

# 5

## Understanding Nutrition and Your Diet

### What Do You Know About Nutrition?

1. Dietary supplements may be harmful to your health. *True or False?*
2. Whole-grain bread does not have the same nutritional benefits as wheat bread. *True or False?*
3. Most people get enough vitamin D from exposure to the sun. *True or False?*
4. Saturated fats are the same thing as trans fats. *True or False?*
5. Most Americans eat enough fruits and vegetables. *True or False?*
6. Food allergies can be fatal. *True or False?*
7. Fruit juice is a good way to meet the dietary recommendations for the fruit group. *True or False?*

*Check your answers at the end of the chapter.*

**H**ealthy eating is important from the prenatal period throughout life, in order to prevent malnourishment and minimize the development of illnesses. Food supports growth and development by providing the body with the nutrients needed for energy, repair of damaged tissue, growth of new tissue, and regulation of physiological processes. Our food selections also reflect personal, familial, and cultural traditions. The preparation and serving of food at regular mealtimes and during holiday gatherings and other special occasions enhance all of the dimensions of health (see the box “Mealtime—A Chance to Share and Bond”). For example, sharing a meal with fellow parishioners after a religious service supports the spiritual dimension of health, sharing popcorn at the movies with your friends can enhance the social dimension of health, and learning about the cuisine of another culture develops the cultural dimension of health. As you read this chapter, keep in mind this balanced view of food as sustenance and food as a resource for the dimensions of health.



## Discovering Your Spirituality

### Mealtime—A Chance to Share and Bond

Food is important to your physical well-being—for energy, growth, repair, and regulation of your body and its functions. But it's also important to the well-being of your spirit. The sharing of food nourishes our spiritual sense of community. This happens through the type of foods selected, the method of preparation, the uniqueness of presentation, and the people involved. From a spiritual perspective, the sharing of food can be a highly satisfying activity.

When food is shared in the company of those who care about us, we experience a sense of community and well-being. The simple act of being together and engaging in a familiar practice is reassuring. Meals that involve family or friends, especially on special occasions or important holidays, can provide a chance to reconnect and build relationships.

Food is often at the center of the celebration of special occasions. Weddings, birthdays, anniversaries, graduations, promotions, retirements, and funerals take on a special meaning when people come together to share food and drink. From the first birthday cake, to the retirement dinner, to the lunch provided by neighbors after the funeral of a loved one, food can help to symbolize and acknowledge these events in our lives.

Food has been part of many religious practices and customs for centuries. Some foods have symbolic meanings related to major life

experiences and to ceremonies and religious rites. Food can take on symbolic and spiritual meaning, such as bread representing the body of Christ in the Christian religion. The use of food in spirituality helps to bring groups together to build a stronger sense of community. For example, Ramadan, the ninth month of the Islamic calendar, is considered one of the holiest months of the year in Islam, and from dawn to sunset Muslims abstain from food. The fast is broken at sunset when families and friends come together to enjoy traditional dishes such as fattoush, a salad. In the Jewish religion, the Seder, a ritual feast celebrated on the first day of Passover, features long-held traditions and customs involving food. Food takes on a symbolic meaning and is eaten during the retelling of the story of the Exodus from Egypt and freedom from slavery. In the Christian religion, family and friends celebrate Easter by having a meal together on Easter Sunday, usually including lamb, which represents Christ and is seen as a good omen.

Finally, food connects people on a spiritual level by allowing them to share traditions, religious practices, and beliefs. These customs help people build a sense of fellowship and can unify them in times of joy and sorrow.



## Types and Sources of Nutrients

Your body relies on seven **nutrients** to carry out its physiological functions: carbohydrates, fats, protein, vitamins, minerals, dietary fiber, and water.\* The first three—carbohydrates, fats, and protein—will be discussed together because they provide **calories**. These calories are either used quickly by our bodies in energy metabolism or stored in the form of glycogen or fat for delayed use as energy sources. The other nutrients—vitamins, minerals, dietary fiber, and water—are not sources of calories for the body. However, regardless of their relationship to calories, all nutrients are essential to human health. The function of each is discussed later in the chapter.

### Carbohydrates

**Carbohydrates** are various combinations of sugar units, or saccharides, and are the major energy source for the body.<sup>1</sup>

**Types and Sources of Carbohydrates** Carbohydrates occur in three forms, depending on the number of saccharide (sugar) units that make up the molecule. Carbohydrates are divided into two categories: simple

(monosaccharides and disaccharides) and complex carbohydrates (polysaccharides).

- **Monosaccharides**—*carbohydrates with one saccharide unit*. These are the primary source of the body's energy. Examples include glucose, found in vegetables, honey, fruits, and syrup; and fructose, found in fruits and berries.
- **Disaccharides**—*carbohydrates with two saccharide units, one of which is always a glucose unit*. Examples include sucrose, or table sugar; maltose, which is derived from germinating cereals; and lactose, found in human and animal milk.
- **Polysaccharides**—*carbohydrates with more than two saccharide units*. Polysaccharides include starches and dietary fiber. Examples are vegetables, breads, cereals, legumes, and pasta.

Both simple and complex carbohydrates contain 4 calories per gram, and both are converted into glucose in digestion. Simple carbohydrates are digested more quickly because they are composed of fewer saccharide units than complex carbohydrates. Complex carbohydrates also take longer to digest because they have more fiber, vitamins, and minerals.

**How Much Carbohydrate Is Recommended?** Each gram of carbohydrate contains 4 calories. Since the average person requires approximately 2,000 calories per day

\*Since most of our water intake comes from beverages rather than from food, some nutritionists do not consider water a nutrient, even though it is essential for life.

and about 45–65 percent of our calories come from carbohydrates, it is recommended that approximately 1,200 of our daily calories come from carbohydrates.<sup>1</sup> However, age, gender, and activity level affect the number of calories an individual requires each day; individual energy needs are discussed later in this chapter.

**Simple Sugars: The American Sweet Tooth** According to the U.S. Department of Agriculture (USDA), the average adult American consumes approximately 22.2 teaspoons of sugar per day while the USDA recommendations are no more than 8 teaspoons per day, a difference of 335 calories.<sup>2</sup> These sugars are usually found in sodas, candy, and bakery items, which have little nutritional value. Corn sweetener consumption has decreased since 2003 from 79 pounds to 37.8 pounds per year. However, sugar consumption has increased to 47.2 pounds per year.

Much of the sugar we consume is hidden; that is, sugar is a principal product we may overlook in a large number of food items. Foods such as ketchup, salad dressings, cured meat products, and canned vegetables and fruits can contain much hidden sugar. Corn syrup, frequently found in these items, is a highly concentrated sucrose solution. Whether the sugar is overt or hidden, the USDA has suggested a limit of 8 teaspoons of sugar per day for a 2,000-calorie diet, which would be equivalent to 8 ounces of yogurt.

**Sugar Substitutes** For a number of years, sugar substitutes have been used in a wide array of beverages, candy, baked goods, chewing gum, frozen desserts, gelatins and puddings, jams, toppings, and syrups. Among the most familiar of these are saccharin and aspartame (NutraSweet), both of which are several hundred times sweeter than sucrose. Since 1977, saccharin has been linked to cancer, particularly bladder cancer, and warnings were given about its use until 2000, when Congress removed this requirement.<sup>3</sup> Some of the newer artificial sweeteners are sorbitol, found in ice cream; acesulfame-potassium (ace K), used in Pepsi ONE; xylitol, found in some brands of chewing gum; neotame, found in candy and soft drinks; sucralose (Splenda); and tagatose, found in Slurpees. These sweeteners can be more than 600 times sweeter than sugar; neotame is 7,000–13,000 times sweeter than sugar. Stevia is an herbal sweetener made from the leaves of the South American shrub of the same name. It is 200–300 times sweeter than table sugar and is sold as a dietary supplement in the United States. There has been concern that consumption of stevia could cause infertility and cancer. Stevia can be found in soft drinks under the name Truvia (in Coca-Cola) and Purevia (in Pepsi-Cola). There have been concerns about other artificial sweeteners such as aspartame and acesulfame-potassium being associated with cancer, but the USDA has deemed them safe at this point. While many people use artificial sweeteners as a way to decrease

caloric intake and to manage weight, studies have shown that people consuming food and beverages with artificial sweeteners actually consumed more calories than those who did not. So sugar substitutes may actually contribute to weight gain rather than weight loss.<sup>4</sup>

## Fats

Fats (lipids, fatty acids) have been given a bad name but are an important nutrient in our diets. Fats provide a concentrated form of energy (over double that of carbohydrates—there are 9 calories per gram consumed versus 4 for carbohydrates and protein). Fats provide a sense of **satiety** and keep us from feeling hungry. Because fats take longer to leave the stomach than either carbohydrates or proteins do, our stomachs feel full for a longer period of time, decreasing our appetite. Fats also help to give our food its pleasing taste, and they serve as carriers of fat-soluble vitamins A, D, E, and K. Without fat, these vitamins would quickly pass through the body. Fat insulates the body and helps it retain heat.

**Sources of Fat** Dietary sources of fat are often difficult to identify. The visible fats in our diet, such as butter, salad oils, and the layer of fat on some cuts of meat, represent only about 40 percent of the fat we consume. Most of the fat we eat is “hidden” in food because it is incorporated into the food during preparation or used to fry the food or as a sauce.

**Types of Fat** Every type of dietary fat is made up of a combination of three forms of fat (saturated, monounsaturated, and polyunsaturated), based on its chemical composition (see Figure 5-1). In each of the three forms of fat, the absence of double bonds (saturated fats) or the presence of double bonds (monounsaturated and polyunsaturated fats) and the location of the double bonds within the molecule determine the nature and degree of restructuring that the body can do in changing dietary

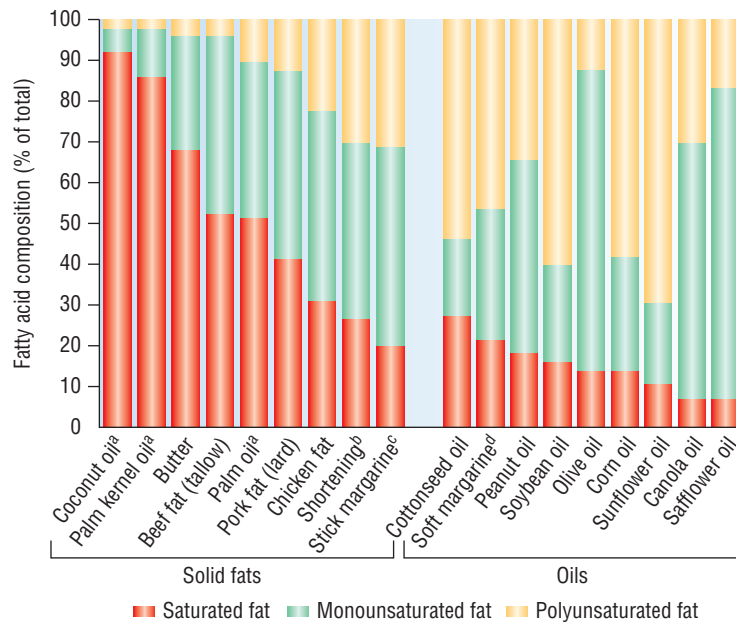
### Key Terms

**nutrients** Elements in foods that are required for the growth, repair, and regulation of body processes.

**calories** Units of heat (energy); specifically, 1 calorie is the amount of energy needed to raise the temperature of 1 gram of water by 1°C. In common usage, on food labels, and in this chapter, the term *calorie* is used to refer to a larger energy unit, *kilocalorie* (1,000 calories).

**carbohydrates** The body's primary source of energy for all body functioning; chemical compounds including sugar, starches, and dietary fibers.

**satiety** (suh **tie** uh tee) The feeling of no longer being hungry; a diminished desire to eat.



**Figure 5-1 Fatty Acid Profiles of Common Fats and Oils**

<sup>a</sup> Coconut oil, palm kernel oil, and palm oil are called oils because they come from plants. However, they are semi-solid at room temperature due to their high content of short-chain saturated fatty acids. They are considered solid fats for nutritional purposes.

<sup>b</sup> Partially hydrogenated vegetable oil shortening, which contains trans fats.

<sup>c</sup> Most stick margarines contain partially hydrogenated vegetable oil, a source of trans fats.

<sup>d</sup> The primary ingredient in soft margarine with no trans fats is liquid vegetable oil.

Source: U.S. Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory, USDA National Nutrient Database for Standard Reference, Release 22, 2009, <http://www.ars.usda.gov/ba/bhnrc/ndl>, accessed July 19, 2010.

fat into physiology-friendly forms. Today, consumers need to pay attention to the amount of each type of fat in dietary fat because of the role that each form plays in heart disease (see Chapter 10).

**Saturated and Trans Fats** Not all fats are created equal. **Saturated fats**, including those found in animal sources and in vegetable oils to which hydrogen has been added (hydrogenated), becoming **trans-fatty acids**, need to be carefully limited in a modern healthy diet. The presence of trans-fatty acids (an altered form of normal vegetable oil molecules or from meat and dairy products, having formed naturally by fermentation in the intestinal tract of animals)<sup>5</sup> is associated with changes in the cell membrane, including those cells lining the artery wall. This possibly prevents these vessel wall cells from freeing cholesterol from their surfaces.<sup>6</sup> Processing can change the structure of fat, making it more saturated. As a result, the oils become semisolid and more stable at room temperature. The term *trans* describes the chemical makeup of a fatty acid. Most trans-fatty acids come from hydrogenated oil, which is found in foods such as stick margarine, peanut butter, and crackers. They are popular in food manufacturing because they can extend the shelf life of the food: The oil stays mixed in the food and doesn't rise to the top, and the food doesn't become too soft at room temperature. The fast-food industry uses these fats to fry many foods.<sup>7</sup> Additionally, trans-fatty acids

are associated with increases in low-density lipoprotein (LDL), the “bad” cholesterol, without corresponding increases in high-density lipoprotein (HDL), the “good” cholesterol<sup>8</sup> (see Chapter 10). The amount of trans-fatty acids in the diet should be limited to 2 grams or less daily.

Trans fats can act like saturated fat, potentially raising LDL blood cholesterol levels and decreasing HDL cholesterol. This is the reason nutritionists encourage us to use butter rather than stick margarine. To reduce your intake of trans fat, make sure you check the labels on foods to see if they list “partially hydrogenated vegetable oil” as one of the ingredients. Cakes, cookies, crackers, snack foods, stick margarine, vegetable shortening, and fried foods are most likely to contain hydrogenated vegetable oil.

There has been a big push for restaurants and food manufacturers to discontinue using trans fats in their products, which has resulted in a 70 percent decrease in the use of trans fats over the past three years. Trans fat has been called a “dangerous and unnecessary ingredient” and has been banned for use in restaurants in New York City. The FDA now requires food manufacturers to list trans fat on any product that contains more than 0.5 gram of trans fat per serving. However, that means products that boast they contain “no trans fat” can have less than half a gram of trans fat per serving, and if you eat multiple servings, you can easily consume more than the 2 grams of trans fat a day that is the USDA's suggested daily limit. Many food producers are jumping on the



no-trans-fat bandwagon, and you will see more cereals, chips, crackers, and other foods labeled “No trans fat.”

**Monounsaturated Fats** Fortunately, the replacement of saturated fats with monounsaturated and polyunsaturated fats and oils appears to lower blood cholesterol levels and reduce the risk of heart disease. Vegetable oils tend to be low in saturated fats, with the exception of the tropical oils (coconut, palm, and palm kernel oils). Monounsaturated fats are found in high quantities in olive oil, peanut oil, and sesame oil.

**Polyunsaturated Fats** Polyunsaturated fats are especially prevalent in soybean oil and corn oil. Monounsaturated fats can reduce the harmful low-density lipoproteins (LDLs). Polyunsaturated fats reduce both LDLs and total cholesterol. However, polyunsaturated fats also lower the healthful high-density lipoproteins (HDLs), which is not a desirable outcome. Omega-3 fatty acids, found in most varieties of fish, are a type of polyunsaturated fat and have been associated with decreased risk of heart disease. Our bodies require omega-3 fatty acids, but we can't produce them on our own, and therefore we must get them from the foods we eat. Flax seed, walnuts, and olive oil are good sources for omega-3 fatty acids. You can also consume omega-3 fish oil as a dietary supplement.

**Tropical Oils** Although all cooking oils (and fats such as butter, lard, margarine, and shortening) have the same number of calories by weight (9 calories per gram), some oils contain high percentages of saturated fats. All oils and fats contain varying percentages of saturated, monounsaturated, and polyunsaturated fats. The tropical oils—coconut, palm, and palm kernel—contain much higher percentages of saturated fats than do other cooking oils. Coconut oil is 92 percent saturated fat. Tropical oils can still be found in some brands of snack foods, crackers, cookies, nondairy creamers, and breakfast cereals, although they have been removed from most national brands. Do you check for tropical oils on the ingredients labels of the food you select?

**How Much Fat, and What Type, Is Recommended?** The current dietary guidelines recommend that no more than 20–35 percent of our calories come from fat. In addition it is suggested that people do the following:

- Consume less than 10 percent of calories from saturated fatty acids and less than 300 mg per day of cholesterol, and keep trans-fatty acid consumption as low as possible, no more than 2 grams per day.
- Get most fats from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.
- Make choices that are lean, low-fat, or fat-free when selecting and preparing meat, poultry, dry beans, and milk or milk products.



Food labels are an important source of information about the type and amount of fats, carbohydrates, and other nutrients contained in a food.

**Cholesterol** **Cholesterol** is a white, fatlike substance found in cells of animal origin. It is not found in any vegetable product, so products such as peanut butter and margarine that claim they are cholesterol-free never had it in the first place. Cholesterol is used to synthesize cell membranes and also serves as the starting material for the synthesis of bile acids and sex hormones. Although we consume cholesterol in our diet, in such foods as shrimp and other shellfish, animal fat, and milk, we don't need to obtain cholesterol from external sources—the human liver can synthesize enough of the substance to meet the body's needs.

Cholesterol is essential for many of the body's functions. However, if you have too much cholesterol, it builds

#### Key Terms

**saturated fats** Fats that promote cholesterol formation; they are in solid form at room temperature; primarily animal fats.

**trans-fatty acid** An altered form of an unsaturated fat molecule in which the hydrogen atoms on each side of the double bond(s) are on opposite sides; also called *trans fats*.

**cholesterol** A primary form of fat found in the blood; lipid material manufactured within the body, as well as derived from dietary sources.

up in your bloodstream and clogs arteries, putting you at risk for heart disease, heart attack, and stroke. There are different kinds of cholesterol. LDL, often referred to as “bad” cholesterol, builds up on the walls of arteries to form artery-clogging “plaques” that contribute to the development of heart disease and stroke. HDL, or “good” cholesterol, helps remove excess LDL cholesterol from the blood and transports it back to the liver, where it can be eliminated from the body. You want to have lower LDL (under 130) and higher HDL (over 40), with total cholesterol under 200 (see Chapter 10). Almonds, oatmeal, fish, soy, and red wine (a limit of one glass daily) help lower overall cholesterol levels. Whole milk, processed meats, and foods with trans fats and tropical oils, such as fast foods and baked goods, can increase overall cholesterol levels and should be avoided.

