<td></td>
<td>2 oz grains</td>
<td>250</td>
<td>2</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>2 cream-filled snack cakes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 c herbal tea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DRI recommended intakes:

- 2,000 cal: 210% <20d 25 75 1,000
- Percentage of DRI recommended intakes: 113% 52% 36% 77%

### Intakes Compared with MyPyramid Amounts

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Snack</th>
<th>Dinner</th>
<th>Snack</th>
<th>Tuesday’s Totals</th>
<th>Recommended MyPyramid Amounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>0 c</td>
<td>1 c</td>
<td></td>
<td>2 c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>a</td>
<td>1 c</td>
<td>1 c</td>
<td>2 1/2 c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grains</td>
<td>2 oz</td>
<td>2 oz</td>
<td>1 oz</td>
<td>2 oz</td>
<td>7 oz</td>
<td>6 oz</td>
<td></td>
</tr>
<tr>
<td>Meat and legumes</td>
<td>2 oz</td>
<td>6 oz</td>
<td>9 oz</td>
<td>5 1/2 oz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>1 c</td>
<td>1 c</td>
<td>2 c</td>
<td>3 c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oils</td>
<td>7 1/2 tsp</td>
<td>5 1/2 tsp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calorie allowance</td>
<td>2,263 cal</td>
<td>2,000 cal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*a* The potato in 14 potato chips provides less than 1/2 cup vegetables.

*b* The saturated fats of steak, butter, and sour cream are among the solid fats and do not qualify as oils.

*c* DRI values for a sedentary woman, age 19–30. Other DRI values are listed on the inside front cover.

*d* The 20-gram value listed is the maximum allowable saturated fat for a 2,000-calorie diet. The DRI recommends consuming less than 10 percent of calories from saturated fat.
Compare Your Intakes with MyPyramid

The purpose of this chapter’s exercise is to give you a feel for how your diet compares with MyPyramid and help you consider your discretionary calorie sources.

1. From the Home page of DA+, select the Reports tab and select MyPyramid Analysis. Choose Day Two of your three-day diet intake (from Chapter 1). Choose all meals for that day. Generate a report. Did your intake for that day conform to the MyPyramid pattern? Did you consume too few foods from any particular food group(s)? Which, if any, were lacking? Using Table 2-2 (page 44) and Figure 2-5 (pages 38–39) to guide you, suggest ways that you might realistically change your intake to better conform to the MyPyramid diet pattern.

2. What about fat? Select the Reports tab then Macronutrient Ranges. Generate a report. Did your fat intake fall between 20–35 percent of your total energy? Did you take in enough raw oils to meet your need (see Table 2-2, page 44)? Which ones? Change your date to include all three days of your record and generate a report to see a fat intake average. How does your single day’s fat intake compare with your three-day average?

3. Find your discretionary calorie allowance on the bottom line of Table 2-2. Select the Track Diet tab and look over your day’s food list. Which foods provided discretionary calories? (Use Table 2-1 on page 43 as a guide.)

4. Breaking this information down further, consider that the USDA generally recommends that no more than half of the day’s discretionary calories come from added sugars. Which foods on your food list contribute added sugars? If you consumed substantial amounts of added sugars, suggest realistic ways to reduce your intake.

5. A great feature of the Diet Analysis program is its Source Analysis Report that allows you to list food sources of calories (kcal) or specific nutrients in order of predominance. From the Reports tab, select Source Analysis, Day Three, and choose all meals. Generate a report. Which foods provided most to your calorie intake on that day? If you consumed vegetables, where did they fall on the list? In later chapters you’ll use this report again to analyze various nutrients in your diet.

Concepts in Action

Throughout this chapter, the Cengage NOW logo indicates an opportunity for online self-study, linking you to interactive tutorials and videos based on your level of understanding. Go to www.cengage.com/sso.

Search for “diet” and “food labels” at the U.S. Government health information site: www.healthfinder.gov.

Learn more about the Dietary Guidelines for Americans: www.healthierus.gov/dietaryguidelines.

Learn more about the USDA Food Guide and MyPyramid: www.mypyramid.gov.

Get healthy eating tips and ideas of ways of eating more fruits and vegetables: www.fruitsandveggiesmatter.gov.

Find Canadian information on nutrition guidelines and food labels at: www.hc-sc.gc.ca.

