

Assignment Discovery Online Curriculum

Lesson Title: Allergies vs. Viral Infections

Grade level: 6-8, 9-12

Subject Area: Life Science, Biology, Health

Duration: Two class periods

Objectives:

Students will do the following:

- Understand how a virus and an allergen infect the body and how the body responds to each
- Create flowcharts to show the body's reaction to the common cold (a viral infection) or hay fever (an allergic reaction)
- Examine the differences in how colds and allergies are diagnosed and treated.

Materials:

- Internet access
- Poster board
- Colored markers (for each student)
- Print resources about allergies and viral infections (including the common cold)

Procedures:

1. Find out what students know about allergies by discussing the following questions:
 - What causes allergies?
 - What happens to the body during an allergic reaction?
 - How are allergies treated?
2. Find out what students know about viral infections by focusing on these questions:
 - What initially causes an infection?
 - How does the body react?
 - How is a viral infection treated?
3. Explain to students that the body uses its immune system to fight infections and illnesses. When an antigen, or foreign substance, is introduced into the body, the immune system responds. Antigens may take the form of a virus, bacteria, or a substance that causes an allergic reaction, like pollen. The latter type of antigen is called an allergen.
4. Tell students that they will compare the immune system's reaction to pollen, a common allergen, and the common cold, a viral infection. First review with the class the following descriptions:

Allergic reaction: When pollen or another allergen invades the body, it may set in motion an allergic reaction. The allergen binds to the antibodies attached to **mast cells** in the nose, skin,

stomach, or sinus membranes. Becoming activated, the mast cells release **histamine**. This substance produces many of the symptoms normally associated with allergic reactions: sneezing, nasal congestion, itching, rashes, and wheezing. The reactions help the body fight off the invading allergens.

Viral infection: When a virus enters the body, it lands on a host cell. The virus starts reproducing immediately, which marks the beginning of an infection. The infected cell produces new viruses that are released from the host cell. Occasionally, the new viruses build up enough to rupture the host cell, releasing more new viruses that infect other cells and keep the process going.

When a virus infects a cell, the body responds by activating parts of the immune system. Reactions may include the following:

- Lymphocytes, or white blood cells, produce antibodies that cover a virus' protein coat and prevent the virus from attaching itself to another cell.
- Other lymphocytes destroy infected cells, killing the virus before it can reproduce.
- The body produces a high fever, which limits the virus' ability to reproduce.
- The body forms large amounts of mucus in the nose and throat to trap the virus and expels both mucus and virus from the body by sneezing, coughing, or blowing the nose.
- The body makes interferons, or protein substances, which provide some protection against many types of viruses.

5. Print out the vocabulary list found at the end of this lesson. Review the vocabulary terms before students proceed with their research.
6. Explain that students will continue their studies of an allergic reaction to pollen (more commonly known as hay fever) or a viral cold. Have students work in small groups using the Web sites suggested below. Have them take notes and answer the following questions:
 - What are the causes?
 - What are the symptoms?
 - How long do symptoms typically last?
 - How is it treated?
 - How can they be prevented?
 - How is it diagnosed?

Allergic Reactions

Hay Fever

<http://my.webmd.com/content/article/1625.50516>

<http://my.webmd.com/content/article/1680.50309>

What Are Allergies?

<http://my.webmd.com/content/article/1625.50536>

Kids' Health: Allergies

http://kidshealth.org/kid/health_problems/allergy/allergies_p3.html

Allergy Glossary

<http://my.webmd.com/content/article/1625.50534>

Cold, Flu, Allergies

<http://www.bhg.com/bhg/category.jhtml?catref=C208>

Common Cold

Common Cold

<http://www.commoncold.org/>

<http://my.webmd.com/content/article/1680.50949>

Cold, Flu, Allergies

<http://www.bhg.com/bhg/category.jhtml?catref=C208>

Kids' Health: Cold

http://kidshealth.org/kid/ill_injure/sick/colds.html

What's a Virus?

<http://www.microbe.org/microbes/virus1.asp>

Fact Sheet: Common Cold

<http://www.niaid.nih.gov/factsheets/cold.htm>

7. Have each group create a flowchart showing the body's reaction to an allergen or virus. The chart can use both text and symbols and should include the antigen entering the body, the immune system's various reactions, the body's physical symptoms, and how the body heals. Tell students to use the lesson's vocabulary terms to explain the process.
8. Have the groups present their flowcharts to the class.
9. Finally, compare the two reactions as a class. How are they alike? Which symptoms are similar? How can you tell the difference between a virus and an allergen? (*A virus follows a course of beginning, middle, and end. White blood cells increase if the body is fighting an infectious disease. In an allergic reaction, allergies will likely persist as long as irritants are in the environment. Allergies tend to last more than two weeks.*)

Discussion Questions:

1. If you have a runny nose, fever, sore throat, and headache, how might you be able to tell if you have a cold or allergic reaction?
2. Why are people more susceptible to certain allergies at different times of the year?