A number of medical conditions can give rise to high blood cholesterol, such as liver disease, kidney failure, hypothyroidism, and diabetes. Certain medications (some diuretics, for example) can also raise blood cholesterol, irrespective of diet.

The USDA dietary guidelines recommend that people restrict their dietary intake of cholesterol to 300 mg or less per day. In addition, no more than 20–35 percent of your total caloric intake should come from fat, with most fats being monounsaturated and polyunsaturated.

**Low-Fat Foods** *Low-fat* and *low-calorie* do not mean the same thing, but often people confuse the two. Fat-free, low-fat, and reduced-fat foods have been popular for many years, with people thinking they can eat as much as they want of these foods. This is far from true; a fat-free or reduced-fat product may have as many if not more calories per serving than regular products do. For example, 2 tablespoons of fat-free caramel topping have 103 calories, the same amount as homemade-with-butter caramel topping; 2 tablespoons of Skippy peanut butter have the same number of calories as 2 tablespoons of Skippy reduced-fat peanut butter, 190 calories; and 2 tablespoons of Cool Whip are equal to lite Cool Whip, 25 calories.<sup>9</sup>

Fatty foods make people feel fuller longer than do fat-free foods; thus, people tend to eat more of the fat-free foods and so consume more calories. In general, the lower the fat, the higher the price tag, because the food industry recognizes that Americans are willing to pay more for products labeled *reduced-fat* and *fat-free*. However, foods such as low-fat sour cream, yogurt, or salad dressings are healthier choices because they have less saturated fat.

**Fat-Free Substitutes** Fat-free substitutes such as Z-Trim, Simplese, Simple Pleasures, Olestra, and Trailblazer contain no cholesterol and have 80 percent fewer calories than do similar products made with fat. Although fat-free substitutes first appeared only in snack foods, today they

are found in ice cream, salad dressing, cheese spreads, yogurt, cakes, pies, and French fries.

The development of Olestra (marketed as Olean), as an example, required more than 25 years and \$200 million on the part of Procter & Gamble, as an array of new technologies were required. In general, fat-free substitutes are made through a process called *microparticulation*, in which several fatty acids are bonded to a sugar molecule to create a triglyceride-like molecule that imparts all the characteristics of fats but is incapable of being enzymatically broken down by the body as are the triglycerides.

In spite of the apparent desirability of the fat-free technology, concerns have been voiced regarding the inability of these “nouveau fats” to carry fat-soluble vitamins (vitamins A, D, E, and K) and their interference with nutrient absorption. Additional concern was raised over side effects in some people, such as abdominal cramping, loose stools, anal leakage, and an unpleasant aftertaste.<sup>10</sup>

## Proteins

The word *protein* derives from the ancient Greek word *proteios*, meaning “first importance.” Protein serves primarily to promote growth and maintenance of body tissue. However, when caloric intake falls, protein is broken down for glucose. This loss of protein can impede the growth and repair of tissue. From this, it can be seen that adequate carbohydrate intake prevents protein from serving as an energy source.<sup>11</sup> Protein also is a primary component of enzyme and hormone structure; it helps maintain the *acid-base balance* of our bodies and serves as a source of energy (4 calories per gram consumed).

**Sources and Types of Proteins** **Proteins** are manufactured in every living cell; they are composed of chains of amino acids. **Amino acids** are the “bricks” from which the body constructs its own protein. Twenty amino acids are used in various combinations to build the protein required for physiological processes to continue in a healthy manner.

The human body obtains amino acids from two sources—by breaking down protein from food (as if to take a brick wall apart for its bricks) or by manufacturing its own bricks (amino acids) within its cells. The latter process is less than fully successful because only 11 of the necessary 20 amino acids can be built by the body. The 9 amino acids that cannot be built by the body are called *essential amino acids* (indispensable amino acids), because they must be obtained from outside the body through the protein in food. The 11 amino acids that the body itself can make are called *nonessential amino acids* (dispensable amino acids) because the body does not have to rely solely on food protein to obtain these bricks.<sup>11</sup>

In terms of food sources of amino acids, foods can be classified into one of two types, depending on whether they can supply the body with the essential amino acids.

Complete protein foods contain all nine essential amino acids and are of animal origin (milk, meat, cheese, and eggs). The incomplete protein foods do not contain all the essential amino acids and are of plant origin (vegetables, grains, and legumes [peas or beans, including chickpeas and butter beans]). Vegan vegetarians (discussed later in the chapter), people with limited access to animal-based food sources, and those who have significantly limited their meat, egg, and dairy product consumption, need to understand how essential amino acids can be obtained from incomplete protein sources. When even one essential amino acid is missing from the diet, deficiency can develop.

Soybeans are a good source of protein for vegetarians. Soybeans provide the same high-quality protein as animal protein.<sup>12</sup> Furthermore, soybeans contain no cholesterol or saturated fat. There has been much debate about whether consuming foods with soybean can reduce the risk of heart disease.<sup>12</sup> In 1999 the FDA stated that diets low in saturated fat and cholesterol that include 25 grams of soy protein a day may reduce the risk of heart disease. The sale of soy foods doubled after that proclamation. However, the research on which that claim was based has not been replicated, and in February 2006, the American Heart Association concluded that soy doesn't lower cholesterol as much as was originally suggested. Three long-term government-funded studies currently are investigating the effects of soy on cholesterol levels and its role, if any, in the prevention of cancer and heart disease.<sup>13</sup>

**How Much Protein Is Recommended?** The latest recommendations for protein intake are part of a set of standards known as the **Dietary Reference Intakes** or DRIs. Protein intake recommendations are based on body weight and activity level. The current DRI for protein is 0.36 gram per pound of body weight per day, based upon a sedentary lifestyle, and is higher for athletes and those who are more active. In terms of overall energy intake, nutritionists recommend that 10–35 percent of our total caloric intake come from protein.<sup>14</sup>

## Vitamins

**Vitamins** are organic compounds that are required in small amounts for normal growth, reproduction, and maintenance of health. Vitamins differ from carbohydrates, fats, and proteins because they do not provide calories or serve as structural elements for our bodies. Vitamins serve as *coenzymes*. By facilitating the action of **enzymes**, vitamins help initiate a wide variety of body responses, including energy production, use of minerals, and growth of healthy tissue.

**Types and Sources of Vitamins** Discovered in the early twentieth century, the 13 essential vitamins can be classified as *water-soluble* (capable of being dissolved



*Many people think that taking megadoses of vitamins is healthy; however, it can actually be harmful.*

in water) or *fat-soluble* (capable of being dissolved in fat or lipid tissue). Water-soluble vitamins include the B-complex vitamins and vitamin C. Most of the excess of these water-soluble vitamins is eliminated from the body during urination. The fat-soluble vitamins are A, D, E, and K. These vitamins are stored in the body in the adipose tissue or fat with excessive intake.

**Dietary Reference Intakes for Vitamins** It is possible to consume and retain too many fat-soluble vitamins, particularly A and D. All the fat-soluble vitamins, however,

### Key Terms

- proteins** Compounds composed of chains of amino acids; primary components of muscle and connective tissue.
- amino acids** The building blocks of protein; can be manufactured by the body or obtained from dietary sources.
- Dietary Reference Intakes (DRIs)** Measures that refer to three types of reference values: Estimated Average Requirement, Recommended Dietary Allowance, and Tolerable Upper Intake Level.
- vitamins** Organic compounds that facilitate the action of enzymes.
- enzymes** Organic substances that control the rate of physiological reactions but are not altered in the process.



**Table 5.1 Facts About Vitamins and Minerals**

|                               | Functions in the Body   | Selected Food Sources   | Adult Daily DRI*  |
|-------------------------------|---|---|---|
| <b>Water-Soluble Vitamins</b> |   |   |   |
| Biotin                        | Supports the nervous system, helps form red blood cells, aids digestion and energy production   | Liver, eggs, peas, beans, nuts, tomatoes; smaller amounts in fruits and meats   | Men: 30 µg<br>Women: 30 µg                                    |
| Folate                        | Helps produce and maintain new cells, prevents a form of anemia and neural tube birth defects   | Dark green leafy vegetables; legumes; oranges; bananas; enriched, fortified, and whole-grain products                       | Men: 400 µg<br>Women: 400 µg<br>UL: 1,000 µg from supplements |
| Niacin                        | Helps maintain the skin and the nervous and digestive systems, helps the body process protein and fats                                      | Meat, fish, poultry; peanuts; beans; enriched, fortified, and whole-grain products  | Men: 16 mg<br>Women: 14 mg<br>UL: 35 mg                       |
| Pantothenic acid              | Helps form new red blood cells, helps the body process nutrients  | Chicken, beef, potatoes, oats, tomato products, peas, beans, eggs, broccoli, whole grains                                   | Men: 5 mg<br>Women: 5 mg                                      |
| Riboflavin                    | Helps maintain skin and create energy   | Organ meats, milk, bread products, fortified cereals  | Men: 1.3 mg<br>Women: 1.1 mg                                  |
| Thiamine                      | Supports the nervous system, aids in production of energy from carbohydrates  | Enriched, fortified, and whole-grain cereals and other grain products   | Men: 1.2 mg<br>Women: 1.1 mg                                  |
| Vitamin B <sub>6</sub>        | Helps form enzymes and maintain normal blood sugar levels, supports the nervous and immune systems, prevents a type of anemia               | Fortified cereals, soybeans, meat, poultry, fish, bananas, carrots, potatoes, nuts  | Men: 1.3 mg<br>Women: 1.3 mg<br>UL: 100 mg                    |
| Vitamin B <sub>12</sub>       | Maintains healthy nerve and red blood cells, prevents one type of anemia  | Fortified cereals, meat, fish, poultry, eggs, milk  | Men: 2.4 µg<br>Women: 2.4 µg                                  |
| Vitamin C                     | Helps form connective tissue, acts as an antioxidant, promotes wound healing and iron absorption  | Citrus fruits, tomatoes, potatoes, cruciferous vegetables, green leafy vegetables, strawberries, bell peppers, tomato juice | Men: 90 mg<br>Women: 75 mg<br>UL: 2,000 mg                    |
| <b>Fat-Soluble Vitamins</b>   |   |   |   |
| Vitamin A                     | Aids in vision, bone growth, immunity, reproduction, and tissue repair; maintains healthy skin and mucous membranes; acts as an antioxidant | Liver, dairy products, tomatoes, fish, eggs, deep yellow and orange fruits and vegetables, dark green vegetables            | Men: 900 µg<br>Women: 700 µg<br>UL: 3,000 µg                  |
| Vitamin D                     | Helps the body absorb calcium and phosphorus and build bone, supports immune function, regulates cell growth                                | Fatty fish, eggs, fortified milk products and cereals   | Men: 5 µg<br>Women: 5 µg<br>UL: 50 µg<br>200 IU               |

*(Continued)*

hold the potential for toxicity if taken in amounts that far exceed Dietary Reference Intakes (see Table 5.1). Most toxicity results from the use of supplements by adults or through excessive food intake of particular sources in very small children. When toxicity develops, the condition is referred to as **hypervitaminosis**.

People often think taking megadoses of vitamins such as vitamin C can be health-enhancing, but the reverse is true. Taking large doses of vitamin C from a dietary supplement can put a strain on your kidneys, causing kidney stones and diarrhea. Too much niacin, vitamin B<sub>6</sub>, and folate can also be harmful.<sup>7</sup>

Because water-soluble vitamins dissolve rather quickly in water, you should be cautious in the preparation of fresh fruits and vegetables. One precaution is to avoid overcooking fresh vegetables. The longer fresh

vegetables are steamed or boiled, the more water-soluble vitamins will be lost. More vitamins are retained with microwave cooking and steaming than with boiling vegetables. Even soaking sliced fresh fruit or vegetables can result in the loss of vitamin C and B-complex vitamins.

Taking a multivitamin can serve as added protection to ensure you are getting all of your recommended vitamins daily. To ensure an adequate vitamin intake, do not rely solely on bottled vitamins sold in grocery stores or health food stores. The best way is really the simplest and least expensive way: Eat a variety of foods. Unless there are special circumstances, such as pregnancy, infancy, or an existing health problem, usually anyone in our society who eats a reasonably well-rounded diet consumes appropriate levels of all vitamins.



**Table 5.1** Facts About Vitamins and Minerals (Continued)

|                            | Functions in the Body  | Selected Food Sources   | Adult Daily DRI*  |
|----------------------------|--|---|---|
| Vitamin E                  | Helps repair body tissues, supports immunity, acts as an antioxidant   | Vegetable oils, fortified grains, seeds, nuts, tomato products, green leafy vegetables, avocados                  | Men: 15 mg<br>Women: 15 mg<br>UL: 1,000 mg                  |
| Vitamin K                  | Promotes normal blood clotting and bone health   | Dark green leafy vegetables, cruciferous vegetables, vegetable oils, cheese                                       | Men: 120 µg<br>Women: 90 µg                                 |
| <b>Minerals (Selected)</b> |  |   |   |
| Calcium                    | Forms bone, aids in blood clotting and muscle and nerve function   | Dairy products, calcium-set tofu, canned fish, dark green vegetables, fortified products                          | Men: 1,000 mg<br>Women: 1,000 mg<br>UL: 2,500 mg            |
| Iron                       | Helps form red blood cells, enzymes, and proteins; supports energy production and the immune system; prevents a form of anemia | Meat, shellfish, poultry, legumes, fortified grain products, deep green leafy vegetables, pumpkin seeds           | Men: 8 mg<br>Women: 18 mg<br>UL: 45 mg                      |
| Magnesium                  | Maintains normal muscle, nerve, and heart functions; supports immunity; helps the body produce energy; aids in bone health     | Green leafy vegetables, whole grains, seeds, nuts, legumes, fish, soybeans, artichokes                            | Men: 420 mg<br>Women: 320 mg<br>UL: 350 mg from supplements |
| Potassium                  | Aids in nerve transmission and muscle function, helps regulate blood pressure  | White and sweet potatoes, green leafy vegetables, winter squash, bananas, oranges, dried fruit, legumes, tomatoes | Men: 4,700 mg<br>Women: 4,700 mg                            |
| Sodium                     | Maintains body fluid balance and blood pressure, aids in nerve transmission and muscle function                                | Processed foods, table salt, soy sauce, and other condiments; small amounts occur naturally in foods              | Men: 1,500 mg<br>Women: 1,500 mg<br>UL: 2,300 mg            |
| Zinc                       | Supports immunity, aids in tissue repair, maintains the senses of taste and smell, aids in reproduction, growth, development   | Fortified cereals, red meat, poultry, certain seafood, milk, eggs, whole grains, legumes, seeds, nuts             | Men: 8 mg<br>Women: 18 mg<br>UL: 40 mg                      |

\*For a complete listing of the Dietary Reference Intakes for all age groups and life stages, as well as information on the adverse effects of excessive consumption, visit the website for the Food and Nutrition Board, Institute of Medicine, National Academies ([www.iom.edu/CMS/3788.aspx](http://www.iom.edu/CMS/3788.aspx)).

Sources: Food and Nutrition Board, Institute of Medicine of the National Academies. Dietary Reference Intakes, [www.iom.edu/CMS/3788.aspx](http://www.iom.edu/CMS/3788.aspx); U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans 2010, [www.healthierus.gov/dietaryguidelines](http://www.healthierus.gov/dietaryguidelines); NIH Office of Dietary Supplements, Vitamin and Mineral Supplement Fact Sheets, [http://ods.od.nih.gov/Health\\_Information/Vitamin\\_and\\_Mineral\\_Supplement\\_Fact\\_Sheets.aspx](http://ods.od.nih.gov/Health_Information/Vitamin_and_Mineral_Supplement_Fact_Sheets.aspx).

**Should You Take a Vitamin Supplement?** While conducting research to formulate the new dietary guidelines, the USDA found that most Americans are consuming too many calories but are not meeting their nutritional needs. How can this be? We eat too many nutrient-deficient foods such as junk food and not enough nutrient-dense foods (which will be discussed later in this chapter). The USDA and the American Dietetic Association recommend following the USDA dietary guidelines, particularly eating 4½ cups of fruits and vegetables a day, rather than taking supplements to rectify this problem. Most Americans do not consume this amount of fruit and vegetables on a daily basis and don't meet their DRIs. We discuss the dietary guidelines in a later section.

Some believe that additional vitamin intake will prevent or delay the onset of chronic health conditions such as cancer and cardiovascular disease. To date there seems to be no conclusive evidence regarding the effectiveness of most supplements in chronic disease prevention. That said, there is at least one well-established success story

regarding vitamin supplementation: the effectiveness of folic acid supplementation in ensuring the appropriate closure of the neural tube during embryonic development, thus preventing the development of spina bifida.<sup>15</sup> In spite of widespread awareness of the necessity for folic acid, however, nearly one-third of women of childbearing age do not take this B vitamin on a daily basis.

The DRI for folic acid for adults is 300–400 µg daily; however, for pregnant women it is 600 µg a day, and for lactating women it is 500 µg daily. There has been some debate about whether folic acid can prevent cardiovascular disease, cancer, and Alzheimer's disease. There still isn't enough evidence to make these claims.

### Key Terms

**hypervitaminosis** Excessive accumulation of vitamins within the body; associated with the fat-soluble vitamins.

Some research suggests that folic acid can accelerate the spread of cancer in people with precancerous or cancer cells. Vitamin B<sub>12</sub> deficiency is a concern for vegetarians because this vitamin is primarily obtained from liver, fish, cheese, and eggs. Anemia, disturbances in walking and balance, a loss of vibration sensation, confusion, and dementia can be caused by vitamin B<sub>12</sub> deficiencies. The body requires B<sub>12</sub> to make the protective coating surrounding the nerves, and inadequate B<sub>12</sub> can expose nerves to damage. B<sub>12</sub> can sometimes be difficult for the body to absorb. The DRI for vitamin B<sub>12</sub> is 2.4 µg daily and for B<sub>6</sub> is 1.3–1.7 mg per day. Vitamin B<sub>6</sub> deficiency can lead to a anemia, fatigue, poor appetite, and diarrhea. Good sources of B<sub>6</sub> are meat, liver, cereal, grains, bananas, and nuts.

Who else might benefit from vitamin supplementation? In the opinion of nutritionists, this group might include vegans, people with limited milk intake and limited exposure to sunlight, people with lactose intolerance, and people on a severely restricted weight loss diet. Children and adolescents are another group that may benefit from vitamin D supplements. Physicians have been increasingly concerned about vitamin D deficiency owing to reduced outdoor activity and decreased milk consumption among children and adolescents. Stress, as well as soft drinks, fiber, and iron in foods, can decrease calcium absorption, and calcium is best absorbed when taken in frequent, small amounts and with meals. Vitamin C improves the absorption of calcium, as does the presence of estrogen (so women after menopause are at increased risk of calcium deficiency).

