Wardlaw's Perspectives in Nutrition A Functional Approach 2nd edition Byrd-Bredbenner Solutions Manual

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Wardlaw Functional Nutrition, 2/e

Answers to Study Questions

Chapter 1

Answer Key:

1.b
2.a
3.a
4.b
5.b
6.b
7.b
8.c
9.a
10.a
11.d
12.a
13.a
14.a
15.b
16.refer to Section 1.1
17.refer to Section 1.2
18.refer to Section 1.3
19.refer to Section 1.4
20.refer to Clinical Perspective
21.refer to Section 1.5
22.refer to Section 1.5
23.refer to Section 1.6
24.refer to Global Perspective
25.refer to Expert Perspective
26.refer to Clinical Perspective

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Chapter 1
The Science of Nutrition

Overview

In Chapter 1, students will be introduced to the basic terminology of nutrition, such as the six classes of nutrients. Measurement of food energy and the physiological fuel values for various macronutrients are presented. Typical dietary patterns of North Americans are discussed in relation to recommendations of health authorities of the United States and Canada. Students will learn to assess nutritional health status, including analyzing background factors, anthropometrics, biochemical measurements, clinical evaluations, dietary assessment, and environmental influences. Overall health and disease risk are presented as the result of the complex interplay of genetics, lifestyle choices (including nutrition), and environment. Methods of nutrition research are discussed, including several interesting historical examples that contributed to the determination of today's nutrient recommendations. Finally, students will learn how to evaluate nutrition-related products and advice as scientists and educated consumers.

Learning Objectives

1. Define the terms nutrition, carbohydrates, proteins, lipids (fats and oils), vitamins, minerals, water, and calories.
2. Use the physiological fuel values of energy-yielding nutrients to determine the total energy content (calories) in a food or diet.
3. Describe the major characteristics of the North American diet and the food behaviors that often need improvement.
4. Describe the factors that affect our food choices.
5. Discuss the components and limitations of nutritional assessment.
6. List the attributes of lifestyles that are consistent with Healthy People 2020 goals and those that contribute to the leading causes of death in North America.
7. Describe the role of genetics in the development of nutrition-related diseases.
8. Explain how the scientific method is used in developing hypotheses and theories in the field of nutrition.
9. Identify reliable sources of nutrition information.

Teaching Strategies, Activities, Demonstrations, and Assignments

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1. Use the **Take Action "Why you Eat What You Do"** activity in Chapter 1. Have the students follow the instructions, and use it as an object for class discussion regarding their eating habits.

   A. Make sure they follow the assignment instructions closely because this one-day food record can be used for future activities. They should record all foods and beverages consumed and the serving sizes, in addition to the other data. To allow them to get a sense of serving sizes, bring in measuring cups and devices, and actually illustrate what 1 cup of cereal looks like in a bowl, as well as the serving sizes of other foods. Encourage the class to eat as typical as possible, letting them know that complex mixtures are more challenging to enter and may need to be entered as individual food items. It can be difficult to break these complex mixtures into individual ingredients for analysis.
   B. Even though this is an end-of-the-chapter activity, it would be best if the food record were completed during the first week of class, so it can be used for subsequent activities.
   C. Instructors could require a three-day food record so it can be used for future activities. The data, at a later time, can be averaged for the three days to assess nutrient intake.

2. Have students list the various kinds of restaurants in the campus area and tally how often they have frequented them. Do they use college or university food service? How often do they use vending machines? Why do they make the choices they do? What changes would they like to see made in the food and food service choices available?

3. Have students discuss their parents' food habits, both good and bad. How are the students' food habits similar to their parents'? How have their parents' food habits and attitudes affected their eating habits?

4. During the first couple of lectures, have students bring examples of nutrition topics in the popular press to class. Group the articles by syllabus topic and revisit them after students have read the appropriate chapter in the text. Have students form small groups to discuss and evaluate the topics in terms of what they learned about nutrition since the beginning of the course.

