

Activity 5.3.3: Fighting the Common Cold

Introduction

In PBS, you learned that human blood contains three main cells or cell fragments. Red blood cells help transport oxygen around the body. Platelets assist in protection by helping your blood clot. But it is the white blood cells that really function to keep you well. Your body’s immune system relies on special white blood cells to pinpoint and destroy microbes that may make it through your body’s non-specific defenses. In Activity 5.3.2, you were introduced to antibodies, special proteins that can target and inactivate specific antigens. Antibodies are one of your body’s main defenses. These Y- shaped proteins are created by the white blood cells and circulate in your blood and lymph. Specific antibodies are produced when an unwanted antigen enters the body. The antibodies work to disable these invaders and target them for destruction.

In this activity, you will walk through the steps of fighting off a cold and you will graph data about your immune response to specific pathogens. By looking at the way in which antibodies respond and how your body reacts, you will begin to see how your white blood cells keep you well and allow you to build up your resistance. You will investigate the amazing white blood cells that are at the center of your body’s specific defense system and trace immune response in a flow chart. Relating what you see on your graph to your flow chart, you will understand what really happens in your body when the common cold comes your way.

Equipment

* Computer with Internet access and Inspiration® software
* Red and blue colored pencil or marker
* Graph paper
* Laboratory journal

Procedure

You are at the movies and a man behind you sneezes. Even though you do not realize it, tiny particles propelled by this sneeze are making their way over to your body. He is just getting over a cold, but some of the remaining virus particles are headed your way. We will call this virus “antigen A.” Never knowing the cause, you do get pretty sick. Your body recovers, but soon after you visit your little sister’s nursery school class. Again, without knowing it, you are exposed to “antigen A” and to a new bug, “antigen B.” Thankfully, you do not get too sick. You notice a slight sore throat (a symptom you never had last time), but other than that, you feel fine. Remember that your immune system can work to produce and distribute antibodies that are specific to an antigen. Let’s take a look at your body’s antibody response to the both “antigen A” and “antigen B.”

1. Use graph paper to plot the data shown below. Plot all of your data on one graph. Plot time on the X-axis and antibody concentration on the Y-axis. Label your axes and add a title to your graph. Make sure to scan the data points and choose an appropriate scale for each axis.

Initial exposure to “antigen A” occurs on Day 1. Second exposure occurs on Day 28

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Time (days)** | **Antibody Concentration** |  |
|  | 1 | 0 |  |
|  | 7 | 1 |  |
|  | 10 | 8 |  |
|  | 14 | 10 |  |
|  | 18 | 20 |  |
|  | 21 | 8 |  |
|  | 25 | 2 |  |
|  | 28 | 1 |  |
|  | 32 | 50 |  |
|  | 35 | 1000 |  |
|  | 42 | 5000 |  |
|  | 49 | 800 |  |
|  | 56 | 100 |  |

Initial exposure to “antigen B” occurs on Day 28.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Time (days)** | **Antibody Concentration** |  |
|  | 28 | 0 |  |
|  | 34 | 1 |  |
|  | 37 | 8 |  |
|  | 41 | 10 |  |
|  | 49 | 20 |  |
|  | 55 | 8 |  |

NOTE: Units for antibody concentration are arbitrary in this example.

1. Connect the points for “antigen A” using a red colored pencil or marker.
2. Connect the points for “antigen B” using a blue colored pencil or marker.
3. With your partner, analyze the data and describe your findings in your laboratory journal. What does this graph tell you about your immune system? Compare your 1st and 2nd response to “antigen A” and describe how your body reacted to “antigen B.” Make sure to relate both antibody curves to the symptoms you were feeling at each time period.
4. Answer conclusions 1-3.
5. Now relate the data from the experiment back to what is happening inside of your body.
6. View the animation, “Fighting the Common Cold” at the Life Sciences/HHMI Outreach Program site <http://outreach.mcb.harvard.edu/animations/commoncold.swf>. Take notes in your laboratory journal as you watch the animation.

Conclusion

1. Compare your body’s response to antigen “A” both times you were exposed. Describe at least two ways in which the body’s response is different.
2. Propose a reason why the second response to antigen “A” was so different.
3. What do you think might have been causing the slight sore throat you felt after visiting your sister’s school? Make sure to use “antigen A” and “antigen B” in your response.