

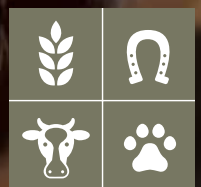


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# **Understanding and Applying Veterinary Science**

## **Module 4: Principles of Bio-Security**



# **Facilitator Guide**

# Acknowledgements

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Facilitator Guide

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# Table of Contents

## Facilitator Tips

2-6

## Activity 1: Bio-Security and Risk Mitigation: Reducing the Risk!

7-10

APPENDIX A: Outbreak Press Release	14
APPENDIX B: Disease Control Agent Data Sheet	15
APPENDIX C: Account #1 First Reported Case	16
APPENDIX D: Account #2 Second Reported Case	17
APPENDIX E: Account #3 Third Reported Case	18
APPENDIX F: Account #4 Fourth Reported Case	19
APPENDIX G: Account #5 Fifth Reported Case	20
APPENDIX H: Bio-Security Risk Assessment Tool	21-22
APPENDIX I: Bio-Security Risk Mitigation Plan	23
APPENDIX J: Risk Analysis Table	24-25
APPENDIX K: Detailed Risk Mitigation Plan Template (Example)	26
APPENDIX L: Detailed Risk Mitigation Plan Template	27

# 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 4: Principles of Bio-Security

### Background Information

#### What is bio-security?

An important aspect of **animal husbandry**, the raising of and caring for animals, is **bio-security**. Specifically, bio-security is the process of implementing procedures that can help protect humans and animals from contracting and spreading diseases (Smith, February 2010). The transmission of **pathogens**, disease-causing agents, may occur **directly** from animal to animal, human to animal, or animal to human, or **indirectly** through contaminated water, food contamination, or through air currents (Kahn & Line, 2011). Transmission may also occur through **fomites**, inanimate objects that come in contact with the infected animal, such as equipment, clothing, or vehicles (Viera & Dvorak, 2011). Reducing the transmission of diseases from animals to animals, animals to humans, and humans to animals is an essential **animal husbandry** practice.

#### Disease Risk; Risk Assessment; and Risk Mitigation

A **risk** can be defined as the **probability** of a **negative outcome** that results from engaging in an event or activity. In bio-security, the risk is the probability of disease transmission occurring, and the goal is to reduce **disease risk** by lessening the chances that an animal or human will be exposed to one or more pathogens.

**Risk assessment** is the examination and evaluation of potential risks associated with a given situation. Just as people are cautious about potential risks in their daily lives, one must also be cautious of potential risks to animals in their care. **Risk mitigation** refers to carrying out preventative strategies based on risks identified through an assessment (Dement, 2009). By assessing potential disease risks and using mitigation strategies, one can help protect animals from contracting a potential life-threatening disease and lower the risk of incurring a financial loss due the treatment and care of the sick animal.

#### Isolation/Quarantine Animals

When obtaining new animals it is extremely important to screen and quarantine them, including those that look healthy. Quarantining involves physically separating an animal from other animals and providing it with its own food, water, shelter, and space. It is also important to quarantine animals that have been taken to fairs and shows since it is possible to contract pathogens at these public venues. Another important point is that while an animal may appear healthy it is still possible for it to be a **vector**, i.e., a carrier that could transmit a pathogen to other animals without showing any symptoms itself. New animals, or animals that have been to shows or exhibitions, should be quarantined for approximately 2-4 weeks before being exposed to other animals. This is the average amount of time it takes for most diseases to either yield symptoms or run their course (Wolfgang, n.d.).

## Background Information (continued)

### **Sanitation/Keeping It Clean**

Keeping all areas where animals are housed or transported, clean at all times, is central to reducing the transmission of diseases. Animal manure, mucus, and saliva are the easiest and most common ways to spread disease between animals and the people that work with them (Smith, 2010). It is also important to ensure that any equipment or clothing that comes in contact with animals or animal waste be disinfected since such surfaces serve as fomites that can transmit pathogens. Keeping separate equipment, clothing, and boots dedicated to areas where animals are housed or transported will help ensure that individuals do not unintentionally transmit pathogens. Equipment should also be stored away from the animal containment areas. Additionally, individuals interacting with animals need to sterilize their hands and clean all other accessories before making contact with other animals.

