

Preventing Disease in Animals and People

Suggested Grade Level: 6-8

Time: 45 minutes

Subject: Science, Biology, Zoonotic Diseases, Public Health, Language Arts, Informational Reading, Writing, Speaking and Listening, Agriculture, Veterinary and Animal Health Regulations

Overview: In this lesson, students will explore how zoonotic diseases can spread between animals and humans by simulating disease transmission at a county fair. Through hands-on activities and demonstrations, they will learn how germs travel through direct and indirect contact and discover practical ways to prevent the spread of illness.

Objectives:

1. Demonstrate how zoonotic diseases may be spread.
2. List ways to prevent the spread of disease.

Background Information:

Zoonotic diseases are infections that spread from animals to humans, caused by pathogens such as bacteria, viruses, parasites, or fungi that are harmful to humans. These diseases can be transmitted in several ways: through direct contact with animals (such as touching, feeding, or cleaning), indirect contact with contaminated surfaces (like gates, bedding, and equipment), airborne transmission, or by consuming contaminated food or water. Common zoonotic diseases include ringworm, Salmonella, E. coli, and certain strains of influenza. While many animals can carry these pathogens without showing signs of illness, humans may become sick after exposure.

Environments like petting zoos, livestock barns, fairs, and farms increase the risk of zoonotic disease spread due to the close and frequent interactions between people and animals. These risks are particularly high when animals are stressed, housed close together, or relocated, as stress and travel can compromise their immune systems and increase the shedding of disease.

Preventing the spread of zoonotic diseases requires good hygiene and biosecurity practices. These include washing hands after contact with animals, avoiding eating or drinking in areas where animals are present, wearing protective gear when necessary, isolating sick animals, and cleaning and disinfecting equipment and surfaces to prevent the spread of disease. Learning how germs spread helps keep both people and animals

healthy, especially in agricultural and public settings where they frequently come into contact.

Kansas Connections

Kansas is home to many county fairs, livestock shows, and the Kansas State Fair, all of which involve close interaction between people and animals. To protect public and animal health, these events follow strict biosecurity and animal health guidelines. Veterinarians, 4-H leaders, FFA advisors, Extension agents, and livestock owners work together to ensure animals are clean, healthy, and disease-free before they are exhibited. The Kansas Department of Agriculture's Division of Animal Health plays a key role in overseeing animal movement and health regulations at these events to help prevent the spread of zoonotic diseases.

In addition, Kansas State University is home to the Biosecurity Research Institute (BRI), a high-level biocontainment facility that researches threats to animal, human, and plant health. Scientists at BRI study how diseases spread and how to prevent outbreaks, contributing to state and national preparedness (Kansas). These combined efforts help protect the well-being of Kansas communities and support the safe interaction between people and animals in agricultural settings.

Materials:

- Numbered clear plastic cups
- Numbered name tags
- Behavior cards
- Distilled water
- Baking soda
- Phenol Red
- Dropper
- Permanent marker
- Outbreak Investigation Packet
- Bubble blower and bubbles

Instructional Format:

1. Review Background Information and Kansas Connections.
2. Conduct engagement exercise.
3. Complete the activity.
4. Conduct assessment activity.

Procedures:

1. Before beginning this lesson, fill 10% of the cups half full with a solution of baking soda and water, and fill the remaining cups half full with distilled water. Then, place numbered name tags with the corresponding cup. Make a note of which cups contain baking soda and water.
2. Set a behavior card under each cup.

