



Veterinary Science Information

Biosecurity A Practical Approach

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In today's animal agricultural industries various trends are present to potentially increase the spread and prevalence of infectious diseases in herds. Many of the diseases are of food safety concern or of economic concern. In either case it is important to the animal industry both for confidence in agricultural products, market share and for economic reasons to prevent the spread of infectious diseases from farm to farm. **The series of management practices that are employed to prevent the importation of infectious agents from entering a farm is termed biosecurity.** Biocontainment is similar to biosecurity. **Biocontainment is the series of management practices that prevent the spread of infectious agents between animal groups on a farm or the management practices designed to prevent the infectious agent from leaving the farm.**

As herd size increases and as herds are placed in more intensive housing management systems, in many cases it is easier for infectious diseases to enter and spread throughout a herd. In this regard relatively small and stable herds with minimal herd additions and good animal comfort frequently have a lower prevalence of infectious disease and may have several advantages in developing a biosecurity and biocontainment program. With the recent headlines and concern regarding infectious disease spurred by the spread and economic devastation wrought by Foot and Mouth Disease in Britain, this is an excellent time to re-enforce the need for an effective biosecurity program. One way to concisely introduce biosecurity and biocontainment is to use the acronym IRS. Simply put IRS stands for **Isolation-Resistance-Sanitation.**

Isolation

The most common biosecurity risk factor is the purchase of animals. The prevalence of specific infectious agents of concern should be determined for the farm. New additions to the herd should be inspected carefully, screened, and quarantined for infectious diseases. A program to routinely and systematically monitor and survey the herd for the presence of important infectious agents should be implemented. These steps are the foundation for **Isolation.** Many



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people do not appreciate that apparently healthy looking animals can still be in the prepatent or carrier state of infection. In this case the animal may be shedding or harboring an infectious agent but appear perfectly normal. When stressed or housed adjacent to susceptible animals these silent carriers can spread the infection to other animals. Developing a strategy to keep infectious agents and discharges away from susceptible animals, especially critical with herd additions, can help to reduce animal disease and minimize economic loss.

Careful screening and appropriate testing will help to limit the addition of animals with unwanted infectious conditions. Understanding the limitations of testing is important. The characteristics of common tests coupled with an adequate herd history allows veterinarians and agriculture professionals to make sound scientific judgment on the risks of potential herd additions. Far too often this crucial step is skipped because it is sometimes difficult to see the economic benefit of pre-purchase testing and inspection. Inevitably the small price paid for screening is a bargain compared to dealing with the long term consequences of disease introduction.

Ideally even after screening, new herd additions should be quarantined for a minimum of two weeks or a more ideal four weeks. All animal discharges, manure, urine, and fetal fluids should be isolated from the quarantined animals and the established herd. The quarantine period should also involve separate air handling and separate feed and water troughs. In general, many acute diseases run their course in two to three weeks, and the use of an effective quarantine program can greatly reduce many of the acute biosecurity hazards. This quarantine period can also be used to further screen animals to detect any disease conditions that might have been missed in the initial screening. Any animals that become ill shortly after purchase or during the quarantine period should undergo a thorough diagnostic work up and adequate treatment program or be culled. Rapid early detection and treatment when appropriate can prevent the initial case of an outbreak from spreading through the herd.

Other risk areas where animals can become exposed and isolation needs to be practiced include: common equipment to feed and haul or scrape manure, clothing/boots, wildlife vectors, or stock trucks/ trailers that have not been adequately cleaned between herds. Common fence lines, shows and fairs are also possible contact areas.

Resistance

The second important aspect of a biosecurity program is **Resistance**. Resistance includes nutritional, environmental, pharmacological and immunological practices that improve the animal's ability to resist disease. These external factors coupled with the natural genetic disposition of certain animals provide an animal with either increased or decreased susceptibility to certain infectious diseases. Antibiotics and immunizations have been the primary tool for controlling infectious disease in the past. While the importance of these two factors cannot be ignored, more and more emphasis is being placed on supporting the innate ability of animals to resist disease. Therapy and immunization can then be viewed as adjunct treatments. A sound nutritional program that promotes good overall health and growth and an environment that minimizes stress, promotes the animal's resistance to all sorts of infectious agents. A bonus included in the overall immune status or resistance is that such overall improvement, typically increases the productivity of the animal as well as promotes good health. A further benefit is that the healthy animal on a good nutritional plane, generally responds better to antibiotic therapies and immunizations when they are indicated.

A truly effective immunization program needs to be customized to the farm. While some generalities can be made concerning vaccines and immunization, the most cost effective plan

must be designed to compliment the animal groups and risk of exposure on a particular farm. One size does not fit all, and more is not always better. A well-designed immunization plan will compliment animal health but cannot be substituted for good management or prevent infection in the face of overwhelming challenge. The local private veterinary practitioner is the person best able to assess and recommend the most cost effective immunization program for a specific farm.

