Practical on-farm biosecurity

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Abstract

This manuscript will cover practical approaches to biosecurity on the farm. Biosecurity practices based on route of disease transmission will be emphasized, as well as a review of basic principles of biosecurity. Biosecurity principles commonly described as "everyday" and "enhanced" will be summarized in a practical, succinct way. Additional discussion on biosecurity risks, barriers and strategies will occur, and resources on helping veterinarians help their clients create a site-specific biosecurity plan, as well as related topic-specific resources like disinfection, will be shared.

Key words: biosecurity, disease

Introduction

The introduction of infectious diseases into a livestock herd can occur in a number of ways. Natural introductions can occur sporadically, particularly in endemic areas, from the environment or contact with infected wildlife. Additionally, microorganisms are constantly evolving and adapting, which can result in changes in the distribution, host range, or virulence of a pathogen. The accidental introduction of disease pathogens can occur through the movement of animals (e.g., new animals to a herd or flock), food products (e.g, contaminated meats from areas or countries where a disease occurs), or can be transferred by people, vehicles or equipment contaminated by infected animals. Pathogens of livestock or poultry can also be introduced intentionally (e.g., acts of bioterrorism, agroterrorism or warfare).

Disease spread occurs when the agent leaves its reservoir or host through a portal of exit, is transferred by some mode of transmission, and enters through an appropriate portal of entry to infect a new susceptible host. This sequence is sometimes called the chain of infection. The disease-causing organism has various factors which influence its ability and likelihood for causing disease, including its pathogenicity, the infectious dose required for disease to develop, the reservoir host, and the source of the organism, as well as the route by which the disease-causing organism can spread and factors pertaining to the new host, such as individual host factors, nonspecific resistance and immunity. The spread of infectious disease agents can be broken down into 5 possible routes of transmission: direct contact (horizontal or vertical), inanimate objects in the environment or fomites, ingestion, aerosol and vectors. It is important to remember that individuals (animals and humans) may be infected without obvious signs of illness and can possibly serve as a source of infection to others. Equally important is knowing that not all pathogens are spread by all routes of transmission. Understanding the portals of exit and entry and modes of transmission helps to determine appropriate prevention and control measures. Many diseases have a public health impact since they are zoonotic. Disease outbreaks have both direct and indirect costs for farmers. Farmers have fewer animals to sell, transporters have fewer animals to haul, slaughterhouses and processing plants have less animals and products to process, and the public pays a higher price for milk, meat or eggs. Additionally, there is a longer time to finishing and farmers must pay any costs associated with treatment.

Principles of biosecurity

Broadly, biosecurity is defined as on-farm management practices designed to prevent disease introduction (keeping disease off the farm, also known as bioexclusion) and control disease spread (keeping disease on the farm from spreading within the herd/flock and to other farms, also known as biocontainment). Biosecurity principles are commonly described as "everyday" and "enhanced". Everyday biosecurity measures are meant to protect animals from endemic disease, while the term "enhanced biosecurity" is most often applied to measures for the prevention of highly contagious foreign animal diseases, such as Foot and Mouth Disease. This manuscript describes the eleven categories commonly used in biosecurity guidance resources, briefly summarizing existing "everyday" and "enhanced" biosecurity measures, and distilling to a simple and practical recommendation for each.

Biosecurity measures

Biosecurity manager and written plan

Farms designate a biosecurity manager, who is familiar with the facility, develops a biosecurity plan with a veterinarian, communicates biosecurity measures, and monitors to ensure compliance. A written, site-specific biosecurity plan includes a labeled premises map including items such as parking, the perimeter buffer area, and the line of separation (described later), is communicated to employees and be accessible to others, and is reviewed annually and as changes occur. Items on the biosecurity plan are assessed as either "in place", "in progress", or "not in place", in the biosecurity plan and implemented on the dairy operation as evidenced by visual inspection or by signed and/or dated documentation, as applicable. In practical terms, "someone should be in charge, and a plan should be written down".

Training

The biosecurity manager and essential personnel are trained at least annually on how to keep FMD out of the herd. The training must be in a language understood by the individuals receiving training. Effective training ensures that individuals are aware of the concepts and procedures that apply to their specific areas of responsibility; training occurs at least annually and is documented. The biosecurity manager also ensures that all contractors, truck drivers, and service personnel are aware of and adhere to the biosecurity measures in the biosecurity plan. In practical terms, "go over what you wrote down with animal caretakers, and if someone's new or something changes, go over it again".