Answers to these Self Check questions are in Appendix G.

1. The nutrient standards in use today include all of the following except:

   A. Adequate Intakes (AI)
   B. Daily Minimum Requirements (DMR)
   C. Daily Values (DV)
   D. (a) and (c)
2. The Dietary Reference Intakes were devised for which of the following purposes?
   A. to set nutrient goals for individuals
   B. to suggest upper limits of intakes, above which toxicity is likely
   C. to set average nutrient requirements for use in research
   D. all of the above

3. According to the USDA Food Guide, which of the following may be counted among either the meats or the vegetables?
   A. chicken
   B. avocados
   C. black beans
   D. potatoes

4. The USDA Food Guide recommends a small amount of daily oil from which of these sources?
   A. olives
   B. nuts
   C. vegetable oil
   D. all of the above

5. Which of the following values is found on food labels?
   A. Daily Values
   B. Dietary Reference Intakes
   C. Recommended Dietary Allowances
   D. Estimated Average Requirements

6. The energy intake recommendation is set at a level predicted to maintain body weight.
   T  F

7. The Dietary Reference Intakes (DRI) are for all people, regardless of their medical history.
   T  F

8. People who choose not to eat meat or animal products need to find an alternative to the USDA Food Guide when planning their diets.
   T  F

9. By law, food labels must state as a percentage of the Daily Values the amounts of vitamin C, vitamin A, niacin, and thiamin present in food.
   T  F

10. To be labeled "low fat," a food must contain 3 grams of fat or less per serving.
    T  F
CONTROVERSY 2

Are Some Foods “Superfoods” for Health?

LO 2.6

Headlines these days often focus on the latest “superfoods” for health: “Forgetful? Blueberries sharpen brain function!” “Too many colds? Try immune-boosting soybeans!” “Worried about cancer? Eat tomatoes!” Can simply eating certain foods accomplish these wondrous things? Although headlines tend to overstate their talents, what these foods and many others have in common is a rich supply of phytochemicals—nonnutrient components of plants, introduced in Chapter 1. Phytochemicals often act as bioactive food components, food constituents with the ability to alter body processes (terms are defined in Table C2-1).

Just a few of today’s “superfoods” appear here; later chapters address others, such as olive oil and nuts (Controversy 5) and broccoli and its relatives (Chapter 11). These are functional foods of the simplest kind—they naturally contain substances having biological activity in the body beyond those of the nutrients. Other functional foods arise when manufacturers dose candy bars, juices, margarine, snack chips, and the like with nutrients, phytochemicals, herbs, or other bioactive food components. Which kind might be most beneficial to health and why are topics of the last section of this Controversy.

A SCIENTIST’S VIEW OF PHYTOCHEMICALS

At one time, phytochemicals were known only for their sensory properties in foods, such as taste, aroma, texture, and color. Thank phytochemicals for the burning sensation of hot peppers, the pungent flavor of onions and garlic, the bitter tang of chocolate, the aromatic qualities of herbs, and the beautiful colors of tomatoes, spinach, pink grapefruit, and watermelon.

Today, phytochemicals are emerging as potential regulators of health: many act as antioxidants that protect DNA and other cellular compounds from oxidative damage; some interact with genes to regulate protein synthesis; some mimic hormones; while others alter the blood chemistry in other ways.

Of the tens of thousands of phytochemicals known to exist, just a few have been researched at all, and only a sampling of those are mentioned in this Controversy—enough to illustrate their potential roles in human health and the wide array of foods that supply them. So far, the most promising results have come from studies of cells or animals; studies of human beings are less encouraging.

Many phytochemicals belong to the large chemical group known as flavonoids. Many plant foods, including many fruits, vegetables, whole grains, nuts, red wine, spices, and even dark chocolate (see Table C2-2), contain them. Such phytochemicals may act at the level of the genes to reduce inflammatory processes related to many disease processes.

Blueberries

When researchers feed rats on chow rich in blueberry extracts, they exhibit fewer age-related mental declines than rats on plain chow. The antioxidant phytochemicals of blueberries are credited with the effect because they reduce oxidative stress. Oxidative stress is a chemical imbalance that promotes inflammation and damages molecular structures of cells. Chronic oxidative stress worsens the brain’s loss of mental powers as it ages. The brain cannot readily replace its damaged cells, so when oxidative damage builds over time, memory and reasoning, loss of muscle control, and other brain function diminish.

