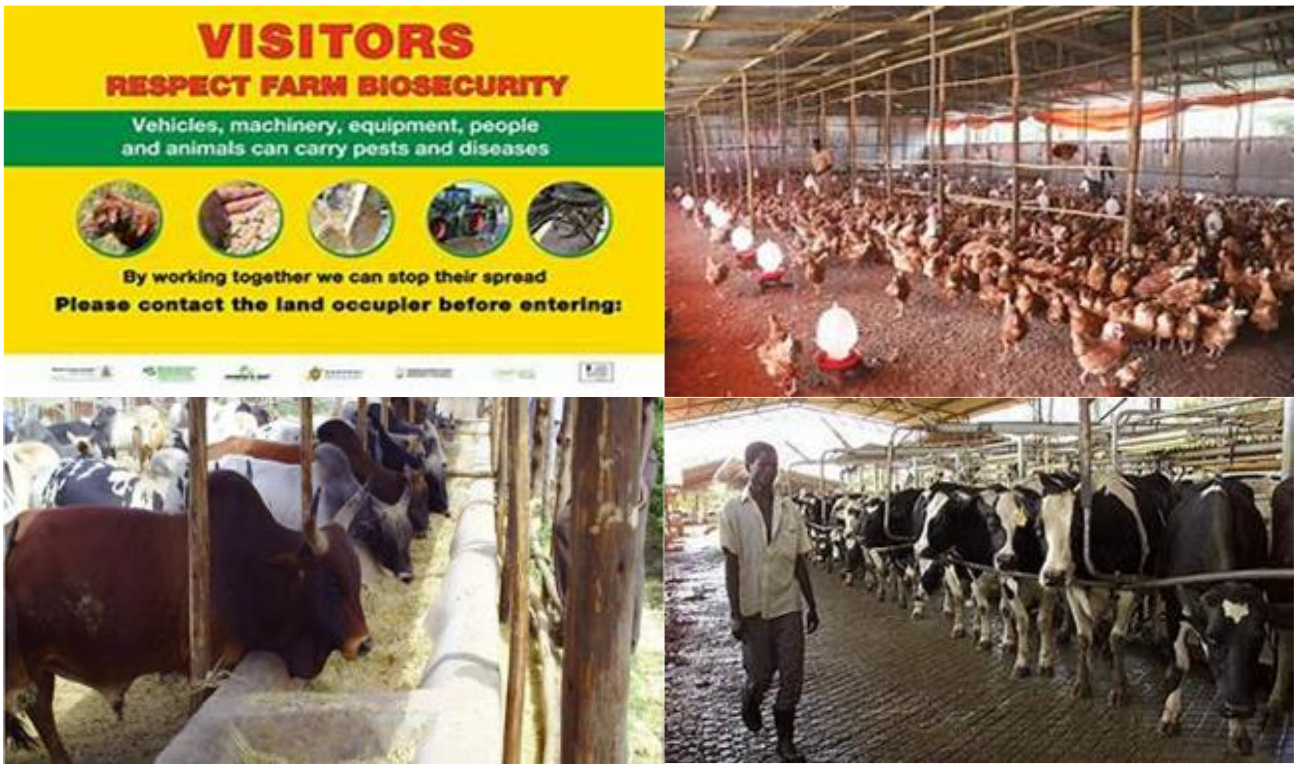
CONTINUING PROFESSIONAL DEVELOPMENT TRAINING MODULE ON BIOSECURITY IN POULTRY, DAIRY AND FEEDLOT FARMS



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1. COURSE INTRODUCTION

Biosecurity is a major component of livestock production systems to maintain food safety and security, protect the environment, and facilitate continuity of farm business by protecting animals and animal products. Biosecurity refers to strategies and management practices that lessen biological risk. The term biosecurity actually embraces a complete concept of risk assessment and reduction which is aimed at maintaining and improving the health and, therefore, welfare, productivity and profitability of the herds and flocks that contribute to our livestock industry. Biosecurity has been defined by the World Health Organization and the Food and Agriculture Organization as "a strategic and integrated approach to analyzing and managing relevant risks to human, animal and plant life and health and associated risks for the environment". As part of the One Health approach, strengthening biosecurity in the different animal production systems is also important to preserve the public and environmental health.

Biosecurity built upon a strong foundation of excellent animal care and husbandry practices can help animals thrive and farm business to sustain. The aim of implementing basic biosecurity practices is to prevent the introduction and dissemination of animal diseases within a farm system. This happens when steps are put in place to limit livestock and poultry exposure to disease agents through separation and cleanliness while strengthening the hosts immunity and creating an optimal environment for healthy living. Biosecurity plans and protocols are developed based on the risk assessment and evaluation of individual farms, and circumstances. Established biosecurity measures are effective only when they are consistently followed by the farm owners, employees and veterinarians.

Biosecurity in animal production systems includes the measures that can be implemented by the animal producers at the farm level in order to manage the risks of infectious diseases in their premises. In Ethiopia, the concept and practice of biosecurity in livestock and poultry production firms is not well established due to knowledge and skill gaps of animal producers and animal health personnel. Skill gaps among the Ethiopian veterinary professionals were also recently identified as a cause for low quality veterinary service delivery in the country. This being the case, it is aimed to develop and offer tailored CPD training program on selected topics including farm biosecurity. Provision of CPD training to field veterinary and para-veterinary professionals could contribute to the development of their competences and ultimately for the national improvement of the performances of veterinary services. This training module on farm biosecurity is therefore, developed based on the current Ethiopian CPD needs assessment and CPD framework studies in veterinary domains. Animal farm biosecurity manuals, standard operating procedures and online course materials used to develop the module.

1.1 **Course Title:** Biosecurity in Poultry, Dairy and Feedlot Farms

1.2 Course Code:

1.3 Credit Points:

2. TARGET TRAINEES

The CPD training course on biosecurity of poultry, dairy and feedlot farms can primarily be used by in-service Veterinarians and Veterinary Paraprofessionals (field veterinarians and/or animal health officers, and animal health assistants) and trainers from public veterinary service delivery establishments. The module can also be used by farm managers/owners and employees engaged in intensive animal production.

3. COURSE DESCRIPTION

This training course highlights concepts of biosecurity, basic components and strategies of biosecurity including appropriate procedures to keep disease agents out; implementing the procedures, which require personnel training and communication; and complying with protocols. Animal farm biosecurity is a collection of measures or management practices intended to protect animals and workers against the introduction and spread of disease or harmful biological agents. It is viewed as a multi-step process and the most cost-effective disease prevention and control approach for animal farms.

The module consists of six sections;

- The first section introduces the concept, importance and principles of biosecurity.
- The second section describes concepts related to principles of disease transmission and biosecurity risk assessment.
- The third section introduces conceptual or primary level of biosecurity deals with the physical location of animal production firms.
- The fourth section describes the structural biosecurity/ secondary level of biosecurity that involves the physical structure such as farm design, construction and maintenance of animal facilities in relation to disease prevention.
- The fifth section focus on the operational biosecurity that deals with routine biosecurity procedures to prevent introduction and spread of disease in a farm.
- The six section describes how biosecurity plans are developed for specific farms and implemented.

4. COURSE DURATION

Module	Sessions	Time required (hours)		
		Theory	**Practical**	**Total hour**
Biosecurity in Poultry, Dairy and Feedlot Farms	**Session I:** Introduction to Biosecurity	2	1	3
	Session II: Disease Transmission and Risk Assessment	2	1	3
	Session III: Conceptual Biosecurity	1	1	2
	Session IV: Structural Biosecurity	2	1	3
	Session V: Operational Biosecurity	6	4	10
	Session VI: Biosecurity Planning for Farms	2	7	9
	Total hours	**15**	**15**	**30**

5. COURSE OBJECTIVES

5.1 Goals of the Module

The goal of this module is to foster a comprehensive knowledge and skill on concepts and principles of farm biosecurity including mechanisms of disease transmission, risk assessment and development of biosecurity strategy, and how participants will apply biosecurity measures in the animal farming system. The course will also provide participants an opportunity to gain a working knowledge of biosecurity and apply this knowledge in formulating strategies and interventions on to the livestock and poultry farms. Participants will acquire the skills and knowledge to be effective agents of farm biosecurity approaches to mitigate disease challenges.

5.2 Learning Objectives of the Module

The objectives of this course are to acquaint trainees:

- Inform with the concepts and principles of biosecurity
- Explain mechanisms of disease transmission and risks of exposure
- Demonstrate biosecurity risk assessment on animal farms

- Develop biosecurity plans for animal farms
- Apply biosecurity measures or interventions on animal farms

6. LEARNING OUTCOMES

By the completion of the module, learners will develop their competence in biosecurity through;

- Gaining basic knowledge of biosecurity principles and concepts
- Demonstrating skills of biosecurity application for improved performance on animal farms
- Assessing and analyzing disease exposure and transmission risk in farms
- Developing biosecurity strategies and applying interventions on animal farms

7. LEARNING APPROACH

Different learning methods such as brainstorming, plenary session, Power Point slide presentations, group activities, internet searches, case studies and scenario videos are used to study the module. The course material is designed for both face to face delivery and self-study.

8. MEASUREMENT OF LEARNING

Learners' performance will be measured through formative and summative assessments. Assessments such as reflections, knowledge reviews, self- and peer-assessment will be used to estimate learners' level of achievement during the learning process. Knowledge and task-based evaluation methods would also be applied.

9. COURSE CONTENT

9.1 SESSION I: INTRODUCTION TO BIOSECURITY

9.1.1 Concepts and Importance of Biosecurity

This section introduces the definition and concept of biosecurity and explains the importance of biosecurity on farms. It addresses producer risk perception and the role of veterinary professionals in biosecurity education and communication.

Session Learning Objectives

By the completion of this section, learners will be able to:

1. Define biosecurity
2. Explain the importance of biosecurity in farm business
3. Describe the principles of biosecurity
4. Acknowledge the role of veterinarians in biosecurity of farm animals
5. Demonstrate external and internal biosecurity risks.

9.1.1.1 Definition of Biosecurity

Activity 1: *Take about 10 minutes to discuss and answer the following questions*

1. How do you define biosecurity?
2. Why should we care about biosecurity?
3. What should be the responsibility of veterinary professionals in farm biosecurity?

Biosecurity is defined as **"*a collection of measures or management practices intended to protect animals or humans against the introduction and spread of disease or harmful biological agents***".

- Biosecurity is a cornerstone of livestock and poultry production systems to maintain food safety and security, protect the environment, and facilitate sustainable business by protecting animals and animal products.
- On-farm biosecurity is incorporated into the daily, routine management protocols to prevent or reduce the introduction of diseases to farm animals, and to contain the spread of any diseases within and between farms.

- Biosecurity can be considered in terms of individual animals or populations of animals (flocks or herds), economic entities (production facilities), or geographic regions (states, countries, or continents), thus facilitating compartmentalization for trade purposes.
- Biosecurity addresses strategies for both ***disease prevention*** and ***control*** (limiting the consequence of infection).

Biosecurity concepts involve strategic decisions, adequate investment, and management practices, as well as movements of livestock, equipment, and personnel. Training, supervision, and accountability of personnel are necessary. Biosecurity requires the adoption of a **set of attitudes** and **behaviors** by people to reduce risk in all activities involving farm animals and their products.

9.1.1.2 Importance of Biosecurity

Think of infectious diseases!

- Infectious diseases of livestock and poultry remain one of the biggest threats to animal health and producer sustainability.
- Infectious diseases have the potential to spread quickly and affect a large number of animals and humans.
- They can have serious health consequences and compromise animal production due to high rates of morbidity and mortality.

Infectious diseases can have negative consequences, impacting:

- **Animal health:** increased morbidity and mortality, production losses, reduced animal welfare, loss of genetic diversity.
- **Producer livelihood:** financial losses due to reduced income and increased disease costs.
- **Public health** (if zoonotic): illnesses and death, food safety, occupational health risks for farm workers.

The economic impact of disease on animals is affected by both direct and indirect losses.

- **Direct losses** - due to animal sickness and death, premature culling, reduced reproductive performance.
- **Indirect losses** - due to decreased animal production (meat, dairy, and eggs) and costs of disease control efforts.

S/no	**Activity 2:** *List possible biosecurity actions for prevention/control of diseases – 15 minutes*		
	Actions to be taken to prevent/control infectious diseases	Disease	of animals and humans

The ultimate goal of biosecurity is reducing risk of diseases through containing outbreaks, controlling their spread, and eradicating diseases from reoccurring in order to keep animals and humans healthy. In short, biosecurity aims to "contain, control, and eradicate disease".

Remember! We can never totally eliminate the risk of disease but we can substantially mitigate risks and risk factors.

