

Chapter 38. Biosecurity

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Objectives

- Discuss the importance of biosecurity.
- Provide an example of a biosecurity program.
- Outline actions that should be taken for Orange and Red threat levels.

Biosecurity describes programs for preventing the introduction of pathogens considered potentially harmful to the health and well being of the herd. A pathogen is defined as any infectious agent that causes disease. Examples of various pathogens are viruses (foot and mouth disease, bovine viral diarrhea virus BVDV), bacteria (*Brucella abortus* or brucellosis, *Mycobacterium paratuberculosis* or Johne's Disease), and prions (bovine spongiform encephalopathy, scrapie in sheep). Biosecurity on a national level consists of foreign animal disease surveillance performed by the Animal and Plant Health Inspection Service Laboratory (APHIS) at Plum Island, New York and the United States Department of Agriculture (USDA) Harry S. Truman Animal Import Center, Fleming Key, Florida. APHIS veterinarians and support personnel across the nation provide constant vigilance to keep our livestock free of foreign animal diseases that could cost the industry and consumers billions of dollars. Biosecurity at the herd level is up to the individual producer and their veterinarian to design strategies to prevent entry of costly diseases.

"The common disease prevention and control practices employed by the majority of beef herds today are inadequate to meet the future demands. They rely on visual observation, regulatory compliance, vaccination, and limited attention to biosecurity of the herds making animal additions." (Thompson)

THE IMPORTANCE OF BIOSECURITY

Infectious diseases introduced into an operation can have a devastating effect on cash flow and equity. It is commonly thought that the adverse effect of disease is decreased reproductive efficiency (decreased pregnancy rates, early embryonic deaths, abortions, congenital defects, weak calves), decreased production (weaning weights, daily gain, decreased feed efficiency), and increased morbidity (sickness) and mortality (death) rates. Just as

important can be the loss of marketing options. With increased scientific information available on the pathogenesis, transmission, and diagnosis of diseases such as BVD, Johne's and others, the liability associated with selling infected animals will increase. A "slaughter-only" option to a seed stock producer can be devastating. Similarly, as other countries embark on programs to control or eliminate specific pathogens, these issues may become the focus of future trade negotiations. With the stakes so high, biosecurity should be a very high priority in day-to-day management decisions.

Pathogens considered in biosecurity programs include *anaplasma marginale*, bluetongue virus (BTV), BVDV, infectious bovine rhinotracheitis (IBRV), bovine leukosis virus (BLV), Johne's, *mycobacterium bovis* (TB), brucellosis or bangs, *salmonella sp.*, *moraxella bovis* (pinkeye), vesicular stomatitis virus, parasites (coccidiosis, cryptosporidiosis, lice), fungal infections, and genetic diseases. Producers involved with international trade who need advice concerning diseases that limit access to markets should have their veterinarian obtain that information from the APHIS Area Veterinarian in Charge (AVIC).

LEVEL OF BIOSECURITY

Producers must decide the level of risk they are willing to accept. When estimating the potential impact of a disease on a unit, consider the level of risk incurred and the economic consequences of that disease. It is obvious that unit biosecurity levels will differ with marketing strategies. The commercial cow-calf producer who retains ownership to slaughter will not have the same concerns as the seedstock operator or the person marketing in international trade channels. It is helpful to have a basis to work from when determining the level of biosecurity in use or to be implemented (Table 38.1). The necessity of a qualified veterinarian as a component of the development and implementation of a herd health and biosecurity program cannot be overemphasized.

Table 38.1 – Levels of biosecurity.

1. Closed herd [specific pathogen free (SPF)].
2. No entry or reentry of animals.
3. No entry of new animals, but reentry allowed.
4. Entry of new animals, known medical records, and isolation.
5. Entry of new animals, known medical records, and no isolation.
6. Entry of new animals, no medical records, and no isolation.

Source: Thompson, 1997.

COMPONENTS OF A BIOSECURITY PROGRAM

Often only the replacement animal is considered. Special biosecurity issues will differ with the age, sex, and reproductive status (open, pregnant whether through natural pregnancy or embryo recipient, nursing). Also to be considered as herd additions are semen and embryos, which require the same origin scrutiny as the live animal.