5. Have students make a list of five questions they have about food and nutrition. Collect the questions. The last week of the course hand back the questions. Have them divide up into groups and discuss whether they can answer their own questions. If some are left unanswered let them discuss possible answers in their groups. This will be a good way to review course material.

6. Have the students write down what they think is good about their diet and where they think they need improvements. Ask the students to write down any nutritional goals that they may have, what they hope to learn from the course, and why they are taking the course. Students should retain this assignment to review at the end of the semester. Did they make any changes to their diet? Are they making progress towards their nutritional goals? What did they learn from the course that is most valuable and how will they continue to apply nutrition information they learned from the course?

7. Have students review a scientific research study. Divide the students up into small groups, giving each group a different study to review. Have the identify the steps in the scientific method for their article, including the initial observation, the hypothesis of the study, the study design used, what were the results and what were any limitations or follow-up recommendations made, and finally did they accept or reject the hypothesis. Have each group share their findings with the class.

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8. Prior to class, have students complete the Take Action "Create Your Family Tree for Health-Related Concerns." Ask students to volunteer what they learned about their risk for chronic nutrition-related diseases. Have students form into small groups based on their risk for, or interest in, heart disease, cancer, diabetes, obesity, and osteoporosis. Have the groups list the lifestyle and nutrition factors that they think may affect these diseases. Discuss now or revisit these later in the semester as you discuss each topic.

Lecture Outline

1.1 Nutrition Overview

- A. Nutrients
  - 1. General
    - a. Nutrition: the science of food; the nutrients and the substances therein; their action, interaction, and balance in relation to health and disease; and the process by which the organism ingests, digests, absorbs, transports, utilizes, and excretes food substances
    - b. Nutrients: substances essential for health that the body cannot make or makes in quantities too small to support life
      - i. Specific biological function
      - ii. Removal from diet leads to decline in human biological function
      - iii. Returning before permanent damage occurs restores impaired biological functions
    - c. Categorizing nutrients by function
      - i. Primarily provide energy (most carbohydrates, proteins, most lipids)
      - ii. Promote growth and development (proteins, lipids, some vitamins, some minerals, water)
      - iii. Regulate body processes (proteins, some lipids, some vitamins, some minerals, water)
    - d. Categorizing nutrients by needs
      - i. Macronutrients: needed in large quantities (carbohydrates, proteins, lipids, water)
      - ii. Micronutrients: needed in small quantities (vitamins, minerals)
  - 2. Carbohydrates
    - a. Composed of carbon, hydrogen, and oxygen
    - b. Primary dietary sources: fruits, vegetables, grains, beans
    - c. Main types
      - i. Simple carbohydrates (sugars): sucrose, glucose
      - ii. Complex carbohydrates (polysaccharides): starch, glycogen, fiber
    - d. Glucose is the major source of energy for most cells; provides 4 kcal/g
    - e. Body can make glucose from proteins

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3. Lipids
    a. Composed of carbon, hydrogen, and oxygen
    b. Fats are solid at room temperature; oils are liquid at room temperature
    c. Yield more energy than carbohydrates; provide 9 kcal/g
    d. Insoluble in water; dissolve in certain organic solvents
    e. Chemistry of lipids
        i. Triglycerides (primary form of lipids in food and the body): 3 fatty acids attached to glycerol
        ii. Fatty acid: long chains of carbon flanked by hydrogen with acid group at end opposite glycerol
        iii. Saturated: solid at room temperature; predominate in animal fats; dietary raises blood cholesterol, can lead to cardiovascular disease
        iv. Unsaturated: liquid at room temperature; predominate in plant oils; healthier than saturated fats
        v. Essential fatty acids: linoleic and alpha-linolenic acid; must be supplied by our diets; can be found in vegetable oils and fish; important roles in the body regulate nerve transmission, blood pressure, and act as structural components of cell walls
        vi. *Trans* fatty acids: unsaturated fats that have been processed to change their structure from *cis* form to *trans* form; primarily found in deep-fried foods; dietary intake should be minimized because they pose a health risk
4. Proteins
    a. Composed of carbon, oxygen, hydrogen, and nitrogen
    b. Main structural components in the body
        i. Bone
        ii. Muscle
        iii. Blood
        iv. Cell membranes
        v. Enzymes
        vi. Immune factors
    c. Provide 4 kcal/g
    d. Formed by bonding of amino acids
5. Vitamins
    a. Enable chemical reactions to occur in the body
    b. Provide no energy, but help release energy trapped in carbohydrates, lipids, and proteins
    c. 13 vitamins, 2 groups:
        i. Fat-soluble (A, D, E, K)
        -More likely than water-soluble vitamins to cause toxicity
        ii. Water-soluble (thiamin, riboflavin, niacin, B-6, pantothenic acid, biotin, folate, B-12, C)

