

P A R T

Nutrition Basics and Applications

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CHAPTER

1

Introduction to Nutrition

Time for completion

Activities: 1½ hours

Optional examination: ½ hour



OBJECTIVES

Upon completion of this chapter, the student should be able to do the following:

1. Define major concepts and terms used in nutritional science.
2. Identify guidelines and rationale used for planning and evaluating food intake.
3. Describe some major concerns about the American diet.
4. Use appropriate sources and services to obtain reliable nutrition information.

GLOSSARY

Adequate diet: one that provides all the essential nutrients and calories needed to maintain good health and acceptable body weight.

Adequate Intake (AI): an estimate of average requirements when evidence is not available to establish an RDA.

Calorie (Cal): unit of energy, often used for the term *kilocalorie* (see also kilocalorie). Common usage indicating the release of energy from food.

Culture: the beliefs, arts, and customs that make up a way of life for a group of people.

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Daily Reference Values (DRVs): a set of values that covers nutrients, such as fat and fiber, that do not appear in the RDA tables. Expressed as % Daily Value (%DV).

Diet: (a) the foods that a person eats most frequently; (b) food considered in terms of its qualities and effects on health; (c) a particular selection of food, usually prescribed to cure a disease or to gain or lose weight.

Dietary Guidelines for Americans: dietary recommendations to promote health and to prevent or delay the onset of chronic diseases.

Dietary Reference Intakes (DRIs): a set of dietary reference values including but not limited Adequate Intake (AI), Estimated Average Requirement (EAR), Recommended Dietary Allowance (RDA), and Tolerable Upper Intake Level (UL) used for planning and assessing diets of individuals and groups.

Energy: capacity to do work; also refers to calories, that is, the “fuel” provided by certain nutrients (carbohydrates, fats, proteins).

Estimated Average Requirement (EAR): intake that meets the estimated nutrient needs of one half of the individuals in a specific group. Used as a basis for developing the RDA.

Food: any substance taken into the body that will help to meet the body’s needs for energy, maintenance, and growth.

Good nutritional status: the intake of a balanced diet containing all the essential nutrients to meet the body’s requirements for energy, maintenance, and growth.

Gram (g): a unit of weight in the metric system. 1 g = .036 oz. There are 28.385 grams to an ounce. This conversion is usually rounded to 30 g for ease in calculation, or rounded down to 28 g.

Health: the state of complete physical, mental, and social well-being; not merely the absence of disease and infirmity.

Kilocalorie (kcalorie, kcal): technically correct term for unit of energy in nutrition, equal to the amount of heat required to raise the temperature of 1 kg of water 1°C.

Malnutrition: state of impaired health due to undernutrition, overnutrition, an imbalance of nutrients, or the body’s inability to utilize the nutrients ingested.

Microgram: a unit of weight in the metric system equal to 1/1,000,000 of a gram.

Milligram: a unit of weight in the metric system equal to 1/1,000 of a gram.

Monitor: to watch over or observe something for a period of time.

National Cholesterol Education Program (NCEP): program designed to educate the public and healthcare providers about the risks of an elevated cholesterol level and methods to lower it.

Nutrient: a chemical substance obtained from food and needed by the body for growth, maintenance, or repair of tissues. Many nutrients are considered essential. The body cannot make them; they must be obtained from food.

Nutrition: the sum of the processes by which food is selected and becomes part of the body.

Nutritional status: state of the body resulting from the intake and use of nutrients.

Optimum nutrition: the state of receiving and utilizing essential nutrients to maintain health and well-being at the highest possible level. It provides a reserve for the body.

Overnutrition: an excessive intake of one or more nutrients, frequently referring to nutrients providing energy (kcalories).

Poor nutritional status: an inadequate intake (or utilization) of nutrients to meet the body’s requirements for energy, maintenance, and growth.

Recommended Dietary Allowances (RDAs): levels of nutrients recommended by the Food and Nutrition Board of the National Academy of Sciences for daily consumption by healthy individuals, scaled according to sex and age.

Tolerable Upper Intake Level (UL): maximum intake by an individual that is unlikely to pose risks of adverse health effects in a healthy individual in a specified group. There is no established standard for individuals to consume nutrients at levels above the RDA or AI.

Undernutrition: a deficiency of one or more nutrients, including nutrients providing energy (calories).

BACKGROUND INFORMATION

The subject of nutrition is both exciting and confusing to the beginning student. Nutrition has become a major topic of conversation at places of work, at social gatherings, and in the media. We are living at a time when the focus is on prevention of disease and responsibility for one’s own health. The newest trends in health care emphasize the importance of nutrition education.

Throughout history, food and its effects on the body have been studied and written about, but most of the information gathered was based on trial and error. Many superstitions regarding the magical powers and healing capabilities of food also evolved.

The study of nutrition as a science is relatively new, developing only after chemistry and physiology became established disciplines. Its growth begins with the end of World War II. Nutrition science is now a highly regarded discipline. The progressive advances in the science and technology of this discipline offer us hope in controlling our destiny by preventing or delaying the onset of a number of chronic diseases related to nutrition, food, and lifestyle.

Every specialized field has its own language. A beginning student in nutrition needs to comprehend the language used in this discipline and to understand some basic concepts upon which the science is based. The activities in this chapter should assist you in gaining the knowledge and vocabulary necessary to understand the science of nutrition.

ACTIVITY 1:

Dietary Allowances, Eating Guides, and Food Guidance System

The appropriate diet at any stage of life is one that supplies sufficient energy and all the essential nutrients in adequate amounts for health. For more than 50 years, professionals from the government and academics have made recommendations on such basic needs.

For more than two decades there has been increasing concern about the eating patterns of American people. National health policy makers have linked several specific dietary factors to chronic diseases among the population. This connection between diet and disease has, in turn, led to publication of guidelines to promote healthier eating habits. Most of these publications have been issued by relevant units within the following national agencies:

1. U.S. National Academy of Sciences (NAS)
2. U.S. Department of Agriculture
3. U.S. Department of Health and Human Services
4. U.S. National Institute of Health
5. U.S. Surgeon General

According to these agencies, the major chronic diseases in the United States are coronary heart disease, strokes, hypertension, atherosclerosis, some cancers, obesity, and diabetes. Several high-risk factors for these diseases are linked to the American diet. A discussion of these health factors and a proper diet presented in such national publications as *Healthy People 2000*, *American Dietary Guidelines*, and *MyPyramid* will be presented in this chapter. We will first look into the concept of dietary standards in the United States.

DIETARY STANDARDS

There are two basic questions regarding dietary standards: What are the nutrients in food? How much of each nutrient do we need everyday to be healthy? Collectively, this information is the core of the U.S. Dietary Standards. Each country has its own dietary standard, and no two countries have the same standards, for a variety of reasons.

For more than half a century the U.S. National Academy of Sciences (NAS) has been the major scientific arm of the federal government to provide answers to these questions. The NAS in turn depends on one of its institutes, the Institute of Medicine (IOM), to review scientific literature to arrive at the appropriate conclusions. IOM has developed many boards of experts to perform such scientific investigations. One such board is the Food and Nutrition Board (FNB) which is the actual scientific body that develops most of the U.S. dietary standards.

At present the FNB is using the concept of dietary reference standards to define the terms describing the amount of nutrients we consume, such as *recommen-*

dation, requirement, dietary allowances, adequate intake, upper limits, tolerance, estimation, average requirements, and so on. In general, there are four sets of reference data, collectively called Dietary Reference Intakes or DRIs: Estimated Average Requirement (EAR), Recommended Dietary Allowance (RDA), Adequate Intake (AI), and Tolerable Upper Intake Level (UL). They are defined as follows:

- **Estimated Average Requirement (EAR):** The intake that meets the estimated nutrient needs of half of the individuals in a specific group. This figure is to be used as the basis for developing the RDA and is to be used by nutrition policy makers in evaluating the adequacy of nutrient intakes of the group and for planning how much the group should consume.
- **Recommended Dietary Allowance (RDA):** The intake that meets the nutrient needs of almost all of the healthy individuals in a specific age and gender group. The RDA should be used in guiding individuals to achieve adequate nutrient intake aimed at decreasing the risk of chronic disease. It is based on estimating an average requirement plus an increase to account for the variation within a particular group.
- **Adequate Intake (AI):** When sufficient scientific evidence is not available to estimate an average requirement, Adequate Intakes (AIs) have been set. Individuals should use the AI as a goal for intake where no RDAs exist. The AI is derived through experimental or observational data that show a mean intake that appears to sustain a desired indicator of health, such as calcium retention in bone for most members of a population group. For example, AIs have been set for infants through 1 year of age using the average observed nutrient intake of populations of breastfed infants as the standard. The committee set AIs for calcium, vitamin D, and fluoride.
- **Tolerable Upper Intake Level (UL):** The maximum intake by an individual that is unlikely to pose risks of adverse health effects in almost all healthy individuals in a specified group. This figure is not intended to be a recommended level of intake, and there is no established benefit for individuals to consume nutrients at levels above the RDA or AI. For most nutrients, this figure refers to total intakes from food, fortified food, and nutrient supplements.

There are nine tables of DRIs that are of interest to this book. They are all issued and distributed by the National Academy Press, the publishing arm of NAS. The data are prepared by the FNB of the NAS. The tables are described below:

Presented inside the front cover of this book:

1. Table F-1: Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Vitamins.
2. Table F-2: Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Elements.

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Accessible at the National Academies of Science Web site (www.nas.edu):

1. Dietary Reference Intakes (DRIs): Tolerable Upper Intake Levels (UL), Vitamins
2. Dietary Reference Intakes (DRIs): Tolerable Upper Intake Levels (UL), Elements
3. Dietary Reference Intakes (DRIs): Estimated Energy Requirements (EER) for Men and Women
4. Dietary Reference Intakes (DRIs): Acceptable Macronutrient Distribution Ranges
5. Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Macronutrients
6. Dietary Reference Intakes (DRIs): Additional Macronutrient Recommendations
7. Dietary Reference Intakes (DRIs): Estimated Average Requirements for Groups

Because nutritional requirements differ with age, sex, body size, and physiological state, all data are presented for males and females in different age and weight groups. Nutrition-related health problems such as premature birth, metabolic disorders, infections, chronic diseases, and the use of medications require special dietary and therapeutic measures. The amount of nutrients in each table is determined through scientific research and varies from nutrient to nutrient.

