Nutrition for Life 4th edition Thompson Solutions Manual

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CHAPTER

2 The Human Body: Are We Really What We Eat?

Chapter Summary

We are prompted to seek food through both hunger and appetite.

The primary goal of digestion is to break food into molecules small enough to be transported throughout the body. The brain uses signals from the gastrointestinal (GI) tract and hormones to initiate hunger and satiation. When we eat, the food we consume is digested, the useful nutrients are absorbed, and the waste products are eliminated. These processes occur in the GI tract. Digestion begins in the mouth, where food is mechanically broken down by chewing and digestion of carbohydrates begins. Food travels to the stomach through the esophagus via peristalsis. Protein and a small amount of fat digestion occur in the stomach as the food is mixed with gastric juices. Most digestion and absorption occur in the small intestine. Accessory organs such as the pancreas, gallbladder, and liver assist with digestion and absorption as well. The large intestine digests any remaining food particles, absorbs water and chemicals, and moves feces to the rectum for elimination. The neuromuscular system involves coordination of the muscles and the nervous system to move food along the GI tract and to control all aspects of digestion, absorption, and elimination. A number of disorders can affect the GI tract. Heartburn or gastroesophageal reflux disease (GERD) can occur when hydrochloric acid (HCl) flows back into the esophagus. An ulcer is an area of the GI tract that has been eroded by a combination of HCl and pepsin and results in a burning pain in the abdominal area. A food intolerance is a transient response to foods that doesn't involve the immune system. A food allergy is an allergic reaction to food by the immune system. Other disorders that can affect the GI tract include celiac disease, irritable bowel syndrome, diarrhea, and constipation.

Learning Outcomes

After studying this chapter, you should be able to:

1. Compare and contrast the feelings of hunger and appetite, and the factors contributing to each, pp. 39–43.
2. Identify the relationship between the foods we eat and the structures and functions of our cells, pp. 43–45.
3. Name and state the function of each of the major organs of the gastrointestinal tract and the four accessory organs, pp. 46–56.
4. Explain how the food you eat is broken down mechanically and chemically, pp. 46–56.
5. Identify the unique features of the small intestine that contribute to its ability to absorb nutrients, pp. 52–53.

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6. Describe how the body eliminates food wastes, pp. 55–56.
7. Discuss the causes, symptoms, and treatment of gastroesophageal reflux disease and peptic ulcers, pp. 57–60.
8. Distinguish between food intolerance and food allergy, and between celiac disease and non-celiac gluten sensitivity, pp. 60–63.
9. Compare and contrast diarrhea, constipation, and irritable bowel syndrome, pp. 63–65.

Key Terms

absorption, p. 46
accessory organs, p. 46
appetite, p. 39
anorexia, p. 38
bile, p. 52
celiac disease, p. 61
cell, p. 43
cell membrane, p. 44
chyme, p. 51
constipation, p. 63
cytoplasm, p. 44
diarrhea, p. 63
digestion, p. 46
elimination, p. 46
enzymes, p. 48
esophagus, p. 49
food allergy, p. 60
food intolerance, p. 60
gallbladder, p. 52
gastric juice, p. 50
gastroesophageal reflux disease (GERD), p. 58
gastrointestinal (GI) tract, p. 46
hormone, p. 40
hunger, p. 39
hypothalamus, p. 40
irritable bowel syndrome (IBS), p. 65
large intestine, p. 55
liver, p. 54
metabolism, p. 43
organ, p. 45
organism, p. 45
pancreas, p. 52
peptic ulcer, p. 59
peristalsis, p. 50
saliva, p. 46
salivary glands, p. 46
small intestine, p. 51
sphincter, p. 46
stomach, p. 50
system, p. 45
tissue, p. 45

Chapter 2 Outline

I. Why Do We Want To Eat What We Want To Eat?

A. The hypothalamus prompts hunger in response to various signals.
  1. Nerve cells lining the stomach and small intestine relay data to the hypothalamus.
  2. Hormones and hormone-like substances signal the hypothalamus to cause us to feel hunger or satiated.
  3. The types of foods we eat have an effect on hunger and satiety.

B. Environmental cues trigger appetite.
  1. Foods stimulate our five senses.
  2. Social and cultural cues affect when and what we eat.
  3. Food preferences are affected by what we learn throughout life.