Other common sources of some pathogens are

- Commodity feeds – Quality control in commodity feeds includes analysis for incoming ingredients and using select suppliers that have quality control programs in place and who stand behind their products. Some ingredients are naturally more perishable than other feed ingredients. Most incoming feed ingredients should be evaluated for moisture, color, odor, texture, presence of foreign material, heat damage and mold or other spoilage. Presence of any suspected problems requires further testing. Feed concentrates (corn, barley, cottonseed, canola, soybeans, etc.) can be sources of *Salmonella sp.* Keep a sample of suspected feedstuffs for later testing in a cool but not frozen state. Feed fats should be analyzed for moisture, free fatty acid content, rancidity and impurities, or you should purchase your feed from a source that guarantees the analysis of their products. **Ruminant-derived animal protein feeds are not allowed to be used under current federal law.**
- Feed storage, processing, and handling – Harvesting and storing feeds at the correct moisture level will help prevent contamination by molds, mycotoxins and pathogenic bacteria and improves feed efficiency. Forages (corn silage, alfalfa, hay, etc.) can serve as sources of *Salmonella sp.* when irrigated with contaminated water. Improper harvesting and storage can lead to clostridial infections. Equipment used for loading feed should be routinely inspected for leaks in the hydraulic or other fluids. These fluids can be toxic if ingested and pose a residue threat. Clean tractors and equipment and routinely inspect for fluid leaks. When equipment is used for other non-feed purposes, such as a front-end loader, clean it again before using it for feeding purposes. Never store crop chemicals, petroleum products or other

potentially hazardous material in areas near where feed is stored, mixed or processed.

- Water sources contaminated with *Salmonella sp.*, *E. coli*, or *Cryptosporidium*.
- Fence line contact, shows, fairs, and stray animals.
- Wildlife.
 - Birds – salmonellosis.
 - Deer – brucellosis.
 - Coyotes – salmonellosis, leptospirosis.
 - Rodent feces that can serve as a source of *Salmonella sp.* and *E. coli*.
- Ticks and blood sucking insects that transfer anaplasmosis and other blood borne diseases.
- Transport vehicles (livestock, feed, rendering trucks, etc.).
- Human visitors and workers.
- Pets – feces from dogs infected with *Neospora caninum* can serve as a source of this parasitic organism. When cattle consume feedstuffs contaminated with infected dog feces, abortions may occur.

EXAMPLE PROGRAM FOR NON-PREGNANT REPLACEMENT BEEF HEIFERS

As with many herd additions, one should first answer the question—would I purchase replacement heifers from a herd that had a genetic base inferior to my own? The answer is obvious. Likewise, a similar question about purchasing animals from a herd with a higher disease incidence and a less stringent vaccination program should elicit the same answer. The following is an example of a stepwise procedure to assist in preventing the introduction of pathogens onto the premises.

I. Preshipment

- A. Become knowledgeable about the health, vaccination, and parasite control programs of the source herd.
- B. Special testing should be done within 30 days of shipment.
 1. Isolate BVDV by serum, blood, or virus identification using special stains (immunohistochemistry) on formalin fixed skin retrieved from ear notching.
 - a. Animals that test positive for BVDV will need to be retested in 30 days to verify whether they are persistently infected.

- b. A serum BVDV antibody titer is not useful information for identification of animals persistently infected with BVDV.
 - c. Calves from any replacements that are pregnant at purchase should be tested as soon after birth as possible using immunohistochemistry testing of skin samples.
2. Present tests for Johne's disease in replacement beef heifers are less reliable than for older animals. Therefore, it is advisable to purchase replacements from herds that are above the level of your herd in the voluntary Johne's certification program (if that is an option in your area).
 3. Fulfill the brucellosis, tuberculosis, and other regulatory requirements for shipment. Current information can be obtained from the Oklahoma Department of Agriculture Import and Export Division: 405-524-6404 or contact the State Veterinarian's office in the state of destination.

II. Isolation and quarantine management

- A. Minimum 30-day isolation period.
- B. Strict control of contact with other animals and/or other traffic.
- C. Herd identification (herd of origin and as an individual in the herd).
- D. Serum bank for retesting or future testing if needed.
- E. Vaccinate with IBR, BVDV vaccine, 5-way leptobacterin, campylobacter (vibrio) bacterin, and 7-way clostridial bacterin/toxoid. Modified live virus IBR and BVDV vaccine should be administered at least 30 days prior to breeding.
- F. Internal and external parasite treatments should be administered.
- G. Add a coccidiostat (amprolium, decoquinat, or ionophore) to the ration for the entire quarantine period.

III. Post-isolation/quarantine period

- A. Following the isolation/quarantine period, turn the heifers out with virgin bulls or bulls that tested negative for trichomoniasis. Bulls should have tested negative for the same

diseases and received the same vaccines and treatments as the purchased replacement heifers.