To be valuable from a practical standpoint, the technical information supplied by the dietary standards must be interpreted in terms of a selection of foods to be eaten daily. The RDAs and other standards should be met by consuming a wide variety of acceptable, tasty, and affordable foods and not solely through supplementation or the use of fortified foods. Various basic diet patterns may be devised to serve as guides in food selection.

There are many applications of the DRIs, some of which will be discussed in various chapters in this book.

DIETARY GUIDELINES

The *Dietary Guidelines for Americans* (*Dietary Guidelines*), first published in 1980, provides science-based advice to promote health and to reduce risk for chronic diseases through diet and physical activity. The recommendations contained within the *Dietary Guidelines* are targeted to the general public over 2 years of age who are living in the United States. Because of its focus on health promotion and risk reduction, the *Dietary Guidelines* form the basis of federal food, nutrition education, and information programs.

By law (Public Law 101445, Title III, 7 U.S.C. 5301 et seq.), the *Dietary Guidelines* is reviewed, updated if necessary, and published every 5 years. The content of the *Dietary Guidelines* is a joint effort of the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA). Visit www.healthier.us.gov/dietaryguidelines. The information in

this section has been modified from this document, 2005 edition.

Major causes of morbidity and mortality in the United States are related to poor diet and a sedentary lifestyle. Some specific diseases linked to poor diet and physical inactivity include cardiovascular disease, type 2 diabetes, hypertension, osteoporosis, and certain cancers. Furthermore, poor diet and physical inactivity, resulting in an energy imbalance (more calories consumed than expended), are the most important factors contributing to the increase in overweight and obesity in this country. Combined with physical activity, following a diet that does not provide excess calories according to the recommendations in this document should enhance the health of most individuals.

The intent of the *Dietary Guidelines* is to summarize and synthesize knowledge regarding individual nutrients and food components into recommendations for a pattern of eating that can be adopted by the public. In this publication, key recommendations are grouped under nine interrelated focus areas. It is important to remember that these are integrated messages that should be implemented as a whole. Taken together, they encourage most Americans to eat fewer calories, be more active, and make wiser food choices.

A basic premise of the *Dietary Guidelines* is that nutrient needs should be met primarily through consuming foods. Foods provide an array of nutrients and other compounds that may have beneficial effects on health. In certain cases, fortified foods and dietary supplements may be useful sources of one or more nutrients that otherwise might be consumed in less than recommended amounts. However, dietary supplements, while recommended in some cases, cannot replace a healthful diet.

Key recommendations of the *Dietary Guidelines* are presented below.

Adequate Nutrients Within Calorie Needs

Key recommendations for the general public:

- Consume a variety of nutrient-dense foods and beverages within and among the basic food groups while choosing foods that limit the intake of saturated and trans fats, cholesterol, added sugars, salt, and alcohol.
- Meet recommended intakes within energy needs by adopting a balanced eating pattern, such as the USDA Food Guide or the DASH Eating Plan.

Key recommendations for specific population groups:

- People over age 50—Consume vitamin B₁₂ in its crystalline form (i.e., fortified foods or supplements).
- Women of childbearing age who may become pregnant—Eat foods high in heme-iron and/or consume iron-rich plant foods or iron-fortified foods with an enhancer of iron absorption, such as foods rich in vitamin C.

- Women of childbearing age who may become pregnant and those in the first trimester of pregnancy—Consume adequate synthetic folic acid daily (from fortified foods or supplements) in addition to food forms of folate from a varied diet.
- Older adults, people with dark skin, and people exposed to insufficient ultraviolet band radiation (i.e., sunlight)—Consume extra vitamin D from vitamin D-fortified foods and/or supplements.

Weight Management

Key recommendations for the general public:

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

Key recommendations for specific population groups:

- Those who need to lose weight—Aim for a slow, steady weight loss by decreasing calorie intake while maintaining an adequate nutrient intake and increasing physical activity.
- Overweight children—Reduce the rate of body weight gain while allowing growth and development. Consult a healthcare provider before placing a child on a weight-reduction diet.
- Pregnant women—Ensure appropriate weight gain as specified by a healthcare provider.
- Breastfeeding women—Moderate weight reduction is safe and does not compromise weight gain of the nursing infant.
- Overweight adults and overweight children with chronic diseases and/or on medication—Consult a healthcare provider about weight loss strategies prior to starting a weight-reduction program to ensure appropriate management of other health conditions.

Physical Activity

Key recommendations for the general public:

- Engage in regular physical activity, and reduce sedentary activities to promote health, psychological well-being, and a healthy body weight.
- To reduce the risk of chronic disease in adulthood, engage in at least 30 minutes of moderate-intensity physical activity, above usual activity, at work or home on most days of the week.
- For most people, greater health benefits can be obtained by engaging in physical activity of more vigorous intensity or longer duration.
- To help manage body weight and prevent gradual, unhealthy body weight gain in adulthood, engage in

approximately 60 minutes of moderate- to vigorous-intensity activity on most days of the week while not exceeding caloric intake requirements.

- To sustain weight loss in adulthood, participate in at least 60 to 90 minutes of daily moderate-intensity physical activity while not exceeding caloric intake requirements. Some people may need to consult with a healthcare provider before participating in this level of activity.
- Achieve physical fitness by including cardiovascular conditioning, stretching exercises for flexibility, and resistance exercises or calisthenics for muscle strength and endurance.

Key recommendations for specific population groups:

- Children and adolescents—Engage in at least 60 minutes of physical activity on most, preferably all, days of the week.
- Pregnant women—In the absence of medical or obstetric complications, incorporate 30 minutes or more of moderate-intensity physical activity on most, if not all, days of the week. Avoid activities with a high risk of falling or abdominal trauma.
- Breastfeeding women—Be aware that neither acute nor regular exercise adversely affects the mother's ability to successfully breastfeed.
- Older adults—Participate in regular physical activity to reduce functional declines associated with aging and to achieve the other benefits of physical activity identified for all adults.

Food Groups to Encourage

Key recommendations for the general public:

- Consume a sufficient amount of fruits and vegetables while staying within energy needs. Two c of fruit and 2-½ c of vegetables per day are recommended for a reference 2000-calorie intake, with higher or lower amounts depending on the calorie level.
- Choose a variety of fruits and vegetables each day. In particular, select from all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.
- Consume 3 or more 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.
- Consume 3 c per day of fat-free or low-fat milk or equivalent milk products.

Key recommendations for specific population groups:

- Children and adolescents—Consume whole-grain products often; at least half the grains should be whole grains. Children 2 to 8 years should consume 2 c per

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day of fat-free or low-fat milk or equivalent milk products. Children 9 years of age and older should consume 3 c per day of fat-free or low-fat milk or equivalent milk products.

Fats

Key recommendations for the general public:

- Consume less than 10% of calories from saturated fatty acids and less than 300 mg/day of cholesterol, and keep consumption of trans-fatty acids as low as possible.
- Keep total fat intake between 20% to 35% of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.
- When selecting and preparing meat, poultry, dry beans, and milk or milk products, make choices that are lean, low fat, or fat free.
- Limit intake of fats and oils high in saturated and/or trans-fatty acids, and choose products low in such fats and oils.

Key recommendations for specific population groups:

- Children and adolescents—Keep total fat intake between 30% to 35% of calories for children 2 to 3 years of age and between 25% to 35% of calories for children and adolescents 4 to 18 years of age, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.

Carbohydrates

Key recommendations for the general public:

- Choose fiber-rich fruits, vegetables, and whole grains often.
- Choose and prepare foods and beverages with little added sugars or caloric sweeteners, such as amounts suggested by the USDA Food Guide and the DASH Eating Plan.
- Reduce the incidence of dental caries by practicing good oral hygiene and consuming sugar- and starch-containing foods and beverages less frequently.

Sodium and Potassium

Key Recommendations for the general public:

- Consume less than 2300 mg (approximately 1 tsp of salt) of sodium per day.
- Choose and prepare foods with little salt. At the same time, consume potassium-rich foods, such as fruits and vegetables.

Key recommendations for specific population groups:

- Individuals with hypertension, blacks, and middle-aged and older adults—Aim to consume no more than 1500 mg of sodium per day, and meet the potassium recommendation (4700 mg/day) with food.

Alcoholic Beverages

Key recommendations for the general public:

- Those who choose to drink alcoholic beverages should do so sensibly and in moderation—defined as the consumption of up to one drink per day for women and up to two drinks per day for men.
- Alcoholic beverages should not be consumed by some individuals, including those who cannot restrict their alcohol intake, women of childbearing age who may become pregnant, pregnant and lactating women, children and adolescents, individuals taking medications that can interact with alcohol, and those with specific medical conditions.
- Alcoholic beverages should be avoided by individuals engaging in activities that require attention, skill, or coordination, such as driving or operating machinery.

Food Safety

Key recommendations for the general public (*also see* Chapter 13):

To avoid microbial food-borne illness:

- Clean hands, food contact surfaces, and fruits and vegetables. Meat and poultry should not be washed or rinsed.
- Separate raw, cooked, and ready-to-eat foods while shopping, preparing, or storing foods.
- Cook foods to a safe temperature to kill microorganisms.
- Chill (refrigerate) perishable food promptly, and defrost foods properly.
- Avoid raw (unpasteurized) milk or any products made from unpasteurized milk, raw or partially cooked eggs or foods containing raw eggs, raw or undercooked meat and poultry, unpasteurized juices, and raw sprouts.