If you take a vitamin D supplement, look for vitamin D<sub>3</sub> (also called cholecalciferol) instead of vitamin D<sub>2</sub>, which is 25 percent less potent. The DRI for vitamin D has been increased to 600 international units (IU) (higher for individuals over 50 years of age), with 50 µg or 2,000 IU as the Tolerable Upper Intake Level (UL). The recommended amount of calcium intake is 1,000 mg a day (1,200 if you are over 50 years of age).<sup>16</sup> Too much calcium may cause kidney stones and may block absorption of other substances such as antibiotics.

Physicians also recommend supplementation to individual patients because of pregnancy, lactation, smoking, and malnutrition. People with diabetes, cancer, colitis, pancreatitis, or other medical conditions may also benefit from a vitamin supplement. Some physicians recommend that supplements be taken with food, since they're really components of food and help the body metabolize other food components. The fat-soluble nutrients should be taken with a little oil or fat to enhance absorption. The water-soluble nutrients are easily absorbed without food but may work better when taken with meals. In addition, some people complain of stomach upset when they take vitamins on an empty stomach. See the box "Should You Take a Fish Oil Supplement?" for a discussion of another dietary supplement.

## Phytochemicals

Certain physiologically active components are believed to deactivate carcinogens or function as **antioxidants**. Antioxidants are substances that may protect cells from the damage caused by unstable molecules known as free radicals, which can lead to cancer. Antioxidants may prevent cancer by interacting with and stabilizing free radicals. A few examples of antioxidants are beta carotene, lycopene, and vitamins C, E, and A. However, Americans' number-one source of antioxidants is coffee. Chocolate, green tea, and nuts are other popular sources of antioxidants for Americans.<sup>17</sup> The different types of **phytochemicals** include the carotenoids (from green vegetables), polyphenols (from onions and garlic), indoles (from cruciferous vegetables), and allyl sulfides (from garlic, chives, and onions). These phytochemicals may play an important role in sparking the body to fight and slow the development of some diseases, such as cancer. At this time, however, the exact mechanisms through which the various phytochemicals reduce the formation of cancer cells is not understood. Although it is generally agreed that these foods are important in planning food selections, no precise recommendations regarding the amounts of various phytochemical-rich plants have been made.

## Minerals

Nearly 5 percent of the body is composed of inorganic materials, the *minerals*. Minerals function primarily as structural elements (in teeth, muscles, hemoglobin, and thyroid hormones). They are also critical in the regulation of a number of body processes, including fluid balance, nerve impulses, muscle contraction, heart function, blood clotting, protein synthesis, and red blood cell synthesis. Approximately 21 minerals have been recognized as being essential for human health.<sup>1</sup> Unlike vitamins, minerals are inorganic and can't be destroyed by heat or food processing.


*Macronutrients* (major minerals) are those minerals that are seen in relatively high amounts in our body tissues. Examples of macronutrients are calcium, phosphorus, sodium, potassium, and magnesium. Examples of *micronutrients*, minerals seen in relatively small amounts in body tissues, include zinc, iron, copper, selenium, and iodine. Although micronutrients (**trace elements**) are required only in small quantities, fewer than 20 mg daily of each, they are still essential. Active, menstruating women need at least 18 mg of iron daily; however, a well-balanced, 2,000-calorie diet supplies around 12 mg of iron. Eating a food rich in vitamin C along with iron-rich foods will help your body efficiently utilize iron. Examples of this might be eating spaghetti with meat and tomato sauce, meat and potatoes, hamburger and coleslaw, fruit and iron-fortified cereal, or fruit with raisins.

## Considering Complementary Care

### Should You Take a Fish Oil Supplement?

Everywhere you look, you encounter some individual or group extolling the wonders of fish oil in lowering incidence of heart disease; reducing the risk of breast and colon cancer; lowering blood pressure; acting as an antiaging agent; fighting depression, bipolar disorder, and schizophrenia; mitigating age-related macular degeneration contributing to blindness; and reducing the symptoms and pain associated with arthritis. Are these claims too good to be true, or should you jump on the fish oil bandwagon?

It is not the fish oil but the important omega-3 fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) contained in fish oil that result in these health benefits. We cannot make omega-3 fatty acids, so we rely on food or external sources for these fatty acids. The FDA does not have a specific recommended dosage for fish oil but suggests that an average healthy person should eat two servings of fish per week or obtain the equivalent through fish oil or other sources. The FDA further recommends not exceeding 3 grams of omega-3 fatty acids per day, as higher doses can increase the risk of bleeding, easy bruising, and nose bleeds, as fish oil tends to thin the blood. The best sources of fish oil are salmon, tuna, sardines, and anchovies. If you take a fish oil supplement, make sure it contains omega-3 fatty acids, as it is the omega-3, not the fish oil, that produces the health benefits.



Another consideration in taking a fish oil supplement is to read the labels to ensure quality and safety. Fish oil can become rancid quickly, and rancid fish oil has the opposite health benefits, promoting heart disease. Make sure the fish oil is fortified with antioxidants, especially vitamin E, which prevents oxidation. There have also been concerns about fish oil being contaminated with environmental pollutants such as mercury. Some common side effects in taking fish oil supplements are fish-flavored belches, upset stomach, nausea, and diarrhea. Liquid fish oil or a vegetarian alternative may be a better option if you encounter these side effects.

A vegetarian option is to consume enough alpha-linolenic acid (ALA), a third type of omega-3 fatty acid, as the body can convert it into EPA and DHA. ALA is found in dark green leafy vegetables, flax and hemp seeds, walnuts, and vegetable oils. However, sometimes the body is not able to convert ALA into EPA and DHA, or the individual doesn't consume enough ALA in his or her diet. There are also vegetarian supplements such as Seven Seas omega-3.

Sources: Fish oil benefits, [www.fishoilbenefit.net](http://www.fishoilbenefit.net), May 14, 2010; Making sense of omega-3 fatty acids, [www.drbenkim.com](http://www.drbenkim.com), October 13, 2009.

## Water and Fluids

Water may well be our most essential nutrient, since without water most people would die from **dehydration** effects in less than a week. People could survive for weeks and even years without some of the essential minerals and vitamins. More than half the body's weight comes from water. Water provides the medium for nutrient and waste transport and temperature control, and plays a key role in nearly all of the body's biochemical reactions. A common indication of inadequate fluid intake is strained, uncomfortable bowel movements.

Most people seldom think about the importance of an adequate intake of water and fluids. The average adult loses about 10 cups of water daily through perspiration, urination, bowel movements, and breathing. Physical activity and heat exposure contribute to water loss and an increased need for fluids. The Institute of Medicine's general recommendation for the average woman is approximately 2.7 liters (91 ounces) of total water (from all food and beverages) each day, and for the average man approximately 3.7 liters (125 ounces) daily. Recommendations for fluid intake vary with age, gender, metabolism, weight, and diet.

There are several ways to calculate how much water intake an individual requires. One simple rule is that for every pound of body weight, you need about half an ounce of fluid intake per day. Another method is to base

your fluid need on your caloric intake, using the following formula:  $0.034 \text{ ounce} \times \text{daily caloric intake} = \text{daily fluid requirement in ounces}$ .

About 80 percent of people's total water intake comes from drinking water and beverages, including caffeinated beverages, while the other 20 percent is derived from food. It is recommended that you avoid beverages that are high in sugar, such as fruit juice, regular sodas, and flavored coffee drinks. For example, a Starbucks white chocolate mocha has 400 calories.<sup>18</sup>

### Key Terms

**antioxidants** Substances that may prevent cancer by interacting with and stabilizing unstable molecules known as free radicals.

**phytochemicals** Physiologically active components of foods that are believed to deactivate carcinogens and to function as antioxidants.

**trace elements** Minerals whose presence in the body occurs in very small amounts; micronutrient elements.

**dehydration** Abnormal depletion of fluids from the body; severe dehydration can be fatal.

To see if you're drinking enough fluid, check your urine. A small amount of dark-colored urine can be an indication that you are not consuming enough fluid and need to drink more. Urine that is pale or almost colorless means you are most likely taking in enough fluids. Of course, people also obtain needed fluids from fruits, vegetables, fruit and vegetable juices, milk, and noncaffeinated soft drinks, although these can be high in sugar and calories. However, excessive water consumption by persons of any age, including forced consumption by infants, can lead to fatal brain edema (swelling) and aspiration pneumonia.<sup>19, 20</sup>

## Fiber

Although not considered a nutrient by definition, **fiber** is an important component of sound nutrition. Fiber consists of plant material that is not digested but rather moves through the digestive tract and out of the body. Beans, fruits, and vegetables all provide us with dietary fiber.

Fiber can be classified into two large groups on the basis of water solubility. *Insoluble* fibers are those that can absorb water from the intestinal tract. By absorbing water, the insoluble fibers give the stool bulk and decrease the time it takes the stool to move through the digestive tract. In contrast, *soluble* fiber turns to a "gel" within the intestinal tract and in so doing binds to liver bile, which has cholesterol attached. Thus, soluble fiber is valuable in removing (or lowering) blood cholesterol levels. Also, because foods high in soluble fiber are generally low in sugar and saturated fats, fiber may indirectly contribute to keeping blood sugar low<sup>21</sup> and reduce the risk of colon cancer associated with diets high in saturated fats, although today this latter contention is being seriously challenged.<sup>22</sup>

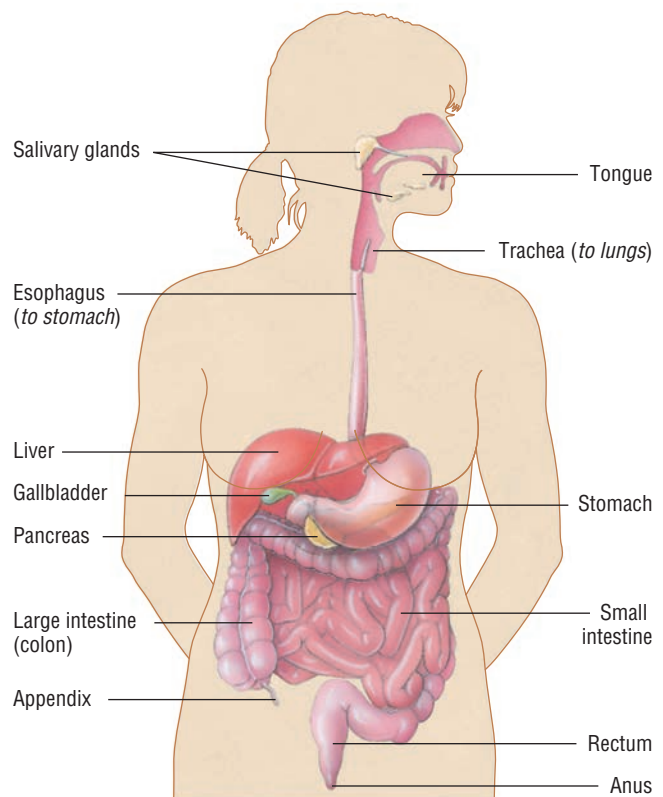
How much fiber do you need? Women need 25 grams and men require 38 grams of fiber each day; however, most American adults eat only 11 grams per day. Fiber has many benefits, including helping to curb your appetite and prevent overeating because it is filling, requires more chewing, stays in the stomach longer, and absorbs water, adding to the feeling of fullness. Fiber also helps to slow the absorption of sugar from the intestines, thus steadying the blood sugar and slowing down the absorption of fat from the foods you eat. Consuming adequate amounts of fiber has an important effect of reducing serious medical problems because soluble fiber lowers LDL cholesterol and protects against cardiovascular disease, whereas insoluble fiber protects against developing colon cancer.<sup>23</sup> A high-fiber diet has been associated with lower risk of death from infectious and respiratory diseases as well.<sup>24</sup>

In recent years attention has been directed toward three forms of soluble fiber—oat bran, psyllium (from the weed plantain), and rice bran—for their ability to lower blood cholesterol levels and prevent heart disease.<sup>25</sup>

To lower your total cholesterol by 5 or 6 points, daily consumption of oat bran equaling a large bowl of oat bran cold cereal or three or more packs of instant oatmeal would be necessary. One serving of bran plus one serving of beans each day will also fill more than half your total daily fiber needs. It is recommended that you eat fiber from a variety of sources to obtain a good balance of soluble and insoluble fibers.

## The Absorption of Nutrients

When we eat, the food is digested and then absorbed into and through the walls of the gastrointestinal (GI) tract, into the bloodstream, and is distributed to the cell sites at which it will be used for energy, growth, repair, and regulation. Figure 5-2 shows the GI tract and other organs of the digestive system. In terms of the absorption of nutrients, the first 18 inches of the small intestine are the most active site for absorption, surpassing the level of activity in the remainder of the small intestine, the large intestine, and the stomach. Some portion of the alcohol contained in alcoholic drinks enters the body through the stomach wall



**Figure 5-2 The Digestive System** Food moves through the digestive tract (mouth, esophagus, stomach, large and small intestines, rectum, anus) as it is changed into substances that can be absorbed into the bloodstream for distribution to the body. The liver, pancreas, and gallbladder produce enzymes and other compounds that help digest food.

Source: From Insel, P., *Core Concepts in Health*, 12e. © 2012 by The McGraw-Hill Companies, Inc. Reprinted by permission.



(more in women than in men), although most is absorbed in the small intestine. Water and salts are principally regulated by the walls of the large intestine.

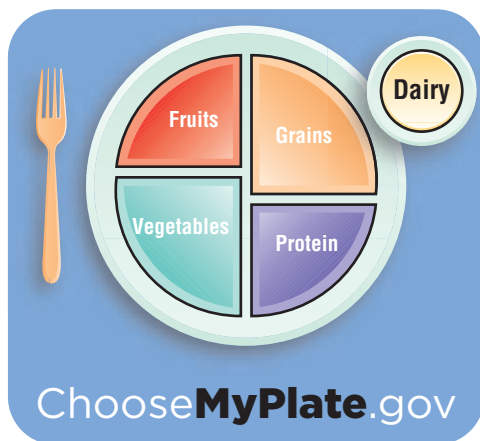
In light of the importance of the small intestine, any injury or disease in this location could seriously harm one's nutritional status by impairing the body's ability to obtain nutrients. Gastric bypass surgery involves cutting away a portion of small intestine to restrict the movement of nutrients into the body. Many nutrients needed for overall health must then be supplemented, often for the rest of the person's life (see Chapter 6).

## Planning a Healthy Diet

Several tools, including USDA's MyPlate and the Dietary Guidelines for Americans, are available to help you plan a diet that will provide adequate nutrients, as well as reducing your risk of developing heart disease, cancer, and other chronic diseases.<sup>26</sup>

### The USDA Food Guide: MyPlate

The most effective way to take in adequate amounts of nutrients is to eat a balanced diet as outlined by the USDA's most current guidelines.<sup>27</sup> The latest version of



#### Balancing Calories

- Enjoy your food, but eat less.
- Avoid oversized portions.

#### Foods to Increase

- Make half your plate fruits and vegetables.
- Make at least half your grains whole grains.
- Switch to fat-free or low-fat (1%) milk.

#### Foods to Reduce

- Compare sodium in foods like soup, bread, and frozen meals – and choose the foods with lower numbers.
- Drink water instead of sugary drinks.

**Figure 5-3 Choose MyPlate.gov** The USDA changed the pyramid icon to a plate to prompt consumers to make healthier choices at meals.

the USDA food group plan is called MyPlate (see Figure 5-3). The USDA replaced MyPyramid with MyPlate in June 2011, thinking that a plate is a better visual icon to prompt Americans to make healthier food choices. The plate is a familiar and simpler icon to decipher. MyPlate recommends that fruits and vegetables take up half the plate (a little more vegetables than fruits), with grains and proteins on the other half of the plate (more grains than proteins). See Table 5.2 for specific recommendations based upon gender and age. The new MyPlate also suggests decreasing portion sizes, consuming at least half your grains from whole grains, drinking fat-free or low-fat milk, choosing food lower in sodium, and drinking water instead of sugary drinks. Most Americans do not follow the MyPyramid recommendations in their daily food intake, and it is hoped that the MyPlate will be a better way to encourage people to follow the dietary guidelines. (Figure 5-4 shows how typical American diets compare to the recommended intake levels.) To evaluate and track your food intake and physical activity, visit [MyPlate.gov](http://MyPlate.gov). The “Rate Your Plate” Personal Assessment at the end of this chapter will also help you evaluate your current eating habits.

Fifteen percent of Americans are not meeting their nutritional needs according to the dietary guidelines. We will look at the specific recommendations and how Americans are meeting them.

