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ACTIVITY : 1 HR

Bad Germs: Keep Out!

Students consider what our bodies do to help protect us from germs through discussion and a reading activity. They create a body map to show the location, structure, and function of different parts of the immune system. Students then collaborate on a class version of the body map that shows how the different parts work together to fight off germs.

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/bad-germs-keep-out/

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DIRECTIONS

This activity is part of The Truth About Year Round Germs unit.

1. Invite students to share ideas about how our bodies help to protect us from germs.

- Revisit the *Know and Need to Know* chart created in the first activity, *Sick Days*. Review the questions in the "Need to Know" column to see if students can now answer them after the last lesson, *Germ Flow*, and can move those questions to the "Know" column. Elicit any new questions students have developed and add them to the "Need to Know" column.
- Connect to students' ideas from the activities in the *Germ Flow* lesson by asking:
    - *Last time, we talked about activities that help or prevent germs from spreading. What do you think our bodies do to help protect us from germs?* (Depending on students' prior knowledge and experiences, their responses may include: Sneezing and coughing helps to expel germs; Our bodies make extra snot/mucus to help flush germs out; Hair in our noses and our skin helps to trap and shield us from germs.)
        - Document students' responses in a visible place, to be referenced as they learn more about the immune system in the following steps.

2. Support students as they collaboratively read about how our immune systems help protect our bodies from germs.

- Organize students into reading pairs and provide each pair with the *Attack of the Germs!* article and the *Our Immune System: Body Map* handout.
- Introduce the *Attack of the Germs!* article and the purpose for reading it: to understand how the different parts of the immune system help protect our bodies from germs.
- Display the class body map (see Setup) in a visible location and introduce it as the class version of what students will create with a partner.
- Explain that as students read, they will add what they learn about the location, structure, and function of different parts of the immune system to their map of the human body.
- Read the first page of the article aloud to the class, to model how to annotate the body map with relevant information.
    - The first page focuses on bacteria and viruses; as you read, connect the key concepts to what students already know about these microbes from the *Germs All Around Us* activity, especially the idea that many bacteria are beneficial and necessary for our bodies to function properly.

- Model how students should add relevant information to their body map on the *Our Immune System: Body Map* handout. In the second section, Unwanted Guests, pause to emphasize the following sentences: "About 500 types of bacteria live in your intestines (collectively, these are referred to as your "gut microbiome" – fun fact: about 700 trillion bacteria total live in our digestive systems including beneficial ones and germs). The gut environment is complex – many of the bacteria living in your guts are beneficial to absorb nutrients, process food, remove waste, fight off germs – and can be even necessary for a healthy immune system; however, some can be harmful to our health.
- Invite students to explain how this information addresses the reading purpose.
- Demonstrate how to add this to the class body map:

    - Sketch a picture of the intestines, roughly where they are in the body. Label the sketch with a brief summary: "Bacteria: help digest food; can keep out and kill germs (bad bacteria)."

- After modeling the sections described above, prepare student pairs to finish the article with the reading purpose in mind and continue adding what they learn about the location, structure, and function of some key parts of the immune system to the body map on their handout. Encourage creativity in how students draw the body parts and germs!
- Information from the article includes:

    - Skin (considered our heaviest and largest organ): Covers and protects the body by acting as a waterproof barrier. Also has special cells to warn the body that germs are going to attack, makes chemicals to kill germs.
    - Mucus (water-insoluble gel): Mainly in the nose (and in stomach internal surfaces), acts as a wall to block viruses (and other germs) from getting further into the body.
    - Hairs in nose (act as a natural filter): Try to sweep virus (and other germs) out. Particles tend to stick to the wet surface of hairs preventing them to go in further.
    - White blood cells (account for one percent of all blood but have an essential role – think of them as always being in war towards protecting your immune system): Present in the bloodstream throughout the whole body. Different kinds of white blood cells: Some, such a neutrophiles (these are your first line of defense!), surround germs (bad bacteria and fungi) as they enter and destroy them. Others, like B cells (aka lymphocytes), create antibodies which match specific germs to help stop infection. B cells remember which germs they have encountered before so they can fight them off again faster and more efficiently (which is how some vaccines work!). T cells: Some tell other white blood cells what to do; others fight to kill cells that have germs inside.

- As students near the end of the article, highlight the two prompts in Part two of the handout. Partners should add tips from the last section of the article about how to help stay healthy and support our immune systems. Additionally, encourage students to add their new ideas and questions in the space provided.
- Circulate to support understanding of the article and press their thinking about the immune system and human body by asking questions related to the structure and function of the different immune system tools, such as "How do microbes play a role in the different defense systems we have in the body?"
- In preparation for students' game show development in the final step of this activity, ask partners to review their tips, questions, and ideas and annotate those that will be interesting and helpful to share with their community through the Germology Game Show.

3. Use student's ideas about how the immune system fights off germs to create a class body map.

- Lead a class discussion and have students share out the different immune system parts identified on their body maps.
    - As students share, document their ideas on the class body map. Elicit additional ideas beyond the information in the article and add these parts of the immune system to the body map, as well.
        - Additional responses could include:
            - Coughs and sneezes to expel germs
            - Extra mucus production in nose to flush out germs
            - Probiotics to help fight off bad germs in stomach
            - Increased body temperature (fever) which helps support T-cells and other parts of the immune system
    - Use the completed body map to introduce the idea that different immune tools work together as a system to protect our bodies and fight off germs.
        - For example: As a first line of defense, mucus and hairs in the nose work together with sneezing to help keep out or expel germs.
        - Another example: If we get a stomach bug, we may need to use the restroom more often as our body. (stomach/intestines) are working hard to expel the virus/bacteria causing our sickness

- Note for students that they will return to this idea in the next activity, *Helping and Hurting Our Immune Systems*.