A healthy herd or flock is vital for farm profitability and sustainability. Some **benefits of biosecurity** can be;

- Greater productivity on farm – farmers are investing in high quality genetics and feed, but poor biosecurity can easily negate that investment through poor efficiency and performance
- Reduced risks to a farm – less diseases, pests and weeds entering your farm means less action for you to take
- Early detection and management of any diseases – catch problems before they take hold
- Reduced costs if there is an outbreak of disease – early detection and sound farm biosecurity practices may result in faster eradication and shorter quarantine periods.

Biosecurity plans might be different from farm to farm as disease threats may not be similar for every farm. But all biosecurity plans aim to minimize disease risk while maintaining the health and productivity of animals.

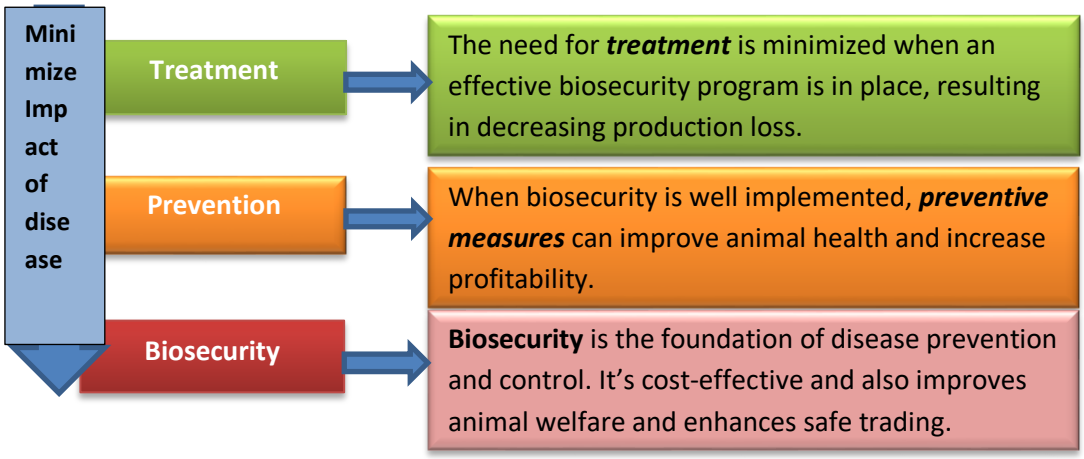

Figure 1: Biosecurity to minimize impact of disease

From Principles to Practice. 2019.Adapted from DeWulf J, Van Immerseel F. Biosecurity in Animal Production and Veterinary Medicine:

9.1.1.3 The Role of Veterinary Professionals in Farm Biosecurity

Training in animal health and husbandry, infectious disease, herd health, and food safety makes veterinary professionals well-equipped to assist producers with biosecurity. Farmers' attitudes and perceptions influence the implementation of biosecurity measures on farms. They are more likely to implement biosecurity measures when they understand the benefits.

The roles include;

- Biosecurity risk assessment and planning strategies.
- Educate and help producers understand how biosecurity keeps animals healthy and safe.

In order to help farmers build a biosecurity program, veterinarians should:

- Establish trust
- Understand the farmer's motivation, both immediate and long-term (priorities, concerns, and expectations, thoughts, feelings, opinions, values, and beliefs)
- Consider farmers' animal knowledge, education, culture, and socioeconomic background
- Tailor messaging to the farmer's worldview

> ***Veterinary professionals must engage producers and empower them to make informed biosecurity decisions.***

9.1.2 Principles of Biosecurity

This section introduces principles of biosecurity (risk assessment, separation, cleaning and disinfection), types of biosecurity (external and internal biosecurity), risk reduction through biosecurity, and the three levels/ hierarchy of biosecurity (conceptual, structural and operational biosecurity). Although each farm is different, some biosecurity principles are universal. Dividing biosecurity into two components-external and internal-can help producers conceptualize practices designed to keep disease out or in.

9.1.2.1 General Biosecurity Principles

Some of the biosecurity guidelines apply to all farm environments regardless of production type or farm size. General Biosecurity principles involve ***risk assessment, separation, and sanitation.***

Principle 1: Risk Assessment

- Producers and veterinarians should evaluate disease transmission risk and frequency for farm practices.
    - Some are high-risk but occur infrequently, like bringing new animals onto the farm.
    - In contrast, others are low-risk but occur every day, like feeding and watering.
- The size of the herd must also be considered.
    - When many susceptible animals are in one place, there are more contacts with the outside world (through animal movements, feed delivery, etc.) and diseases can spread more easily.
    - Often, biosecurity plans must be adapted as farm size increases.

Principle 2: Separation

- Healthy animals should always be kept away from potential sources of disease, including sick animals, contaminated fomites (people, vehicles, equipment), and vectors (rodents, birds, wildlife).

Principle 3: Sanitation

- Animal environments must be kept clean to reduce contact with potential pathogens.
- Even when urine, feces, and soiled bedding have been removed, some pathogens persist on contaminated surfaces, and needs cleaning and disinfection.

9.1.2.2 Components of Biosecurity

In all animal farms, biosecurity should address external and internal disease threats. Both involve the movement of animals, people, and equipment.

a. External Biosecurity/Bioexclusion

External biosecurity or bioexclusion is prevention of disease introduction into a farm or herd or a facility.

External biosecurity can be used to protect against outside threats.

Common bioexclusion practices include ***entry gates, quarantine barns, showers, inlet filters, supply decontamination rooms,*** etc.

Risks that can be mitigated by ***external biosecurity*** include:

- People carrying disease onto the farm, including workers, delivery persons, and visitors
- New animals entering or animals returning to the farm
- Biological materials like colostrum, semen, and embryos
- Contaminated vehicles and equipment that come onto the farm
- Contaminated feed and water
- Arthropods, rodents, and wildlife that carry diseases

The goal of ***external biosecurity*** is to keep diseases off the farm.

Examples of routine farm practices that enhance ***external biosecurity***:

- Use of gates, fencing, and signage to prevent unauthorized farm entry and direct people to parking areas away from animal housing
- Use of quarantine facilities for new and returning animals
- Cleaning and disinfection of vehicles and equipment that enter the farm
- Screening of animal housing to prevent entry of insects and birds
- Implementation of a rodent control program
- Use of safe feed and water sources
- Safe manure and carcass disposal
- Cleaning and disinfection of equipment and tools

b. Internal Biosecurity/Biocontainment

Internal biosecurity known as *biocontainment* is preventing the spread of disease within a farm or to other farms.

- Containment of extremely pathogenic organisms could be done by ***isolation*** in secure facilities to prevent their accidental release. Eg. During disease outbreak.
- Once a disease is present on the farm, it can spread in many different ways.

Risks that can be mitigated by ***internal biosecurity*** include:

- Disease transmission from sick animals to healthy animals, and older animals to younger animals.
- Disease transmission from contaminated equipment or tools to susceptible animals.

- Disease transmission from farm workers to susceptible animals via contaminated hands, clothing, or boots.

The goal of ***internal biosecurity*** is to control disease inside the farm.

Examples of routine farm practices that enhance ***internal biosecurity***:

- Herd health management (housing; nutrition; vaccines, drugs, and parasite control; stress)
- All-in/all-out animal flow
- Age segregation, or separation of young animals from older animals
- Disease monitoring
- Isolation of sick animals
- Hygiene protocols for workers, including frequent hand washing or use of gloves, changing boots, etc.

Both external and internal biosecurity should be part of a farm overall biosecurity

Points to Keep in Mind

- *Biosecurity is a set of practices that control the spread of disease.*
- *Careful assessment of disease risks on the farm is needed to help identify and implement appropriate biosecurity practices.*
- *Farmer attitudes and perceptions influence their implementation of biosecurity measures.*
- *Biosecurity principles apply to all farms. These include evaluating disease transmission by risk and frequency (risk assessment), keeping animals away from potential disease sources (separation), and keeping equipment and the environment clean (cleaning and disinfection, or sanitation).*
- *External biosecurity or bioexclusion involves keeping disease off the farm or out of the herd.*
- *Internal biosecurity, or biocontainment, focuses on controlling disease spread within a herd or flock and to other farms.*

Knowledge Review

1. Which actions do you think would be effective in preventing or controlling infectious diseases? Select those apply.
    a. Keep new animals separate from others
    b. Only buy healthy animals
    c. Clean and disinfect regularly
    d. Separate sick animals from those that are healthy

e. Vaccinate animals against diseases of concern
f. Wash hands before and after handling of animals
g. Make and follow a biosecurity plan

2. Which of the following are *true* regarding biosecurity?
    a. External biosecurity/bioexclusion, involves keeping diseases off the farm.
    b. Internal biosecurity/biocontainment, involves controlling disease spread within a herd or flock on the farm and preventing disease spread to other farms.
    c. Biosecurity reduces the impact of disease, improves animal health and well-being, and ensures the quality and safety of animal products.
    d. All options are correct.

9.2 SESSION II: DISEASE TRANSMISSION AND RISK ASSESSMENT

9.2.1 Disease Exposure and Transmission

Biosecurity plans should consider the different ways that diseases spread. Understanding route of infection and disease transmission is central to designing proper biosecurity protocols. It is necessary to understand how each disease of concern is spread and how susceptible animals are exposed. Each disease has transmission pathways based on the nature of the pathogenic agent. A mitigating action which prevents the spread of one disease may not be effective against another. This section introduces concepts related to disease exposure and transmission, including; pathogen types, principles of infectious diseases and routes of disease transmission.

Learning Objectives

After completing this section, learners should be able to:

- Describe how the pathogen, host, and environment contribute to disease development
- List the sequence of events in the chain of transmission.
- Describe how diseases are transmitted
- List the routes of disease transmission.
- Discuss the importance of reservoirs and their role in disease transmission.

9.2.1.1 What Causes Disease?

Microorganisms are found everywhere: in air, water, soil, and in or on hosts like animals and humans. The types of pathogens include bacteria, viruses, fungi, protozoa and helminths. On the farm, infected animals and contaminated fomites (like boots or clothing) are potential pathogen sources.

Pathogens are also introduced to new areas through movement of animals or animal products from areas or countries where disease is present (i.e., importation).

Three factors; the **pathogen, host**, and **environment** are needed to cause any disease.

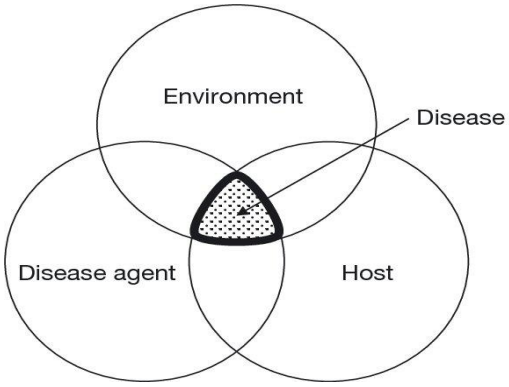

Figure 2: Factors affecting disease risk

Pathogen

- One or several pathogens may contribute to sickness.
- Generally, the pathogen must be present for the disease to occur; however, the presence of that pathogen alone is not always sufficient to cause disease.
- Pathogenicity (ability to elicit disease) matters.

Host

- A host offers subsistence and lodging for a pathogen and may or may not develop the disease.
- The level of immunity, nutritional status, genetic makeup, level of exposure, and overall fitness of the host can determine the effect of a disease organism.

Environment

- The ability of the pathogen to accept the new environment.
- Environmental factors can include the biological and physical aspects of the environment.
- The environment can be within or outside a host in the community.
- Housing conditions, sanitation, climate/season, and presence of vectors or reservoirs.

In intensive production units, the housing environment, pathogen, and host factors are largely under the control of the farm **manager or caretaker**.

*The severity of disease depends on interactions between the **pathogen, host** and **environment**. Diseases are accidents that we can prevent. When we try to prevent pathogens from making animals or humans sick, we call it **Biosecurity.***

9.2.1.2 Spectrum of Disease

Many infectious diseases have a clinical spectrum that ranges from subclinical to severe. Diagnoses are often made when clinical signs of illness appear. The endpoint of the disease process is ***recovery or death***.

Characteristics of the pathogen, host, and environment influence disease development and severity. For example,

- A highly virulent pathogen may cause severe disease in all hosts, regardless of health status
- An immunocompromised host may develop clinical disease, even when an infection is asymptomatic in other animals
- A crowded, dirty environment can harbor a high pathogen load (large numbers of pathogens), resulting in increased exposure and possibly increased disease severity.

A key concept for producers is that* infected animals can look healthy*. Subclinical infections can be challenging to eliminate from a herd or flock since the number of affected animals is usually unknown.

9.2.1.3 Route of Transmission

For this part, learners can go through 15 minute presentation on disease exposure and transmission.

PPT-Route of Disease Transmission.pptx; available at (https://www.cfsph.iastate.edu/Emergency-Response/Just-in-Time/03-Biosecurity_Routes-Disease-Transmission.pptx)

Using a transmission-based approach to biosecurity is practical and easy for producers to understand. Since there are a limited number of transmission routes, biosecurity doesn't depend on knowing all of the pathogens present on a farm.