**Fruits** MyPlate recommends that almost a quarter of your plate be filled with fruit for each meal (half your plate contains fruits and vegetables). The specific amount depends upon gender and age (see Table 5.2). The dietary guidelines suggest eating 2 cups of fruits per day for a 2,000-calorie/day adult diet. However, only a third of adults eat the recommended number of fruits per day. This is far below the Healthy People 2010 objective from the U.S. Department of Health and Human Services of having 75 percent of Americans meeting the daily fruit recommendations. One medium-sized fruit, ½ cup dried fruit, or 1 cup of fresh, frozen, or canned fruit is equivalent to 1 cup. Orange fruits such as mango, cantaloupe, apricots, and red or pink grapefruit are sources of vitamin A. Kiwi, strawberries, guava, papaya, cantaloupe, and citrus fruits are good sources of vitamin C. Oranges and orange juice also provide folate. Some good sources for potassium are bananas, plantains, dried fruits, oranges and orange juice, cantaloupe and honeydew melons, and tomato products. For the majority of your fruit intake, it is generally recommended that you consume whole fruits and avoid fruit

#### Key Terms

**fiber** Cellulose-based plant material that cannot be digested; found in cereal, fruits, and vegetables.

**Table 5.2** MyPlate Daily Diet Recommendations, by Age and Gender

| How many grain foods are needed daily?          |       |  |  | How much food from the dairy group is needed daily?         |       |  |
|---|-------|--|--|---|-------|--|
|   | Age   | Daily Recommendation (ounce equivalents) | Daily Minimum Amount (ounce equivalents) |   | Age   | Daily Recommendation (cups)              |
| Children  | 2–3   | 3  | 1½                                       | Children  | 2–3   | 2  |
|   | 4–8   | 5  | 2½                                       |   | 4–8   | 2½                                       |
| Girls   | 9–13  | 5  | 3  | Girls   | 9–13  | 3  |
|   | 14–18 | 6  | 3  |   | 14–18 | 3  |
| Boys  | 9–13  | 6  | 3  | Boys  | 9–13  | 3  |
|   | 14–18 | 8  | 4  |   | 14–18 | 3  |
| Women   | 19–30 | 6  | 3  | Women   | 19–30 | 3  |
|   | 31–50 | 6  | 3  |   | 31–50 | 3  |
|   | 51+   | 5  | 3  |   | 51+   | 3  |
| Men   | 19–30 | 8  | 4  | Men   | 19–30 | 3  |
|   | 31–50 | 7  | 3½                                       |   | 31–50 | 3  |
|   | 51+   | 6  | 3  |   | 51+   | 3  |
| How many vegetables are needed daily or weekly? |       |  |  | How much food from the protein foods group is needed daily? |       |  |
|   | Age   | Daily Recommendation (cups)              |  |   | Age   | Daily Recommendation (ounce equivalents) |
| Children  | 2–3   | 1  |  | Children  | 2–3   | 2  |
|   | 4–8   | 1½                                       |  |   | 4–8   | 4  |
| Girls   | 9–13  | 2  |  | Girls   | 9–13  | 5  |
|   | 14–18 | 2½                                       |  |   | 14–18 | 5  |
| Boys  | 9–13  | 2½                                       |  | Boys  | 9–13  | 5  |
|   | 14–18 | 3  |  |   | 14–18 | 6½                                       |
| Women   | 19–30 | 2½                                       |  | Women   | 19–30 | 5½                                       |
|   | 31–50 | 2½                                       |  |   | 31–50 | 5  |
|   | 51+   | 2  |  |   | 51+   | 5  |
| Men   | 19–30 | 3  |  | Men   | 19–30 | 6½                                       |
|   | 31–50 | 3  |  |   | 31–50 | 6  |
|   | 51+   | 2½                                       |  |   | 51+   | 5½                                       |
| How much fruit is needed daily?                 |       |  |  | How much is my allowance for oils?                          |       |  |
|   | Age   | Daily Recommendation (cups)              |  |   | Age   | Daily Allowance (teaspoons)              |
| Children  | 2–3   | 1  |  | Children  | 2–3   | 3  |
|   | 4–8   | 1½                                       |  |   | 4–8   | 4  |
| Girls   | 9–13  | 1½                                       |  | Girls   | 9–13  | 5  |
|   | 14–18 | 1½                                       |  |   | 14–18 | 5  |
| Boys  | 9–13  | 1½                                       |  | Boys  | 9–13  | 5  |
|   | 14–18 | 2  |  |   | 14–18 | 6  |
| Women   | 19–30 | 2  |  | Women   | 19–30 | 6  |
|   | 31–50 | 1½                                       |  |   | 31–50 | 5  |
|   | 51+   | 1½                                       |  |   | 51+   | 5  |
| Men   | 19–30 | 2  |  | Men   | 19–30 | 7  |
|   | 31–50 | 2  |  |   | 31–50 | 6  |
|   | 51+   | 2  |  |   | 51+   | 6  |

*(Continued)*

juices to ensure adequate fiber and to avoid the high sugar content associated with fruit juices. The American Cancer Society indicates that this food group may play an important role in the prevention of certain forms of cancer.<sup>28</sup>

**Vegetables** MyPlate recommends that over a quarter of your plate contain vegetables at each meal, with half the plate being filled with fruits and vegetables. The specific amount of vegetables depends on gender and

**Table 5.2 MyPlate Daily Diet Recommendations, by Age and Gender** (Continued)

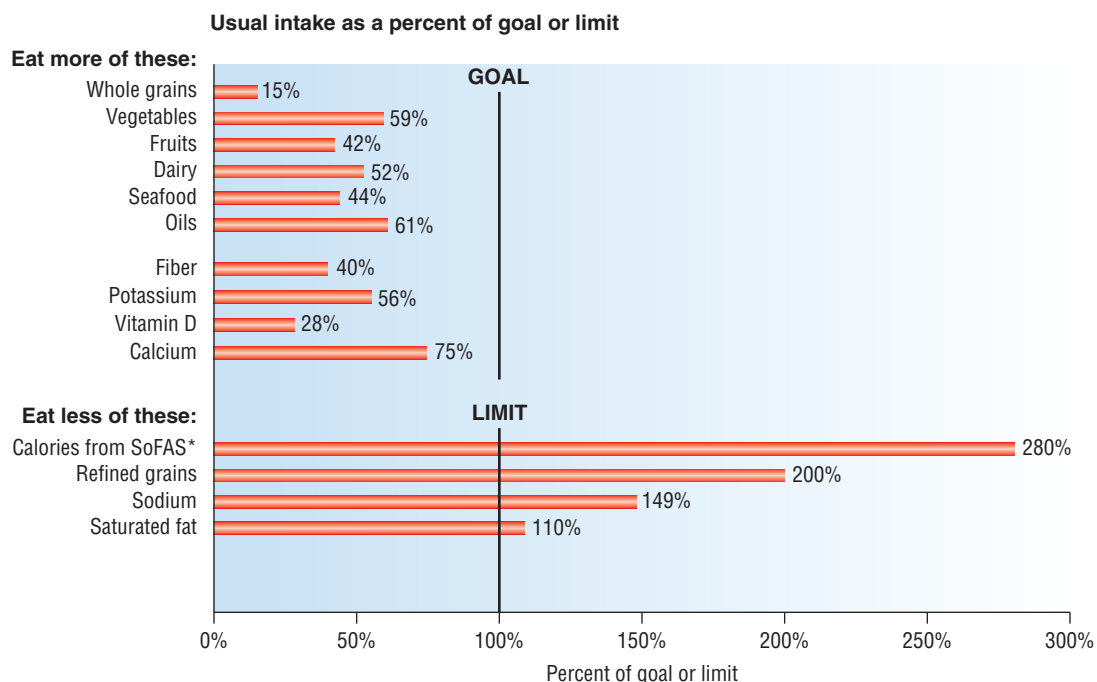
| How many empty calories can I have? |       |                           |                                |
|-------------------------------------|-------|---------------------------|--------------------------------|
|                                     | Age   | Total Daily Calorie Needs | Daily Limit for Empty Calories |
| <b>Children</b>                     | 2–3   | 1000                      | 135                            |
|                                     | 4–8   | 1200–1400                 | 120                            |
| <b>Girls</b>                        | 9–13  | 1800                      | 120                            |
|                                     | 14–18 | 1800                      | 160                            |
| <b>Boys</b>                         | 9–13  | 1600                      | 160                            |
|                                     | 14–18 | 2200                      | 265                            |
| <b>Women</b>                        | 19–30 | 1800                      | 160                            |
|                                     | 31–50 | 1600                      | 120                            |
|                                     | 51+   | 2400                      | 330                            |
| <b>Men</b>                          | 19–30 | 1600                      | 260                            |
|                                     | 31–50 | 2200                      | 265                            |
|                                     | 51+   | 2000                      | 260                            |

age (see Table 5.2). Also, MyPlate includes red vegetables such as red peppers and tomatoes, making a “red and orange vegetable” subcategory of recommended intake. Two and one-half cups of vegetables per day

is the recommendation for adults following a 2,000-calorie diet. Americans fall short in this category as well, with only 27 percent meeting this recommendation. The Healthy People 2010 objective was for 50 percent of Americans to meet this recommendation. As with the fruit group, the important function of this group is to provide vitamins A and C, complex carbohydrates, and fiber. Because Americans tend to eat only a few vegetables, such as potatoes, corn, and carrots, the new guidelines give specific recommendations about the types of vegetable. One general rule is to “eat your colors,” meaning you should consume a variety of vegetables over the course of a week. The USDA recommends the following:

- Dark green vegetables (such as broccoli and spinach)—3 cups/week
- Red and orange vegetables (such as carrots, tomatoes, and sweet potatoes)—2 cups/week
- Beans and peas (such as soy, kidney, lentil, and pinto beans)—3 cups/week
- Starchy vegetables (such as corn, potatoes, and green peas)—3 cups/week
- Other vegetables (such as cauliflower, asparagus, and celery)—6½ cups/week

Again, avoid drinking vegetable juices as a way of meeting these requirements because they can be high



**Figure 5-4 How Do Typical American Diets Compare to Recommended Intake Levels or Limits?**

\* SoFAS = Solid fats and added sugars.

Source: Based on data from U.S. Department of Agriculture, Agricultural Research Service, and U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, What we eat in America, NHANES 2001–2004 or 2005–2006.

**Table 5.3** USDA Food Guide at Six Different Calorie Levels

Daily Amount of Food from Each Group (vegetable subgroup amounts are per week)

| Calorie Level                   | 1,200  | 1,600            | 2,000            | 2,400          | 2,800            | 3,200            |
|---------------------------------|--|------------------|------------------|----------------|------------------|------------------|
| <b>Food Group</b>               | <b>Food group amounts shown in cup (c) or ounce-equivalents (oz-eq), with number of servings (srv) in parentheses when it differs from the other units. Oils are shown in grams (g).</b> |                  |                  |                |                  |                  |
| Fruits                          | 1 c<br>(2 srv)   | 1.5 c<br>(3 srv) | 2 c<br>(4 srv)   | 2 c<br>(4 srv) | 2.5 c<br>(5 srv) | 2.5 c<br>(5 srv) |
| Vegetables                      | 1.5 c<br>(3 srv)   | 2 c<br>(4 srv)   | 2.5 c<br>(5 srv) | 3 c<br>(6 srv) | 3.5 c<br>(7 srv) | 4 c<br>(8 srv)   |
| Dark green                      | 1.5 c/wk   | 2 c/wk           | 3 c/wk           | 3 c/wk         | 3 c/wk           | 3 c/wk           |
| Red and orange                  | 1 c/wk   | 1.5 c/wk         | 2 c/wk           | 2 c/wk         | 2.5 c/wk         | 2.5 c/wk         |
| Beans and peas                  | 1 c/wk   | 2.5 c/wk         | 3 c/wk           | 3 c/wk         | 3.5 c/wk         | 3.5 c/wk         |
| Starchy                         | 2.5 c/wk   | 2.5 c/wk         | 3 c/wk           | 6 c/wk         | 7 c/wk           | 9 c/wk           |
| Other                           | 4.5 c/wk   | 5.5 c/wk         | 6.5 c/wk         | 7 c/wk         | 8.5 c/wk         | 10 c/wk          |
| Grains                          | 4 oz-eq  | 5 oz-eq          | 6 oz-eq          | 8 oz-eq        | 10 oz-eq         | 10 oz-eq         |
| Whole grains                    | 2  | 3                | 3                | 4              | 5                | 5                |
| Other grains                    | 2  | 2.5              | 3                | 4              | 5                | 5                |
| Protein                         | 3 oz-eq  | 5 oz-eq          | 5.5 oz-eq        | 6.5 oz-eq      | 7 oz-eq          | 7 oz-eq          |
| Dairy                           | 2 c  | 3 c              | 3 c              | 3 c            | 3 c              | 3 c              |
| Oils                            | 17 g   | 22 g             | 27 g             | 31 g           | 36 g             | 51 g             |
| Discretionary calorie allowance | 171  | 182              | 267              | 362            | 426              | 648              |

Source: U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans, 2010, [www.healthierus.gov/dietaryguidelines](http://www.healthierus.gov/dietaryguidelines).

in salt and sugar and don't provide the fiber intake that whole vegetables do. **Cruciferous vegetables**, such as broccoli, cabbage, brussels sprouts, and cauliflower, may be particularly helpful in the prevention of certain forms of cancer.<sup>28</sup>

**Dairy** MyPlate has changed the “milk and milk products” category to the “dairy” category to include foods such as yogurt and cheese. MyPlate recommends consuming 3 cups of fat-free or low-fat milk each day, or its equivalent in another dairy product. The good news is that the consumption of whole milk is decreasing; however, chocolate milk is rising in popularity. Consumption rates for fat-free, 1 percent, and 2 percent reduced-fat milk are holding steady, but it was hoped that more people would opt for either the low-fat or fat-free options, as 2 percent milk contains almost as much fat as whole milk. Overall, Americans are not getting 3 cups of milk or its equivalent per day as recommended by the dietary guidelines.

Dairy consumption has been associated with higher bone density and can help fight osteoporosis.<sup>29</sup> Calcium and high-quality protein, required for bone and tooth development, are two primary nutritional benefits provided by this food group. The guidelines further suggest

that children 2–3 years old should consume 2 cups per day of fat-free or low-fat milk, or equivalent milk products, whereas children 4–8 years of age should consume 2½ cups per day of fat-free or low-fat milk, or equivalent dairy products. Milk, cheese, pudding, yogurt, and ice



*MyPlate recommends that half of all grain servings come from whole grains. Because whole grains can't always be identified by color, it is important to check food labels for whole-grain content.*



cream are included in this food group. For individuals who are lactose-intolerant (lactose upsets their intestines) or are vegan (vegetarians who don't consume any animal products, including dairy products), soybeans, tofu, spinach, kale, okra, beet greens, and oatmeal are good alternative sources of calcium.

**Protein** MyPlate changed the “meat, poultry, fish, eggs, dry beans and nuts” category to simply the “protein” category to encapsulate all of these foods. Our need for selections from this protein-rich group is based on our daily need for protein, iron, and the B vitamins. Meats include all red meat (beef, pork, and game), fish, and poultry. It is strongly recommended that we choose lean meats and low-fat or fat-free foods in this group. It is further recommended that we increase the amount and variety of seafood consumed and eat seafood instead of meat and poultry. Meat substitutes include dry beans, eggs, tofu, peanut butter, nuts, and seeds. The average American eats 120 pounds of meat, poultry, and seafood a year, with beef being the most consumed in this food group and fish the least. MyPlate recommends that adults eat 5–6 ounces of protein foods each day. One ounce is equivalent to

- 1 ounce cooked lean meat, poultry, or fish
- 1 egg
- ¼ cup cooked dry beans
- ¼ cup tofu
- 1 tablespoon peanut butter
- ½ ounce nuts or seeds

The fat content of meat varies considerably. Some forms of meat are only 1 percent fat, whereas others may be as high as 40 percent fat. Poultry and fish are generally significantly lower in overall fat than are red meats. Interestingly, the higher the grade of red meat, the more fat is marbled throughout the muscle fiber. People may find that higher-grade steak usually tastes better, but that is because of its higher fat content.

Meats are generally excellent sources of iron. Iron is present in much greater amounts in red meats and organ meats (liver, kidney, and heart) than in poultry and fish. Iron plays a critical role in hemoglobin synthesis in red blood cells and thus is an important contributor to physical fitness (see Chapter 4) and overall cardiovascular health (see Chapter 10). However, meat and fish should be fresh, stored appropriately, and cooked adequately to reduce the likelihood of serious foodborne illnesses. This will be discussed later in this chapter.

**Grains** Bread, cereal, rice, and pasta are referred to as the “grain group” in the MyPlate icon. Rates of consumption in this food group are on the rise, as we now eat 25 percent more grains than Americans did in 1970. Corn flour, starch, and grits are the main grains for which consumption has increased, while the numbers have remained

steady for oats. There is a particular emphasis on consuming at least half your grains from whole grains. Whole grains can reduce the risk of chronic disease and help with weight maintenance.

Whole grains consist of the entire grain seed, or the kernel, and can't be identified by the color of the food. The FDA requires that food contain 51 percent or more whole-grain ingredients by weight and be low-fat in order to be called “whole grain.” On food labels, “whole grain” should be the first ingredient listed. Avoid refined grains because the grain-refining process typically removes most of the bran and some of the germ, resulting in the loss of dietary fiber, minerals, vitamins, and other important nutrients. Wheat flour, enriched flour, and degerminated cornmeal are not whole grains.

Reading and understanding what labels mean is important when you are trying to meet your whole-grain requirements. Optimally, you want the label to say “100% whole grain,” meaning there is no refined flour in the food. If it says “Made with whole grain,” then it has some whole grain but you don't know how much. “A good source of whole grain” indicates that the food may have as little as 8 grams of whole grain per serving, and “An excellent source of whole grain” means as little as 16 grams per serving. “Multigrain” is a mixture of grains that is mostly refined grain with some whole grains sprinkled in. Some products are labeled **enriched**, meaning that some of the nutritional elements that were removed during processing are returned to the food; however, only three B vitamins (thiamine, niacin, riboflavin) and iron are replaced.

The food industry has risen to the challenge of providing nutritious whole-grain foods with improved taste and texture. For example, ConAgra spent millions of dollars to develop “white wheat” made from a naturally occurring albino variety of flour. It has 3½ times more dietary fiber, 11 times more vitamin E, 5 times more magnesium, and 4 times more niacin than does refined, unenriched wheat flour. It also tastes milder and sweeter than most whole grains do. It combines the best of both worlds—the nutrition of whole wheat and the taste of white flour.<sup>30</sup>

For a 2,000-calorie diet, MyPlate recommends 6 ounces of grains daily, with at least 3 ounces coming from

### Key Terms

**cruciferous vegetables** Vegetables, such as broccoli, whose plants have flowers with four leaves in the pattern of a cross.

**enriched** Foods that have been resupplied with some of the nutritional elements (B vitamins and iron) removed during processing.

whole grains. Specific recommendations vary depending on gender and age (see Table 5.2). One ounce is equivalent to

- 1 slice bread
- 1 cup dry cereal
- ½ cup cooked rice, pasta, cereal

The nutritional benefit from the breads, cereals, rice, and pasta group lies in its contribution of B-complex vitamins and energy from complex carbohydrates. Some nutritionists believe that foods from this group promote protein intake, since many of them are prepared as complete-protein foods—for example, macaroni and cheese, cereal and milk, and bread and meat sandwiches.

**Oils** The USDA defines oils as fats that are liquid at room temperature, such as vegetable oils used in cooking. Oils come from many different plants and from fish. Some common oils are canola oil, corn oil, cottonseed oil, olive oil, safflower oil, soybean oil, and sunflower oil. Canola and olive oil are preferred over other types of oils. Some foods, such as nuts, olives, fish, and avocados, are naturally high in oils. Foods that are mainly oil include mayonnaise, salad dressings, and soft margarine with no trans fats. A limit of 24 grams, or 6 teaspoons, of oils is the daily recommendation, although this can vary by gender and age (see Table 5.2). One teaspoon is equal to

- 1 teaspoon margarine
- 1 tablespoon low-fat mayonnaise
- 2 tablespoons light salad dressing
- 1 teaspoon vegetable oil

**Empty Calories** Where do such items as beer, butter, candy, sodas, cookies, corn chips, and pastries fit into your diet? Most of these items contribute relatively little to healthful nutrition; they provide additional calories, generally from sucrose and significant amounts of salt and fat. Fats, salt, sugar, and alcohol are referred to as “empty calories” and are limited to 120–330 calories a day by the MyPlate food guide depending on gender and age (see Table 5.2). As described earlier in this chapter, the recommended total daily fat intake should be 20–35 percent of total calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids. Less than 10 percent of total calories should be from saturated fats, and less than 300 mg per day should come from cholesterol. Trans-fatty acid consumption should be kept to 2 grams or less daily.