Are blueberries a brain superfood, then? Although blueberries currently lead the way in antioxidant and brain research, it is unknown whether or not they can prevent aging effects in the human brain. Furthermore, antioxidants in other berries, artichokes, coffee, pomegranates, spinach, or even seaweed could turn out to play similar or better roles. In addition, the brain needs carbohydrate, certain lipids, and vitamins and minerals for peak performance. Rather than gambling on one particular food’s phytochemical, the wisest course is to choose a variety of phytochemical-rich fruits and vegetables in the context of an adequate, balanced diet needed to sustain brain functioning.

Chocolate

Imagine the delight of young research subjects who were paid to eat 3 ounces of dark (bittersweet) chocolate for an experiment. Less appealingly, researchers then drew blood from the subjects to test whether an antioxidant flavonoid in chocolate was absorbed into...
• antioxidants (anti-OX-ih-dants) compounds that protect other compounds from damaging reactions involving oxygen by themselves reacting with oxygen (anti means “against”; oxy means “oxygen”). Oxidation is a potentially damaging effect of normal cell chemistry involving oxygen (more in Chapters 5 and 7).
• bioactive food components compounds in foods, either nutrients or phytochemicals, that alter physiological processes.
• broccoli sprouts the sprouted seed of Brássica itálica, or the common broccoli plant; believed to be a functional food by virtue of its high phytochemical content.
• drug any substance that when taken into a living organism may modify one or more of its functions.
• edamame fresh green soybeans, a source of phytoestrogens.
• flavonoids (FLAY-von-oyds) members of a chemical family of yellow pigments in foods; phytochemicals that may exert physiological effects on the body. Flavus means “yellow.”
• flaxseed small brown seed of the flax plant; used in baking, cereals, or other foods. Valued in nutrition as a source of fatty acids, lignans, and fiber.
• functional foods whole or modified foods that contain bioactive food components believed to provide health benefits, such as reduced disease risks, beyond the benefits that their nutrients confer. All whole foods are functional in some ways because they provide at least some needed substances, but certain foods stand out as rich sources of bioactive food components. Also defined in Chapter 1.
• genistein (GEN-ih-steen) a phytoestrogen found primarily in soybeans that both mimics and blocks the action of estrogen in the body.
• kefir (KEE-fur) a liquid form of yogurt, based on milk, probiotic microorganisms, and flavorings.
• lignans phytochemicals present in flaxseed, but not in flax oil, that are converted to phytoestrogens by intestinal bacteria and are under study as possible anticancer agents.
• lutein (LOO-teen) a plant pigment of yellow hue; a phytochemical believed to play roles in eye functioning and health.
• lycopene (LYE-koh-pee-en) a pigment responsible for the red color of tomatoes and other red-hued vegetables; a phytochemical that may act as an antioxidant in the body.
• miso fermented soybean paste used in Japanese cooking. Soy products are considered to be functional foods.
• organosulfur compounds a large group of phytochemicals containing the mineral sulfur. Organosulfur phytochemicals are responsible for the pungent flavors and aromas of foods belonging to the onion, leek, chive, shallot, and garlic family and are thought to stimulate cancer defenses in the body.
• phytochemicals (FIHG-toe-CHEM-ih-cals) compounds in plants that confer color, taste, and other characteristics. Often, the bioactive food components of functional foods. Also defined in Chapter 1. Phyto means “plant.”
• phytoestrogens (FIHG-toe-ESS-troh-gens) phytochemicals structurally similar to the female sex hormone estrogen. Phytoestrogens weakly mimic estrogen or modulate hormone activity in the human body.
• phytosterols phytochemicals that resemble cholesterol in structure, but that lower blood cholesterol by interfering with cholesterol absorption in the intestine. Phytosterols include sterol esters and stanol esters.
• prebiotic a substance that may not be digestible by the host, such as fiber, but that serves as food for probiotic bacteria and thus promotes their growth.
• probiotic a live microorganism which, when administered in adequate amounts, alters the bacterial colonies of the body in ways believed to confer a health benefit on the host.
• resveratrol (rez-VER-ah-trol) a flavonoid of grapes under study for potential health benefits.
• soy milk a milklike beverage made from soybeans, claimed to be a functional food. Soy drinks should be fortified with vitamin A, vitamin D, riboflavin, and calcium to approach the nutritional equivalency of milk.
• tofu a white curd made of soybeans, popular in Asian cuisines, and considered to be a functional food.

