

## **Assignment Discovery Online Curriculum**

### **Lesson title:**

Introduction to Bacteria

### **Grade level:**

6-8

### **Subject area:**

Life Science, Biology

### **Duration:**

Three class periods

### **Objectives:**

Students will do the following:

- Research how bacteria move, where they live, and how they reproduce
- Learn how bacteria can be helpful or harmful
- Create a display illustrating what they learned about bacteria.

### **Materials:**

- Newsprint
- Poster board
- Markers
- Colored pencils
- Photographs from magazines or the Internet
- Scissors
- Print resources
- Internet access

### **Procedures:**

1. Ask students what they know about bacteria. Record their responses on a piece of newsprint. Do not be surprised if they know very little about this topic, or if their only familiarity with bacteria is as the cause of illnesses like strep throat. Put away the sheet of newsprint until the end of the lesson.
2. Explain to students that they will be learning about bacteria, their characteristics, helpfulness, and harmfulness. During the first day of the activity, students will focus on the basic characteristics of bacteria: what they look like, where they live, how they move, how they breathe, and how they reproduce. Students should work individually or in pairs. Using the following Web sites, they should answer the accompanying questions in their notebooks.

### **Basic Characteristics of Bacteria**

<http://www.microbe.org/microbes/bacterium1.asp>  
<http://www.bacteriamuseum.org/>  
[http://whyfiles.org/shorties/count\\_bact.html](http://whyfiles.org/shorties/count_bact.html)  
<http://www.ucmp.berkeley.edu/bacteria/spirochetes.html>  
[http://www.microbe.org/microbes/where\\_live.asp](http://www.microbe.org/microbes/where_live.asp)  
<http://www.amnh.org/nationalcenter/youngnaturalistawards/1998/bacteria.html>

### Questions

- a. What do bacteria look like?
  - b. What are the three basic shapes?
  - c. How are bacteria classified? Name the two large classes.
  - d. Where have bacteria been located? Name as many places as possible.
  - e. How many bacteria live on Earth? (The third Web site listed above has information on this.)
  - f. How quickly do bacteria reproduce? Try to show this pattern as a graph or other visual display.
  - g. What do bacteria eat? How do they take in their food?
3. On the second day, divide the class in half. Working again as individuals or in pairs, half of the class will focus on helpful bacteria, and the other half will focus on harmful bacteria. Using the following Web sites, students should answer the accompanying questions in their notebooks.

### Helpful Bacteria

[http://www.microbe.org/microbes/friend\\_or\\_foe.asp](http://www.microbe.org/microbes/friend_or_foe.asp)  
[http://www.microbe.org/microbes/at\\_work.asp](http://www.microbe.org/microbes/at_work.asp)  
<http://www.microbeworld.org/mlc/pages/roles.asp>  
<http://www.amnh.org/nationalcenter/youngnaturalistawards/1998/bacteria.html>

### Questions

- a. Name some helpful bacteria.
- b. How are bacteria helpful to humans? Give at least four examples.
- c. How do bacteria help keep ecosystems healthy?
- d. What do bacteria do that is especially helpful to plants?

### Harmful Bacteria

<http://www.bacteriamuseum.org/niches/pbacteria/pathogens.shtml>  
[http://www.cdc.gov/ncidod/dbmd/diseaseinfo/groupastreptococcal\\_g.htm](http://www.cdc.gov/ncidod/dbmd/diseaseinfo/groupastreptococcal_g.htm)  
<http://vm.cfsan.fda.gov/~MOW/chap7.html>  
<http://hna.ffh.vic.gov.au/phb/hprot/food/fhpp/fp1.html>  
<http://www.microbe.org/microbes/bacterium1.asp>

## Questions

- a. What are pathogenic bacteria?
  - b. Where do these harmful bacteria usually live?
  - c. Describe how bacteria can cause food poisoning.
  - d. Give two examples of bacteria that cause disease. Include their names and how the bacteria spread.
  - e. How can these diseases be prevented?
4. To display the results of their research, have students (as individuals or pairs) design a poster that teaches about helpful or harmful bacteria. Each display should include at least one micrograph, a photograph of bacteria taken under a high-powered microscope. Encourage students to organize their displays as creatively as possible. They can include comic strips, diagrams, charts, graphs, or any other device that conveys the information in an interesting way.
  5. During the next class period, give each group a few minutes to present their displays. Then discuss the similarities and differences among bacteria. Help students understand that all bacteria eat, breathe, and reproduce, and some move. Bacteria can be one of three main shapes: round, rod shaped, and spiral. Make sure students understand that even though some bacteria can cause serious problems, most perform important functions and are necessary to maintain the health of plants, animals, and the environment.
  6. Display the newsprint with the students' original ideas about bacteria. What do students know about bacteria now? How have their ideas changed as a result of doing research and discussing bacteria as a class?