Farm access

For daily biosecurity, recommended practices include gates, fencing and barriers, signage, limiting entry to essential personnel, recording movements, and parking away from animal areas. Enhanced biosecurity farm access measures include a line of separation (LOS), which is an outer control boundary to minimize contamination near animals and separates off-farm from on-farm movements of vehicles, people, animals OR is the walls of building which separate animals from all possible sources of infection, and a perimeter buffer area (PBA), which is an outer control boundary to minimize contamination near animal building(s) and separates off-farm from on-farm movements of vehicles, people, animals. The LOS and PBA should have a minimum number of access points, which can be determined by thinking about the inputs/outputs that occur regularly on the operation over a 30-day period. In practical terms, "make sure not just anybody gets in or goes near animals", and design "traffic flow" thoughtfully." Once this is done, try to keep the "ins" in and the "outs" out, and if something from the outside needs to go in, be thoughtful about where and how it enters (and make sure it's clean).

Vehicles/equipment

Avoid or minimize sharing vehicles and equipment. If sharing is required, the vehicle or equipment should stay outside of the PBA/LOS; if it must enter, it is cleaned and disinfected. Routes minimize contact with animals, feed and manure. In practical terms, "don't share stuff, or if you have to, clean and disinfect (C&D) it first; the stuff shouldn't touch animals, feed, or manure (unless that's what it's for), and think about biosecurity when loading and unloading animals". Cleaning involves four steps: dry clean, wash, rinse and dry. Before disinfecting, be sure to read the product label so that you understand mixing, application, contact time and safety. Disinfection involves four steps as well: apply the disinfectant, wait for the appropriate contact time, rinse and dry. It's also important to consider the type of surface that is being disinfected. Smooth surfaces are the easiest to disinfect, porous surfaces are more difficult to disinfect, and dirt surfaces are the most challenging to disinfect. In practical terms, "if you are going to C&D, do it right by cleaning before you disinfect, use the right product for the situation, give it time to work, and use it safely".

Personnel

Prior to arriving at the dairy, access is limited to individuals who are essential to the operation of the dairy. Everyone crossing the LOS on foot or exiting their vehicle inside the LOS arrives at the operation having showered and wearing clean clothing and footwear since last contacting susceptible animals. All individuals crossing the LOS have a signed agreement on file agreeing to follow these instructions. An entry logbook, and written biosecurity entry and exit procedures, should be followed. All individuals who cross an LOS access point on foot or exit their vehicle inside the LOS, ensure that visible contamination on their footwear, clothing or exposed skin does not enter or exit the operation, following the biosecure entry and exit procedures as specified in the biosecurity plan. In practical terms, "wash your hands, wear clean clothes and shoes, avoid contact with outside livestock if possible, and visitors, delivery people, and service persons who don't need to enter livestock areas should be asked to go elsewhere".

Animal movement

Daily biosecurity practices include recordkeeping, such as identification, movement logs and source documentation, as well as animal health protocols, established in collaboration with a veterinarian, and which should include protocols for quarantine and isolation and animal flow. Enhanced biosecurity practices pertain to incoming animals, whereby animals only come from sources with documented biosecurity practices and no current or previous evidence of FMD infection, and follow a pre-movement isolation period, whereby no animals from an FMD Control Area are introduced onto the operation for at least 7 days prior to moving animals to another production site with susceptible animals. In practical terms, "establish quarantine and isolation protocols, and follow them… always".

Animal product movement

Semen and embryos come from sources with documented biosecurity protocols and no current or previous evidence of FMD infection. Semen and embryos are transported in containers that can be cleaned and effectively disinfected to minimize the risk of virus transmission. Colostrum should be fed from the source herd or pasteurized. A milk disposal plan exists in the event raw milk cannot be moved to processing off-farm. In practical terms, "Check on biosecurity practices for wherever your products are coming from (or going to, if they're picked up on farm)".

Carcass disposal

Dead cattle are disposed of in a manner that prevents the attraction of wildlife, rodents and other scavengers. Rendering trucks and other vehicles hauling dead animals to a common disposal site do not cross the LOS. In practical terms, "Be smart about where you put carcasses and how you move them and ensure carcasses don't attract scavengers".