Key recommendations for specific population groups:

- Infants and young children, pregnant women, older adults, and those who are immunocompromised—Do not eat or drink raw (unpasteurized) milk or any products made from unpasteurized milk, raw or partially cooked eggs or foods containing raw eggs, raw or undercooked meat and poultry, raw or undercooked fish or shellfish, unpasteurized juices, and raw sprouts.
- Pregnant women, older adults, and those who are immunocompromised: Only eat certain deli meats and frankfurters that have been reheated to steaming hot.

FOOD GUIDANCE SYSTEM

The USDA has released the MyPyramid Food Guidance System (www.mypyramid.gov). Along with the new MyPyramid symbol, the system provides many options to help Americans make healthy food choices and to be active every day. Figures 1-1 and 1-2 provide visual presentations of the general goals and food groups or system of MyPyramid. Consult these two figures as you follow the discussion in this section.

The general messages in the MyPyramid symbol are: physical activity, variety, proportionality, moderation, gradual improvement, and personalization. The specific messages are about healthy eating and physical activity, which apply to everyone. MyPyramid helps consumers find the kinds and amounts of foods they should eat each day. The Food Guidance System is the core of MyPyramid.

The 2005 *Dietary Guidelines for Americans* are the basis for federal nutrition policy. The Food Guidance System provides food-based guidance to help implement the recommendations of the *Dietary Guidelines*. The system was based on both the *Dietary Guidelines* and the Dietary Reference Intakes from the National Academy of Sciences, while taking into account current consumption patterns of Americans. The system translates the *Dietary Guidelines* into a total diet that meets nutrient needs from food sources and aims to moderate or limit dietary components often consumed in excess. An important complementary tool to the system is the nutrition data displayed on the labels of food products.

The Food Guidance System provides Web-based interactive and print materials for all citizens: consumers, news media, and professionals. They include the following:

- Food intake patterns identify what and how much food an individual should eat for health. The amounts to eat are based on a person's age, sex, and activity level. These patterns have been published in the 2005 *Dietary Guidelines*.



FIGURE 1-1 MyPyramid: Steps to a Healthier You

Source: Courtesy of the USDA.

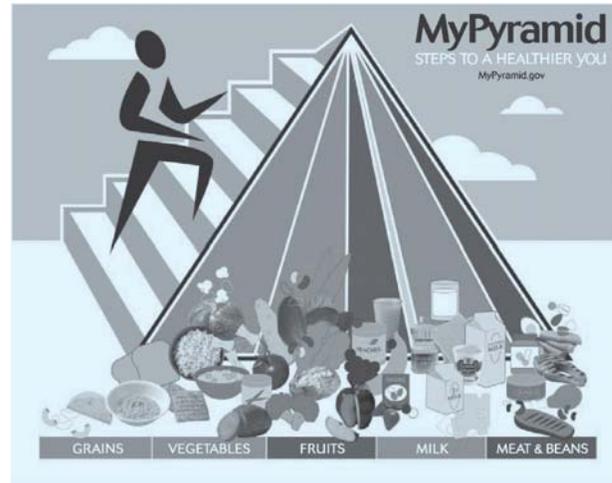


FIGURE 1-2 MyPyramid: The Food Groups

Source: Courtesy of the USDA.

- An education framework explains what changes most Americans need to make in their eating and activity choices, how they can make these changes, and why these changes are important for health.
- A glossary defines key terms used in the Food Guidance System documents.

The education framework provides specific recommendations for making food choices that will improve the quality of an average American diet. These recommendations are interrelated and should be used together. Taken together, they would result in the following changes from a typical diet:

- Increased intake of vitamins, minerals, dietary fiber, and other essential nutrients, especially of those that are often low in typical diets
- Lowered intake of saturated fats, trans fats, and cholesterol, and increased intake of fruits, vegetables, and whole grains to decrease risk for some chronic diseases
- Calorie intake balanced with energy needs to prevent weight gain and/or promote a healthy weight

The recommendations in the framework fall under four overarching themes:

- Variety—Eat foods from all food groups and subgroups.
- Proportionality—Eat more of some foods (fruits, vegetables, whole grains, fat-free or low-fat milk products), and less of others (foods high in saturated or trans fats, added sugars, cholesterol salt, and alcohol).
- Moderation—Choose forms of foods that limit intake of saturated or trans fats, added sugars, cholesterol, salt, and alcohol.
- Activity—Be physically active every day.

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The framework's recommendations are presented as key concepts for educators. The key concepts are organized by topic area: calories; physical activity; grains; vegetables; fruits; milk, yogurt, and cheese; meat, poultry, fish, dry beans, eggs, and nuts; fats and oils; sugars and sweets; salt; alcohol; and food safety. Under each topic area, information is presented on the following:

- What actions should be taken for a healthy diet
- How these actions can be implemented
- Why this action is important for health (the key benefits)

Food Groups

The core of MyPyramid is the Food Guidance System as indicated in Figure 1-2. A brief discussion of the food groups follows.

Calories and Physical Activity

One must balance calorie intake from foods and beverages with calories expended and engage in regular physical activity and reduce sedentary activities.

Grains

The grains group includes all foods made from wheat, rice, oats, cornmeal, barley, such as bread, pasta, oatmeal, breakfast cereals, tortillas, and grits. In general, 1 slice of bread, 1 c of ready-to-eat cereal, or $\frac{1}{2}$ c of cooked rice, pasta, or cooked cereal can be considered as 1 ounce-equivalent from the grains group. At least half of all grains consumed should be whole grains.

Consume 3 or more ounce-equivalents of whole-grain products per day. Since the recommended 3 ounce-equivalents may be difficult for young children to achieve, they should gradually increase the amount of whole grains in their diets. An ounce-equivalent of grains is about 1 slice of bread, 1 c of ready-to-eat cereal flakes, or $\frac{1}{2}$ c of cooked pasta or rice, or cooked cereal.

Vegetables

The vegetable group includes all fresh, frozen, canned, and dried vegetables and vegetable juices. In general, 1 c of raw or cooked vegetables or vegetable juice, or 2 c of raw leafy greens can be considered as 1 c from the vegetable group.

Eat the recommended amounts of vegetables, and choose a variety of vegetables each day. For example, those needing 2000 calories per day need about 2- $\frac{1}{2}$ c of vegetables per day. See food intake patterns in the next section for other calorie levels.

Fruits

The fruit group includes all fresh, frozen, canned, and dried fruits and fruit juices. In general, 1 c of fruit or 100% fruit juice, or $\frac{1}{2}$ c of dried fruit, can be considered as 1 c from the fruit group.

Eat recommended amounts of fruit, and choose a variety of fruits each day. For example, people who need 2000 calories per day need 2 c of fruit per day. See food intake patterns in the next section for other calorie levels.

Milk, Yogurt, and Cheese

The milk group includes all fluid milk products and foods made from milk that retain their calcium content, such as yogurt and cheese. Foods made from milk that have little to no calcium, such as cream cheese, cream, and butter, are not part of the group. Most milk group choices should be fat free or low fat. In general, 1 c of milk or yogurt, 1- $\frac{1}{2}$ ounces of natural cheese, or 2 ounces of processed cheese can be considered as 1 c from the milk group.

Consume 3 c of fat-free or low-fat (1%) milk, or an equivalent amount of yogurt or cheese, per day. Children 2 to 8 years old should consume 2 c of fat-free or low-fat milk, or an equivalent amount of yogurt or cheese, per day. Consume other calcium-rich foods if milk and milk products are not consumed.

Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts

For the meat and beans group in general, 1 ounce of lean meat, poultry, or fish; 1 egg; 1 tbsp peanut butter; $\frac{1}{4}$ c cooked dry beans; or $\frac{1}{2}$ ounce of nuts or seeds can be considered as 1 ounce-equivalent from the meat and beans group.

One should make choices that are low fat or lean when selecting meats and poultry. Choose a variety of different types of foods from this group each week. Include fish, dry beans, peas, nuts, and seeds, as well as meats, poultry, and eggs. Consider dry beans and peas as an alternative to meat or poultry as well as a vegetable choice. Keep the overall amounts of foods eaten from this group within the amount needed each day. For example, people who need 2000 calories per day need 5- $\frac{1}{2}$ ounce-equivalents per day. See food intake patterns in the next section for other calorie levels.

Fats and Oils

Oils include fats from many different plants and from fish that are liquid at room temperature, such as canola, corn, olive, soybean, and sunflower oil. Some foods are naturally high in oils, such as nuts, olives, some fish, and avocados. Foods that are mainly oil include mayonnaise, certain salad dressings, and soft margarine.

Choose most fats from sources of monounsaturated and polyunsaturated fatty acids, such as fish, nuts, seeds, and vegetable oils. Keep the amount of oils consumed within the total allowed for caloric needs. For example, people who need 2000 calories per day can consume 27 grams of oils (about 7 tsp). See food intake patterns for amounts for other calorie levels. Choose fat-free, low-fat, or lean meat, poultry, dry beans, milk, and milk products. Choose grain products and prepared foods that are low in saturated and trans fat.

Limit the amount of solid fats consumed to the amount within the discretionary calorie allowance, after taking into account other discretionary calories that have been consumed. For example, people who need 2000 calories per day have a total discretionary calorie allowance of 267 calories.

Sugars and Sweets

Choose and prepare foods and beverages with little added sugars or caloric sweeteners. Keep the amount of sugars and sweets consumed within the discretionary calorie allowance, after taking into account other discretionary calories that have been consumed. For example, people who need 2000 calories per day¹ have a total discretionary calorie allowance of 267 calories. See food intake patterns in the next section for amounts for other calorie levels. Practice good oral hygiene and consume sugar- and starch-containing foods and beverages less frequently.

Salt

Choose and prepare foods with little salt. Keep sodium intake less than 2300 mg per day. At the same time, consume potassium-rich foods, such as fruits and vegetables.

