

Pre-Harvest Food Safety in 4-H Animal Science

Part 2: Food-Producing Animal Selection and Pre-Harvest Food Safety Considerations

OVERVIEW AND BACKGROUND INFORMATION

Pre-Harvest Food Safety involves following specific practices in the pre-harvest environment in order to reduce the risks that livestock and poultry will contract pathogens and diseases that can subsequently pose a threat to human health. By the **pre-harvest environment**, we mean everything that happens from the producer's acquisition of an animal until the food product is collected (e.g., milk or eggs) or harvested (e.g., meat). Preventive measures include the initial selection of healthy livestock, proper husbandry, appropriate use of antibiotics and other pharmaceuticals, and other disease prevention measures.

Pre-harvest food safety is an important component of animal agriculture. Failure to follow proper pre-harvest food safety guidelines can result in the illness and even death of both livestock and people. It is the responsibility of everyone who raises food animals to take proper precautions to ensure the safety of the food supply. These precautions begin with the acquisition of a healthy food-producing animal. Such an animal should originate from a safe and sanitary, **pathogen-free** environment with a low **stocking density**. Additionally, the animal should be transported safely in a vehicle with adequate **ventilation** and should have a health record that includes past and current vaccinations, any **antibiotic** use, and no history of any serious illnesses.

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Activity Concepts and Vocabulary:

- **Antibiotic:** A chemical substance, produced by a microorganism, that has the capacity to inhibit the growth of or to kill other microorganisms. Antibiotics that are sufficiently nontoxic to the host are used in the treatment of infectious diseases.
- **Critical Control Point:** A point, step, or procedure in the course of growing food where humans can introduce a process that can help prevent, eliminate, or reduce a food safety hazard.
- **Pathogen:** A disease-causing organism.
- **Pre-Harvest Environment:** Any and all factors associated with the acquisition and raising of a food-producing animal until such time as the associated food product is collected (e.g., milk or eggs) or harvested (e.g., meat).
- **Pre-Harvest Food Safety:** Safety measures taken that reduce the risk that pathogens associated with livestock and poultry food products that can adversely affect human health will enter the food supply.
- **Stocking Density:** The number of animals in a given amount of space.
- **Ventilation:** The movement of air through an area.

Life Skills

- **Head:** Keeping records, critical thinking, problem solving, decision making
- **Heart:** Sharing, cooperation, communication
- **Hands:** Contributions to a group effort, teamwork
- **Health:** Disease prevention

Subject Links

Science, Language Arts

Next-Generation Science Standards (NGSS)

Crosscutting Concepts

- **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:** Events have causes, sometimes simple, sometimes multi-faceted. 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.

Purpose of Activity

The purpose of this activity is to have youth learn the best practices associated with raising a healthy animal prior to its harvest. In addition, the goal is to have youth learn the importance of acquiring a healthy animal by

knowing the background information on the animal as well as looking for characteristics of a healthy animal. Having this knowledge, youth will increase their chances of raising a healthy animal and the chances that it or its products will be safe for human consumption.

Overview of Part 1: Choosing a Calf

In Part 1, the youth will go through a simulated process of obtaining a calf for a 4-H project that will eventually be marketed and harvested for human consumption. As the youth learn more about their animal, they will identify potential disease risks that their animal has experienced. The youth will identify critical control points in the calf's history and explain how these points might be related to disease transmission.

Overview of Application, Part 1: Which calf am I going to pick?

After completing Part 1, youth will receive a **Pre-Harvest Food Safety Risk Checklist** that they will use to review animals that are available for purchase. Given a few options, youth will assess the animals' records, site and transportation history, will choose a calf to purchase, and will explain their reasons for making that particular choice.

Overview of Application, Part 2

After completing Application Part 1, youth will have the opportunity to apply the **Pre-Harvest Food Safety Risk Checklist** to their own food-producing animal or to a friend's food-producing animal.

PART 1: CHOOSING A CALF

Time Required

30–45 minutes

Suggested Grouping

Pairs or small groups (as many as five pairs or groups)

Materials Needed

(* = Materials provided in curriculum)

- * *Calf Profiles* (each includes a calf picture, transportation, site and record information)
- * *Recording Sheet*
- * *Pre-Harvest Food Safety Risk Checklist*
- Pens or pencils; markers
- Flipchart paper

Getting Ready

- Make enough copies of *Calf Profiles* so each group gets one.
- Make enough copies of *Recording Sheet* and the *Pre-Harvest Food Safety Risk Checklist* for each group.
- Make certain each group has an adequate supply of writing utensils and flipchart paper.

Opening Questions

1. **What does the term “risk” mean to you?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.
2. **Why, do you think, it is important to keep your food-producing animals healthy?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.

3. **What does the term “food safety” mean to you?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.
4. **What do you think are some risks related to food safety?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.

