

Biosecurity and Biological Risk Management for Livestock Enterprises¹

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Introduction

The Department of Homeland Security has identified agriculture and food as one of 11 critical infrastructures for potential terrorist targets. Because of this and many other potential threats, biosecurity and biological risk management (BRM) for the farm or ranch should be considered as important as many of our other management practices.

Biosecurity management refers to management practices that protect the health of the livestock herd by preventing introduction of pathogens and poisons that are considered potentially harmful. Biological risk management is the overall process of awareness education regarding the risk of infectious diseases entering or spreading through an animal facility. It also involves evaluating and managing those risks. BRM is designed to help livestock producers understand the need for disease control, not only for foreign animal disease threats but for domestic diseases as well. Biological risk management provides the tools to minimize the risk.

The purpose of biosecurity is to establish a prevention barrier to disease-causing agents and other threats by minimizing the movement of biological organisms and external threats onto and within livestock operations. The concept of BRM recognizes that animal diseases cannot be eliminated, but that livestock producers can manage

disease risk through effective control measures. For diseases that are always present (endemic), reducing the dose of infectious agent the animal is exposed to can positively affect the farm's economic impact and help justify the cost of implementing BRM. Just as there are many different livestock enterprises, there are many different management options and solutions to implement BRM.

Why is biosecurity and BRM important? There are several reasons—the importance of US and Florida agriculture, concentrated food/livestock production practices, the rise in emerging and re-emerging infectious diseases, increasing globalization and increased human interaction with animals. In the state of Florida, agriculture is the second leading economic industry behind tourism. Biosecurity and BRM are important to the state's economy in order to minimize the threat to animal health and the economic consequences to the state and to the agriculture industry should there be a disease incident.

It is essential that we realize the impact of agriculture on every person and do everything we can to keep animals healthy and to ensure that a career in livestock production continues to provide a livable income. Protecting animals from disease through proper hygiene of people and equipment has a direct effect on the agricultural industry. Disease control and working to institute BRM plans can help mitigate the economic consequences of a disease outbreak.

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Biosecurity encompasses a variety of activities on the farm/ranch: management of visitors, traffic control, employee training, management of replacement animals, technical services, storage and handling of feedstuffs, rendering practices, and manure management all impact biosecurity. Because of the vast array of potential threats, a Biosecurity Resource Group should be considered. The group should include operation supervisors, a veterinarian, a nutritionist, an extension specialist, and others who may have specific expertise. This group can work to fit a biosecurity management plan to your livestock operation.

Basic Biosecurity/BRM Management

Risk is an important concept in understanding and developing biosecurity and BRM plans. Every livestock owner/manager has different perceptions as to the level of risk that their enterprise faces. The risk the livestock enterprise faces must be understood before the risk assessment can begin. Risk assessment provides an objective look at the operation to evaluate the various strengths and weaknesses related to a threat or disease entering and spreading across the ranch/farm. Risk assessments can and should change over time depending on the situation for the ranch/farm. The vulnerability of the animals on a ranch/farm to disease is influenced by a number of factors including: cleanliness, stress, nutrition, and other management factors; these are all aspects that can be managed. The three main issues to address in a successful biosecurity management program are isolation, traffic control, and sanitation.

Isolation

The most important step in disease control is limiting contact, co-mingling, and movement of livestock. This issue is of special importance for new animals arriving on the farm/ranch, including replacement animals, breeding animals, or animals returning from livestock shows. Even co-mingling between established groups of livestock on the farm/ranch should be minimized. An important biosecurity option on ranches is to separate livestock by age and/or production groups. Isolation of animals can be particularly difficult during natural disasters because of damage to facilities and or perimeter fences or lack of feed resources. Isolate sick animals, especially animals with unfamiliar symptoms or those with symptoms that do not improve with usual treatment.

Traffic Control

Consider points where disease could enter the ranch/farm, and how it could spread. Traffic control within the operation should be designed to stop or minimize contamination of animals, feed, and equipment. It is important to remember that traffic includes more than vehicles. All animals and people should be considered when addressing the issue of traffic. Restrict people to places where they need to be. Limit visitors' access to barns and lots. Post a warning sign asking visitors to keep out and giving instructions or a telephone number to call instead of entering the operation. Keep a record of all visitors that enter the premises. Visitors to a ranch/farm operation present several potential problems. Consideration should be given to a visitor's previous stops; both the people and their transportation are potential contaminants. Be aware of foreign visitors and ban footwear, clothing, and other products from foreign countries. People who have traveled outside of the United States should be denied access to a ranch/farm for a minimum of 14 days to control accidental introduction of foreign animal diseases (FAD). Disposable boot covers may be a better option than footbaths to contain contamination from soil and manure. Other animal traffic concerns include pets, dogs, cats, horses, wildlife, rodents, and birds. Traffic control within the operation should be designed to stop or minimize contamination of livestock, feed, feed handling equipment, and equipment used on animals.