Alcohol

If one chooses to drink alcohol, consume it in moderation. Some people, or people in certain situations, should not drink. Keep consumption of alcoholic beverages within daily discretionary calorie allowance. For example, people who need 2000 calories per day¹ have a total discretionary calorie allowance of 267 calories.

Food Intake Patterns

The suggested amounts of food to consume from the basic food groups, subgroups, and oils to meet recommended nutrient intakes at 12 different calorie levels are provided in Table 1-1. Nutrient and energy contributions from each group are calculated according to the nutrient-dense forms of foods in each group (e.g., lean meats and fat-free milk). The table also shows the discretionary calorie allowance that can be accommodated within each calorie level, in addition to the suggested amounts of nutrient-dense forms of foods in each group. Table 1-2 shows the vegetable subgroup amounts per week. Table 1-3 shows the calorie levels for males and females by age and activity level. Calorie levels are set across a wide range to accommodate the needs of different individuals. Table 1-3 can be used to help assign individuals to the food intake pattern at a particular calorie level.

Discretionary calorie allowance is the remaining amount of calories in a food intake pattern after accounting for the calories needed for all food groups—using forms of foods that are fat free or low fat and with no added sugars.

Table 1-4 shows some weekly sample menus for a daily 2000 calorie intake diet. Table 1-5 describes the nutrient contribution from these weekly menus.

The original MyPyramid contains many more details about the Food Guidance System. The best sources are your instructors and the Web site MyPyramid.gov.

At this Web site, consumers can enter their age, gender, and activity level, and they are given their own plan at an appropriate calorie level. The food plan includes

TABLE 1-1 Daily Amount of Food from Each Group

Calorie Level	1000	1200	1400	1600	1800	2000
Fruits	1 cup	1 cup	1.5 cups	1.5 cups	1.5 cups	2 cups
Vegetables	1 cup	1.5 cups	1.5 cups	2 cups	2.5 cups	2.5 cups
Grains	3 oz–eq	4 oz–eq	5 oz–eq	5 oz–eq	6 oz–eq	6 oz–eq
Meat and Beans	2 oz–eq	3 oz–eq	4 oz–eq	5 oz–eq	5 oz–eq	5.5 oz–eq
Milk	2 cups	2 cups	2 cups	3 cups	3 cups	3 cups
Oils	3 tsp	4 tsp	4 tsp	5 tsp	5 tsp	6 tsp
Discretionary calorie allowance	165	171	171	132	195	267
Calorie Level	2200	2400	2600	2800	3000	3200
Fruits	2 cups	2 cups	2 cups	2.5 cups	2.5 cups	2.5 cups
Vegetables	3 cups	3 cups	3.5 cups	3.5 cups	4 cups	4 cups
Grains	7 oz–eq	8 oz–eq	9 oz–eq	10 oz–eq	10 oz–eq	10 oz–eq
Meat and Beans	6 oz–eq	6.5 oz–eq	6.5 oz–eq	7 oz–eq	7 oz–eq	7 oz–eq
Milk	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups
Oils	6 tsp	7 tsp	8 tsp	8 tsp	10 tsp	11 tsp
Discretionary calorie allowance	290	362	410	426	512	648

Source: Courtesy of the USDA.

TABLE 1-2 Vegetable Subgroup Amounts per Week

Calorie Level	1000	1200	1400	1600	1800	2000
Dark green veg.	1 c/wk	1.5 c/wk	1.5 c/wk	2 c/wk	3 c/wk	3 c/wk
Orange veg.	.5 c/wk	1 c/wk	1 c/wk	1.5 c/wk	2 c/wk	2 c/wk
Legumes	.5 c/wk	1 c/wk	1 c/wk	2.5 c/wk	3 c/wk	3 c/wk
Starchy veg.	1.5 c/wk	2.5 c/wk	2.5 c/wk	2.5 c/wk	3 c/wk	3 c/wk
Other veg.	3.5 c/wk	4.5 c/wk	4.5 c/wk	5.5 c/wk	6.5 c/wk	6.5 c/wk
Calorie Level	2200	2400	2600	2800	3000	3200
Dark green veg.	3 c/wk					
Orange veg.	2 c/wk	2 c/wk	2.5 c/wk	2.5 c/wk	2.5 c/wk	2.5 c/wk
Legumes	3 c/wk	3 c/wk	3.5 c/wk	3.5 c/wk	3.5 c/wk	3.5 c/wk
Starchy veg.	6 c/wk	6 c/wk	7 c/wk	7 c/wk	9 c/wk	9 c/wk
Other veg.	7 c/wk	7 c/wk	8.5 c/wk	8.5 c/wk	10 c/wk	10 c/wk

Source: Courtesy of the USDA.

TABLE 1-3 The Calorie Levels for Males and Females by Age and Activity Level

Activity level Age	Males			Females			
	Sedentary*	Mod. active*	Active*	Activity level Age	Sedentary*	Mod. active*	Active*
2	1000	1000	1000	2	1000	1000	1000
3	1000	1400	1400	3	1000	1200	1400
4	1200	1400	1600	4	1200	1400	1400
5	1200	1400	1600	5	1200	1400	1600
6	1400	1600	1800	6	1200	1400	1600
7	1400	1600	1800	7	1200	1600	1800
8	1400	1600	2000	8	1400	1600	1800
9	1600	1800	2000	9	1400	1600	1800
10	1600	1800	2200	10	1400	1800	2000
11	1800	2000	2200	11	1600	1800	2000
12	1800	2200	2400	12	1600	2000	2200
13	2000	2200	2600	13	1600	2000	2200
14	2000	2400	2800	14	1800	2000	2400
15	2200	2600	3000	15	1800	2000	2400
16	2400	2800	3200	16	1800	2000	2400
17	2400	2800	3200	17	1800	2000	2400
18	2400	2800	3200	18	1800	2000	2400
19–20	2600	2800	3000	19–20	2000	2200	2400
21–25	2400	2800	3000	21–25	2000	2200	2400
26–30	2400	2600	3000	26–30	1800	2000	2400
31–35	2400	2600	3000	31–35	1800	2000	2200
36–40	2400	2600	2800	36–40	1800	2000	2200
41–45	2200	2600	2800	41–45	1800	2000	2200
46–50	2200	2400	2800	46–50	1800	2000	2200
51–55	2200	2400	2800	51–55	1600	1800	2200
56–60	2200	2400	2600	56–60	1600	1800	2200
61–65	2000	2400	2600	61–65	1600	1800	2000
66–70	2000	2200	2600	66–70	1600	1800	2000
71–75	2000	2200	2600	71–75	1600	1800	2000
76 and up	2000	2000	2400	76 and up	1600	1800	2000

*Calorie levels are based on the Estimated Energy Requirements (EER) and activity levels from the Institute of Medicine's *Report on Dietary Reference Intakes—Macro Nutrients*, 2002.

Sedentary = less than 30 minutes a day of moderate physical activity in addition to daily activities.

Mod. active = at least 30 minutes up to 60 minutes a day of moderate physical activity in addition to daily activities.

Active = 60 or more minutes a day of moderate physical activity in addition to daily activities.

Source: Courtesy of the USDA.

TABLE 1-4 Sample Weekly Sample Menus for a Daily 2000 Calorie Intake Diet

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST
Breakfast burrito 1 flour tortilla (7" diameter) 1 scrambled egg (in 1 tsp soft margarine) ½ cup black beans* 2 tbsp salsa 1 cup orange juice 1 cup fat-free milk	Hot cereal ½ cup cooked oatmeal 2 tbsp raisins 1 tsp soft margarine ½ cup fat-free milk 1 cup orange juice	Cold cereal 1 cup bran flakes 1 cup fat-free milk 1 small banana 1 slice whole wheat toast 1 tsp soft margarine 1 cup prune juice	1 whole wheat English muffin 2 tsp soft margarine 1 tbsp jam or preserves 1 medium grapefruit 1 hard-cooked egg 1 unsweetened beverage	Cold cereal 1 cup shredded wheat cereal 1 tbsp raisins 1 cup fat-free milk 1 small banana 1 slice whole wheat toast 1 tsp soft margarine 1 tsp jelly	French toast 2 slices whole wheat French toast 2 tsp soft margarine 2 tbsp maple syrup ½ medium grape- fruit 1 cup fat-free milk	Pancakes 3 buckwheat pancakes 2 tsp soft margarine 3 tbsp maple syrup ½ cup strawberries ¾ cup honey- dew melon ½ cup fat-free milk
LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
Roast beef sandwich 1 whole grain sandwich bun 3 ounces lean roast beef 2 slices tomato ¼ cup shredded ro- maine lettuce ¼ cup sauteed mushrooms (in 1 tsp oil) 1 ½ ounce part- skim mozzarella cheese 1 tsp yellow mustard ¾ cup baked potato wedges* 1 tbsp ketchup 1 unsweetened beverage	Taco salad 2 ounces tortilla chips 2 ounces ground turkey, sauteed in 2 tsp sun- flower oil ½ cup black beans* ½ cup iceberg lettuce 2 slices tomato 1 ounce low-fat cheddar cheese 2 tbsp salsa ½ cup avocado 1 tsp lime juice 1 unsweetened beverage	Tuna fish sandwich 2 slices rye bread 3 ounces tuna (packed in water, drained) 2 tsp mayonnaise 1 tbsp diced celery ¼ cup shredded romaine lettuce 2 slices tomato 1 medium pear 1 cup fat-free milk	White bean- vegetable soup 1 ¼ cup chunky vegetable soup ½ cup white beans* 2 ounce breadstick 8 baby carrots 1 cup fat-free milk	Smoked turkey sandwich 2 ounces whole wheat pita bread ¼ cup romaine lettuce 2 slices tomato 3 ounces sliced smoked turkey breast* 1 tbsp mayo-type salad dressing 1 tsp yellow mustard ½ cup apple slices 1 cup tomato juice*	Vegetarian chili on baked potato 1 cup kidney beans* ½ cup tomato sauce w/ tomato tidbits* 3 tbsp chopped onions 1 ounce lowfat cheddar cheese 1 tsp vegetable oil 1 medium baked potato ½ cup cantaloupe ¾ cup lemonade	Manhattan clam chowder 3 ounces canned clams (drained) ¾ cup mixed vegetables 1 cup canned tomatoes* 10 whole wheat crackers* 1 medium orange 1 cup fat-free milk
DINNER	DINNER	DINNER	DINNER	DINNER	DINNER	DINNER
Stuffed broiled salmon 5 ounce salmon filet 1 ounce bread stuffing mix 1 tbsp chopped onions 1 tbsp diced celery 2 tsp canola oil ½ cup saffron (white) rice 1 ounce slivered almonds ½ cup steamed broccoli 1 tsp soft margarine 1 cup fat-free milk	Spinach lasagna 1 cup lasagna noodles, cooked (2 oz dry) ¾ cup cooked spinach ½ cup ricotta cheese ½ cup tomato sauce tomato bits* 1 ounce part-skim mozzarella cheese 1 ounce whole wheat dinner roll 1 ounce whole wheat dinner roll 1 cup fat-free milk	Roasted chicken breast 3 ounces boneless skinless chicken breast* 1 large baked sweet potato ½ cup peas and onions 1 tsp soft margarine 1 ounce whole wheat dinner roll 1 tsp soft margarine 1 cup leafy greens salad 3 tsp sunflower oil and vinegar dressing	Rigatoni with meat sauce 1 cup rigatoni pasta (2 ounces dry) ½ cup tomato sauce tomato bits* 2 ounces extra lean cooked ground beef (sauteed in 2 tsp vegetable oil) 3 tbsp grated Parmesan cheese Spinach salad 1 cup baby spinach leaves ½ cup tangerine slices	Grilled top loin steak 5 ounces grilled top loin steak ¾ cup mashed po- tatoes 2 tsp soft margarine ½ cup steamed carrots 1 tbsp honey 2 ounces whole wheat dinner roll 1 tsp soft margarine 1 cup fat-free milk	Hawaiian pizza 2 slices cheese pizza 1 ounce canadian bacon ¼ cup pineapple 2 tbsp mushrooms 2 tbsp chopped onions Green salad 1 cup leafy greens 3 tsp sunflower oil and vinegar dressing 1 cup fat-free milk	Vegetable stir- fry 4 ounces tofu (firm) ¼ cup green and red bell peppers ½ cup bok choy 2 tbsp vegetable oil 1 cup brown rice 1 cup lemon- flavored iced tea