The heart, vulnerable to damage by oxidation, could benefit from such flavonoids and other antioxidants (Table C2-3 lists some contributors). In addition, dark chocolate may reduce the likelihood of blood clots, promote normal blood pressure, help to relax blood vessels, improve blood lipids, and reduce inflammation, factors associated with heart disease prevention. A recent study, however, detected no benefits of chocolate in terms of heart risk factors or as an indicator of inflammation. No one yet knows whether chocolate fans actually suffer less heart disease.

Flaxseed
Flaxseed is valued for relieving constipation and digestive distress, but other potential health benefits are...
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Possible Effects</th>
<th>Food Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkylresorcinols (phenolic lipids)</td>
<td>May contribute to the protective effect of grains in reducing the risks of diabetes, heart disease, and some cancers.</td>
<td>Whole-grain wheat and rye</td>
</tr>
<tr>
<td>Allicin (organosulfur compound)</td>
<td>Antimicrobial that may reduce ulcers; may lower blood cholesterol.</td>
<td>Chives, garlic, leeks, onions</td>
</tr>
<tr>
<td>Capsaicin</td>
<td>Modulates blood clotting, possibly reducing the risk of fatal clots in heart and artery disease.</td>
<td>Hot peppers</td>
</tr>
<tr>
<td>Carotenoids (include beta-carotene, lycopene, lutein, and hundreds of related compounds)</td>
<td>Act as antioxidants, possibly reducing risks of cancer and other diseases.</td>
<td>Deeply pigmented fruits and vegetables (apricots, broccoli, cantaloupe, carrots, pumpkin, spinach, sweet potatoes, tomatoes)</td>
</tr>
<tr>
<td>Curcumin</td>
<td>Acts as an antioxidant and anti-inflammatory agent; may reduce blood clot formation; may inhibit enzymes that activate carcinogens.</td>
<td>Turmeric, a yellow-colored spice</td>
</tr>
<tr>
<td>Flavonoids (include flavones, flavonols, isoflavones, catechins, and others)</td>
<td>Act as antioxidants; scavenge carcinogens; bind to nitrates in the stomach, preventing conversion to nitrosamines; inhibit cell proliferation.</td>
<td>Berries, black tea, celery, citrus fruits, green tea, olives, onions, oregano, purple grapes, purple grape juice, soybeans and soy products, vegetables, whole wheat, wine</td>
</tr>
<tr>
<td>Genistein and daidzein (isoflavones)</td>
<td>Phytoestrogens that inhibit cell replication in GI tract; may reduce or elevate risk of breast, colon, ovarian, prostate, and other estrogen-sensitive cancers; may reduce cancer cell survival; may reduce risk of osteoporosis.</td>
<td>Soybeans, soy flour, soy milk, tofu, textured vegetable protein, other legume products</td>
</tr>
<tr>
<td>Indoles (organosulfur compound)</td>
<td>May trigger production of enzymes that block DNA damage from carcinogens; may inhibit estrogen action.</td>
<td>Cruciferous vegetables such as broccoli, brussels sprouts, cabbage, cauliflower, horseradish, mustard greens, kale</td>
</tr>
<tr>
<td>Isothiocyanates (organosulfur compounds that include sulforaphane)</td>
<td>Act as antioxidants; inhibit enzymes that activate carcinogens; activate enzymes that detoxify carcinogens; may reduce risk of breast cancer, prostate cancer.</td>
<td>Cruciferous vegetables such as broccoli, brussels sprouts, cabbage, cauliflower, horseradish, mustard greens, kale</td>
</tr>
<tr>
<td>Lignans</td>
<td>Phytoestrogens that block estrogen activity in cells possibly reducing the risk of cancer of the breast, colon, ovaries, and prostate.</td>
<td>Flaxseed and its oil, whole grains</td>
</tr>
<tr>
<td>Monoterpenes (including limonene)</td>
<td>May trigger enzyme production to detoxify carcinogens; inhibit cancer promotion and cell proliferation.</td>
<td>Citrus fruit peels and oils</td>
</tr>
<tr>
<td>Phenolic acids</td>
<td>May trigger enzyme production to make carcinogens water-soluble, facilitating excretion.</td>
<td>Coffee beans, fruits (apples, blueberries, cherries, grapes, oranges, pears, prunes), oats, potatoes, soybeans</td>
</tr>
<tr>
<td>Phytic acid</td>
<td>Binds to minerals, preventing free-radical formation, possibly reducing cancer risk.</td>
<td>Whole grains</td>
</tr>
<tr>
<td>Resveratrol</td>
<td>Acts as antioxidant; may inhibit cancer growth; reduce inflammation, LDL oxidation, and blood clot formation.</td>
<td>Red wine, peanuts, grapes, raspberries</td>
</tr>
<tr>
<td>Saponins (glucosides)</td>
<td>May interfere with DNA replication, preventing cancer cells from multiplying; stimulate immune response.</td>
<td>Alfalfa sprouts, other sprouts, green vegetables, potatoes, tomatoes</td>
</tr>
<tr>
<td>Tannins</td>
<td>Act as antioxidants; may inhibit carcinogen activation and cancer promotion.</td>
<td>Black-eyed peas, grapes, lentils, red and white wine, tea</td>
</tr>
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</table>
emerging from research. Flaxseed contains lignans, compounds converted into biologically active phytoestrogens by bacteria that normally reside in the human intestine. Some evidence about their effects follows:

