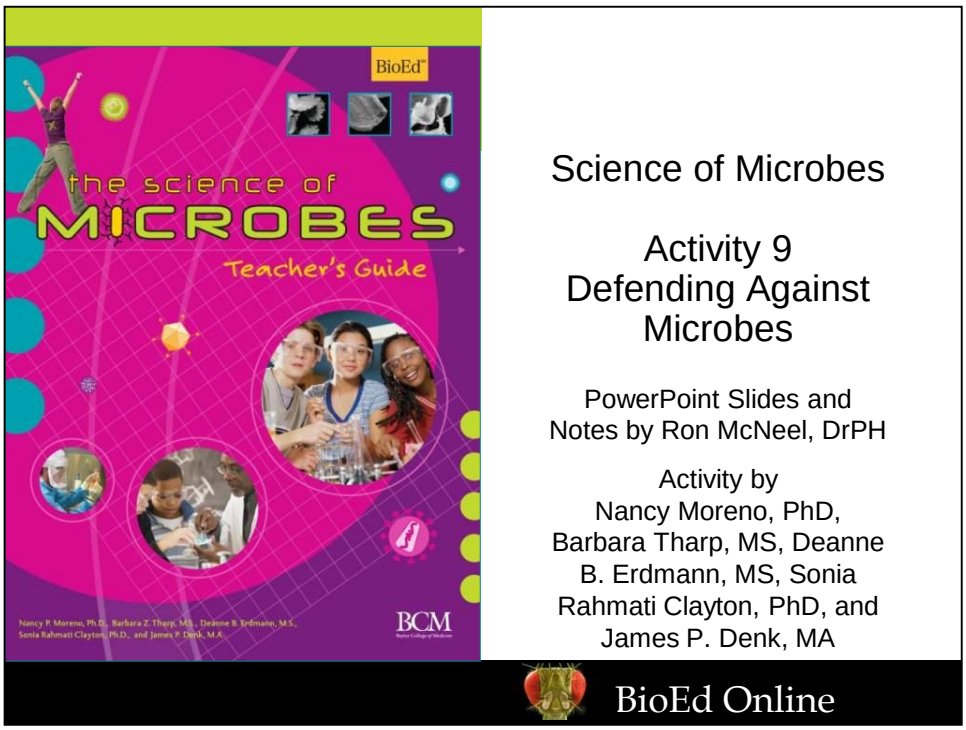

Science of Microbes

Defending Against Microbes is the ninth lesson in the unit, *The Science of Microbes*. It addresses National Science Education Content Standards related to Inquiry and Life Science. See the downloadable lesson PDF (web address below) for a complete list of the standards addressed.

In this activity, students will learn how the body's immune system fights microbes and protects us from disease. Specifically, students will use information obtained from an article to solve a crossword puzzle featuring immune system vocabulary words.

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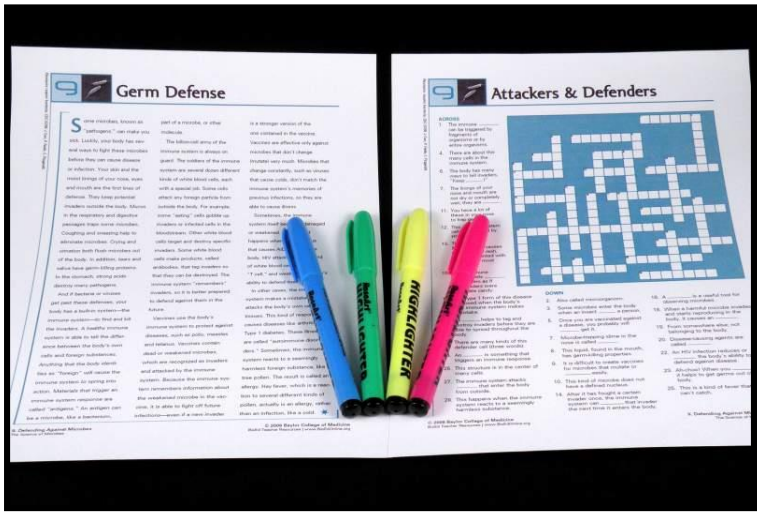
Materials for Each Group of Students



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Materials for the Students

Have the students work individually or in groups of four. Or, have them start individually, and then complete the activity in groups.

