

Mighty Microorganisms

Lesson Concept	Microorganisms can be both beneficial and harmful. One of their main benefits is playing a key role as a decomposer in the cycling of matter.
Link	In the previous lesson, students learned how decomposers play an important role in breaking down matter and returning it to the soil. In this lesson, students learn that microorganisms can be both beneficial and harmful; one benefit is their decomposer role in the cycling of matter. In the next lesson, students will participate in a play that will be the summation of their understanding of how matter cycles through food chains.
Time	<p>This lesson takes a week to complete and can be divided into the following times:</p> <ul style="list-style-type: none">• Engage/Explore #1-25-45 minutes depending on if students are using microscopes or drawing from pictures• Explore#2 Setup- 20 minutes• Observations-5 minutes per day for one week• Explain/Extend/Evaluate-40 minutes which can be done, if necessary, in a 20 minute Explain and 20 minute Extend/Evaluate
Materials	<p><u>Per Group (groups of 5-6)</u></p> <p>Microscope or slide viewer</p> <p>Slides or pictures of 4 microorganisms (included in this lesson are pictures of streptococcus bacteria, mold, algae, E. coli, and paramecium—see advance preparation)</p> <p>Chart paper</p> <p>Copy of 4 microorganism pictures that you have selected (see advance preparation)</p> <p><u>Individual</u></p> <p>Science notebook</p> <p>Colored pencils or crayons</p> <p>2 Sealable plastic bags (or Petri dish if available)</p> <p>1 Slice of bread cut in half</p> <p>3x5 Card</p>
Advance preparation	<ol style="list-style-type: none">1. Decide which microorganisms you want the students to view. This lesson makes reference to those that are beneficial as

decomposers (e.g., mold and algae) and those that are harmful because they make us sick (e.g., E. coli, streptococcus). There are picture for each of these organisms included in the lesson. In addition, a picture of paramecium, which are not directly used in the lesson, is included because it is a common microorganism and you probably can find slides of this organism.

2. Determine if you can get slides for the microscope or Slide Viewer.
2. Even if you are using microscope slides, you need to duplicate pictures for EACH group of the microorganisms you want students to observe.
3. Cut bread in half, being SURE to use gloves and clean materials so as to not contaminate the bread.

Procedure:

Engage (5 minutes.) **Decomposers break down matter and return it to the soil.**

1. Ask students what the worms did in the compost bin. Discuss their answers.
2. Ask students if they can think of any other examples of decomposition, or if they know of other things that could break down matter. Record their responses on a chart.

Explore #1 (40 minutes) **Microorganisms are small living things that can't be seen without a microscope.**

Teacher Note: if you are using microscopes, it will take the students about 40 minutes to share the scope and draw their pictures. If you are using hard copy pictures, it will take about 20 minutes to accomplish the same task.

3. Write the word microorganism on the board. Ask students if they can determine what the word means based on its roots: micro and organism. Build on what students say making sure that they understand that they are small living things that can't be seen without a microscope.
4. Explain to the students that today they will observe and draw microorganisms through a microscope.

If you do not have a microscope or slide viewer, use copies of the E.Coli, paramecium, algae, mold and streptococcus.

5. Divide students into groups of four or five.
6. Set behavior expectations regarding taking turns and respectfully using materials.
7. Distribute the microscopes and slides, one for each group of students.

8. Have each student observe, draw, and color the microorganisms in their science notebook. Students who have used the microscope but need a reference to continue drawing, should use the pictures of the microorganisms.
9. Ask questions and discuss as they conduct their observations, such as:
 - “What do you observe?” (size, shape, color, etc.)
 - “Where do you think these microorganisms live?”
 - “What do you think these microorganisms do?”
 - “Do you think they would hurt you or help you?” Why?
10. Ask students to share their drawings and discussions in their table groups. What do they notice?

Explore #2 **(20 minutes setup; 5 minute observations for one week) One of the main benefits of microorganisms is their important role in decomposing matter.**

11. Point to the mold that students looked at in Explore #1. Explain that students will next investigate what this microorganism has to do with food chains.
12. Give each student one half of a slice of bread and ask them to handle it with unclean, unwashed hands by holding it and turning it.
13. Distribute a marker and a sealable plastic bag so students may label the bag with their name and “Sample A”. Have students place the contaminated bread in the bag and seal tightly.