Activity 3: *What you need to know to prevent a disease from spreading. Take 10 minutes to complete and discuss.*

Question	Example, Rabies	Newcastle disease	Mastitis
Who can get the disease?	All mammals, human		
What effect does the disease have on the body?	Infects nerve cells causing seizures, nervousness, drooling		
When is the animal most likely to get the disease?	When animals are not vaccinated		
Where is the disease found in the environment?	Primarily found in wild carnivores – fox, wolf, goose, bats…		
How can this disease spread to other groups of animals?	Infected animals bite other animals		
Why is this disease important to know?	When animals or people are exposed to rabies they will die if not protected by a vaccine		

- ***Route of infection:*** is the ways disease gets into the animal or human body (5 routes: ingestion, inhalation, mucus membrane, breaks in skin, and in-utero).
- ***Means of transmissions:*** how disease is spread among animals and between animals and humans (direct conact between animals or animals and humans, indirect contact – fomites, vectors, etc)

Direct Contact

Direct contact involves touching an infected animal or its tissues, excretions, or secretions through nose-to-nose contact, rubbing, biting, or scratching.

Examples: Open wounds, mucous membranes, skin, blood, saliva, nose to nose, rubbing, biting.

- Direct contact transmission occurring between animals is also known as ***horizontal transmission***. This includes reproductive contact through mating.
- Transmission during pregnancy or shortly after birth is sometimes known as ***vertical transmission*.**

Fomites

Fomites are inanimate objects that carry pathogens from one animal to another. Fomites become contaminated when in contact with tissues, secretions, or excretions from an infected animal.

Fomites can include;

- Shovels, buckets, blankets, footwear, clothing, farm equipment, and vehicles used around animals.
- Soil and organic material, such as bedding or litter, can also act as fomites.

Airborne (Aerosol/ Inhalation)

Airborne transmission occurs when pathogens suspended in air (aerosols) are inhaled by an animal or a person.

- Droplets containing disease agents pass through the air and are inhaled.
- Aerosols are generated when an animal breathes, coughs, sneezes, or vocalizes. If animals are sick, respiratory pathogens can be expelled during these processes.
- Pathogens in infectious body fluids (including birthing tissues or fluids), feces, or urine can be swept up in dust and become airborne.

  Examples: Anthrax, Bovine Respiratory Syncytial Virus, BVD, CBPP, FMD, IBR, MCF, Pasteurella, Mycoplasma bovis, Parainfluenza Virus (PI3), Q Fever, Tuberculosis, Vesicular Stomatitis Virus.

Oral (Ingestion)

Ingestion involves the consumption of pathogens, often via contaminated feed and water.

- Animals also ingest pathogens by licking or chewing on objects or surfaces like feed and water troughs, fencing, salt and mineral blocks, or possibly other animals.
- Feed, water, and objects become contaminated if exposed to an infected animal's feces or body fluids (e.g., urine, saliva, nasal discharge).
    - Other sources of contamination include garbage or animal proteins in feed and feces/urine from rodents, birds, wildlife, and other animals.

Vector

Vectors include any living organism that carries pathogens between animals.

There are two types of vector transmission:

- ***Biological transmission*** **-** occurs when a pathogen undergoes part of its life cycle in the vector and then is transferred to a new animal host (by blood-feeding mosquitoes and ticks).
- ***Mechanical transmission*** - occurs when a pathogen is carried on the vector's body from one location to another (with no internal development or multiplication of the pathogen).

Rodents and wildlife act as reservoirs of disease:

- Animal reservoirs usually do not show signs of disease when infected.
- These animals can contact livestock or poultry that live outdoors; they may also contaminate pastures or outdoor water sources.
- Rodents, for example, can be involved in the transmission of salmonellosis. Wild birds are known reservoirs for avian influenza.

Zoonotic diseases can be transmitted between animals and humans by any route (direct contact, fomite, airborne, oral, vector) and may involve any type of animal (livestock, poultry, wildlife, companion animals) or animal product (meat, milk, eggs).

Activity 4: *Reflect on the different means of transmission by your own words*		
Term	Your explanation	Compare
Direct:		Close contact between infected and non-infected animals.
Indirect:		Contact with things or animals that carry the disease but are not infected.

9.2.1.4 Prevention by Transmission Route

- **Direct contact** - limit contact with infected animals (quarantine and isolation)
- **Fomites** - do not share equipment between animals or farms, clean and disinfect
- **Airborne** - keep sick animals away from healthy animals, ventilate buildings
- **Oral** (ingestion) - keep feed and water free from contamination, keep wild animals and pests out of animal areas
- **Vector** - keep insects and wild animals out of animal areas, implement an insect and rodent control program, clean and disinfect

> ***Biosecurity planning should consider disease transmission routes that are most likely on a particular farm.***

Points to Keep in Mind

- *Infectious diseases are not random; they involve interaction between the pathogen, the host (animal or human), and the environment.*
- *All components of the chain of infection must be present for an infection to occur.*
- *Many infectious diseases have a clinical spectrum that ranges from subclinical to severe. Subclinically infected animals can look healthy.*
- *There are five main routes of transmission: direct contact, fomite, airborne, oral, and vector.*
- *After transmission, pathogen entry occurs through the skin, mucous membranes, or gastrointestinal tract.*

<table>
<tr><td colspan="4">Activity 6: Select each cause on the bottom and the disease from the list on the right to the correct means of transmission in the chart</td><td rowspan="5">Disease list

• Rabies
• Scrapie
• Toxoplasmosis
• Leptospirosis
• Blue tongue
• Ring worm
• Anthrax
• Caseous lymphadenitis</td></tr>
<tr><td colspan="2">Direct contact</td><td colspan="2">Indirect contact</td></tr>
<tr><td colspan="2">Eg. Dog bite (Rabies)</td><td colspan="2">Eg. Biting flies (Bluetongue)</td></tr>
<tr><td>After birth</td><td>Dog bite</td><td>Shared brush</td><td>Contact with abscess</td></tr>
<tr><td>Rats in feed</td><td>Biting flies</td><td>Cats in grain</td><td>Delivery truck</td></tr>
</table>

9.2.2 Biosecurity Risk Assessment

Risk assessment is the foundation of a biosecurity program. Once producers understand the likelihood of disease and its potential impact on their farm, they can decide whether their current biosecurity practices are adequate or improvement is needed. This section describes the risk assessment process, including hazard identification.

Learning Objectives

After completing this lesson, learners should be able to:

- Understand the need for risk assessment
- List the four components of a risk analysis.
- Explain the main difference between qualitative and quantitative biosecurity risk assessments.
- Describe the minimum features to include on a farm map.

9.2.2.1 What is Risk Assessment?

Risk assessment is a process used to identify biosecurity risks on the farm. It requires evaluating factors including:

- Pathogens of concern
- Possible pathways of introduction and likelihood of a biosecurity breach (disease introduction)
- Short- and long-term consequences for the producer/operation (loss of animals, decreased production, trade implications)
- Local government or international regulations

Risk assessment is used to estimate the;

- Probability of ***exposure*** to a pathogen,
- Probability that exposure will cause ***infection and disease***,
- Probability that disease will **spread**, and
- ***Consequence*** of such spread.

Risk assessment helps to identify the ***biosecurity strengths and weaknesses,*** usually through a series of questions. Before developing and implementing biosecurity measures, a farm site risk assessment or hazard analysis should be performed. When performing a risk assessment at the farm level some important questions to be asked are:

- Have any new animals been brought to the farm?
- Do animals receive routine veterinary care?
- Are they up-to-date on their vaccinations?

- Any shared equipment with other farms?
- How does housing and manure management look like in the farm?
- What is the biosecurity protocol for visitors?

Risk assessment and analysis considers the health status and species of the livestock, identifies sources/areas of potential contamination and areas that need to be protected from contamination. Risk assessment also includes evaluation of farm boundaries, farm access points, points of vulnerability. A farm site map helps to visualize these areas of concern. Mapping is useful not only for biosecurity purposes, but also for emergency response.

Biosecurity measures are prioritized based on risk, probability of occurrence, ease/cost of implementation, and economic and non-economic consequences.

- As part of site-specific hazard analysis, **critical control points** should be identified in movement and work pathways.
- A **critical control point** is a point, step, or procedure where control can be applied to prevent the transfer of a disease agent.
    - Points where the pathogen can be prevented from entering (or leaving) a premises, facility, or a barn unit are identified as critical control points.
    - Critical control points involve ***people, supplies and equipment, vehicles, feed, mortalities, and animals/animal products***.
    - The goal is to prevent the transfer of a disease agent across a specific control point, whether the intention is to keep disease out (bioexclusion), or keep disease in (biocontainment).

9.2.2.2 Biosecurity Risk Assessment Methods

According to the WOAH, both qualitative and quantitative risk assessment methods are valid. **Qualitative methods** express risk in non-numerical terms like *high*, *medium*, *low*, or *negligible*.

- This assessment helps producers identify movement risks based on frequency. In this case, the hazard isn't a specific pathogen, it's the movement itself. The more often movements occur, the greater the biosecurity risk.
- Once the producer has evaluated their biosecurity strengths and weaknesses, they're ready for risk management - in other words, developing a biosecurity plan.

In case of **quantitative risk assessment**, biosecurity scoring system and probability estimates are used.

An example of a biosecurity scoring system is available at https://www.cfsph.iastate.edu/Assets/step2-biosecurity-checklist-livestock-poultry.pdf

- It is risk-based and used to quantify on-farm biosecurity for poultry and cattle.
- The system evaluates biosecurity risks according to user input.

The score for each biosecurity measure is multiplied by a factor relative to its importance (as determined by expert opinion).

- The weighted scores are combined to find the external biosecurity score and the internal biosecurity score.
- The overall biosecurity score is an average of the external and internal scores.

No single method of risk assessment has proven applicable in all situations, and different methods may be appropriate in different circumstances.

Points to keep in Mind

Risk assessment is a process used to identify biosecurity risks on the farm. Checklists or a biosecurity scoring system is used to evaluate farms.

Knowledge Review

To identify pathogens of concern on the farm, producers must consider which of the following? Select all that apply.

a. Species affected
b. Pathogen characteristics
c. Preventive measures available/in place (e.g., vaccination)
d. Zoonotic potential
e. All answers are correct

9.3 SESSION III: CONCEPTUAL BIOSECURITY

An important step in implementation of biosecurity measures is educating the livestock producers on how many levels of biosecurity are there and which one should they implement. There are three levels of agricultural biosecurity; CONCEPTUAL, STRUCTURAL, and OPERATIONAL biosecurity measures (known as hierarchy of biosecurity or biosecurity levels).

Conceptual, structural, and operational level biosecurity work together. Changes at one biosecurity level can mitigate weaknesses in the others.

Conceptual biosecurity is *primary level of biosecurity* that involves **location of animal facilities** and **geography.**

- It requires the animal producers to locate their farms far away from other farms, public roads, slaughterhouses, live-animal markets, and other publically dense places.
- It involves locating the animal facilities in relatively remote isolated areas.
- It involves the scope and size of animal production units

Conceptual level of biosecurity helps in the prevention of the introduction and spreading of any disease because of its densely populated surroundings. The ***Physical isolation*** limits disease risk and to be considered when establishing new farms.

Since conceptual level biosecurity involves farm location and geography, it is impacted by:

- Number of farms and number of animals within a close distance (< 2 miles)
- Number of animals on the farm
- Proximity to wildlife and wildlife habitats (including water sources)

Evaluation of conceptual biosecurity can identify strengths and weaknesses related to farm location. Even if you can't eliminate a weakness, biosecurity changes can reduce the associated risk.

Best practices in conceptual level of biosecurity include:

- ❖ Separation or isolation with enhanced distance to neighboring livestock or facilities
- ❖ Conceptual designs to manage smaller groups of animals as biosecure units
- ❖ Enhanced distance to wildlife areas or fenced properly,
- ❖ Isolation from main roads to avoid heavy volume of traffic nearby

Figure 3: Farm location, separated and with all facilities at one site

Source: https://blueskyfarms.com/our-locations/

9.3.1 **Farm Location**

Farm location and proximity to other farm animals can affect both external and internal biosecurity, as can animal density and climate.

Geographic location:

- Farms that are located near other farms are at higher risk for disease transmission.
- Close proximity to a processing plant, or road with frequent livestock transport is also a concern.
- Ideally, farms should be located at least 2 miles apart to prevent transmission of pathogens.

***Animal density*:**

- The number of animals present on a farm is a risk factor independent of farm density.
- High animal density increases the likelihood of disease - and if animals become infected, pathogens spread quickly in concentrated populations.

Figure 4: Farm location and high animal density as a biosecurity risk

Source: https://ce2.cfsph.iastate.edu/

Climate: Certain climates are more favorable to disease transmission than others based on temperature and humidity. Cold and humid conditions are often better for pathogen survival than hot and dry conditions.