3. Pair the baking soda cups with a "Participants in multiple open, county, and state shows" card.
4. Briefly review the Background Information and Kansas Connections sections.
5. Explain to your students, "Some people and animals carry diseases. These carriers may appear healthy or may be slightly ill. By the time the carriers get sick, they may have already infected others." Show this infographic:
https://cdn.agclassroom.org/media/uploads/LP791/How_do_germs_spread_.jpg
6. Then say, "This activity is designed to simulate an uncontrolled spread of a disease through direct and indirect contact." Walk students through procedure steps 5-13.
7. Pick up a cup containing a clear liquid, a behavior card, and a number sticker. The cup represents your (or your animal's) body, and the liquid your bodily fluids. One or two of you have a cup that has been "infected" with an infectious disease.
8. Put on your numbered sticker and review your behavior card.
9. The instructor will announce when to start the activity. You will swap fluids as outlined on your behavior card.
 - a. To exchange fluids, dump all of the contents of your cup into another person's cup.
 - b. Return half of the solution to the empty cup.
 - c. Record the number of the person you exchanged with on the table on the next page of this packet.
10. Repeat step 3 as many times as specified on your behavior card. Each swap should be with someone you haven't already swapped with. You should only swap as many times as indicated on your behavior card.
11. When you have finished swapping, return to your seat with your cup. Remember to be careful and not spill any liquid.
12. The instructor adds 2-3 drops of phenol red to each cup. a. A color change to pink (either bright or faint) indicates a positive result – you are considered "infected." No color change is "uninfected."
13. Fill out Table 1 together with the instructor, asking those with each exposure to stand up and be counted. Have the students answer questions 2 and 3 individually before discussing. Continue the packet together.
14. What preventative measures could have been taken to avoid exposure to the disease? Be sure to include the following:

Ways to prevent direct contact disease transmission:

 - Isolate sick animals
 - Wear gloves when working with sick animals
 - Wash your hands after having contact with animals or being in animal areas, even if you did not touch the animals

Ways to prevent indirect contact disease transmission:

 - Avoid sharing equipment, or clean and disinfect equipment when sharing is necessary

- Clean and disinfect any equipment used with sick animals or animals with skin lesions
- Dispose of or wash boots and clothing after animal contact
- Wash your hands after having contact with animals or being in animal areas, even if you did not touch the animals

15. How would an airborne disease spread differently? Use a bubble blower to see who gets hit with a bubble, modeling the spread of airborne diseases. Explain that airborne disease spread requires less movement. Some diseases can be transmitted in the air over long distances.

Vocabulary:

- **Contaminate:** to make something dirty or impure by accidentally or purposely adding something harmful
- **Pathogen:** something that causes disease or illness
- **Transmission:** the act or process by which something is spread or passed from one person or thing to another
- **Zoonotic disease:** an infectious disease caused by a pathogen that has jumped from an animal to a human

Kansas Standards:

Next Generation Science Standards

From Molecules to Organisms: Structures and Processes

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Ecosystems: Interactions, Energy, and Dynamics

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Earth and Human Activity

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Language Arts

6th Grade

Reading: Informational

Craft and Structure

RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative and technical meanings.

Integration of Knowledge and Ideas

RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

Language in Reading: Informational

RI.6.11 Determine or clarify the meaning of unknown and multiple-meaning words and phrases to expand language comprehension.

Writing

Text Types and Purposes

W.6.1 Write arguments to support claims with clear reasons and relevant evidence.



Speaking and Listening

Comprehension and Collaboration

SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on sixth grade topics, texts and issues, building on others' ideas and expressing their own clearly.

SL.6.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text or issue under study.

7th Grade

Reading: Informational

Language in Reading: Informational

RI.7.11 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on seventh grade reading and content.

Writing

Text Types and Details

W.7.1 Write arguments to support claims with clear reasons and relevant evidence.

Production and Distribution of Writing

W.7.4 Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.

Speaking and Listening

Comprehension and Collaboration

SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on seventh grade topics, texts and issues, building on others' ideas and expressing their own clearly.

SL.7.2 Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text or issue under study.

8th Grade

Reading: Informational

Language in Reading: Informational

RI.8.11 Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on eighth grade reading and content.

Writing

Text Types and Details

W.8.1 Write arguments to support claims with clear reasons and relevant evidence.

Production and Distribution of Writing

W.8.4 Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.

Speaking and Listening

Comprehension and Collaboration

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on eighth grade topics, texts and issues, building on others' ideas and expressing their own clearly.

National Ag Literacy Standards: Agriculture and the Environment



- Compare and contrast the advantages and disadvantages involved when converting natural ecosystems to agricultural ecosystems (T1.6-8 a.)

Plants and Animals for Food, Fiber, and Energy

- Explain the role of ethics in the production and management of food, fiber (fabric or clothing), and energy sources (T2.6-8 b.)
- Identify strategies for housing for animal welfare and the safety of animal products (e.g., meat, milk, eggs) (T2.6-8 e.)

