

Chapter 2

Tools of a Healthy Diet

Overview

Chapter 2 provides students with the science behind current nutrition recommendations for North Americans. The components of the Dietary Reference Intakes are defined, including Estimated Average Requirements, Recommended Dietary Allowances, Adequate Intakes, Tolerable Upper Intake Levels, and Estimated Energy Requirements. The required and optional elements of food labels are also discussed. The text defines Daily Values as they relate to DRIs and also examines the various nutrition claims allowed on food labels. The development and utility of nutrient databases are presented. Finally, the Dietary Guidelines for Americans and MyPlate are presented as sound nutrition advice based on the latest scientific research.

Key Terms

Adequate Intake	Empty-calorie food	Qualified health claim
Adequate Macronutrient Distribution Range	Energy density	Psyllium
Daily Reference Value	Estimated Average Requirement	Recommended Dietary Allowance
Daily Value	Estimated Energy Requirement	Reference Daily Intakes
Dietary Guidelines for Americans	Exchange system	Structure/function claim
Dietary Reference Intakes	Health claim	Tolerable Upper Intake Level
Discretionary calories	MyPlate	
	Nutrient content claim	
	Nutrient density	

Student Learning Outcomes

After studying this chapter, you will be able to:

- 2.1 Explain the purpose of the Dietary Reference Intake (DRI) and its components (Estimated Average Requirements, Recommended Dietary Allowances, Adequate Intakes, Upper Levels, Estimated Energy Requirements, and Acceptable Macronutrient Distribution Ranges).
- 2.2 Compare the Daily Values to the Dietary Reference Intakes and explain how they are used on Nutrition Facts panels.
- 2.3 Describe Nutrition Facts panels and the claims permitted on food packages.
- 2.4 Describe the uses and limitations of the data in nutrient databases.
- 2.5 Discuss the 2010 Dietary Guidelines for Americans and the diseases they are intended to prevent or minimize.
- 2.6 Discuss the MyPlate food groupings and plan a diet using this tool.
- 2.7 Develop a healthy eating plan based on the concepts of variety, balance, moderation, nutrient density, and energy density.

Lecture Outline

- 2.1 Dietary Reference Intakes (DRIs)
 - A. General
 1. Food and Nutrition Board formed in 1941 to establish the first dietary standards
 - a. Evaluate nutrient intake of population
 - b. Plan agricultural production
 2. Dietary standards are periodically updated to reflect latest research
 3. DRIs were established by scientists from the United States and Canada
 4. DRIs vary by life stage and gender
 5. Recommendations should be applied to average dietary intake
 6. Figure 2-1 illustrates the relationship of the DRIs to each other
 - B. Estimated Average Requirements (EARs)
 1. Daily nutrient intake amounts that are estimated to meet the needs of half of the people in a certain life stage
 2. Only set for a nutrient when functional markers are available to evaluate the effects of nutrient status on physiological function; currently set for 17 nutrients
 3. EARs are adjusted to account for digestibility and absorption
 4. Used to evaluate the adequacy of diets of groups, not individuals
 - C. Recommended Dietary Allowances (RDAs)
 1. Daily nutrient intake amounts sufficient to meet the needs of nearly all individuals (97 - 98%) in a life stage