- Using what you know about how the common cold is transmitted, how might you try to prevent catching a cold?

Extension:

Treating Allergies and Viral Infections

Diagnosing allergies and viral infections can be confusing, and their treatments are different. Have students interview their own or another pediatrician about treatments for these conditions with similar symptoms. Brainstorm with students about questions they might ask. They may want to include the questions below in their interviews:

- How does a vaccine work?
- How do antihistamines work?
- How do antibiotics work? When won't an antibiotic work? (Antibiotics help fight bacterial infections only, not viral infections.)
- Why is rest important? (It allows the body's immune system to work.)
- Is there a treatment for a virus? (No, it has to run its course.)
- Why is it wise *not* to treat a fever? (The body needs heat to fight the illness; a lower body temperature might extend the time needed to fight the infection.)
- How is the common cold spread?

Evaluation:

Use the following three-point rubric to evaluate how well students participated in class discussion, researched allergic reactions or the common cold, and created flowcharts to describe the body's reaction to the allergen or virus.

Three points: active participation in class discussion; strong research skills; clear, thorough flowchart created using several vocabulary words learned in the lesson.

Two points: average participation in class discussion; on-grade research skills; complete flowchart created using some of the vocabulary words learned in the lesson.

One point: little participation in class discussion; weak research skills; incomplete flowchart created using few or none of the vocabulary words learned in the lesson.

Suggested Reading:

Allergies (Disease and People series)

Sara L. Latta. Enslow Publishers, 1998.

About 20 percent of the population is allergic to something. That's a lot of people! Using clear language and occasional illustrations, this is a solid introduction to the world of allergies: how they were first understood, how they are diagnosed, and how they are prevented and treated. An extensive bibliography and a glossary are included.

Allergies: What You Need to Know (Johns Hopkins Health)

Mark Giuliucci. Time Life Books, 1999.

Beginning with a detailed explanation of the changes that take place in your body's immune system when you have an allergic reaction, this handy book covers a variety of allergic responses, including hay fever, asthma, and skin, food, and drug allergies. Later chapters explain how to choose an allergist and various treatments for allergies, from creating an allergy-free environment to using drugs or shots for allergy prevention. The appendix lists support groups, Internet resources, and more.

Vocabulary:

allergen

Definition: A substance such as pollen or mold that causes an allergy; the body's immune system interprets it as an invader.

Context: Pollen is a common **allergen** that causes hay fever.

allergy

Definition: An exaggerated or abnormal reaction (such as sneezing, itching, or a rash) to substances or conditions that are harmless to most people.

Context: Common forms of **allergy** include asthma, hay fever, eczema, and hives.

antibodies

Definition: Proteins produced in blood and tissue to help neutralize and destroy foreign bodies (antigens).

Context: **Antibodies** are an essential part of the immune system.

antigen

Definition: A chemical substance (usually a protein) that the body perceives as foreign; antigens cause the body to form antibodies against it when it is introduced into the body.

Context: In the case of allergies, the **antigen** is an allergen.

hay fever

Definition: An allergic reaction caused by the pollens of ragweed, grasses, and other plants whose pollen is spread by the wind.

Context: **Hay fever** and the common cold have similar symptoms.

histamine

Definition: A naturally occurring substance released by the immune system after being exposed to an allergen.

Context: **Histamine** produces many of the symptoms normally associated with allergic reactions, such as sneezing, nasal congestion, itching, rashes, and wheezing.

immune system

Definition: The body's defense system that fights infections and foreign substances.

Context: The **immune system** provides protection against potentially damaging substances that may invade the body.

mast cell

Definition: A large cell involved in allergic reactions.

Context: An allergic reaction activates **mast cells** to send out histamines.

pollen

Definition: A fine, powdery substance released by plants and trees.

Context: Hay fever is an allergic reaction caused by **pollen**.

rhinovirus

Definition: Viral infection of the mucous membranes of the nose, throat, and sometimes the air passages and lungs.

Context: The **rhinovirus** causes most common colds.

virus

Definition: A microscopic infectious organism that can multiply only in living cells, causing diseases in human beings, lower animals, and plants.

Context: The common cold and the flu are two types of **viruses**.

Academic Standards:

This lesson adheres to the National Science Education Standards for students in grades 5-8:

- Life science

Credit:

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This lesson was developed in consultation with Frank Wiesel, life science curriculum consultant and former middle school science teacher.

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