9.4 SECTION IV: STRUCTURAL BIOSECURITY

A structural biosecurity is a ***secondary level of biosecurity*** that involves the **physical structure** or farm design, construction (the drainage facilities, fencing, presence of showers, air filtration systems), and maintenance of animal facilities, and how they contribute to disease prevention. Structural biosecurity should be a consideration when animal facilities are renovated or built.

The steps involved in structural level biosecurity help in the prevention of infections by taking care of on-site hygiene and movement of vehicles, equipment, and persons on the farm.

- **Farm Access:** Farms should have fences or barriers to limit movement and ensure that people, animals, and equipment cross only at controlled access points.
- **Parking area** away from animal housing, gates for visitors and workers' entrance where biosecurity protocols are implemented.
- **Building entry:** Animal buildings should have a dedicated entryway. Biosecurity protocols for entering animal buildings should be specified.
- **Cleaning and disinfection:** Farms should have an area dedicated to cleaning and disinfecting vehicles and equipment near the farm entryway. There should be on-site laundry facilities for farm-specific clothing.
- **Wildlife:** Buildings can be designed or retrofitted with features that discourage wild animal access. For example, screens or netting can prevent birds from nesting in buildings.

9.4.1 Farm Characteristics and Access

Farm characteristics and access can influence how easily pathogens enter a farm or spread once they are present. This section covers farm characteristics and farm access that impact biosecurity, including farm location, farm layout, environmental controls and Line of Separation (LOS).

Learning Objectives

After completing this section, trainees should be able to:

- Describe how farm layout and building orientation influences disease risk.
- List environmental conditions that generally increase pathogen survival.
- Define the terms *clean side* and *dirty side*.
- Describe the *LOS* and its importance in farm biosecurity.

9.4.1.1 Farm Layout

- Housing type and building orientation influences disease risk.
- Building orientation can impact disease transmission, particularly airborne spread. For instance, the length of an animal building should be perpendicular to the prevailing wind to ensure air flow.
- Large farms with high numbers of concentrated animals are at increased risk of disease.

Producers should consider what types of animals are housed together.

Animals should often be segregated by age and species.

- Breeding animals may be housed separately from growing animals. Sometimes, even within breeding herds, animals are segregated by age (calves vs. cows) since they have different nutritional needs.
- Young animals are usually kept apart from older animals that may carry diseases.
- Some species should not be housed together, if diseases that affect both are a concern on the farm. For example, keeping poultry and pigs in the same space is ill-advised since both are susceptible to influenza.

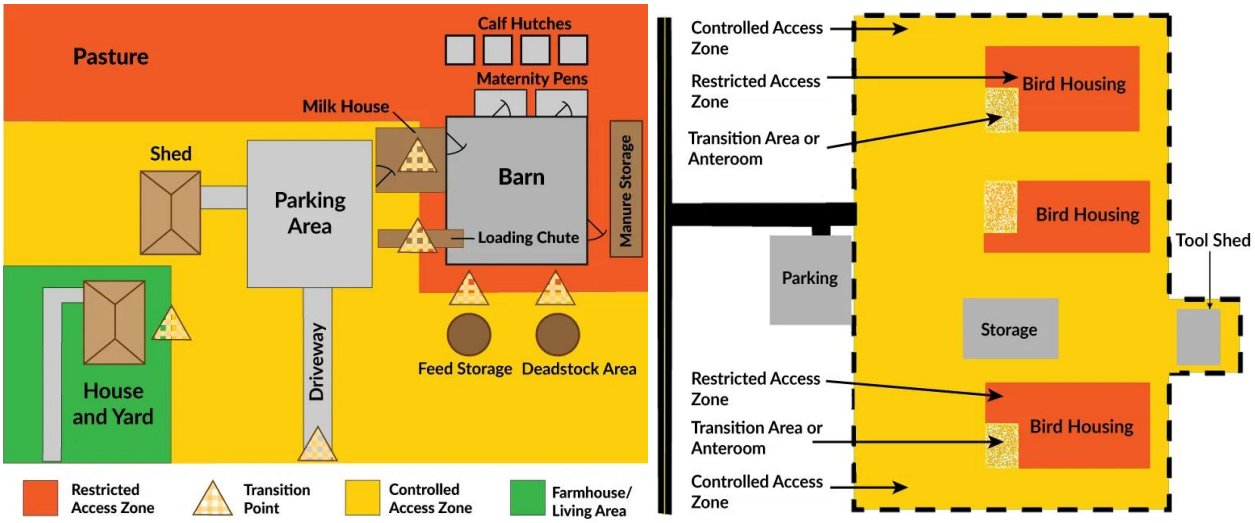

Figure 5: Dairy and poultry farms lay out with biosecurity zones

Source: *https://www.healthyagriculture.org/prevent/traffic-control/*

9.4.1.2 Environmental Control

Animals may be housed outdoors, indoors, or a combination of both.

- For animals housed indoors, environmental control is particularly important for disease prevention.
- Environment (poor ventilation and heat/cold stress) affect animal comfort and impacts disease risk.

Activity 8: *Which of these biosecure risk factors are common in your area? Select and discuss on factors that apply.*

a. Many farms in close proximity
b. Farms with close proximity to major roads
c. Farms with large numbers of livestock or poultry present
d. Cold, wet weather (at least part of the year)
e. Farm ground that is largely flat and treeless

9.4.1.3 Controlling Farm Access

There are many different points at which farmers can control access to their site and to animal areas. The first example below (A) shows a small, outdoor farm, while the second (B) shows a larger farm with indoor animal production.

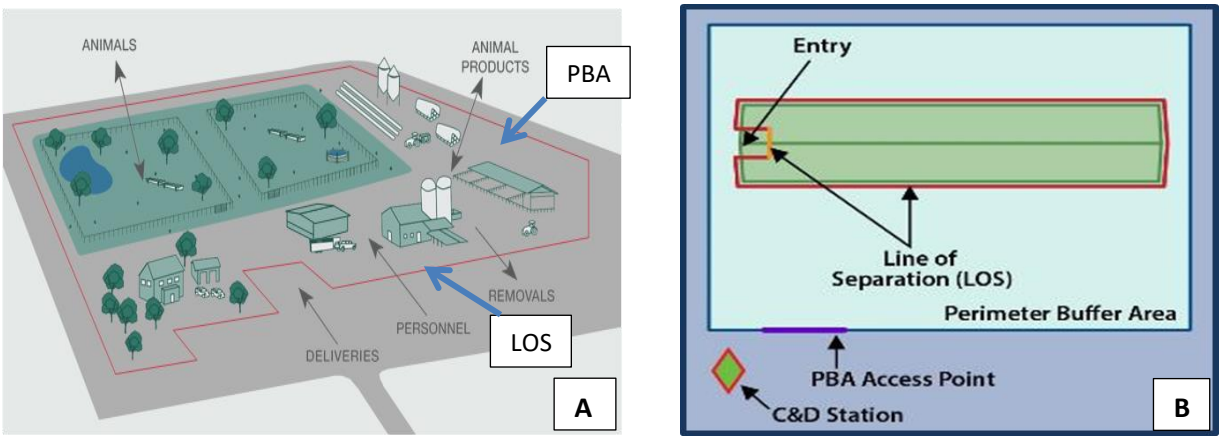

Figure 6: Perimeter buffer area and line of separation for farms

Source: Center for Food Security and Public Health (CFSPH), Iowa State University

Think of LOS representing an inner control boundary and the PBA representing an outer control boundary for the farm.

9.4.1.4 Line of Separation and Access Points

The biosecurity line separates the "clean" from the "dirty", and is part of the zones that you create to either increase or lower restrictions of movement, sanitation, vehicles, visitors, manure management, deadstock handling, etc. depending on how close they are to livestock areas.

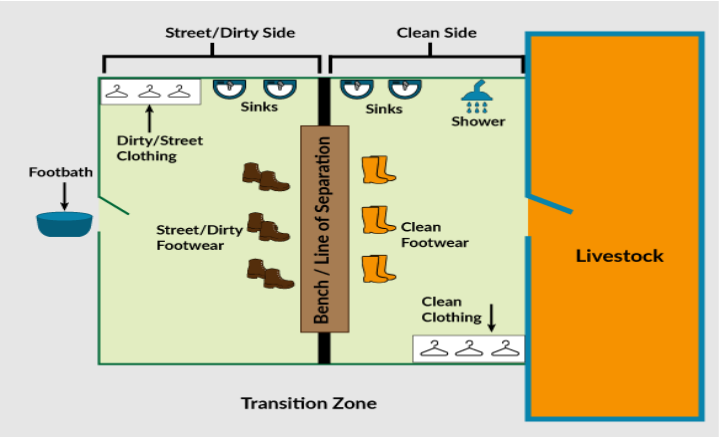

Figure 7: *Example of a Danish entry set up for crossing the line of separation*

Source:
https://www.healthyagriculture.org/prevent/traffic-control/line-of-separation/

- **Clean side**: includes everything inside the farm/building (within the LOS)
- **Dirty side**: includes everything outside the farm/building (outside the LOS)

> ***Failure to respect the LOS (the clean-dirty line) is one of the most common biosecurity errors on farms.***

- The LOS can be crossed only at the LOS Access Point. Depending on the farm size or setup, there may be one or more LOS Access Points.
- LOS Access Points should be marked with signs, and include required biosecurity protocols for anyone or anything crossing the LOS including animals, people, equipment.
- Signs may also direct people to a source for biosecurity information.
- People, animals, vehicles and equipment must always cross through a LOS Access Point and follow farm biosecurity rules.

After crossing the LOS, before contacting livestock:

- Ensure hands are clean; wash or sanitize hands.
- Put on clean biosecurity PPE (i.e., site-specific coveralls or clothing).
- Ensure that any street clothes or accessories are completely covered by biosecurity PPE.
- Put on clean, site-specific boots or boot covers.

Remember! No one can cross the LOS without permission. *People, animals, vehicles and equipment must always cross through a LOS Access Point and follow farm biosecurity rules.*

Activity 9: *What types of biosecure entryways have you encountered in your working area? Select those apply and discuss.*

a. Shower-in/ shower-out
b. Bench entry
c. LOS marked with tape or paint
d. Other(s)

9.4.1.5 Perimeter Buffer Area

Intensive farms that raise animals indoors often designate the walls of the animal buildings as the LOS. Then, a new boundary is drawn around the entire farm known as the Perimeter Buffer Area or PBA.

- Not all farms have a PBA.
- When present, a PBA is considered ***the first line of defense***.
- The PBA boundary is not necessarily the same as the property boundary.

The PBA should be clearly indicated using a road, fences, or signs that are visible to employees, visitors, and delivery personnel.

The boundary should consider the:

- Location of houses and common driveways (these should be *outside* the PBA)
- Daily activities of farm workers and where they occur (people should not cross the PBA repeatedly throughout the day)

There may be one or more places to enter the PBA, known as **PBA Access Points**. These points should be marked with a sign and protected with a cable, gate, or rope.

Farms should keep a record of all animals, visitors, vehicles, and equipment that enter the PBA.

- People, animals, and vehicles and equipment must always pass through a PBA Access Point and follow farm biosecurity protocols.
- Deliveries should be made outside the PBA.

Points to Keep in Mind

- Location risks, like proximity to other farms can influence the ease with which pathogens enter a farm or spread once they are present.
- Environment (e.g., ventilation, temperature) also impacts disease risk, especially for animals housed indoors.
- Any type of movement on or off the farm is a biosecurity risk.
- The LOS represents an inner control boundary and the PBA represents an outer control boundary for the farm. Not all farms have a PBA.
- To manage farm movements, limit the entry of people and vehicles, post signs at entry points with biosecurity information, and provide a parking area for vehicles away from animal areas.
- Designate one or more LOS to demonstrate the boundaries between animal and non-animal areas, and clean and disinfect all vehicles and equipment that enter the LOS/PBA.

Knowledge Review

Which of the following is true regarding the Line of Separation? Select all that apply.

a. The LOS is also referred to as the clean-dirty line
b. The LOS must surround the entire farm
c. The LOS can be crossed only at a PBA Access Point
d. LOS Access Points can be designated by showers, a bench, or tape or paint on the floor

9.5 SESSION V: OPERATIONAL BIOSECURITY

Operational biosecurity is the *tertiary level of biosecurity* that deals with **routine procedures** to prevent introduction and spread of infection within a farm/facility.

It is used to address:

- Movement of anyone who enters or lives on the farm including employees, delivery drivers, service personnel and visitors
- Management of animals, supplies, equipment, vehicles, and anything else related to disease control

A comprehensive biosecurity program is directed at preventing infectious disease transmission within and across farms, facilities, regions and countries.

The scope of implementation will vary and depends on the individual livestock facility, the risk or benefit, and practicality of the measure.

- A biosecurity measure is only effective if it is practiced ***correctly and consistently***.
- Avoidance or separation is the most effective way to prevent disease transmission.
- Day-to-day procedures should be stringent enough that in the face of a disease outbreak, no enhancements would be necessary.