BIOSECURITY IN DIRECT RESPONSE TO BIO-TERRORISM

The Department of Homeland Security issues the national threat level of terrorist attacks based upon the color-coded system shown on television and in newspapers. The system is labeled as follows:

Green: Low risk of terrorist attacks.

Blue: Guarded condition. General risk of terrorist attack.

Yellow: Elevated condition. Significant risk of terrorist attacks.

Orange: High risk of terrorist attacks.

Red: Severe risk of terrorist attacks.

National Cattlemen's Beef Association (NCBA) has received questions regarding what this means for livestock operations. NCBA has joined with the USDA in sending out recommendations to producers as the terror alert levels increase.

While beef producers have been asked to be on alert regarding protecting their operations since September 11, 2001, some specific actions are taken by the Animal and Plant Health Inspection Service (APHIS) of USDA in response to heightened threat levels. APHIS has issued the following notice regarding the heightened (orange or red) threat level.

"As a result of the increased security level, foreign animal disease surveillance should be increased nationwide. No potential foreign animal disease cases should be disregarded. Potential hoaxes should be treated as suspect incursions of FADs until proven otherwise. Specific attention should be directed at livestock and poultry concentration points. Investigators and laboratory personnel should implement an appropriate level of personal protection when examining animals, carcasses, and submitting samples until potentially zoonotic (transmissible to man) diseases can be ruled out.

Physical security on farms, livestock concentration points, and quarantine stations should be heightened. Limited animal movements and farm contacts should be kept to essential people for continued operations."

APHIS has issued the following set of guidelines in regard to High Condition/High Risk (Orange) and Severe Condition/High Risk (Red) threat levels.

RECOMMENDED ACTIONS FOR OPERATORS IN RESPONSE TO HIGH CONDITION (ORANGE) THREAT WARNING SYSTEM

Communication

- Review clinical signs of foreign animal diseases with all employees.
- Contact the private veterinarian, extension agent, or local industry organizations (contact numbers attached) for updates on situations, information, or actions needed.

Physical Security

- Post signs outlining security procedures in place at the operation.
- Ensure that all gates are locked.
- If possible, move animals away from pastures located along major roads and away from areas where they cannot be adequately monitored.

Biosecurity

- Consider canceling participation in shows, fairs, and exhibits.
- If visiting farms is a must, wear disposable boots or rubber boots that can be disinfected.
- Avoid livestock and poultry for at least 10 days after visiting premises with sick livestock or poultry, or after returning from a foreign country.
- Wash clothing and footwear using an APHIS-approved disinfectant after contact with sick livestock or poultry.
- Clean nostrils and fingernails and wash hair thoroughly after contact with sick livestock or poultry.
- After visiting foreign farms, dispose of clothing, shoes, equipment, cameras, and other items that are difficult or impossible to disinfect.
- Use shower-in, shower-out facilities, if possible, following visits to foreign countries.
- Account for the recent movements and health history of all newly introduced animals at their premises of origin through accurate record-keeping.
- Account for the recent history of potentially contaminated equipment and animal transport vehicles, including renderers' trucks, that may be used to haul carcasses away from your premises.
- Purchase feed only from suppliers who have a quality assurance program for the safe

manufacturing, storage and delivery of their products.

- Prevent feed and water from coming into contact with animal waste or other potentially contaminated animal products.
- If water contamination is suspected, test it and establish its safety before giving it to animals.
- Control all movement of people, vehicles, and equipment on and off property to reduce the risk of disease transmission. This may include measures such as locking unguarded entrances, repairing boundary fences, and enforcing strict biosecurity measures for people, vehicles, and equipment at all times.
- Do not contaminate person, clothing, or equipment at foreign fairs, zoos, or other livestock or poultry events.
- Do not wear items such as jewelry, watches, glasses, or hairpieces when working around animals, since these items cannot be successfully disinfected.
- Do not bring any meat or animal products from foreign countries onto property. Do not bring equipment onto property that has been used around foreign or sick livestock or poultry.
- Do not use feed equipment to handle manure.

Monitor

- Increase the number of times per day that livestock are observed.
- Report sick animals or unexpected death losses to the veterinarian.
- Watch for and report any observations of sick or dead birds, fish or insects.
- Monitor feed and chemical storage areas for tampering or unauthorized entrance.
- Watch for unusual packages or containers, especially those found in unlikely or sensitive areas.
- Verify the source of all incoming animals, feed, supplements, equipment, and individuals prior to moving them into the animal area.
- Scrutinize the actions of personnel on the farm, the entry of unnecessary personnel, and deviations from normal operations.

Prepare

- Conduct an operation vulnerability assessment. Look at the operation, determine possible areas of vulnerability, and correct them.
- Review clinical signs of foreign animal disease and discuss with all employees.