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-More susceptible than fat-soluble vitamins to destruction by cooking
-More readily excreted than fat-soluble vitamins

6. Minerals
    a. Simple, inorganic structures
    b. Not destroyed by cooking
    c. Yield no energy
    d. Roles
        i. Nervous system function
        ii. Skeletal system structure
        iii. Water balance
    e. Major minerals: needed daily in gram amounts (e.g., sodium, potassium, chloride, calcium, phosphorus)
    f. Trace minerals: needed daily in amounts of less than 100 mg (e.g., iron, zinc, copper, selenium)
7. Water
    a. Macronutrient needed in largest amounts by the body
    b. Roles
        i. Lubricant
        ii. Solvent
        iii. Transport nutrients
        iv. Temperature regulation
    c. Sources
        i. Dietary intake: food and beverages
        ii. By-product of metabolism

B. Phytochemicals and Zoochemicals
1. Phytochemicals: physiologically active compounds found in plants (fruits, vegetables, legumes, and whole grains)
2. Zoochemicals: physiologically active compounds found in foods of animal origin
3. Neither considered to be essential; both have potential health benefits
4. Dietary sources are superior to supplemental sources
5. Table 1-3 lists examples of phytochemical and zoochemicals under study

C. Expert Perspective from the Field: Functional Foods
1. Foods rich in phytochemicals and zoochemicals can be referred to as functional foods
    a. Provides health benefits beyond those supplied by traditional nutrients
    b. May decrease disease risk and/or promote optimal health
2. Four categories of functional foods
    a. Conventional foods: unmodified whole foods
    b. Modified foods: fortified, enriched, or enhanced
    c. Medical foods: food, formula, or supplement used under medical supervision to manage a health condition
    d. Special dietary use foods: foods that help meet a special dietary need

1.2 Energy Sources and Uses

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A. Uses
   1. Build new compounds
   2. Perform muscular movements
   3. Perform nerve transmission
   4. Maintain ion balance within cells

B. Calorie: amount of heat energy required to raise the temperature of 1 g of water 1°C

C. Kilocalories: amount of heat energy required to raise the temperature of 1000 g of water 1°C; more appropriate unit of measurement for energy in food

D. Physiological fuel values
   1. Carbohydrates (4 kcal/g)
   2. Fats (9 kcal/g)
   3. Proteins (4 kcal/g)
   4. Alcohol (7 kcal/g); not essential

1.3 The North American Diet

A. General
   1. U.S. Department of Health and Human Services' National Health and Nutrition Examination Survey (NHANES) and surveys by Health Canada and Agriculture and Agrifood Canada collect information on North American diets
   2. Typical macronutrient distribution of North American diets
      a. 16% protein
      b. 50% carbohydrates
      c. 33% fats
   3. Issues with North American diet
      a. Too many calories are being consumed
      b. Too much protein and fat from animal sources; too little from plants
      c. Too many carbohydrates from simple sugars; too few from complex carbohydrates

   4. Recommendations for Improvement
      a. Increase intake of vitamin A, vitamin E, iron, potassium, and calcium
      b. Decrease intake of sodium
      c. Moderate intake of sugary soft drinks and fatty foods
      d. Eat more fruits, vegetables, whole-grain breads, and reduced-fat dairy