Procedure (Experiencing)

1. Start by explaining to the youth that they are going to be given, at random, a calf for a market 4-H project. They are to raise the calf, and eventually it will be harvested for human consumption.
2. Give each group a *Recording Sheet*.
3. Choose at random one *Calf Profile* for each group, and distribute them accordingly.
4. Looking at the information provided on the *Calf Profiles* about their calf, ask each group to identify what they believe are that animal’s pre-harvest food safety risks within each category (records, site, and transportation) that might lead to their calf contracting an illness.
5. Have youth record their observations on their *Recording Sheet*. Additionally, ask them to discuss ways they might be able to reduce these pre-harvest food safety risks, and to record these under “Suggestions of Ways to Reduce Risks” on the *Recording Sheet*.
6. Pass out a copy of the *Pre-Harvest Food Safety Risk Checklist* to each group. Have the youth compare the information they have recorded on their *Recording Sheet* with the *Pre-Harvest Food Safety Risk*

Checklist. Are there any similarities or differences? Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.

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. As a group, share your thoughts on how the information you collected from the *Recording Sheet* could be important in the context of pre-harvest food safety.
2. If you had had the opportunity to choose your calf yourself, would you have chosen the calf you were given at the beginning of this activity? Why or why not? Please explain.
3. How do you think the factors listed on the *Pre-Harvest Food Safety Risk Checklist* help protect humans and animals from potential diseases in food products? Please explain.

Concept and Term Introduction

At this point, volunteers need to ensure that the concepts and terms **critical antibiotics, critical control points, pathogen, pre-harvest environment, pre-harvest food safety, stocking density, and ventilation** 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.)

APPLICATION PART 1: WHICH LAMB AM I GOING TO PICK?

Time Required

30–45 minutes

Suggested Grouping

Pairs or small groups (as many as five pairs or groups)

Materials Needed

(* = Materials provided in curriculum)

- * *Lamb Profiles* (each includes a lamb picture, record, transportation, and site information)
- * *Pre-Harvest Food Safety Risk Checklist*
- * *Risk Sheet*

Getting Ready:

- Make enough copies of *Lamb Profiles* so each group gets a set (all 5 lambs).
- Make enough copies of *Pre-Harvest Food Safety Risk Checklist* so each group gets 5 copies.
- Copy one *Risk Sheet* for each group.

Procedure (Experiencing)

1. Start by explaining to the youth that they are going to be choosing a lamb for a market 4-H project. Let the youth know that the lamb they select will eventually be harvested for human consumption.
2. First, have each group review the *Pre-Harvest Food Safety Risk Checklist*.
3. Give each group a set of *Lamb Profiles* and a *Risk Sheet*.
4. Each group will be given an opportunity to look at the records of 5 lambs before they choose their lamb.
5. As a group, have the youth review all of the *Lamb Profiles* and use the *Pre-Harvest Food Safety Risk Checklist* to help choose the animal they would like to purchase.
 - » (**Volunteer Tip:** When choosing their animal, youth can use a separate *Pre-Harvest Food Safety Risk Checklist* for each animal they review).
6. For their chosen animal, have each group determine the animal's pre-harvest food safety risks and write them down on the *Data Sheet*. Then, if possible, have the group determine how to reduce those risks.

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. (**Volunteer Tip:** During this discussion, the youth should reach the conclusion that there is no “right” answer for this activity. Unless they find a case where an animal has no risk factors at all, the exercise of choosing an animal is always about considering options and weighing various risks).

Specific questions for each group might include:

- **Which animal did you pick and why did you choose that animal?**
- **For the animal you chose, what did you identify as potential pre-harvest food safety risks? How did you weigh different alternatives and how did you prioritize risk factors. What are some ways to reduce these risks?**
- **How do you think you might go about obtaining the type of information discussed in this activity when you need to choose a real project animal? Please explain.**

APPLICATION PART 2:
CONSIDERATIONS TO HELP REDUCE RISK OF DISEASE SPREAD
WHEN OBTAINING AND TRANSPORTING FOOD-PRODUCING ANIMALS

1. Use the *Pre-Harvest Food Safety Risk Checklist* to assess the records of your actual food-producing animal or the food-producing animal of someone you know.
2. Determine the critical control points that might apply to your animal and identify ways to reduce risks to the animal at these points.