- Flaxseed intake, but not flaxseed oil, appears to improve blood lipids in ways supportive of heart health, particularly among older women.  
- Rats fed chow high in flaxseed develop fewer cancerous changes and reduced tumor growth in mammary tissue under experimental conditions.  
- In one study, men with prostate cancer given flaxseed had less cancer cell proliferation than controls.  

Some evidence also suggests that flaxseed may lower blood pressure.  
Some risks are associated with flaxseed overuse, however. Flaxseed contains compounds that interfere with vitamin or mineral absorption, and thus high daily flaxseed intakes could cause nutrient deficiencies. Large quantities of flaxseed also cause digestive distress. Including a spoonful or two of flaxseed in the diet may not be a bad idea, however. Flaxseed richly supplies linolenic acid, an essential fatty acid often lacking in the U.S. diet (see Chapter 5).

Garlic

For thousands of years, people have credited garlic with medicinal properties. Descriptions of its uses for headaches, heart disease, and tumors are recorded in early Egyptian medical writings. Scientific study of garlic’s properties are ongoing.

Among garlic’s most promising constituents are antioxidant organosulfur compounds, reported to inhibit cancer development. Oxidizing compounds damage DNA in animal cells and trigger cancerous changes. Antioxidants of garlic quench these oxidizing compounds, at least in test tubes. Whether garlic prevents cancers in people is unknown. Other potential roles for garlic include opposing allergies, heart disease, infections, and ulcers, but these effects remain uncertain. However, if you like garlicy foods, you can consume them with confidence; history and at least some research are on your side.

Common Foods Ranked by Antioxidant Content

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1. Blackberries</td>
<td>3. Strawberries</td>
</tr>
<tr>
<td>2. Walnuts</td>
<td>4. Spinach</td>
</tr>
<tr>
<td>5. Artichokes, prepared</td>
<td>6. Cranberries</td>
</tr>
<tr>
<td>7. Coffee</td>
<td>8. Raspberries</td>
</tr>
<tr>
<td>11. Cloves, ground</td>
<td>12. Grape juice, cranberry juice, pomegranate juice</td>
</tr>
<tr>
<td>15. Wine, red</td>
<td></td>
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</tbody>
</table>

Soybeans and Soy Products

Compared with people in the West, Asians living in Asia suffer less frequently from heart disease; cancers, especially of the breast, colon, and prostate; and osteoporosis (adult bone loss). Women in Asia also suffer less from symptoms related to menopause, the midlife decline in women’s estrogen secretion when menstruation ceases. When Asians immigrate to the United States and adopt Western diets and habits, however, they experience these diseases and problems at the same rates as native Westerners.

Asians consume far more soybeans and soy products, such as edamame, miso, soy milk, tofu, and other soy foods than do Westerners. Soybeans are rich sources of phytoestrogens. However, soy is just one among many diet and lifestyle differences between East and West—and even the forms of soy foods consumed in these areas differ.

