The Healthy Herd Series: A Biosecurity Overview

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Swine producers continue to enhance their farm's biosecurity plan, but unfortunately disease outbreaks still occur and cause significant economic losses. For example, the cost of PRRSv has risen from $664 million between 2006 to 2010 to $1.2 billion annually (National Hog Farmer, 2024) and PEDv costs US pork producers approximately $50 million annually (Ann Hess, 2024). Disease outbreaks not only impact animal well-being but can have a profound impact on human mental health. Biosecurity is the farm's first line of defense and is ever evolving. Biosecurity protocols should have clear, concise instructions about human and animal movements, cleaning of the facility and disinfection. These protocols should be easily accessible, understandable, and communicated to farm staff and visitors. It is beneficial for producers to regularly evaluate their current biosecurity protocols with their herd health providers and stay vigilant to any signs of illness within the herd. Regular evaluation is key to staying one step ahead, and with the rising cost of disease breaks, it is more important than ever. While this is not an exhaustive list, below are some key items to take into consideration when creating a biosecurity protocol.

System Type Matters

The type of facility that you have can affect your protocols. An all-in all-out system is going to have different procedures regarding cleaning the facility compared to a continuous flow system.

All-In | All-Out

All-in all-out systems offer the highest level of biosecurity because it reduces the possibility of disease transmission from one group of pigs to the next (Varga Lab-Module 5). If one group breaks with disease, they will all be leaving the facility at roughly the same time. Once the barn is empty, it can be thoroughly deep cleaned, disinfected, and dried prior to the next group's arrival (Varga Lab-Module 5).

Continuous Flow

Continuous flow systems can make biosecurity more difficult. In a continuous flow system, new animals are introduced while the previous animals are still present. This means if there are infections in the current group of animals, the new group will also be subjected to whatever pathogens are present (Varga Lab-Module 5). This continuous supply of pigs makes it difficult to get illness under control (Varga Lab-Module 5).

Perimeter Buffer Area (PBA)

A perimeter buffer area is an outer perimeter around the barn that is used to help keep disease from entering the system. This can be something such as a fence around the property. It should be noted that the property perimeter and PBA do not have to be the same (SPS Information Manual for Enhanced Biosecurity: Animals Raised Indoors)!

This area should be large enough to create a true buffer zone and permit only necessary movement of people

and vehicles, and small enough to prevent unnecessary or unwanted traffic (Verga Lab-Module 3).

People, vehicles, supplies etc. should be thoroughly disinfected and follow all biosecurity precautions prior to entering the PBA. Ideally any unnecessary movement within this area should be limited.

Line of Separation (LOS)

Line of separation is transition zone from the dirty side (outside of barn) to the clean side (area where animals are housed). Examples being a shower or bench. A LOS is a critical part of biosecurity and should be clearly defined and never crossed with footwear from the dirty side. The shower or bench options are extremely helpful because they are physical barriers that make personnel take some form of action to cross. This action causes employees to stop and consider the right choice regarding crossing the barrier. Nothing should cross this line until they have been decontaminated. Signs are also helpful to indicate a LOS.

When using a shower-in shower-out LOS, an individual enters one side of the shower (the “dirty side”), removes outside items and clothing, enters the shower, and after showering emerges on the “clean side” where clean farm-only clothing items would be waiting. Upon exiting the facility, employees would be required to leave any barn clothing on the clean side to be washed internally, and shower again when exiting. Once back on the dirty side, they should wear their personal or “dirty side” clothing to exit the facility. Showering when leaving the facility is important in limiting the spread of known or unknown pathogens that may be within the facility.

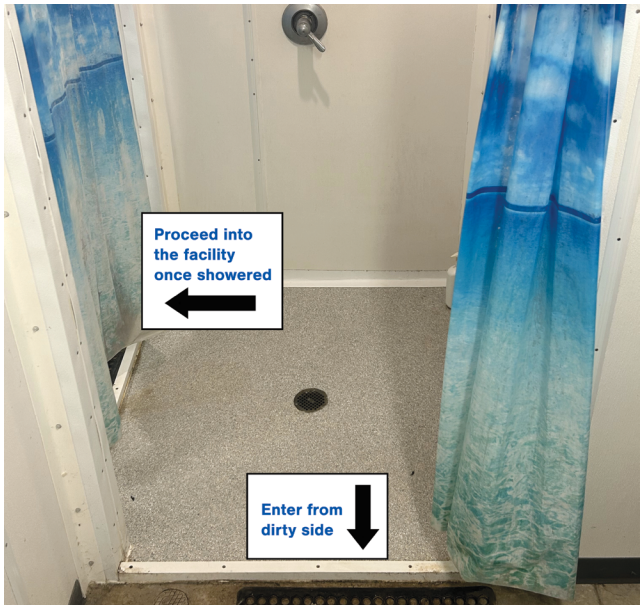

Photo courtesy of Dr. Rafe Royall and SDSU Swine Unit

A bench LOS is a literal bench separating the clean side from the dirty side. In this situation an individual would leave at minimum their dirty/outside footwear on the dirty side (do not let your feet touch the dirty side floor), cross the bench, put on clean boots, and clean or disposable coveralls, boot covers, or additional clothing items depending on farm protocol. Using a bench in conjunction with a shower, further reduces potential pathogen transfer. This is commonly known as the Danish Entry System.

