

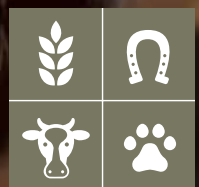


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# **Understanding and Applying Veterinary Science**

## **Module 3: Understanding Disease Transmission and Risks**



# **Facilitator Guide**

# Acknowledgements

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National 4-H Curriculum  
Facilitator Guide

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# Facilitator Tips:

How to get the most from this curriculum

## Teaching and Learning Strategies

All activities in the *Understanding and Applying Veterinary Science in 4-H* curriculum were designed using experiential learning and inquiry. **Experiential learning (EL)** is grounded in the idea that experience is essential to learning and understanding. Specifically, EL involves a recurring sequence of three distinct steps: 1) an experience (“Do”) that involves learner exploration; 2) a period of reflection (“Reflect”) where learners share their reactions and observations, process their experience, and make generalizations to real-life examples; and 3) an opportunity to apply (“Apply”) new knowledge and skills in an authentic manner, which helps learners deepen and broaden their understanding (it helps learning last!).

**Inquiry** is a teaching and learning strategy whereby learners are engaged in activities that require the observation and manipulation of objects and ideas in order to construct knowledge and develop skills. Inquiry is grounded in experience, focuses on the use and development of critical thinking skills, and targets the learning and application of specific content knowledge.

The inquiry-based activities in the *Understanding and Applying Veterinary Science in 4-H* curriculum were designed using the 5-step EL cycle (Pfeiffer and Jones, 1983): Experience, Sharing, Processing, Generalizing, and Application. It is recommended that adequate time be allotted for youth learners to proceed through each step in order for learning to be maximized.

## Organization of Learning Environment

### Creating the environments where learning takes place

The activities in the *Understanding and Applying Veterinary Science in 4-H* curriculum were designed to be facilitated in a small group-learning environment. Learners construct understanding through inquiry using observations, the manipulation of objects and ideas, and personal reflection. However, **learning is a social endeavor** where dialogue and reflection with others are critical elements. Therefore, creating physical and social environments where learners can carry out inquiry will help them organize their thoughts and develop an understanding of the content and processes being emphasized in specific curriculum activities.

# Facilitator Tips:

How to get the most from this curriculum

## Curriculum Activity Layout

- **Activity Title**  
The activity title introduces the facilitator to the topic that will be addressed during the activity. A subtitle may specify the area of focus within the topic.
  
- **Background Information**  
This introductory section provides facilitators with a brief overview of the subject matter and offers examples that help to explain why the topic is important. This section may also include brief descriptions of the sections included in each activity (e.g., concepts and vocabulary, life skills targeted, subject links to education standards, and an overview of activities.)  
  

**Facilitator Tip:** The background information is **not** meant to be shared with the youth prior to the activity. Rather, it is intended to support facilitators by providing factual information that may help ground and inform group discussions.
  
- **Time Required**  
Each module includes an estimate of the time needed to complete the activities. The actual time required for the activities will vary based on level of learner interest, size of the group, age of the group members, and the setting in which the activities take place.
  
- **Learning Objectives: Concepts and Vocabulary**  
Facilitators are provided with a list of defined concepts and vocabulary that represent key curriculum content that is meant to be discovered by the youth through their exploration, reflection, and discussion with others.  
  

**Facilitator Tip:** The list should **not** be provided to the youth at the beginning of the activity. At the end of each activity, the facilitators should ensure that the appropriate terms and concepts have been discovered by or introduced to the youth.
  
- **Life Skills**  
Life skills are abilities that help youth become productive, contributing members of society. The activities are designed to provide youth with the opportunity to practice particular life skills that are utilized in everyday life. The life skills being targeted are listed for each activity. Learn more about the Targeting Life Skills model at: [http://www.csrees.usda.gov/nea/family/res/pdfs/Targeting\\_Life\\_Skills.pdf](http://www.csrees.usda.gov/nea/family/res/pdfs/Targeting_Life_Skills.pdf)
  
- **National Science Education Standards Supported**  
The Next Generation Science Standards are guidelines for educators regarding what K-12 students should know, comprehend, and be able to do in order to be scientifically literate, competent members of society. Each activity supports at least one of the Next Generation Science Standards Crosscutting Concepts. For more information about the Next Generation Science Standards, visit: <http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf>
  
- **Suggested Groupings**  
Activities are designed for youth to work in pairs, small groups, large groups, or individually. The suggested groupings are meant to help facilitate quality learning among the youth.