(continues)

TABLE 1-4 (continued)

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
			½ ounce chopped walnuts 3 tsp sunflower oil and vinegar dressing 1 cup fat-free milk			
SNACKS	SNACKS	SNACKS	SNACKS	SNACKS	SNACKS	SNACKS
1 cup cantaloupe	½ ounce dry-roasted almonds* ¼ cup pineapple 2 tsp raisins	¼ cup dried apricots 1 cup low-fat fruited yogurt	1 cup low-fat fruited yogurt	1 cup low-fat fruited yogurt	5 whole wheat crackers* ½ cup hummus ½ cup fruit cocktail (in water or juice)	1 ounce sunflower seeds* 1 large banana 1 cup low-fat fruited yogurt

*Starred items are foods that are labeled as no-salt-added, low-sodium, or low-salt versions of the foods. They can also be prepared from scratch with little or no added salt. All other foods are regular commercial products that contain variable levels of sodium. Average sodium level of the 7 day menu assumes no-salt-added in cooking or at the table.

Source: Courtesy of the USDA.

TABLE 1-5 Nutrient Contribution from Weekly Menus in Table 1-4

Food Group	Daily Average Over One Week	Nutrient	Daily Average Over One Week
Grains	Total Grains (oz–eq) 6.0	Calories	1994
Vegetables*	Whole Grains 3.4	Protein, g	98
Fruits	Refined Grains 2.6	Protein, % kcal	20
Milk	Total Veg* (cups) 2.6	Carbohydrate, g	264
Meat & Beans	Fruits (cups) 2.1	Carbohydrate, % kcal	53
Oils	Milk (cups) 3.1	Total fat, g	67
	Meat/Beans (oz–eq) 5.6	Total fat, % kcal	30
	Oils (tsp/grams) 7.2 tsp/32.4 g	Saturated fat, g	16
		Saturated fat, % kcal	7.0
		Monounsaturated fat, g	23
		Polyunsaturated fat, g	23
		Linoleic Acid, g	21
		Alpha-linolenic Acid, g	1.1
		Cholesterol, mg	207
		Total dietary fiber, g	31
		Potassium, mg	4715
		Sodium, mg*	1948
		Calcium, mg	1389
		Magnesium, mg	432
		Copper, mg	1.9
		Iron, mg	21
		Phosphorus, mg	1830
		Zinc, mg	14
		Thiamin, mg	1.9
		Riboflavin, mg	2.5
		Niacin Equivalents, mg	24
		Vitamin B ₆ , mg	2.9
		Vitamin B ₁₂ , mcg	18.4
		Vitamin C, mg	190
		Vitamin E, mg (AT)	18.9
		Vitamin A, mcg (RAE)	1430
		Dietary Folate Equivalents, mcg	558
*Vegetable subgroups			(weekly totals)
Dk-Green Veg (cups)			3.3
Orange Veg (cups)			2.3
Beans/Peas (cups)			3.0
Starchy Veg (cups)			3.4
Other Veg (cups)			6.6

Source: Courtesy of USDA.

specific daily amounts from each food group and a limit for discretionary calories (fats, added sugars, alcohol). Their food plan is one of the 12 calorie levels of the food intake patterns from the *Dietary Guidelines*. Visitors to the Web site can print out a personalized miniposter of their plan and a worksheet to help them track their progress and choose goals for tomorrow and the future.

FOOD EXCHANGE LISTS

The Food Exchange Lists are the basis of a meal planning system designed by the American Dietetic Association and the American Diabetes Association. They are based upon principles of good nutrition for everyone. There are 11 lists, of which the last one is alcohol. For some lists, each contributes an *approximate* level of nutrients for each food: calories, carbohydrates, proteins, and fats. For others, the contribution of nutrients varies within or between lists. Every time you replace one food item with another item in the same or different list, you know approximately the change in levels of nutrients you will be consuming.

Choices from each group balance the meal. Health practitioners use the exchange system because it is an easy tool to work with and teaches food selection in a practical way. It also meets the guidelines for limiting saturated fat and cholesterol intake.

The associations revise and update the exchange system regularly to reflect current nutrition research and the national dietary guidelines for health promotion and reduction of chronic disease risk factors as new information becomes available.

The 2007 edition of the Food Exchange Lists continues the basic principles of 2003 edition, arranging the food groups into 11 broad categories or listed based on their nutrient content. Subcategories that appear within these categories provide additional information to assist clients in choosing more healthful foods, as well as more choices. They reflect today's consumers' changing dietary habits and lifestyles. The 11 lists in this document are described below, with alcohol as the last category:

Starch list

- Bread
- Cereals and grains
- Crackers and snacks
- Starchy vegetables
- Beans, peas, and lentils

Sweets, desserts, and other carbohydrates list

- Beverages, sodas, and energy/sports drinks; brownies, cake, cookies, gelatin, pie, and pudding
- Candy, spreads, sweets, sweeteners, syrups, and toppings
- Condiments and sauces
- Doughnuts, muffins, pastries, and sweet breads

Frozen bars, frozen desserts, frozen yogurt, and ice cream

Granola bars, meal replacement bars/shakes, and trail mix

Fruit list

- Fruits
- Fruit juices

Vegetables (nonstarchy) list

Meat and meat substitutes list

- Lean meat
- Medium-fat meat
- High-fat meat
- Plant-based proteins (for beans, peas, and lentils, see starch list)

Milk list

- Fat-free and low-fat milk
- Reduced fat
- Whole milk
- Dairy-like foods

Fat list

- Monounsaturated fats list
- Polyunsaturated fats list
- Saturated fats list

Fast-foods list

- Breakfast sandwiches
- Main dishes/entrees
- Oriental
- Pizzas
- Sandwiches
- Salads
- Sides/appetizers
- Desserts

Combination foods list

- Entrées
- Frozen entrées/meals
- Salads (deli-style)
- Soups

Free foods list

- Low-carbohydrate foods
- Modified-fat foods with carbohydrate
- Condiments
- Free snacks
- Drinks/mixes

Alcohol list

Chapter 18 and Appendix F provide more details on these lists concerning food, nutrient data, and applications.

RESPONSIBILITIES OF HEALTH PERSONNEL

1. Assume responsibility for one's own health through changes in eating habits and lifestyle patterns.
2. Select, prepare, and consume an adequate diet.
3. Promote good eating habits for all age groups.

16 PART 1 NUTRITION BASICS AND APPLICATIONS

4. Use appropriate guidelines when teaching clients regarding food selection.
5. Facilitate healthy lifestyles by encouraging clients to expand their knowledge of nutrition.
6. Use approved food guides when assessing, planning, and evaluating a client's intake.

PROGRESS CHECK ON ACTIVITY 1**SHORT ANSWER**

Define the following terms:

1. Calorie _____
2. Health _____
3. Nutrient _____
4. Optimum nutrition _____
5. Appropriate diet _____

FILL-IN

6. Dietary recommendations to promote health and prevent or delay the onset of diseases are known as _____.
7. The recommended dietary allowances (RDAs) are _____.
8. Tolerable Upper Intake Levels (ULs) are _____.
9. Dietary Reference Intakes (DRIs) are _____.
10. An adequate intake is defined as what? _____

DEFINE THESE ACRONYMS

11. FNB _____
12. ADA _____
13. EAR _____
14. USDA _____
15. AHA _____
16. NCEP _____
17. UL _____

MULTIPLE CHOICE

Circle the letter of the correct answer.

