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DISEASE DETECTIVES

**Elementary Science Olympiad
 Kennesaw State University
 Kennesaw, Georgia
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Developed by the
 Career Paths to Public Health Program
 Centers for Disease Control and Prevention (CDC)

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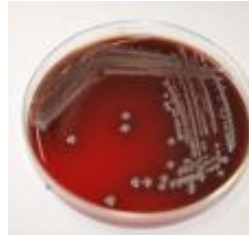
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service



Part A: Antibiotic Resistance¹

A pathogen is a microorganism, or germ, that can cause disease. There are many types of pathogens, like bacteria, viruses, fungi, and parasites that can cause disease. When people get a disease caused by bacteria, they often take antibiotics, a type of medicine that kills bacteria and fights infections.



Although antibiotics have many beneficial effects, using them has contributed to the problem of antibiotic resistance, which means that certain bacteria are no longer killed by these medicines. For example, taking antibiotics when they are not needed increases your risk of getting an infection later that resists antibiotic treatment. When you use antibiotics appropriately, you do the best for your health, your family's health, and the health of those around you.

1. (1 pt) Antibiotics fight infections caused by
 - a. Viruses
 - b. **Bacteria**
 - c. Viruses and Bacteria

2. (1 pt) Bacteria are germs that cause colds and flu.
 - a. True
 - b. **False**

3. (1 pt) Which of these illnesses should be treated with antibiotics?
 - a. Runny Nose
 - b. The Flu
 - c. Cold
 - d. **Strep Throat**

4. (1 pt) Bacteria can become resistant to antibiotics.
 - a. **True**
 - b. False

5. (1 pt) I can increase antibiotic-resistant infections when I (Hint: More than one may apply)
- a. Take an antibiotic for a viral infection
 - b. Take the full dose of an antibiotic when it is prescribed
 - c. Take an antibiotic prescribed for someone else
 - d. Take my antibiotic exactly as my pediatrician or doctor tells me to
6. (1 pt) What can happen if I get an antibiotic-resistant infection? (Hint: More than one may apply)
- a. I may have a longer-lasting illness
 - b. I may have to visit my doctor more
 - c. I may get better quicker
 - d. I may need more costly medicine that can cause side effects
7. (1 pt) Alexander Fleming discovered the first antibiotic in 1927. What was the antibiotic called?
- a. Mold
 - b. Penicillin
 - c. Vancomycin
 - d. Doxycycline

Part B: Dental Health

Having good dental health practices is important for keeping your teeth and gums healthy. You only get one set of permanent teeth and it is your responsibility to properly care for your teeth.



8. (14 pts) Use the words in the box to fill in the blanks below. Each blank is worth 1 point.

| | | | | | |
|---------------|-----------------|-------------------|------------------|----------------------|---------------|
| acid | incisors | gingivitis | fluoride | floss | decay |
| molars | once | tartar | halitosis | sealant | enamel |
| tongue | cavities | calcium | twice | periodontitis | |

Dentists recommend that you brush your teeth at least **twice** a day with toothpaste that contains **fluoride**, which is a mineral found in toothpaste and some drinking water that helps protect your teeth. It is also important for you to **floss** between your teeth at least **once** a day as well as to gently brush your **tongue** with your toothbrush. One result of not brushing properly is bad breath, also known as **halitosis**.

Cleaning your teeth helps get rid of a sticky, clear film of bacteria on your teeth called **plaque**. when it is not cleaned off, it will become hard and turn into **tartar**. This is bad for your teeth because it makes **acid** that causes **cavities**, which are small holes in your teeth. They do not go away by themselves and must be repaired by a dentist. Another word for the holes in your teeth is called tooth **decay**. The build-up of bacteria on your teeth and gums over time can also lead to inflammation of the gums called **gingivitis**.

In order to protect against holes in your teeth, your dentist can add dental **sealant**, a special plastic coating for your teeth. Dentists typically add this protection to the **molars**, the teeth you use to mash up food.