2. Based on a multiple of the EAR for a nutrient (generally, $RDA = EAR \times 1.2$); can only be set for nutrients with established EARs
 3. Considers nutrient's ability to prevent chronic disease in addition to ability to prevent deficiency
 4. Goal for average daily intake
 5. If average intake is habitually lower than RDA (especially lower than EAR), risk for nutrient deficiency increases
- D. Adequate Intakes (AIs)
1. Daily intake amounts set for nutrients for which there are insufficient research data to establish an EAR; currently set for essential fatty acids, fiber, 9 vitamins and minerals
 2. Based on observed or experimentally determined estimates of average nutrient intakes that appear to maintain a defined nutritional state in a specific life-stage group
 3. Should cover needs of more than 97 - 98% of individuals in a life-stage group
 4. Goal for average daily intake
- E. Tolerable Upper Intake Levels (Upper Levels, or ULs)
1. Maximum daily intake amounts of nutrients that are not likely to cause adverse health effects in 97 - 98% of individuals in a life-stage group
 2. Applies to chronic daily intake; set with a large margin of safety
 3. For most nutrients, ULs are set based on combined intake of food, water, supplements, and fortified foods; refers only to nonfood sources of niacin, magnesium, zinc, and nickel
- F. Estimated Energy Requirements (EERs)
1. Average daily energy intake needs for each life-stage group; no margin of safety
 2. Only serve as estimates because actual EER depends on energy expenditure
 3. Set to achieve and maintain a healthy weight
- G. Adequate Macronutrient Distribution Ranges (AMDRs)
1. Range of intake, as a percentage of energy, associated with good health and reduced risk of chronic diseases while providing for recommended intakes of essential nutrients
 2. Established for carbohydrate, protein, fat, and essential fatty acids
- H. Appropriate Uses of the DRIs
1. Intended mainly for diet planning
 2. Apply to healthy people; undernutrition and some diseases may increase nutrient requirements
- I. Putting the DRIs into Action to Determine the Nutrient Density of Foods
1. Determining nutrient density
 - a. Divide the amount of a nutrient in a serving of food by daily recommended intake
 - b. Divide the calories per serving by daily calorie needs
 - c. A food is nutrient dense if it provides a greater contribution to nutrient needs than calorie needs

2. Easy comparison for individual nutrients, but overall dietary nutrient density is difficult to describe; some experts recommend averaging nutrient density for several key nutrients
3. Empty-calorie foods provide many calories but few nutrients

2.2 Daily Values (DVs)

A. General

1. Generic standards developed by FDA to use on food labels because DRIs are age- and gender-specific
2. Set for 4 groups:
 - a. Infants
 - b. Toddlers
 - c. Pregnant or lactating women
 - d. People over 4 years of age - appear on all food labels except those specifically marketed for infants, toddlers, or pregnant or lactating women
3. Based on combination of Reference Daily Intakes and Daily Reference Values
4. Canadian Daily Values are discussed in Appendix D

B. Reference Daily Intakes (RDIs)

1. Set for vitamins and most minerals
2. Usually set at the highest value for any life-stage group from 1968 RDAs
3. Current DVs tend to be slightly higher than RDAs for most nutrients; should be revised to reflect latest scientific evidence
4. Table 2-2 compares Daily Values with current RDAs and other nutrient standards

C. Daily Reference Values (DRVs)

1. Standards for energy-yielding nutrients, cholesterol, sodium, and potassium
2. Based on daily calorie intake, using 2000 kcal/d as reference for calculation
3. Larger food labels may list DRVs for 2500 kcal/d as well
4. Calculations based on:
 - a. Fat: 30% of kcal
 - b. Saturated fat: 10% of kcal
 - c. Carbohydrate: 60% of kcal
 - d. Protein: 10% of kcal
 - e. Fiber: 11.5 g/1000 kcal

D. Putting the Daily Values into Action on Nutrition Facts Panels

1. Required information on food labels:
 - a. Product name
 - b. Name and address of manufacturer
 - c. Amount of product in package
 - d. Ingredients listed in descending order by weight
 - e. Ingredients that are common allergens
 - f. Nutrition Facts panel
 - g. Country of origin of certain products
2. Food labeling is regulated by FDA in the United States

3. Nutrition Facts panel
 - a. Presents information for a single serving
 - i. Serving size is specified by FDA for consistency
 - ii. Serving size may differ from MyPlate recommendations
 - b. Required
 - i. Total kcal
 - ii. Kcal from fat
 - iii. Total fat
 - iv. Saturated fat
 - v. *Trans* fat
 - vi. Cholesterol
 - vii. Sodium
 - viii. Total carbohydrate
 - ix. Fiber
 - x. Sugars
 - xi. Protein
 - xii. Vitamin A
 - xiii. Vitamin C
 - xiv. Calcium
 - xv. Iron
 - c. Listing of other nutrients is optional
 - d. Nutrient must be listed on Nutrition Facts panel if label makes a claim about its health benefits or if food is fortified with the nutrient
 - e. % DV for protein is not mandatory for products marketed for people 4 years of age and older because protein deficiency is not a public health concern in the United States; such listing requires analysis for protein quality
4. Uses of DVs
 - a. Determine how a particular food fits into an overall diet
 - b. Make necessary adjustments for nutrients based on calorie intake
5. Nutrients listed on Nutrition Facts panel are those of greatest public health concern in North America
 - a. Keep intake below 100% DV for
 - i. Total fat
 - ii. Saturated fat
 - iii. Cholesterol
 - iv. Sodium
 - b. Plan to achieve 100% DV for
 - i. Fiber
 - ii. Vitamin A
 - iii. Vitamin C
 - iv. Iron
 - v. Calcium