# Facilitator Tips:

How to get the most from this curriculum

## Materials Needed

A list of the materials needed to complete the activities is provided for the facilitator. The list describes the materials to be used, as well as how many of each item is required for each activity. Most materials are provided (these are marked with an \*); however, other materials will need to be obtained by the facilitator.

## Getting Ready

This section describes what needs to be done by the facilitator to prepare for the activity. It is highly recommended that facilitators review this list carefully and prepare necessary materials prior to activity implementation.

## Opening Questions/Prompts

**Facilitator Tip:** This is the point where each activity begins with the youth.

Questions or prompts presented at the beginning of each activity are meant to draw the youth into the topic being addressed in the activity. Responses to the questions will also provide the facilitator with an understanding of what the youth already know about the topic. Each question is designed to be open-ended and to support collaboration within the group. Facilitators should encourage the youth to record their answers to these introductory questions on the provided flip chart paper, as this is an important part of the learning process.

**Facilitator Tip:** Ask the questions/prompts as they are written. Open-ended questioning is a key element of inquiry-based learning.

## Procedure (Experiencing)

This is the part of the curriculum when the youth experience and complete the activity itself. It is highly recommended that facilitators review the procedure prior to implementing with youth so the activity flows smoothly from one section to another. It is important for youth to record their observations, ideas, and other thoughts during the procedure on the flip chart paper provided, as this is an important part of the learning process.

## Sharing, Processing, and Generalizing

Following the activity procedure there is a period of reflection, during which time the youth come back together as a large group and share their observations with each other. This is an opportunity for youth to communicate their findings, listen to what others discovered, consider the various thought processes, and learn from each other. This section helps to solidify what the youth have learned throughout the course of the activity.

## Concept and Term Discovery/Introduction

At this point of the activity, most of the concepts will have most likely already been discovered by the youth. Many concepts will have already been defined by now as well. However, some technical terms may need to be introduced to the youth. The facilitator needs to confirm that all important terms and concepts have been defined.

# Facilitator Tips:

How to get the most from this curriculum

**Facilitator Tip:** Ensure that all terms/concepts have been discovered by or introduced to the youth. Additionally, make certain that any misconceptions have been addressed.

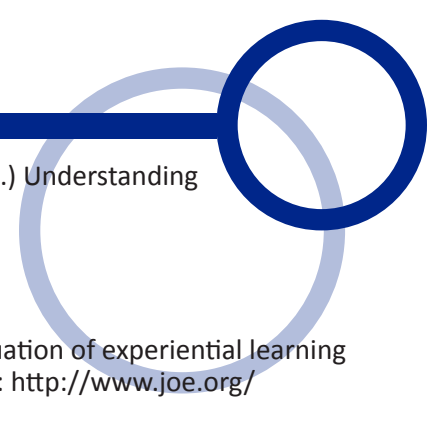
- **Concept Application**

The true test of understanding takes place when learners attempt to apply their new knowledge and skills to authentic situations. At this point of the activity, youth have already completed the hands-on activities that have introduced the new concepts and skills. The concept application section provides the facilitator with activities that allow youth the opportunity to take what they have learned and apply it to independent, real-world situations. This application may be subdivided according to level of knowledge and experience of the learners. This application of knowledge is a critical step of the learning process. It is recommended that the youth be required to participate in the application activity and report back on their experience at the following group meeting.

- **References:**

Following the concept application section, the facilitator is provided with a list of references. The references list can be used as an additional resource by the facilitator to learn more information about the topics addressed during the activity.

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# Understanding and Applying Veterinary Science

## Module 3: Understanding Disease Transmission and Risks

### Background Information

#### Disease and Disease Transmission

A **disease** is a disorder of function in an animal, human, or plant, especially one that produces **symptoms**, signs that point to potential abnormalities in function. Diseases can be **infectious** or **non-infectious**. Infectious diseases are caused by microorganisms, or **pathogens**, such as viruses, bacteria, fungi, or parasites. Infectious diseases, such as influenza or *Salmonella*, can easily be transmitted from one organism to another. Infectious diseases that can be transmitted between animals and humans are called **zoonotic diseases**. **Non-infectious diseases**, such as cardiovascular diseases and cancers cannot be transmitted between organisms. Common causes of non-infectious diseases include environmental factors (e.g., excessive exposure to the sun and skin cancer), lifestyle (e.g., cardiovascular disease and diet), and genetics.