9. (3 pts) List three (3) types of foods that are not healthy for your teeth. (**Sodas, sweets, etc., accept reasonable answers.**)

Part C: Bicycle and Road Safety^{2,3,4}

Bike riding is a lot of fun, but accidents happen. Every year, about 300,000 kids go to the emergency department because of bike injuries. Some of these injuries are so serious that children die, usually from head injuries.

A head injury can mean a brain injury. That's why it's so important to wear your bike helmet. Wearing one doesn't mean you can be reckless, but a helmet will provide some protection for your face, head, and brain in case you fall down.



Wearing a helmet is not the only thing that you can do to be safe when riding your bike. It is important to follow road safety signs and rules, to use hand signals, to wear brightly colored clothing, and to ride a bike that is the right size for you.

10. (1 pt) You should ride your bicycle

- a. On the left side of the road against the flow of traffic
- b. In the middle of the road
- c. **On the right side of the road with the direction of traffic**
- d. On the sidewalk

11. (1 pt) What **MUST** you do before crossing a road?

- a. Listen, look, and cross
- b. **Stop, look, and listen**
- c. Cross anywhere you like
- d. Both a and b

12. (1 pt) Also before crossing a road, you should look _____ for traffic.
- a. Left-right
 - b. Left-right-left
 - c. Directly in front of you
 - d. Right-left
 - e. Right-left-right
13. (2 pts) Riding your bike in the dark is dangerous. If you have to ride at night, list two (2) things you can do to make yourself more visible to drivers. **Wear clothing that reflects the light; make sure your bike has a front headlight that is bright and white; and equip your bike with reflections on the front and rear; and on the pedals and wheels. Accept reasonable answers.**
14. (2 pts) Is it OK to ride a bicycle while listening to audio headphones? Why or why not? **No. Can't hear traffic noises very well; it's against the law (1 pt for no, and 1 point for reason).**
15. (1 pt) It is a good idea to slow down when riding on wet pavement.
- a. True
 - b. False
16. (1 pt) When riding your bike you must stop at all stop signs and red lights.
- a. True
 - b. False

Part D: Foodborne Illness⁵

Foodborne pathogens like bacteria and viruses cause about 76 million illnesses each year in the United States. A foodborne illness outbreak happens when two or more similar illnesses result from eating a common food. Disease Detectives investigate foodborne outbreaks and collect surveillance data. They determine the causes of foodborne illness, the types of foods that caused the illness, and the place where foodborne infections occur— like your home or a restaurant.

The following table gives the number of foodborne outbreaks and illnesses in the United States for 4 different types of pathogens.

TABLE 1. Number and percentage of reported foodborne outbreaks and outbreak-associated illnesses, by pathogen --- United States, 2007

| Pathogen | Outbreaks | | Illnesses | |
|--|-----------|-----|-----------|-----|
| | 2007 | | 2007 | |
| | Total | | Total | |
| | No. | (%) | No. | (%) |
| Bacterial | | | | |
| <i>Salmonella</i> | 142 | 20 | 3,515 | 23 |
| <i>Clostridium perfringens</i> | 45 | 6 | 1,606 | 10 |
| <i>Escherichia coli</i> , Shiga toxin-producing (STEC) | 42 | 6 | 603 | 4 |
| <i>Bacillus cereus</i> | 19 | 3 | 164 | 1 |
| <i>Shigella</i> | 11 | 2 | 355 | 2 |
| <i>Vibrio parahaemolyticus</i> | 1 | 0 | 5 | 0 |
| <i>Escherichia coli</i> , enterotoxigenic | 2 | 0 | 142 | 1 |
| Other bacterial | 4 | 1 | 43 | 0 |
| Chemical | | | | |
| Scombroid toxin/Histamine | 20 | 3 | 74 | 0 |
| Ciguatoxin | 14 | 2 | 84 | 0 |
| Mycotoxins | 3 | 0 | 10 | 0 |
| Paralytic shellfish poison | 1 | 0 | 4 | 0 |
| Other natural toxins | 3 | 0 | 12 | 0 |
| Other chemical | 5 | 1 | 18 | 0 |
| Parasitic | | | | |
| <i>Cryptosporidium</i> | 3 | 0 | 14 | 0 |
| <i>Giardia</i> | 2 | 0 | 51 | 0 |
| Viral | | | | |
| Norovirus | 317 | 45 | 8,024 | 52 |
| Hepatitis A | 4 | 1 | 28 | 0 |
| Rotavirus | 2 | 0 | 18 | 0 |
| Other Viral | 1 | 0 | 17 | 0 |

