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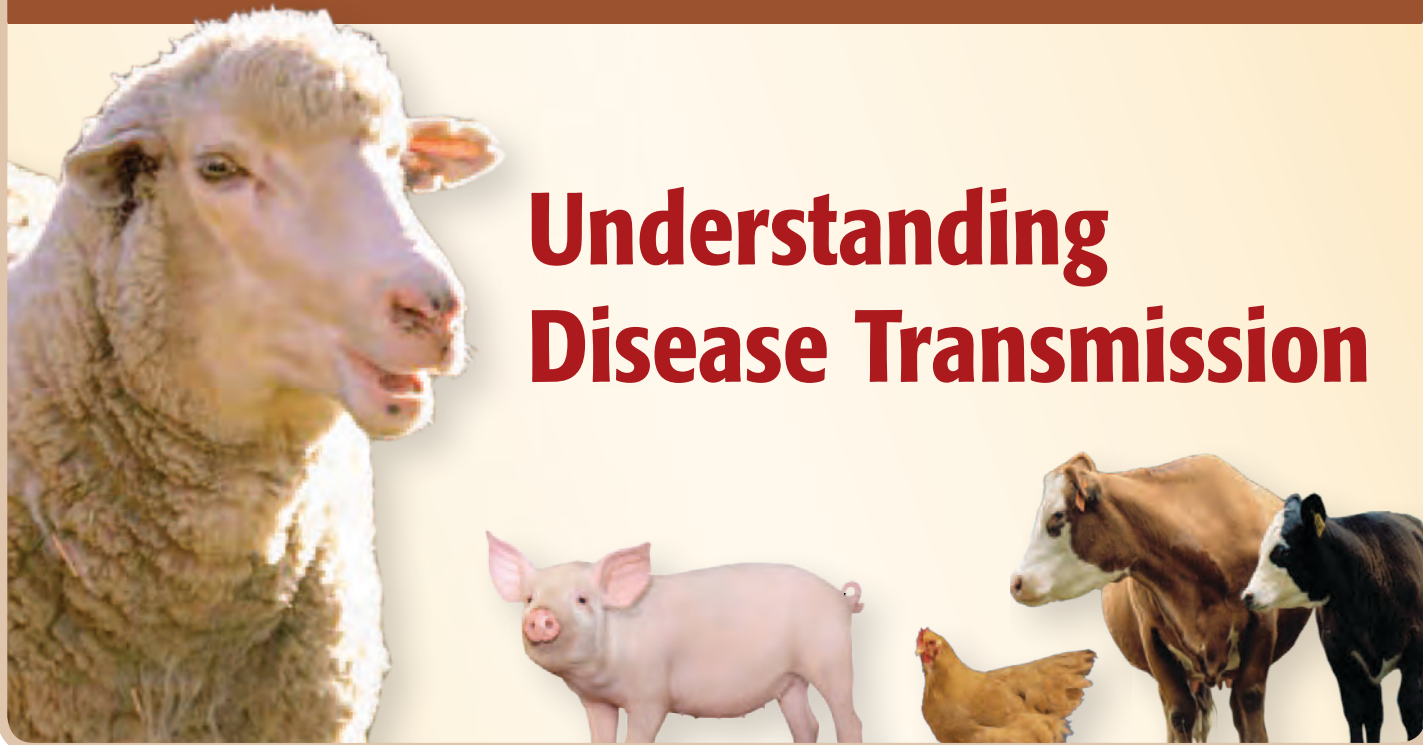
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## BIO-SECURITY in 4-H Animal Science

A Project Curriculum ♦ Volunteer Guide for 4-H Youth Ages 9–11

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# Understanding Disease Transmission

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### Curriculum Overview

Animal Science projects are a cornerstone of the 4-H Youth Development Program. Many 4-H youth enroll in these projects, and the majority focus on the rearing and husbandry of market animals, including poultry, ruminants, and swine.

The activities in Module 1 of this curriculum teach youth how contagious diseases spread among livestock. Module 2 focuses on recognizing and addressing disease risks that are present at home or at any given fair or livestock event. Modules 3A and 3B (choose one or the other for your group) have activities that address the issue of tracking animal movement, including the use of Global Positioning System (GPS) technology in 3B.

## ACTIVITY



# Disease Transmission Detectives

## Subject Overview and Background Information

A **disease** is a condition found in plants or animals that causes harm and typically is characterized by a group of identifiable **symptoms**. Diseases can affect tissues, organs, or entire systems of an organism and can result in discomfort, dysfunction, distress, or even death. Diseases can be caused by genetic defects or environmental factors and they may or may not be **infectious diseases** brought about by disease-causing organisms (**pathogens**). There are various ways for a disease to be transmitted from one organism to another, including **direct contact** (physical contact with an active case of the disease), **indirect contact** (contact with a contaminated object), and **airborne transmission** (pathogens carried by the air).