To determine whether soy foods account for differences in disease rates requires clinical evidence, not just correlation.

Soy and Chronic Diseases

A small drop in blood cholesterol occurs when subjects, particularly men with elevated cholesterol, replace meat and dairy foods in their diets with soy protein sources. It takes a lot of soy to achieve this effect—more than half the daily protein intake must come from soy. Also, the effect comes from food; benefits are diminished if the phytoestrogen is removed from the soybean matrix. As is true for flaxseed, soy foods contain compounds that intestinal bacteria convert to biologically active forms.

With regard to cancer, concerns about breast cancer, colon cancer, and prostate cancer involve estrogen-sensitive varieties—cancers that grow when exposed to estrogen. Soy phytoestrogens are chemical relatives of the human hormone estrogen and may weakly mimic or oppose the hormone’s effects. Age of the eater affects the results: a high soy intake during childhood and adolescence seems to reduce breast cancer risk in women before menopause; soy intake by adults may or may not reduce this risk, but more research is needed to clarify these relationships.
form, soy phytoestrogens may interfere with the actions of a drug used in breast cancer treatment, however. 29 Also, high doses of genistein given to pregnant mice produced female offspring with a high risk of cancer of the uterus. 8 Pregnant women should never take chances with unproven supplements of any kind (Chapter 13 explains why). With regard to the biological activity of soy, scientific understanding is incomplete. 30

As for menopause, no consistent findings indicate that soy phytoestrogens can eliminate the common sensations of elevated body temperature known as “hot flashes.” 31 Some evidence does suggest that soy phytoestrogens may help to preserve women’s bone density after menopause but more research is required to confirm or refute this finding. 32 Hormone replacement therapy, once routinely used in menopause to prevent symptoms and bone loss, involves serious health risks, so alternatives are needed. Phytoestrogen supplements sold as “natural” hormone therapy are unproven, however, and may pose health risks.

The opposing actions of phytoestrogens should raise a red flag against taking supplements, especially by people who have had cancer or whose close relatives have developed cancer. The American Cancer Society recommends that breast cancer survivors and those under treatment for breast cancer should consume only moderate amounts of soy foods as part of a healthy plant-based diet and should not intentionally ingest very high levels of soy products.

Tomatoes

People around the world who eat the most tomatoes, about five tomato-containing meals per week, are less likely to suffer from cancers of the esophagus, prostate, or stomach than those who avoid tomatoes. Among phytochemical candidates for promoting this effect is lycopene, a red pigment with antioxidant activity found in guava, papaya, pink grapefruit, tomatoes (especially cooked tomatoes and tomato products), and watermelon.

Lycopene and some of its chemical relatives filter high-energy wavelengths of visible light. In the skin, they may act as a sort of internal sunscreen, protecting skin from damaging sun rays that cause skin cancer. 33 Lycopene and some products of its metabolism also act as antioxidants and, theoretically, could inhibit the growth of cancer cells, but so far, research does not support the idea. 34 Something else about tomato-eating peoples may be reducing their risks. An evidence-based review by the FDA concluded that no or very little credible evidence exists to support an association between lycopene or tomato consumption and reduced cancer rates. 35 It does appear that lycopene supplements are not as hazardous as those of its chemical cousins, beta-carotene and lutein, which clearly raise the risk of lung cancer in smokers. 36

Tea, Wine, Pomegranate, and Whole Grain

Diets containing flavonoid-rich foods are frequently credited with health-promoting qualities. For example, a recent study suggests that young women who drink three or more cups of tea each day suffer less breast cancer than others. 37 When researchers reviewed the results of 51 studies, the evidence for green tea and cancer was mixed—sometimes drinking the tea seemed protective but other times it did not, so no conclusion can be drawn. 38

People in Japan who drink five cups of green tea each day die less often from a form of stroke than people who drink less than a cup. 39 Green tea consumption has also been associated with reduced oxidative stress and inflammation among smokers, lower blood lipids, and even reduced body fatness. 40 Whether such associations will hold up under further scrutiny is unknown. High-dose supplements of green tea extract have caused liver toxicity and should be avoided. 41