The USDA also suggests that we choose and prepare foods and beverages with little added sugars or caloric sweeteners. The new food guide recommends no more than 8 teaspoons of added sugars per day, which is equivalent to ½ ounce of jelly beans or an 8-ounce glass of



*The Dietary Guidelines for Americans recommend that we increase our intake of fruits, vegetables, whole grains, and fat-free or low-fat dairy products. Fruit can be easily incorporated into the daily diet as part of a meal or as a snack.*

lemonade. Eating too much sugar is thought to be a major contributor to the increase in obesity in Americans.

## Dietary Guidelines for Americans 2010

The Dietary Guidelines for Americans are science-based and summarize the most current information regarding nutrition, health, physical activity, and food safety. The goal of these guidelines is to lower the risk of chronic disease and promote health through diet and physical activity. Together, these guidelines encourage Americans to take in fewer calories, make wiser food choices, and be more physically active. The key recommendations focus on increasing consumption of nutrient-dense food and fruits and vegetables, exercising regularly, decreasing portion sizes, and decreasing consumption of sodium, trans fat, saturated fatty acids, dietary cholesterol, sugar, refined grains, and alcohol. We will discuss these recommendations in the next section along with guidelines for food safety and special populations.

**Focus on Nutrient Density** Many Americans consume too many calories and too much saturated and trans fat, cholesterol, added sugar, and sodium. At the same time, many people do not meet the recommended intakes for fiber and a number of vitamins and minerals.

Therefore, people should choose mostly **nutrient-dense foods**, which provide substantial amounts of vitamins and minerals and comparatively few calories. Junk foods typically are not nutrient-dense because they are high in sugar and saturated and trans fat, high in calories, and low in vitamins and minerals. Choosing nutrient-dense foods can be especially challenging when eating out.

Following the recommendations in the MyPlate plan can help you choose nutrient-dense foods. In general, Americans are advised to consume more dark green and red and orange vegetables; more legumes, fruits, and whole grains; low-fat milk and dairy products; and more seafood.

**Physical Activity** Of course, part of managing your weight in a healthy manner includes physical activity. The Dietary Guidelines for Americans emphasize the important role that physical activity plays in our lives. It is proposed that adult Americans engage in at least 2 hours and 30 minutes of moderate-intensity aerobic physical activity spread over three days a week. This is in addition to the usual activities of daily life at work or home on most days of the week to reduce the risk of chronic disease. It is further recommended that adults engage in strength training activities such as sit-ups, push-ups and weight lifting two times a week. Children and adolescents are to engage in one hour or more of moderate- to vigorous-intensity physical activity every day, including strengthening activities such as climbing and jumping at least three times a week. Children younger than 5 are recommended to be active each day. Seventy-seven percent of Americans don't meet the USDA's recommendations for physical activity.

**Weight Management** The Dietary Guidelines for Americans define weight management as meaning “to maintain body weight in a healthy range, balance calories from foods and beverages with calories expended, and to prevent gradual weight gain over time, make small decreases in food and beverage calories and increase physical activity.” The dietary guidelines were designed with the goal of weight management in mind, and the recommendations for the different food groups were developed to reach this goal. However, most Americans don't know how many calories they should consume each day to maintain their weight, making it difficult to achieve this goal. Chapter 6 will go into further detail on how to identify a healthy weight and manage your weight effectively.

**Food Groups to Encourage: Fruits, Vegetables, Dairy, and Seafood** Americans are advised to consume more fiber-rich whole grains, fruits and vegetables, seafood, and dairy products. Specifically, it is suggested that we consume 3–6 ounce-equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products. In general, at least half the grains should come from whole grains.

Americans are also encouraged to choose a variety of fruits and vegetables, selecting from all four vegetable subgroups: dark green, red, orange, and starchy vegetables and legumes. Drinking 3 cups of fat-free or low-fat milk or the equivalent per day is also encouraged, especially because milk consumption has been decreasing over the past 30 years. Americans are further encouraged to drink water instead of sugary drinks. There is also a push to eat seafood in place of meat and poultry.

### **Foods to Limit: Fats, Sugars, Sodium, and Alcohol**

**Choose Your Fats Wisely** According to the USDA, we should limit our total fat intake to 20–35 percent of calories, with most fat calories coming from polyunsaturated and monounsaturated fatty acids. However, 34 percent of calories Americans consume come from fat intake. Less than 10 percent of our calories should come from saturated fatty acids, keeping our consumption of trans-fatty acids as low as possible. Also, we need to limit our cholesterol intake to less than 300 mg/day, getting our protein from low-fat, fat-free, or lean meat, poultry, dairy, and bean products.

**Sugar Consumption** The Dietary Guidelines for Americans suggest that we choose and prepare foods and beverages with little added sugar or noncaloric sweeteners. Most added sugar comes from soft drinks; energy, fruit, and sports drinks; desserts; and candy. For example, a regular 12-ounce soft drink contains 8 teaspoons of sugar. The dietary guidelines specifically focus on reducing Americans' consumption of sugary beverages for this reason. There is a further recommendation to decrease the amount of added sugars in foods. It is estimated that Americans consume 400 calories worth of added sugars daily. Added sugars have been associated with higher risk of obesity, heart disease, diabetes, and gout.<sup>31</sup> Shopping for foods that limit sugar can be a challenge, however; see the box “Does Watching Television Influence Your Eating?”

**Sodium Intake** The USDA guidelines recommend limiting sodium intake to less than 2,300 mg daily, and for Americans over 51, less than 1,500 mg daily; however, the average American consumes 3,400 mg daily (see Figure 5-5). Most of our salt intake comes from processed or prepared foods. Many people are unaware of the high sodium content in prepared foods, sauces, soups, and canned foods, and so reading the labels for ingredients is extremely important. You might be surprised by some of the foods that contain salt—cookies,

#### **Key Terms**

**nutrient-dense foods** Foods that provide substantial amounts of vitamins and minerals and comparatively few calories.

## Building Media Literacy Skills

### Does Watching Television Influence Your Eating?

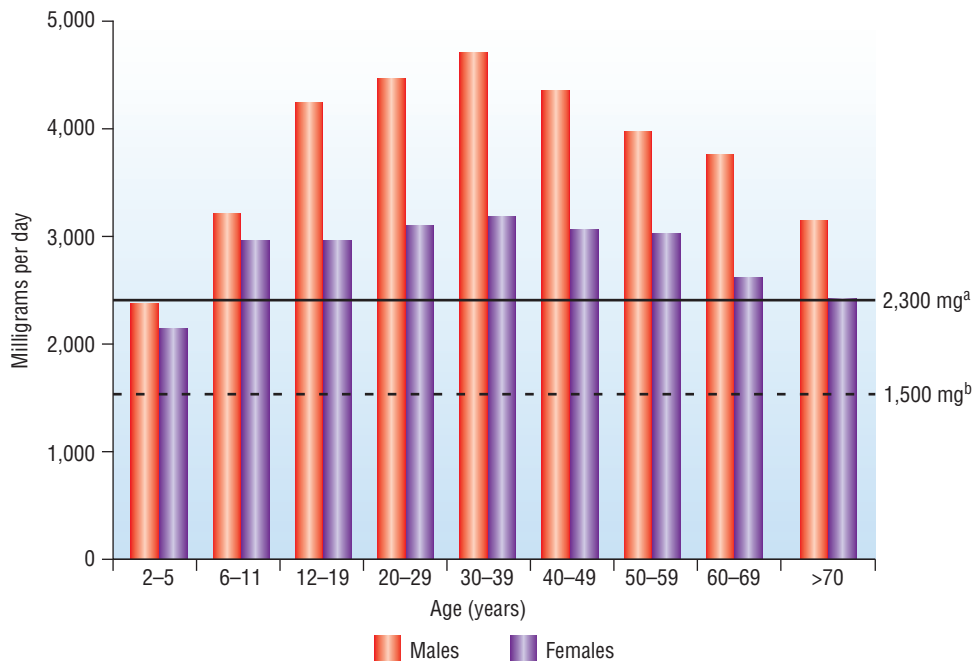
Does seeing a television advertisement for a juicy, mouth-watering Steak and Shake burger make you hungry? Does a Dove chocolate waterfall cascading down the television screen make you salivate? Advertisers hope so and are spending over \$10 billion on food and beverage television ads each year, with the lowest amount of money being spent on advertising fruits, vegetables, and milk. Most of these ads are targeted toward children and adolescents, who view one food ad every five minutes of television screen time. Eighty-nine percent of these ads are for products that are high in sugar, fat, and/or sodium. Children as young as 2 years of age begin asking their parents to buy certain food items seen on television; this is known in the advertising industry as “pestering power” or “nag power.” Most of these requests are for cereal, soft drinks, cookies, and candy, and parents comply with their children’s requests 50 percent of the time. The least nutritious, high-sugar cereals are the most heavily marketed to children.

Studies have shown that people do eat more after watching television food ads, regardless of how hungry they reported they were at the time. One study found that children ate 45 percent more after seeing a television food ad, compared to those who didn’t view one,

potentially contributing to a weight gain of 10 pounds per year. The ads don’t show viewers the whole picture, such as caloric count or the fat, sodium, and sugar content of these foods. Nor do they tell viewers that the more people see these ads, the more they eat and the more they weigh.

So what is the answer? It is very difficult if not impossible to avoid these ads as they bombard us constantly. Do you think there should be regulation for food ads, such as requiring them to list the nutritional information for these foods? Should there be an equal number of ads for fruits, vegetables, and dairy products? One thing that we as consumers can do is educate ourselves about the nutritional information of these foods—that is, be more informed viewers and look at the ads with a more realistic and knowledgeable perspective.

Sources: Approximately how much money is spent each year marketing food products to children? *Purdue Extension*, March 16, 2010; Story M, French S, Food advertising and marketing directed at children and adolescents in the US, *International Journal of Behavior, Nutrition, and Physical Activity*, 5, 1, 2004; Taylor J, Are fast-food advertisers playing you? *WebMD*, March 20, 2011; Kids’ cereals pour on the sugar and sodium, *USA Today*, October 26, 2009.



**Figure 5-5 Estimated Mean Daily Sodium Intake, by Age-Gender Group, NHANES 2005–2006**

<sup>a</sup> 2,300 mg/day is the Tolerable Upper Level (UL) for sodium intake in adults set by the Institute of Medicine (IOM). For children younger than age 14 years, the UL is less than 2,300 mg/day.

<sup>b</sup> 1,500 mg/day is the Adequate Intake (AI) for individuals ages 9 years and older.

Source: U.S. Department of Agriculture, Agricultural Research Service, and U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *What we eat in America, NHANES 2005–2006*, <http://www.ars.usda.gov/Services/docs.htm?docid513793>, accessed August 11, 2010.

bread, salad dressings, soft drinks, and cereal. Too much sodium is linked to hypertension, and about 30 percent of Americans have sodium-sensitive high blood pressure, which can lead to heart attack or stroke. A study

showed that a low-sodium diet reduced the risk of cardiovascular disease by 25–30 percent.<sup>32</sup> It is estimated that about 150,000 deaths each year are caused by consumption of too much salt. For this reason salt has been



referred to as the “silent killer,” and the USDA labeled salt as “public enemy No. 1.” The Institute of Medicine issued a report in 2010 urging the government to reduce the maximum amount of sodium that manufacturers and restaurants can add to foods and beverages.<sup>33</sup> For example, the sodium content in McDonald’s Big Mac is 1,040 mg; in Panera’s broccoli cheddar soup, 1,020 mg; and in Olive Garden’s spaghetti and meatballs, 2,180 mg.<sup>33</sup> Some companies are already acting in anticipation of this possible FDA regulation. Subway decreased its sodium content by 28 percent in its “fresh fit” sandwich line, following the lead of others who have already cut sodium in their products, such as PepsiCo, ConAgra, Del Monte, General Mills, Kraft, Heinz, Mars, Starbucks, and Campbell. Perhaps sodium will go the way of trans fat in being severely reduced in Americans’ diet if the food and beverage industry continues the trend of decreasing the sodium in its products.

**Alcohol Consumption** The USDA states that “if alcohol is consumed, it should be consumed in moderation—up to one drink per day for women and two drinks per day for men—and only by adults of legal drinking age.” One drink is defined as either 12 fluid ounces of regular beer, 5 fluid ounces of wine, or 1½ fluid ounces of 80-proof distilled spirits. Because alcoholic beverages tend to contribute calories but little nutrition, they are counterproductive to taking in sufficient nutrients while not going over the daily caloric allotment. However, there are some indications that moderate alcohol consumption, such as having a glass of red wine each day, decreases the risk of coronary heart disease.

**Food Safety** Food safety has become an increasing concern with the numerous foodborne pathogens showing up in peanuts, seafood, meat, eggs, vegetables, and even dog food. The Dietary Guidelines for Americans suggest commonsense safety measures, such as making sure your hands and work surfaces are clean before you prepare food. Food should be cooked or chilled at appropriate temperatures (see the section “Food Safety” on page 141). It is further suggested that you *not* wash meat or poultry prior to preparing them, which is the opposite of what has been advised in the past. Avoid unpasteurized juices, milk, and milk products; raw or partially cooked eggs, or foods containing raw eggs; undercooked meat and poultry; and raw sprouts. This will be discussed in more detail in the food safety section later in this chapter.

**Recommendations for Special Populations** There are also some special recommendations for specific population groups. For people over 50, consuming vitamin B<sub>12</sub> in its crystalline form (such as fortified foods or supplements) is recommended. Women of childbearing age need to eat iron-rich plant food or iron-fortified food

with an enhancer for iron absorption, such as vitamin-C-rich foods. Taking in adequate amounts of folic acid daily from fortified foods or supplements is important for pregnant women and women who may become pregnant. Pregnant or breast-feeding women are further recommended to consume 8–12 ounces of seafood per week, limiting tuna and abstaining from tilefish, shark, swordfish, and mackerel due to high mercury content. Older adults, people with dark skin, and those not exposed to enough sunlight need to consume extra vitamin D from vitamin-D-fortified foods or supplements.

Dietary modifications may also be recommended for athletes and other active individuals.

## Additional Eating Plans and Recommendations

Other eating plans are consistent with the Dietary Guidelines for Americans and appropriate for different groups. This section describes the DASH diet, introduces different types of vegetarian diets, and provides nutritional guidelines for older adults. The box “Diverse Food Pyramids” describes food group plans based on different ethnic dietary patterns.

**Dietary Approaches to Stop Hypertension (DASH)** The DASH diet is not a weight loss program but an example of how to eat in accordance with the Dietary Guidelines for Americans. The DASH diet is constructed across a range of calorie levels to meet the needs of various age and gender groups. Originally developed to study the effects of an eating pattern on the prevention and treatment of hypertension, DASH is a balanced eating plan consistent with the USDA’s dietary guidelines and similar to the Mediterranean diet. You can view examples of the DASH program on the National Institutes of Health website at [www.nhlbi.nih.gov/health/public/heart/hbp/dash](http://www.nhlbi.nih.gov/health/public/heart/hbp/dash). Table 5.4 also shows how the DASH diet varies by caloric intake requirements. A 25-year study of 88,000 women showed that those who followed the DASH diet were 24 percent less likely to have a stroke than were those who didn’t follow it .

## Vegetarian Diets

For some, vegetarianism is a way of eating, and for others, it is a way of life. In the sections that follow, various forms of vegetarianism will be addressed. The MyPlate food guide described earlier in this chapter can be used as a guide for all types of vegetarian diets as well.

A *vegetarian diet* relies on plant sources for most of the nutrients the body needs. Studies show that vegetarians who eat a balanced diet don’t seem to have any more iron-deficiency problems than do meat eaters. Although the iron in plant food is not as well absorbed as the iron in animal food is, vegetarians tend to eat more iron-containing foods and more vitamin C foods, which



# Learning from Our Diversity

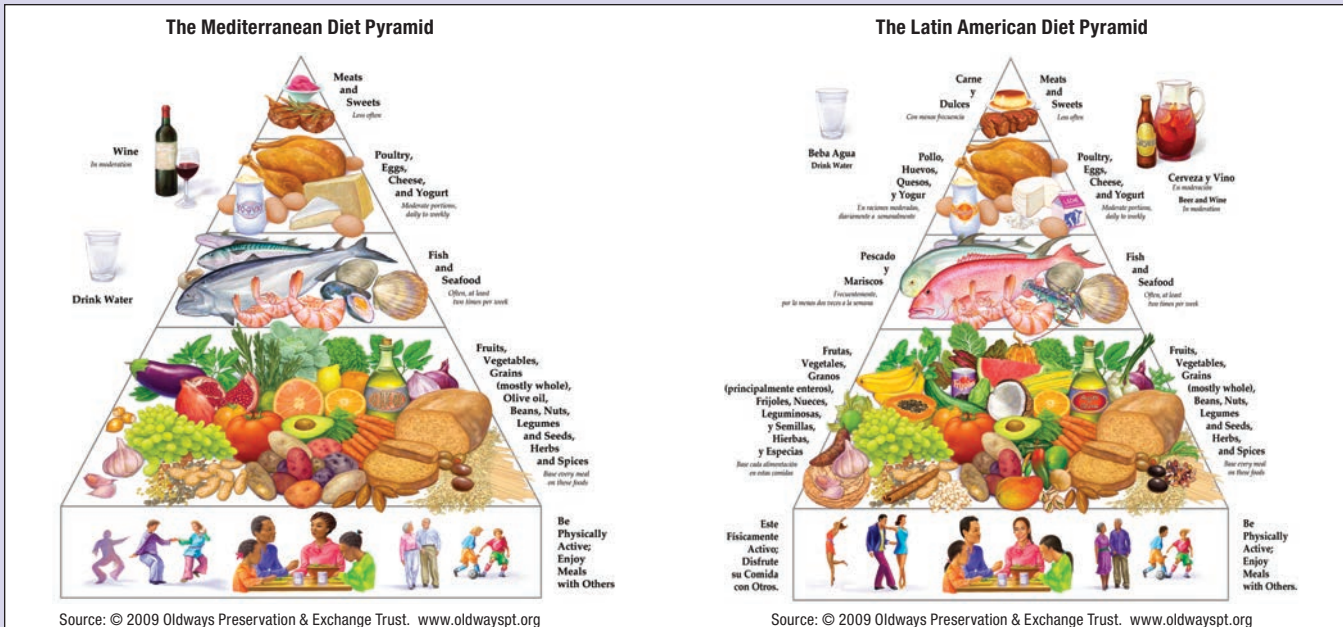
## Diverse Food Pyramids

Besides MyPlate, discussed earlier in this chapter, other food pyramids exist. The Mediterranean food pyramid emphasizes fruits, beans, legumes, nuts, vegetables, whole grains, and small amounts of meat. In fact, the latest version of the USDA pyramid and dietary guidelines is in keeping with what had already been suggested by the Mediterranean food pyramid—for example, using more olive oil; limiting consumption of alcohol; eating more whole grains, fruits, and vegetables; choosing lean meat; eating fish and shellfish; and exercising daily.