### **Resistance/Act Don't React**

When purchasing animals, make certain to verify whether they have been properly immunized; additionally, gather any other information regarding the animals' health status (e.g., prior illnesses, behavior, feeding, growth, and **conformation**). At home, provide animals with an age-appropriate, nutritious diet and a clean environment. These practices can help promote good health and growth and build an animal's resistance to a variety of infectious disease agents (Wolfgang, n.d.).

### **Risk Assessment Procedures/Strategies**

#### *Assessing Biological Risks*

There are three questions to consider when assessing potential biological risks (Caskey et al., 2010):

- 1) What can happen?
- 2) What is the chance it will happen?
- 3) If it happens, what are the consequences?

When assessing biological risks, it is important to understand the types of pathogens that may be present in a given environment (e.g., specific diseases; bacteria and/or viruses) and ways the infectious agents might be transmitted from one host to another (Caskey et al., 2010).

#### *Assessing Financial Risks*

When considering the consequences of biological risks, it is also important to assess financial risks. By implementing regular disease risk assessments, there is a greater chance that pathogens will be discovered before they have a chance to spread. Doing so reduces the possible costs associated with treating and caring for sick animals.

# Concepts and Vocabulary

- **Animal husbandry:** the science of caring for and breeding animals, including grooming, livestock farming, hygiene and accommodation.
- **Bio-security:** protection against the incursion or escape of potentially harmful or undesirable organisms, especially pathogens.
- **Directly transmitted:** transmission of a pathogen either from animal to animal, human to animal, or animal to human.
- **Disease risk:** the chances that an animal or human may be exposed to a potential pathogen.
- **Fomites:** transmission of pathogens through inanimate objects that come in contact with the infected animal, such as equipment, clothing, or vehicles.
- **Immune system:** the complex system of organs, cells, and molecules responsible for producing the body's protective response to a foreign organism or substance or its own abnormal cells.
- **Indirectly transmitted:** transmission through exposure to fomites.
- **Negative outcome:** a change resulting in an undesired outcome.
- **Pathogens:** a microorganism that causes disease.
- **Probability:** the likelihood that a given event will occur.
- **Risk:** the possibility of loss, injury, or other adverse or unwelcome circumstance.
- **Risk assessment:** the examination and evaluation of potential hazards associated with a given situation.
- **Risk mitigation:** a process whereby risks are identified and strategies are developed and implemented to make risks less likely or dangerous.
- **Vector:** a person, animal, or plant which carries a pathogenic agent and acts as a potential source of infection for members of another species.

## 4-H Life Skills



- Head: Critical thinking, keeping records, problem solving
- Heart: Cooperation, communication, sharing
- Hands: Teamwork, organization
- Health: Disease prevention, planning

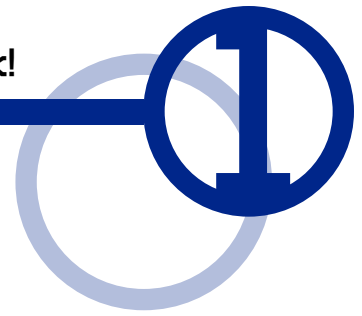
## Subject Links

- Science and Language Arts

## 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 (NGSS, 2013).
- *Cause and Effect: Mechanism and explanation.* 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 (NGSS, 2013).

# Activity 1: Bio-Security and Risk Mitigation: Reducing the Risk!



## Getting Ready

- Organize the youth into pairs or small groups.
- Make one copy of Appendices C-G.
- Provide each pair/small group with flip chart paper, markers, pens/pencils.
- Provide each pair/small group with one press release (Appendix A) and at least three copies of the Disease Control Agent Data Sheet (Appendix B).
- Provide each pair/small group with one copy of the Bio-Security Risk Assessment Tool (Appendix H).

## Opening Questions/Prompts

1. **Explain what you know about disease transmission.** Ask the youth to write down their thoughts and ideas on the flip chart paper provided.
2. **What are some strategies you think could help prevent disease transmission?** Ask the youth to write down their thoughts and ideas on the flip chart paper provided.
3. **Describe your ideas regarding what you think the term “bio-security” means.** Ask the youth to write down their thoughts and ideas on the flip chart paper provided.