6. Nutrition Facts panel may include a footnote to show intake recommendations for fat, cholesterol, sodium, carbohydrate, and fiber for 2000- (and sometimes 2500-) kcal diet
7. Figure 2-4 highlights prominent features of the Nutrition Facts panel
8. Claims on Food Labels
 - a. FDA permits and regulates specific label claims
 - b. Nutrient content claims: describe nutrients in food (see Table 2-3)
 - i. Calories
 - ii. Total fat
 - iii. Saturated fat
 - iv. Cholesterol
 - v. Sugar
 - vi. Sodium
 - vii. Fiber
 - c. Health claims: describe a relationship between a disease and a nutrient, food, or food constituent
 - i. Calcium/osteoporosis
 - ii. Low sodium/hypertension and stroke
 - iii. Low total fat/cancer
 - iv. Low-fat, fiber-containing grain products, fruits, and/or vegetables/cancer
 - v. Low saturated fat and cholesterol/cardiovascular disease
 - vi. Low in saturated fat and cholesterol, rich in fruits, vegetables and grains with soluble fiber/cardiovascular disease
 - vii. Low saturated fat, low cholesterol, 25 g/d soy protein/cardiovascular disease
 - viii. Foods with plant stanols and sterols/cardiovascular disease
 - ix. Folate/brain or spinal cord defects
 - x. Sugar alcohols/tooth decay
 - d. Conditions for health claims
 - i. Must use “may” or “might”
 - ii. Must be a good source of fiber, protein, vitamin A, vitamin C, calcium, or iron before fortification
 - iii. Cannot contain more than 13 g fat, 4 g saturated fat, 60 mg cholesterol, or 480 mg sodium
 - e. Qualified health claims
 - i. Based on incomplete scientific knowledge
 - ii. Must include disclaimer
 - iii. Food must meet definitions of “healthy” as described in Table 2-3
 - f. Structure/function claims: describe how a nutrient affects human body structure or function
 - i. Do not focus on disease risk reduction
 - ii. Not approved or authorized by FDA

iii. Self-policed by food manufacturers

2.3 Nutrient Composition of Foods

A. General

1. Compare nutrient intake to dietary standards
2. Determine nutrient density and energy density of foods
3. Nutrient values in databases are average values of analyzed samples, but many factors may affect actual values
 - a. Farming conditions
 - b. Maturity and ripeness of plant foods
 - c. Food processing
 - d. Shipping conditions
 - e. Storage time
 - f. Cooking processes
 - g. Absorption

B. Putting Nutrient Databases into Action to Determine Energy Density and Dietary Intake

1. Energy density compares a food's calorie content per gram weight of the food
 - a. Fiber and water content decrease energy density (e.g., fruits, vegetables)
 - b. Eating foods with low energy density can assist with weight control
 - c. Eating foods with high energy density can help people with poor appetites to maintain or gain weight
 - d. Table 2-4 lists energy density of common foods
2. Analysis of personal dietary intake may aid in improving food choices

2.4 Dietary Guidelines for Americans

A. General

1. Published by USDA and DHHS every 5 years
2. Foundation of government's nutrition policy and education
3. Designed to meet nutrient needs while reducing the risk of obesity, hypertension, cardiovascular disease, type 2 diabetes, osteoporosis, alcoholism, and foodborne illness
4. Guide government nutrition programs (e.g., WIC), research, food labeling, and nutrition education and promotion (e.g., MyPlate)
5. Based on meeting nutrient needs with food, although dietary supplements and fortified foods may be warranted in some people

B. Nutrition-related objectives

1. Balancing calories to maintain weight
 - a. Prevent and/or reduce overweight and obesity through improved eating and physical activity behaviors.
 - b. Control total calorie intake to manage body weight. For people who are overweight or obese, this will mean consuming fewer calories from foods and beverages.
 - c. Increase physical activity and reduce time spent in sedentary behaviors.