Sanitation

The final piece to the IRS acronym is **Sanitation**. While frequently the least attractive aspect of a biosecurity/biocontainment plan, sanitation is often the key factor in minimizing spread and limiting the course of infectious diseases. This involves the removal or eradication of persistently infected or carrier animals, as well as the disinfection of any potentially contaminated equipment or facilities. Once animals that are shedding pathogens are cured or removed, as much contaminated material as possible should be removed. This will help to eliminate the source of the infectious agents. Disinfection of partitions, floors, and other objects that can serve as fomites or harbor pathogens must be part of the biosecurity plan. Failure to adequately clean and disinfect and ensure all sources and reservoirs of the pathogen are removed can allow an infectious agent to re-enter the herd. An abbreviated table of disinfectants is included as Table 1. As part of the farm plan, which includes biocontainment, it is important for other producers and product quality that infectious agents do not leave the farm and enter the food chain (for zoonotic diseases) or neighboring herds (for contagious animal diseases).

The life span of pathogens varies greatly. Many viruses and bacteria have a relatively short life span outside the host in an unprotected environment, often hours to days. Others can be viable for years. However, the lifespan of most pathogens can be expanded greatly when protected in organic material. Thus protected, even the fragile pathogens can often remain infective for days, months or in some cases, years. Organic material can also inactivate many disinfectants limiting their ability to destroy the pathogens. Therefore a key control feature to limit or eliminate most infectious agents is the careful and thorough removal of all organic material. In many cases just thorough cleaning will remove as much as 95% of the pathogens. Unusual or special equipment that may be used for many animals needs special attention for sanitation. Such equipment would include feeding equipment for young animals, medical equipment for treating sick or injured animals, obstetrical or other equipment for use in maternity stalls. Buckets and feeding troughs should be scrubbed to eliminate any secretions and then sanitized. Equipment used to mix or deliver feed must be kept clean and sanitized as necessary. Trucks or trailers that visit multiple farms should be cleaned and sanitized before hauling any animals back to a farm.

Other areas that need special attention are, boots and soiled clothing as these can serve as important mechanical vectors. Manure, dead animals, or tissues must be disposed of in such a manner to allow time, temperature, desiccation, or ultra-violet light to inactivate the pathogen. These potentially highly infectious materials need special attention, to prevent the re-introduction of pathogens into susceptible herd mates. Veterinary practitioners and Ag professionals may need to employ some creativity to help producers identify appropriate methods to dispose of such materials.

Biosecurity/biocontainment can be accomplished on nearly every farm if some common sense and science are employed to create a program and protocol. A biosecurity plan can potentially save a producer from significant economic loss and lend assurance to consumers that products are safe and wholesome. A common stumbling block on many farms is the inability to break down the concept of biosecurity into understandable and simple steps that can be

consistency practiced. Using the acronym **I** for isolation, **R** for resistance, and **S** for sanitation helps to make the biosecurity principles easier to remember and may help to motivate a consistent and effective program.

Developing a Biosecurity Plan

In order to effectively begin to develop a biosecurity program it is important to review the risk areas that may be present on a farm. Risk assessment helps to determine the areas or factors are most likely to lead to the spread of infectious agents. Risk management is the second step. Here a preventive plan is developed and implemented. The final step the risk communication. In this step, all members of the farm management team, suppliers, and service personnel are informed of the plan to ensure cooperation and buy-in.

To make the development of biosecurity plans more effective materials are being developed to reflect areas or activities on the farm that can be classified as to the level of risk. Certainly these will vary with the disease in question and the individual herds' goals and disease prevalence. However, on practically every farm there are groups of animals that tend to be the more susceptible to disease and activities that can potentially affect animal groups very differently. These can vary simply due to the potential to carry pathogens between animal groups or between farms. To make this concept easier to understand risk areas are being classified as low risk (green), moderate risk (yellow), and high risk (red). A low risk area is typically the farm office. An example of a moderate risk area on a dairy farm would be the milk house. Examples of a high-risk area would include the maternity or nursery areas, which for many diseases, has the highest risk animals. Coupling the goals of the farm, the characteristics of specific pathogens, and the prevalence of the disease on the farm allows the veterinarian and other ag professionals to assist producers in identifying key practical areas to concentrate their efforts. Providing a plan that truly manages risk allows the producer to customize a biosecurity plan to focus on areas and activities that make the plan practical and effective. Finally, all employees, visitors, and service personnel must participate in the program. Everyone that works on or visits the farm for any reason should be aware of and follow the biosecurity protocols. Table 2 is a risk assessment tool for farm visitors to determine their relative areas of risk. This risk assessment would apply to many of the common domestic animal diseases. Foreign animal diseases would require a much more stringent set of biosecurity protocols. The following are other procedures can be included to make it less likely to spread pathogens from farm to farm.