17. (3 pts) Which three (3) specific pathogens had the greatest number of illnesses in 2007?
Salmonella, clostridium, and norovirus
18. (1 pt) How many *Shigella* outbreaks were there in 2007? **11**
19. (1 pt) How many people got sick in the paralytic shellfish poison outbreak in 2007? **4**
20. (1 pt) How many more people had an illness from hepatitis A than from rotavirus? **10**
21. (1 pt) Of the two parasitic pathogens, which one had the greater number of illnesses per outbreak? *Giardia*
22. (2 pts) Of the total reported parasitic illnesses in 2007, what percent of the illness were caused by *Cryptosporidium*? Please show your work and give your answer as a percent rounded to one decimal place. **21.5% (14+51 = 65; 14/65 = 21.5%) (1 pt for correct calculations, 1 pt for correct answer)**
23. (2 pts) Which bacterial pathogen had the greatest number of illnesses per outbreak in 2007?
- a. *Clostridium*
 - b. *E. coli, enterotoxigenic*
 - c. Norovirus
 - d. *Salmonella*

Part E: Food Safety^{6,7,8}

People usually become infected with foodborne illness when they eat a contaminated food item. The food item can be contaminated with bacteria or a virus, and many foodborne illnesses are caused by foodborne bacteria. Foodborne bacteria can't be seen, smelled or tasted, and they can make you sick.

Food safety is important for you and your family, and it is important for you to have safe food habits every day. You can reduce your risk of eating foods infected with foodborne bacteria by following the 4 rules of food safety:

1. **CLEAN:** *Wash your hands and surfaces often*
2. **SEPARATE:** *Don't cross-contaminate!* Cross-contamination is the scientific word for how bacteria can be spread from one food product or surface to another.
3. **COOK:** *Cook food to its proper temperature*
4. **CHILL:** *Refrigerate food promptly*

Match each of the food safety tips below with the correct food safety rule above. Write the correct answer in the blank.

24. **CLEAN** _____ (1 pt) Rinse fresh fruits and vegetables under running tap water, including those with skins and rinds that are not eaten.
25. **CHILL** _____ (1 pt) Divide large amounts of leftovers into shallow containers for quicker cooling in the refrigerator.
26. **SEPARATE** _____ (1 pt) Use one cutting board for fresh produce and a separate one for raw meat, poultry and seafood.
27. **CHILL** _____ (1 pt) Never let raw meat, poultry, eggs, cooked food, or cut fresh fruits or vegetables sit at room temperature more than two hours before putting them in the refrigerator or freezer (one hour when the temperature is above 90°F).
28. **CLEAN** _____ (1 pt) Wash your cutting boards, dishes, utensils, and counter tops with hot soapy water after preparing each food item and before you go on to the next food.

29. **COOK** _____ (1 pt) Cook eggs until the yolk and white are firm, not runny. Don't use recipes in which eggs remain raw or only partially cooked.
30. **SEPARATE** _____ (1 pt) Never place cooked food on a plate that previously held raw meat, poultry, seafood or eggs.
31. **CLEAN** _____ (1 pt) Wash your hands with warm water and soap for at least 20 seconds before and after handling food and after using the bathroom, changing diapers, and handling pets.
32. **COOK** _____ (1 pt) Make sure there are no cold spots in food (where bacteria can survive) when cooking them in a microwave oven. For best results, cover food, stir and rotate for even cooking. If there is no turntable, rotate the dish by hand once or twice during cooking.
33. **CHILL** _____ (1 pt) Never defrost food at room temperature. Food must be kept at a safe temperature during thawing. There are three safe ways to defrost food: in the refrigerator, in cold water, and in the microwave. Food thawed in cold water or in the microwave should be cooked immediately.