Sanitation

The sanitation component of biosecurity addresses the issue of the disinfection of people, equipment, animals, and material entering the ranch/farm and the maintained cleanliness of people and equipment. Avoid using common syringes and needles for vaccination, blood testing, or administering animal health product. Be vigilant when working with sick animals: move from healthy to sick animals during the day, never vice-versa.

An important objective of sanitation is to prevent fecal contaminates from being ingested by livestock. The use of separate equipment for feed handling and manure/dead animal removal is optimal. If the same equipment is utilized for manure and feed handling, perform thorough cleaning and disinfection. Additionally, loaning of equipment or trailers presents another opportunity for pathogen introduction to the ranch/farm. Cleaning of facilities and equipment between groups of livestock during processing is a good management practice to reduce pathogen transmission.

Disease Transmission Routes

In order to perform the risk assessment and formulate biosecurity/BRM plans, it is important to know how diseases are introduced and spread.

An effective way to evaluate risk and implement plans against disease threats is to understand how diseases can be spread based on their route of transmission to the animal, or human in the case of zoonotic diseases. An advantage of minimizing risk by examining routes of transmission is that it will also help protect against new or unanticipated infectious diseases. While disease agents and the infections they produce vary, they all have one thing in common: the animal must be exposed to them to develop disease. Once it is understood that different diseases can be acquired orally and others are breathed in via aerosol transmission, it is easier to gain control over them. This classification system is effective and easy to understand without requiring knowledge about a wide range of diseases. From a management standpoint, it may be easier to identify risk areas, such as fomites, and then design protocols to minimize exposure.

Disease agents can be spread from animal to animal, or from animal to human or vice versa, through a variety of transmission routes. Biosecurity/BRM considers five main routes: aerosol, direct contact, fomite, oral and vector-borne. The sixth route, zoonotic, can be spread from animals to humans through one of the five previously listed routes. Many infectious agents can be transmitted by more than one route of infection.

Aerosol Transmission

Aerosol transmission occurs when disease agents contained in droplets are passed through the air from one animal to another, or from an animal to a human or vice versa. Most pathogenic agents do not survive for extended periods of time within the aerosol droplets, and as a result, close proximity of infected and susceptible animals is required for disease transmission.

Direct Contact

Transmission by direct contact requires the presence of an agent or organism in the environment or within an infected animal. A susceptible animal becomes exposed when the agent directly touches open wounds, mucous membranes, or the skin through blood, saliva, nose to nose contact, rubbing or biting. It is important to note that depending on the disease agent, it is possible for direct contact transmission to occur between animals of different

species including humans. For the purposes of the BRM information, reproductive transmission will encompass those diseases spread through venereal and in-utero routes. *Venereal transmission* (breeding), a type of direct contact, is the spread of pathogenic agents from animal to animal through breeding. *In-utero* (dam to offspring) transmission, another type of direct contact, is the spread of pathogenic agents from dam to offspring during gestation.

Fomite Transmission

A fomite is an inanimate object that can carry disease agents from one susceptible animal to another. Examples of fomites include contaminated brushes, clippers, needles, balling guns clothing, milking units, teat dip cups, feed or water buckets, and shovels. *Traffic transmission* is another special type of fomite transmission in which a vehicle, trailer, or human spreads organic material to another location.

Vector-Borne Transmission

Vector-borne transmission occurs when an insect acquires a pathogen from one animal and transmits it to another. Fleas, ticks, and mosquitoes are common biological vectors of disease, and flies and cockroaches are a common mechanical vector.

Oral Transmission

Pathogenic agents can also be transmitted to animals or humans orally through consumption of contaminated feed, water, or licking/chewing on contaminated environmental objects. Feed and water contaminated with feces, urine or saliva are frequently the cause of oral transmission of disease agents. However, feed and water can be contaminated with other infectious agents as well such as ruminant protein in ruminant feed.

Environmental Contamination

Many disease agents can survive for extended periods of time in soil or other organic material like bedding, old feed, etc. Animals or humans can then acquire the disease agent as discussed in previous sections: from the environment through inhalation of aerosolized microbes, via oral consumption, or from direct contact with an animal or with fomites. Therefore, environmental contamination should not be ignored but studied. The routes the disease agent uses to get into the animal can be controlled if the animal's environment is controlled.

It is important to remember that disease transmission can occur without animals exhibiting obvious signs of disease.

That is why awareness of the various routes of transmission becomes so essential when assessing and developing a strategy to minimize the risk of disease for a facility or operation.

Enterprise Security

The other important aspect of biosecurity is the protection of the livestock enterprise from external threats or pressures whose goals are to prevent or stop the livestock enterprise. The reasons associated with the threat could include the desire to alter management practices, free the animals, destroy facilities and equipment, stop modern agriculture practices, or ultimately to bring harm to individuals associated with agriculture enterprises. The federal government defines actions against agriculture-associated industries with the intent to harm as *agroterrorism*. Activities of agroterrorism could arise from individuals or groups such as People for the Ethical Treatment of Animals (PETA), Animal Liberation Front (ALF), Earth Liberation Front (ELF), Greenpeace, or foreign countries.