1. If more than one farm is visited per day, and it can be anticipated where activities are likely to be in wet or manure areas, or in an animal contact area, do this farm visit last in the day. Do the cleanest sites first and dirty sites last whenever possible.
2. Visitors, ag professionals, or service personnel should carry coveralls (clean cloth or disposable would be ok) disinfected boots or disposable boots. If activities take place in animal contact areas or feed mixing areas coveralls and boots should be worn.
One pair of coveralls per site. With cloth coveralls they should be clean or washed between sites. For cloth coveralls, nylon or blends often are the best. They are the best for clean up, don't hold much debris, and are fast drying. For highly infectious materials and the highest on farm biosecurity, impervious disposable coveralls (such as Tyvek), caps, masks, and disposable boots should be worn.
3. On routine farm visit hats and jackets should also be considered. If they become soiled they should be washed before being worn on the next farm. A light nylon shell can be carried and worn when needed. These are light and easy to wash, and they dry quickly. A further advantage is that they can be worn alone or over a regular coat.

4. Coveralls and boots should be removed before entering the car. If possible find someplace dry and throw them in a bag, tub, or bucket so that the car interior doesn't become contaminated. Coveralls can be rolled up inside out and stored in a bucket with the boots.
5. If during a farm visit, ag service personnel or ag professionals become contaminated or find themselves on a farm where they suspect problems or know there are infectious diseases, they should go home and shower and change before any other farm visits. Rather than visit other farms that day they may want to review their schedule. If possible, they should work in their office or make other calls that do not require farm visits, especially to farms, which may house susceptible animals. If in doubt ag professionals should not go directly to another farm and risk contaminating it after a visit to a farm where there are known or suspected problems.

Table 1.

General Facts About Disinfectants

Chemical	Gram + Bacteria	Gram - Bacteria	TB like bacteria	Fungi	Virus	Best pH for activity	Activity in organic material	Common uses *
Chlorhexidene	SA	SA	SA	SA	Most	Wide range	Good	EPF
Formaldehyde and aldehydes	++	++	++	++	++	Wide range	Good	EPF
Chlorine Chloramines	++	++	SA	++	SA	Acid	Very poor	CE
Iodophors	++	++	SA	++	SA	Acid	Fair to poor	CE
Sodium Hydroxide	++	++	SA	++	++	Alkaline	Good	P
Quaternary ammoniums	++	+	No	SA	SA	Alkaline	Fair	CE
Phenols	++	++	+	SA	SA	Acid	+Good	EPF

- SA-some activity

*E-equipment

P-premises

F-footbaths

C-clean equipment

Adapted from Purdue University Cooperative Extension Bulletin PIH80

Table 2

Biosecurity Risk Assessment Ag Service Personnel and Neighbors

Check most appropriate box	Low Risk	Moderate Risk	High Risk
Number of farm visits per day	One farm, little or no animal contact	Occasionally visits more than one farm per day Minimal animal contact	Visits many farms or auctions Much animal contact
Protective Clothing	Wears sanitized shoes or boots One pair of coveralls per site	Wears sanitized boots and clean coveralls. If clean may not change coveralls	Does not wear protective clothing or the same clothing between farms
Leaves materials or borrows supplies	Materials and supplies away from animal or feed areas	Materials and supplies in areas of minimal animal or feed contact areas	Materials and supplies may be left in animal or feed contact areas
Animal ownership	Does not own similar species at home	Similar species but a different production type	Owns and/or cares for a similar species and production type at home
Contact with potentially infected animals	Minimal or no contact with potentially infected animals	Contact with healthy animals and avoids contact with potentially infected animals	May own or be exposed to many animals of unknown health status
Work in animal contact areas	Does not work in areas with highly susceptible animals	Minimal exposure to high risk animals and only with protective clothing	Works with highly susceptible animals. Little precautions.
Biosecurity knowledge	Understands promotes biosecurity for industry	Exposed to biosecurity principles but is not an advocate	Little appreciation for biosecurity and does not view it as an industry issue
Foreign Travel	Does not travel out of the US or Canada	Limited travel outside of US or Canada without animal contact	Travel to foreign countries with animals contact in those countries
Foreign Visitors	Prohibits foreign visitors contact with animals or feeds	Foreign visitors may be in animal or feed areas after adequate quarantine	Visitors are permitted in animal or feed contact areas without screening or quarantine

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Issued in furtherance of Cooperative Extension work, Acts of Congress May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture and the Pennsylvania Legislature. T R Alter, Director of cooperative Extension, The Pennsylvania State University.

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