

SUGGESTED REFERENCES

- Balkwill, Francis R.
Germ Zappers
Cold Spring Harbor Laboratory Press 2001
- Grossman, Charles J and Eve J. Wilson
The Immune System, Mechanisms that Counteract Disease, **Health and Research Magazine**. World Winter 1992
- *The Wonders of Microbes*
www.microbeworld.com
- *Stalking the Mysterious Microbe*
www.microbe.org

NATIONAL SCIENCE EDUCATION STANDARDS

- K - 4**
Life Science
Characteristics of Organisms
Life Cycles of Organisms
- 5 - 8**
Life Science
Structure and Function in Living Systems
- K - 4 and 5 - 8**
Science in Personal and Social Perspectives
Personal Health

*Source: National Science Education Standards, 1996, National Academy Press

CREDITS

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SCIENCE SCREEN REPORT FOR KIDS

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THE IMMUNE SYSTEM - BARRIER TO INFECTION



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SYNOPSIS

Our immune system has a tough job keeping our bodies free of harmful microbes. We come in contact with germs and bacteria every day, and our immune system is challenged to protect us.

In this edition of SCIENCE SCREEN REPORT FOR KIDS, we will explore how our body's immune system goes to battle against germs in order to keep us healthy. Sometimes the immune system requires assistance. Over the years, scientists have experimented with ways to help the immune system fight harmful germs and bacteria. As a result, vaccinations and other techniques to recreate white blood cells were born. As we explore the immune system, we will learn how germs, bacteria and toxins invade the body, how the immune system protects us and what can happen when it falters.

CURRICULUM UNITS

- BIOLOGY
- CELLULAR BIOLOGY
- CHEMISTRY
- MICROBIOLOGY

RUNNING TIME

13:23

BACKGROUND

All around us lurk millions of different types of dangerous germs. They are found on money, desks, food, and floating in the air. If germs can be so harmful, how do we survive each day? Our daily survival is possible with the work of our immune system, a system people often take for granted. The immune system is responsible for our health. It isn't until we become ill or develop a reaction to something, like a mosquito bite, that we tune in to our bodies. For example, when the common cold develops, it indicates a breakdown has occurred in the immune system.

The immune system consists of both internal and external barriers that fight the daily battle against various microbes - small organisms such as bacteria, fungi and viruses. The first barrier is the skin. There are millions of microbes living on us. In fact, it is the human hand that is home to over several million microbes! The skin secretes an antibacterial substance that kills most bacteria and spores that land on our bodies. In addition, the eyes and nose contain an enzyme that breaks down the bacteria cell wall, and acids in the stomach are quick to destroy any bacteria that enter. Internally, tiny hairs in our lungs called cilia help keep bacteria and dust away.

When germs do make it past our first line of defense, illness can occur. It is now that the most important part of the immune system - the white blood cells - begin to fight back. White blood cells, such as leukocytes and phagocytes, fight off the harmful microbes.

Sometimes the body needs assistance in fighting against certain diseases. This is accomplished with vaccinations, which were discovered during the time of the small pox epidemic. They consist of weakened doses of a virus that trigger white blood cells to create antibodies as a defense against the virus. Vaccinations are now available for a variety of viral and bacterial diseases. Unfortunately, the common cold, which mutates very quickly, is an example of one virus that cannot be cured with vaccination. Bacterial infections are different from viral infections in that they are living cells and can reproduce on their own. Not all bacteria are harmful. The bacteria that cause disease are called pathogens. In 1928, a form of bacteria was discovered that actually kills bacteria. Today, this antibiotic is known as penicillin.

Occasionally, an error in the immune system occurs. An example of this is allergies. This is when the system reacts to allergens that it would otherwise ignore. As a result, histamine is released. Allergic symptoms can be alleviated with an antihistamine.

The immune system is constantly on guard. It is a system determined to rid our bodies of harmful matters and keep us alive and well. Scientists marvel at the capabilities of our immune system. They continue their research to develop ways to assist the immune system by creating new vaccines.