18. Energy is:

- a. the capacity to do work.
- b. food that provides calories.
- c. chemical substances in the body.
- d. heat required to raise body temperature.
- e. a and b
- f. a, b, c, and d

19. There are _____ grams in one ounce.

- a. 2.285
- b. 28.385
- c. 1000
- d. 36

20. Malnutrition is defined as:

- a. impaired health due to undernutrition.
- b. imbalance of nutrients.
- c. excessive nutrients.
- d. the inability of the body to use ingested nutrients.
- e. all of the above.

21. Nutritional requirements vary from nutrient to nutrient because of which of these factors?

- a. age
- b. gender
- c. physiological state
- d. size
- e. a, b, and d
- f. a, b, c, and d

GENERAL QUESTIONS

22. What is MyPyramid? _____
23. How does MyPyramid help the consumers? _____
24. Define the milk, yogurt, and cheese group according to MyPyramid. _____
25. The Food Guidance System is based on two important food guides. They are: _____.
26. Name the seven chronic diseases in the United States that are linked to risk factors associated with diet. _____
27. List four nutrition health problems that require special dietary measures. _____
28. Explain the difference(s) between the *Dietary Guidelines for Americans* and MyPyramid Food Guidance System. _____

29. List the 11 primary lists in the 2007 Food Exchange Lists. _____
30. Name three approved food guides you would use when assessing, planning, or evaluating a client's diet: (a) _____ (b) _____
(c) _____

SELF-STUDY

Use Table 1-3 to determine your approximate daily caloric need. Write down everything you ate or drank in the last 24 hours for meals and snacks. Then do the following:

1. Did you have the number of servings from the five major food groups that are right for you according to MyPyramid.gov?
2. At approximately which of the three calorie levels was your 24-hour intake? Was the number of servings you ate greater, less, or about right for your age, gender, and activity?
3. Using the *Dietary Guidelines*, look at your diet to see if you should make any substitutions regarding your salt, sugar, or fiber content (clue: visit the Web site given for the *Dietary Guidelines*).
4. Write a short summary of things you could do to improve your present diet if improvement is needed.

Self-Study: Your individual answers will provide information for your personal health status.

ACTIVITY 2:

Legislation and Health Promotion

At present, there are national policies and recommendation on nutrition labeling, dietary supplements, and educational programs on cholesterol and our health. In the last decade, a new concept of bioactive food ingredients (nutraceuticals) and functional foods has developed and will be discussed with other national policies in this activity.

FOOD LABELING

In general, food and nutrition labeling is now mandatory for many foods excluding meat and poultry, with special considerations for seafood and other fresh foods.

The information in this section has been modified from the document issued by the U.S. Food and Drug Administration, *How to Understand and Use the Nutrition Facts Label*. This document was published in June 2000 and updated twice, July 2003 and November 2004. See www.cfsan.fda.gov/label.html for the latest updates and other legal announcements related to food labeling.

People look at food labels for different reasons. But whatever the reason, many consumers would like to know how to use this information more effectively and easily.

The food label is headed with the title, "Nutrition Facts." It describes the nutrients, among other data, including the following:

Total calories
Calories from fat
Calories from saturated fat
Total fat
Saturated fat
Polyunsaturated fat
Monounsaturated fat
Cholesterol
Sodium
Potassium
Total carbohydrate
Dietary fiber
Soluble fiber
Insoluble fiber
Sugars
Sugar alcohol (for example, the sugar substitutes xylitol, mannitol, and sorbitol)
Other carbohydrate (the difference between total carbohydrate and the sum of dietary fiber, sugars, and sugar alcohol if declared)
Protein
Vitamin A
Vitamin C
Calcium
Iron
Other essential vitamins and minerals

Listing of most of the above nutrients is mandatory. Some are voluntary listings, and others require special consideration. Let us look at a sample label of macaroni and cheese. Refer to Figure 1-3.

The information in the main or top section (see Step 1 through Step 4 and Step 6 on the sample nutrition label that follows), can vary with each food product; it contains product-specific information (serving size, calories, and nutrient information). The bottom part (see Step 5 on the sample label that follows) contains a footnote with Daily Values (DVs) for 2000 and 2500 calorie diets. This footnote provides recommended dietary information for important nutrients, including fats, sodium, and fiber. The footnote is found only on larger packages and does not change from product to product.

The Contents of a Food Label

Only selected information is included. Refer to Figure 1-3.

Step 1. Start here.

The first place to start when you look at the Nutrition Facts label is the serving size and the

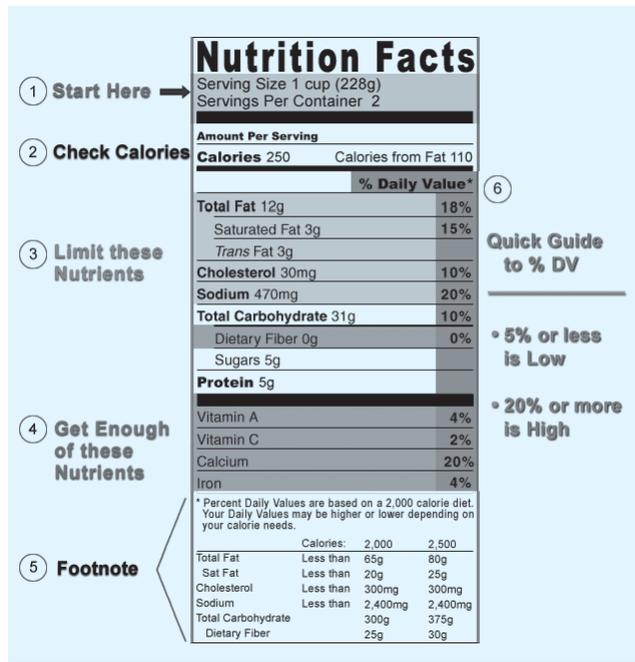


FIGURE 1-3 Sample Label of Macaroni and Cheese

Source: Courtesy of the FDA.

number of servings in the package. Serving sizes are standardized to make it easier to compare similar foods; they are provided in familiar units, such as cups or pieces, followed by the metric amount (the number of grams).

The size of the serving on the food package influences the number of calories and all the nutrient amounts listed on the top part of the label. *Pay attention to the serving size, especially how many servings there are in the food package. Then ask yourself, “How many servings am I consuming?”* (e.g., $\frac{1}{2}$ serving, 1 serving, or more). In the sample label, one serving of macaroni and cheese equals 1 c. If you ate the whole package, you would eat 2 c. That doubles the calories and other nutrient numbers, including the %DVs as shown in the sample label. Table 1-6 compares the nutritional contributions for a single or double serving.

Step 2. Check calories.

Calories provide a measure of how much energy you get from a serving of this food. Many Americans consume more calories than they need without meeting recommended intakes for a number of nutrients. The calorie section of the label can help you manage your weight (i.e., gain, lose, or maintain). *Remember: The number of servings you consume determines the number of calories you actually eat (your portion amount).*

In the example, there are 250 calories in one serving of this macaroni and cheese. How many calories from fat are there in *one* serving? Answer: 110 calories, which means almost half the calories in a single serving come from fat. What if you ate the whole package content? Then, you would consume two servings, or 500 calories, and 220 would come from fat.

Box 1-1, General Guide to Calories, provides a general reference for calories when you look at a Nutrition Facts label. This guide is based on a 2000-calorie diet.

Eating too many calories per day is linked to overweight and obesity.

Look at the top of the nutrient section in the sample label (Figure 1-3). It shows you some key nutrients that affect your health and separates them into two main groups.

Step 3. Limit these nutrients.

The nutrients listed first are the ones Americans generally eat in adequate amounts, or even too much. Eating too much fat, saturated fat, trans fat, cholesterol, or sodium may increase your risk of certain chronic diseases, such as heart disease, some cancers, or high blood pressure.

Important: Health experts recommend that you keep your intake of saturated fat, trans fats, and cholesterol as low as possible as part of a nutritionally balanced diet.

Step 4. Get enough of these nutrients.

Most Americans don't get enough dietary fiber, vitamin A, vitamin C, calcium, and iron in their

TABLE 1-6 Single vs. Double Serving

	Example		
	Single Serving	Double %DV	Serving %DV
Serving Size	1 cup	2 cups (228 g)	(456 g)
Calories	250	500	
Calories from Fat	110	220	
Total Fat	12 g	18	24 g 36
Trans Fat	1.5 g		3 g
Saturated Fat	3 g	15	6 g 30
Cholesterol	30 mg	10	60 mg 20
Sodium	470 mg	20	940 mg 40
Total Carbohydrate	31 g	10	62 g 20
Dietary Fiber	0 g	0	0 g 0
Sugars	5 g		10 g
Protein	5 g		10 g
Vitamin A		4	8
Vitamin C		2	4
Calcium		20	40
Iron		4	8

Source: Courtesy of the FDA.

BOX 1-1 General Guide to Calories

40 calories is low

100 calories is moderate

400 calories or more is high

Source: Courtesy of the FDA.

diets. Eating enough of these nutrients can improve your health and help reduce the risk of some diseases and conditions. For example, getting enough calcium may reduce the risk of osteoporosis, a condition that results in brittle bones as one ages. Eating a diet high in dietary fiber promotes healthy bowel function. Additionally, a diet rich in fruits, vegetables, and grain products that contain dietary fiber, particularly soluble fiber, and low in saturated fat and cholesterol, may reduce the risk of heart disease.

Remember: You can use the Nutrition Facts label not only to help limit those nutrients you want to cut back on but also to increase those nutrients you need to consume in greater amounts.

Step 5. Footnote.

Note the asterisk (*) used after the heading “% Daily Value” on the Nutrition Facts label. It refers to the footnote in the lower part of the nutrition label, which tells you “Percent Daily Values are based on a 2,000 calorie diet.” This statement must be on all food labels. But the remaining information in the full footnote may not be on the package if the size of the label is too small. When the full footnote does appear, it will always be the same. It doesn’t change from product to product, because it shows recommended dietary advice for all Americans—it is not about a specific food product.