Science, Technology, Engineering, and Mathematics

- Explain the harmful and beneficial impacts of various organisms related to agricultural production and processing (e.g., harmful bacteria/beneficial bacteria, harmful/beneficial insects) and the technology developed to influence these organisms (T4.6-8 f.)
- Provide examples of science and technology used in agricultural systems (e.g., GPS, artificial insemination, biotechnology, soil testing, ethanol production, etc.); explain how they meet our basic needs; and detail their social, economic, and environmental impacts (T4.6-8 i.)

Supporting Resources:

TED-Ed: How do viruses jump from animals to humans? - Ben Langdon

<https://www.youtube.com/watch?v=xjcsrU-ZmgY> (5 min)

Bring Home the Blue, Not the Flu Lesson Plan:

<https://www.agclassroom.org/matrix/lesson/791/>, complete lesson details

<https://content.cfsph.iastate.edu/bluenotflu/>: free online module lessons.

Career Information: Veterinarian

Veterinarians are licensed medical professionals who diagnose, treat, and prevent disease in animals, from household pets to livestock. While most work in clinical or agricultural settings, some collaborate with public health officials to monitor and manage zoonotic diseases. Becoming a veterinarian requires a Doctor of Veterinary Medicine (DVM) degree, along with a strong foundation in biology, chemistry, and animal science.

Assessment: Before they leave, have students answer two short questions: (1) What is one way germs can spread between animals and people? (2) Name one way to prevent disease spread.

Author: Adapted by Amy Benz, retired middle school technology teacher, St. Marys, KS, from “Bring Home the Blue, Not the Flu!” by Trisha Collins, BS; Brittney Nelson, BS; Abbey Canon, DVM, MPH, DACVPM; Molly Lee, DVM, MPH, DACVPM; Kristen Obbink, DVM, MPH, DACVPM, and edited by Marissa Cook, Secondary Art Education Major at KSU, KFAC intern.

References:

Kansas State University. (n.d.). *Biosecurity Research Institute*. Retrieved July 15, 2025, from <https://www.bri.k-state.edu>



Participated in County Fair Only Swap Once	Participated in County and State Fair Swap Twice	Participated in Multiple Open, County, and State Shows Swap Three Times
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Disease Transmission and Outbreak Activity Packet

INSTRUCTIONS

- 1) Pick up and put on a pair of gloves.
- 2) Pick up a cup containing a clear liquid, a behavior card, and a number sticker. The cup represents your (or your animal's) body and the liquid your bodily fluids. One or two of you has a cup that has been "infected" with an infectious disease.
- 3) Put on your numbered sticker and review your behavior card.
- 4) The instructor will announce when to start the activity. You will swap fluids as outlined on your behavior card.
 - a. To exchange fluids, one person will dump all of the contents of their cup into the other person's cup.
 - b. Return half of the solution back to the empty cup.
 - c. Record the number of the person you exchanged with on the table on the next page of this packet.
- 5) Repeat step 3 as many times as specified on your behavior card. Each swap should be with someone you haven't already swapped with. You should only swap as many times as your behavior card indicates.
- 6) When you have finished swapping, return to your seat with your cup. Remember to be careful and not spill any liquid.
- 7) The instructor will come around and add "testing" drops to your cup.
 - a. A color change to pink (either bright or faint) indicates a positive result – you are considered "infected." No color change is "uninfected."
- 8) **Record your results:** _____
- 9) Return your cup to the instructor to be disposed of.

FLUID SWAP RECORD

Record the participants' names/numbers you exchanged fluids with.

Exchange #	Partner's Name/Number
1	
2	
3	

OUTBREAK INVESTIGATION & ADDITIONAL DISCUSSION

1. Work with the group to fill out following table and discuss any apparent risk factors.

	Infected <i>Yes</i>	Infected <i>No</i>	Total
Exposure <i>Participated in county fair only</i>			
Exposure <i>Participated in county and state fair only</i>			
Exposure <i>Participated in multiple open shows, county fair, and state fair</i>			
Total			