ADVANCED ORGANIZERS

Prior to showing this video students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press, which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 6: The Human Organism

Section C - Basic Functions

Know by the end of Grade 5

- Skin protects the body from harmful substances

Section E - Physical Health

Know by the end of Grade 2

- Some diseases are caused by germs, some are not. Diseases caused by germs may be spread by people who have them. Washing one's hands with soap and water reduces the number of germs that can get into the body or that can be passed on to other people.

Know by the end of Grade 5

- If germs are able to get inside one's body, they may keep it from working properly. For defense against germs, the human body has tears, saliva, skin, some blood cells, and stomach secretions. A healthy body can fight most germs that do get inside. However, there are some germs that interfere with the body's defenses.

- There are some diseases that human beings can catch only once. After they've recovered they don't get sick from them again. There are many diseases that can be prevented by vaccination, so that people don't catch them even once.

*Benchmarks can be found at www.project2061.org/tools/benchol/bolintr.htm

CRITICAL THINKING EXERCISES

1. Discuss and chart various diseases and illnesses that are caused by microbes.
2. Choose one disease or illness to research and write a report.
3. Compare and contrast viruses and bacteria. How do we assist our body is battling each of these invaders?
4. Have students list household items that aid in disinfecting. Example: Lysol, antibacterial soaps. Read labels to identify and discuss common ingredients that aid in disinfecting.
5. Paint hands with washable paint to represent germs on your hands. Blindfolded and with a partner, wash your hands as you normally do. Look to see how well you wash your hands. Is there much paint (germs) left? What can you do to improve your hand washing skills?
6. Write a narrative story about the journey of a bacteria or a virus through the human body. What will it encounter? Will the immune system combat it or will it need assistance?
7. Read a book aloud about a topic that was viewed in the video. For example you can read a book about small pox such as, Dr. Jenner and the Speckled Monster, by Albert Marrin, or Pox Americana, by Elizabeth A. Fenn.

VOCABULARY

- Antibiotic** A substance, such as penicillin, produced by or derived from certain fungi, bacteria, and other organisms, that can destroy or inhibit the growth of other microorganisms.
- Antibodies** A protein that is secreted into the blood in response to an antigenic stimulus such as bacterium, virus, or a parasite.
- Bacteria** Single celled or non cellular organism that is important as a pathogen.
- Bone marrow** The soft, fatty, vascular tissue that fills most bone cavities and is the source of red blood cells and many white blood cells.
- Immune system** The integrated body system of organs, tissues, cells, and cell products such as antibodies that neutralize potentially pathogenic organisms or substances.
- Microbes** A minute life form; a microorganism, especially a bacterium that causes disease.
- Microscopic** Too small to be seen by the unaided eye, but large enough to be studied under a microscope.
- Pathogens** An agent that causes disease, especially a living microorganism such as a bacterium or fungus.
- Penicillin** Any of a group of antibiotic drugs obtained from penicillium molds or produced synthetically, and used in the treatment of various infections and diseases.
- Small pox** An acute, highly infectious, often fatal disease caused by a poxvirus and characterized by high fever and aches with subsequent widespread eruption of pimples that blister, produce pus, and form pockmarks.
- Vaccine** A weakened or killed pathogen, such as a bacterium or virus that stimulates antibody production or cellular immunity against the pathogen but is incapable of causing severe infection.
- Virus** Any of various simple submicroscopic parasites that often cause disease. Unable to replicate without a host cell, viruses are typically not considered living organisms.
- White blood cell** White cells in the blood that have a nucleus and cytoplasm, and help protect the body from infection and disease through specialized neutrophils, lymphocytes, and monocytes.

CAREER POSSIBILITIES

- ALLERGIST
- BIOLOGIST
- CHEMIST
- IMMUNOCHEMIST
- MICROBIOLOGIST
- PHARMACIST