The Asian food pyramid limits meat consumption even more by recommending consumption of meat on a monthly basis and daily consumption of fish, shellfish, and dairy products. The Asian diet,

like the Mediterranean diet, encourages daily intake of fruit, legumes, vegetables, and whole grains. In addition, the Asian diet includes rice and noodles and suggests eating poultry, eggs, and sweets only once a week.

The Latin American food pyramid also advises consumption of meat, sweets, and eggs only once a week. Like the Asian diet, it encourages eating fish and shellfish on a daily basis, and unlike the Mediterranean and Asian diets, it advises consumption of poultry on a daily basis. As in the other food pyramids, fruit, vegetables, beans, and whole grains are to be consumed every day. Physical exercise and water consumption are also emphasized by all three food pyramids.



Source: © 2009 Oldways Preservation & Exchange Trust. [www.oldwayspt.org](http://www.oldwayspt.org)

Source: © 2009 Oldways Preservation & Exchange Trust. [www.oldwayspt.org](http://www.oldwayspt.org)

### The Asian Diet Pyramid



Source: © 2000 Oldways Preservation & Exchange Trust. [www.oldwayspt.org](http://www.oldwayspt.org)

**Table 5.4 DASH Eating Plan**

| Food Groups                   | Servings/day       |                    |                    |                    |
|-------------------------------|--------------------|--------------------|--------------------|--------------------|
|                               | 1,600 calories/day | 2,000 calories/day | 2,600 calories/day | 3,100 calories/day |
| Grains*                       | 6                  | 6–8                | 10–11              | 12–13              |
| Vegetables                    | 3–4                | 4–5                | 5–6                | 6                  |
| Fruits                        | 4                  | 4–5                | 5–6                | 6                  |
| Dairy                         | 2–3                | 2–3                | 3                  | 3–4                |
| Lean meats, poultry, and fish | 3–6                | 6                  | 6                  | 6–9                |
| Nuts, seeds, and legumes      | 3/week             | 4–5                | 1                  | 1                  |
| Fats and oils                 | 2                  | 2–3                | 3                  | 4                  |
| Sweets and added sugars       | Less than 3        | Less than 5        | Less than 2        | Less than 2        |

\*Whole grains are recommended for most grain servings as a good source of fiber and nutrients.

Source: National Heart, Lung, and Blood Institute, Your guide to lowering your blood pressure with DASH, 2006, [www.nhlbi.nih.gov/health/public/heart/hbp/dash/how-make-dash.html](http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/how-make-dash.html).

help with the absorption of the iron.<sup>33</sup> In addition, vegetarians tend to get enough calcium from dairy foods, tofu, beans, soybeans, calcium-fortified cereals, and vegetables such as broccoli. There has been some concern about a vitamin B<sub>12</sub> deficiency because animal foods are the best source for B<sub>12</sub> and plant foods don't naturally contain this vitamin. However, soy foods may contain vitamin B<sub>12</sub>, although it is not as biologically active as in animal foods. Many soy products are fortified with vitamin B<sub>12</sub> as well. Note also that the liver stores so much B<sub>12</sub> that it would take years to become deficient in this vitamin.<sup>33</sup> Vegetarians tend to eat healthier diets; have lower rates of cardiovascular disease, lower blood pressure, lower levels of LDL cholesterol, and less incidence of diabetes; and weigh 15 percent less than do those who eat meat. Vegetarian diets encompass a continuum from diets that allow some animal sources of nutrients to those that exclude all animal sources. We briefly describe three vegetarian diets, beginning with the least restrictive in terms of food sources.

**Ovolactovegetarian Diet** Depending on the particular pattern of consuming eggs (*ovo*) and milk (*lacto*) or using one but not the other, ovolactovegetarianism can be an extremely sound approach to healthful eating during the entire course of the adult years. An **ovolactovegetarian diet** provides the body with the essential amino acids while limiting the high intake of fats seen in more conventional diets. The exclusion of meat as a protein source lowers the total fat intake, while the consumption of milk or eggs allows for an adequate amount of saturated fat to remain in the diet. The use of vegetable products as the primary source of nutrients is consistent with the current dietary recommendations for an increase in fruits and vegetables and an increase in fiber. Most vegetarians in the United States are ovolactovegetarians.

Meatlike products composed of textured vegetable protein are available in supermarkets. Nonmeat bacon strips, hamburger and chicken patties, and link sausage can be consumed by people who want to restrict their meat intake but still want a meatlike product. Soybeans are a primary source of this textured vegetable protein.

Vegetarians who do consume dairy products face challenges when making food choices if they wish to avoid other animal products in their food. Because most cheese is made with rennet, a coagulating agent that usually comes from the stomachs of slaughtered newborn calves, many vegetarians eliminate cheese from their diet or opt for rennetless cheese. Vegetarian cheeses are manufactured using rennet from either fungal or bacterial sources. Similarly, yogurt is often made with gelatin derived from animal ligaments, skins, tendon, and bones (gelatin is also found in marshmallows, candy such as jelly beans and candy corn, poptarts, and a variety of other foods).

It has become easier to follow a vegetarian diet since stores have begun offering organic vegetarian items that do not contain these animal products. However, it can be difficult to avoid all animal products without being an avid and knowledgeable label reader.

**Lactovegetarian and Ovovegetarian Diets** People who include dairy products in their diet but no other

### Key Terms

**ovolactovegetarian diet** (oh voh lack toe veg a tee in) A diet that excludes all meat but does allow the consumption of eggs and dairy products.





Soy foods are an important source of protein and other nutrients for vegetarians.

animal products, such as eggs and meat, are *lactovegetarians*. In contrast, people who exclude dairy products such as milk and cheese, yet consume eggs, are *ovovegetarians*. Both diets carry the advantages of ovo-lacto-vegetarianism.

**Vegan Vegetarian Diet** A **vegan vegetarian diet** is one in which not only meat but also other animal products, including milk, cheese, and eggs, are excluded. When compared with the ovo-lacto-vegetarian diet, the vegan diet requires a higher level of nutritional understanding to avoid nutritional inadequacies.

One potential difficulty is that of obtaining all the essential amino acids. Since a single plant source does not contain all the essential amino acids, the vegan must learn to consistently employ a complementary diet. By carefully combining various grains, seeds, and legumes, amino acid deficiency can be prevented.

In addition to the potential amino acid deficiency, the vegan could have some difficulty in maintaining the necessary intake of vitamin B<sub>12</sub>. Possible ramifications of inadequate B<sub>12</sub> intake include depression, anemia, back pain, and menstrual irregularity. Vegans often have difficulty maintaining adequate intakes of iron, zinc, and calcium.<sup>1</sup> Calcium intake must be monitored closely by the vegan. In addition, vitamin D deficiencies can occur. Supplements and daily exposure to sunshine will aid in maintaining adequate levels of this vitamin.

A final area of potential difficulty for the vegan is that of an insufficient caloric intake because of the satiety resulting from the nature of the diet. Early satiety caused by a large amount of fiber may lower carbohydrate intake to the point that protein stores (muscle mass) are used for energy.

When practiced knowledgeably, vegan vegetarianism is sound for virtually all people, including pregnant

and breast-feeding women, infants and children, older adults, and athletes.

**Semivegetarian Diets** People become vegetarians for many reasons. Some avoid meat and animal products for ethical or spiritual reasons. Others choose vegetarianism for health or environmental reasons. In recent years, however, some people have found a middle ground between the two eating styles. These so-called **semivegetarians**, also referred to as *flexitarians*, are increasing their intake of vegetables and cutting back greatly on meat consumption but not necessarily eliminating meat entirely. Semivegetarians add occasional servings of fish and poultry to the ovo-lacto-vegetarian diet, and some even eat red meat on occasion. **Pesco-vegetarians** eat fish, dairy products, and eggs along with plant foods.

A semivegetarian diet is much healthier than the typical meat-laden Western diet. The American Cancer Society, the American Heart Association, and the National Academy of Science all recommend dietary changes that are closely related to the typical semivegetarian diet. The health benefits of such a diet are well documented.

The semivegetarian diet may be desirable to some people because the limited consumption of meat products may help ward off some nutrient deficiencies, and such a diet can be healthier than that of the typical American.

## Nutrition and the Older Adult

Nutritional needs change as adults age. Age-related alterations to the structure and function of the body are primarily responsible for this. Included among the changes that alter nutritional requirements and practices are changes in the teeth, salivary glands, taste buds, oral muscles, gastric acid production, and peristaltic action (movement of food through the gastrointestinal tract). Older adults can find food less tasteful and harder to chew. Chronic constipation resulting from changes in gastrointestinal tract function can also decrease interest in eating.<sup>34</sup>

The progressive lowering of the body's basal metabolism is another factor that eventually influences dietary patterns of older adults. As energy requirements fall, the body gradually senses the need for less food. This gradual recognition of lower energy needs results in a lessened food intake and loss of appetite in many older adults. Because of this decreased need for calories, nutrient density—the nutritional value of a food relative to the number of calories supplied—is an important factor for older adults. The USDA dietary guidelines make some specific suggestions for people over 50. These include consuming more vitamin B<sub>12</sub>, because older people tend to have difficulty absorbing this vitamin. Older adults are also encouraged to consume extra vitamin-D-fortified foods, since this vitamin may be lacking in this group.



Besides the physiological factors that influence dietary patterns among the elderly, several psychosocial factors alter the role of food in the lives of many older adults. Social isolation, depression, chronic alcohol consumption, loss of income, transportation limitations, and housing restrictions are factors in lifestyle patterns that can alter the ease and enjoyment associated with the preparation and consumption of food.

## Special Nutrition Concerns: Challenges and Tools for Consumers

### Food Labels

Since 1973, food manufacturers have been required by the FDA to provide nutritional information (labels) on products to which one or more nutrients have been added or for which some nutritional claim has been made. Despite the presence of these labels, there was concern about whether the public could understand the labels as they appeared and whether additional information was required. Accordingly, the FDA, in consultation with individual states and public interest groups, developed new labeling regulations. Revised labels began appearing on food packages in 1993. The currently used label is shown in Figure 5-6. Specific types of information contained on the new label are highlighted.

In 2008, the “Country of Origin” legislation took effect requiring all fresh or frozen meats, fish, fruits, and vegetables to be identified by their country of origin. This identification may be made by using a sticker, sign, placard, or label to indicate the country of the product’s origin. However, cooked and processed foods, such as frozen or cooked shrimp and smoked ham or fish, are exempt. Also exempt are foods packaged together such as frozen peas and carrots.

As of January 2006, food makers are required by the FDA to put the amount of trans fat on food labels. The FDA has further recommended that food labels list calories in larger print, list the percentage of the consumer’s daily allotment of calories, and list the total amount of calories in the container, not just the calories per serving. For example, pretzels might be listed as having 100 calories per serving and approximately 15 servings per bag, leaving it up to you to compute how many servings and calories you have consumed. The FDA prohibits any nutrient claim that it has not defined. For example, the FDA redefines *low-fat* as containing 3 grams or less of fat per serving. The FDA has not yet defined what can be considered to be *low-carb* even though many food makers and restaurants use this term in their advertising. Consumers need to know what is meant by claims such as *low-calorie*, *low-fat*, and *low-carb*; having a standard definition makes it much easier to make healthy and informed nutritional choices.

| <b>Nutrition Facts</b>  |                              |
|---|------------------------------|
| Serving Size 1 Bar (40g)  |                              |
| Amount Per Serving  |                              |
| <b>Calories</b> 170   | Calories from Fat 60         |
| <b>% Daily Value*</b>   |                              |
| <b>Total Fat</b> 7g   | 11%                          |
| Saturated Fat 7g  | 15%                          |
| Trans Fat 0g  |                              |
| <b>Cholesterol</b> 0mg  | 0%                           |
| <b>Sodium</b> 160mg   | 7%                           |
| <b>Total Carbohydrate</b> 24g   | 8%                           |
| Dietary Fiber 3g  | 12%                          |
| Sugars 10g  |                              |
| <b>Protein</b> 5g   |                              |
| Vitamin A 2%  | Vitamin C 2%                 |
| Calcium 20%   | Iron 8%                      |
| * Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs: |                              |
|   | Calories: 2,000    2,500     |
| Total Fat   | Less than 65g    80g         |
| Sat Fat   | Less than 20g    25g         |
| Cholesterol   | Less than 300mg    300mg     |
| Sodium  | Less than 2,400mg    2,400mg |
| Total Carbohydrate  | 300g    375g                 |
| Dietary Fiber   | 25g    25g                   |
| Calories per gram:  |                              |
| Fat 9 • Carbohydrate 4 • Protein 4  |                              |

Check Calories

Limit These Nutrients

Get Enough of These Nutrients

Footnote

### Ingredients

Granola Bar (Brown Rice Syrup, Granola [rolled oats, honey, canola oil], Dry Roasted Peanuts, Soy Crisps [soy protein isolate, rice flour, malt extract, calcium carbonate], Crisp Brown Rice [organic brown rice flour, evaporated cane juice, molasses, rice bran extract, sea salt], Glycerine, Peanut Butter [ground dry roasted peanuts], Inulin, Whey Protein Isolate, Gold Flax Seeds, Quinoa Flakes, Calcium Carbonate, Salt, Natural Flavors, Water, Soy Lecithin [an emulsifier]), Dark Compound Coating (evaporated cane juice, palm kernel oil, cocoa [processed with alkali], palm oil, soy lecithin [an emulsifier]).

**Figure 5-6 The Nutrition Facts Label and Ingredients List of a Granola Bar**

Source: Dietary Guidelines for Americans, 2010.

### Key Terms

**vegan vegetarian diet** (*vee gun or vay gun*) A vegetarian diet that excludes the consumption of all animal products, including eggs and dairy products.

**semivegetarian diet** A diet that significantly reduces but does not eliminate meat consumption and allows consumption of dairy products and eggs; also called *flexitarian*.

**pesco-vegetarian diet** A vegetarian diet that includes fish, dairy products, and eggs along with plant foods.

At the same time, the FDA began requiring food labels to clearly state if food products contain any proteins derived from any of the eight major food allergens. In addition, the Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA) requires manufacturers to clearly identify the presence of ingredients that contain protein derived from milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, or soybeans in the list of ingredients or to say “contains” followed by name of the food allergen after or adjacent to the list of ingredients. However, the FDA does not require manufacturers to provide precautionary statements such as “This product has been made on equipment that manufactures peanut products,” and cross-contamination can cause an allergic reaction. This is very important for those who suffer from food allergies, and there is a discussion of this topic later in the chapter.

Anticipating that the FDA would eventually develop a system to indicate healthy food choices on packaging, some companies, such as PepsiCo, General Mills, and Kellogg, implemented voluntary food labeling using a green check mark on the front of the item to indicate a “smart choice.” However, this type of labeling came under fire as high-sugar foods such as Froot Loops and Cracker Jacks had these green “smart choice” check marks on their packages. Critics claimed that this labeling practice was more misleading than helpful, as it resulted in people not reading the nutritional information, assuming that the food was a healthy choice. Consumers may have believed that these food labels were regulated by the FDA when in reality they were not. The “smart choice” check marks are now being replaced by “nutrition keys” on the front of packages, listing calories, saturated fat, sodium, and sugars per serving. Again, this is a voluntary nutrition labeling system created by the Grocery Manufacturers’ Association and the Food Marketing Institute, not the FDA.

A new law, part of the U.S. health care bill, mandates that nutrition information be posted on the menu or menu board next to the menu item in any restaurant that has 20 or more locations. This law also applies to vending machine food. New York City, California, and Seattle already have this calorie-posting law. The hope is that Americans will make more informed choices when eating out. As of 2012, the FDA requires nutrition labels on beef, poultry, lamb, and pork; previously, this was not required. The labels list calories, calories from fat, saturated fat, cholesterol, sodium, protein, and vitamins.<sup>34</sup>

## Fast Foods

Fast foods are convenience foods usually prepared in walk-in or drive-through restaurants. The nutritional values of fast foods can vary considerably, and **fat density** remains a serious limitation of fast foods. In comparison to the recommended standard (20–35 percent of total

calories from fat), 40–70 percent of the calories in fast foods are obtained from fats. The restaurant and fast-food industry has received strong criticism for its contribution to creating overweight Americans.

Many restaurants and fast-food chains have discontinued using trans fat in their food and are offering “diet menus” featuring foods that are lower in caloric content, fat, and sugar. Subway has a “fresh-fit,” low-fat menu; Taco Bell offers items with 9 or fewer grams of fat, all under 200 calories; Starbucks has under-400-calorie Panini sandwiches and skinny lattes; and IHOP has “simple and fit” under-600-calorie menu items.

Despite these efforts, a recent study showed that those who said they ate out at fast-food restaurants at least twice a week gained 10 pounds more than those who did not. Another study showed that most people underestimate how many calories they have eaten when they eat fast food, often by as much as 681 calories. This makes some sense given that a study of restaurants found that menu items were up to 18 percent higher in calories than was listed in the nutritional information. Nutritional information for restaurants and fast-food chains can be found on websites such as [www.chowbaby.com](http://www.chowbaby.com).

While fast-food restaurants are offering some healthy choices, they still have high-fat, high-calories options such as Hardee’s Western Bacon Thickburger, weighing in at 900 calories, 470 from fat; Burger King’s XT Steakburger at 970 calories, 549 from fat; and McDonald’s Double Quarter Pounder with Cheese at 730 calories, 360 from fat, as well as supersize fries at 610 calories, 261 from fat, and 32-ounce chocolate shake at 770 calories, 160 from fat, for a grand total of 2,110 calories.

Who are these restaurants appealing to with these menu items? Research shows that men ages 18–24 make fast-food choices based on getting the most for the least amount of money, not on nutritional value. And don’t be fooled by thinking that if it’s salad, it’s healthy; that can be far from the truth. Wendy’s Baja Salad has 740 calories, 420 from fat, and 1,990 mg of sodium. McDonald’s Southwest Salad with Crispy Chicken, without salad dressing, has 430 calories, 20 grams of fat, and 920 mg of sodium.

On the other side of the coin, some healthy fast-food choices are Taco Bell’s Chicken Soft Taco with 150 calories, Wendy’s Grilled Chicken Go Wrap with 127 calories, McDonald’s Hamburger with 250 calories, and McDonald’s Fruit and Yogurt Parfait with 160 calories.

See the box “Eating on the Run” for more suggestions on healthier fast-food choices.



**TALKING POINTS** Which fast-food restaurants are your favorites? Are you surprised at any of the information in this chapter regarding your favorite meals? Will you change your order next time you visit a fast-food restaurant?