Each student or group will need the following materials.

- Set of colored highlighters (one marker per student/one different colored marker for each student in a group)
- One copy of “Germ Defense” and “Attackers & Defenders” per student
- Group concept map (ongoing)

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Image Reference:

Denk, J. (2009). Materials for activity 9. Baylor College of Medicine. Houston, TX.

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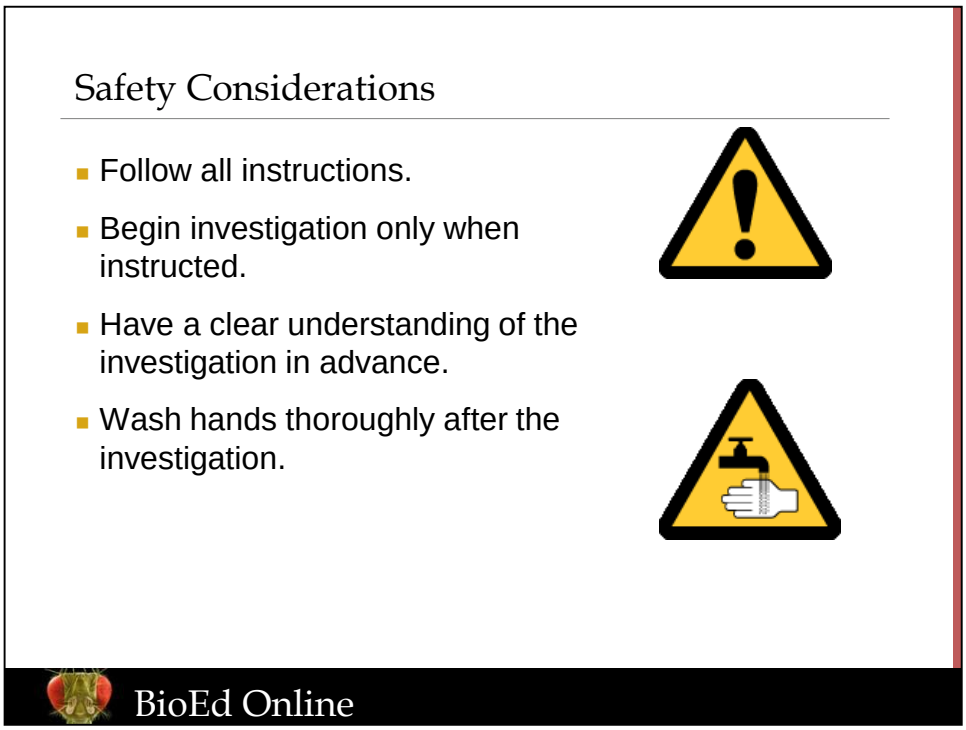

Safety Considerations

It is important that students always think about safety when conducting a science investigation. This slide may be used to review safety with your class before starting the activity. Also, keep the following points in mind.

- Always follow district and school safety guidelines.
- Have a clear understanding of the investigation in advance (practice any investigation with which you are not familiar).
- Continually monitor the area where the investigation is being conducted.

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Defending Against Microbes

Recalling the last activity, *Microbes are Everywhere*, and the abundance of microbes throughout our environment, ask students, *If microbes are everywhere, why aren't we sick all the time?* List students' answers on the board. Lead them to understand that the body's immune system defends us against dangerous microbes.

Distribute the *Germ Defense* article to each student. Have students read the article individually and highlight any new words or concepts they find.