II. Are We Really What We Eat?

A. Atoms bond to form molecules.

B. Food is composed of molecules.
  1. Digestion results in breaking our food into small molecules.

C. Molecules join to form cells.
  1. Cells are the smallest units of life.
  2. Cells are encased in a membrane.

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a. The cell membrane is semipermeable.

3. Cells contain fluid and tiny structures that support life.

a. The nucleus contains DNA, which provides instructions for cells to make protein.

b. Mitochondria produce adenosine triphosphate (ATP) from basic food components.

D. Cells join to form tissues and organs.

E. Organs make up functional systems.

III. What Happens To The Food We Eat?

A. Digestion begins in the mouth; it is the process by which foods are broken down into molecules.

1. Chewing moistens food and mechanically breaks it down.

2. Saliva moistens food and contains the enzyme amylase, which begins the process of carbohydrate digestion.

a. Enzymes are chemicals, usually proteins, which speed up body processes.

B. The esophagus transports food into the stomach.

1. Peristalsis refers to rhythmic waves of muscular contraction that move food in one direction through the length of the GI tract.

2. Food passes into the stomach through the gastroesophageal sphincter.

C. The stomach mixes, digests, and stores food.

1. Gastric juice contains several important compounds.

a. Hydrochloric acid (HCl) keeps the stomach interior acidic.

b. Pepsin begins to digest protein.

c. Gastric lipase is an enzyme responsible for fat digestion.

d. Mucus protects the stomach lining from being digested.

2. The stomach mixes the food until it becomes a liquid called chyme.

3. Chyme is periodically released into the small intestine through the pyloric sphincter.

D. Most of digestion and absorption occurs in the small intestine; absorption is the process of taking the products of digestion through the walls of the intestine.

1. The gallbladder and pancreas aid in digestion.

2. Absorption is increased by the folds of the mucosal membrane and small, finger-like projections called villi.

a. Inside the villi are capillaries and a lacteal, which absorb the final products of digestion.

3. Intestinal cells readily absorb vitamins, minerals, and water.

4. Blood and lymph transport nutrients.

5. The liver regulates blood nutrients.

a. The liver performs more than 500 functions, including digestive and regulatory functions.

E. The large intestine stores food waste until it is excreted.

1. Nondigestible food material such as fiber, bacteria, and water enters the large intestine.

a. Bacteria finish digesting some nutrients.

b. The digestive mass is stored for 12 to 24 hours.

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c. Nutrients and water are absorbed, leaving a semisolid mass called feces, which is then eliminated from the body.

d. Elimination is the process by which undigested food and waste products are removed from the body.

IV. What Disorders Are Related To Digestion, Absorption, And Elimination?

A. Belching and flatulence are common.

B. Gastroesophageal reflux disease (GERD) is backflow of gastric juice.

C. An ulcer is an area of erosion in the GI tract; any ulcer within the GI tract is a peptic ulcer.

1. A gastric ulcer is located in the stomach area.

2. A duodenal ulcer is located in the duodenum, usually close to the stomach.

3. The bacterium *Helicobacter pylori* causes most peptic ulcers.

D. Some people experience disorders related to specific foods.

1. A food intolerance is a transient response to specific foods that does not involve the immune system.

2. A food allergy is an allergic reaction to food, caused by a reaction of the immune system.

3. Celiac disease is a genetic disorder that causes damage to the intestinal villi following consumption of gluten.

E. Diarrhea results when stools are expelled too quickly

1. Diarrhea is the frequent elimination of loose, watery stools.

a. Diarrhea should be treated promptly to avoid dehydration.

F. Constipation results when stools are expelled too slowly.

1. Constipation is characterized by the lack of bowel movements for a period of time that is significantly longer than normal for the individual, resulting in small, hard stools that are difficult to pass.

G. Irritable bowel syndrome (IBS) can cause either diarrhea or constipation

1. Symptoms include abdominal cramps, bloating, and constipation or diarrhea.

Activities

1. Have students bring to class or research on the Internet over-the-counter products used to treat digestive difficulties such as heartburn, diarrhea, and constipation. Discuss the advantages and disadvantages of taking these products. Ask students if they can come up with any alternative ideas for addressing these problems.

