PART 2 The Respiratory and Circulatory Systems

LESSON 9

Anchor Activity—Diseases and Health Careers

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The Internet will be a helpful resource for your Anchor Activity research.

INTRODUCTION

Diseases have had a strong impact on human history. For example, a disease called the bubonic plague killed millions of people in the Middle Ages.

Because of scientific advances, some diseases that used to cause widespread suffering and death have been nearly wiped out. The severity of other diseases has been greatly reduced. In your parents' lifetime, for example, a vaccine has eliminated smallpox from the world. Tuberculosis, a serious lung disease, can often be cured. When public health measures are in place, the spread of this disease can be controlled.

New diseases are always emerging, however. For example, acquired immune deficiency syndrome (AIDS) was unknown until the last quarter of the 20th century.

OBJECTIVES FOR THE ANCHOR ACTIVITY

Research a disease that has a major effect on the human body,

or—

Explore a health career that involves disease research, diagnosis, treatment, or prevention.

Use a variety of tools and techniques to gather, interpret, and explain your data.

Design and create a poster to display the results of your research.

Make an oral presentation to the class summarizing your research.

What are diseases? What causes them? How are they spread? How do they affect the human body? How are they diagnosed, treated, prevented, and cured? What role do health professionals—doctors, nurses, researchers, technicians, health educators, and others—have in keeping people healthy and disease-free?

The Anchor Activity that begins in this lesson will help you and your classmates answer questions such as these. You and your partner will choose one disease or health career to research in detail. Over the next few weeks, you will work on your research and organize your findings. Finally, you'll share your findings with the class in a poster presentation.

Getting Started

1. Discuss with the class the answers to the questions following the reader entitled "Disease: What's Gotten Into You?" in this lesson.

2. With your group, discuss the following questions. Record your answers in your science notebook.

   A. How many health careers can you think of? List them.

   B. What do you think someone should know about a health career before deciding to enter it?

3. Share your responses with the class.

MATERIALS FOR LESSON 9

For you

- 1 copy of Student Sheet 9.1a: Anchor Activity Time Line
- 1 copy of Student Sheet 9.1b: Anchor Activity Scoring Rubrics

For you and your partner

- 1 sheet of poster paper
- Glue or transparent tape
- Scissors

Anchor Activity

PROCEDURE

1. Listen and follow along on Student Sheets 9.1a and 9.1b as your teacher introduces the Anchor Activity. With your partner, you will research a disease or health career, organize your materials, and create a poster. Then you will summarize your findings in a 2-minute oral presentation to the class. Your teacher will give you the deadline for completing your poster. Your teacher will also set other deadlines for completing the preliminary stages of your work. These deadlines appear in the left-hand column (labeled "Date Due") on Student Sheet 9.1a.

2. You and your partner may select the topic for your research.

A. If you decide to research a disease, you may consider the following topics:

Addison's disease
AIDS
Alzheimer's disease
Anthrax
Arthritis
Asthma
Attention deficit disorder
Cancer
Chickenpox
Chronic bronchitis
Chronic fatigue syndrome
Cirrhosis of the liver
Colitis
Congenital heart disease
Crohn's disease
Degenerative joint disease
Diabetes
Emphysema
Endocarditis
Epilepsy
Glaucoma
Infectious mononucleosis
Influenza
German measles
Hepatitis
Hodgkin's disease
Huntington's disease
Hydrophobia (rabies)
Hypoglycemia
Jaundice
Leukemia
Lou Gehrig's disease
Lupus
Lyme disease
Malaria
Meningitis
Multiple sclerosis
Mumps
Myocarditis
Osgood-Schlatter disease
Parkinson's disease
Peptic ulcer
Pneumonia
Psoriasis
Rheumatic heart disease
Sleep apnea
Smallpox
Strep throat
Stroke
Tetanus (lockjaw)
Tuberculosis
Typhoid fever
Whooping cough
Yellow fever