After students have finished reading the article, divide them into groups of four. Have each group discuss the new terms and concepts they found in the article. Provide resources for further investigation of the immune system. For example, student groups might search the Internet for more information at websites such as those for the National Institutes of Health (http://www.nih.gov/) or the Centers for Disease Control and Prevention (http://www.cdc.gov/).

Lead a classroom discussion about the new words and concepts discovered in the article, *Germ Defense*. Allow each group to present one new word or concept, and continue around the room until all new words and concepts have been discussed. Then, distribute the crossword puzzle, which students can complete individually or in their groups.

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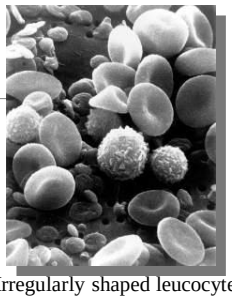
Let's Talk About It

- Review answers to the crossword puzzle with students.
- Students should understand that there are three levels of protection within the body's defense system.



Irregularly shaped leucocytes, red blood cells and platelets.

1. The skin, mucus membranes, secretions (e.g., tears and saliva), and coughing/sneezing (nonspecific or general barriers).
2. Inflammation and white blood cells that gobble up invaders (nonspecific or general barriers).
3. Production of specialized antibodies in response to a particular microbial invader (specific barrier)

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Let's Talk About It

As a class, review students' answers to the crossword puzzle. If a group was not able to complete one or more line of the puzzle, have another group explain its correct answer to insure that everyone has a clear understanding.

Lead the students to understand that there are three levels of protection within the body's defense system. It is important for students to grasp that the body has multiple ways to protect itself against disease-causing organisms.

Many students take our bodies' first layer of defense—the skin—for granted. Ask them to think about what they do when they get a cut or scrape on their skin.

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Image Reference:

Wetzel, B. and Schaefer, H. (1982). Circulating human blood. National Cancer Institute. Retrieved 12-15-2009 from http://en.wikipedia.org/wiki/File:SEM_blood_cells.jpg

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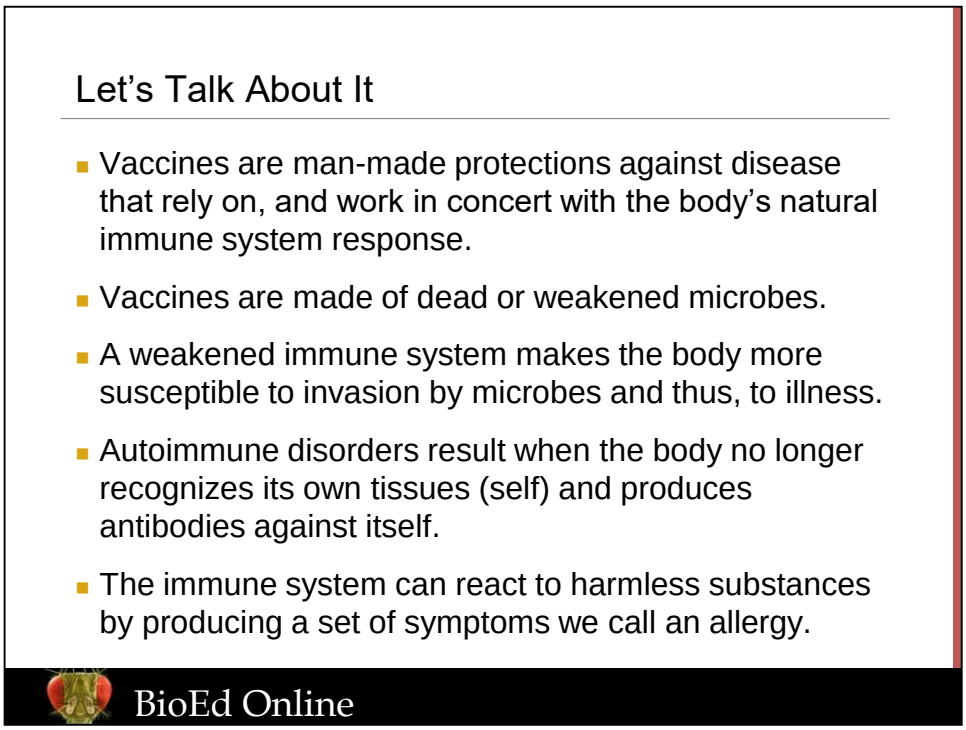