## Discussion Questions:

1. What was the single most surprising fact you learned about bacteria? For example, did you know that bacteria live in your body? How have your ideas about bacteria changed as a result of working on this lesson?
2. You may have read in the newspaper or heard your parents talking about bacteria that are resistant to antibiotics. This means that streptococcus or harmful bacteria may not die when a person takes an antibiotic. Based on what you have learned about bacteria, why do you think they can become resistant? Hint: Remember how quickly bacteria reproduce. (*Bacteria's rapid reproduction increases the likelihood that a particularly hardy type of bacteria will emerge. This bacteria will then reproduce, resulting in greater numbers of hardy bacteria. This situation is compounded by overuse of antibiotics, which enables bacteria to develop mutations against certain medications.*)
3. What do you think microbiologists, or scientists who study bacteria, look for in their research? (Answers could include the discovery of different kinds of bacteria, the conditions in which bacteria grow, and the rate at which bacteria multiply.) Why is it

important to continue to learn about bacteria? (*New strains of bacteria are always emerging, and bacteria can become resistant to antibiotics. It is important for scientists to be aware of these and other developments.*)

**Evaluation:**

Use the following three-point rubric to evaluate how well students conducted research, created and presented their displays, and participated in class discussions.

**Three points:** showed strong research skills; developed creative and innovative ways to present information; gave a detailed, interesting report to the class; and participated actively in class discussions and activities.

**Two points:** showed on-grade research skills; developed competent ways to present information; gave a satisfactory report to the class; and was somewhat engaged in class discussions and activities.

**One point:** showed weak research skills; did not complete the display; gave a brief report with some errors to the class; and was not engaged in class discussions and activities.

**Extension:**

**Bacteria and World Events**

Did you know that bacteria have had—and continue to have—a role in world events? Have students go to the following Web site and read about how bacteria changed the course of history: <<http://www.microbeworld.org/mlc/pages/amazingtales.asp>>. Then have them pick one story and write what could have happened if bacteria had not been around. Would the outcome have been better or worse?

To share other interesting anecdotes about bacteria with the class, look for the book *Power Unseen: How Microbes Rule the World*, by Bernard Dixon.

Alternatively, students can keep a scrapbook of how the bacteria anthrax has played a role in recent events following the terrorist attacks in the United States. Make sure students include in their scrapbooks what anthrax is, what it looks like, how it affects living things, and its role in the lives of U.S. citizens.

**Suggested Reading:**

***Killer Germs: Microbes and Diseases That Threaten Humanity***

Barry E. Zimmerman and David J. Zimmerman. Contemporary Books, 1996.

Disease-causing microbes have existed almost as long as the Earth! Follow the history of diseases caused by bacteria, viruses, parasites, fungi, and worms, as well as treatments and the efforts to develop cures for disease, in this well-researched book. The outlook for the future is a major concern of the authors, who are both scientists.

***Plague and Pestilence: Deadly Diseases That Changed the World***

Margrete Lamond. Allen & Unwin, 1997.

This is a small paperback, packed full of information about major diseases that have caused epidemics throughout time as well as those that are problems today. Using short paragraphs, occasional drawings, and highlighted facts, each chapter explains the history of a wide range of diseases, including bubonic plague, typhus, and Lyme disease.

### **Vocabulary:**

#### **bacteria**

Definition: Single-celled organisms that are classified as prokaryotes, a group whose DNA is not enclosed in a cell nucleus.

Context: **Bacteria** appeared on Earth billions of years ago and have been found everywhere—in the ground, in the air, and in the bodies of most living things.

#### **microbiologist**

Definition: A scientist who specializes in the study of microscopic forms of life.

Context: A **microbiologist** studies all aspects of bacteria, including where they live, what they eat, how they reproduce, and how they affect life on Earth.

#### **micrograph**

Definition: A graphic representation of an image as shown under a microscope.

Context: A **micrograph** of bacteria is usually magnified several hundred times so that we can see their parts clearly.

#### **pathogen**

Definition: Bacteria that cause diseases in humans.

Context: Streptococcus is the **pathogen** that causes strep throat.

### **Academic Standards:**

This lesson adheres to the National Science Education Standards for students in grades 5-8:

- Life Science

### **Credit:**

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This lesson was developed in consultation with Donna Clem, a high school biology teacher.

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