

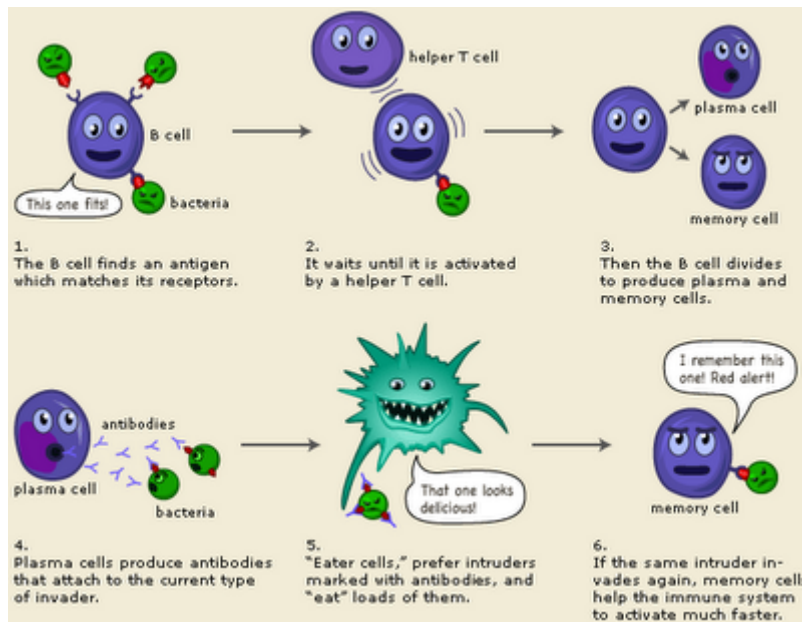
Immune System Cartoon Strip

Objective:

- Describe the role of the skin in providing non-specific defense against pathogens.
- Differentiate between specific and nonspecific defenses.
- Explain the process in which antibodies oppose antigens in order to combat pathogens.
- Contrast T and B lymphocytes.
- Explain the role of vaccinations in producing memory cells to prevent future infections.

Overview

During this activity you will draw a cartoon strip representing how your body fights pathogens such as viruses and bacteria that you come into contact with every day. For this activity, analogies are provided that explain the role of the immune system in fighting pathogens. For this analogy, the classroom represents the body, and the classroom door represents the protective covering, the skin.



Directions

1. This activity will be divided into 2 different cartoons. Cartoon 1 = Bacteria Infection; Cartoon 2 = Viral Infection
2. For each cartoon you will need to include at least 10 cartoon boxes that explain your immune system's reaction.
3. Your cartoon must accurately represent immune system function.
4. Points will be awarded for creativity and quality of finished product.
5. The following **vocabulary** must be included in the cartoon:

Antigen, antibody, bacteria, B cells, macrophages, pathogens, T cells, viruses, cytokine, inflammation, memory cells, T helper cells, T killer cells

6. After the scenarios have been presented, answer the conclusion questions located at the end of this handout.

Cartoon #1: Bacterial Infection

One day you were out planting in your garden when OUCH!!! You got stuck with an old nail in the soil. You ran inside to rinse the wound, but the nail had pushed some bacteria into your skin and it entered your bloodstream. What did your immune system do about this?

Cartoon #2: Viral Infection

One day you were standing in the quad talking to a friend during break who looked sick when AWCHOOO!!! your friend sneezed right in your face! Unfortunately it happened just as you were inhaling with your mouth open and the virus entered your bloodstream. What did your immune system do about this?

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BACTERIAL INFECTION

1. The bacteria has entered the body through the skin! Students with bacteria roles enter through the door.
2. Inflammation occurs and the blood rushes to the area of infection in order to help fight it. The T helper cell, macrophages and other blood components rush to where the bacteria is.
3. The macrophages gobble up some of the bacteria, but can't get it all. They need help! Only two of the bacteria cells are destroyed. (A discussion of phagocytosis could take place prior to the activity so that students can explain how these bacteria are being "gobbled up".) Or, an explanation of phagocytosis could be placed on the information card on the back of the macrophage cut-out for students to refer to while acting out the process.
4. The macrophages show the T helper cell the parts of the bacteria that it ate up.
5. Now that the T helper cell knows there is a problem, it sends a messenger, the cytokine to get the B cells. The cytokine goes over to where the B cells are waiting and calls for them to help.
6. The B cells rush to the scene, but only the B cell with the matching antibody can really help. The others have to go find another infection to fight.
7. When a match is found, the B cell makes multiple copies of the antibody it has on its surface. Antibodies appear at the scene.
8. The antibodies attach themselves to the antigens that are present on the bacteria cells.
9. Once the antibodies are attached to the antigens on the bacteria cell, the messenger is then sent to get more macrophages.
10. The macrophages find the bacteria with the antibodies attached to them and (not so violently) put to death the bacteria cells by way of phagocytosis.
11. Meanwhile, the B cell that recognized the antigen is replicating and making memory cells with the same antibody on them so that if this bacteria comes back they can recognize it more quickly and destroy it.

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VIRAL INFECTION

1. A virus enters the body through a mucus membrane. A student with a virus card walks through the door of the classroom.
2. The virus enters a body cell by puncturing its cell membrane. Student with virus card describes this process which is written on the back of the card.
3. The virus begins to replicate inside the cell. The student with the infected cell may describe how this happens. This process should be written on the back of the body cell card.
4. Fragments of the virus are presented on the body cell membrane.
5. A passing T cytotoxic cell does not recognize the fragment as being a part of the body and binds to the fragment with its receptor.
6. The T cytotoxic cell then releases toxin that causes holes to form in the cells membrane, and the cell lyses. This process is described by the Tc cell.
7. After the cell explodes, virus fragments are recognized by a B cell with a matching antibody.

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Conclusion Questions

1. What is the purpose of inflammation?
2. Once a T cell recognizes a piece of the pathogen what does it do to get the attention of the B cells?
3. What is a cytokine?
4. Once B cells arrive on the scene, what is on the pathogen that will help the B cells recognize it?
5. What structure is on the B cells that helps them recognize the pathogen?
6. What must happen between the B cell and the pathogen in order for the B cells to help out?
7. What are two things that B cells do when the pathogen is “recognized”?
8. What is the role of T killer cells?
9. What is the role of B memory cells?
10. What part of this immune response was an innate response?
11. What part of this immune response was a learned response?