B. If you decide to research a health career, you may consider the following ideas:

Allopathic physician
Anesthesiologist
Audiologist
Biomedical engineer
Chiropractor
Clinical laboratory technician
Dental assistant
Dental laboratory technician
Dentist
Dialysis technician
Dietitian
Electrocardiograph technician
Emergency medical technician
Environmental health specialist
Epidemiologist
Health care administrator
Health educator
Industrial hygienist
Licensed practical nurse
Nurse practitioner
Occupational therapist
Operating room technician
Ophthalmologist
Optician
Osteopathic physician
Pediatrician
Pharmacist
Physical therapist
Podiatrist
Prosthetist
Psychiatrist
Psychologist
Radiation therapist
Registered nurse
Research scientist
Respiratory therapist
Speech pathologist
X-ray technician

3. Once you and your partner have picked your topic, follow the directions in the first block on Student Sheet 9.1a: Anchor Activity Time Line to record your idea. Write it down on a sheet of paper and give it to your teacher. You and your partner will have to divide the responsibilities and do your research individually. Once you have both completed your research, you will work together to organize your material.

4. Your presentation should include information on each of the following areas (under "4A. Disease" or "4B. Health Career"):

A. Disease

- Cause of the disease. If caused by a pathogen, include an illustration of the pathogen.
- Scientists who discovered the cause of the disease. Who? When? Where? How?
- Symptoms of the disease.
- Effects of the disease. What short- and long-term effects can this disease have

on the body? (Be sure to relate what you have learned about the affected body systems.)
- Prevention. Can the disease be prevented? If so, how? What scientists have made contributions to preventing this disease?
- Treatment and cure. If no cure has been found, how close are scientists to developing one? What scientists have made contributions to the search for a cure?
- Technology implications. How have advances in technology affected the way in which this disease is diagnosed and treated?
- Self-treatment. Can a person with the disease control it by changing some of his or her daily habits?

B. Health Career

- Job title. Include a photo or an illustration of a person who has this job title.
- Job description. Describe in detail the duties of a person in this career.
- Educational requirements.
- Salary. What is the salary range? What is the potential for advancement?
- Job outlook. Describe the need for this career in the future.
- Lifestyle implications. How does this career affect one's personal life? (For example, how many hours a day does the person work? Does the person have to work nights? Does the job involve contact with people, or does the person usually work alone?)
- Technology. How has technology influenced this career over time? (For example, what forms of technology have led to improvements in diagnosing problems or treating patients?)

5. Use a variety of references to create your poster. Sources of information might include your school media center, the World Wide Web, public libraries, personal interviews, CD-ROMs, DVDs, magazines, newspapers, encyclopedias, books, and videotapes. Your final product must include references from the following:

- At least two Internet or CD-ROM/DVD sources
- At least two print sources

If you are researching a career, consider doing an interview with someone working in the career you have chosen. Take along a camera to take a photo of the person you are interviewing.

6. List your references in a bibliography. Prepare the bibliography on a separate sheet of paper and turn it in with your poster. Your teacher will give you information on how to format your references.

7. Organize your poster so that the required information described in Step 4A or 4B of the Procedure is clearly visible. Make your poster as creative and interesting as you can.

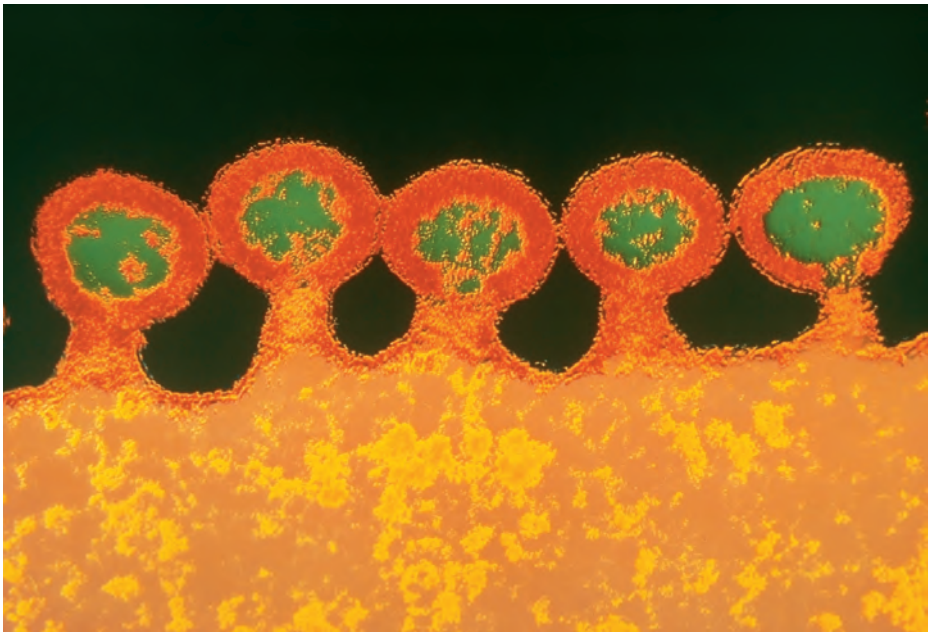
8. Plan your oral presentation. It should contain highlights from your poster. Be sure to practice your presentation beforehand.