Teacher Note: You can use a covered Petri dish instead of the baggies. Have students label them as they would have labeled the baggies.

14. Collect samples and place them in an area that will be easy to observe over the next week.
15. As students finish with Sample A, give them the second plastic bag and have them label it with “Sample B” and their name.
16. Give students a chance to wash and dry their hands with warm, soapy water and a clean towel.
17. Distribute the other half of the bread after their hands have been cleaned.
18. Instruct students to handle the bread again with their hands, and seal it inside the plastic bag labeled “Sample B”
19. Collect and add these to the observation area.

Teacher Note: If space is an issue, plastic bag are easily displayed on a wall.

20. Over the course of the next week, ask students to make 5-minute observations and draw the changes that occur to their bread. Ask them to record their observations/drawing in their science notebook.

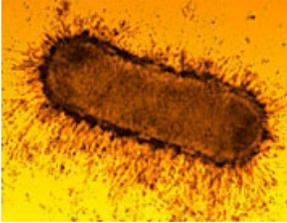
Explain **(15 minutes) Microorganisms act as decomposers to break down matter.**

21. Ask students as partners to share their observations. What was similar in what they observed? What was different?
22. Have partners share with the whole class, asking probing questions such as: What were the microorganisms doing? How do these observations compare with what you noticed with the worms? What is the end result of these organisms “working” on a piece of matter?
23. Re-show the algae and mold microorganisms pictures and explain that since microorganisms like these can break down matter, they are used in many ways. For example, they help us digest our food and to make certain foods such as cheese and yogurt.
24. Re-show the picture of E. coli and streptococcus. Mention that some microorganisms like these may also be harmful because they cause disease like diarrhea, and sore throats.

Evaluate **(15 minutes) Decomposers (worms and microorganisms)**
decompose matter and return nutrients to the soil.

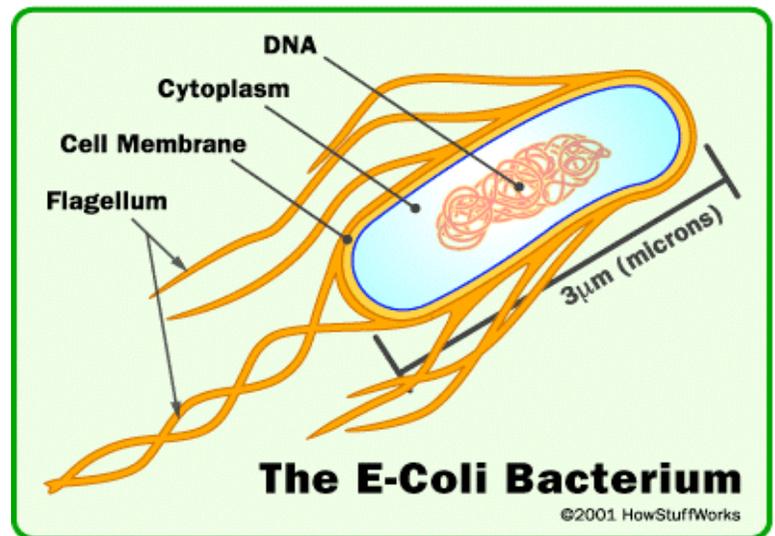
25. Divide students into small groups.
26. Distribute chart paper and ask students to compare and contrast worms and microorganisms as decomposers. Ask them to record their ideas on a Venn diagram. Collect.
27. Distribute the 3x5 cards and ask them to imagine the following scenario: “Pretend that you have traveled to another planet and discovered a new microorganism. What questions would you have to ask to determine if it is beneficial or harmful?” Ask students to record the questions on the card. Collect.