Manure management

Manure is stored and removed in a manner that prevents exposure of susceptible animals (either on or off the premises of origin) to disease agents and meets state, local and Responsible Regulatory Officials' regulations. Manure handling equipment is separate from feed handling equipment, or is C&D between use. In practical terms, "Regularly remove manure from animal areas, and use separate equipment for manure and feed (or clean between use)".

Rodents, wildlife and other animals

Three steps are followed: clean, exclude and control. Cleaning includes general farm maintenance, weed/grass control around buildings, sanitation and drainage, which are important because it reduces attraction of wildlife and rodents. Trash should be regularly removed and feed spills cleaned up immediately. Waste milk and dead cattle should be disposed of/removed promptly. Outdoor raised animals are at risk of wildlife contact. Sturdy, double fencing at a height that accounts for jumping deer and aggressive feral pigs surrounding dry lots, pastures and buildings housing cattle is one option that could be implemented for exclusion. Complete exclusion of wildlife may not be possible. Bird control should follow local or state regulations. Dogs and cats should be secured during an outbreak to prevent contact with cattle and feed areas. Ask your neighbors to the do the same to prevent roaming. Rodent control options could include designating an on-farm monitor or using a company. In practical terms, "control/deter wild birds, rodents, and wildlife, and don't allow pets, etc. in animal areas if possible".

Feed and Water

Daily biosecurity practices include feed storage and handling that prevents contamination, cleaning of feed spills immediately, including disposal methods and routes in plan/labeled on map, and separating manure handling equipment from feed handling equipment (or C&D between use). C&D feed delivery vehicles, if cross LOS, and finished feed is stored in closed bins or buildings. In practical terms, "Store feed securely, clean up feed spills promptly, and use separate equipment for feed and manure".

Biosecurity planning and resources

The Secure Milk Supply Plan (securemilk.org) describes enhanced biosecurity for Foot and Mouth Disease prevention. A variety of other advanced biosecurity resources are available, including training materials on Secure Food Supply biosecurity, and checklists and videos pertaining to specific topics such as setting up and operating a cleaning and disinfection station on a livestock premises. This manuscript recommends the Biosecurity Your Way resource for practical, on farm biosecurity (**farmbiosecurity.cfsph.iastate.edu**). This tool provides resources to learn about biosecurity, design a biosecure farm and make a customized plan. Offered are checklists, tip sheets, videos, lessons, templates and more. The resources are also available in Spanish.

Biosecurity barriers and strategies

Although many biosecurity measures are effective, there may be barriers to implementing them on the farm. These can include social and cultural acceptability, risk perception and access to biosecurity information. Additionally, the cost of biosecurity measures can be a barrier. It may be helpful to provide cost-benefit data to farmers – this enables them to see how biosecurity can improve their livelihood. Remember that some biosecurity costs are due to setup while others are recurring. In some countries there may be public programs that share the cost of biosecurity implementation, since animal health impacts national economies. The public sector has the ability to impact farm biosecurity through regulation and penalties. However, incentives are a powerful tool to increase compliance in a positive way. Trust between farmers and the public sector is critical for animal health. While explanations, recommendations, and messaging are important, the public sector must listen and advocate for rural communities to achieve farmer buy-in. In addition, farmers must advocate for the importance of animal health. Education, especially of animal owners, can be critical in preventing and controlling disease. Sharing specific interventions that can impact animal health can be helpful. In addition, reminding animal owners that preventing and controlling animal diseases can also have impacts on food security, public health and finances can provide additional benefits.

Conclusions

The introduction of infectious diseases into a livestock herd can occur in a number of ways. Understanding the portals of exit and entry and modes of transmission helps to determine appropriate prevention and control measures. Broadly, biosecurity is defined as on-farm management practices designed to prevent disease introduction (keeping disease off the farm, also known as bioexclusion) and control disease spread (keeping disease on the farm from spreading within the herd/flock and to other farms, also known as biocontainment). Biosecurity principles are commonly categorized into 11 areas: biosecurity manager and written plan, training, farm access, vehicles and equipment, personnel, animal movement, animal product movement, carcass disposal, manure management, rodents, wildlife and other animals, and feed and water. While all categories may include measures that are complex, it is also possible to distill practices into simple, practical recommendations. A useful resource for practical implementation of biosecurity is the Biosecurity Your Way website, which includes lessons, checklists, templates, tip sheets, videos, and more, available in English and Spanish. Visit the website at **https://www.extension.iastate.edu/smallfarms/biosecurity-your-way**.

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