

Lesson 3, Activity 2

Learning about *Giardia* and Giardiasis—Research and Role Play

(1 hour 20 minutes or less, depending on student research time)

Section

Diseases

Investigative Questions

How does the disease giardiasis affect people who get it (the host)? How is it spread? What are some ways to prevent the spread of *Giardia*?

Description of Content

In this activity, students do a case study of giardiasis, an infectious disease caused by the tiny parasite *Giardia lamblia* (“lambilia” means intestine). Giardiasis is sometimes called a “swimming pool” disease because it is frequently transmitted via water from a pool that has been contaminated by feces from an infected swimmer. Students will apply what they have learned about the “host” vertex of the Epidemiologic Triangle as they learn about giardiasis.

Objectives

Students will:

- Define what it means to be the “host” of a disease
- Research giardiasis, an infectious disease caused by a tiny parasite, *Giardia lamblia*
- Describe *Giardia*, particularly the symptoms it causes in its host, how it is transmitted, and what can be done to prevent or contain giardiasis outbreaks

Materials

- Student Reproducible 1: *Giardia Information Collection Flow Chart*
- Student Reproducible 2: *Giardia Fact Sheet*

Safety

Normal classroom safety guidelines should be observed.

Teacher Background on *Giardia*

As discussed in Lesson 1, the host of an infectious disease is the person or animal that is exposed to and harbors the disease. In giardiasis, the host is a human being or sometimes an animal. The agent in *Giardia* is a protozoan called *Giardia lamblia*. It is a microscopic one-celled animal that lives in the intestines of humans and animals.

Because a protozoan is an animal, *Giardia* is considered an infectious disease caused by a parasite. It spreads when one person swallows water that has been contaminated by the

feces from a person who is already infected with the disease. It does not spread like a cold or flu, which is spread by sneezes or coughs from an infected person. It also does not spread through infected blood or other body fluids, as HIV/AIDS and hepatitis do.

There are several reasons giardiasis is very hard to eradicate:

- First, for most of its life cycle the protozoan is encased in a microscopic cyst. That cyst can live for a long time outside the intestines of a human. It can live in warm water, like a pool or lake, and it can live in soil.
- Second, it only takes one microscopic *Giardia* parasite to cause symptoms in its host, the human or animal that gets the disease. For many infectious diseases, like food poisoning or the stomach flu, millions of bacteria are necessary before the host has symptoms.
- Third, the symptoms of giardiasis do not appear in those infected for between 7 and 14 days. It is also difficult to culture (grow and identify) in the lab. That means many people may be infected with *Giardia* before the source is known.

Procedure

Engagement (5 minutes)

1. Ask students if they know why babies with diapers are not allowed in swimming pools. Have they ever been at a pool when a preschooler had an “accident” and the pool had to be shut down, sometimes for several hours?
2. Explain that one of the reasons pools have to be so careful is *Giardia lamblia*, an infectious disease-causing microbe that is the agent of the disease called giardiasis. Tell them they will be investigating *Giardia*, particularly how it affects its host (the people who get the disease) and how *Giardia* is transferred from one person to another.

Exploration (40 minutes or less, depending on whether students go beyond the *Giardia* fact sheet for their research)

1. Explain to students that they should use the Student Reproducible 1, *Giardia Information Collection Flow Chart*, to guide their research. Pass out the flow chart. Point out that you could use the same flow chart when examining any infectious disease. Review each of the chart sections with the students and have them work in pairs to complete the chart. They may use Student Reproducible 2 *Giardia Fact Sheet*, they may go to any of the Internet sites listed below under “Web Resources,” or both. When the students have completed the flow chart, they will have identified each of the vertices of the Epidemiologic Triangle for *Giardia*.

Explanation (15 minutes)

1. After students have completed their research, review the flow chart with your students. Here are some responses your students may have written.

Agent: List as many facts as you can find about the microbe *Giardia lamblia*. *Examples might include:*

- *Giardia is a one-celled, microscopic parasite.*
- *Once an animal or person has been infected with Giardia lamblia, the parasite lives in the intestine and is passed in the stool.*
- *Because the parasite is protected by an outer shell, it can survive outside the body and in the environment for long periods of time.*

Transmission: How does the disease spread from person to person?

Examples might include:

- *Putting anything into the mouth that has touched the stool of a person or animal with giardiasis*
- *Eating uncooked or undercooked food contaminated with Giardia cysts*
- *Touching and bringing to the mouth cysts picked up from surfaces that have been contaminated with stool from an infected person such as toys, bathroom fixtures, changing tables, diaper pail*

The Host: Provide as much information as you can find on how the disease affects the host—the symptoms of the disease, how long it lasts, how it is treated.

