4-H at HOME

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DEFENSE DEPARTMENT

Learn how the immune system helps humans and animals fight off illnesses.

60 minutes | Grades: 6-8

Defense Department

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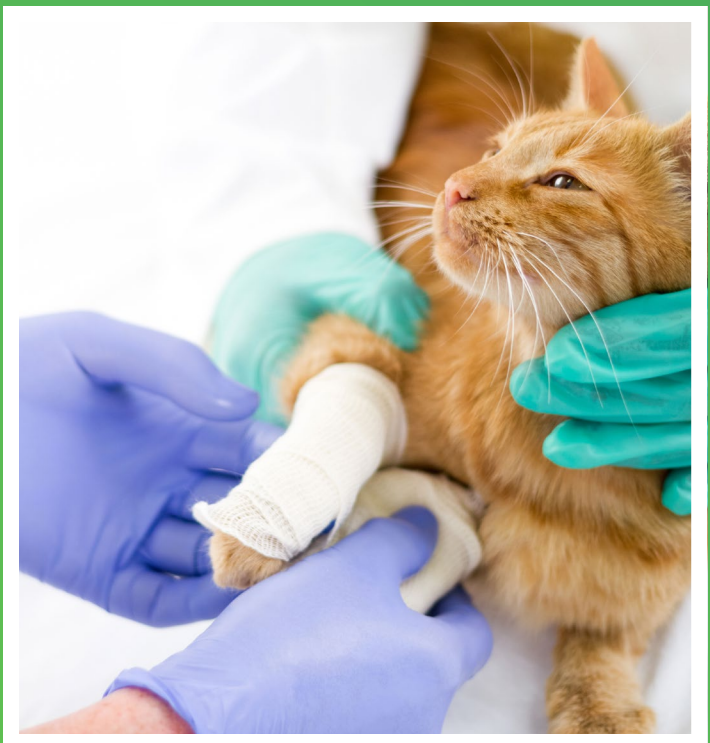
Learn how the immune system helps humans and animals fight off illnesses.

About the Activity

*This is the first in a four-part educational series about preventing and treating illness in animals. You can see the other activities on **4-H Veterinary Science on 4-H at Home**.*

This fun and educational activity will show kids how the body's immune system works and how it protects animals and humans against sickness. Plus, there's candy involved, so it should be a hit.



Supplies

These simple materials will get you started:

- A pencil or pen
- Internet access to research the immune system
- A bag of M&Ms, jellybeans or other multi-colored candy
- A calculator
- The downloadable activity guide PDF with information on immune systems

Grades: 6-8

Topic: Animal Science
Time: 60 minutes

Activity Steps

Before we start, think about this: Having a fever is not fun, but when you — or an animal — are sick, it's actually a good sign. That's because fevers have been shown to "turn on" the immune system, helping the body fight infection. So you may feel sick when you have a fever, but that's because your body is working hard to protect itself! Now, let's get started. Follow these steps to complete the activity.

1. To start, read through the downloadable activity guide and glossary and the information about the immune system. There's some pretty amazing stuff in there. For instance:

   DID YOU KNOW: Lymphocytes are white blood cells that support your immune system by attacking pathogens (any microorganism that can cause sickness in your body). They are found in the bloodstream and lymph nodes. **ALSO:** Erythrocytes are red blood cells that carry oxygen from the lungs to the body's tissues.

2. Now it's time for M&Ms! Open your bag of candy and sort the pieces according to color. Put the color group with the most pieces at the top of your working area; put the group with the second-most pieces below this, and continue until the group with the fewest pieces is at the bottom.

   NOTE: A typical bag of M&Ms has six colors in it, so if you don't have enough different colors to do all eight of the blood cell types, that's fine, the basic idea is still the same.

3. Count the total number of "cells" you have and record this number.

4. Assign a blood cell type name from the list in the matching activity to each color of candy.

5. Finish performing your Complete Blood Count by counting the number of each color candy, then calculating the percent of each type of "cell." The total of all candy percentages should equal 100.

   TIP: To calculate a percentage, divide the number of a specific color candy by the total number of cells. Then multiply that by 100 to convert that decimal to a %.

   For example, if you have 10 red pieces of candy and 36 total pieces, you would calculate the percentage as 10/36, which equals 0.27. Multiplied by 100, you get 27.7, and that's your percentage of red candies: 27.7%

   DID YOU KNOW: A Complete Blood Count is also called a CBC, for short, which is a set of medical lab tests that gives information about the types of cells in a person's blood.

6. Record your results in the corresponding table, then refer to the Normal Blood Count chart for different animals. Based on your totals, do you have a healthy level of blood cells for a cat? For a dog? For a cow?

   TIP: A cat has 6-20 white blood cells (x1000); a dog has 6-17; and a cow has 4-12.

Color of Candy	Cell Type Assigned	Number Counted	Percent of Total

Glossary of Terms

Basophil (BAZE-oh-fill)**:**
A type of white blood cell; precursors of macrophages; circulate in bloodstream; leaves vessels and enters tissues in response to disease-causing agents; engulf invaders and kills them with enzymes.

Eosinophil (ee-oh-SIN-oh-fill)**:**
Also known as platelets; important in blood clotting process.

Erythrocyte (ee-RITH-row-site)**:**
A type of white blood cell; circulates in bloodstream and present in thymus, lymph nodes and spleen; produces antibodies when activated by invading pathogens.

Lymphocyte (LIMF-oh-site)**:**
A type of white blood cell; derived from monocytes; found in tussues; engulfs invaders and destroys them with enzymes.

Macrophage (MAK-row-faj)**:**
A type of white blood cell; rare; function poorly understood.