CALF PROFILES

CALF A



<https://www.flickr.com/photos/unitedsoybean/9622288195/s>

Records

- Born in Canada, transported to California
- Has no vaccinations
- Gaining weight steadily
- No signs of sickness in the herd or animal

Site Where Calf Was Obtained

- High stocking density
- Clean food and water
- Not exposed to wildlife
- Housed in a barn; well ventilated
- Clean bedding
- Facility cleaned three times a day
- No vermin

Transportation from Site to 4-Her's Home

- Motor vehicle — travels in the family van
- Poor ventilation
- Transported alone
- No drainage in the van
- Carpet flooring — non-slip
- Adequate protection from the sun and rain
- Van not sanitized prior to transport

CALF B



<http://www.flickr.com/photos/otterpix/2861573452/> Pamela

Records

- Born on site, never transported
- Has all vaccinations
- Losing weight rapidly
- Animal exhibits some symptoms of intestinal distress (e.g., diarrhea); in the animal but not in the herd.

Site Where Calf Was Obtained

- Low stocking density
- Clean food and water, but not changed daily
- Some exposure to wildlife
- Housed in a barn; limited ventilation, only one opening and no fans
- Clean bedding
- Facility cleaned once a day
- Lots of crows and crow feces

Transportation from Site to 4-Her's Home

- Semi-trailer with jagged edges on inside
- Poor ventilation
- Transported alone
- Adequate drainage
- Metal floor; no rubber mat
- Poor protection from sun and rain
- Trailer sanitized prior to transport

CALF C



<http://www.flickr.com/photos/66176388@N00/2385870454/> Mark Robinson

Records

- Born on site, never transported
- Has some vaccinations, but not all
- Gaining weight very rapidly
- Exhibited signs of ringworm, but has been treated

Site Where Calf Was Obtained

- High stocking density, crowded with other cows
- Dirty water and food
- Not exposed to wildlife
- Housed in a barn; moderate ventilation with fans
- Dirty bedding
- Facility cleaned every other day
- Lots of flies

Transportation from Site to 4-Her's Home

- Pick-up truck with enclosure
- Adequate ventilation
- Transported with different species
- Poor drainage
- Wooden floor without rubber mat
- Adequate protection from sun
- Truck not sanitized prior to transport

CALF D



<http://www.flickr.com/photos/boynton/295333640/> Lucy Boynton

Records

- Born on site, never transported
- Has some vaccinations, but not all
- Trouble gaining weight
- No signs of sickness in the herd or animal

Site Where Calf Was Obtained

- Low stocking density
- Clean food and access to pond water
- Lives on pasture; exposed to wildlife
- No barn available
- No bedding available
- Lots of vermin

Transportation from Site to 4-Her's Home

- Double-stacked trailer
- Adequate ventilation
- Transported with same species
- Adequate drainage
- Metal floor with rubber non-slip mat
- Adequate protection from sun and rain
- Trailer sanitized prior to transport

CALF E



<https://www.flickr.com/photos/pinti1/7809394940/>

Records

- Born on site, never transported
- Fully vaccinated
- Gaining weight appropriately
- No signs of sickness in the herd or animal

Site Where Calf Was Obtained

- Low stocking density
- Clean food and water provided
- Wildlife is kept out with double fencing
- Excellent ventilation
- Lives on pasture; shelter available
- Clean bedding
- Shelter and bedding cleaned twice a day
- Some flies

Transportation from Site to 4-Her's Home

- Single-stack trailer
- Adequate ventilation
- Transported with cattle and pigs from the same farm
- Adequate drainage
- Metal floor with rubber non-slip mat
- Poor protection from sun and rain
- Trailer not sanitized prior to transport

Recording Sheet

Calf _____	Pre-harvest food safety risks	Suggested ways to reduce risks
Transportation		
Site		
Records		

LAMB PROFILES

LAMB A



<http://www.flickr.com/photos/11285577@N04/2840401565> Saxophone player

Records

- 65 days old, 70 lb
- Born on site, never transported
- Has some, but not all vaccinations
- Farmer has never sold club lambs
- Gaining weight steadily
- Had foot rot but received antibiotic treatment

Site Where Calf Was Obtained

- High stocking density
- Access to natural pond and clean food
- Lots of exposure to wildlife
- Lives on pasture; no shelter available
- Large presence of flies

Transportation from Site to 4-Her's Home

- Double-decker truck
- Smooth sides, no sharp edges
- Truck sanitized prior to transport
- Proper drainage and ventilation
- Used for sheep from one farm only
- Sheep are crowded into truck
- Protection from sun and rain

LAMB B



<http://www.flickr.com/photos/mdpettitt/445330317/> Martin Pettitt

Records

- 70 days old, 95 lb
- Born on site, never transported
- Has some vaccinations, but not all
- Farmer often sells club lambs
- Gaining weight steadily
- Foot rot in some of the herd, but no signs in this animal

Site Where Calf Was Obtained

- Low stocking density
- Clean water and food provided
- Close proximity to wildlife
- Housed in a barn; moderate ventilation with fans
- Clean bedding
- Facility cleaned twice a day
- Lots of crows