Examples might include:

- *Diarrhea*
- *Abdominal cramps*
- *Nausea*

Environment and Prevention: Where does *Giardia* live? How can the spread of *Giardia* be prevented?

Examples might include:

- *Wash hands often*
- *Avoid water or food that might be contaminated with stool*
- *Always boil, filter, or chemically treat surface water before drinking when you are hiking or camping*

Elaboration and Evaluation (20 minutes)

Role Play: Docs and Parents

1. Once the students have finished their research, divide the class into groups of five. Tell them they will use the information they have gathered on the flow chart to do the next activity.
2. Tell half of the groups that they are local pediatricians. A number of parents have brought children to their offices who have been having diarrhea and gas. The

doctors have had laboratories analyze the stools of all the children and have discovered that the cause is *Giardia*. As doctors, they now need to prepare to meet with a group of the parents and explain to them what *Giardia* is and answer any of their questions.

3. Assign the other half of the groups the role of concerned parents. They are getting ready to meet with the doctors and are trying to get their questions together about what is wrong with their children. They want answers. They want to understand the disease. They also don't understand why it has taken several weeks for the doctors to figure out what is wrong with their kids. Give the groups 10 minutes to prepare their questions and answers.
4. Have each of the groups choose one or two people to represent them in the role play. Have those "doctors" and "parents" come to the front of the room. Tell students who are not in the role play that they are listening in on a conference call. They may raise their hands and be doctor or parent if they feel there are questions or answers that have not been covered by those in the role play. Have the doctors and parents introduce themselves and begin the role play.

Performance Descriptors

While students are making their presentations, you may want to use this evaluation tool. Rate students' participation from 1 to 4, with 4 being the highest.

Were the "doctors" able to give a clear presentation about the causes of *Giardia*?

1 2 3 4

Did the "parents" have good questions?

1 2 3 4

Were the doctors able to answer the parents' questions?

1 2 3 4

Did the parents' questions indicate that they were listening to the doctors?

1 2 3 4

Extension (from 1 hour to several days)

1. Explain to students that there is no way to eradicate giardiasis and the best defense against the disease is to be careful. Have students design some comic strips that could be posted around their community swimming pools to help prevent giardiasis from happening there.

Text Correlations

Glencoe, *Teen Health, Level 1*, Chapter 5: Nutrition and Physical Activity; Chapter 12: Understanding Communicable Diseases

Glencoe, *Teen Health, Level 1*, Chapter 4: Food and Nutrition; Chapter 7: Preventing Diseases

Glencoe, *Teen Health, Level 3*, Chapter 8: Nutrition for Health; Chapter 17: Communicable Diseases

Web Resources

CDC *BAM! Body and Mind*TM: www.cdc.gov/bam or www.bam.gov

BAM! Body and Mind is brought to you by the Centers for Disease Control and Prevention (CDC), an agency of the U.S. Department of Health and Human Services (DHHS). *BAM!* was created to answer kids' questions on health issues and recommend ways to make their bodies and minds healthier, stronger, and safer. *BAM!* also serves as an aid to teachers, providing them with interactive activities to support their health and science curriculums that are educational and fun.

Centers for Disease Control and Prevention (CDC): www.cdc.gov

The CDC Web site provides a comprehensive overview of the latest research on infectious diseases. From research studies on infectious diseases to information for travelers, this site provides a wealth of information. Some is written for medical professionals, but much of the information is written for health care consumers.

Partnership for Food Safety Education: www.fightbac.org/main.cfm

Educational materials for educators and consumers on ways to fight food-borne illnesses.

Web Resources on *Giardia*

Centers for Disease Control and Prevention (CDC): www.cdc.gov

Giardiasis: www.cdc.gov/ncidod/dpd/parasites/giardiasis/factsht_giardia.htm

This Web site features the CDC fact sheet on *Giardia* and giardiasis.

Healthy Swimming, *Giardia*: www.cdc.gov/healthyswimming/giardiafacts.htm

This easy-to-read fact sheet provides information on *Giardia* in swimming pools.

Giardia and Drinking Water from Private Wells:
www.cdc.gov/ncidod/dpd/healthywater/factsheets/giardia.htm

This CDC fact sheet provides information in *Giardia* in well water.