Important points to consider for biosecurity traffic control:

- Establish a line of separation and post signs on the premises so employees and visitors will know about and follow the biosecurity measures.
- Restrict access to high risk areas. Create "zones" that designate where visitors may or may not enter.
- Only allow essential workers and vehicles in areas where animals are housed, pastured and fed.
- Employees should be aware of the possibilities for disease transmission from vehicles and equipment.
- Farm employees who have livestock at their own home should be required to report to work personally clean and in clean clothes that have not been exposed to their livestock.
- Use dedicated equipment for manure management.
- Properly dispose of deadstock and document in accordance with established procedures.
- Establish a dead animal pickup point away from pen areas and not in yard vehicle traffic patterns so that rendering trucks do not contaminate the operation.
- Prohibit visitors from being near livestock unless absolutely necessary.

9.5.1. Personnel movement control

Any person coming onto the farm can carry disease, including employees, visitors and veterinarians. Clothing, footwear, and hands can pick up animal pathogens and spread them to other animals or people. This section covers movement of people on and off the farm and procedures for crossing the LOS and PBA.

Learning Objectives

After completing this section, trainee should be able to:

- Describe how off-farm behavior can influence the likelihood of bringing disease onto the farm.
- Explain potential biosecurity risk factors involving farm visitors.
- List the five steps involved in crossing the Line of Separation.

> ***Activity 10:*** *Do any biosecurity risk factors apply to you? Select all that apply.*
>
> a. Animal ownership or contact outside of work
> b. Animal contact on the farm (i.e., enter animal buildings on farm visit)
> c. Regular visits to farms or other places with animals like markets, etc.

For farm personnel, recommended practices to reduce the risk of contact with sick animals (outside of work) include the following.

- Do not raise animals at home. If employees keep livestock at home, they should always shower and change into clean clothing before coming into work.
- Do not work at or visit animal markets, slaughter plants, or rendering facilities.

Farm workers

- Everyone working on the farm should be familiar with the farm's biosecurity practices.
- Wear clean boots or boot covers that are used only on one farm; or, clean and disinfect boots before entering and after leaving the farm.
- Wear farm-specific, clean clothing when entering animal areas.

Visitors

- Farm visitors pose a risk to animal health since they may have contact with other animals or farms.
- Signs should be posted restricting farm access.
- Gates or fencing should be placed around animal areas to prevent visitors from contact with animals.

Biosecurity for veterinarians and staff should focus on PPE, vehicles, and equipment.

a. Personal protective equipment (PPE):

- Forms a barrier between a person and the hazards they encounter.
- Reduce pathogen transmission between animals and prevent from leaving the farm.
- The type of PPE depends on type of hazard and routes of transmission.

Vehicles

- Keep work vehicle clean.
- Designate separate places in the vehicle for clean and dirty items.
- Schedule time for regular cleaning and disinfection, and for vehicle maintenance.
- Equipment
- Clean and disinfect veterinary equipment after use, using either a chemical product or an autoclave.
- Do not share needles - use one needle per animal to prevent accidental disease spread.

Entering Animal Areas

There are specific biosecurity protocols for *all* people entering animal areas, including family members, employees, service personnel (eg. veterinarian), and vehicle drivers.

- All people who enter animal areas must wear clean clothing and footwear.
- **Clothing:** use clean washable or disposable coveralls.
- **Footwear:** use cleaned and disinfected rubber boots or disposable boot covers.
- Always change your clothing/coveralls, footwear, gloves between farms, or even between buildings on a site if needed.

Entering the Perimeter Buffer Area

Biosecure entry is required for all people who come onto the farm. The PBA can be entered only in designated places known as ***PBA Access Points***.

People who enter the PBA are more likely to spread disease than others.

Crossing the Line of Separation

Once people have entered the PBA, they must cross the LOS *before* entering animal areas. The LOS is an inner boundary, often surrounding each animal building.

There are *five biosecurity steps* involved in crossing the LOS:

- **Remove personal items** like cell phones, glasses and jewelry and they must be left on the dirty side.
- **Locate a LOS access point –** it can be a bench, a shower, or paint marking the LOS on the floor. *Always cross only through a LOS Access Point*.
- **Change boots -** Dirty boots must be removed outside the animal area, before crossing the LOS.
- **Wash hands -** hands must be cleaned before crossing the LOS.
- **Enter animal area -** it's time to enter the animal area.

When leaving the animal area, follow these steps for crossing the LOS in reverse.

Always make sure you understand biosecurity protocol and respect the line of separation.

Points to Keep in Mind

- Limit the people who have contact with animals.
- Do not allow people on the farm if they have recently traveled to other farms.
- Provide gloves or a handwashing station with running water, soap, and towels for people that handle animals.
- Put barriers in place to limit contact between animals and visitors.
- Post signs that promote handwashing before and after animal contact.

Knowledge Review

1. Biosecurity best practices for personnel include which of the following?
   a. Only family members can cross the LOS (to enter animal areas) without using a LOS Access Point
   b. All personnel should put on clean boots and clothing when crossing the LOS
   c. Visitors should be restricted if they were sick during travel
   d. Animal transporters should never exit the cab of the truck

2. Put the five steps for crossing the LOS in order (1=first, 5=last)
   - Locate a LOS Access Point
   - Remove personal items
   - Wash your hands or sanitize
   - Enter animal area
   - Change boots and clothing

9.5.2 Animal Movement Control

Animals moving on and off the farm can spread disease. *Incoming animals* can include new arrivals or animals returning to the farm after breeding, or receiving medical care. *Outgoing animals* are those that leave the farm and do not return. This section covers quarantine and isolation.

Learning Objectives

After completing this section, trainee should be able to:

- Describe the similarities and differences between quarantine and isolation.
- Explain potential biosecurity breaches that can occur during loading/unloading.

Start with 6-minute video; Biosecurity Basics: Animal Movement Tips

9.5.2.1 Animal Identification

- Animal disease traceability is critical when disease strikes; producers need to know where animals have moved before—or after—being on their farm.

- Identification is important for producers to keep accurate records.
    - For instance, animals that have been treated with an antibiotic must be identified, and the appropriate withdrawal time must be observed, to prevent residues in products for human consumption.
- Individual animal identification devices (ear tags, tattoos, branding) can be used.

9.5.2.2 Quarantine

- Farms should have both quarantine and isolation facilities, since the farm may have sick animals and returning animals at the same time.
- Incoming animals are a significant biosecurity risk for farms. Although they might not look sick, they could be carrying infectious diseases.

Quarantine applies to *individual animals or groups of animals* that might have been exposed to a pathogen but are not clinically sick. Incoming animals may be new to the farm (e.g., breeding herd replacements, animals from a growing facility) or returning to the farm (e.g., breeding animals).

- Quarantine facilities act as biocontainment units.
- Quarantine facilities should be located at least 2 miles away from the main farm.
- Quarantine periods often last for 21 to 30 days.
- *The exact duration depends on pathogens of concern; their incubation period, infectious period, and time needed for diagnosis.*

Management: quarantine facilities should be managed independently from other production sites.

- Workers, vehicles and equipment used in the quarantine facility should not be shared with other farms.

Monitoring: trained caretakers should observe and diagnose animals daily for signs of illness.

Acclimatization or adaptation program can be used to ensure that incoming animals are vaccinated and treated for internal and external parasites.

Quarantine of new animals or returning animals is critical to prevent disease introduction.

9.5.2.3 Isolation

- Isolation prevents disease from spreading on the farm.
- Animals showing signs of illness in the main herd or flock should be removed immediately.
- Isolation facilities are similar to quarantine facilities and apply to animals that are already sick.
- They must be located & managed apart from the main farm (use separate personnel, vehicles, equipment).

Points to Keep in Mind

- *Buy animals only from places with strict biosecurity programs.*
- *Separate new or returning animals for a period of time before introducing them into the home herd or flock (i.e., quarantine). Remove sick animals from the main or flock to prevent disease spread (i.e., isolation).*
- *Use different equipment (e.g., cleaning supplies, feed and water containers or buckets) for animals while in quarantine and isolation.*
- *Develop an emergency action plan to care for animals in the event of disease outbreak that could stop animal movement, and plan for evacuation if needed.*

Knowledge Review

Which of the following is true regarding animals and biosecurity?

a. Individual identification is required for all animals being sent to slaughter
b. Incoming animals must be quarantined if they are visibly ill
c. Quarantine periods usually last 4 to 8 weeks
d. Outgoing animals cannot return to a building/barn once they have crossed the LOS

9.5.3 Carcass Disposal

When livestock and poultry die on the farm, proper carcass disposal is essential. It prevents the spread of pathogens to other animals and safeguards public health by preventing sick animals from entering the food supply.

This section covers carcass disposal options, planning considerations and carcass handling equipment

Learning Objectives

After completing this section, you should be able to:

- List the main on-farm and off-farm carcass disposal options.
- Explain biosecurity concerns related to carcass handling.

Carcass disposal options

Start with 5-minute video; Biosecurity Basics: Carcass Management and Disposal

Dead animals must be disposed of promptly to prevent disease transmission, remove potentially contaminated feed/food products from the food supply (animal and human), and safeguard public health. Disposal options can be;

- **On-site** carcass disposal methods include incineration, open air burning, burial (above ground or deep) and composting.
- **Off-site** carcass disposal methods include landfills, rendering, and incineration.

The best disposal options in the case of ***disease outbreak situation*** may be different from those used in routine mortality management since they are influenced by additional factors like biosecurity risk and public acceptance.

Activity 11: *Which disposal options have you or your clients used in the past? Select those apply and discus challenges on practice.*

a. Landfill
b. Burial
c. Rendering
d. Incineration
e. Composting

Points to Keep in Mind

- Know the approved options for carcass disposal in an area.
- Keep vehicles that take dead animals to a disposal site out of animal areas.
- Use disposal options that keep wildlife and pests away from dead animals.

9.5.4 Fomites

9.5.4.1 Manure and Litter Management

Fomites including manure, litter, and bedding may contain pathogens. Safe handling of these materials prevents disease in animals and people.

Learning Objectives

After completing this section, you should be able to:

- Describe biosecurity practices for and removal and storage of manure.
- Explain ways to minimize disease risk associated with bedding.

Animal housing areas - should be cleaned regularly to eliminate or reduce pathogens and decrease spread on hooves, boots, and equipment.

Manure handling equipment – use **s**eparate equipment to handle manure, litter, or bedding.

- If equipment is used for other purposes (like feed) or shared with other farms, it must be *cleaned and disinfected* thoroughly between uses.

Manure Removal

Method and frequency of manure removal depends on the number of animals and housing type; however, good management practices generally include;

- Remove manure and dirty bedding/litter as needed to keep housing clean and dry
- Remove manure and birthing products (eg. placenta) from maternity areas and clean pens between every birth,
- House young animals separately minimize contact with manure, bedding, and litter from older animals

Access - keep animals, including dogs, cats, and wildlife, away from manure and soiled bedding or litter areas with fencing or other barriers.

Bedding - the right bedding is important not only for disease prevention and control, but also for comfort and hygiene. Use bedding that is clean, comfortable, and that absorbs liquids

Points to Keep in Mind

- *Clean up manure, litter, or soiled bedding regularly to prevent buildup of disease.*
- *Keep young animals away from manure and soiled bedding from other animals.*

9.5.4.2 Vehicles and Equipment

Raising animals requires moving things on and off the farm, like vehicles, equipment, and machinery. These items can be contaminated with dangerous pathogens if shared among farms. Like people, there should be restrictions on where vehicles and equipment are allowed on the farm, particularly animal areas. This section covers biosecurity procedures for animal and non-animal transports.

Learning Objectives

After completing this section, learners should be able to:

- List factors to consider when assessing biosecurity risks related to vehicles and equipment.
- Explain why and how non-animal transport vehicles can spread disease.
- Describe requirements for animal transport vehicles in order to cross the LOS.

Start with 7-minute video - Biosecurity Basics: Vehicles and Equipment

Most vehicles and equipment can transport disease, especially if they visit other farm locations or carry high-risk materials like manure.

- Limit access of vehicles and equipment coming from off-site.
- Clearly mark farm entry points with signs.
- Prevent off-farm vehicles and equipment from entering animal areas.
- Plan drive paths so that off-farm vehicles or equipment do not drive into animal areas.
- Allow only clean vehicles and equipment to enter the farm.
- During an animal disease outbreak, disinfect vehicles and equipment used in animal areas before entry.
- Set up a PBA around the farm and LOS around animal areas.

Activity 12: *Which of the following are true regarding movement of vehicles and equipment? Select all that apply.*

a. Biosecurity risk is associated with the type of movement, how often it occurs, and where vehicles have been before they come onto a farm
b. Most vehicles and equipment should remain outside the LOS
c. Empty animal transport vehicles (no animals onboard) should undergo C&D before arriving at the loading area
d. Loaded animal transport vehicles (animals onboard) should undergo C&D before arriving at the unloading area

9.5.4.3 Feed and Water

Fresh feed and water are necessary for animal health. However, potential contaminants can impact production, make animals sick, or affect the safety of animal products destined for human consumption. This section covers feed contamination and storage, practices, and water.