E. coli



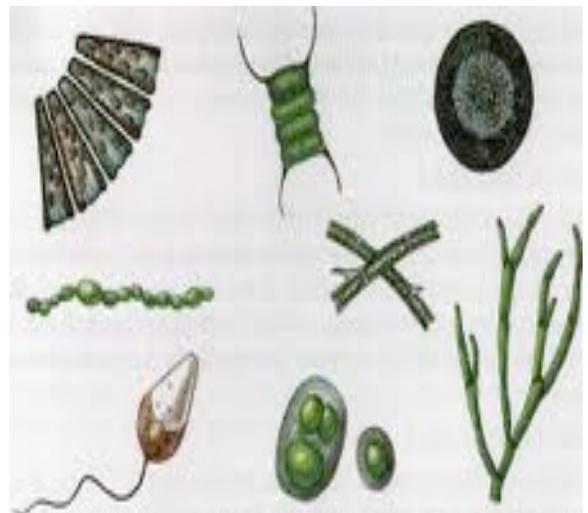
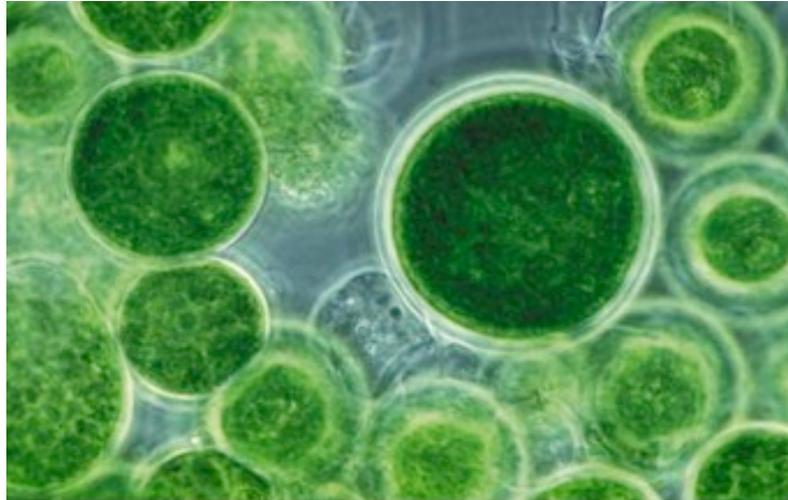
E. Coli are a very common kind of microorganism that lives mainly inside mammals and birds, including inside you. They can only live for a short time on their own, because they have evolved over time to live inside animals. E. Coli live in your intestines, where they help digest your food. They also kill off other germs that might hurt you and some of them produce vitamins you need.

But a few kinds of E. coli bacteria are poisonous, and occasionally people even die from eating the wrong kind of E. coli. You can avoid most bad E. coli infections by cooking meat well before eating it, and washing your hands with soap often when you are cutting up raw meat and after you go to the bathroom.



Algae

Algae are plantlike, usually microscopic organisms, that conduct photosynthesis like larger plants, but they lack stems, roots and leaves. Some algae are used in food products. Not only do they assist in breaking down organic matter, but they also provide organic matter to the soil.



Mold

When bread is old, it develops a furry, green or gray coat called mold. Since no one “plants” this mold on the bread, where then does it come from?



The mold’s spores, which are its reproductive bodies, float around in the air until they find some place to land. They are too tiny to even be seen when they are floating about. But when they land, usually on warm, moist bread, they begin to grow just like seeds do in warm, moist soil. As they grow, they send more spores into the air and onto the bread as well.

Interestingly, a mold’s diet is quite varied. Not only will it grow on bread, but also on meat, vegetables, and even shoes, clothes, and books if they’re in warm, moist areas.

A mold, similar to the one found on bread, is grown in special tanks by scientists and produces penicillin!



Streptococcus Bacteria

Streptococcus bacteria grow in long chains. They cause strep throat, which is the most common *bacterial* infection (be aware that most sore throats are caused by viruses, not strep) especially for children between the ages of 5 and 15.



Strep throat is most common in the late fall, winter, and early spring. The infection is spread by person-to-person contact with nasal secretions or saliva, often among family or household members.

Strep throat may be very mild, with only a few symptoms, or it may be severe. Often, persons with strep throat get sick 2 to 5 days after they are exposed to the bacteria that cause the illness.

Symptoms can include: fever, sore throat, headache, stomachache, chills, loss of appetite. Strep is treated with antibiotics such as penicillin or amoxicillin.

Paramecium

The tiny paramecium has no eyes, no ears, no heart, and no brain. Yet despite its size and shape, this one-celled microorganism can do almost all the things that any animal can do.



A paramecium takes in food through a hole on one side of its body, digests it, and eliminates waste through another opening. It can move through water by waving hairs on its sides, and reacts to very warm or salty water by scurrying away from it.

These creatures sometimes reproduce by exchanging bits of matter from one organism to another, and defend themselves by shooting out tiny spike-like hairs all over their body to form a sort of “armor” against attackers.

So, although you have millions of cells in your body, and the paramecium has just one, you both behave the same in many ways, and both belong to the group of living things we call the animal kingdom!