B. What Influences Our Food Choices?
   1. Hunger: physical need for food
   2. Appetite: psychological desire to eat
   3. Appetite depends on many factors
      a. Flavor, texture, and appearance preferences
      b. Culture
      c. Lifestyle
      d. Routines and habits
      e. Food cost and availability
      f. Environment
      g. Food marketing

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h. Health and nutrition concerns, knowledge, and beliefs

1.4 Nutritional Health Status

A. General

1. Desirable (optimal) nutritional status: body tissues have enough of a nutrient to support normal functions as well as build and maintain surplus stores to be used in times of increased need
2. Malnutrition
   a. Undernutrition: nutrient intake does not meet nutrient needs, causing surplus stores to be used
      i. Subclinical nutrient deficiency: nutrient stores are depleted, but person exhibits no overt signs or symptoms of deficiency
      ii. Clinical nutrient deficiency: signs and symptoms of nutrient deficiency become outwardly apparent
      iii. Sign: feature that can be observed (e.g., flaky skin)
      iv. Symptom: change in body function that may not be apparent to health care provider (e.g., fatigue, ache)
   b. Overnutrition: nutrient intake exceeds nutrient needs
      i. Most common type in industrialized nations: excess energy intake

B. Health Objectives for the U.S. for the Year 2020

1. *Healthy People 2020*, issued in 2010 by U.S. Department of Health and Human Services, Public Health Service; Report that provides science-based, 10-year national goals for improving the health of all Americans
2. Main objective: help all people attain high-quality, longer lives free of preventable disease, disability, injury, and premature death
3. Table 1-5 lists nutrition-related objectives from *Healthy People 2020*

C. Assessing Nutritional Status

1. Background factors
   a. Medical history
   b. Family medical history
2. Nutritional factors
   a. Anthropometric assessment: measurement of aspects of the body (height, weight, skinfold thickness, arm muscle circumference, body composition)
   b. Biochemical assessments: measurement of concentrations of nutrients and nutrient by-products in blood, urine, and feces or measurement of enzyme activities
   c. Clinical assessments: physical evidence of diet-related diseases
   d. Dietary assessments: food frequency, food history, typical intake
   e. Environmental assessment: education and economic background

D. Limitations of Nutritional Assessment

1. Many signs and symptoms are not specific
2. Signs and symptoms or clinical evidence of poor nutritional health may be slow to develop

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E. Importance of Being Concerned about Your Nutritional Status
   1. More likely to enjoy a long, vigorous life
   2. Less likely to develop nutrition-related health problems
   3. Figure 1-8 summarizes health problems associated with poor dietary habits

F. Getting Nutrition-Related Advice: The Nutrition Care Process
   1. Registered dietitians or physicians
   2. They should:
      a. Conduct a nutritional assessment
      b. Diagnose nutrition-related problem
      c. Create an intervention
      d. Monitor and evaluate progress

G. Clinical Perspective: Genetics and Nutrition
   1. General
      a. Our genes, as well as our lifestyle and diet, affect our health.
      b. DNA directs how the body uses the nutrients consumed.
      c. Genes dictate how nutrients will be transformed and reassembled into body structures and compounds.
      d. Genes direct the growth, development, and maintenance of the cells.
      e. Individual genetic risks of a disease are an important factor in determining whether that individual develops a disease.
      f. Mutation: a change in the sequence of the DNA that may increase the risk of certain diseases.
   2. Nutritional Diseases with a Genetic Link
      a. Family history is considered one of the most important risk factors in the development of many nutrition-related diseases:
         i. Diabetes (types 1 and 2)
         ii. Some types of cancer (e.g., colon, prostate, breast)
         iii. Osteoporosis
         iv. Cardiovascular disease (cholesterol metabolism, salt sensitivity)
         v. Hypertension
         vi. Obesity
      b. Heredity ≠ destiny; individuals have some control over the expression of their genes
   3. Your Genetic Profile
      a. By recognizing your potential for developing a disease, you can avoid behaviors that contribute to it
      b. Construct a family tree of illnesses and deaths (genogram)
         i. High risk: more than one first-degree relative with disease, particularly if occurred before age 50 or 60
   4. Gene Therapy
      a. Scientists are developing therapies to correct damaged D N A that causes some genetic disorders.
      b. Gene therapy is not yet approved by the F D A.
   5. Genetic Testing