There are many other ways to clean food surfaces, cook and to chill food properly, and separate foods to prevent cross-contamination. These safe food practices can be done in your home, at school, and at the grocery store.

34. (1 pt) In order to properly wash your hands before or after handling food, exactly what is the minimum amount of time you should wash your hands under running water?
- a. 10 seconds
 - b. **20 seconds**
 - c. 45 seconds
 - d. 1 minute

35. (1 pt) Before you open a can of food, you should
- Take the label off so it doesn't get in the way
 - Wash the lid of the can
 - Turn the can upside down
 - Shake the can to hear what's inside
36. (1 pt) Food that should be kept cold, like milk, and food that should be kept hot, like cooked lasagna, should be kept out of "the danger zone." What is the danger zone?
- A place where dangerous tools are stored
 - The top shelf of the refrigerator
 - A place at the North Pole where they have a lot of avalanches
 - The temperature range in which harmful microorganisms can grow in foods
37. (1 pt) Which of the following ways is NOT a safe way to defrost raw meat?
- In the refrigerator
 - On the counter
 - In the microwave
 - All of the above
38. (1 pt) You've just finished a roast turkey dinner and there are a lot of leftovers. How should you store the leftover turkey?
- Place the whole leftover turkey in a container and put it in the fridge.
 - Remove the turkey meat from the bones and put all of the turkey in one container. Cover the container and refrigerate it.
 - Remove the turkey meat from the bones and divide the meat into shallow containers. Cover the containers and refrigerate them.
 - Place the whole leftover turkey in a container and put it in the freezer.
39. (1 pt) How soon do leftovers have to be stored in the fridge?
- Within 1 week
 - Within a day
 - Within 6 hours
 - Within 2 hours

40. (1 pt) To avoid cross contamination, where should raw meat and seafood be thawed in the fridge?

- a. On the bottom shelf
- b. On the top shelf
- c. On the middle shelf
- d. In the freezer

41. (1 pt) How can you avoid cross contamination at the grocery store?

- a. You put raw meat and seafood in plastic bags before you put them into the shopping cart
- b. You don't put raw meat and seafood in the same bag or with other foods
- c. You tell the store manager if you find raw meat juices or seafood juices dripping in the display cases
- d. All of the above

42. (1 pt) Which of the following federal agencies is responsible for regulating meat and poultry products in the United States?

- a. USDA (U.S. Department of Agriculture)
- b. FDA (Food and Drug Administration)
- c. EPA (Environmental Protection Agency)
- d. CDC (Centers for Disease Control and Prevention)

Please answer TRUE or FALSE for the following three (3) questions about food safety.

43. FALSE ____ (1 pt) Refrigeration stops bacterial growth.

44. FALSE ____ (1 pt) The best way to keep the fridge cold is to fill it up with a lot of food.

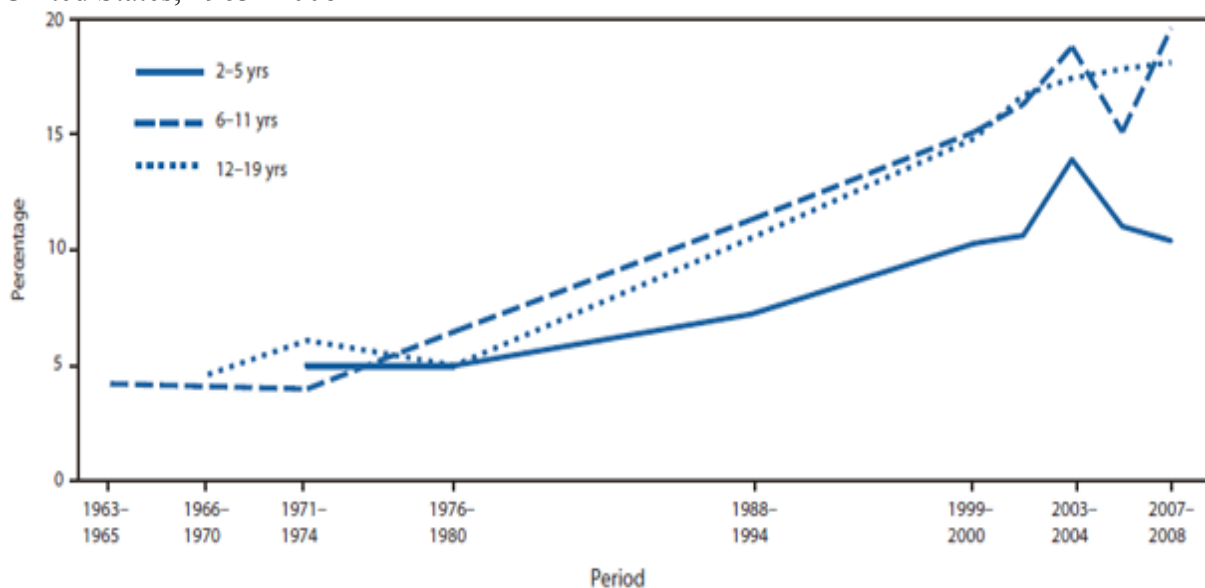
45. FALSE ____ (1 pt) When shopping at the grocery store, you should pick up the cold and frozen items first, and then shop for the other foods, like dry goods.