Whether working with **livestock**, **companion animals**, or **poultry**, it is important to understand the mechanisms by which infectious diseases are transmitted. There are several ways infectious diseases are commonly spread: **vector transmission**, **biological transmission**, **mechanical transmission**, **fecal-oral transmission**, **airborne transmission**, **fomite transmission**, and **reproductive transmission**. Some of these disease transmission mechanisms occur directly (**direct transmission**) when an infected host transmits a pathogen by coming into direct contact with an uninfected animal; in contrast, **indirect transmission** is when an uninfected animal comes into contact with an object, food or water, or an environment where a pathogen is present.

- **Vector Transmission:** A **vector** is any living organism that transmits an infectious disease agent from one **host** to another host. Common vectors include mosquitoes, ticks, and fleas.
- **Fecal-Oral Transmission:** **Fecal-oral transmission** occurs when an infected animal passes pathogens through its fecal particles into an uninfected animal through its oral cavity. This occurs most frequently under conditions of unsuitable sanitation whereby a previously uninfected animal ingests contaminated infected food or water.
- **Airborne Transmission:** **Airborne transmission** occurs when pathogens are transmitted through air currents, e.g., through spraying of liquids, sneezing, coughing, or raising dust. Uninfected animals can receive pathogens through any entry point on the body, including the mouth, nose, or cuts on the skin.
- **Fomite Transmission:** A **fomite** is any non-living substance, such as clothing, fence posts, and trailers, that carries pathogens, transferring them from one organism to another organism. In this way, pathogens are transmitted indirectly.
- **Reproductive Transmission:** **Reproductive transmission** occurs when diseases are spread through contact of tissue and bodily fluids in the process of breeding, gestation, or during birth.

## Background Information (continued)

### Strategies to Minimize Individual Animal and Herd Health

**Risk** refers to the possibility of suffering harm or loss. When thinking about risk relative to disease, one must consider not only the health implications, but also financial and welfare aspects that can affect both the caretaker and animal.

**Animal husbandry** is the caring, breeding, and rearing of domesticated animals; disease control through proper husbandry practices is integral to being an animal caregiver. Relative to disease prevention, animal caregivers need to develop awareness of the risks associated with disease transmission and learn how to conduct basic **risk assessments** relative to **bio-security**. By identifying disease transmission **critical control points** (locations or procedures where risks of disease transmission are high), strategies can be implemented to reduce or prevent pathogen presence or spread.

Although the risk of disease transmission cannot be eliminated completely, it can be greatly reduced through practical measures. For example: provide adequate living space and avoid mixing species; **quarantine** new animals before they are introduced to a herd/flock; quarantine animals that have been at show or exhibition; keep equipment, transport trailers, barn boots, and clothing sanitized; maintain a clean, dry housing area that is free of vectors and **vermin**; ensure that food and water are fresh and clean; and ensure that **disease resistance** is enhanced through recommended **vaccinations**.

# Concepts and Vocabulary

- **Airborne Transmission:** The spread of pathogens and disease through air particles.
- **Companion Animal:** A pet or a household animal that is kept for a person's enjoyment, such as cats and dogs.
- **Direct transmission:** The spread of pathogens and disease from one host to another host.
- **Disease:** A disorder of structure or function in a human, animal, or plant, especially one that produces specific signs or symptoms or that affects a specific location and is not simply a direct result of physical injury.
- **Fecal-Oral Transmission:** The spread of pathogens and disease from the fecal particles of a living organism/host into the oral cavity into another living organism/host.
- **Fomite Transmission:** Inanimate objects and non-living substances such as clothing and hair that carry pathogens, and spread them from one living organism to the other.
- **Host:** Any organism that harbors a pathogen.
- **Indirect transmission:** The spread of pathogens and disease from one living organism to another through the presence of a vector.
- **Livestock:** Domesticated animals such as cattle, sheep and pigs that are raised in an agricultural setting to produce commodities like food, fiber, and labor.
- **Pathogen:** A microorganism that causes disease in its host.
- **Poultry:** Domesticated birds such as chickens that are raised for collection of their eggs, meat and/or feathers.
- **Prevention:** Methods that exist to reduce the spread of disease.
- **Reproductive Transmission:** Pathogens and diseases that are passed from mother to infant through the birth process.
- **Risk:** The probability or threat of damage, injury, liability, loss or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through preemptive action.
- **Symptom:** A sign that points to potential abnormalities in an organism's normal functioning.
- **Vector:** Any living organism that carries and transmits an infectious pathogen into another living organism.
- **Vector Disease:** Pathogens and diseases that are spread through organisms carrying the pathogen or disease
- **Vector Transmission:** The spread of pathogens and disease from a vector to another living organism.
- **Zoonosis:** The spread of pathogens and disease from animals to humans, and from humans to animals.