Learning Objectives

After this section, you should be able to:

- Describe biosecure feed storage practices.
- List feeding practices that reduce the risk of exposure to toxins or chemical hazards.

Feed Contamination

Producers use different types of feed, from many different sources, to meet the energy needs of livestock and poultry. Feed can become contaminated at different points before or after delivery.

Feed contaminants include agents that can cause illness or injury to animals or humans when present in feed. Contaminants include:

- *Biological agents* - bacteria, viruses, and prions
- *Chemical agents* – such as pesticides, industrial chemicals, heavy metals, and mycotoxins
- *Physical agents* - rodent droppings, insects, dirt, and other foreign objects

To keep feed free from contamination, follow these practices:

- Buy feed only from reputable sources that have a quality control program.
- Save a feed sample and record the date of each feed purchase or delivery, so feed can be tested for contaminants at a later time (if needed).
- Check feed shipments for contaminants (e.g., rodent droppings, mold, and foreign materials) and evaluate whether feed is safe for consumption.
- Wash hands before and after handling feed.

Even if feed is clean when delivered, it can become contaminated on the truck or at the farm.

> ***Feed should always be safely and securely stored.***
> ***Always check feed shipments for signs of contamination including changes in color, smell, appearance, or presence of foreign objects.***

Feeding Equipment

- Feeding equipment can be easily contaminated if used to handle carcasses or manure.
- It's best to have dedicated equipment for storing, handling, and preparing feed.
- If equipment must be used for multiple purposes, or shared between sites, it must be thoroughly cleaned and disinfected before using for feeding.

Feeding Practices

- **Keep feed off the ground:** use feeders and troughs and place them up high to minimize contamination
- **Keep feeders clean**: clean feeders regularly to prevent the buildup of manure and debris

Water

- Clean water should be available at all times.

- Animals should be kept away from areas with wastewater or contaminated surface water.
- Develop a backup plan for water access in case natural sources become unsafe to drink.
- Water quality should be tested at least once per year.

Points to Remember

- Store feed securely to prevent access by rodents, birds, and wildlife.
- Clean up feed spills immediately.
- Clean and disinfect feeding equipment if it is used for other things like manure handling.
- Ensure that animals have fresh, clean water available throughout the day.

Knowledge review

Which of the following is *true* regarding feed biosecurity?

a. The presence of a contaminant does not necessarily make feed unsafe for consumption
b. Feed contamination primarily occurs at the manufacturer or mill
c. Feed should be stored in open-top carts for easy access
d. Feeding equipment can also be used for manure handling as long as it's on the same farm

9.5.5 Sanitation

Cleaning and disinfection (C&D) are an essential part of any biosecurity plan. Successful C&D involves following the steps correctly and using the right product for the pathogen, surface, and environment. Ineffective C&D can lead to a false sense of security and disease outbreaks on the farm. Understanding the principles and science behind C&D helps veterinary professionals work with producers to implement a biosecurity plan.

Learning Objectives

After completion of this section, you should be able to:

- Explain how to choose a disinfectant for a given situation.
- Read and interpret a disinfectant product label.
- List the basic steps in the C&D process.

Cleaning vs. Disinfection

Cleaning and disinfection is a two-step process. Without cleaning, disinfection does not work.

- **Cleaning** is the *manual removal* of microbes and other debris, like soil, bedding, litter, or feed, from surfaces and equipment.
- **Disinfection** is a *chemical or physical proces*s that destroys pathogens on inanimate objects.

How Cleaning and Disinfection Works

Detergents (from synthetic sources) and soaps (from natural sources) are water- and lipid-soluble. Soap molecules in water break apart the lipid membrane of pathogens and disrupt the chemical bonds that help pathogens stick to surfaces.
There are two general methods of disinfection - chemical and physical.

Chemical disinfectants react with proteins and essential enzymes of microbes, leading to inactivation or death.

- **Sanitizers** reduce bacterial populations on surfaces; they do not destroy all microbes.
- **Disinfectants** destroy or irreversibly inactivate most pathogens.
- **Sterilants** destroy or eliminate all forms of microbial life on inanimate objects, including bacterial spores.

Boot baths are common on farms but they are often ineffective due to improper use.

- First, boots must be scrubbed to remove visible manure.
- Then, manure-free boots should be soaked in a *clean* boot bath for five minutes to achieve disinfection.

Basic Cleaning and Disinfection Procedure

Cleaning and Disinfection should be standardized to ensure best results.

Before proceeding to disinfection, surfaces should be inspected to make sure they are visibly clean.

Moisture should be spread evenly over surfaces.

To increase effectiveness, C&D include:

- Pre-soak areas and items with adhered organic material prior to cleaning.
- Heat buildings to 20°C if needed to ensure adequate disinfection.
- Systematically clean and apply disinfectants to make sure you cover all areas
- Pay special attention to floor drains and corners since these areas can contain high pathogen load; clean and disinfect them last.
- Rinse areas around feeders, waterers, or other animal areas before reintroducing livestock and poultry.
- Clean pressure sprayers and pumps after use to remove corrosive disinfectant residues.
- Clean and disinfect all supplies (towels, mops, etc.) after the C&D process is complete.

Choosing a Disinfectant

The perfect disinfectant would be broad-spectrum, fast-acting, and easy to use. It would be non-toxic, non-irritating, non-corrosive, relatively inexpensive, and work on any surface or environment. Unfortunately, there is no perfect disinfectant.

In real life, the best disinfectant is determined by evaluating many factors. Let's take a closer look at some of these considerations.

Points to Remember

- Cleaning is the critical first component of C&D.
- Once items are free from organic debris, successful disinfection depends on choosing the right product, applying it according to the product label, and letting it sit for the full contact time.
- While chemical disinfection is often used, physical methods like heat/drying and UV radiation can be highly effective. Not all disinfection methods are practical for all solutions. However, a combination of methods can be used, if needed, to achieve effective C&D.

Knowledge Review

Put the steps for proper C&D in order.

1. Apply disinfectant
2. Dry clean
3. Dry
4. Wash with soap/detergent
5. Rinse off soap/detergent
6. Rinse off disinfectant
7. Let disinfectant "sit" for contact time

9.5.6 Vector Control

9.5.6.1 Control and Prevention of Vector-borne Diseases

Many insects can transmit disease through feeding/biting or by carrying pathogens on their bodies. This section covers control of arthropds (mosquitoes, flies, biting midges, lice, ticks, and mites) and prevention of vector-borne diseases.

Learning Objectives

After completing this section, you should be able to:

- Identify vector and explain preventive measures
- Describe preventive measures for insects

a. Arthropods

Arthropods can have negative impacts on the health and productivity of livestock and poultry, including:

- Spreading disease and causing death
- Reduced feed consumption and growth
- Reduced output (e.g., milk or eggs)
- Physical damage to animal (host)

b. **Prevention of Vector-borne Diseases**

- Insect monitoring is an important first step in prevention.
- Insect traps (sticky or baited) can be used to monitor insect populations.
- Species are identified and control program can be implemented.
- Both environmental control and treatment of animals must be considered.

  Environmental control is an important part of vector management.
  Application of chemical**s directly by spraying or dipping**

Points to Remember

- Monitor vector populations on the farm and develop a control plan based on farm needs.
- Use an integrated pest management approach to control insect vectors: reduce insect numbers, make the environment less habitable, and treat affected animals with insecticides).
- Always read and follow label directions for insecticides. A product that is safe for one species may not be safe for others.

Knowledge Review

1. Environmental vector management includes which of the following strategies?
   a. Eliminate standing water sources
   b. Disrupt flying insects (using fans, screens, etc.)
   c. Mow tall grass/brush around animal buildings
   d. All answers are correct

9.5.6.2 Wildlife and Pets Control

Wild birds

Birds can spread germs such as *Salmonella* to livestock and poultry by contaminating feed and water with droppings, etc. Practices to control bird populations include:

- Identify areas where birds perch, nest, and bathe around livestock and poultry areas
- Minimize bird presence and entrance to farms
- Remove feed spills and feed waste that can attract birds

Rodents

- Rodents can spread serious diseases like leptospirosis and salmonellosis.
- Rodents are attracted to farms since they offer food and shelter.
- Rodent control often requires Integrated Pest Management, a series of common-sense pest management controls.
- Trapping is the safest control method.
- Rodenticides can be used but needs care not harm other animals and people.

Pets

- Dogs and cats can have a positive role on the farm by guarding animals, and controlling pests. However, pets can pose biosecurity risks.
- Diseases and parasites such as leptospirosis, rabies, toxoplasma and tapeworms can be transmitted between pets and livestock.
- Pets should be kept away from areas of feeders and waterers.
- Pets must be spayed or neutered
- Pets must be kept up to date on vaccinations and deworming

Points to Remember

- Place and monitor rodent/pest baits to control unwanted populations.
- Remove trash from the farm often.
- Discourage bird and rodent nesting with screens or netting and by filling holes.
- Keep roaming dogs and cats out of animal areas.

9.5.7 Species-Specific Biosecurity Measures

The basic biosecurity issues we've discussed so far apply to multiple species. However, there are some differences in biosecurity needs between farm animal species. This section highlights some of the biosecurity measures that are specific to poultry, dairy and beef cattle.

- Farm facilities differ in size, layout, flow of animals and traffic, and human and equipment resources.
- There is no "***one size fits all***" biosecurity plan.
- Biosecurity measures need to be tailored to fit each farm type.

9.5.7.1 Biosecurity Measures on Poultry Farms

In Ethiopia, small and large scale poultry operations are found in the urban and peri-urban areas. Both layer and broiler farms practice different level of biosecurity measures to control disease introduction and spread in poultry.

This section highlights poultry farm biosecurity risks and their management measures.

Learning objectives:

By the end of this session, learners will be able to:

- Identify poultry farm biosecurity risks
- Identify risk management measures that can reduce biosecurity problems
- Develop a biosecurity action plan for the poultry farms

Facilitator provides ***50 minute*** presentation on biosecurity measures on poultry farms.

Link: PPT-Biosecurity in Poultry Farm.pptx

9.5.7.2 Biosecurity Measures on Dairy and Beef Cattle Farms

This section highlights biosecurity risk management or standard biosecurity protocols on dairy and beef cattle farms.

Learning objectives:

By the end of this session, learners will be able to:

- Identify biosecurity risks in dairy and beef cattle farms
- Identify risk management measures that can reduce biosecurity problems
- Develop a biosecurity action plan for dairy and beef cattle farms

For the section, the facilitator provides ***45 minute*** presentation on biosecurity measures on dairy and beef farms.

Link: PPT-Biosecurity in Dairy-beef farms.pptx

9.5.8 Animal Management and Disease Monitoring

9.5.8.1 Animal Management

Biosecurity helps to minimize pathogen exposure. However, good animal care is also important to maximize immunity and improve animal health. Good animal husbandry combined with good biosecurity helps animals thrive. This section covers housing, disease monitoring, nutrition, vaccines, drugs, parasite control, and stress.

Learning Objectives

After completing this section, you should be able to:

- List the characteristics of good animal husbandry.
- Describe proper storage for vaccines and drugs.
- Identify potential stressors for livestock and poultry, and explain how to mitigate them on the farm.

Start this session with 10-minute video; Link: Biosecurity Basics: Animal Health and Disease Monitoring

Housing

Whether animals are raised primarily indoors or outdoors, housing should be provided to protect them from the elements and ensure their comfort. Characteristics of good animal housing include the following.

- *Clean and dry* – clean house with dry bedding
- *Well Ventilated* - have good air flow to prevent the buildup of ammonia and odors. Ventilation may be natural or powered, using fans and air inlets to circulate air.
- *Sufficient Space* - for animals to move around easily. Overcrowding negatively impacts animal well-being.

Nutrition

A balanced diet is needed for animals to maintain good body condition, produce milk or eggs, reproduce, and develop a strong immune system to fight disease.

- Commonly used feedstuffs in livestock production include grains, forages (pasture, grasses, legumes), and roughages (silage, hay, stover).
- Protein, vitamins, minerals, carbohydrates, and fats must be provided in the diet.

Vaccines, Drugs, and Treatments

- Vaccines prevent common animal diseases. If animals get sick, drugs can help them recover.
- A veterinarian can help set up a health management plan for animal herds or flocks.
- Producers and veterinarians should make sure vaccines, drugs, and treatments are used and stored effectively.

Parasite Control

Parasites can slow animal growth and reduce the ability to fight off diseases. In severe cases, they can cause death.

- **Internal parasites -** most often found in the intestinal tract. Eg. helminths (worms) and coccidia.
- **External parasites -** live on hair or skin. Eg. Lice, ticks and mites.
- A veterinarian can help develop a parasite control program that is effective and safe for livestock and poultry.
- Deworming and good pasture management practices can reduce animal exposure to parasites.