**Microorganisms** (*microbes*) are microscopic or submicroscopic organisms (e.g., bacteria). There are millions of different microorganisms living on earth. Some of these microbes are harmless, but some can cause mild to serious diseases. Diseases caused by microorganisms are referred to as **infectious diseases**. Microorganisms that cause disease are referred to as **pathogens**.

## Activity Concepts and Vocabulary

- **Airborne transmission:** Exchange of pathogens that are carried by the air, as pollen and dust.
- **Direct contact:** Physical contact between an ill person or animal and a healthy person or animal.
- **Disease:** An impairment of health or condition of abnormal and harmful functioning.
- **Indirect contact:** When an uninfected person or animal touches the contaminated surface of an inanimate object (e.g., a food dish or table top) that has previously come into contact with an infected person or animal.

- **Infectious disease:** A disease that is caused by a bacterium, fungus, parasite, or virus that can be transmitted to another healthy individual, causing disease.
- **Microorganism/microbe** (pronounced my-kro-awr-guh-niz-uhm/*my*-krobe): A minute form of life.
- **Pathogen** (pronounced *path*-uh-juhn): A disease-causing organism.
- **Symptoms:** Signs or indicators of a disorder or a disease.
- **Zoonotic disease:** A disease that can be transmitted between humans and other animals.

## Life Skills

- **Head:** Learning to learn, keeping records.
- **Heart:** Cooperation, communication, sharing.
- **Hands:** Teamwork, self-motivation.
- **Health:** Disease prevention.

## California Educational Content Standards

- Third Grade:
  - ✓ Life Sciences and Investigation and Experimentation – 3a, 3c, 5e
- Fourth Grade:
  - ✓ Life Sciences – 3b, 3d
- Fifth Grade:
  - ✓ Life Sciences – 2a
- Sixth Grade:
  - ✓ Ecology (Life Sciences) – 5b, 5d

## Subject Links

Science and Language Arts.

## Purpose of Activity

The purpose of this activity is to have youth explore where, when, and how diseases can be transmitted during their daily activities.

## Overview of Activity

This activity will illustrate how diseases can be spread through direct contact, indirect contact, and airborne transmission. In order to demonstrate indirect contact, the youth may become “contaminated” with colored glitter placed on door knobs, the floor, a table, etc., in the room where the activity takes place. Direct contact will be illustrated by transmitting “pathogens” (colored glitter) by shaking hands with an “infected person” who has glitter on his or her hands. At the same time, to illustrate airborne transmission, different fragrances (e.g., scented perfume; food extracts; candles) will be placed around the room to allow students to smell the scent. Whoever detects the smell can be classified as having become “infected.” Youth will have to be “Disease Transmission Detectives” to figure out where the sources of infection are.

## Time Required

30 to 40 minutes.

## Suggested Grouping

Pairs, small groups, or one large group.

## Materials Needed

- Glitter (4–6 different colors; each color represents a separate pathogen)
- Small (2–3 oz) plastic mist sprayer or sprayers (1 or 2 of them)
- 1–2 types of liquid food extract (peppermint and vanilla are recommended)
- Vacuum cleaner for clean up
- Paper towels and water for clean up
- Flip chart paper
- Pencils, pens, or markers

## Getting Ready

**Note:** *Do this part before the youth arrive.*

- Sprinkle one color of glitter on the floor near entrances to the room.
- Sprinkle a second color of glitter on doorknobs.
- Sprinkle a third color of glitter on surfaces (e.g., tables, chairs).
- Sprinkle a fourth color of glitter in the area where snacks or beverages are served.
- Sprinkle glitter on the volunteers’ hands, and then have the volunteers shake hands with random youth as they arrive for the activity.
- Using the mist sprayer(s), spray the extract(s) in localized areas within the room where the activity is occurring.
  - ✓ **Volunteer Tip:** Do not let the youth see you sprinkling the glitter or spraying the extracts.

## Opening Questions

1. **Think of times when you’ve been sick, and explain what you know about different ways humans contract illnesses.** Ask the youth to write their thoughts and ideas on the paper provided.
2. **What are some ways that you think diseases can be spread from one human to another?** Ask the youth to write their thoughts and ideas on the paper provided.
3. **If you get an illness, what are some of the signs that indicate you are sick?** Ask the youth to write their thoughts and ideas on the paper provided.

