

RESOURCE LIBRARY | ACTIVITY : 1 HR

Helpful Microbes

Students engage in a jigsaw reading activity to become experts on a specific body system and then share with peers how microbes help that system. They analyze the design of an example public service announcement (PSA).

GRADES

6, 7, 8

SUBJECTS

Biology, Health

CONTENTS

2 PDFs, 1 Link, 1 Resource

OVERVIEW

Students engage in a jigsaw reading activity to become experts on a specific body system and then share with peers how microbes help that system. They analyze the design of an example public service announcement (PSA).

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/helpful-microbes/>

In collaboration with



DIRECTIONS

This activity is a part of the Misunderstood Microbes unit.

1. Project a series of visuals to show the variation and relative scale of microbes.

- Use the slideshow featuring electron microscope pictures of microbes found at the top of the Small, Small World article to introduce students to the small scale of microbes. Emphasize the variation in the microbes' body forms.
- Then use the Cell Size and Scale interactive to further solidify students' understanding of the miniscule scale at which microbes exist. Point out the cells and other structures that are present in the interactive, which students will be familiar with from the activities in the Getting Organized lesson.
- Prompt students to connect to their thinking about relative scale from the cell investigation in Activity 1.4. Ask students to discuss with a partner and then elicit their ideas via a whole-class discussion: *How does this visualization relate to our cell investigation in the previous activity?* (Possible responses: The different magnifications of the microscope allowed us to zoom in and out of seeing the cells, similar to this visualization.)

2. Organize students into jigsaw groups to become experts on a specific body system and how microbes help that system.

- Distribute and review the Microbes: Our Best Frenemies handout, which students will use to structure their learning throughout the Microbes In or On Humans lesson.
- Explain the purpose for reading: Learn how microbes impact specific body systems and our health.
- Arrange students into "expert" groups of four, to closely read one article about microbes and its interactions with a particular body system. Provide students in each group access to one of the following articles; the expert group will work together to complete Part A of the handout. Depending on the size of your class, there may be multiple expert groups per article.
 - Armpits Are "Rain Forests" for Bacteria, Skin Map Shows (integumentary System—skin)
 - Feeling Anxious? Have a Pickle (nervous / digestive Systems)
 - What's Up with the Bacteria in Your Gut? (digestive System)
 - Antibiotic Found in Noses—Here's What You Need to Know (respiratory System)
- Encourage groups to chunk the reading into sections, take turns reading those sections aloud, and stop to discuss each section and add relevant information to the handout before moving on. Model this approach as needed to prepare students.
- While the expert groups are reading, prompt students to discuss the main ideas of what they read and ensure they are successfully completing the table in Part A of the handout.

- As you circulate, press students to identify evidence in the text to support their ideas, especially about how microbes are beneficial.
- Reorganize students into jigsaw groups that have at least one expert from each article:
 - Review the purpose for reading: Learn how microbes impact specific body systems and our health.
 - Each group member is now an expert on a different body system and microbe and should share out to the rest of the group. The other group members will listen, ask questions, and take notes on the remaining body systems in Part A of the handout.

3. Lead a discussion to debrief students' ideas about how microbes help the systems of the human body and address open questions on the class *Know & Need to Know* chart.

- Elicit and discuss students' ideas from the previous step about how microbes are helpful to different body systems.
- Review some of the questions students generated in the *Need to Know* column of the class *Know & Need to Know* chart, which will likely include questions related to microbes' impacts on the human body.
 - Prompt students to decide if the ideas they shared from the readings help to answer some of these questions.
 - Add any new questions that students have about microbes and the human body.
 - Additionally, resolve any open questions in the *Need to Know* column that students now can answer as a result of completing the activities in the Getting Organized lesson.
- Explain that although students have some of the information to address part of the Unit Driving Question (*Which microbes should we protect or eradicate to keep our bodies healthy?*), they will be able to fully answer the question after the remaining two activities in the Microbes In or On Humans lesson.

4. Analyze a PSA to prepare for project work in the Misunderstood Microbes unit.

- Remind students of the project they will undertake in this unit: Small groups will collaborate to create a public service announcement (PSA) with an online animation app (teacher's choice) that introduces a particular microbe to their community. Their PSA will

include an evidence-based argument regarding the value of eradication for the microbe based on how it impacts the systems of the human body.

- Explain that to prepare for making their own PSA, students will be watching and analyzing a variety of example PSAs throughout the Microbes In or On Humans lesson.
- Remind students that the purpose of a PSA is to inform or persuade the public and that effective PSAs use engaging visuals and text to communicate important information to the audience.
- Explain that students will critique how well this PSA conveys information and see if they can identify the target audience.
- Remind students that effective feedback is *specific, helpful, and kind*.
- Distribute the PSA Design Analyzer. Model for students how to use the design square to note the effectiveness of different design elements as they watch the first sample PSA. In the first design square, students should take notes about each of the following elements in the designated part of the square:
 - Visuals / Animation
 - Text
 - Information
 - Call to Action
- Show the How the Food You Eat Affects Your Gut PSA, prompting students to take notes on the first design square during and after watching.
- Ask students to share some of the effective and less-effective design elements that they noticed, either in small groups or as a whole class. (Possible responses: Students will likely point out many positive elements such as great animation and narration. Areas that could use improvement include sections with complicated information that might be hard for viewers to understand quickly. Also, while the purpose of the PSA becomes clear by the end of the video (it promotes understanding of how healthy food choices support healthy gut microbes) the key message is delayed; the call to action could be introduced much earlier.