A. If you researched a disease, include the name of the disease; its cause, treatment, prevention, and cure (when applicable); and the scientists recognized for their work with the disease.

B. If you researched a health career, include the name of the career, its educational requirements, and a brief description of the duties of a person in this career.

9. When all the presentations have concluded, your teacher will display all the posters and give you time to look at them.

Disease: What's Gotten Into You?



An electron micrograph of the human immunodeficiency virus (HIV), which causes acquired immune deficiency syndrome (AIDS). The viruses are budding from a host white blood cell. When they do this, they damage the cell membrane. The cell dies and the body's immune system is weakened (magnification ×72,000).

Why do you get sick? Most of the time, the answer is simple. You've been invaded by aliens!

These germs—tiny organisms that invade your body and cause disease—are known as "pathogens." (The Greek word for "sickness" is *pathos*.) The two most common kinds of pathogens, bacteria and viruses, are responsible for many human diseases.

Other things cause disease, too. If your body doesn't produce the right amounts of the chemicals it needs, you might get a disease like diabetes. You might get sick if you're exposed to a harmful substance in air, food, or water. Other diseases, such as sickle-cell anemia, are inherited.

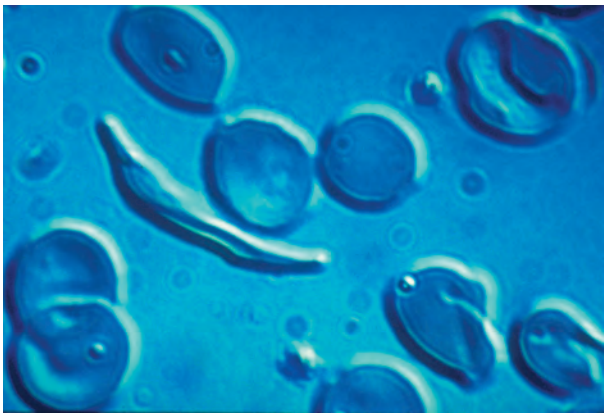
There are many ways to get sick, but your body's immune system has powerful weapons to fight those alien invaders. And when you do get sick, there are medicines that can often help you get well.

Bacteria: Unwelcome Guests

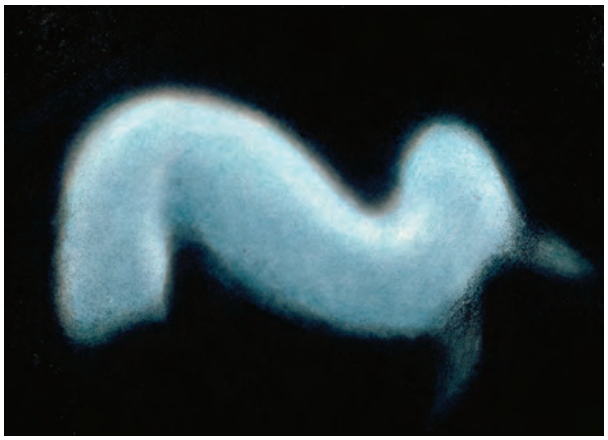
Bacteria are single-celled organisms. They are so small that you can't see the individual cells without a microscope. When they find the right environment—a place like your body, where it's warm and moist and there's plenty of food—they reproduce readily.

Most bacteria are harmless. Some are even helpful. But there are also about 100 types of bacteria that are dangerous, and they are a major cause of human illness.