Giardiasis:
www2.ncid.cdc.gov/travel/yb/utls/ybGet.asp?section=dis&obj=giardiasis.htm

This Web site provides travel information about *Giardia*, but includes some additional information

Risk Factors for Sporadic Giardiasis: A Case-Control Study in Southwestern England: <http://www.cdc.gov/ncidod/EID/vol9no2/01-0488.htm>

This site is written for a scientific audience, but includes a real case study done in England.

Giardiasis Surveillance—United States, 1992–1997:
www.cdc.gov/mmwr/preview/mmwrhtml/ss4907a1.htm

This site includes data about reported cases of *giardiasis* from participating states.

Directors of Health Promotion and Education: <http://astdhppe.org>
Giardia: <http://astdhppe.org/infect/giardiasis.html>

The information on giardiasis is easy for students to read.

U.S. Food and Drug Administration,
Center for Food Safety and Applied Nutrition: <http://vm.cfsan.fda.gov/list.html>
Giardia lamblia: <http://vm.cfsan.fda.gov/~mow/chap22.html>

This more technical Web site includes information about *Giardia* taken from the Food and Drug Administration's *Bad Bug Book*.

Relevant Standards

Benchmarks for Science Literacy

By the end of the 8th grade, students should know that:

Chapter 6, Benchmark E, Grades 6-8: Physical Health

- Viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions. A person can catch a cold many times because there are many varieties of cold viruses that cause similar symptoms.

National Health Education Standards

Standard 1

Students will comprehend concepts related to health promotion and disease prevention.

- Explain the relationship between positive health behaviors and the prevention of injury, illness, disease and premature death.
- Analyze how environment and personal health are interrelated.
- Describe how lifestyle, pathogens, family history and other risk factors are related to the cause or prevention of disease and other health problems.

Standard 3

Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks.

- Demonstrate strategies to improve or maintain personal and family health.

Giardia Information Collection Flow Chart

The Agent

List as many facts as you can find about the microbe *Giardia lamblia*.

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Transmission

How does the disease spread from person to person?

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The Host

Provide as much information as you can find on how the disease affects the host—the symptoms of the disease, how long it lasts, how it is treated.

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Environment and Prevention

Where does *Giardia* live? How can the spread of *Giardia* be prevented?

Giardia Fact Sheet

What is *Giardia*?

Giardia (gee-ARE-dee-ah) is a microbe that causes diarrhea. It is a *protozoan* (pro-toe-ZOE-an)—a small, single-celled animal. It is a parasite, which means it lives off other organisms, in some cases humans. It moves with the aid of five *flagella* (flah-GEL-lah). You cannot see *Giardia* with the naked eye.

Giardia is found in infected people's stool. This germ is protected by an outer shell that allows it to survive outside the body and in the environment for long periods of time. It can be found everywhere in the U.S. and in most countries of the world.

In the last 20 years, scientists have learned that *Giardia* is one of the most common causes of illnesses that you can get from water either water you drink or water you swim in (pools, lakes, streams, and even hot tubs). *Giardia* can live in the intestines of people or animals. But unlike many microbes, it can also live outside the body for a long time.

What is giardiasis?

Giardiasis (GEE-are-DYE-uh-sis) is an infectious disease caused by *Giardia*. The most common symptoms of this disease include:

- Diarrhea
- Loose or watery stool
- Stomach cramps
- Upset stomach
- Gas

Children are more likely than adults to get sick.

How is *Giardia* spread?

- By swallowing water that has been contaminated with *Giardia*. If a person infected with *Giardia* swims in a pool, and if even a tiny bit of infected feces gets into the water, others who swallow the water can get giardiasis.
- By swallowing *Giardia* picked up from surfaces (such as lounge chairs, picnic tables, bathroom fixtures, changing tables) that have been contaminated by the feces of an infected person.
- Eating uncooked or undercooked food contaminated with *Giardia* cysts.

What can people do to prevent the spread of *Giardia*?

Practice good hygiene.

- Wash hands thoroughly with soap and water. Be sure to wash your hands after you use the bathroom and before you handle food.
- Avoid swimming if you have diarrhea. (For little kids who are still wearing diapers, this is essential.)
- Take a shower before swimming.
- If you are babysitting or have younger brothers and sisters, teach them not to use a lake or a pool as a bathroom.

Avoid water that might be contaminated.

- Avoid swallowing water in lakes, rivers, swimming pools, and water parks.
- Avoid drinking untreated water from shallow wells, lakes, rivers, springs, ponds, and streams.
- Avoid drinking untreated water unless it has been boiled for one minute or filtered through an approved filter. (For specific information, see the CDC Web site at www.cdc.gov/mmwr/preview/mmwrhtml/ss4907a1.htm.)