2. Did any of the exposures lead to greater risk of becoming infected?

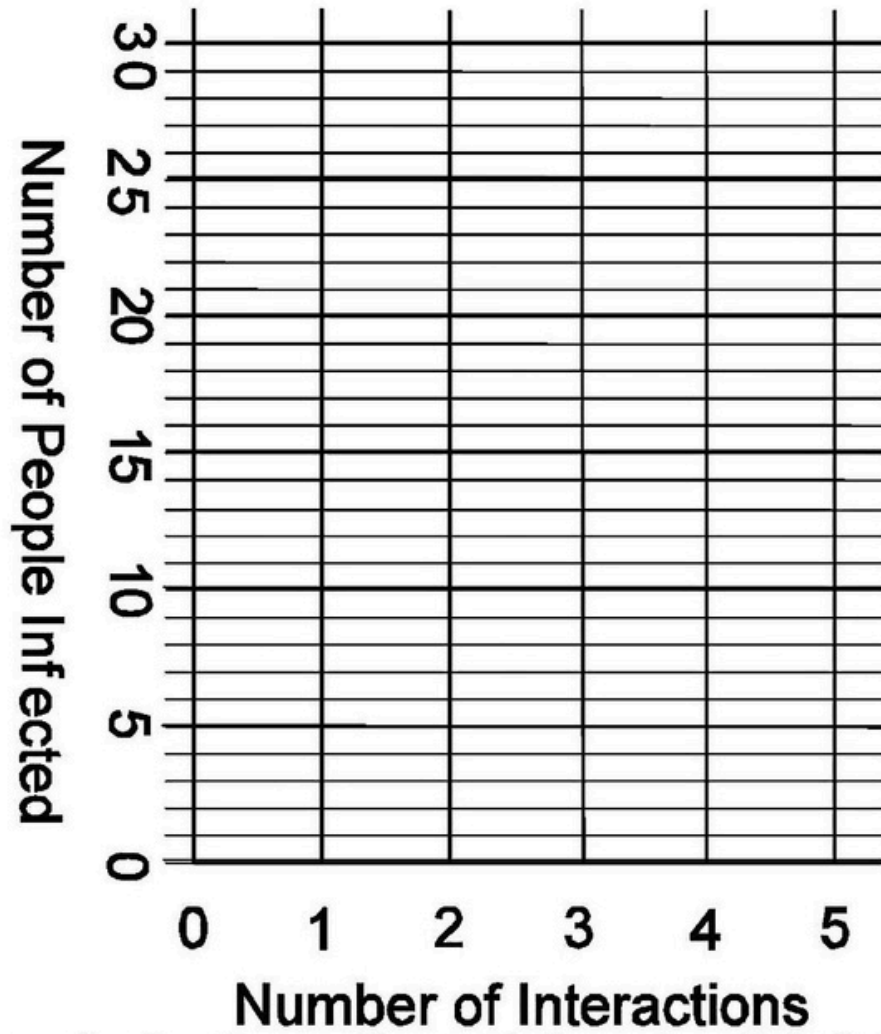
3. How does this translate to the increased risk of infection for you and your animals based upon the shows you attend and number of animals commingled in real life?

How did the number of people infected increase with each round of interactions?

4. Assuming one person was initially infected, fill out the following table and graph

Number of interactions	Previously Infected	Newly Infected	Total # of Infections
0	Student #1	0	1
1	Student #1	Student #2	2
2			
3			
4			
5			

5.



6. What do you notice about the rate of increase in the number of infections? Does the graph show linear or exponential growth?

7. If we did this activity long enough, would everyone become infected? Why or why not?

8. How can we determine who was the original source of infection?

9. How would this investigation be different if you hadn't kept notes about whom you swapped fluids with and in what order?

- Do you think you would have remembered clearly after the activity was over? How well do you think you'd remember tomorrow or in a week from now? A month?

10. What preventative measures could have been taken to avoid exposure to the disease?

11. How would an airborne disease spread differently? Why?

Infection Tree

Instructions: Complete this "tree" to trace back the path of transmission of the disease. Write your cup number and the cup numbers of the people that you exchanged fluids with. Depending on your behavior card, you may have swapped with less than six people. Find out which of your partners had a positive test (were infected). Highlight their cup numbers. Talk to each of the people you swapped with and find out if they had interactions with infected people before they interacted with you. Circle the cup number of the partner that infected you. Draw a box around the cup numbers of the people that you infected (directly or indirectly).