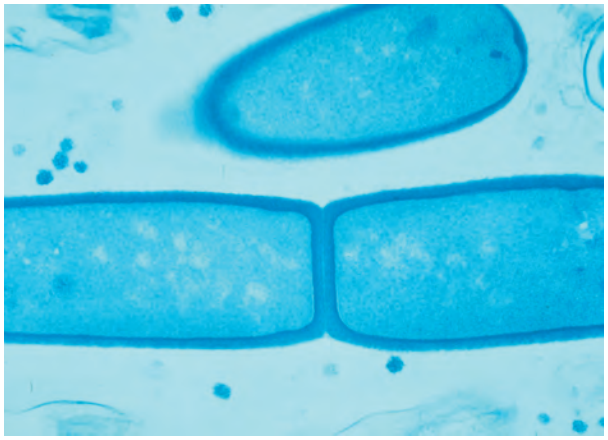
Bacteria can get into your body when you breathe. There are also bacteria on the food



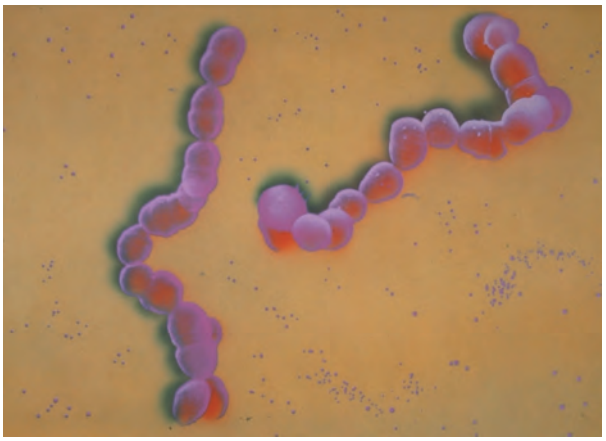
Can you see the sickle-shaped red blood cell in the middle left section of this photograph? The distinctive shape interferes with the cell's ability to carry oxygen.



The Spirillum minus *bacterium is named for its spiral shape. It causes spirillar fever, a form of rat-bite fever.*



Under magnification, Bacillus subtilis *cells resemble bluish, rectangular boxes. These bacteria often occur in chains.*



Streptococcus bacteria are spherical. They often occur in chains and resemble a pearl necklace.

you eat. Bacteria can invade your body if your skin is cut or scratched. Bacteria can damage cells directly, or they can produce substances called toxins, which are poisons.

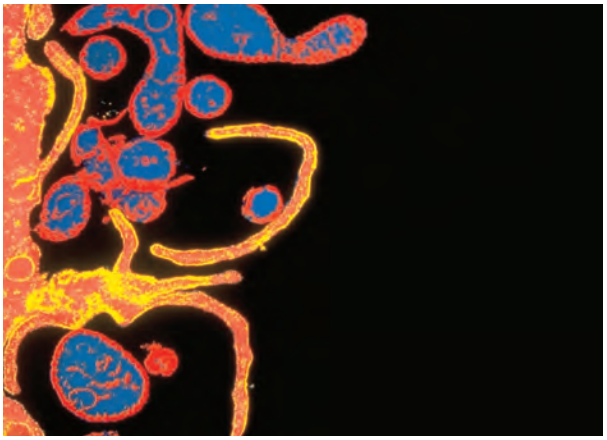
Bacteria are specialists. Some prefer to live in your digestive system. They may cause abdominal cramps, diarrhea, and vomiting. When your doctor says you've got "strep throat," he or she usually means that a colony of streptococcus bacteria are living in your throat.

Viruses: Tiny Packets of Trouble

Viruses are even smaller than bacteria. They must invade your cells in order to survive and reproduce. Like bacteria, viruses can get into your body through the air you breathe or the food you eat. Some viruses, as well as some bacteria, are spread through sexual contact.

Once the viruses have invaded your body, they attach themselves to your cells and penetrate the cell membranes. Then they trick normal cells into producing more virus particles, which rupture the cell membranes and move on to infect other cells.

Viruses cause many diseases. Some of these diseases are as simple as the common cold. But other viral diseases can cripple or kill. Hepatitis, rabies, polio, and AIDS are all caused by viruses.



Measles viruses budding from the surface of an infected cell (magnification ×14,400).

Prevention: Protecting Your Territory

"I think you ought to put a bandage on that scratch."

"Cover your mouth when you sneeze."