Stress

- Extreme temperatures, inadequate housing, poor handling and restraint, and transportation can stress livestock and poultry.
- When animals are stressed, their immune systems are impaired and they may not eat normally. These factors increase their chances of becoming ill.

Animal Flow

- **"All-in/all-out"** systems are based on the idea that moving animals of the same age, at the same time, reduces disease risk and improves growth performance.
- In all-in/all-out systems, new animals cannot be added to an existing group since they could introduce disease.

Points to Remember

- Provide a clean, dry place for animals to rest.
- Feed animals based on their age, growth, and health needs.
- Develop a vaccination program for all species on the farm. Store vaccines and medications at the correct temperature.
- Develop and implement a farm-specific parasite control program.
- Minimize animal stress to help keep animals healthy.

9.5.8.2 Disease Monitoring

Disease monitoring, or surveillance, means watching animals for signs of illness or poor health. When a disease is noticed quickly, transmission can be lessened or prevented. This section covers signs of illness in animals and active observational surveillance principles.

Learning Objectives

After completing this section, you should be able to:

- List potential signs of illness in livestock and poultry.
- Describe the components of Active Observational Surveillance

Signs of Illness

Different pathogens can cause different clinical signs. Sometimes animals may just seem off, even though no abnormalities are detected. Many infectious diseases cause non-specific clinical signs like fever, depression, decreased feed intake, and decreased activity.

A daily observation log should be kept to record abnormal findings. Clinical signs of concern include:

- High fever
- Ocular discharge or dull, sunken eyes
- Nasal discharge
- Drooling or dropping of food, teeth grinding
- Difficulty breathing or deep coughing
- Loss of gut fill (indicates off feed)
- Lameness
- Diarrhea (bloody or non-bloody)
- Abortion

If sick animals are identified, they should be immediately moved to a separate area, away from the rest of the herd and treated. This location - the isolation area - should also have separate personnel, feeding supplies, and cleaning supplies.

Begin with the healthiest and youngest animals and then move to older animals. Work with sick animals last.

Active Observational Surveillance

- In an outbreak situation, enhanced animal monitoring may be needed.
- *Active Observational Surveillance (AOS)* is a systematic method for assessing livestock to detect early signs of disease.
- AOS is most important for producers with enhanced biosecurity and it can also be a part of daily biosecurity.

There are three main components of AOS:

1. **Daily visual observation** of animals should be conducted by producers or trained employees.
    - Recognize abnormalities - early signs of illness or changes in production parameters - that may be indicators of disease.
    - Observe animals when they are active (at feeding, when being moved, at herd checks, etc.).
2. **Daily documentation** of observations when looking for specific clinical signs
3. **Prompt reporting** of abnormal findings - including suspicious clinical signs or unexplained changes in production parameters - is essential during a disease outbreak.

Points to Remember

- Monitor animals for signs of illness daily. If sick animals are found, isolate them immediately to prevent disease spread.
- When doing tasks, work with the healthiest, youngest animals first, older animals, and sick animals last.
- During a disease outbreak, use a systematic method for detecting early signs of disease such as Active Observational Surveillance.

9.5.9 Records and Documentation

Record keeping is a key component of managing an efficient farm business. Records are needed for maintaining a permanent record of the farm business and monitoring day-to-day activities, and future planning. A farm owner or manager should be able to 'trace back' and 'trace forward' if there is a disease incursion on their property. In the event of disease occurrence, valuable time can be lost trying to determine how far the disease may have spread. Sound record keeping can speed up this process and prevent the spread of the disease. For farm biosecurity, it is essential to;

- Keep a record of every visitor to a farm and include details of their biosecurity risk assessment
- Ensure farm visitor register is up to date
- Keep a record of all livestock that comes onto a farm, including the source, date, treatments and certifications, and where it is stored on the farm.
- All products that leave the farm should be recorded, including the commodity, and destination.
- Record animal mortalities and dispose of dead stock in accordance with documented procedures
- Record vaccination and treatments
- Follow any national or regional regulations or guidelines for record keeping

List of the required farm record formats related to biosecurity:

S/No.	Record Forms	Use
1	Employee training record	Tracking form for employee biosecurity training
2	Vehicle and Equipment Entry Log	Form for logging vehicle and equipment entry onto the premises
3	Visitor Entry Log	Tracking visitor entry onto the premises
4	Livestock Receiving Record	Tracking new /return arrivals of livestock
5	Livestock Movement Record	Log for tracking animal movement
6	Livestock Health Record	Animal health record tracking for livestock/poultry treatment and vaccination

9.6 SESSION VI: DEVELOPING BIOSECURITY PLAN FOR FARMS

Developing and implementing a biosecurity plan is part of risk management on the farm. Some biosecurity measures are cheap and relatively easy to implement, yet they yield high rewards. Others are more complex and require a greater financial investment. Overall, however, disease prevention usually costs less than a disease outbreak. This section covers developing a biosecurity plan, biosecurity responsibilities, and biosecurity evaluation.

Learning Objectives:
After completing this section, learner should be able to:

- Describe the steps required for developing a biosecurity plan
- Explain the role of the biosecurity management

9.6.1 Steps in Developing a Biosecurity Plan

Biosecurity actions are needed daily to help ensure the health of animals. Biosecurity also protects people from diseases that spread from animals to humans. A plan should address the ways disease could enter or spread on the farm and describe preventive measures. A separate biosecurity plan should be developed for each site.

Steps in developing a plan

Producers can use a three-step process to develop a biosecurity program. The steps include;

1. Assessing movement risks
2. Assessing biosecurity risk factors
3. Write the biosecurity plan using a template

The Biosecurity Plan Templates (Fig.) can be used for any species. It guides producers through the planning process, addressing biosecurity factors like:

- Farm location (including address, GPS coordinates)
- Contact information for key personnel including the producer and farm veterinarian
- Farm access and entry/movement protocols for personnel, animals, vehicles, and equipment
- Animal health and disease monitoring practices, including vaccination and deworming programs
- Carcass disposal; handling of manure, litter, and bedding; and management of wildlife, rodents, and other animals
- Cleaning and disinfection practices

Figure: Templates (step1-3) used for farm biosecurity risk assessment and developing plan
Source: *Farm Biosecurity - CFSPH (iastate.edu)*

Step 1: Assessing movement risks

Risk assessment of the farm helps producers identify movement risks based on frequency. In this case, the hazard isn't a specific pathogen, it's the movement itself. The more often movements occur, the greater the biosecurity risk. The assessment can be done using a checklist.

Find Movement Risks document (available at: https://cfsph.iastate.edu/biosecurity/) to learn and exercise about changes you can make. You may open the link: *Movement Risks and Biosecurity* for accessing the checklist.

Step 2 – Assessing biosecurity risk factors

Completing a self-assessment checklist will help owner/veterinarian to identify biosecurity strengths and weaknesses on the property. Biosecurity actions can reduce the risk of disease from entering, spreading, and leaving the farm. It might be helpful to have a farm map to consider the best places to locate biosecurity zones or 'check points'. This could include signs at entrances to the property, parking areas near the house or site office, where deliveries are picked-up or dropped-off in relation to storage facilities, vehicle wash down areas, existing roads or tracks for movement within the property.

The self-assessing checklist (link: *Self-Assessment Biosecurity Checklist*) points out biosecurity strengths and areas for improvement on the farm. You can fill out the checklist for step-2 to exercise.

Step-3 – Write the biosecurity plan

After completion of a risk assessment, the next step is developing a biosecurity program focusing on external and internal biosecurity.

- Biosecurity actions are needed daily to help ensure the health of animals.
- Biosecurity plans should be simple to implement.
- A plan should address the ways disease could enter or spread on the farm and describe preventive measures.
- A separate biosecurity plan should be developed for each farm or site.

The actual biosecurity practices to use can vary from site to site, depending on the size of the farm, the physical facilities available and the day-to-day management of operations.

Biosecurity action plan should be updated regularly at least once a year. The table below can help trainees to exercise and complete practically for developing farm specific biosecurity plan at their work place.

9.6.1.1 Farm Biosecurity Action Planner

Farm Input/ Output	Potential Risk	Actions to Reduce the Risk	Actions to Take	Yes or No
New animals	Introducing new animals on to your farm can allow diseases to enter. Isolating new animals for a quarantine period limits the risk of exposing your entire stock to new diseases.	Isolate new animals away from production areas for 21 days before mixing them with your existing stock. This provides animals to show signs of disease that were not obvious when purchased.		
Animal feed	Animal feed can harbour diseases and pests	Ensure any feed you purchase is fit for purpose and from a reliable source.		
Water sources	Many disease-causing organisms can survive for a long time in water sources until they find a suitable host	Ensure water sources are secure from contamination by wild animals and pests.		
Animal bedding	Animal bedding material can harbour diseases and pests	Ensure bedding material is fit for purpose, refreshed regularly and is stored in a clean, dry and vermin free environment.		
Moving animals	Livestock can spread diseases from your farm to others.	Ensure animals are fit to travel, your records are up to date and that the transport vehicle is clean.		
Personnel (Visitors, Employees, veterinarians)				
Farm access	Multiple, unsecured entry points to a farm make it difficult to control visitor access and manage high risk visitors.	Limit the number of access points to a farm (lock unused gates). Use signs to direct visitors to designated parking or reception areas.		
Signage	Without signage, visitors and staff may be unaware of the biosecurity procedures enforced on a farm.	Erect signs to instruct visitors. Use clear instructions and provide relevant contact details.		
Visitor risk assessment	The risk is greater if visitors have been in contact with other livestock.	Conduct a risk assessment before allow a visitor onto your farm. Provide cleaning equipment or a change of clothing or footwear to reduce the risk.		
General hygiene	Pathogens can be present on hands, clothing, footwear and personal items of people.	Provide hand washing facilities, foot baths or alternative clothing and footwear for visitors to use while on-farm.		

Farm Input/ Output	Potential Risk	Actions to Reduce the Risk	Actions to Take	Yes or No
Vehicles and Equipment				
Equipment hygiene	Tools and equipment can carry diseases. The risk for disease spread is higher when equipment is borrowed or bought from other properties.	Clean and disinfect tools and equipment before and after use on livestock. Clean and disinfect equipment between different herds of animals.		
Vehicle entry points	Multiple entry points to a farm make it difficult to control and manage high risk visitors	Encourage visitors to enter the farm via allowed route only. Use signs to inform visitors about farm access points.		
Vehicle movement and parking	All parts of a vehicle can carry disease causing organisms. Without restricting parking and vehicle movements, it is difficult to control and monitor the spread of diseases.	Minimise the number of vehicles to allow and restrict them to designated visitor parking areas. If possible, use your own farm vehicles to transport visitors around the property.		
Production Practices				
Water management	If water sources become contaminated can spread disease to the production areas.	Make sure livestock cannot drink from waste water storages.		
Animal manure and waste	Waste and dead animals can harbour disease organisms. Disease agents in effluent can contaminate pastures, stockfeed and water sources.	Dispose of animal carcasses and waste as soon as practical in a segregated area that cannot be accessed by livestock or wild animals. Select disposal areas		
Feed storage	Poor feed storage may contaminate feed or reduce its usefulness. Old feed can harbour disease, and moulds that cause poisoning.	Keep feed in a clean, dry storage area. Regularly inspect feed supplies for pests, mould and damage and ensure they remain secured and fit for purpose.		
Feed and water troughs	Contaminants can accumulate in animal feed and water troughs if they are not cleaned regularly. Old feed & water left in the trough can contaminate new feed or water.	Clean feed and water troughs regulary to prevent contaminants. Keep the troughs high enough not to be contaminated by animal faeces and urine.		
Monitoring and surveillance	Early detection of diseases gives the best chance of preventing diseases from establishing on a farm. Early detection increases the chances of eradicating a new disease. Recording the absence of diseases is just as important as recording what you do see.	Regularly monitor your livestock. Become familiar with diseases commonly found in the area. Display posters showing common diseases to help staff with identification. Increase frequency of inspections during disease outbreaks.		
Fencing	Damaged fences can allow livestock to stray. It could also allow neighbour's livestock to mix with your stock.	Ensure fences prevent livestock from straying onto a farm. Use double fencing if required.		
Vaccination	Animals can be immunized against important diseases.	Ensure animals on-farm are vaccinated for identified risk diseases.		
Wild and feral animals	Wild animals may carry disease causing organisms.	Develop a wild animal control program. Ensure farm buildings are in good repair.		

9.6.2 Biosecurity Responsibilities

Farms should designate a *Biosecurity Manager* - someone who is familiar with the structural and operational biosecurity of the farm and the health status of the animals. The Biosecurity Manager may be the owner, manager, herd/flock veterinarian, or an on-site employee.