Transportation from Site to 4-Her's Home

- Pick-up truck
- Great ventilation
- Metal floors
- Proper drainage
- Multiple sheep from the same farm
- Traveling in separated sections
- Smooth gates and sides
- Truck sanitized prior to transport

LAMB C



<http://www.flickr.com/photos/ajy/3498158540/> Alistair Young

Records

- 65 days old, 40 lb
- Born in Iowa; transported to California
- Has no vaccinations
- Farmer often sells club lambs
- Gaining weight slowly
- No foot rot in herd

Site Where Calf Was Obtained

- Low stocking density
- Access to clean water at all times
- No exposure to wildlife
- Housed in a barn; plenty of ventilation, several fans
- Bedding cleaned every other day
- Sheep have a dry, draft-free pen for lambing
- Difficult to disinfect the facility
- Few vermin

Transportation from Site to 4-Her's Home

- Family van
- Sheep from multiple farms transported together
- Protection from sun and rain
- Adequate ventilation
- Wooden floor
- No drainage
- Van not sanitized prior to transport

LAMB D



<http://www.flickr.com/photos/timparkinson/263819208/> Tim Parkinson

Records

- 60 days old, 60 lb
- Born on site, never transported
- Has all vaccinations
- Farmer has never sold club lambs
- Gaining weight steadily
- No foot rot in herd

Site Where Calf Was Obtained

- High stocking density
- Dirty water and food
- Some exposure to wildlife
- Housed in a barn; inadequate ventilation
- Concrete flooring
- Dirty bedding
- Facility cleaned daily
- Rat infestation

Transportation from Site to 4-Her's Home

- Semi-trailer
- Limited ventilation
- Sharp edges
- Non-slip floor with proper drainage
- Traveling with chickens
- Trailer not sanitized prior to transport

LAMB E



<http://www.flickr.com/photos/naritheole/2287086672/n> ole

Records

- 60 days old, 65 lb
- Born on site, never transported
- Has some vaccinations, but not all
- Farmer often sells club lambs
- Weight gain has slowed recently
- No foot rot in herd

Site Where Calf Was Obtained

- High stocking density
- Water and feed contaminated by manure
- Exposure to wildlife
- Housed in a barn; limited ventilation, no fans
- Soiled bedding
- Facility is not cleaned often
- Large presence of rats and birds

Transportation from Site to 4-Her's Home

- Double-decker trucks
- Proper ventilation
- Sheep are not crowded
- Protection from sun and rain
- Sheep from multiple farms transported together
- Non-slip floor with no drainage
- Trucks cleaned prior to transport

RISK SHEET

Chosen animal: _____

Pre-harvest food safety risks	Ways to reduce these risks

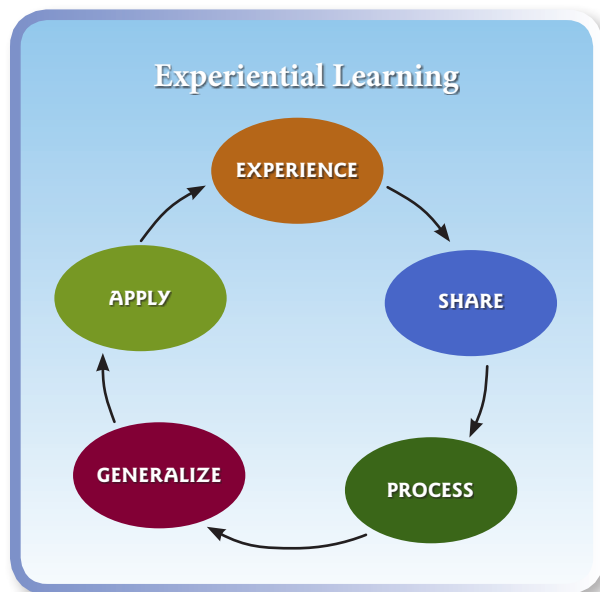
PRE-HARVEST FOOD SAFETY RISK CHECKLIST

Considerations to help reduce risk of diseases spread when obtaining and transporting food-producing animals

Transportation	When transporting your animal, look for:	✓
	No sharp edges	
	Well ventilated	
	Animal traveling alone	
	Sanitized vehicle	
	Well protected from harsh weather	
	Good drainage	
Site	When researching the site your animal came from, look for:	✓
	Low stocking density (the amount of animals in a given space)	
	Clean water and food	
	No exposure to wildlife	
	Well ventilated (example: open windows in barn)	
	Barn/shelter available	
	Clean bedding	
	Facility cleaned daily	
	Limited vermin (rats, flies, birds, etc.)	
Records	When reading through your animal's health records, look for:	✓
	Born on site	
	Fully vaccinated	
	Gaining weight steadily/appropriately	
	No signs of sickness in the herd or the animal	

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 a real-life setting. 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 website, <http://www.experientiallearning.ucdavis.edu/default.shtml>.

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