**Note:** Once all questions/prompts have been answered, engage the youth in a group discussion. Ask the youth to share and compare their thoughts and ideas.

## Procedure (Experiencing)

Explain to the youth that they will be playing the role of “Disease Control Agents” in search of the source(s) of the EHV-1 virus outbreak. Specifically, they will be investigating a disease outbreak among horses. The goals are to determine how the animals might have become infected and ways in which the risk of infection might have been reduced.

1. Provide each group with one copy of the Press Release (Appendix A).
2. Provide each group with three copies of the Disease Control Agent Data Sheet (Appendix B).
3. Provide each group with one copy of the Bio-Security Risk Assessment Tool, (Appendix H).
4. Provide each group with one different Account Sheet, (Appendices C-G). (**Note:** each group receives only one account).

**Suggested Groupings:** Pairs or small groups of 3-4 youth

**Time Required:** 40-50 minutes

### Materials Needed

- |  |  |
|--|--|
| ▪ Flip chart paper (one piece for each group)    | ▪ Bio-Security Risk Assessment Tool* (Appendix H)              |
| ▪ Markers (shared materials)                     | ▪ Bio-Security Risk Mitigation Plan Instructions* (Appendix I) |
| ▪ Pens/Pencils (shared materials)                | ▪ Risk Analysis Table* (Appendix J)                            |
| ▪ Press Release* (Appendix A)                    | ▪ Sample Risk Mitigation Plan* (Appendix K)                    |
| ▪ Disease Control Agent Data Sheet* (Appendix B) | ▪ Risk Mitigation Plan* (Appendix L)                           |
| ▪ Account Sheets* (Appendices C-G)               | *Materials provided in the curriculum                          |

## Activity 1: Bio-Security and Risk Mitigation: Reducing the Risk! (continued)



5. Ask the groups to review the Press Release and Account worksheets provided. They should read these documents carefully and note their ideas and findings on the Disease Control Agent Data Sheet provided (Appendix B).
6. When all the groups have completed step 5, ask them to use the flip chart paper provided and write the ideas and findings they recorded on the data worksheet.
7. After the groups have finished recording their findings on the flip chart paper, have the youth go review their account sheet again using the Bio-Security Risk Assessment Tool (Appendix H).
8. Once all the groups are finished with steps 6 and 7 provide them with a second account sheet. Repeat steps 4-7 with the second account.
9. Once all the groups are finished with steps 6 and 7 provide them with a third account sheet. Repeat steps 4-7 with the third account. **Note:** Each group should complete at least three different accounts.
10. After the groups have completed their last account, ask them to come 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, observations, and conclusions. If necessary, use more targeted questions as prompts to get to particular points. Specific questions might include:

1. Where and how do you believe the horse and/or youth in your account(s) came into contact with the EHV-1 virus, and how might have the disease transmission been prevented? Please explain.
2. In your opinions, what are some things that the people in the accounts could have done in order to lower their horse's risk of catching a disease? Please explain.

### Concept and Term Discovery/Introduction

At this point, volunteers need to ensure that the concepts and terms **animal husbandry, bio-security, directly transmitted, disease risk, fomites, immune system, indirectly transmitted, negative outcome, pathogens, probability, risk, risk assessment, risk mitigation**, and **vector** 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

The goals of the application activity are:

1. For each individual youth do a **risk assessment** at the location where he/she raises their animal(s). Using the **Bio-Security Risk Assessment Tool** (Appendix H; provide each with a copy), ask each youth to rate the risks listed as "low," "moderate," or "high." Then, complete the **Risk Analysis Table** (Appendix J).
2. Develop a **Risk Mitigation Plan** (Appendix L) to address "moderate" and "high" risks that the youth identified through their risk assessment. (**Note:** Specific instructions for the risk mitigation are included in Appendix I.)  
**Facilitator Tip:** A sample Risk Mitigation Plan is shown in Appendix K.
3. To implement the risk mitigation plan to the extent possible.