Simple things can help protect your body from pathogens or help prevent you from infecting other people. Your body has its own built-in protection, too. Your skin forms a seal to keep most things out. The mucus in your mouth and nose can trap invaders and then destroy them with enzymes. The gastric juice in your stomach can kill germs.

When a bacterium or virus gets into your body, your immune system goes to work.

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Dr. Edward Jenner vaccinates 8-year-old James Phipps against smallpox.

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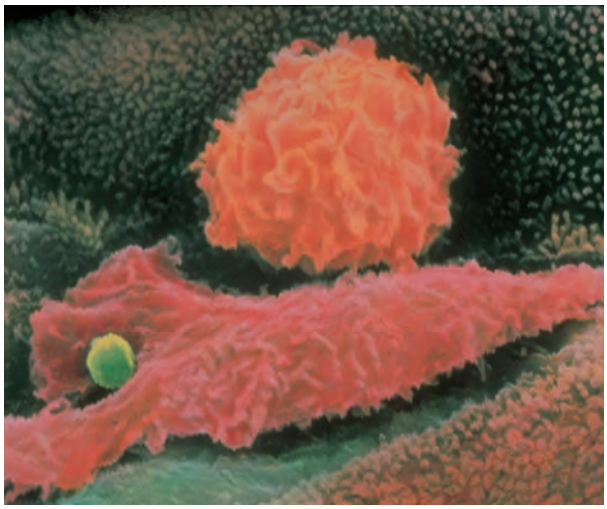

Two macrophages in a human lung. Macrophages can clear the lungs of dust, pollen, and bacteria; however, some pollutants can destroy the macrophages. This can lead to pulmonary disease.

Special cells recognize it as foreign. These cells release chemicals that bring other defenders to work. Some are cells called macrophages (which means "big eaters") that surround and break apart the germs.

Other cells memorize important information about the invader. The memory cells circulate through your body to recruit more defenders and tell them what to look for. When the infection is gone, your body saves a chemical record—like a chemical memory—in substances called antibodies. The next time the same pathogen gets into your body, the antibodies recognize it and destroy it before it makes you sick again.

The shots your doctor gave you before you started school contained pathogens that were too weak to make you sick. They tell your immune system how to identify dangerous germs.

This kind of medicine is called a vaccine. The first vaccine was invented in 1789 by an English doctor named Edward Jenner. Modern vaccines protect people from diseases like hepatitis, polio, and measles. Although the vaccines may prevent these diseases, they cannot cure them.

Treatment: Battling the Bad Guys

Many medicines do not actually cure disease. They just help you feel better while your body heals itself. In other words, they relieve the symptoms of disease.

For example, drugs such as aspirin lower your temperature if you have a fever.

Other medicines kill the bacteria that are making you sick. Antibiotics are a good example of this kind of medicine. In 1928, a Scottish doctor named Alexander Fleming discovered penicillin, which was the first antibiotic.

When penicillin first became available, it was called a wonder drug. Since then, scientists have developed many more antibiotics to treat diseases caused by bacteria. Doctors used to prescribe antibiotics to treat many diseases, but now doctors are more careful.

Why? Because bacteria are beginning to become resistant to antibiotics. Bacteria that are especially strong may not be killed by antibiotics. When these bacteria reproduce, they pass on their resistance to the next generation. If antibiotics kill only the weakest bacteria, the strongest types become more common. The antibiotics don't always work against these superpowerful bacteria.

Some doctors today will not prescribe an antibiotic to control a mild infection. That way, the bacteria population stays weak, and antibiotics will still work when they are really needed.

CORBIS/LESTER V. BERGMAN

Penicillin, the first "wonder drug," is extracted from Penicillium *mold such as this.*

You can help, too. If your doctor tells you to take your medicine for a week, don't stop after 3 days, even if you feel better. That way, the antibiotic will kill as many of the bacteria as possible. □

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Dr. Alexander Fleming examines a culture dish containing Penicillium *mold. He is pictured in his laboratory at St. Mary's Hospital in Paddington, Scotland.*

QUESTIONS

1. What are three diseases caused by bacteria?
2. What are four diseases caused by viruses?
3. What are two ways in which your body deals with disease-causing microorganisms?
4. Why is it important to take all the antibiotic tablets that your doctor prescribed for you, even if you already feel better?