## Procedure (Experiencing)

1. After the youth have entered and moved around the room (offer them snacks, shake hands with a few of the youth), make sure to ask them the opening questions and have them write down and share their answers.
2. When all of the questions have been answered, ask the youth to examine their hands, clothing, and shoes

for glitter. Ask them to write down the different colors of glitter, where on their bodies they found the glitter, and how they think they “contracted” it.

3. After the youth have finished noting their thoughts, split them into groups and assign each group to a different area of the room. Tell them they are “Disease Transmission Detectives” in search of the sources of the glitter. Make sure one group is in an area near where one of the food extracts was sprayed (some groups may be closer or farther away). Ask the youth to note their observations on the paper provided.
4. When all of the groups seem to have completed step 3, ask them to rotate to an area they have not been to before. Again, instruct them to make observations and write them down.
5. Continue the rotations until each group has inspected the entire area. As they finish up their observations, they can come back together into a large group to share their observations.

## Sharing, Processing, and Generalizing

Follow the lines of thinking developed by the youth as they share and compare their thoughts and observations. If necessary, use more-targeted questions as prompts to get to particular points. Specific questions might include:

1. **Assuming that the glitter or the scents in the air were disease-causing organisms, where and how did you come into contact with them, and how might you have prevented making contact? Please explain.**
2. **How do you think a cold that one of your friends or family members has might infect other people? Please explain.**
3. **What are some things you might be able to do to lower your risk of catching your friend’s or family member’s cold? Please explain.**

## Concept and Term Introduction

At this point, volunteers need to ensure that the concepts and terms **airborne transmission, disease, direct contact, indirect contact, infectious disease, microorganism/microbe, pathogen, symptoms, and zoonotic disease** have been introduced. (**Note:** The goal is to have the youth develop these concepts through their own exploration and define the terms using their own words.)

## Concept Application

### First:

- Ask the youth where the risks of being infected by a “pathogen” (glitter or airborne scent) were the greatest, and why? Ask them to explain.
- Ask participants to determine strategies that could help prevent or control the spread of the “pathogens” they encountered.

### Next:

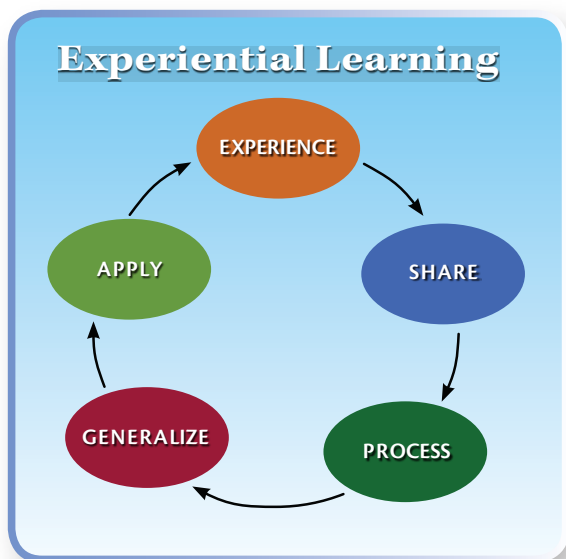
- Ask participants to brainstorm ways that 4-H Animal Science projects they are involved in or know about have the potential to allow contraction and spread of diseases.
- Ask participants to develop ideas for different management strategies that could be implemented for their 4-H Animal Science projects to reduce the risk of contracting and spreading diseases.

## Reference

Department of Microbiology, Mount Sinai Hospital, Toronto, Canada. 1999-2007. FAQ: Methods of disease transmission. Available online: <http://microbiology.mtsinai.on.ca/faq/transmission.shtml>

## APPENDIX

The activities in this curriculum were designed around inquiry and experiential learning. Inquiry is a learner-centered approach in which individuals are problem solvers investigating questions through active engagement, observing and manipulating objects and phenomena, and acquiring or discovering knowledge. Experiential learning (EL) is a foundational educational strategy used in 4-H. In it, the learner has an experience phase of engagement in an activity, a reflection phase in which observations and reactions are shared and discussed, and an application phase in which new knowledge and skills are applied to real-life settings. In 4-H, an EL model that uses a five-step learning cycle is most commonly used. These five steps—Experiencing, Sharing, Processing, Generalizing, and Applying—are part of a recurring process that helps build learner understanding over time.



For more information on inquiry, EL, and the five-step learning cycle, please visit the University of California Science, Technology, and Environmental Literacy Workgroup's Experiential Learning Web site, <http://www.experientiallearning.ucdavis.edu/>.

## For More Information

You will find related information in other publications, slide sets, CD-ROMs, and videos from UC ANR.

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