Look at the amounts or the Daily Values (DV) for each nutrient listed. These are based on public health experts’ advice. DVs are recommended levels of intakes. DVs in the footnote are based on a 2000 or 2500 calorie diet. Note how the DVs for some nutrients change, while others (for cholesterol and sodium) remain the same for both calorie amounts.

Look at Table 1-7 for another way to see how the DVs relate to the %DVs and dietary guidance. For each nutrient listed there is a DV, a %DV, and dietary advice or a goal. If you follow this dietary advice, you will stay within public health experts’ recommended upper or lower limits for the nutrients listed, based on a 2000 calorie daily diet.

The nutrients that have upper daily limits are listed first on the footnote of larger labels and on

the example. Upper limits means it is recommended that you stay below—eat less than—the Daily Value nutrient amounts listed per day. For example, the DV for saturated fat is 20 g. This amount is 100%DV for this nutrient. What is the goal or dietary advice? To eat less than 20 g or 100%DV for the day.

Now look at the entry where dietary fiber is listed. The DV for dietary fiber is 25 g, which is 100%DV. This means it is recommended that you eat at least this amount of dietary fiber per day.

The DV for the entry Total Carbohydrate is 300 g or 100%DV. This amount is recommended for a balanced daily diet that is based on 2000 calories, but can vary, depending on your daily intake of fat and protein.

Now let’s look at the %DVs.

Step 6. The percent daily value (%DV).

The % Daily Values (%DVs) are based on the Daily Value recommendations for key nutrients but only for a 2000 calorie daily diet—not 2500 calories. You, like most people, may not know how many calories you consume in a day. But you can still use the %DV as a frame of reference whether or not you consume more or less than 2000 calories.

The %DV helps you determine if a serving of food is high or low in a nutrient. Note: A few nutrients, like trans fat, do not have a %DV—they will be discussed later.

You don’t need to know how to calculate percentages to use the %DV? The label (the %DV) does the math for you. It helps you interpret the numbers (grams and milligrams) by putting them all on the same scale for the day (0–100%DV). The %DV column doesn’t add up vertically to 100%. Instead each nutrient is based on 100% of the daily requirements for that nutrient (for a 2000 calorie diet). This way you can tell high from low and know which nutrients contribute a lot, or a little, to your *daily* recommended allowance (upper or lower).

TABLE 1-7 Examples of DVs vs. %DVs, Based on a 2000 Calorie Diet

Nutrient	DV	%DV	Goal
Total Fat	65 g	= 100%DV	Less than
Sat Fat	20 g	= 100%DV	Less than
Cholesterol	300 mg	= 100%DV	Less than
Sodium	2400 mg	= 100%DV	Less than
Total			
Carbohydrate	300 g	= 100%DV	At least
Dietary Fiber	25 g	= 100%DV	At least

Refer to Step 6 in Figure 1-3, as shown below:

Quick Guide to %DV:

- 5% or less is low
- 20% or more is high

This guide tells you that 5%DV or less is low for all nutrients, those you want to limit (e.g., fat, saturated fat, cholesterol, and sodium), or for those that you want to consume in greater amounts (fiber, calcium, etc.). As the Quick Guide shows, 20%DV or more is high for all nutrients.

Example: Look at the amount of total fat in one serving listed on the sample nutrition label. Is 18%DV contributing a lot or a little to your fat limit of 100%DV? Check the Quick Guide to %DV, and you'll see that 18%DV, which is below 20%DV, is not yet high, but what if you ate the whole package (two servings)? You would double that amount, eating 36% of your daily allowance for total fat. Coming from just one food, that amount leaves you with 64% of your fat allowance ($100\% - 36\% = 64\%$) for *all* of the other foods you eat that day, snacks and drinks included. See Figure 1-4.

The %DV can be used for:

Comparisons: The %DV also makes it easy for you to make comparisons. You can compare one product or brand to a similar product. Just make sure the serving sizes are similar, especially the weight (e.g., gram, milligram, ounces) of each product. It's easy to see which foods are higher or lower in nutrients because the serving sizes are generally consistent for similar types of foods, except in a few cases such as cereals.

Nutrient Content Claims: Use the %DV to help you quickly distinguish one claim from another, such as “reduced fat” vs. “light” or “nonfat.” Just compare the %DVs for total fat in each food product to see which one is higher or lower in that nutrient—there is no need to memorize definitions. This works when comparing all nutrient content claims, such as less, light, low, free, more, or high.

Dietary Trade-Offs: You can use the %DV to help you make dietary trade-offs with other foods throughout the day. You don't have to give up a favorite food to eat a healthy diet. When a food you like is high in fat, balance it with foods that are low in fat at other times of the day. Also, pay attention to how much you eat so that the total amount of fat for the day stays below 100%DV.

Health Claims

You may have noticed that some labels have health claims and some do not. At present, the FDA permits six groups of qualified health claims subject to enforcement discretion. They include the following.

1. Qualified Claims About Cancer Risk
 - a. Tomatoes and/or tomato sauce and prostate, ovarian, gastric, and pancreatic cancers
 - b. Calcium and colon/rectal cancer and calcium and recurrent colon/rectal polyps
 - c. Green tea and cancer
 - d. Selenium and cancer
 - e. Antioxidant vitamins and cancer
2. Qualified claims about cardiovascular disease risk
 - a. Nuts and heart disease
 - b. Walnuts and heart disease
 - c. Omega-3 fatty acids and coronary heart disease

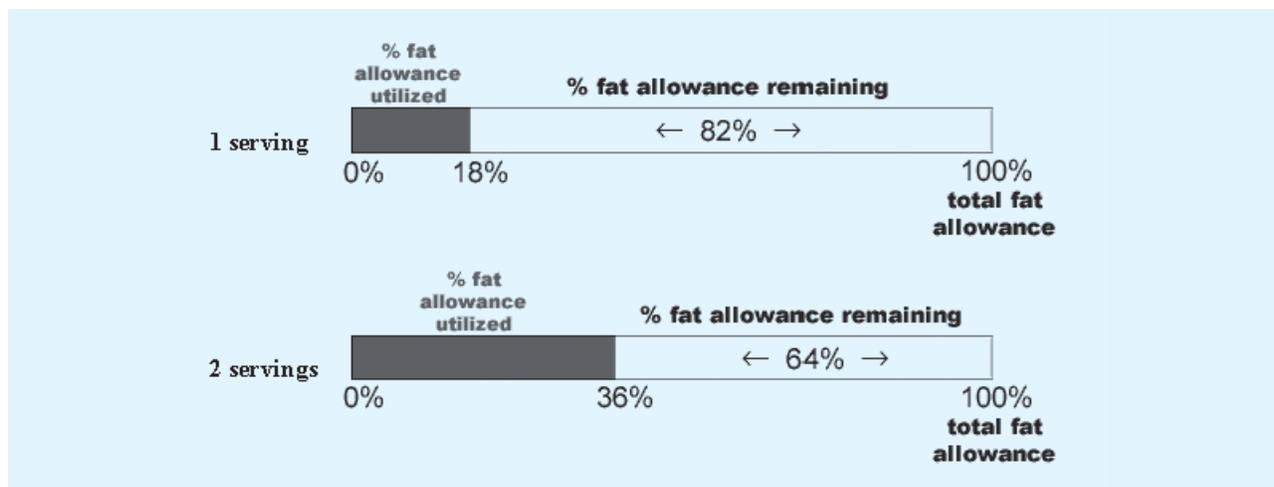


FIGURE 1-4 Fat Allowance and %DV: Low vs. High Consumption

Source: Courtesy of the FDA.

- d. B vitamins and vascular disease
- e. Monounsaturated fatty acids from olive oil and coronary heart disease
- f. Unsaturated fatty acids from canola oil and coronary heart disease
- g. Corn oil and heart disease
- 3. Qualified claims about cognitive function
 - a. Phosphatidylserine and cognitive dysfunction and dementia
- 4. Qualified claims about diabetes
 - a. Chromium picolinate and diabetes
- 5. Qualified claims about hypertension
 - a. Calcium and hypertension, pregnancy-induced hypertension, and preeclampsia
- 6. Qualified claims about neural tube birth defects
 - a. 0.8 mg folic acid and neural tube birth defects

Space limitation does not permit a detailed discussion of different aspects of food and nutrition labeling. You may obtain more details in two ways:

1. The instructors will provide more information where applicable.
2. Visit the Web site www.cfsan.fda.gov/label.html for reference.

DIETARY SUPPLEMENT LAW

The Dietary Supplement Health and Education Act (DSHEA) was signed into law in October 1994. While it is a compromise between the supplement industry and the FDA position, it still preserves the standards set by the FDA in the Nutrition and Labeling Act of 1990. It provides consistency between food regulations and regulation of dietary supplements. Chapter 11, “Dietary Supplements,” provides a detailed discussion of this law.

NATIONAL CHOLESTEROL EDUCATION PROGRAM (NCEP)

The NCEP is one of three principal programs administered by the Office of Prevention, Education, and Control of the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health (NIH). The program came about after years of trials and scientific evidence that linked blood-cholesterol levels to coronary heart disease. The trials showed that levels could be lowered safely by both diet and drugs. Hence, the National Cholesterol Education Program, today known as the NCEP, came into being. This became known as Adult Treatment Panel 1 (ATP 1). In 1989 the first guidelines were issued for the adult population. In 1991 the NCEP drafted an additional report that included children and adolescents.

Three ATP reports have been issued. ATP 1 outlined a major strategy for primary prevention of coronary heart disease (CHD) in persons with high levels of low density

lipoprotein (LDL) (> 160 mg/dl) or borderline LDL of 130–159 mg/dl. ATP 2 affirmed this approach and added a new feature: the intensive management of LDL cholesterol in persons with CHD. It set a new goal of < 100 mg/dl of LDL.

