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ACTIVITY : 1 HR 30 MINS

Helping and Hurting Our Immune Systems

Students watch a video about how different parts of the immune system work together. They then consider how different activities, such as maintaining a healthy diet, exercise, sleep, and going outside to absorb vitamin D from sunshine, affect the immune system. Through a jigsaw format, students analyze data to understand how those activities vary between summer and winter. Finally, they collaborate to write evidence-based trivia questions for the unit project.

GRADES

3, 4

SUBJECTS

Biology, Health

CONTENTS

2 PDFs

OVERVIEW

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For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/helping-hurting-our-immune-systems/

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DIRECTIONS

This activity is part of The Truth About Germs unit.

1. Show a video to demonstrate how the different parts of the immune system work together to help protect our bodies and fight off germs.

- Use the class body map from the *Bad Germs: Keep Out!* activity to remind students of the key parts of the immune system and how they protect our bodies.
- Prepare students to watch a video that demonstrates what happens to the body when germs get into our bodies.
- Ask students to listen for answers to the following questions and to be ready to share after the video:
    - *How do the different parts of the immune system work together?*
    - *What similarities and differences do you see between the video and our body map?*
- Use "The Cells that are Part of the Immune System" table on *The Story Behind the Scenes* page of Arizona State University's digital comic book, *Viral Attack,* to preview some of the key immune system vocabulary from the video, which differs from the terms used in the *Bad Germs: Keep Out!* activity. Emphasize that the specific terms and parts of the immune system are less important than the idea of the different parts working together.
- Show the *Viral Attack* video (3:41). Consider stopping and pausing at key moments to point out the new parts of the immune system or eliciting students' initial ideas about how the different parts work together.
- Lead a debrief discussion for students to share their ideas about how the different parts of the immune system work together and how it relates to the class body map.
    - Key ideas may include:
        - The first wave of defense (macrophages and neutrophils) calls for backup from the T-cells (some T-cells are actually called "killer cells") when they aren't able to kill all of the viruses.
        - The T-cells call for backup from the B-cells when they aren't able to kill all of the cells that have viruses in them.

    - The B-cells create a "memory" of the viruses so that any B-cell can recognize the virus in the future.
    - T-cells and B-cells were documented on the class body map, but connections were not made about how they work together.

- Share that these waves of immune response as shown in the video accurately show how our bodies actually work as a system to protect us from germs.

2. Lead a class discussion to prompt students to consider how our immune systems can be weakened by a variety of factors.

- Transition to the main idea for this activity: Our immune systems don't always function as well as they should, especially if there are factors that weaken different parts of people's immune system (such as infections, poor diet, lack of exercise, stress, exposure to harsh chemicals, smoking, drinking alcohol).
- Use the class Question Quadrant to remind students of the unit driving question: Why do germs make us sick more often during the winter?

    - Remind students about what they learned during the *Germs All around Us* activity about environmental factors that help viruses survive in the winter and the ideas in the *Spreading Germs* activity about how people interact inside more often during the winter.

- Explain that students will now investigate what may happen to our immune systems during winter to increase the chances of getting sick. Elicit student's initial ideas about this by asking: *Why don't our immune systems always protect us?*

    - Lead a discussion to document and follow students' ideas and thinking.

- Build on their responses to remind them of the tips to support the immune system that they read about in the *Attack of the Germs!* article during the *Bad Germs: Keep Out!* activity:

    - Eating healthy foods, exercising, getting enough sleep, keeping stress levels low
    - Add on to explain that vitamin D from sunlight is another evidence-based factor that helps our immune systems function.

3. Guide students as they read about and analyze data representations that show how our immune systems are impacted by activities differently during the winter versus the summer.

- Explain that students will now become experts on one of these activities and how they impact our immune systems. Organize students into groups of four and distribute the *Helping and Hurting Our Immune Systems* handout.
- Within their groups, have students determine which activity they will focus on. Direct them to circle the activity and make a prediction about how it might differ between summer and winter on the top section of their handout.
- Then re-organize students into expert groups based on the activity on which they are focusing; for example, all students who are focused on sleep. Distribute the relevant *Helping and Hurting Our Immune Systems Data Sheets* for the activity they are focusing on.

    - Using the relevant page for their activity, prompt expert groups to collaborate in reading about their activity and analyzing a graph showing how people's engagement in the activity changes seasonally. Students should individually record their findings in the relevant section of their Results Table on the handout, since they will be responsible for reporting to their original group.

        - Circulate as expert groups collaborate, using the data sheets as a reference and pressing their thinking in terms of cause-and-effect relationships and how their results help us understand why germs make us sick more often in the winter.

            - Students' ideas for the cause-and-effect pathways should come from the paragraph that they read. For example: For the activity "Eating lots of fruit and vegetables," one effect is "helping the body create better white blood cells by providing essential nutrients and minerals," which in turn has the effect of "white blood cells create antibodies and fight germs." Another effect of eating lots of fruit and vegetables is that it "gives your body fiber feeding 'good' microbes in our stomachs," which has the effect of "help[ing] support digestion and fight infection in your gut."

        - Support data literacy for interpreting the graphs by:

            - Reminding students of the steps they have taken in previous activities, such as first identifying what each axis tells us, then what the line means over time.
            - Modeling how to interpret one of the graphs.

- After expert groups complete the table for their activity, have them reorganize into their original groups and facilitate as students share with their group members. Prompt students to record results on their finding table.
- Lead a class discussion to review their results and lead to the idea that our immune systems do not function as effectively in the winter, due to decreased eating of fruits and vegetables, exercise, and exposure to sunlight (which means less natural vitamin D).