2. Demonstrate the Heimlich maneuver. Discuss when it is appropriate to perform this maneuver and the dangers of being too forceful.

3. Have students bring food labels to class and identify possible allergens. Have them search for the less obvious culprits: for example, casein for a milk allergy or a candy without nuts—but made where nuts were used in other products—for a nut allergy.

4. Have students visit supermarkets or health food stores or do research using the Internet to find probiotic products. They should report to the class on the types of products they found and the number of active bacteria these products contain per serving.

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5. Develop a survey for the students to use to find out how prevalent food intolerances are among their friends and family. Compile the results and discuss which intolerances are most common and how people control them.
6. Discuss the results from the "Social and Cultural Cues/Learned Factors" feature in the textbook (page 41). Ask for volunteers to share their results, and as a class, brainstorm on possible solutions to eating when you are not really hungry. Make a list of the students' eating cues, noting which ones are the most common for the class, and discuss why this might be so.
7. Have students work in small groups to demonstrate the connection between taste, smell, and food texture. Bring small samples of various foods to class. Each student in the group can take a turn tasting a food item using no other senses. To do this, the student taster should close his or her eyes and pinch the nostrils closed. Another student in the group should gently place the food on the taster's tongue. The taster should try to identify the food without chewing or moving the food in the mouth. The taster should then chew the food to see if that aids in identification. Finally, the taster can un-pinch the nose to see if that helps to identify the food. Some food suggestions include small pieces of fruit or vegetables, onion, nuts, or chocolate.

   Important notes:

   a. Make sure you check for any students with food allergies before beginning this activity.
   b. Make sure you are working in a clean environment.
   c. Students may want to wear sterile, disposable gloves when handling the food items.

MyDietAnalysis Activity

8. The health of the GI tract depends to a great extent on the foods we eat. Using the nutritional assessment previously completed, students should review the information provided by their diet analysis software and note the following:

   a. Do you meet recommendations for fiber intake?
   b. Do you meet recommendations for water intake (for MyDietAnalysis only)?
   c. If you have any GI difficulties, can you correlate them with any of the foods you consume?
   d. What changes could you make in your diet to improve the health of your GI tract?

See for Yourself

9. Cut a section of thick string several feet in length for each student. Using Figure 2.4 in the text, have students follow the figure of the GI tract, organizing the string into the general shape of a mini-GI tract from mouth to anus. Then have the students label each anatomical region (organs and sphincters) using sticky notes. Finally, have them diagram the path of the most recent meal they have eaten through the GI tract they formed, specifying where the various components of foods will be digested and the nutrients absorbed.

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In the Kitchen

10. Discuss ways to increase fiber in cooking. Have students prepare some foods at home and bring them to class to share, if desired.

Hints for increasing fiber in cooking:

- Make mashed potatoes with skins on.
- Add oatmeal to meatloaf or other dishes as filler.
- Make salsa with whole tomatoes (chop up in a blender).
- Substitute brown rice for white rice.
- Substitute whole-wheat pasta for white pasta.
- Add shredded vegetables to spaghetti sauces.
- Substitute whole-wheat flour for half of the white flour in recipes.
- Substitute oat bran for up to one-third of the white flour in recipes.
- Use granola to top pie crusts and cobblers.

11. Have the students gather recipes and scrutinize the ingredients for common allergens. Brainstorm on substitutions that could be made in the recipes to eliminate possible allergens. For example, for milk allergies, soy milk could be used as a substitute in recipes calling for cow's milk. Ask for volunteers to prepare some of the recipes and bring them to class to share.

12. Ask for volunteers to make sugar cookies at home to bring to class. Give each volunteer a secret assignment for a color and flavoring for each cookie that don't typically go together. Some examples are yellow color with peppermint flavoring, green color with lemon flavoring, and red color with vanilla flavoring. Have the class taste test the different cookies and see if they can guess the flavors. Discuss how sight influences taste.

Nutrition Video Discussion Questions

These discussion questions are designed to promote critical thinking after viewing the following ABC News video clips.

Food Allergy Myths

1. Why do some people believe they have food allergies when they actually do not?

2. What kinds of tests can be performed to determine if a person has food allergies?

3. What is the difference between food intolerance and a food allergy?

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