Body Battles!

Purpose

Students will explain that white blood cells engulf invaders or produce antibodies that attack invaders or mark the invaders for killing by other white blood cells, and will know that the antibodies produced will remain and can fight off subsequent invaders of the same kind.

Materials

For the teacher: yellow index cards, red index cards (in a class of 20 students, 10 of each), tape, 50 balloons, 10 black markers
For each student: copy of Black Line Master (BLM) *Body Battles*
For each pair of students: paper, pencils

Activity

A. Pre-Activity Preparation

1. Arrange for students to play the game outside.
2. Obtain and have students blow up at least 50 balloons.

B. Pre-Activity Discussion

1. Ask students: "What types of organisms make us sick?"
2. Discuss how *pathogens*, such as viruses, bacteria, protists, and fungi, can enter the body and cause infections.
3. Inform students that our bodies have defenses that protect, defend, and attack against such pathogens.
4. Tell students that skin, mucus, saliva, and tears are the first line of defense. Ask students: "How do you think they help protect the body from pathogens?"
5. Discuss that while most pathogens are prevented from entering the body by this first line of defense, some do enter the body. Explain that this is when the immune system plays a role.
6. Tell students that the human body contains white blood cells that identify and attack foreign objects and pathogens in the body.
7. Explain that there are many different kinds of white blood cells, each with a particular job.

C. Flow Charts

1. Distribute a copy of the BLM *Body Battles* to each student and divide the class into pairs.
2. Read through the top half of the BLM with the class and instruct students to make flow charts showing the immune response process. Monitor and guide students as they work.

(continued)

connecting across the curriculum

Visual Arts

Provide craft materials and have students construct models of pathogens and each type of white blood cell. Have students portray the "Body Battle" using their models.

EXTENDING THE ACTIVITY

Have students research autoimmune diseases, such as rheumatoid arthritis, Graves' disease, and multiple sclerosis.

Standards Links
7.4.12, 7.6.3

Activity (continued)

3. Have students share and explain their flow charts to each other and correct any misconceptions or mistakes.

D. Activity

1. Tell students that they will act out and play a game called Body Battles. Explain that they will play two rounds of the game, which will simulate some of the actions of the immune system.
2. Assign a role from the BLM to each student (see Teacher Directions on the back of the BLM).
3. Instruct students to read the bottom half of the BLM and discuss each of their roles.
4. Distribute a yellow card to each of six invaders and three antibodies. Distribute a red card to each of four invaders and none to antibodies.
5. Give each invader a marker to mark the "infected cells."
6. Set up a boundary, which represents saliva, tears, mucus, and skin (this boundary could be a rope).
7. Place half of the balloons in an area behind the boundary.
8. Direct students to take positions and begin the game.
9. At the end of the first round, have each student discuss his/her role and explain the game in terms of the immune response process.
10. Ask students: "What happened to the pathogens with red antigens?"
11. Discuss how there were no antibodies to match the red antigens, therefore those pathogens survived and could attack the body cells successfully.
12. Direct students to move back to the start position, and redistribute antigen cards. Distribute red antigen cards to antibodies. Place the second half of the balloons behind the boundary.
13. When students have completed the second round, discuss what was different. Discuss with students how in the second round, the B-cells already had memory of the red antigens, could recognize them, and were prepared to make antibodies to attack them.

Classroom Assessment

Basic Concepts and Processes

At the end of the activity, ask questions, such as the following:


What roles do white blood cells play when protecting the body from pathogens and other foreign objects?


How is using different-colored cards to represent different antigens accurate? How is it inaccurate?

Name: _____

BODY BATTLES

How the body battle begins:

1. Pathogens and/or other foreign objects get past the first line of defense – saliva, mucus, tears, and skin.
2. Macrophages (a type of white blood cell) move to the site and engulf and digest the invaders. If they cannot handle the job alone, they "call" for back-up.

Calling for back-up:

3. As the macrophages engulf and digest the pathogens, they take pieces of the pathogen and present them on their surfaces like flags. This is the signal for other white blood cells to attack.
4. Helper T-cells are on the site first and survey the area.
5. They call for Killer T-Cells to identify and destroy all infected body cells.
6. They also call for B-Cells to make antibodies that will recognize and attack the pathogens.*
7. Macrophages continue to engulf invaders, but also clean up the battle site. They engulf dead cells and waste materials.**

* Note: Each pathogen has a marker or tag called an antigen on its surface. Antibodies identify the pathogen based on the antigen it presents. Each antibody is made to attack a specific pathogen based on its antigen. Antibodies are made to fit antigens like a key fits a lock.

**Note: Sometimes new kinds of pathogens enter the body and are not recognized by white blood cells. It can take up to two weeks for the body to produce matching antibodies.

BODY BATTLES

✓ Set up a boundary that represents skin, mucus, saliva, and tears.

✓ Place balloons within the boundary. The balloons represent healthy body cells.

INVADERS: You are pathogens. Specifically you all represent one or more forms of a virus. Some of you will wear yellow cards and some will wear red cards. Your card represents your antigen. Your job is to get past the boundary and escape the attack of all white blood cells. You also want to "tag" as many body cells (balloons) with your marker as possible. Once you tag a cell, it is infected. If you get attacked, give your antigen card to the white blood cell or antibody and go back outside the boundary.

MACROPHAGES: Your job is to engulf as many pathogens as possible. Once you digest the pathogens, take their antigen cards and attach them to your shirt. This will signal the helper T-cells. As the other white blood cells attack the invaders, "engulf and digest" them and move them back outside the boundary.

HELPER T-CELLS: Survey the area and call for the B-Cells and Killer T-Cells.

KILLER T-CELLS: Find and destroy any infected body cells. (Pop infected balloons!)

B-CELLS: Count how many different-colored antigens are needed and assign a color to each antibody. Send the antibodies out to mark and attack! Reassign dead pathogens as new antibodies.

ANTIBODIES: Follow the directions of the B-Cells and attack only the invaders with matching antigens/cards.

BODY BATTLES

Teacher Directions

Distribute copies of the BLM *Body Battles* and have students get into pairs. Direct students to read the top half of the BLM and to make a flow chart based on the information.

Monitor and guide students as they work. Have groups share their flow charts with each other and discuss the immune response process.

Direct students to read the second half of the BLM. Discuss the game guidelines for *Body Battles* and assign roles to students. Assign half the class to be invaders. Assign one helper T-cell, two antibodies, and one or two B cells. Divide the remaining students equally between macrophages and killer T-cells. For example, a class of 30 would comprise 15 invaders, one helper T-cell, two antibodies, two B-cells, five killer T-cells, and five macrophages. Direct students to begin the game.

Answer Key

Not applicable.