- d. Maintain appropriate calorie balance during each stage of life—childhood, adolescence, adulthood, pregnancy and breastfeeding, and older age.
2. Foods and food components to reduce
 - a. Reduce daily sodium intake to less than 2,300 milligrams (mg) and further reduce intake to 1,500 mg among persons who are 51 and older and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease. The 1,500 mg recommendation applies to about half of the U.S. population, including children, and the majority of adults.
 - b. Consume less than 10 percent of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids.
 - c. Consume less than 300 mg per day of dietary cholesterol.
 - d. Keep *trans* fatty acid consumption as low as possible by limiting foods that contain synthetic sources of *trans* fats, such as partially hydrogenated oils, and by limiting other solid fats.
 - e. Reduce the intake of calories from solid fats and added sugars.
 - f. Limit the consumption of foods that contain refined grains, especially refined grain foods that contain solid fats, added sugars, and sodium.
 - g. 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.
 3. Foods and nutrients to increase

Individuals should meet the following recommendations as part of a healthy eating pattern while staying within their calorie needs.

 - a. Increase vegetable and fruit intake.
 - b. Eat a variety of vegetables, especially dark-green and red and orange vegetables and beans and peas.
 - c. Consume at least half of all grains as whole grains. Increase whole-grain intake by replacing refined grains with whole grains.
 - d. Increase intake of fat-free or low-fat milk and milk products, such as milk, yogurt, cheese, or fortified soy beverages.⁶
 - e. Choose a variety of protein foods, which include seafood, lean meat and poultry, eggs, beans and peas, soy products, and unsalted nuts and seeds.
 - f. Increase the amount and variety of seafood consumed by choosing seafood in place of some meat and poultry.
 - g. Replace protein foods that are higher in solid fats with choices that are lower in solid fats and calories and/or are sources of oils.
 - h. Use oils to replace solid fats where possible.
 - i. Choose foods that provide more potassium, dietary fiber, calcium, and vitamin D, which are nutrients of concern in American diets. These foods include vegetables, fruits, whole grains, and milk and milk products.
 4. Building healthy eating patterns

- a. Select an eating pattern that meets nutrient needs over time at an appropriate calorie level To reduce risk for chronic disease in adulthood, ≥ 30 min/d of moderate-intensity physical activity
 - b. Account for all foods and beverages consumed and assess how they fit within a total healthy eating pattern.
 - c. Follow food safety recommendations when preparing and eating foods to reduce the risk of foodborne illnesses.
- C. Putting the Dietary Guidelines into Action
- 1. Table 2-5 offers suggestions for implementing recommended changes based on the Dietary Guidelines
 - 2. Control cost of healthy eating by choosing canned and frozen fruits and vegetables and non-fat dry milk
 - 3. Based on current health status and family medical history, identify changes to incorporate into your lifestyle; work on one change at a time
 - 4. Effects of positive changes may not be immediately evident; may require help from RD or MD

2.5 MyPlate

- A. General
- 1. Translates nutrition science into practical terms
 - 2. Key elements
 - a. Balancing calories
 - i. Enjoy your food, but eat less
 - ii. Avoid oversized portions
 - b. Foods to increase
 - i. Make half your plate fruits and vegetables
 - ii. Make at least half your grains whole grains
 - iii. Switch to fat-free or low-fat (1%) milk
 - c. Foods to reduce
 - i. Compare sodium in foods like soup, bread, and frozen meals and choose the foods with lower numbers
 - ii. Drink water instead of sugary drinks
 - 3. Interactive technology available at www.choosemyplate.gov
 - a. Daily Food Plan
 - b. Food Tracker
 - c. MyFoodapedia
 - d. Food Planner
 - 4. Table 2-7 presents MyPlate food serving sizes
 - a. Grains: 1 ounce equivalents
 - i. 1 slice of bread
 - ii. 1 c ready-to-eat breakfast cereal
 - iii. $\frac{1}{2}$ c cooked cereal, rice, or pasta
 - iv. 1 mini bagel or small tortilla^[1]_{SEP}
 - v. $\frac{1}{2}$ muffin^[1]_{SEP}