5. Present options for the focal microbes students can select for their project work during the Introduce a Microbe to the World! lesson.

- Direct students to read the opening paragraphs about the following microbes on the CDC website:
 1. E. coli (bacteria)
 2. Botulism (bacteria)

3. Measles (virus)
4. Giardia (protozoan)
5. Valley Fever (fungi)
6. Ringworm (fungi)

- Ask students to rank their first, second, and third choices for which microbe they want to focus on in their projects. Explain that you will use their rankings to make project groups in the Research a Microbe and Develop an Argument About its Eradication activity.

Informal Assessment

The *Microbes: Our Best Frenemies* handout can be used to assess students' individual understanding about how microbes help the human body. Additionally, during the discussion in Step 3, assess the accuracy of connections that students make between systems of the body and how microbes help those systems function.

Extending the Learning

Teachers may choose to frame the ecological relationships discussed in this activity through the lens of symbiosis, emphasizing that the majority of the relationships between microbes and humans are neutral.

To solidify students' understanding of the different body systems and ways that microbes can be helpful to those systems, have students engage with the Your Microbial Friends interactive.

OBJECTIVES

Subjects & Disciplines

Biology

- Health

Learning Objectives

Students will:

- Analyze the design of a sample public service announcement.

Teaching Approach

- Project-based learning

Teaching Methods

- Discussions
- Jigsaw
- Multimedia instruction

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
 - Information, Media, and Technology Skills
 - Information Literacy
 - Media Literacy
 - Learning and Innovation Skills
 - Communication and Collaboration
 - Creativity and Innovation
 - Critical Thinking and Problem Solving
- 21st Century Themes
 - Health Literacy
- Science and Engineering Practices
 - Asking questions (for science) and defining problems (for engineering)
 - Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- CCSS.ELA-LITERACY.RST.6-8.2:

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

- **CCSS.ELA-LITERACY.SL.7.1:**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

- **CCSS.ELA-LITERACY.SL.7.2:**

Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

NEXT GENERATION SCIENCE STANDARDS

- **Crosscutting Concept 3:**

Scale, proportion, and quantity

- **Crosscutting Concept 4:**

Systems and system models

- **LS1.A: Structure and Function:**

In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.

- **MS. From Molecules to Organisms: Structures and Processes:**

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

- **Science and Engineering Practice 1:**

Asking questions and defining problems

- **Science and Engineering Practice 8:**

Obtaining, evaluating, and communicating information

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Printed handouts or digital access to student handouts

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, 1 computer per pair, Monitor/screen, Projector, Speakers

PHYSICAL SPACE

- Classroom

GROUPING

- Jigsaw grouping
- Large-group instruction
- Large-group learning
- Small-group learning
- Small-group work

ACCESSIBILITY NOTES

For the jigsaw reading activity in Step 2, consider strategically organizing students in mixed-reading level groups to support readers at all levels.

OTHER NOTES

Parts B and C of the Microbes: Our Best Frenemies handout will be used in the *Harmful Microbes* and *Microbe Eradication Complications* activities of the Misunderstood Microbes unit.

RESOURCES PROVIDED: HANDOUTS & WORKSHEETS

- Microbes: Our Best Frenemies
- PSA Design Analyzer

RESOURCES PROVIDED: IMAGES

- National Geographic: Small, Small World

RESOURCES PROVIDED: AUDIO & VIDEO

- Misunderstood Microbes

BACKGROUND & VOCABULARY

Background Information

Microbes are organisms that are too small to be seen by the human eye and include bacteria, archaea, protists, viruses, and fungi. Although some microbes cause disease, they are also crucial to the functioning of human bodies through processes such as digestion and aiding the immune system. The microbes found on a person's body are collectively known as a person's microbiome, especially those found in body organs and systems such as their skin, hair, and digestive system.

Prior Knowledge

["Relationship between structure and function","Organisms process and react to different types of information received through their senses","Systems thinking at different scales"]

Recommended Prior Activities

- [Deep Dive into the Cell](#)
- [Introduction to Microbes and Human Body Systems](#)
- [Microbes Across the Tree of Life](#)
- [The Interconnected Systems of the Human Body](#)

Vocabulary

Term	Part of Speech	Definition
electron microscope	<i>noun</i>	powerful device that uses electrons, not light, to magnify an image.
inform	<i>verb</i>	to provide knowledge.
magnification	<i>noun</i>	measurement of how enlarged an image is
microbe	<i>noun</i>	tiny organism, usually a bacterium.
persuade	<i>noun</i>	to convince someone to do or believe something through reasoning or argumentation.
scale	<i>noun</i>	distinctive relative size, extent, or degree.

Term	Part of Speech	Definition
system	<i>noun</i>	collection of items or organisms that are linked and related, functioning as a whole.

For Further Exploration

Articles & Profiles

- [NIH: Your Microbes and You: The Good, Bad and Ugly](#)

None

- [TEDEd: The beneficial bacteria that make delicious food](#)
- [National Center for Health Research: The Good, the Bad and the Ugly](#)



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