- Review reporting systems and phone numbers in case of a possible foreign animal disease or other emergency. These numbers should include those of your State Veterinarian, Federal Area Veterinarian in Charge, local law enforcement, and USDA Veterinary Services (405-427-9413).

RECOMMENDED ACTIONS FOR OPERATORS IN RESPONSE TO SEVERE CONDITION (RED) THREAT WARNING SYSTEM

Engage in the above activities and, in addition, the following are recommended.

Communication

Frequently check with the veterinarian, extension agent, or livestock organizations for information on possible specific threats and recommended actions.

Physical Security

- Consider security patrols for your property, if indicated.
- Do not leave trucks or vehicles loaded with livestock or feed unattended at truck stops;
- Do not allow visitors or unknown persons onto the property.
- Post signs at the entrances to your operation indicating that the operation is under increased surveillance and that no visitors can enter without permission.

Biosecurity

- Cancel attendance at all fairs, shows, and exhibits.
- Minimize local and interstate movement of animals and conveyances until the threat passes.
- Avoid visiting other farms or areas where animals are gathered.

Monitor

- Frequently monitor animals, crops, feedstuffs, and chemicals used on the operation.
- Contact the veterinarian for a diagnosis on sick or dead animals, even if that is not the normal procedure.

Prepare

- Prepare contingency plans in case of attack, quarantines, or stop movement requirements.
- Ensure at least 1 week's worth of feed and water is on hand in the event animals are quarantined.
- Minimize the addition of animals to the operation.

CONCLUSION

Biosecurity is an important issue for producers. This chapter provides an excellent resource for what to do in the event of a biosecurity hazard.

Biosecurity is a term used to describe programs for preventing the introduction of pathogens (infectious agents including viruses, bacteria, and prions) considered potentially harmful to the health and well being of the herd. **Biosecurity goals** occur at the national, state, and herd level to protect animal and human health and economic well being of the citizens of our nation at an individual and national level.

Biosecurity adequacy today – Common disease prevention and control practices employed by the majority of beef herds today are inadequate to meet future demands.

Biosecurity areas of importance include herd replacements, fence-line contact animals, embryos, recipient cows, semen, feedstuffs, water, livestock shows, livestock auctions, wildlife populations, rodents, pets, insects, vehicles, and humans.

Effects of introduced diseases in a beef cow-calf operation are

1. Decreased reproduction efficiency,
2. Decreased productivity,
3. Increased morbidity (illness),
4. Increased mortality (death),
5. Decreased cash flow and equity, and
6. Loss of marketing options—international, interstate, and intrastate—between farms and ranches.

Biosecurity levels range from a closed herd (SPF) to free entry with no pre-entry testing, no herd of origin medical records or no quarantine/isolation period. **Disease risk level accepted** is each individual's decision. **Biosecurity program requires** veterinarians to be an integral part of any biosecurity program. They are an important source of information concerning diseases, diagnostic testing, vaccination needs, and other informational sources.

Replacement animal programs include pre-shipment herd of origin information, pre-shipment testing, isolation, postshipment testing, and commingled herd monitoring.

A biosecurity program is like an insurance policy for the health and productivity of the herd. Producers, with the help of a qualified veterinarian, must make decisions about the risk tolerance level they will accept based on the chances of a disease occurring and the expected economic losses from the

disease. When the risk tolerance level is determined, then appropriate risk management measures can be initiated.

There is no “one size fits all” program for biosecurity; there are tools available to control many of the infectious diseases jeopardizing cattle operations. These tools can be adapted to the individual objectives for each herd and can be implemented successfully. However, there must be planning, commitment, and education of all personnel throughout the operation to attain the goals set for an effective infectious disease control (biosecurity) program.

REFERENCES

- An Introduction to Infectious Disease Control on Farms (Biosecurity). (2000) *A BAMN Publication*. For copies contact: AFIA, Dorann Towery, 1501 Wilson Blvd., Suite 1100, Arlington, Virginia, 22209, or phone 703.524.1921.
- Purdue University’s National Biosecurity Resource Center for Animal Health Emergencies. Retrieved from <http://www.biosecuritycenter.org/>.
- Routine Biosecurity Measures for On-site Farm Visits or Other Livestock Concentration Points. *APHIS fact sheet*. Retrieved from <http://www.aphis.usda.gov/lpa/issues/fmd/fmdbiose.html>.
- Thompson, J.U. (1997) Implementing Biosecurity in Beef and Dairy Herds. *Proceedings: American Association of Bovine Practitioners* 30: 8-14.