Photo courtesy of Dr. Rafe Royall and SDSU Swine

Having a complete change of clothing, footwear, coveralls and boot covers assists with preventing disease transfer more effectively than changing boots alone. While changing footwear is important, pathogens can be carried in on any clothing that was worn on the dirty side as well as skin, hair, and jewelry (especially porous materials like watchbands).

Not only do people need to take care when crossing LOS, but so do inanimate items entering the farm such as cell phones, food items, and general farm supplies such as new clothing, cleaning, and toiletry items. This is a necessary but easily overlooked precaution. It has been shown that bacteria such as *Mycoplasma hyopneumoniae* have the ability to survive on surfaces for up to 8 days at 4°C (39.2°F) (Browne et al., 2017). There are multiple ways in which these items can become disinfected. Spraying appropriate non consumable items with disinfectants or wiping smaller items with disinfecting wipes in conjunction with quarantining the items is a good precautionary measure.

Ultraviolet light boxes (UV box) are chambers that emit ultraviolet light. UV light boxes are germicidal and reduce microbial load (Holtkamp et al., 2020). These boxes are great for small items such as lunch boxes, phones and other small electronics (Holtkamp et al., 2020).

For larger items, or multiple items, airlock chambers with disinfecting spray work well. Airlock chambers remove dirty air and replace it with filtered air and can be one or two stages. Some chambers are set up to fumigate disinfectants into the chamber to disinfect any items inside.

Biosecurity Maps

Biosecurity Maps are extremely helpful at providing a visual representation of where lines of separation, PBAs, access points, additional on-site locations and routes individuals should use when moving about the property. It is helpful to have each LOS, clean-dirty lines, access points, etc. identified by a different color with a description of what they are and what precautions should be used. Theses maps can be created via Google Earth Pro; a step by step guide from Michigan State University Extension can be seen here: Creating a Biosecurity Plan Map of Your Swine Facilities Using Google Earth.

Signage and Security

Signage is very important for clearly communicating restricted areas and directions for enhanced biosecurity. Variations of “Do Not Enter” or “Stop. Biosecure Area” signs should be clearly visible around the property and at all farm entrances. If applicable, disinfection areas for vehicles should be clearly labeled.

Building doors and gates should always be locked when no one is present.

Security cameras allow for constant monitoring of the facility at all hours. It is important to routinely check that all cameras are functioning and recording.

Employee badges with specific door access are a great option for limiting areas of access and recording who enters and exits a facility, where they went and for how long. Certain barn technology systems such as Maximus have door scanners with badges that can be integrated with the current barn system and assigned to specific personnel. Regular door ID scanners can be purchased from numerous security companies and even Amazon.

Taking security, a step further would be facial or biometric recognition at all farm access points or at high-risk biosecurity areas.

Example of proper farm signage. Courtesy of Dr. Rafe Royall and SDSU Swine Unit

Vehicles

All vehicles including staff vehicles, animal transporters, and feed trucks should have clear instructions about disinfecting and where they are allowed to drive on property prior to arrival.

It can be beneficial to have a disinfecting station at the property’s entrance where all drivers can spray off their tires with disinfectants. This can be done using a hydro-foamer or garden sprayer filled with disinfectants (follow label instructions).

Employees should take personal cars through carwashes when able.

Animal transport vehicles should be washed, disinfected, and dried before returning to pick up additional loads.

Packing plants and livestock auctions are the perfect place to pick up unwanted pathogens. When cleaning, all debris and manure should be removed prior to the application of disinfectants. Corners tend to hold manure and should be examined thoroughly. Even during winter months, it is vital that vehicles are thoroughly disinfected. In a study done by Dr. Scott Dee it was shown that during cold temperatures PRRSV was able to survive on various snow covered surfaces (-2°C) for up to 4 hours (Dee et al., 2002)

Scheduling loads is also very important in maintaining biosecurity. All drivers should have clear instructions on where they can drive on the property and where specifically the load out site is. Communication is key

if there are split loads. A truck with a split load from a farm that has an ongoing or a previous disease break and one that is clean should pick up at the disease break facility last. When transporting pigs or piglets to a new sight, alternative routes should be provided to avoid driving near facilities with a known disease outbreak.