- vi. 3 c popcorn
- b. Vegetable group: 1 cup
 - i. 1 c raw or cooked vegetables
 - ii. 1 c vegetable juice
 - iii. 2 c raw leafy greens
- c. Fruits group: 1 cup
 - i. 1 c fruit
 - ii. 1 c 100% fruit juice
 - iii. ½ c dried fruit
- d. Milk group: 1 cup
 - i. 1 c of milk, yogurt, or calcium-fortified soymilk
 - ii. 1 c frozen yogurt or pudding made with milk
 - iii. 1 ½ c ice cream
 - iv. 1 ½ oz of natural cheese
 - v. 2 oz of processed cheese
- e. Meat & Beans group: 1 ounce equivalent
 - i. 1 oz meat, poultry, or fish
 - ii. 1 egg
 - iii. 1 T peanut butter or hummus
 - iv. ¼ c cooked beans
 - v. ½ oz nuts or seeds
- f. Oils
 - i. 1 t vegetable, fish oil or oil-rich foods (e.g., mayonnaise, soft margarine)

B. Putting MyPlate into Action

1. Estimate energy needs
2. Use Table 2-6 to formulate meal pattern
3. Use Table 2-7 to determine portion sizes that fit into meal pattern
4. Key points
 - a. No one food is required for good nutrition
 - b. No one food group provides all essential nutrients in adequate amounts
 - c. Foods within a group may vary widely in nutrient and energy content
 - d. Use Figure 2-9 to estimate portion sizes
 - e. Variety is the key to obtaining optimal nutrition from each food group
5. Helpful hints for a nutritious diet
 - a. Grains
 - i. Make half your grains whole
 - ii. Daily serving of whole-grain, ready-to-eat breakfast cereal
 - iii. Limit added fats and sugars
 - b. Vegetables
 - i. Variety ensures optimal nutrients and phytochemicals
 - c. Fruits
 - i. Variety ensures optimal nutrients and phytochemicals

- ii. Limit fruit juice to half of recommended fruit servings to ensure adequate fiber intake
 - iii. Select 100% juices rather than punches, fruit-flavored soft drinks, etc. to limit added sugars
 - d. Milk
 - i. Choose primarily low-fat and fat-free items
 - ii. Limit milk desserts and chocolate milk to reduce added sugars
 - e. Meat and beans
 - i. Limit portion sizes of meats
 - ii. Choose lean meats, poultry without skin, and beans to limit fat and cholesterol intake
 - iii. Avoid fried foods and trim visible fat
 - iv. Include plant sources of protein to boost vitamin E, mineral, and fiber intake
 - f. Oils
 - i. Include some plant oils on a daily basis
 - ii. Eat fish twice per week
 - g. Empty Calories
 - i. Foods in each food group that are high solid fats and/or added sugars but contain few or no nutrients
 - ii. Keep consumption at the level that matches calorie needs
- C. Rating Your Current Diet
 - 1. Regular comparison of personal diet to MyPlate recommendations is a simple way to evaluate your overall diet
 - 2. Use Food Tracker program at www.choosemyplate.gov
 - 3. Even small diet and exercise changes can have positive results

2.6 Global Perspective: Front of the Package Labeling

- A. Nutrition Facts panel provides U.S. consumers with accurate information about a food's nutrient and calorie content
- B. However, food industry has tried to condense nutrition labels into nutrition symbols (e.g. check marks, traffic lights, ratings) that are placed on the front of food packages or supermarket shelves
 - 1. Consumers are less likely to check nutritional labels when a symbol appears on the front of food packages
 - 2. Not regulated by FDA
 - 3. Lack of consistency
 - 4. No knowledge of criteria used to calculate ratings
- C. FDA is working with the food industry to develop uniform eligibility criteria for front-of-package food labels
 - 1. Create easy-to-understand labels that consumers can trust

2.7 Expert Perspective: Menu Labeling

- A. Consumers have the right to know the nutrition content of foods

- B. Restaurant food is now a significant portion of the food we eat
- C. Evidence indicates that stating calorie content on menus can lead to dietary improvements
 - 1. Fast food customers who reported seeing calorie information at the point of purchase ordered meals with fewer calories
 - 2. When calorie information was included in menus, customers ordered lower-calorie dinners for themselves and their children
- D. www.menulabeling.org