Got Immunity?

4-H SCIENCE BLAST! IN THE CLASS

Key Concept:
Disease transmission and control

Grade Level: 4–7

Education Subject: Science

Success Indicator:
After completing this lesson, learners will be able to:
- Describe and define the three ways that diseases spread.
- Describe the role of immunizations in disease prevention.

Materials and Methods

Preparation Time: 20 minutes

Lesson Time: 45 minutes

Space:
- Germ Keep Away Game: Any
- Immunity Challenge Game: Open field (such as an athletic field or gymnasium) or open classroom

Materials:
- Disease cards (equal numbers of the three cards, with enough total cards for half the learners)
- A hat or small container
- Bandanas (at least one per learner)
- Same-sized, lightweight balls or balloons (three to five per learner)

MICHIGAN STATE UNIVERSITY | Extension

Adapted from the 4-H Science Toolkit: Animal Science Lesson Plan series developed by Cornell Cooperative Extension, Ithaca, NY.

Instructions:

Preparation time:

1. Read through the activity and gather the supplies in the materials list. You may want to make a handout of the vocabulary list.
2. Photocopy, cut apart and fold over the disease cards. Put the cards in the hat or other small container.

Lesson time:

1. Tell the learners that this lesson is going to focus on how diseases are spread and how immunizations can help slow or prevent the spread of diseases. Ask them the following questions:

   What makes disease spread through a group of animals?

   What are some things that humans do to prevent the spread of disease?

2. **The Germ Keep Away Game.** Explain to the group that they'll be playing the Germ Keep Away Game, which demonstrates a few of the many ways that diseases spread. The game focuses on transmission by contact with:
   • Infected animals (touch).
   • Droplets in the air (air).
   • Insect bites (insect).
3. Divide the class into two groups: "diseases" and "animals."
4. Have each person in the disease group draw one disease card from the hat without showing it to anyone else.
5. Have the animal group huddle and decide on one tactic to prevent the spread of each mode of disease (such as quarantining animals that are sick to prevent infection from diseases that are spread by touch, providing adequate ventilation in barns to prevent infection from diseases that are spread by droplets in the air, and using flea and tick preventives to prevent infection from diseases that are spread by insect bites). Have the group develop a hand signal for each of the prevention measures that the members identify.
6. Next have the disease group spread out across the room. After they're settled, tell the animal group to walk around the diseases until you say "stop" — then they must move to the closest person in the disease group. If two or more members of the animal group are close to the same disease group member, have one of them move to someone else.

Vocabulary:

Antibody – A blood protein made by cells of the immune system to fight infection.

Antigen – A substance that, when introduced into the body, stimulates the production of an antibody.

Disease – An abnormal condition of an animal's body that causes it to function improperly. Rabies is one example of a serious disease that affects animals and humans. If animals and humans are not protected with a rabies vaccination and they are infected with the disease, they can die from it.

Immunity – A medical term that describes having strong enough biological defenses to prevent disease or infection.

Infection – The damaging growth of an invading organism. In an infection, the infecting organism lives and multiplies inside its host. The infecting organism is also called a pathogen.

Pathogen – Typically a microscopic organism, or germ. Types of pathogens include bacteria, parasites, fungi, viruses, prions and viroids.

Vaccine – Injection of a live, weakened or killed microbe into a human or animal to stimulate the person's or animal's immune system against the microbe, preventing disease. Vaccinations are also called immunizations.

Virus – Ultramicroscopic infectious agents that replicate themselves only within the cells of living hosts; many cause disease.

7. When each animal is paired with a disease, tell the learners that on the count of three, those with disease cards will reveal their cards and the animal learners will show one prevention sign. If the preventive measure the animal person is signaling is effective against the type of disease transmission of the person he or she is paired with, then the animal moves on to the next round. If the preventive measure is not effective against that type of disease transmission, then the animal gets sick and must sit out the next round.

8. Play until everyone gets sick! Then switch animals and diseases and play again.

9. After the second round, discuss with the group how an animal could develop immunity against various diseases (immunizations, developing natural antibodies either from being exposed to the disease and recovering, or from drinking its mother's milk).