Employees and Visitors

Biosecurity starts with people. All employees should participate in mandatory biosecurity training provided by the farm to ensure they understand what is expected of them and how crucial these practices are in limiting the spread of disease.

It is important to remember that humans act not only as disease transporters but can be disease introducers in the case of influenza (Alarcón et al., 2021).

Outside footwear should not be brought into the facility and at minimum should be required to be covered with boot covers.

Visitors should be made aware of farm rules and required downtime prior to arriving at the site.

Downtime is the required amount of time an individual should have no exposure to swine prior to visiting a farm, this is typically 24 to 72 hours. However, this varies from farm to farm. There are conflicting views on how long downtime should be and its efficacy so consult with your veterinarian.

Naive, closed, farrowing, biomedical or nucleus farms may require much more downtime due to the devastation that could occur should such a high-health farm break with disease

Visitors should be required to sign into the farm and sign a visitor waiver stating their understanding of the farm rules and that they have completed the mandatory downtime. This helps a farm keep track of visitors and could be beneficial if a disease break occurs. Visitors should indicate their purpose for the visit, company if applicable, and last day they were around swine (Alarcón et al., 2021). Visitors and employees should avoid bringing any pork products onto the farm (Alarcón et al., 2021).

Proper Protective Equipment and Boots

Disposable boot covers, coveralls, and even face masks are great tools in limiting the spread of pathogens. Having these Personal Protective Equipment (PPE) items on the farm allows individuals to put the attire on over their clothing, as visitors cross the LOS and dispose of the PPE before leaving. This kind of PPE can be helpful when interacting with different age groups or if you must visit multiple farms.

Ideally employees and visitors should have boot covers in their vehicles and should cover their footwear before exiting the vehicle, making sure that the freshly applied covers don't touch the vehicle's floor prior to getting out.

Having completely separate sets of clothing and boots for guests and employees allows them to leave dirty side clothing on the dirty side. This helps reduce the chances of pathogens hitching a ride on outside clothing. It is also helpful to have room specific boots and shoes. Employees can transition into the animal area by removing the boots from one room/phase of production and putting on the boots found in the new room's/phase's doorway.

If possible, create boot washing stations where individuals can spray off their boots with water and scrub them with a brush, removing any manure or debris prior to foaming them with disinfectant. Scrubbing boots clean is vital for the efficacy of a boot washing station.

In a study by Dr. Amass examining boot baths, it was observed that the type of disinfectant used was irrelevant if manure was present (Amass et al., 2000), but scrubbing the boots was adequate at reducing pathogen load (Amass et al., 2000). Keep in mind that boot bath cleanliness and time are vital for efficacy. This technique is particularly valuable for employees going between gestation and farrowing, especially since they are working with not only mature pigs but also young pigs with developing immune systems. Remember that disinfectants take time to work effectively and should be used according to label. Also, foot baths need to be changed frequently.

Photo Credit: Dr. Rafe Royall & SDSU Swine Unit

Young to Old | Healthy to Sick

It is good practice when walking barns or performing daily chores to start with the youngest, most susceptible pigs and work your way to the older pigs. Additionally, work with healthy pigs prior to sick pigs, and take extra care to disinfect boots and clothing after caring for ill animals. If you must re-engage healthy pigs, take extra precautions such as changing clothing entirely, washing hands or wearing gloves. Swine consultants or visitors who need to visit more than one facility in a day should schedule visits starting with the youngest, healthiest barns early in the day.

If possible, sick pigs should be removed from the general population to a designated "Sick Pen". This allows for consistent observation and easier treatment. Additionally, a sick pen reduces the chances of staff having to remix with healthy pigs during the day.

Pests and Flys

Pest such as rodents and birds can transport diseases, so it is important to have effective pest management on site. This includes mouse/rat traps or bait boxes in and around the facility. These should be checked on a regular schedule.

Fly control programs should be implemented and maintained on farms. Fly bait and strips should be placed in offices and hallways. There are commercial pit additives to help reduce fly populations, as well as sprays.

Measures should be in place to prohibit all outside animals, including birds, from coming into contact with the pigs. It is also beneficial to clean up any feed on the ground, both inside and outside of the barns, to help reduce rodents, birds, and flies from coming for a free meal. Making sure feed is properly stored not only helps reduce pests but limits chances of contamination.

Conclusions

Biosecurity is the farm's first line of defense and should not be taken lightly. Due to the in-depth nature and variability in practice, we will be releasing factsheets that take a deeper look at specific areas of biosecurity, disease, animal health, and so much more!

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