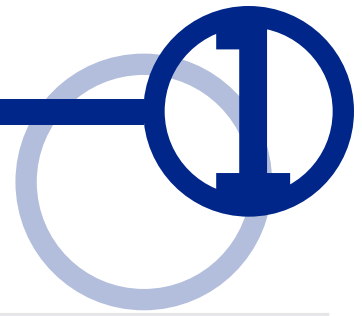
## Life Skills Targeted

- Disease Prevention, Critical Thinking, Problem Solving, Keeping Records, Communication, Sharing

## Next Generation Science Standards: Cross-Cutting Concepts Supported

- Patterns. Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.
- Cause and Effect: Mechanism and Prediction. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
- Stability and Change. For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

# Activity 1: Disease Transmission Risk Assessment



## Getting Ready

1. Copy one scenario sheet for each pair/small group (provide pairs/groups with different scenarios).
2. Provide each pair/small group with writing utensils and a piece of flip chart paper.

### Suggested Groupings

- Pairs or small groups of 3-4 youth.

## Opening Questions/Prompts

1. Explain your understanding of how diseases can be transmitted. Ask the youth record their thoughts and ideas on the flip chart paper provided.
2. Explain your understanding of factors that are important for animal caregivers to consider relative to decreasing the risk of disease transmission. Ask the youth to record their thoughts and ideas on the flip chart paper provided.

### Materials Needed

- Pens/Pencils
  - Markers
  - Flip chart paper
  - \*Animal Disease Scenarios
  - \*Animal Disease Fact Sheets
- \*Materials provided in the curriculum.*

## Procedure (Experiencing)

1. Provide one disease scenario to each pair/small group.
2. Instruct youth to read their disease scenario carefully and spend time as a group discussing and identifying:
  - a. How they think the animals in each scenario became infected.
  - b. Potential mode(s) of disease transmission.
  - c. Risk factors associated with the transmission of the disease.
3. Once they have completed Step 2, ask each pair/small group to share their observations and conclusions with the other youth.
4. Provide each pair/small group with the Animal Disease Fact Sheet associated with their scenario. Ask them to review the fact sheet and compare it to their observations and conclusions. They should then revisit the Animal Disease Scenario and see if there are additional details they might have missed after their first review of the scenario.
5. Lastly, ask each group to develop a list of the risk factors they identified as relevant to the transmission of the disease portrayed in their scenario and propose how those risk factors could be mitigated or eliminated.

## Sharing, Processing, and Generalizing

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

1. What are some instances described in the scenarios that caught the attention of the youth? Ask the youth to record their thoughts/ideas on the flip chart paper provided.
2. What type of systematic strategies might you recommend to help track the progress of the health of the animals? Ask the youth to record their thoughts/ideas on the flip chart paper provided.
3. In your own experience raising animals, explain any similar situations you have encountered. Were there things you did differently? Were these helpful or not helpful? Give examples to reinforce and explain. Ask the youth to record their thoughts/ideas on the flip chart paper provided.

# Activity 1: Disease Transmission Risk Assessment



## Concept and Term Discovery/Introduction

At this point, volunteers need to ensure that the terms **airborne transmission, companion animal, direct transmission, disease, fecal-oral transmission, fomite transmission, host, livestock, pathogen, poultry, prevention, reproductive transmission, risk, symptom, vector, vector disease, vector transmission, and zoonosis** have been introduced (**Note:** the goal is to have the youth discover through exploration and discussion and define the terms in their own words.)

## Concept Application

People who raise animals are responsible for their care and well-being. One element of this care is to understand the different types of diseases common to the specific animal(s) one is raising. This knowledge helps one prevent disease through proper veterinary care (e.g., vaccinations) and husbandry practices.

In this activity, youth are to:

1. Investigate (using library resources or reliable Internet sites) the most common diseases that affect the animal species they are raising.
2. Ensure that all relevant vaccinations are current.
3. Identify the main mode(s) of transmission for these diseases.
4. Identify critical control points at the location where they raise and house their animal.
5. Prepare and deliver a short presentation on points 1-4 to a 4-H Club, fair board, or other pertinent group.

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