Chapter 15

Protecting Health

End of Chapter Questions

Simple Review Questions

15.1 Nutrition, Exercise, and Health

1. Why is it important for you to eat a complete protein regularly?

2. What are some of the important minerals you obtain from your food?

3. What is metabolic syndrome?

4. What are some of the benefits of exercise?

15.2 The Excretory System

5. What is urea?

6. How does fluid move from the circulatory system into a nephron?

7. What happens to the filtrate in the proximal tubule?

8. What is the function of the loop of Henle?

15.3 Body Defenses: The Innate Immune System

9. What are two functions of the lymphatic system?

10. What features of skin make it good at keeping pathogens out of the body?

11. Why is a single innate immune cell able to respond to many different pathogens?

15.4 Body Defenses: The Acquired Immune System

12. What is an antigen?

13. Where in the body are the pathogens to which B cells respond? Where in the body are the pathogens to which T cells respond?

14. What is the function of a memory cell?

(CLICK TO CHECK YOUR ANSWERS)

Challenging Review Questions

15.1 Nutrition, Exercise, and Health

15. What is the difference between a vitamin and a mineral?

16. What role has evolution played in human food preferences? What effect does this have on us today?

17. What factors make a person more likely to develop metabolic syndrome? What are some of the health risks associated with metabolic syndrome?

15.2 The Excretory System

18. What waste materials are produced during the process of making ATP? What body systems are responsible for removing the wastes from the body?

19. How does the endocrine system interact with the excretory system?

20. What is the difference between elimination (feces) and excretion (urine)? What is the body getting rid of in each case?

15.3 Body Defenses: The Innate Immune System

21. How does the lymphatic system support the work of the circulatory system? How does it support the work of the immune system?

22. How do tears help defend your body against pathogens? Does this explain why people with allergies sometimes get watery eyes?

15.4 Body Defenses: The Acquired Immune System

23. Why is the innate immune system described as "nonspecific"? Why is the acquired immune system described as "specific"?

24. What are some differences between the innate immune system and the acquired immune system?

25. Allergies occur when the immune system is abnormally sensitive to particular substances. Why do people sometimes take antihistamines for their allergies? Can you guess from the word *antihistamine* what an antihistamine does?

26. If a virus infects your body, will only one type of T cell respond? In other words, does a single virus have exactly one antigen?

27. How does a vaccine protect you from disease?

(CLICK TO CHECK YOUR ANSWERS)

Apply & Discuss Questions

28. Why do you think people like to eat sweets, fats, and other foods that are not very good for them? Do you think that, over time, our taste for these and other foods might evolve?

29. The liver is an organ that plays important roles in multiple organ systems. What role does the liver play in digestion? What role does it play in excretion?

30. A cell in your body breaks down an amino acid to make ATP and generates a molecule of ammonia, a nitrogen- containing waste. Describe what happens to this ammonia molecule.

31. What do you think explains the placebo effect?

32. The leading causes of death worldwide are listed below. Compare them with the leading causes of death in the United States provided earlier in the chapter.

TABLE 15.3

Leading Causes of Death Globally

(2019 Data from the World Health Organization)

1. Heart disease
2. Stroke
3. Chronic obstructive pulmonary disease
4. Lower respiratory infections
5. Neonatal conditions
6. Trachea, bronchus, lung cancers
7. Alzheimer's disease and other dementias
8. Diarrheal diseases
9. Diabetes mellitus
10. Kidney diseases

(CLICK TO CHECK YOUR ANSWERS)

End of Chapter Solutions

Simple Review Solutions

1. Humans cannot make 9 of the 20 amino acids needed to build proteins. This is why you need to eat a "complete protein"—one containing all the amino acids—regularly.

3. Metabolic syndrome is a set of characteristics that greatly increases the risk of heart disease, stroke, and type 2 diabetes. Metabolic syndrome is associated with two main features: carrying extra weight around the middle and upper parts of the body and insulin resistance, the inability of body tissues to adequately respond to the hormone insulin.

5. One of the most important wastes found in urine is urea. When amino acids are broken down to make ATP, ammonia, a nitrogen-containing waste, is produced. Because ammonia is highly toxic, it is immediately converted to urea, a less-toxic waste, by the liver. The liver releases urea back into the bloodstream for excretion.

7. The proximal tubule is like a sorting machine. "Good" molecules in the filtrate—such as ions, glucose, vitamins, and amino acids—are transported back into the blood so that the body can keep them. "Bad" waste molecules are transported from the blood to the filtrate.

9. One function of the lymphatic system is to collect the fluid that leaks out of blood vessels and return it to the circulatory system. Another function of the lymphatic system is to carry white blood cells, which are found in large numbers in lymph.

11. A single innate immune cell is able to respond to many different pathogens. This is because the receptors of innate immune cells recognize molecules (usually carbohydrates, proteins, or nucleic acids) that are found in many different kinds of pathogens.

13. B cells react to pathogens in bodily fluids such as blood or lymph. T cells attack pathogens that are inside the body's cells as well as the body's own malfunctioning cells.

Challenging Review Solutions

15. Vitamins are organic molecules that are essential nonprotein components of certain enzymes. Minerals are inorganic substances required as components of various body tissues.

17. People who are overweight are more likely to develop metabolic syndrome. Other factors associated with metabolic syndrome include an unhealthy diet, lack of exercise, aging, and certain genes.

19. The answer is, in many ways! Here are just a few examples: Antidiuretic hormone causes more water to be reabsorbed from the filtrate during excretion. Parathyroid hormone decreases calcium excretion. Mineralocorticoids help regulate water and salt balance in the body by affecting excretion of these substances.

21. The lymphatic system supports the work of the circulatory system by collecting the fluid that leaks out of blood vessels in lymphatic vessels and returning this liquid to the circulatory system. The lymphatic system supports the work of the immune system by carrying large numbers of white blood cells in lymph.

23. The innate immune system is described as nonspecific because its defenses work against many different potential pathogens. The acquired immune system is described as specific because its cells have receptors that respond to a single antigen—a very specific feature of a molecule or part of a molecule belonging to a pathogen.

25. Symptoms of allergies come from the reactions of the innate immune system. As part of the inflammatory response of the innate immune system, tissues produce histamines. Antihistamines, as their name suggests, help to counter these histamines and reduce the redness and swelling that make up the inflammatory response.

27. Vaccines protect you from disease by making use of your acquired immune system's "memory" for pathogens it has encountered in the past. A vaccine exposes your body to a pathogen's antigens, but—this is the key—it does not infect you with the pathogen itself. Most vaccines contain either dead pathogens or weak strains of a pathogen. A vaccine also may use only part of a pathogen—perhaps a virus's protein coat or a bacterium's flagellum. Your acquired immune system reacts to antigens in the vaccine just as it would react to the real pathogen. That is, the acquired immune system makes antibodies and—most critically—memory cells. If the real pathogen ever shows up, the acquired immune system is ready to attack.

Apply & Discuss Solutions

29. The liver makes bile, which is important as an emulsifier for digestion. The liver also converts ammonia to the less toxic urea, an important function related to excretion.

31. That is a very good question that no one fully understands the answer to! It seems that natural endorphin release by the brain may be part of the story, particularly when pain reduction is part of the effect. Clearly, however, there is more to the placebo effect than that. Stay tuned, as the next decade may bring some good answers to this question!