The Biosecurity Manager is responsible for;

- Developing the biosecurity plan (along with the herd/flock veterinarian), the implementation, maintenance, and ongoing review/updating of the biosecurity program.
- Training all livestock and poultry owners/caretakers about procedures at least once per calendar year and documented.
- Reviewing the biosecurity program at least once during each calendar year and whenever the farm goes through an important change/expansion.

9.6.3 Biosecurity Evaluation

Once the biosecurity plan is in place, evaluation of the biosecurity program is important for assessing the effectiveness of biosecurity measures and determining the need for additional procedures.

- Biosecurity checklists can aid producers in self assessing their operation.
- A third-party biosecurity audit can help producers know exactly where they stand.
- The auditor might be a veterinarian specializing in biosecurity or another trained biosecurity professional.
- Periodic veterinary evaluations and animal disease testing are also critical for disease surveillance.

Points to Keep in Mind

- Developing and implementing a biosecurity plan is part of risk management on the farm.
- Focus on general daily biosecurity.
- Designate a Biosecurity Manager (owner or veterinarian) for the farm.
- Evaluate the farm biosecurity plan at least once per year and make changes as needed.

Knowledge Review

Components of a biosecurity plan include which of the following?

- Contact information for farm owner and veterinarian
- Farm address
- Number and types of all animals on the farm premises
- Biosecurity measures in place
- Farm map
- All are answer

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11. ANNEX: BIOSECURITY PLAN TEMPLATE–LIVESTOCK AND POULTRY (Step 3)

(adopted from: *Farm Biosecurity - CFSPH (iastate.edu)*

Biosecurity actions are needed daily to help ensure the health of your animals. Biosecurity also protects people from diseases that spread from animals to humans.

Biosecurity plans do not have to be complex to work. A plan should address all the ways disease could enter or spread on your operation and describe actions to prevent it.

Use this three-step process to develop your biosecurity program.

- **Step 1**: Fill out the Movement Risks and Biosecurity assessment.
- **Step 2**: Fill out the Self-Assessment Biosecurity Checklist.
- **Step 3**: Use this biosecurity template to write a biosecurity plan. Once written, manage biosecurity actions and train others about what is needed.

Customize this plan by replacing bracketed text (that looks like this [TEXT]) with information specific to your property.

Biosecurity Tip Sheets provide more information to help you complete this template.

Attach a labeled premises map to the end of this plan. See Creating a Premises Map for a Biosecurity Plan to learn how to make and label a farm/ranch map.

FARM INFORMATION

Farm	[Add Name Here]
Written/Reviewed*	[Add Date Here]
Written/Reviewed By	[Add Name And Position]

*This biosecurity plan will be reviewed and updated annually.

SCOPE OF BIOSECURITY PLAN

Address	[Add Street Address, City, State, Zip Code Here]
Gps Coordinates	[Add Gps Coordinates Here]
Premise Id or Pin*	[Add Premises Id Here]

*Work with your Animal Health Official to request a free PIN for your premises.

OWNER CONTACT INFORMATION

Owner	[Add Name Here]
Phone (Home)	[Add Home Phone Here]
Phone (Cell)	[Add Cell Phone Here]
Email	[Add Email Address Here

VETERINARIAN CONTACT INFORMATION

Veterinarian	[Add Name Here]
Clinic	[Add Clinic Name Here]
Phone (Office)	[Add Office Phone Here]
Phone (Cell)	[Add Cell Phone Here]
Email	[Add Email Here]

OTHER SPECIES AND BUSINESSES ON THE FARM

Other Species On Property?	☐ Yes	☐ No
If Yes, List Species	[Add Species] [Add Species] [Add Species] [Add Species] [Add Species]	[Add Number] [Add Number] [Add Number] [Add Number] [Add Number]
Other Businesses On Property?	☐ Yes	☐ No
If Yes, Identify Businesses	Mark All That Apply: ☐ Produce Stand ☐ Egg Stand ☐ Farm Tours ☐ Other (Describe) _____ _____	Mark All That Apply: ☐ Feed Sales ☐ Fertilizer Sales ☐ Compost Sales

PROTECTING THE HERD/FLOCK

Farm/Ranch Access Is Limited To Protect The Herd/Flock.	☐ Yes ☐ No
Access Points Are Labeled On The Aerial Farm Map At The End Of This Plan	☐ Yes ☐ No ☐ Not Applicable
Number Of Farm Access Points	[Add Number Of Access Points]
Type(S) Of Access Point Barriers	[Describe Access Point Barriers – For Example: Fence, Gate, Etc.]
Language(S) Used For Access Point Signs	[Add Languages Such As English Or Spanish]
Information Included On Access Point Signs	[Describe What Access Point Signs Say – For Example: Phone Number To Call For Entry, Biosecurity Protocol For Entering, Etc.]
Parking Area Location	[Describe Where Parking Area Is Located (Must Be Away From Animal Areas)]
Parking Area Is Labeled On The Aerial Farm/Ranch Map At The End Of This Plan	☐ Yes ☐ No ☐ Not Applicable

ANIMAL HEALTH AND DISEASE MONITORING

Animals Have Access To A Clean, Dry Place To Rest	☐ Yes ☐ No
Animals Are Fed Based On Age, Growth, And Health Needs.	☐ Yes ☐ No
Animals Caretakers Follow Good Animal Handling Practices Like: • Proper Handling/ Restraint • Moving Animals Calmly	☐ Yes ☐ No
Animals Are Checked For Disease:	☐ Twice Daily ☐ Daily ☐ Weekly ☐ Other

Animal Caretakers Work With The Healthiest/Youngest Animals First, Followed By Older Animals And Sick Animals	☐ Yes ☐ No
Farm/Ranch Has An Isolation Area For Sick Animals	☐ Yes ☐ No
If Farm/Ranch As An Isolation Area:	Isolation Area Is Located: [Describe Where Isolation Area Is Located] The Isolation Area Can House: [Describe How Many Animals Can Be Housed In Isolation Area]

MEDICATIONS, VACCINES, AND DEWORMERS

REFRIGERATED MEDICATIONS ARE KEPT AT 36-46^{o}f	☐ YES ☐ NO
Refrigerator Location	[Describe Where Refrigerator Is Located]
Location Of Non-Refrigerated Medications	[Describe Where Non-Refrigerated Medications Are Kept]
Vaccination Program	[Describe Species Vaccinated, Which Products Used, How Often Vaccines Are Given, Etc.]
Parasite Control Program	[Describe Species That Are Dewormed, Which Products Used, How Often Dewormers Are Given, Etc.]

VEHICLES AND EQUIPMENT

Entry Of Dirty Vehicles, Machinery, And Equipment Is Limited	☐ Yes ☐ No
Equipment Is Shared With Other Operations	☐ Yes ☐ No
If Equipment Is Shared, It Is Cleaned And Disinfected Before Entering Our Property	☐ Yes ☐ No ☐ Not Applicable

CLEANING AND DISINFECTION

Objects/Equipment Are Thoroughly Cleaned (Visible Debris Removed) Before Disinfectant Is Applied	☐ Yes ☐ No
Disinfectants Are Used According To The Product Label (Mixing, Concentration, Rinsing, Storage, Etc.)	☐ Yes ☐ No
Disinfectants Are Allowed To "Sit" And Work For The Proper Contact Time	☐ Yes ☐ No
Disinfectant Products Regularly Used On The Farm/Ranch	[List Products Here]
C&D Safety Measures Followed:	Read All Product Labels Before Using ☐ Yes ☐ No Wear Recommended Protective Gear (Rubber Gloves, Aprons, Goggles, Etc.) ☐ Yes ☐ No Keep Run-Off Away From Animal Areas, Drinking Water, Waterways, Etc. ☐ Yes ☐ No

PERSONNEL: FAMILY MEMBERS, EMPLOYEES, VISITORS

Animal Contact Is Limited To Animal Caretakers	☐ Yes ☐ No
All People That Handle Animals Wear Clean Clothing And Footwear, And Have Clean Hands	☐ Yes ☐ No
Handwashing Station With Running Water And Soap Is Available	☐ Yes ☐ No If Yes, Handwashing Station Is Located: [Describe Where]

Additional Supplies Available For Personnel	☐ Gloves ☐ Hand Wipes ☐ Alcohol-Based Hand Sanitizer ☐ Other (Describe) _____ _____

ZOONOTIC DISEASES AND AGRITOURISM

Are Visitors Allowed On The Farm/Ranch?	☐ Yes ☐ No
If Visitors Are Allowed:	Barriers Are In Place To Limit Contact Between Animals And Visitors ☐ Yes ☐ No ☐ Not Applicable Signs Are Posted To Promote Handwashing Before And After Animal Contact ☐ Yes ☐ No ☐ Not Applicable Handwashing Station With Running Water And Soap Is Available ☐ Yes ☐ No ☐ Not Applicable Human Food Is Not Allowed In Animal Areas ☐ Yes ☐ No ☐ Not Applicable

ANIMALS AND ANIMAL MOVEMENT

New Animals Are Always Born On The Farm, Not Purchased	☐ Yes ☐ No
New Animals Are Purchased But Come From Places With Strict Biosecurity Programs	☐ Yes ☐ No ☐ Not Applicable
New Or Returning Animals Are Quarantined Before Being Mixed With The Home Herd/Flock	☐ Yes ☐ No ☐ Not Applicable If Yes, The Quarantine Period Is: [Describe How Long New Or Returning Animals Are Quarantined]
Separate Feed/Water Equipment Is Used For Quarantined Animals	☐ Yes ☐ No

If Feed/Water Equipment Is Shared It Is Cleaned And Disinfected Between Groups	☐ Yes ☐ No ☐ Not Applicable
An Emergency Action Plan Is In Place	☐ Yes ☐ No If Yes, The Emergency Action Plan Is Kept: [Describe Where Emergency Action Plan Is Kept]

CARCASS DISPOSAL

Carcass Handling And Disposal Follows Local And State Rules	☐ Yes ☐ No
Dead Animals Are Disposed Of Promptly	☐ Yes ☐ No
Methods Used For Disposal:	Mark All That Apply: ☐ Burning ☐ Burial ☐ Rendering ☐ Compost ☐ Landfill ☐ Other (Describe)_____
Vehicles That Haul Dead Animals Are Not Allowed To Enter The Farm/Ranch	☐ Yes ☐ No

MANURE, LITTER, AND BEDDING

Manure Handling And Disposal Follows Local And State Rules	☐ Yes ☐ No
Animal Housing Areas Are Cleaned Regularly	☐ Yes ☐ No
Young Animals Are Housed Separately From Older Animals	☐ Yes ☐ No

Bedding Is Purchased From A Trustworthy Source With A Quality Control Program	☐ Yes ☐ No
Manure Storage Procedures:	Manure Is Stored: [Describe How Manure Is Stored – For Example: Piling, Bunker, Composted On Site, Hauled To Another Site] If Needed, Manure Can Be Stored Onsite For: [List Number Of Weeks, Months, Etc.]

WILDLIFE, RODENTS, AND OTHER ANIMALS

Rodent/Pest Bait Use Is Performed By Farm Personnel According To Package Label Directions	☐ Yes ☐ No
Rodent/Pest Bait Use Is Performed By An Outside Company According To Package Label Directions	☐ Yes ☐ No If Yes, Company Name Is: [Add Company Name]
Trash Is Removed:	☐ Twice Daily ☐ Daily ☐ Weekly ☐ Other
Bird And Rodent Nesting Is Prevented By:	[List Preventive Measures Like Screens, Bird Spikes, Etc.]
Dogs, Cats, And Other Animals Are Prevented From Entering Animal Areas	☐ Yes ☐ No

FEED AND WATER

Fresh, Clean Water Is Available To Animals Throughout The Day	☐ Yes ☐ No
Spilled Feed Is Cleaned Up As Soon As It Happens	☐ Yes ☐ No
Feed Is Handled Only By Equipment Used For Feed (Not Manure)	☐ Yes ☐ No

Equipment Used For Manure Handling Is Cleaned And Disinfected Before It Is Used For Feed Handling	☐ Yes ☐ No ☐ Not Applicable

LABELED PROPERTY MAP

Farm Map Is Included With This Biosecurity Plan*	☐ Yes ☐ No		
Farm/Ranch Map Includes The Following Labeled Points (If Applicable):	Perimeter Buffer Area (PBA)	☐ Yes	☐ No
	PBA Access Points	☐ Yes	☐ No
	Line Of Separation (LOS)	☐ Yes	☐ No
	Los Access Points	☐ Yes	☐ No
	C& D Station(S)	☐ Yes	☐ No
	Designated Parking Area	☐ Yes	☐ No
	Carcass Pickup Location	☐ Yes	☐ No
	Carcass Removal Pathway(S)	☐ Yes	☐ No
	Vehicle Movements	☐ Yes	☐ No
	Farm/Ranch Entry	☐ Yes	☐ No

*See Creating a Premises Map for a Biosecurity Plan to learn how to make and label a farm map. Remember to attach your labeled premises map to this biosecurity plan.