10. The Immunity Challenge. Now tell the group they're going to play a game called "The Immunity Challenge," which demonstrates how vaccinations work in an animal's immune system. (For example, through the vaccination process, an animal can build up specific antibodies to help fight off certain diseases. Antibodies provide an animal with a level of protection, but booster shots and revaccination may be required, depending on the situation.)

11. Create boundaries for the play area that provide enough space for learners to escape the disease agents. Set up a veterinary clinic by placing bandanas in a box at one end of the field. On the sidelines at about midfield, scatter the balls or balloons.

12. Tell the group that the bandanas are the vaccinations and the balls are the antibodies. Select one or two learners for about every 10 players to be diseases. Send the remaining learners (the animals) to the opposite end of the field from the vet clinic.

13. Tell the animals that their goal is to avoid the diseases on their way to the vet clinic to receive a vaccination. Explain that if they make it to the vet clinic without being nabbed by a disease, they can tie a bandana around one arm to indicate they've been vaccinated. Once an animal has been vaccinated, it can begin to collect antibodies (the balls or balloons). An animal can collect as many antibodies as it can carry. Try to have at least two antibodies available per animal.

14. Point out that, while the animals are trying to make it to the vet clinic, the diseases will be trying to tag them. Animals who have not been vaccinated and are tagged by a disease must sit out (be quarantined) because they are now contagious. Animals that have been vaccinated and have collected antibodies can have those antibodies knocked away by diseases. (Note: Diseases may not carry antibodies.)

15. If a vaccinated animal loses all the antibodies it has collected, it must return to the vet clinic for a booster. A vaccinated animal that gets tagged when it has no antibodies must go into quarantine for 2 minutes.

16. After 10 or 15 minutes, stop the game and appoint new diseases. Try to end the game while everyone is still having fun.

Check for Understanding:

Bring the group back together and ask the following questions:

- What are the three ways that diseases spread?
- What does it mean if an animal is immune to a disease?
- How do vaccines protect animals?
- What are antibodies?

Optional:

Visit with a veterinarian to learn more about the kinds of vaccines that are available to protect your favorite domestic animal.

Have the group simulate a disease outbreak in your town. Discuss what learners would do and where they would go to learn more if such an event occurred.

Learn More:

- National 4-H Council's Veterinary Science Helper's Guide: *http://www.4-hmall.org/Product/4-hcurriculum-veterinary-science/08051.aspx*.
- PAWSitively Youth: A Guidebook About Dogs for Community Outreach Leaders. (2008). D. Palmer, E. Noble and B. Wiesen. Ithaca, N.Y.: Natural Resource, Agriculture and Engineering Service. Online at nraes.org.
- U.S. Centers for Disease Control and Prevention's "Vaccines and Immunizations" section at *http://www.cdc.gov/vaccines/*.
- FAQ: Methods of disease transmission. (2007). Toronto, Canada: Mount Sinai Hospital, Department of Microbiology. Accessed from *http://microbiology.mtsinai.on.ca/faq/transmission.shtml.*
- Ebola – The Plague Fighters Classroom Activity. NOVA Teachers. (2004). Accessed from *pbs.org/wgbh/nova/teachers/activities/2304_ebola.html.*

Michigan Grade Level Content Expectations:

Grades 4-7: Generate scientific questions based on observations (S.IP.04.12, S.IP.05.11, S.IP.06.11, S.IP.07.11); communicate and present/defend findings of observations and investigations (S.IA.04.13, S.IA.05.13, S.IA.06.13, S.IA.07.13).

Grade 4: Share ideas about science through purposeful conversation in collaborative groups (S.IA.04.12).

Grade 5-7: Evaluate data, claims and personal knowledge through collaborative science discourse (S.IA.05.12, S.IA.06.12, S.IA.07.12).

HANDOUT: GOT IMMUNITY?

Disease Cards

Photocopy and cut apart these disease cards, then fold them in half so the words are hidden.

MEANS OF DISEASE TRANSMISSION: **Touching an infected animal**	**MEANS OF DISEASE TRANSMISSION:** **Droplets in the air**	**MEANS OF DISEASE TRANSMISSION:** **Insect bite**
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