A flavonoid in purple grape juice and red wine, resveratrol, seems to hold promise as a disease fighter, but the amount present in wine or a serving of grape juice may be too small to benefit human health. 42 The flavonoid has been credited with extending the life of yeast cells, worms, flies, and fish but no one knows if such an effect is plausible for human beings. 43 In population studies, people who regularly consume red wine, grapes and their products, and other flavonoid-rich fruits and vegetables often have a lower incidence of cardiovascular disease than others. 44 Scientists have suggested biological mechanisms by which these foods might reduce disease risks but controlled clinical human trials to show that people’s hearts actually benefit from grape consumption are still lacking. 45

In high doses, resveratrol has also demonstrated some anticancer activities, but such doses are larger than those attainable by diet, even with daily red wine intake. 46 As for drinking red wine for health, Controversy 3 concludes that the immediate risks from alcoholic beverages for young adults may outweigh potential benefits.

The juice of the pomegranate fruit ranks high among juices in antioxidants. Antioxidants reduce the oxidative stress and tissue inflammation, conditions associated with many chronic diseases. 47 Much is yet to be learned about the bioavailability, metabolism, and health effects of the principal phytochemicals of pomegranates.

Flavonoids in whole grains may confer health benefits on the eater but also impart a bitter taste. To please consumers who tend to prefer mild or sweet flavors, food producers refine away flavonoid-rich plant parts, such as bran or fruit skins. Thus, white bread, white grape juice, and white wine lack the flavonoid contents of their darker counterparts.

Yogurt

Yogurt is a special case among “superfoods.” Although yogurt lacks
Phytochemicals from plants, it contains living *Lactobacillus* or other bacteria that ferment milk into yogurt or a liquid yogurt beverage called kefir. Such microorganisms, or probiotics, can set up residence in the digestive tract and alter its functioning in ways that are claimed to reduce diseases such as colon cancer, ulcers, and other digestive problems; reduce allergies; or improve immunity and resistance to infections. 47 *Lactobacillus* organisms may indeed be useful for improving the diarrhea that often occurs from the use of antibiotic drugs or from other causes. 48 Reports of increased mortality among patients with diseases of the pancreas and serious infections in those with compromised immunity raise concerns about the safety of probiotic microorganism supplements for some groups of people. 49

Certain foods provide prebiotics, nutrients such as certain carbohydrates, that probiotic organisms need to grow. Certain by-products of such bacterial growth appear to decrease inflammation of the colon, a condition related to disease. 50 More research is needed to clarify whether probiotics and prebiotics may benefit or harm human health. 51

**Phytochemical Supplements**

No doubt exists that diets rich in whole grains, legumes, vegetables, fruits, and other whole foods reduce the risks of heart disease and cancer, but isolating the responsible food, nutrient, or phytochemical has proved difficult. Foods deliver thousands of bioactive food components, all within a food matrix that maximizes their availability and effectiveness. 52 Broccoli, and particularly broccoli sprouts, may contain as many as 10,000 different phytochemicals—each with the potential to influence some action in the body. These foods are under study for their potential to defend against cancers at the DNA level, and Chapter 11 comes back to them. 53

Even if it were known with certainty which foods protect against which diseases, no one can yet predict what diseases any given person may suffer, much less whether an isolated supplement might be of use. Individual phytochemicals, like actors in a play, are part of a larger story with intertwining and complementary roles—a fact that reinforces the principle of variety in diet planning.

**Supporters of Phytochemical Supplements**

Users and sellers of phytochemical supplements argue that existing evidence is good enough to recommend that people take supplements of purified phytochemicals. Users, eager for potential benefits, and sellers, hoping for profits, tend to discount the potential for harm from "natural" substances. People have been consuming foods containing phytochemicals for tens of thousands of years, they say, and because the body can handle phytochemicals in foods, it stands to reason that supplements of those phytochemicals are safe as well.

**Detractors of Phytochemical Supplements**

Such thinking raises concerns among scientists. They point out that although the body is equipped to handle phytochemicals when diluted in the other constituents of whole foods, it is not adapted to concentrated supplement doses. Further, the body absorbs only small amounts of these compounds into the bloodstream and quickly destroys most types with its detoxifying equipment. 54 No one knows why the body thus defends itself against these substances, but supplements of them overwhelm the body’s defenses.