Let's Talk About It

It is important for students to know about vaccines, man-made protections against disease that use dead or weakened microbes to activate the body's natural immune response. As a class, discuss what might happen to a person whose immune system is weakened or destroyed. Lead students to understand that this individual would have little or no ability to fight off an invasion and infection from microbes. For example, HIV weakens the body's immune response to foreign invaders. Patients with HIV usually die from complications due to infection from other microbes, and not from the HIV disease itself.

Sometimes, the body's immune system attacks its own tissues because it no longer recognizes them. This type of response is called an autoimmune disorder.

And occasionally, the body's immune system overreacts to harmless foreign substances, such as tree pollen, producing a condition known as allergies. Common allergic reactions to foreign microbes include swollen, itchy and watery eyes, and sinus pressure.

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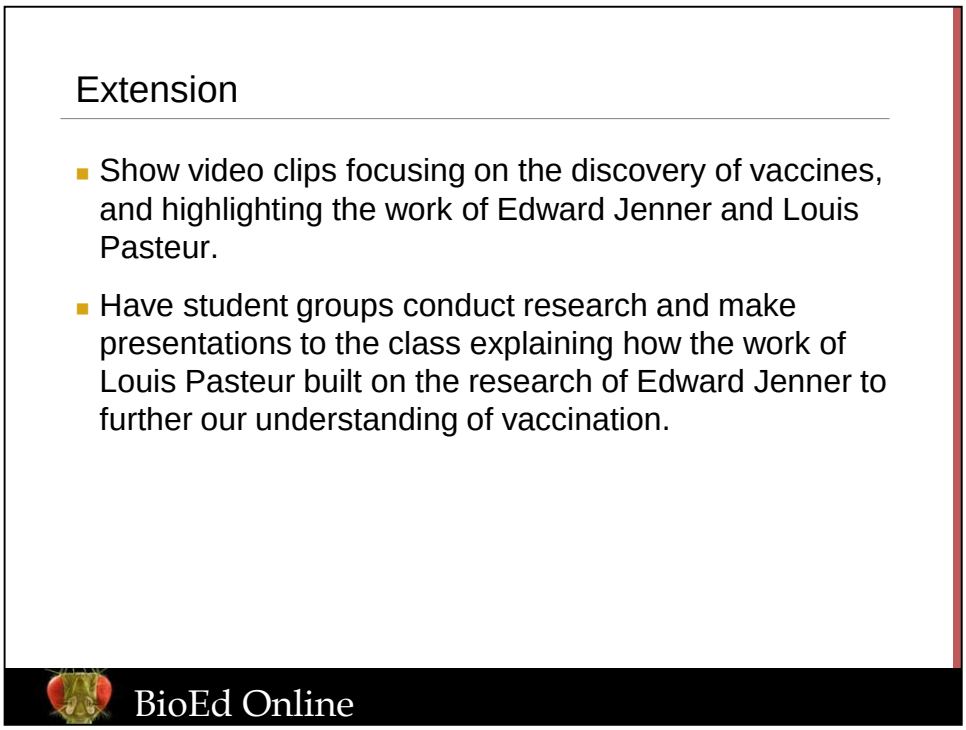

Extension

If your district has access to Discovery Education Streaming videos, log in to access the video, *History of Medicine: Innovations in Obstetrics and Pediatrics*. Scroll down in the right-hand column to view the following video clips, which are focused on the discovery of vaccines, and highlight the work of Edward Jenner and Louis Pasteur.

Video Clip Titles

The Road to Vaccines: Edward Jenner (06:37)

The Road to Vaccines: Louis Pasteur (05:40)

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