## Changing for the Better

### Eating on the Run

**I am always in a hurry and don't have time to cook, and so a lot of my meals end up being fast food. Are there better choices I can make when eating on the run?**

The typical American eats about three hamburgers and four orders of French fries each week, so you aren't alone. With over 300,000 fast-food restaurants in the United States, fast food is definitely part of the American lifestyle. Here are some things to consider when eating at fast-food restaurants:

- Don't supersize! Go for the "small" or "regular" size.
- Don't wait until you are starving because that leads to overeating and supersizing!
- Decide what you want to order ahead of time, and don't be swayed by "value meal" or what "looks good."
- Ask for a nutritional guide for the menu. Look at the calories, fat grams, and sodium when making your selection.

- Order grilled instead of fried chicken or fish.
- Look for the "light" choices.
- Limit your condiments. Mustard, ketchup, salsa, and low-fat or fat-free condiments and dressings are preferable to regular mayonnaise or high-fat dressings.
- Bring fast food from home! Buy portable foods at the grocery store to take with you that can be eaten quickly and easily, such as portable yogurt, bananas, apples, low-fat granola bars, or breakfast bars.
- Order low-fat or skim milk or water instead of soda.
- Go to a variety of different kinds of fast-food restaurants so you aren't eating hamburgers every day, and set a limit on how many meals you are going to eat out each week.



## Functional Foods

At the forefront of healthful nutrition is the identification and development of foods intended to affect a particular health problem or to improve the functional capability of the body. **Functional foods** contain not only recognized nutrients but also new or enhanced elements that impart medicinelike properties to the food. Alternative labels also exist for various subclasses of functional foods, such as *nutraceuticals*, or food elements that may be packaged in forms appearing more like medications (for example, pills or capsules), and *probiotics*.<sup>35</sup> **Probiotics** "for life," are living bacteria ("good bugs") that are thought to help prevent disease and boost the immune system. Probiotic bacteria have been associated with the alleviation of allergies, irritable bowel, and respiratory and urinary tract infections, and with cancer prevention. They make the environment in the digestive system inhospitable for harmful bacteria (the "bad bugs"). More than 400 types of bacteria reside in and on our bodies and outnumber human cells 10 to 1. Yogurt is one example of a food that gives you a dose of these good bugs—*Lactobacillus bulgaricus*.

Examples of functional foods include garlic (believed to lower cholesterol), olive oil (thought to prevent heart disease), foods high in fiber (which prevent constipation and lower cholesterol), and foods rich in calcium (which help prevent osteoporosis). In addition, foods that contain high levels of vitamins A, C, and E—primarily fruits and vegetables—and provide the body with natural sources of antioxidants are functional foods.

Other functional foods are those that contain or are enriched with folic acid. These vitamin-B-family foods aid in the prevention of spina bifida and other neural

tube defects (see Chapter 12) and the prevention of heart disease. Foods that are rich in selenium are sometimes categorized as functional foods because of selenium's potential as an agent in cancer prevention. The FDA approved a "heart healthy" label for foods that are rich in soy protein,<sup>36</sup> although there is some debate about the impact soy protein has in the prevention of cardiovascular disease. All the functional foods discussed here are approved to carry **health claims** on the basis of current FDA criteria.<sup>37</sup> Phytosterols are another example of a functional food. Phytosterols are found in plants and help lower cholesterol levels. They can be found in oils, nuts, vegetables, fruits, and legumes.

One category of functional foods being researched is vegetables that are genetically engineered to produce a specific biological element that is important to human health. An example is tomatoes that are high in lycopene.

### Key Terms

**fat density** The percentage of a food's total calories that are derived from fat; above 30 percent reflects high fat density.

**functional foods** Foods capable of contributing to the improvement/prevention of specific health problems.

**probiotics** Living bacteria ("good bugs") that help prevent disease and strengthen the immune system.

**health claims** Statements authorized by the FDA as having scientific proof of claims that a food, nutrient, or dietary supplement has an effect on a health-related condition.

Food technologists are interested in expanding the functional food family to include a greater array of health-enhancing food items.

## Dietary Supplements

Americans spend \$23 billion annually on a wide array of over-the-counter (OTC) products known collectively as *dietary supplements*. These unregulated, nonprescription products are legally described as

- Products (other than tobacco) that are intended to supplement the diet, including vitamins, amino acids, minerals, glandular extracts, herbs, and other plant products such as fungi
- Products that are intended for use by people to supplement the total daily intake of nutrients in the diet
- Products that are intended to be ingested in tablet, capsule, soft gel, gelcap, and liquid form
- Products that are not in themselves to be used as conventional foods or as the only items of a meal or diet

Unlike prescription medications, dietary supplements have been available in the marketplace for years almost without regulation. However, dietary supplements now must be deemed safe for human use on the basis of information supplied to the FDA by the manufacturers. In addition, the labels on these products cannot make a direct claim, with the exception of calcium and folic acid supplements, that they can cure, treat, or prevent illnesses. However, other materials with such claims may be displayed close to the dietary supplements themselves. Further, the labels on dietary supplements must remind consumers that the FDA doesn't have the authority to do the rigorous research required of prescription medications, and so the FDA cannot attest to their purity, quality, safety, or effectiveness. Beyond this, consumers are left to themselves to decide whether to purchase and use dietary supplements (see the box "Should You Take a Dietary Supplement?").

As we mentioned, probiotic products, dietary supplements with live bacteria, are gaining in popularity, with total sales of \$1.1 billion. Actimel is one of the biggest sellers, claiming to "help to strengthen your body's natural defenses" and enhance your immune system.<sup>38</sup>

Easily accessible to anyone, over 15,000 different dietary supplements can be purchased in grocery stores, drugstores, and discount stores; through mail-order catalogs; and on the Internet. Because of the great demand for these products, major pharmaceutical companies are now entering the dietary supplement field. Whether this trend leads to the development of more effective products, or to a greater effort on the part of the FDA to demand proof of effectiveness, remains to be seen. By definition, supplements are not foods but simply "supplements."

Therefore, they remain free from requirements to substantiate their claims of effectiveness (as is now required for functional foods).



**TALKING POINTS** A friend asks you about the advantages and disadvantages of taking a dietary supplement. What would you point out to your friend?

## Food Allergies

Foods enjoyed by the vast majority of people may be harmful and even deadly to others because of their unique food allergies. For some people, peanuts, the familiar snacks still served on many plane flights, are such a food. Today, U.S. airlines are replacing peanuts with pretzels in order to provide "peanut-free" flights and to protect people known to be allergic to peanuts and peanut-based products. Many schools have already established peanut-free lunchrooms for the same purpose.

Being intolerant to certain foods is not the same as being allergic to particular foods. **Food intolerance** means that a food upsets your intestines, usually because of an enzyme deficiency. A lactase deficiency, for example, causes lactose intolerance. Lactose intolerance affects 20 percent of Caucasian Americans, 75 percent of Native Americans and African Americans, 90 percent of Asian Americans, and 50 percent of Hispanic Americans. Intolerance to gluten (found in wheat, rye, barley, and perhaps oats) affects 1 of every 150 Americans and can cause malnutrition, premature osteoporosis, colon cancer, thyroid disease, diabetes, arthritis, miscarriage, and birth defects. The incidence of celiac disease has quadrupled; when someone with this autoimmune disease consumes gluten, an allergic reaction results.

A **food allergy** mistakenly calls the body's disease-fighting immune system into action, creating unpleasant and sometimes life-threatening symptoms. Peanuts, milk, eggs, shellfish, tree nuts, fish, soy, and wheat account for 90 percent of food allergies. Food allergies in American children have increased 18 percent in the past few years, with African American and Caucasian children having more food allergies than Hispanic children have. Eight percent of children and 2 percent of adults

### Key Terms

**food intolerance** An adverse reaction to a specific food that does not involve the immune system; usually caused by an enzyme deficiency.

**food allergy** A reaction in which the immune system attacks an otherwise harmless food or ingredient; allergic reactions can range from mildly unpleasant to life threatening.





## Should You Take a Dietary Supplement?

Half of Americans take a dietary supplement for health, weight management, and athletic performance enhancement, spending, \$23 billion on them in 2009. But what are the risks? Dietary supplements do not have to have clinical trials to prove their safety or effectiveness and are not subject to regulation by the FDA. Due to the lack of quality control, supplements have been routinely found to contain metals, pesticides, high amounts of selenium and chromium, and prescription drugs. People have reported problems with breathing, liver failure, kidney failure, stroke, high blood pressure, heart attacks, joint pain, diarrhea, hair loss, finger-and toenails falling off, skin turning blue, whites of eyes turning yellow, and fatigue. Fatalities have been associated with taking dietary supplements as well.

*Consumer Reports*, along with the Natural Medicines Comprehensive Database, developed a list of the 12 most dangerous supplements, ones they say should be avoided due to lack of safety and to adverse side effects. These include aconite, bitter orange, chaparral, colloidal silver, coltsfoot, comfrey, country mallow, germanium, greater celandine, kava, lobelia, and yohimbe. They have been associated with liver damage, kidney damage, heart failure, cancer, respiratory problems, and death.

If you do take a dietary supplement, be a cautious and informed consumer. Look for the “USP Verified” mark on the product indicating that the manufacturer has voluntarily undergone quality control testing by U.S. Pharmacopeia. USP is a nonprofit, private

standard-setting authority that verifies the quality, purity, and potency of the product.

You can check out a list of verified products at [www.uspverified.org](http://www.uspverified.org). If the promises seem too good to be true, they probably are. It is illegal for dietary supplement companies to claim that their product can prevent, treat, or cure any disease other than ones caused by nutrient deficiencies. Be sure to tell your doctor or pharmacist if you are taking any dietary supplements to avoid negative interactions with prescription medications. If you experience any problems, consult your doctor immediately.

Source: Dangerous supplements, *Consumer Reports*, September 2010.

have food allergies. Food-based allergies may be serious or even life threatening.

Because food allergies generally develop slowly, initial symptoms may not be fully recognized or even associated with the food. It takes three exposures to the allergic food to obtain a significant food allergy reaction. The first time a person eats a food she is allergic to, she may have little or no reaction. The second time she eats this food, she will most likely have a more observable reaction, such as breaking out in hives, itching, having a runny nose, feeling a burning sensation in the mouth, and wheezing. The third exposure can bring on a full-blown reaction, which, for peanut allergies among others, can result in death within minutes. Also, food allergies may develop later in life. There is no cure for food allergies, and the treatment is for the food-allergic person to avoid these foods and carry an EpiPen (epinephrine) at all times.

For the first time, an experimental drug has proven highly effective against potentially deadly peanut allergies. The once-a-month shots don't cure peanut allergy, which affects about 1.5 million Americans and kills 50–100 people each year. Xolair, a drug currently patented for patients with asthma, may hold promise in preventing or reducing the severity of reactions for people who suffer from peanut allergy. Xolair, an anti-IgE therapy, blocks a protein called *immunoglobulin E* from causing an asthmatic reaction. Genentech and Novartis Pharmaceuticals are currently conducting clinical trials for use with people who suffer from peanut allergy in hope that anti-IgE therapy can be used to diminish or eliminate the reaction caused by peanut allergy in the same way it treats asthma. However, Xolair is not a cure

or a vaccine. It adds protection against a fatal reaction in case of accidental ingestion of peanut-containing food. Scientists also are working on treatments that could suppress peanut allergy permanently, but those developments are probably 5–10 years in the future.

## Food Safety

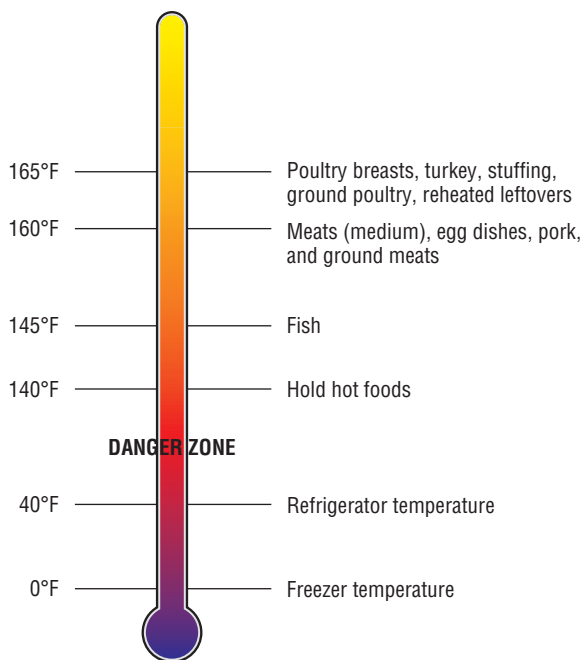
Technological advances in food manufacturing and processing have done much to ensure that the food we eat is fresh and safe. Yet concern is growing that certain recent developments may also produce harmful effects on humans. For example, the preparation, handling, and storage of food; irradiation of foods; and genetic engineering of foods all contribute to the safety of our food.

## Preventing Foodborne Illness

Foodborne illness or food poisoning is the result of eating contaminated food. The symptoms of food poisoning can be easily mistaken for the flu—fatigue, chills, mild fever, dizziness, headaches, upset stomach, diarrhea, and cramps. Illness develops within one to six hours following ingestion of the contaminated food, and recovery is fairly rapid.<sup>39</sup> However, new research suggests that 10 percent of people who contract food poisoning from ingesting food with *Escherichia coli* develop a life-threatening illness, hemolytic uremic syndrome, which can cause kidneys and other major organs to eventually fail. Bacteria are the culprits in most cases of food poisoning, which can be the result of food not being cooked thoroughly to

destroy bacteria or not being kept cool enough to slow their growth. In addition, nearly half of all cases of food poisoning can be prevented with proper hand washing so as to not contaminate food with viruses, parasites, or toxic chemicals. Food safety is such an important issue that the USDA incorporated it into the current dietary guidelines. Food should be refrigerated below 40°F or kept warm above 140°F. Between 40°F and 140°F, bacteria can double in number in as little as 20 minutes, so it is important to keep food at safe temperatures. See Figure 5-7 on temperature rules for safe cooking and handling of foods.

It is estimated that 1 of every 4 Americans is the victim of food poisoning each year, and about 5,000 of these people die. Salmonella bacteria are the most common cause of foodborne illness and are found mostly in raw or undercooked poultry, meat, eggs, fish, peanut butter, fruit, vegetables, unpasteurized milk, and even pet food. *Clostridium perfringens*, also called the “buffet germ,” grows where there is little to no oxygen and grows fastest in large portions held at low or room temperatures. For this reason, buffet table servings should be replaced often and leftovers should be refrigerated quickly. Refrigerated leftovers may become harmful to eat after three days (see Table 5.5). The old adage “If in doubt, throw it out” applies to any questionable leftovers. A third type of food poisoning is botulism, which is rare but often fatal.



**Figure 5-7 Temperature Rules for Cooking and Safe Handling of Food** Keep food out of the danger zone between 40°F and 140°F, in which bacteria can multiply rapidly.

Source: U.S. Department of Health and Human Services and U.S. Department of Agriculture, Dietary Guidelines for Americans, 2010, [www.healthierus.gov/dietaryguidelines](http://www.healthierus.gov/dietaryguidelines).

**Table 5.5 Cold Storage Limits**

|                                      |            |
|--------------------------------------|------------|
| Apples                               | 3 weeks    |
| Apricots, peaches, nectarines, pears | 3–4 days   |
| Bacon                                | 1 week     |
| Beans, green                         | 3–4 days   |
| Berries, cherries                    | 1–2 days   |
| Butter                               | 1–3 months |
| Carrots                              | 2 weeks    |
| Cheese, hard                         | 3–4 weeks  |
| Cheese, soft                         | 1 week     |
| Chicken or turkey (fresh)            | 1–2 days   |
| Chicken or turkey (cooked)           | 3–4 days   |
| Citrus fruit                         | 1–2 weeks  |
| Deli and vacuum-packed products      | 3–5 days   |
| Eggs (fresh, in shell)               | 3–5 weeks  |
| Eggs (hard cooked)                   | 1 week     |
| Fish or seafood (fresh)              | 1–2 days   |
| Fish (cooked)                        | 3–4 days   |
| Fish (canned, after opening)         | 3–4 days   |
| Gravy and meat broth                 | 1–2 days   |
| Hot dogs (after opening)             | 1 week     |
| Lettuce, leaf                        | 3–7 days   |
| Luncheon meat (after opening)        | 3–5 days   |
| Margarine                            | 4–5 months |
| Mayonnaise (after opening)           | 2 months   |
| Milk (after opening)                 | 5 days     |
| Meat (fresh, ground)                 | 1–2 days   |
| Meat (fresh; steak, chops, roasts)   | 3–5 days   |
| Meat (cooked)                        | 3–4 days   |
| Pizza (cooked)                       | 3–4 days   |
| Soups and stews                      | 3–4 days   |
| Spinach                              | 1–2 days   |
| Yogurt                               | 7–14 days  |

Sources: Food Safety and Inspection Service, U.S. Department of Agriculture, Basics for Handling Food Safely, September 2010; Food Marketing Institute, *A Consumer Guide to Food Quality and Safe Handling*.

It is caused by home-canned or commercially canned food that hasn’t been processed or stored properly. Some warning signs are swollen or dented cans or lids, cracked jars, loose lids, and clear liquids turned milky. Can you tell if meat is spoiled by looking at it? Not necessarily. Some supermarkets package their meat with carbon monoxide, which reacts with the pigment in the meat to make it redder.

The Center for Science in the Public Interest found that fruits and vegetables account for the majority of foodborne illnesses. Salads are by far the biggest culprit. The reason for this seems to be because some of the water used to irrigate and wash produce is contaminated with human and animal feces. *Escherichia coli* has historically been a harmless bacterium that resides in the guts of animals, including humans. A new and pathogenic strain called *E. coli* O157:H7 was identified in 1982 and now causes an estimated 73,000 cases of infection and 60 deaths in the United States each year. *E. coli* can be found in uncooked produce, raw milk, unpasteurized juice, contaminated water, and meat. Dozens of people

contracted food poisoning from the green onions in food served at some Taco Bell restaurants in 2006. This same strain of *E. coli* was linked to the spinach that sickened 200 people in 2006. In 2009, over 600 people in 43 states were sickened by tainted peanut butter produced by the Peanut Corp of America (PCA). Twenty-three percent of these people were hospitalized and at least nine died as a result of salmonella poisoning. In its report on the PCA, the FDA found poor sanitation in the form of bird feces, tainted water, and cockroaches accounted for the salmonella. In addition, the FDA contended that there were substandard food inspections, so that the problem was not discovered and corrected quickly. In fact, the FDA issued a recall of the company's products from the previous two years, involving over 432 different products such as crackers, cookies, and ice cream.

A salmonella outbreak caused by eggs from infected hens occurred in 2010. Over 1,500 people became ill, and 550 million eggs from two facilities were recalled. Salmonella was found in chicken feed. A new FDA egg safety rule took effect later that year requiring new procedures for salmonella enteritidis testing and pasteurization. Another new food safety bill passed requiring that manufacturers alert government officials within 24 hours of knowledge of contaminated products, calling for more frequent inspections for food production facilities, giving regulators more power to recall products and suspend or shut down plants with poor safety records, and strengthening surveillance to track foodborne illnesses.<sup>40</sup>

Because produce comes from all over the world, this bacteria problem can be difficult to regulate or correct. Even the ready-to-eat bags of produce that boast they have been "thoroughly" or "triple" washed cannot be guaranteed to be bacteria-free. Washing the produce yourself may not solve the problem, either. Produce washes such as veggie wash don't claim to kill *E. coli*, but only to clean off wax, pesticides, and dirt. The best way to avoid getting sick from produce is to cook it so that you kill any remaining bacteria.