    - Note that the data on sleep shows that people tend to get more sleep during the winter. Getting full hours of sleep is generally considered healthy to allow our body to recover and stay healthy. So we could think that sleeping more during the winter would automatically strengthen our immune system, although this is not often true. Help students make sense of the fact that even though one factor may be helpful to our immune systems during the winter, the other three activities likely outweigh it.
    - Be sensitive to the fact that these activities not only vary seasonally, but also between and within communities, especially in regards to race and socioeconomic status (or religion), which may vary among students within your classroom. Emphasize that access to healthy foods and opportunities to exercise are not available to all people and communities in the same ways.

4. Guide question writing for the Germology Game Show to connect learning about the immune system to the unit driving question.

- Lead the class through thematically organizing the four activities as they relate to each quadrant of the class Question Quadrant chart: Germs, People, Environment, or Something Else.

    - Prompt students to consider if the new evidence supports or counters their revised hypotheses about why germs make us sick more often in the winter.
    - Students may respond: I originally thought that germs make us sick more in the winter because our bodies use more energy to stay warm and can't fight off germs. I know now that this is only part of the story; our bodies' immune systems are affected by factors like decreased vitamin D due to lack of sunlight that makes it harder for our bodies to fight off germs.

- Organize students into their original jigsaw groups from Step 3. Guide students to select one or two ideas from this activity to focus on for writing trivia questions and evidence-

based answers. Use the section for this activity on the *Trivia Question Builder* handout to structure their process.

- For this activity, evidence can come from the video about how the different parts of the immune system work together, cause-and-effect pathways about different activities' effects on our immune systems, and the findings and/or data representations about how those activities differ between the summer and winter seasons.
- Circulate to support and press students' thinking as they work on their questions and evidence-based answers.

Informal Assessment

Use the discussion in Step 1 to assess students' understanding of how the different parts of the immune system work together to help protect our bodies and fight off germs. To build on this key idea, prompt students to write a summary statement on this topic after they have discussed it in Step 1.

The *Helping and Hurting Our Immune Systems* handout can be used to assess students' ability to identify cause-and-effect relationships between certain activities and their impacts on our immune systems as well as analyzing graphs.

Use students' questions and evidence-based answers to assess their developing understanding of how the immune system is negatively impacted by activities and other factors in the winter versus the summer, which can contribute to why germs make us sick more often in the winter.

Extending the Learning

To support students in developing their evidence-based trivia questions for the Germology Game Show, have students survey community members about what they know and don't know about germs and why they think people get sick more often in the winter.

OBJECTIVES

Subjects & Disciplines

Biology

- Health

Learning Objectives

Students will:

- Understand how the different parts of the immune system work together to help protect our bodies and fight off germs.
- Read and analyze data to demonstrate that our immune systems are impacted differently by activities during the winter versus the summer.
- Connect their learning about the immune system and factors that impact it to the unit driving question related to why germs make us sick more often in the winter.
- Collaborate to create trivia questions and evidence-based answers about factors that support or weaken our immune systems.

Teaching Approach

- Project-based learning

Teaching Methods

- Discussions
- Multimedia instruction
- Simulations and games

Skills Summary

This activity targets the following skills:

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.RI.3.3:**
Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and

cause/effect.

• **CCSS.ELA-LITERACY.RI.4.3:**

Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

• **CCSS.ELA-LITERACY.SL.3.1:**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

• **CCSS.ELA-LITERACY.SL.4.1:**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

• **Writing Standards K-5:**

Text Types and Purposes, W.3.2

• **Writing Standards K-5:**

Text Types and Purposes, W.4.2

NEXT GENERATION SCIENCE STANDARDS

• **Crosscutting Concept 2:**

Cause and Effect

• **Crosscutting Concept 4:**

Systems and system models

• **Science and Engineering Practice 4:**

Analyzing and interpreting data

• **Science and Engineering Practice 6:**

Constructing explanations and designing solutions

• **Science and Engineering Practice 8:**

Obtaining, evaluating, and communicating information.

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Chart paper
- Colored markers or pencils

REQUIRED TECHNOLOGY

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

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group learning
- Small-group learning

ACCESSIBILITY NOTES

When showing the video in Step 1, turn on the closed captions to support students' literacy development and comprehension of the content.

BACKGROUND & VOCABULARY

Background Information

This activity builds on what students previously learned about the immune system, with a focus on how specific everyday activities help support our immune systems, and how people's engagement in those activities varies seasonally. The four activities are eating a lot of fruits and vegetables, exercise, sleep, and being in the sunshine (which provides vitamin D). Students learn about the seasonal trends for these activities by analyzing data representations, which is an authentic scientific practice with which students should start developing expertise during elementary school.

Additionally, systems thinking is an important practice for students to make sense of complex phenomena. The cause-and-effect pathways in this activity are a foundational way for students to begin engaging in systems thinking by considering how particular activities impact the ability of the immune system to fight off germs.

Prior Knowledge

["Many common illnesses are caused by microbes/germs.","Different parts of the immune system work together as a system to protect our bodies and fight off germs."]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
antibody	*noun*	molecule that help fight disease and infection.
bacteria	*plural noun*	(singular: bacterium) single-celled organisms found in every ecosystem on Earth.
environment	*noun*	conditions that surround and influence an organism or community.
germ	*noun*	disease-producing microbe.
immune system	*noun*	network of chemicals and organs that protects the body from disease.
mucus	*adjective, noun*	slimy, fluid secretion of some animals.
virus	*noun*	pathogenic agent that lives and multiplies in a living cell.

For Further Exploration

Books

- My Healthy Body

Video

- SciShowKids: Why Do We Get Sick?