Monocyte (MAH-no-site)**:**
A type of white blood cell; precursors of macrophages; circulate in bloodstream; contains granules full of enzymes; engulfs invading organisms and destroys them with enzymes.

Neutrophil (NEW-trow-fill)**:**
Also known as red blood cells; contains hemoglobin and carries oxygen from the lungs to the tissues.

Thrombocyte (THROM-bow-site)**:**
A type of white blood cell; numbers increase in response to allergic or parasitic conditions; circulates in the bloodstream.

Normal Blood Cell Counts of Various Species

	Cat	Dog	Cattle	Horse	Pig	Hamster	Rabbit
White Blood Cells x1,000	5.5-19.5	6-17	4-12	6-12	11-22	5-10.6	5.2-12.5
% Neutroophil	35-78	60-80	15-47	30-76	28-51	17-35	17-59
% Lymphocyte	20-55	12-30	45-75	25-60	39-62	51-92	31-80
% Monocyte	0-14	3-14	2-7	1-8	2-10	.4-4.4	0-13
% Eosinophil	2-12	2-10	2-20	1-10	1-11	.2-1.5	0-3.4
% Basophil	0-2.5	0-2.5	0-2	0-3	0-2	0-5	0-5.6
Red Blood Cells x1,000,000	5-11	5.5-8.5	5-10	6-12	5-8	4-10.3	5.1-8
Platelets x1,000	150-500	200-500	100-800	100-600	325-715	300-573	270-656

60 minutes | Grades: 6-8

Test Your Knowledge

How much did you learn about the immune system?

QUESTION 1

What is the main function of a red blood cell?

a. Fights disease
b. Carries oxygen from the lungs to the rest of the body
c. Regenerates healthy cells
d. Transmits information throughout the body

QUESTION 2

What's another name for a platelet?

a. Thrombocyte
b. Neuron
c. Basophil
d. Erythrocyte

QUESTION 3

True or false? Antibodies promote diseases in animals.

a. True
b. False

QUESTION 4

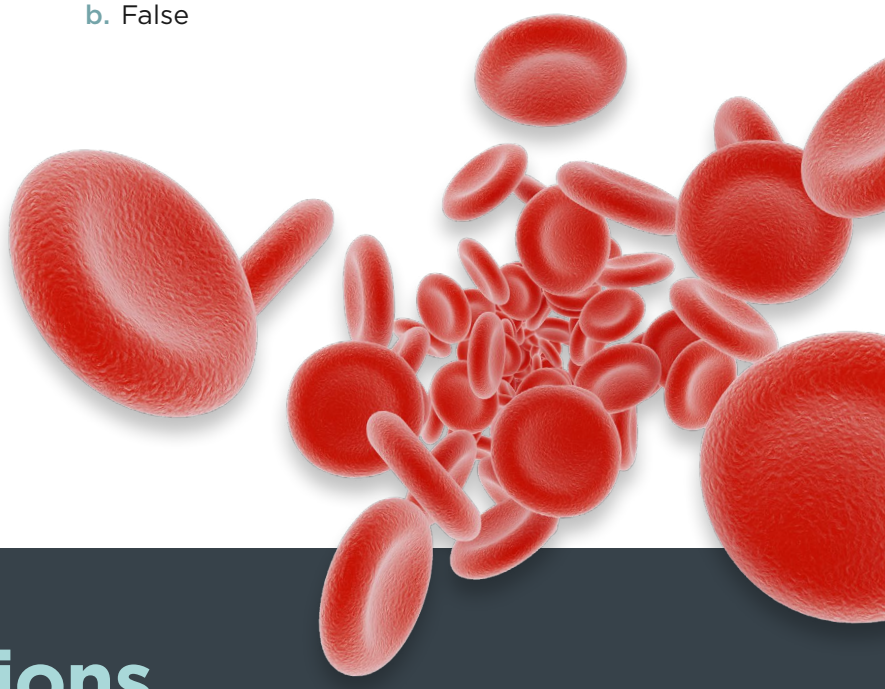
What's the most abundant type of white blood cell?

a. Macrophage
b. Basophil
c. Neutrophil
d. Monocyte

QUESTION 5

True or false? Results from a CBC can help diagnose diseases.

a. True
b. False



Reflection Questions

Questions to deepen wonder and understanding

- How does the immune system protect us against diseases?
- What diseases have you been vaccinated against?
- How can you better protect your pets or animals (if you have any) against diseases?

Investigate & Explore

Take your new knowledge to the next level.

Humans have been studying blood for a long time. The invention of the compound microscope in 1590 made it all possible, and less than a century later the Dutch scientist Jan Swammerdam was the first person to observe red blood cells under the microscope, in 1658.

Over the centuries we've learned a lot about how the different kinds of blood cells drive the immune system, helping it to protect the body by fighting off illnesses. And science has progressed to help the immune system support itself with the evolution of medicines and vaccines. Vaccines are injections that contain the same germs that cause a disease, but that have been weakened so they can't make the body sick; instead, the immune system is stimulated to produce antibodies against the vaccine and, in turn, develops immunity against the disease the vaccine was created against.

The first vaccine was used in 1796 to provide protection against smallpox, but the story of vaccines began long before that. There's evidence to suggest that the Chinese employed smallpox inoculation — not by vaccine, but by exposing a healthy person to a smallpox scab — as early as 1000 CE. Explore more about the history of vaccines here.

There are all kinds of diseases that used to be common that, thanks to vaccines, we don't have to worry about anymore, including polio, measles, and smallpox.

This is the first in a four-part educational series about preventing and treating illness in animals.

To see the other activities in this series, visit our Stopping Sickness activities page.

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TEXAS A&M AGRILIFE EXTENSION