What do you do if you suspect food poisoning?

- Contact a medical professional immediately. Don't wait to see if you feel better.
- Report the incident to your local health department as soon as possible if the suspected food came from a public place.
- Preserve the suspected food including any packaging to give to the health department for investigation and possible prevention of further poisoning.

Handle food properly to avoid food poisoning. Frequent handwashing is at the top of the list of food safety tips (see the box "Dos and Don'ts for Food Safety"). Bacteria live and multiply on warm, moist hands, and hands can inadvertently transport germs from one surface to another. It is also important to clean work surfaces with



## Dos and Don'ts for Food Safety

### Do . . .

1. Wash your hands.
2. Put groceries away as soon as you get home and don't make other stops first.
3. Use two different plates for raw and grilled meat.
4. Use different spoons to stir and taste the food, and use each tasting spoon only once.
5. Refrigerate leftovers from restaurants immediately.
6. Use different knives to cut raw meat and chop vegetables.
7. Store food in an airtight container. Don't store food in open cans or on uncovered dishes.
8. Wash fresh fruits and vegetables, even if you are throwing away the rind or peels, because cutting through the produce can carry bacteria from the outside surface to the inside of the produce.

### Don't . . .

1. Rinse poultry or meat in water, because this can cause cross-contamination.
2. Thaw food on the countertop—keep it in a covered container in the refrigerator.
3. Leave food out of the refrigerator for too long.
4. Use wooden cutting boards with deep grooves or knife scars.
5. Marinate food at room temperature.

Source: Adapted from *The American Dietetic Association's Monthly Nutrition Companion: 31 Days to a Healthier Lifestyle*, by R. Duyff, Chronimed Publishing, 1997. Copyright © 1997 American Dietetic Association. Reproduced with permission of John Wiley & Sons, Inc. and the Leap First Literary Agency.

hot, soapy water and keep nonfood items such as the mail, newspapers, and purses off the countertops. Some people advocate the use of antibacterial products; others maintain that if they are overused, these products can lose their effectiveness, and bacteria then become resistant to them. Utensils, dishes, cutting boards, cookware, and towels and sponges need to be washed in hot, soapy water and rinsed well.<sup>41</sup>

## Food Irradiation

Because of the increasing concern about contaminated meat and meat products, the first irradiated meat, ground beef, arrived in American supermarkets in early 2000. Irradiated frozen chicken was introduced more recently. *Irradiation* is a process that causes damage to the DNA of disease-causing bacteria such as salmonella and *E. coli* as well as of insects, parasites, and other organisms so that they can't reproduce. While irradiated meat has much lower bacteria levels than regular meat does, irradiation doesn't destroy all bacteria in meat. In fact,

irradiation actually destroys fewer bacteria than does proper cooking.<sup>42</sup> The FDA also approved irradiation of spinach and lettuce to kill *E. coli* and other germs. There is some concern that irradiation will lull consumers into a false sense of security so that they erroneously believe that they don't have to take the usual precautions in food handling and preparation. For example, undercooking, unclean work surfaces or cooking utensils, and improper storage can still contaminate meat. Some also claim that irradiated meat has a distinct off-taste and a smell like "singed hair."

## Safe Farming Techniques

In recent decades, there has been an increased push toward ensuring better treatment of animals raised for slaughter and for dairy production in the United States. As a result of recent reforms, more than half of beef cattle in North America meet their end at slaughterhouses based on innovative designs that consider the fears and inclinations of herd animals. The cages of laying hens are nearly one-third larger than the old ones were, and the practice of starving hens for weeks at a time to stimulate egg production is beginning to be phased out. These reforms are important to ensure more humane treatment of these animals, but they are also proving beneficial to human health and food quality. It has been suggested that there is an increase in the quality of meat when animals are treated humanely, with less bruising, more tenderness, lower incidence of dark-cutting beef, and lessened occurrence of pale, soft, and dry pork. Furthermore, the taste of eggs is said to be significantly better if they come from humanely treated hens.

One important component in these reforms—some of which have been government mandated and others voluntarily adopted by the agricultural industry—relates to the feed given to beef cattle. The spread of bovine spongiform encephalopathy, more commonly known as mad cow disease, has largely been attributed to the use of animal feed containing the protein-rich by-products of slaughtered cows, including nerve tissue, the tissue most likely to harbor the disease. Such feed—which is believed to be the primary, if not the only, way the disease can be transmitted—was banned in the United States and Canada in August 1997.<sup>39</sup> However, from August 1997 to March 2004, 52 companies recalled 410 feed products because of suspected infectious prions, the proteins thought to spread mad cow disease. While the disease had been restricted to European cows, three cases from 2003 to 2006 of mad cow disease detected in American cattle encouraged the U.S. government to impose even stricter rules to protect the nation's beef supply from the disease, including banning the butchering of sick or injured cows, banning certain animal parts from the food supply, and increasing testing on suspect animals.<sup>43</sup>

Eliminating animal products from feed has also proven beneficial for hens. Many consumers choose to eat only poultry and eggs from free-range, vegetarian-fed chickens, for health and safety reasons. Several companies (such as Eggland's Best) claim that their vegetarian-fed hens produce eggs that have seven times more vitamin E, are lower in cholesterol, have a higher unsaturated/saturated fat ratio, and contain more omega-3 fatty acids than do factory-farmed eggs.<sup>44</sup>

There has also been increasing concern about giving chickens Roxarsone (3-Nitro) because it contains arsenic. It is given to chickens to fatten the birds faster and to kill microbes. Human antibiotics are also fed to chickens to increase growth, but the bacteria in the chickens' intestines can develop resistance to the antibiotics. This can result in the antibiotic-resistant bacteria being passed along to people who consume this poultry, causing them to become ill and not respond to drugs typically prescribed to treat this illness.

## Organic Foods

The current USDA organic food labels went into effect in October 2002 to standardize regulations for foods grown without synthetic pesticides or other chemicals. Under the current USDA rules, organic means the following:

- Meat, poultry, and eggs are from animals given no growth hormones or antibiotics. Vitamin and mineral supplements are allowed. Livestock are given organic feed and live in conditions that allow for "exercise, freedom of movement, and reduction of stress." Organic milk and meat must come from livestock that are allowed to graze at least four months a year.
- Products are not genetically engineered or irradiated to kill germs.
- Crops are grown on land that has not been fertilized with sewage sludge or chemical fertilizers.
- Pests and plant diseases are treated primarily with insect predators, traps, natural repellants, and other nonchemical methods.
- Weeds are controlled by mulching, mowing, hand weeding, or mechanical cultivation, not chemical herbicides.

There are different types of organic foods: "100 percent organic," meaning the food contains all organic ingredients; "organic," meaning at least 95 percent of the product is organic; and "made with organic ingredients," meaning at least 70 percent of the food is organic as previously defined.<sup>45</sup>

In recent years, the \$24-billion organic food industry has enjoyed a 20 percent annual growth rate, much higher than that of the rest of the food industry. Almost



70 percent of people said they bought organic food at least once in the past three months. While organic foods have been found to have fewer pesticides, to do less damage to the environment, and possibly to have more nutrients, they can still contain some pesticide residue and chemical contaminants from the environment and have risk of *E. coli* contamination. See Chapter 20 for more information on the benefit of organic foods for health and food safety.

## Food Additives

**Food additives** are substances added to food to preserve and improve its taste and appearance. Some additives are thickening agents, and some add color and prevent food from spoiling. Food additives are found in all types of foods and beverages, such as meat, soup, salad dressings, peanut butter, chips, cakes, cookies, and soda. Vinegar, food coloring, artificial sweeteners, white sugar, salt, monosodium glutamate (MSG), and antioxidants are some common examples of additives. For example, emulsifiers help give peanut butter a more consistent texture and prevent separation, while stabilizers and thickeners give ice cream a smoother, more uniform texture. The three most common additives are sugar, salt, and corn syrup.<sup>46</sup> Food additives must undergo FDA testing and approval to ensure that the benefits outweigh any risks associated with them. There has been some debate about how safe some additives are despite their FDA approval. Some of the ones in question are aspartame (NutraSweet); red, blue, yellow, and green food coloring; saccharin; propyl gallate; potassium bromate; sodium nitrate; and 2-methylimidazole (2-MEI) and 4-methylimidazole (4-MEI), the caramel coloring found in products such as cola drinks, beer, and soy sauce; and stevia. These additives have been linked with an increased risk of cancer.



*Organic products have grown in popularity in recent years and are now available in many major grocery stores.*

## Genetically Modified Foods

**Genetically modified foods** are crops that are bred with genes engineered in labs so that they are more resistant to pests, disease, drought, and cold; produce higher yields; and have a higher nutritional content. Ten percent of farm acreage worldwide is planted with genetically engineered or biotech crops, an increase from 1 percent 15 years ago. Soybeans, corn, cotton, canola, sugar beets, alfalfa, papaya, summer squash, and potato are the most commonly grown genetically engineered crops.<sup>47</sup>

The success of American agriculture, in terms of food quality and marketability, has been based on the ability to genetically alter food sources to improve yield, reduce production costs, and introduce new food characteristics. Today, however, genetic technology is so sophisticated that changes are being introduced faster than scientists can fully evaluate their effects. For example, the genetic makeup of plant seeds and animals is being modified while scientists are still trying to determine whether humans can safely consume these products over extended periods. Concerned individuals and agencies in the United States and abroad are calling for more extensive long-term research into safety issues and stricter labeling requirements for genetically altered foods.<sup>48</sup> The label *GM* (for *genetically modified*) is appearing on some food items. Some food manufacturers have announced that they will discontinue the use of genetically modified ingredients in their products. The American public appears about equally divided in believing that genetically modified foods are safe (44 percent) or unsafe (20 percent) or that they are uncertain (36 percent) about the safety of such foods.<sup>49</sup>

In 2008 the FDA finally decided after seven years of discussion to allow the commercial use of genetically engineered animals. The FDA stated that it would allow animals to be genetically altered if such animals produce drugs, serve as models for human disease, produce industrial or consumer products, or have improved food-use qualities such as being more nutritious. Animals are considered genetically altered when either their genes are changed or genes from another animal are added for a specific purpose. This regulation is consistent with legislation concerning giving drugs to animals for similar reasons.<sup>48</sup>

### Key Terms

**food additives** Chemical compounds intentionally added to the food supply to change some aspect of the food, such as color or texture.

**genetically modified foods** Crops bred with genes engineered in labs so that the crops are improved, such as being drought, pest, or cold resistant; producing a higher yield; and/or having a higher nutritional content.



## Taking Charge of Your Health

- Take the Personal Assessment “Are You Feeding Your Feelings?” at the end of this chapter to determine if you are an emotional eater.
- Look on MyPlate.gov to find your personal food plate.
- Assess your physical activity level using MyPlate.gov.
- Keep track of your food intake for a week, using the tracker on MyPlate.gov, and see how well your intake reflects the current dietary guidelines.
- Make one change per week in your eating patterns, such as drinking skim milk or including a new fruit or vegetable.

## SUMMARY

- Carbohydrates are composed of sugar units and are the major source of energy for the body. About 45–65 percent of our calories should come from carbohydrates.
- Fats provide a concentrated source of energy for the body and keep us from feeling hungry. No more than 20–35 percent of our calories should come from fats, and most of these fats should be polyunsaturated or monounsaturated.
- Foods containing trans fats should be avoided as much as possible, and less than 10 percent of our calories should come from saturated fats, according to the current dietary guidelines.
- Protein primarily promotes growth and maintenance of body tissue, and is also a source of energy.
- Vitamins serve as catalysts for the body and are found in either water-soluble or fat-soluble forms.
- Minerals are incorporated into various tissues of the body and also participate in regulatory functions within the body.
- Adequate water and fluids are required by the body on a daily basis and are obtained from a variety of food sources, including beverages.
- Fast foods should play a limited role in daily food intake because of their high fat density, as well as their high levels of sugar and sodium.
- Preventive strategies such as hand washing and proper preparation, cooking, and storage of food can help to decrease foodborne illnesses.
- The USDA Dietary Guidelines for Americans focus on the role that trans fat, saturated fat, sugar, sodium, and alcohol play in weight management and health and disease. These guidelines address the importance of daily physical activity.

## REVIEW QUESTIONS

1. What unique contributions do carbohydrates, fats, and protein each make to overall nutrition?
2. What role do vitamins play in the body? What is the most current perception regarding the need for vitamin supplementation?
3. What roles do minerals play in the body? What is a trace element?
4. What is the current recommendation regarding daily fluid intake? Why is water considered an essential nutrient?
5. What are the two principal forms of fiber, and how does each of them contribute to health?
6. What are functional foods, and what contribution do they make to health beyond supplying various nutrients as do all foods?
7. Identify each of the food groups in the MyPlate current food guidelines. What is the additional group? Explain the nutritional benefit of each food group and the recommended daily adult allotments. What are discretionary calories?
8. What are the specific areas of nutritional concern addressed by the Dietary Guidelines for Americans?
9. What do the dietary guidelines suggest in terms of physical activity, and what are the benefits of such physical activity?
10. What is the principal concern regarding excessive fast-food consumption? How can food selection at a fast-food restaurant be made nutritionally healthier?

## ANSWERS TO THE “WHAT DO YOU KNOW?” QUIZ

- 1 True    2 True    3. False    4. False    5. False    .6True    7. False

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# Personal Assessment



## Rate Your Plate

Take a closer look at yourself, your current food decisions, and your lifestyle. Think about your typical eating pattern and food decisions.

### Do You . . .

|  | Usually                  | Sometimes                | Never                    |
|--|--------------------------|--------------------------|--------------------------|
| Consider the MyPlate model when you make food choices?                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Try to eat regular meals (including breakfast), rather than skip or skimp on some? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Choose nutritious snacks?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Try to eat a variety of foods?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Include new-to-you foods in meals and snacks?                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Try to balance your energy (calorie) intake with your physical activity?           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

### Now for the Details

### Do You . . .

|  |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|
| Consume half of your grains as whole-grain products?                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Eat at least 2½ cups of vegetables daily?                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Eat at least 2 cups of fruits daily?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Consume at least 3 cups of milk, yogurt, or cheese daily?                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Choose low-fat foods?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Choose low-sodium foods?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Drink 8 or more cups of fluids daily?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Limit alcoholic beverages (no more than 1 daily for a woman or 2 for a man)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

### Score Yourself

Usually = 2 points  
 Sometimes = 1 point  
 Never = 0 points

### If you scored . . .

**24 or more points**—Healthful eating seems to be your fitness habit already. Still, look for ways to stick to a healthful eating plan—and to make a “good thing” even better.

**16 to 23 points**—You’re on track. A few easy changes could help you make your overall eating plan healthier.

**9 to 15 points**—Sometimes you eat smart—but not often enough to be your “fitness best.”

**0 to 8 points**—For your good health, you’re wise to rethink your overall eating style. Take it gradually—step by step!

### TO CARRY THIS FURTHER . . .

Whatever your score, make moves for healthful eating. Gradually turn your “nevers” into “sometimes” and your “sometimes” into “usually.” Try some of the suggestions from the discussion of MyPlate and the Dietary Guidelines for Americans.

Source: Adapted from R. Duyff, *The American Dietetic Association’s Monthly Nutrition Companion: 31 Days to a Healthier Lifestyle*, Chronimed Publishing, 2006. Copyright © 2006 American Dietetic Association. Reproduced with permission of John Wiley & Sons, Inc.



# Personal Assessment



## Are You Feeding Your Feelings?

Sometimes people use food as a way of coping with their emotions and problems. To identify how you might be using food as a coping strategy and what feelings you tend to associate with eating, complete the following inventory.

- 0= Never
- 1= Rarely
- 2= Occasionally
- 3= Often
- 4= Always

1. \_\_\_\_ Do you eat when you are angry?
2. \_\_\_\_ When you feel annoyed, do you turn to food?
3. \_\_\_\_ If someone lets you down, do you eat to comfort yourself?
4. \_\_\_\_ When you are having a bad day, do you notice that you eat more?
5. \_\_\_\_ Do you eat to cheer yourself up?
6. \_\_\_\_ Do you use food as a way of avoiding tasks you don't want to do?
7. \_\_\_\_ Do you view food as your friend when you are feeling lonely?
8. \_\_\_\_ Is food a way for you to comfort yourself when your life seems empty?
9. \_\_\_\_ When you are feeling upset, do you turn to food to calm yourself down?
10. \_\_\_\_ Do you eat more when you are anxious, worried, or stressed?
11. \_\_\_\_ Does eating help you to cope with feeling overwhelmed?
12. \_\_\_\_ Do you eat more when you are going through big changes or transitions in your life?
13. \_\_\_\_ Do you reward yourself with food?
14. \_\_\_\_ When you think you have done something wrong, do you punish yourself by eating?
15. \_\_\_\_ When you are feeling badly about yourself, do you eat more?
16. \_\_\_\_ When you feel discouraged about your efforts to improve yourself, do you eat more, thinking "What's the use of trying"?

\_\_\_\_ **TOTAL SCORE**

### Interpretation

**If your total score is . . .**

**0 to 16**—You don't eat to cope with your emotions. Your eating may not be related to your emotional state. However, you may avoid eating when you are upset or having trouble coping with your feelings. You may run away from food rather than running to food to cope.

**17 to 47**—Although you fall in the average range, you may use food to deal with specific situations or feelings such as anger, loneliness, or boredom. See the breakdown of scores below to identify how you may be using food to cope with particular feelings.

**48 to 64**—You run to food to cope with your emotions, and you may want to consider developing other ways of appropriately expressing your feelings.

**Next, look more closely at your specific responses . . .**

If you answered "3" or "4" to most of questions 1–4, this can be indicative of eating when you are angry.

If you answered "3" or "4" to most of questions 5–8, this can be indicative of eating when you are lonely or bored.

If you answered "3" or "4" to most of questions 9–12, this can be an indication that you are a stress eater.

If you answered "3" or "4" to most of questions 13–16, this can be an indication that you are using food to cope with feelings of low self-esteem and self-worth.

### TO CARRY THIS FURTHER . . .

- Use the assessment scores to help you learn to recognize the triggers for your emotional eating.
- Make a list of things to do when you get the urge to eat and you're not hungry. Try going for a walk or calling a friend to distract yourself.
- Do something fun if you are tempted to eat to avoid work or a dreaded task.
- Reward yourself with things other than food.

Source: Adapted from *Nutrition for Healthy Living*. Courtesy of Marcy Leeds.