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a. Can be helpful for families afflicted by certain diseases
b. Recommended to have a genetic counselor evaluate your risk first
c. May be done with or without your physician (at home testing is available)
d. Limitations
i. Not possible to identify all people at genetic risk for diseases
ii. Genetic susceptibility does not guarantee development of a disease
iii. No way to cure a genetic alteration; can only treat health problems

1.5 Using Scientific Research to Determine Nutrient Needs

A. General
1. Research has set the foundation for nutrition.
2. Developed through the use of the Scientific Method
a. Observation must be made.
b. Hypothesis is suggested.
c. Controlled research experiments are conducted.
d. Findings are evaluated by other scientists and published.
e. Follow-up experiments are conducted to confirm findings.
f. Hypothesis is rejected or accepted.

B. Laboratory Animal Experiments
1. Human experiments are most convincing, but not always feasible or ethical
2. Animal model: disease in laboratory animals that mimics human disease

C. Human Experiments
1. Must be approved by research review board
a. Assesses risks and benefits
b. Requires the researchers to inform the participants of:
i. Study's purpose
ii. Procedures
iii. Known benefits and risks
2. Migrant studies: examine changes in health of people who move from one country to another
3. Cohort studies: follow a healthy population over time to look for development of diseases
4. Case-Control Study
a. Compare individuals with a condition (cases) with individuals who do not have the condition (controls)
b. Strongest studies compare groups that are similar in age, race, and gender
c. Limitation = cannot claim cause and effect
5. Double-Blind Study
a. Gives more definitive testing of a hypothesis

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b. Compares one group of participants following a specific protocol (experimental group) with participants in a corresponding group following their usual habits (control group)
c. Placebo: fake treatment (usually given to control group)
d. Random assignment of study participants to experimental or control groups
e. Features that help reduce bias:
i. Neither study participants nor researchers know who is in which group (double-blind).
ii. Expected effects of protocol are not disclosed.
-Reduces chance of placebo effect
f. May only be possible to do single-blind study

6. Peer Review of Experimental Results
a. Prior to publishing, other scientists review study to ensure most unbiased, objective findings are published
b. Results published in peer-reviewed journals

7. Follow-Up Studies
a. One experiment is not enough to accept a hypothesis
b. Results must be confirmed by more experiments
c. The more evidence supporting a hypothesis, the more likely it is to be true

8. Systematic Reviews
a. Critical evaluation and synthesis of research studies focusing on a specific topic or research question
b. Used to help determine which clinical methods are likely to help patients
c. Organizations that create systematic reviews
i. Evidence Analysis Library (EAL)
ii. USDA Nutrition Evidence Library
iii. e-Library for Evidence for Nutrition Actions (eLENA)
iv. Cochrane Collaboration

1.6 Evaluating Nutrition Claims and Products

A. General

1. Apply basic nutrition principles to any nutrition claim
2. Be wary of claims that:
a. Only discuss advantages and ignore possible disadvantages
b. New or “secret” breakthrough
c. Claims to “cure” a disease
d. Sounds too good to be true
e. Extreme bias against medical community
f. Testimonials show dramatic results
3. Examine scientific credentials
4. Note the size, duration, and type of study behind the claim

B. Buying Nutrition-Related Products

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1. Many claims for popular nutrition-related products are unsubstantiated
2. Dietary Supplement Health and Education Act (DSHEA) of 1994 classified vitamins, minerals, amino acids, and herbal remedies as “foods”
    a. Restrained the US Food and Drug Administration (F D A) from rigorous regulation
    b. FDA must now prove these products are unsafe to prevent sale.
3. Scrutinize nutrition-related product labels.
4. Be sure there is scientific proof supporting claims.
5. Do not use products for purposes not stated on label.
6. Allowable claims
    a. General well-being
    b. How product provides benefit
    c. Structure/function claims
7. When claims are made, label must display a disclaimer: “This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent disease.”

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