The third ATP report (May 2001) updates the existing recommendations for clinical management of high blood cholesterol as warranted by advances in the science of cholesterol management. ATP 3 maintains the core of ATP 1 and 2, but its major new feature is a focus on primary prevention in persons with multiple risk factors. It calls for more intensive LDL lowering therapy in certain groups of people and recommends support for implementation. This approach includes a complete lipoprotein profile, high density lipoprotein (HDL) cholesterol and triglycerides, as the preferred initial test. It encourages the use of plants containing soluble fiber as a therapeutic dietary option to enhance lowering LDL cholesterol and presents strategies for promoting adherence. It recommends treatment beyond LDL lowering in people with high triglycerides.

Chapter 16, “Diet Therapy for Cardiovascular Disorders,” discusses the diet therapy associated with ATP guidelines in detail.

FUNCTIONAL FOODS AND NUTRACEUTICALS

In the last 15–25 years, two new concepts, functional foods and nutraceuticals, have been slowly developing with important ramifications to our health. To understand their origins and meanings, we must be familiar with “bioactive ingredients” found in traditional foods and other edible or nonedible items. What are bioactive active ingredients? Examples include some of most popular items in the news media, printed or electronic:

1. Omega-6 polyunsaturated fatty acids (PUFA) come from liquid vegetable oils, including soybean oil, corn oil, and safflower oil. Fish that naturally contain the same ingredient, including salmon, trout, and herring, are higher in EPA and DHA than are lean fish (e.g., cod, haddock, catfish). According to scientists, limited evidence suggests an association between consumption of fatty acids in fish and reduced risks of mortality from cardiovascular disease for the general population. Such acids form a group of bioactive ingredients.
2. Folic acid is a water-soluble vitamin found in green vegetables. Its benefit for pregnant women is getting increasing attention from the government, academic, and industrial scientists, not to mention the general public. There are other claims about their positive effects on clinical disorders such as birth defects. This vitamin is a bioactive ingredient.
3. Green tea contains three chemicals: epicatechin (EC), epicatechin gallate (ECG), eigallocatechin

gallate (EGCG). The claims are that they can neutralize free radicals (responsible for aging) and may reduce risk of cancer. Some consider them as bioactive ingredients.

- The botanical ginkgo contains chemicals known as flavone glycosides. The claims are that they can improve memory and blood flow to the brain and may help cure Alzheimer's disease. Thus, these chemicals are considered by some to be bioactive ingredients from a nonfood substance.

The printed and electronic media have listed hundreds of these bioactive ingredients found in foods (plant and animal), spices, herbs, and so on. Industries engaged in food products, dietary supplements, and over-the-counter (OTC) drugs have expressed tremendous interests in these bioactive ingredients because of their potential ramifications in manufacturing products that have appeal to the consumers because of health implications.

Most popular bioactive ingredients are already sold in traditional foods, dietary supplements, and OTC drugs. We will exclude prescription drugs. All three categories are strictly controlled by the FDA. The industry must comply with all requirements governing labeling. At present, there are many items in food labeling regulated under federal and state agencies. Most of them are not familiar to consumers. The three most important items in food labeling regulated by the FDA and directly related to the consumers are the following:

- Name of the food, supplement, and drug
- Health claims
- Ingredients added

This brings us back to the two concepts mentioned earlier: functional foods and nutraceuticals. Scientifically, they have been used to mean the following, among many other definitions:

- Functional foods refer to "legal" conventional foods (natural or manufactured) that contain bioactive ingredients. One example is adding PUFA to a traditional TV dinner of roast beefs. Another example is adding EC, ECG, or EGCG to any instant tea.
- Nutraceuticals refer to adding a bioactive ingredient, especially one with nutritional value, to a dietary or an OTC drug, such as adding ginkgo or ginseng extracts. Such a product is claimed as a nutraceutical.

Assuming the new product complies with all requirements of the FDA, the logical question is: Can the product be marketed as a functional food or nutraceutical? The FDA is now undergoing the legal process to settle this issue. At the time of printing this book, the FDA is soliciting comments from the public. The FDA hopes that a dialogue among government, academia, industry, and the general public will facilitate the process to reach a final legal decision.

RESPONSIBILITIES OF HEALTH PERSONNEL

- Become an informed consumer. Use the new regulations to promote better health for yourself and family.
- Become an informed educator. Teach others to make healthy choices for a healthier lifestyle.

PROGRESS CHECK ON ACTIVITY 2

FOOD AND NUTRITION LABEL:

- One serving of macaroni and cheese equals _____.
- The number of calories you actually eat is determined by _____.
- Americans should limit the intake of these nutrients if they wish to reduce the risk of certain chronic diseases: _____, _____, _____, _____, or _____.
- Most Americans do not get enough of the following nutrients: _____, _____, _____, _____, and _____.
- The meaning of upper limits is _____.
- The %DV helps you to determine _____.

Functional foods and nutraceuticals:

- One meaning for functional foods is _____.
- One meaning for nutraceuticals is _____.

What is the potential health benefit offered by each of the following bioactive ingredient:

- Omega-6 PUFA: _____.
- Folic acid: _____.
- Green tea: _____.
- Ginkgo: _____.

Cholesterol education:

- What was the major thrust of ATP 1?

- What was the new added feature in ATP 2?

- In addition to retaining the core of ATP 1 and ATP 2, ATP 3 focused on yet another new feature. Name the new feature in ATP 3 and the three approaches used to implement it.

16. Define these acronyms:

- a. NIH _____
- b. CHD _____
- c. LDL _____
- d. HDL _____
- e. FDA _____
- f. NCEP _____
- g. ATP _____

REFERENCES

- Bendich, A. & Deckelbaum, R. J. (Eds.). (2005). *Preventive Nutrition: The Comprehensive Guide for Health Professionals* (3rd ed.). Totowa, NJ: Humana Press.
- Caballero, B., Allen, L., & Prentice, A. (Eds.). (2005). *Encyclopedia of Human Nutrition* (2nd ed.). Boston: Elsevier/Academic Press.
- Eastwood, M. (2003). *Principles of Human Nutrition* (2nd ed.). Malden, MA: Blackwell Science.
- Food and Agriculture Organization. (2001). Human energy requirements: Report of a Joint FAO/WHO/UNU expert consultation. Rome: Food and Agriculture Organization of the United Nations.
- Haas, E. M. & Levin, B. (2006). *Staying Healthy with Nutrition: The Complete Guide to Diet and Nutrition Medicine* (21st ed.). Berkeley, CA: Celestial Arts.
- Hargove, J. L. (2006). History of the calorie in nutrition. *Journal of Nutrition*, 136: 2957–2961.
- Hark, L. & Morrison, G. (Eds.). (2003). *Medical Nutrition and Disease* (3rd ed.). Malden, MA: Blackwell.
- Healthy People. www.healthypeople.gov.
- Klein, S. (2007). Waist circumference and cardiometabolic risk: A consensus statement from shaping america's health: Association for Weight Management and Obesity Prevention: NAASO, The Obesity Society: The American Society for Nutrition and The American Diabetes Association. *American Journal for Nutrition*, 85: 1197–1202.
- Knukowski, R. A. (2006). Consumers may not use or understand calorie labeling in restaurants. *Journal of American Dietetic Association*, 106: 917–920.
- Lane, H. W. (2002). Water and energy dietary requirements and endocrinology of human space flight. *Nutrition*, 18: 820–828.
- Mahan, L. K. & Escott-Stump, S. (Eds.). (2008). *Krause's Food and Nutrition Therapy* (12th ed.). Philadelphia: Elsevier Saunders.
- Mann, J. & Truswell, S., (Eds.). (2007). *Essentials of Human Nutrition* (3rd ed.). New York: Oxford University Press.
- Moore, M. C. (2005). *Pocket Guide to Nutritional Assessment and Care* (5th ed.). St. Louis, MO: Elsevier Mosby.
- MyPyramid food guide. www.mypyramid.gov.
- Ormachigui, A. (2002). Prepregnancy and pregnancy nutrition and its impact on women health. *Nutrition Reviews*, 60 (5, pt. 2): s64–s67.
- Otten, J. J., Pitz, J., Hellwig, & L. D. Meyers, (Eds.). (2006). *Dietary Reference Intakes: The Essential Guide to Nutrient Requirements*. Washington, DC: National Academy Press.
- Park, M. I. (2005). Gastric motor and sensory functions in obesity. *Obesity Research*, 13: 491–500.
- Payne-James, J. & Wicks, C. (2003). *Key Facts in Clinical Nutrition* (2nd ed.). London: Greenwich Medical Media.
- Sardesai, V. M. (2003). *Introduction to Clinical Nutrition* (2nd ed.). New York: Marcel Dekker.
- Shils, M. E. & Shike, M. (Eds.). (2006). *Modern Nutrition in Health and Disease* (10th ed.). Philadelphia: Lippincott, Williams & Wilkins.
- Stewart-Knox, B. (2005). Dietary strategies and update of reduced fat foods. *Journal of Human Nutrition and Dietetics*, 18: 121–128.
- Stover, P. J. (2006). Influence of human genetic variation on nutritional requirements. *American Journal of Clinical Nutrition*, 83: 436s–442s.
- Temple, N. J., Wilson, T., & Jacobs, D. R. (2006). *Nutrition Health: Strategies for Disease Prevention* (2nd ed.). Totowa, NJ: Humana Press.
- Thomas, B. & Bishop, J. (Eds.). (2007). *Manual of Dietetic Practice* (4th ed.). Ames, IA: Blackwell.
- United States Department of Health and Human Services and United States Department of Agriculture. (2005). *Dietary Guidelines for Americans* (6th ed.). Washington, DC: Government Publishing Office.
- U.S. National Cholesterol Education Program (NCEP), National Heart, Lung, and Blood Institute (NHLBI). (2001). Third report of the expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). www.NIH.gov.
- Webster-Gandy, J., Madden, A., & Holdworth, M. (Eds.). (2006). *Oxford Handbook of Nutrition and Dietetics*. Oxford, England: Oxford University Press.