Part F: Childhood Obesity⁹

In the last 30 years, a growing number of kids and teenagers have developed weight problems. Today, 1 out of 3 kids and teens between the ages of 2 and 19 are overweight or obese, which is a word that means very overweight. Obesity affects about 17% of kids and teens. For both kids and adults, weighing too much can lead to illnesses and health problems. Obesity increases the risk for serious health conditions like type 2 diabetes, high blood pressure, and high cholesterol — all once considered to be only adult diseases. And a kid who is overweight or obese might get teased or find it hard to keep up with friends on the playground.

The graph below shows the percentage (or prevalence) of obesity among children and teens (adolescents), by age group, in the United States during 1963-2008.

FIGURE 1. Prevalence of obesity among children and adolescents, by age group --- United States, 1963--2008



46. (1 pt) In 1976-1980, which age group had the highest prevalence of obesity? **6-11 years**

47. (1 pt) In 1999-2000, which age group had the lowest prevalence of obesity? **2-5 years**

48. (1 pt) Which age group had the most steady increase in obesity prevalence from 1971 to 2008? **12-19 years**

49. (1 pt) Approximately, what percentage of 12-19 year olds was obese in 1988-1994?

- a. 6%
- b. 8%
- c. 10%
- d. 12%

50. (2 pts) Using your answer from question 49, how many 12-19 years olds were obese if there were 10 million children and teens (age 2-19) in the population from 1988-1994? Please show your work.

10, 000,000 * 0.10 = 1,000,000 (1 million) (Give partial credit if calculations correct and question 49 was wrong.) (1 pt for correct calculations, 1 pt for correct answer)

51. (3 pts) List 3 different ways to prevent overweight and obesity among children and teens.

Eat healthy, exercise more, reduce much TV/computer/video games, eat less junk food. Accept reasonable answers.

¹Get Smart: Know When Antibiotics Work <http://www.cdc.gov/getsmart/resources/quiz.html>

²Bike Safety http://kidshealth.org/kid/watch/out/bike_safety.html#

³Your Family's Health http://www.yourfamilyshealth.com/kids_health/bike_quiz/

⁴Simon Safety's Bike Safety Quiz <http://www.state.nj.us/cgi-bin/transportation/game/test>

⁵MMWR: Surveillance for Foodborne Disease Outbreaks

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5931a1.htm?s_cid=mm5931a1_w

⁶Fight BAC! Safe Food Handling <http://www.fightbac.org/safe-food-handling>

⁷North Carolina Department of Agriculture <http://www.ncagr.gov/cyber/kidswrld/foodsafefoodquiz.html>

⁸Canadian Food Inspection Agency <http://www.inspection.gc.ca/english/corpaffr/educ/gamejeu/wheeroue/safsale.shtml>

⁹CDC Grand Rounds: Childhood Obesity in the United States

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6002a2.htm?s_cid=mm6002a2_w