Consider these facts about phytochemical supplements and health:

1. Phytochemicals alter body functions, sometimes powerfully, in ways that are only partly understood.
2. Evidence for the safety of isolated phytochemicals in human beings is lacking.
3. No regulatory body oversees the safety of phytochemicals sold to consumers. No studies proving their safety or effectiveness are required before they are marketed.
4. Phytochemical labels may make structure-function claims but existing research to support such claims is generally weak or nonexistent.

Phytochemical researchers conclude that the best-known, most effective, and safest sources for bioactive food components are foods, not supplements. Even those in foods, however, can interfere with the activities of certain drugs and undermine the medical treatment of serious diseases. 55 Such food and drug interactions are of critical importance, and the Controversy section of Chapter 14 is devoted to them.

**The Concept of Functional Foods**

Virtually all whole foods have some special value in supporting health and are therefore functional foods. Cranberries may help prevent urinary tract infections; garlic may lower blood cholesterol; and green tea may inhibit ulcer infections, just to name a few examples. 56 Manufactured functional foods, however, often consist of processed foods that are fortified with nutrients or enhanced with bioactive food components (calcium-fortified orange juice, for example). The creation of these functional foods is a fast-growing trend in the global food supply. 57

An example of a popular manufactured food is a margarine blended with a phytosterol intended to lower blood cholesterol. 58 Such novel functional foods raise questions:

- Does the margarine constitute a food or a drug? 59
- Which is the better choice for the health-conscious diet planner: to eat a food with additives that affect body function or to adjust the diet? 60
- Does it make more sense to add cholesterol-lowering margarine to the diet or to replace butter with unsaturated oils and eat more plant foods to supply phytosterols? 60
- Is it more beneficial to eat fried snack foods sprinkled with phytochemicals and candy bars laced with vitamins than to obtain these substances from ordinary foods? 61
- What about smoothies packed with medicinal herbs—are these foods safe to consume regularly? Are they safe for children?
Critics suggest that the designation “functional foods” may be nothing more than a marketing tool. After all, even the most experienced researchers cannot yet identify the perfect combination of bioactive food components to support optimal health. Yet manufacturers freely generate and distribute such concoctions as if they possessed that knowledge.

**THE FINAL WORD**

In light of all of the evidence for and against phytochemicals and functional foods, it seems clear that a moderate approach is warranted. People who eat the recommended amounts of a variety of fruits and vegetables each day may cut their risk for many diseases by as much as half. Replacing some meat with soy foods and other legumes may also lower heart disease and cancer risks. Choosing green tea or vegetable juice, or fruit juice within bounds, instead of daily soft drinks may also cut risks. In the context of a healthy diet, ordinary foods are time-tested for safety, posing virtually no risk of toxic levels of nutrients or phytochemicals (although some contain natural toxins; see Chapter 12). Table C2-4 offers some tips for consuming the foods known to provide phytochemicals. Various beneficial constituents are widespread among foods, and research indicates that a diverse selection of fruits and vegetables in the diet is more beneficial than an equal number of servings from just a few types. In other words, don’t try to single out a few “superfoods” or phytochemicals for their magical health effects. Instead, take a no-nonsense approach where your health is concerned: choose a wide variety of whole grains, legumes, nuts, fruits, and vegetables in the context of an adequate, balanced, and varied diet to receive all of the health benefits these foods can offer.

### Tips for Consuming Phytochemicals

- **Eat more fruit.** The average U.S. diet provides little more than ½ cup fruit a day. Remember to choose juices and raw, dried, or cooked fruits and vegetables at mealtimes as well as for snacks. Choose dried fruit in place of candy.
- **Increase vegetable portions.** Double the normal portion of cooked plain, nonstarchy vegetables to 1 cup.
- **Use herbs and spices.** Cookbooks offer ways to include parsley, basil, garlic, hot peppers, oregano, and other beneficial seasonings.
- **Replace some meat.** Replace some of the meat in the diet with grains, legumes, and vegetables. Oatmeal, soy meat replacer, or grated carrots mixed with ground meat and seasonings make a luscious, nutritious meat loaf, for example.
- **Add grated vegetables.** Carrots in chili or meatballs, celery and squash in spaghetti sauce, etc. add phytochemicals without greatly changing the taste of the food.
- **Try new foods.** Try a new fruit, vegetable, or whole grain each week. Walk through vegetable aisles and visit farmers’ markets. Read recipes. Try tofu, fortified soy drink, or soybeans in cooking.