Personnel

Enterprise security originates with the same three key principles of livestock health biosecurity: isolation, Traffic Control, and Sanitation. These three components are keys to prevent, contain, and mitigate the potential effects of an attempted or successful security breach. Along with the implementation of basic biosecurity practices additional employee screening and training is important. Careful selection, background checks and monitoring of new employees is crucial. There would be no easier way to bring a potential threat onto the livestock enterprise than through directly employing someone whose intent is to harm the enterprise.

Likewise, adequate employee training is essential. Livestock enterprise employees should be expected to be observant of their workplace and environment. Employees should be encouraged to adopt the philosophy that if a situation does not look right—question it. Owners, managers, and employees are the best suited to make judgments if a situation does not appear as it should or if things have been tampered or altered. Discovery and mitigation of a potential biological risk starts at the livestock enterprise—those associated with the ranch or farm are the first responders. The people and employees of the livestock enterprise are the first line of active defense against and mitigation of biological threats. Proper training in situation assessment and situation response is an extremely important aspect of employee training.

Situation Assessment

Just as situation assessment for BRM of health is important, situation assessment for enterprise security is imperative. Situation assessment should consider the BRM strategy for health and incorporate that strategy into the enterprise security strategy. The situation assessment should evaluate the livestock enterprise from an outside perspective. The goal is to determine where the enterprise is vulnerable. The list below is just a place to start. Additional information for situation assessment can be found in the General Prevention Practices Checklist.

- What type of perimeter enclosure is utilized?
- What level of access can someone gain to the enterprise?
- Are control points for human and animal traffic established?
- Is there a policy for control of visitors?
- What level of access is there to chemicals and feed resources?
- Does regular inventory of animals, chemicals, machinery, etc take place?

Once a situation assessment has been made and security measures have been put into place on livestock enterprises, the job is not finished. Vigilant adherence to the BRM strategies and security measures must be maintained. The time and resources invested in making a plan are wasted if that plan is not fully followed, maintained, and regularly reviewed.

Communication

Finally, direct and effective cooperation with the local law enforcement is crucial. Invite a law enforcement representative to work with you to develop the enterprise security plan. The perspective of law enforcement on the security plan will be valuable. Additionally, the educational opportunity that the livestock enterprise can afford the law enforcement personnel will be equally valuable to them. Familiarity with how a livestock enterprise functions and its personnel will be important should local law enforcement ever need to respond to a situation. The first time to contact law enforcement is not when the livestock enterprise is in crisis.

Five Reasons to Have a Biosecurity Biological Risk Management Plan

1. To prevent economic loss caused by production losses or premature animal depopulation.

2. To prevent theft of livestock, machinery, tools and equipment.
3. To protect the “wholesome” image of the food animal livestock producers sell and to protect “market access” of the products.
4. To prevent or minimize an interruption in cash flow or equity.
5. To change the attitude of ranchers/owners/employees to be aware of suspicious activities and suspicious people, and to “harden” their operation so that their ranch would be a difficult target for people that would do them harm.
8. Quarantine new animals for a minimum of three weeks before introducing them into the herd.
9. Ask feed suppliers about feed quality assurance programs to verify ingredients and prevent introduction of prohibited feed sources.
10. Consider using footbaths or plastic boot covers and handwashing stations to reduce contamination and improve sanitation.
11. Do not use feed equipment for manure handling because of likely fecal contamination.

Committing to a biosecurity/BRM plan is a vital step toward controlling infectious disease and an important component of enterprise security. Keeping pathogens out of a herd improves production efficiency, lowers costs, and reduces risks to personnel associated with the livestock enterprise. Heightened awareness of the issues of biosecurity/BRM at the producer level will ultimately benefit the livestock industry and animal agriculture.

Biosecurity Best Management Practices

1. Regularly evaluate activities management practices on your operation to assess the potential for biosecurity threats.
2. Be vigilant for signs of disease (coughing, weight loss, runny nose and eyes, difficulty breathing, abortions, stillbirths, etc.).
3. Know and understand the warning signs of exotic diseases (FAD).
4. Minimize access routes onto your operation to control unauthorized vehicular and personnel traffic.
5. Minimize unnecessary visitors to your operation; they can unknowingly distribute pathogens onto your operation.
6. Wash trucks and equipment to reduce contamination from outside sources and increase sanitation between uses.
7. Report unexplained death loss or illness affecting a high percentage of you herd.

12. Dispose of dead animals properly to eliminate pathogen exposure of healthy animals.
13. Control populations of rodents, birds, and insects to prevent transmission of diseases and reduce feed spoilage.

Biosecurity and Biological Risk Management Resources

- Center for Food Safety and Public Health: <http://www.cfsph.iastate.edu/BRM>
- Biosecurity Resource Center for Animal Health Emergencies: <http://www.biosecuritycenter.org>
- GMP for Controlling Disease: <http://www.ianrpubs.unl.edu/e-public/live/g1411/build/g1411.pdf>
- Centers for Disease Control: <http://www.cdc.gov/>
- Animal and Plant Inspection Service: <http://www.aphis.usda.gov>
- Association of Bovine Practitioners: <http://www.aabp.org>