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

- Gather and document students' ideas about how to support the immune system and students' additional questions, from the boxes on Page two of the *Our Immune System: Body Map* handout.
    - Connect to the unit's driving question about why germs make us sick more often in the winter by documenting these ideas and questions on the relevant quadrants (likely Germs and People) of the class Question Quadrant chart.
- Organize students back into their reading pairs (or any other grouping of two or three students) to develop trivia questions and evidence-based answers for the Germology Game Show. Re-distribute individual students' *Trivia Question Builder* handouts from the *Germ Flow* lesson.
    - If they did not do so at the end of Step 2, prompt groups to review their tips, questions, and ideas from the body map activity and annotate those that will be interesting and helpful to share with their community.
- Guide students to select two ideas from this activity to focus on for writing trivia questions and evidence-based answers. Use the *Bad Germs: Keep Out!* Question Set section on the *Trivia Question Builder* handout to structure their process.
    - To help support groups, point to the teacher-modeled and collaboratively-developed trivia questions and evidence-based answers from the *Germs All around Us* activity.
    - For this activity, evidence can come from the *Attack of the Germs!* article and students' body maps.
    - Circulate to support and press students' thinking as they work on their questions and evidence-based answers.

Informal Assessment

Reviewing the *Know and Need to Know* chart provides a crucial opportunity to assess students' broad understanding related to the unit driving question and project. Use the *Our Immune System: Body Map* handout, trivia questions, and evidence-based answers they develop for the unit project to assess their developing understanding of how the immune system works to protect us from germs. The last section of the handout elicits student ideas and questions; assessing these to identify themes of understanding and misconceptions can be used to guide subsequent instruction.

Extending the Learning

To supplement the article and support developing readers, consider also showing the video from KidsHealth, *How the Immune System Works* (7:22), or leading a read-aloud of a book about the immune system, such as *My Messy Body* by Liza Fromer and Francine Gerstein.

OBJECTIVES

Subjects & Disciplines

Biology

- Health

Learning Objectives

Students will:

- Read an article to identify how the immune system works to help protect us from germs.
- Create a body map to show the location, structure, and function of different parts of the immune system, and understand that the parts work together as a system to protect our bodies and fight off germs.
- Collaborate to write evidence-based trivia questions, answers, and explanations about the immune system.

Teaching Approach

- Project-based learning

Teaching Methods

- Cooperative learning
- Discussions
- Reading

Skills Summary

This activity targets the following skills:

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **Reading Standards for Informational Text K-5:**
Key Ideas and Details, RI.3.2
• **Reading Standards for Informational Text K-5:**
Key Ideas and Details, RI.4.2
• **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 2:**
Developing and using models
• **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

PHYSICAL SPACE

- Classroom

SETUP

Review the *Attack of the Germs!* article and the *Our Immune System: Body Map* handout to preview the activity and consider how to organize students into reading partners.

Create a body map outline (as on the handout) on chart paper or other public document to use as a class body map. The class will return to this in the next activity, *Helping and Hurting Our Immune Systems*, so be sure to have it on a document that can be revisited.

GROUPING

- Large-group instruction
- Small-group learning

ACCESSIBILITY NOTES

For Step 2, consider strategically grouping students in mixed-level reading pairs to support ELLs and struggling readers.

BACKGROUND & VOCABULARY

Background Information

This activity introduces basic information on some of the key parts of the immune system (skin, mucus, hairs, white blood cells), so that students have some framing with which to respond to the unit driving question about why germs make us sick more often in the winter.

The immune system more broadly is complex and made up of two separate subsystems: the innate (or non-specific) immune system and adaptive (specific or acquired) immune system. The innate immune system (the one we are born with and considered our “first line of defense” that immediately tries to prevent the spread and movement of germs/particles) generally defends the body from infectious germs and harmful/foreign particles through skin (and skin oils), mucous membranes (which physically trap bacteria), enzymes in tears, stomach acid, and immune responses, such as sneezing or blood clotting. In contrast, the adaptive immune system creates antibodies that specifically target germs the body has previously encountered. Vaccines, which expose the body to a deactivated version or genetic material from an infectious germ, work by stimulating the production of specific antibodies (produced by the adaptive immune system) to help fight future infections. Examples of how the body responds when the adaptive immune system is activated includes swelling, redness, pus, pain and production of lymphocytes. Sometimes, the adaptive immune system can make errors and attack itself instead of attacking foreign germs – when this occurs, autoimmune diseases can arise (such as lupus).

In addition to the parts of the immune system introduced in this activity, other parts of the immune system include the tonsils, spleen, bone marrow, stomach acid, lymph nodes, bowel, internal mucous membranes, and the thymus.

A third type of immunity (that is transient and short-lived) exists and is called “passive” immunity. This defense is “borrowed” from a different source such as the mother’s breast milk that provide antibodies to the baby, protecting them from the diseases the mother has been exposed to.

Prior Knowledge

["Many common illnesses are caused by microbes/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.
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 Messy Body

Video

- KidsHealth: How the Immune System Works
- TED-Ed: How does your immune system work?
- SciShowKids: Why Do We Get Sick?
- TED-Ed: How mucus keeps us healthy
- TED-Ed: The surprising reason you feel awful when you're sick