

Biosecurity and Biological Risk Management for Livestock Enterprises

Dr. Matt Hersom
Department of Animal Sciences
Institute of Food and Agricultural Sciences
University of Florida

UF | UNIVERSITY of
FLORIDA
IFAS Extension

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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 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 U.S. 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 animal health and economic consequences to the state and 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 provide an income conducive

to a lifestyle in livestock production. 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.



Biosecurity encompasses a variety of activities on the farm/ranch: visitors, traffic control, employees, replacement animals, technical services, 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, veterinarian, nutritionist, extension specialist, and others who may have specific expertise. This group can work to fit a biosecurity management plan to your beef cattle 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. An understanding of risk that the livestock enterprise is faced with needs to be determined, after this has been established 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. There are three main issues to address in a successful biosecurity management program – 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 animal can be



particularly difficult during natural disasters because of damage to facilities and or perimeter fences or lack of feed resources.

Traffic Control

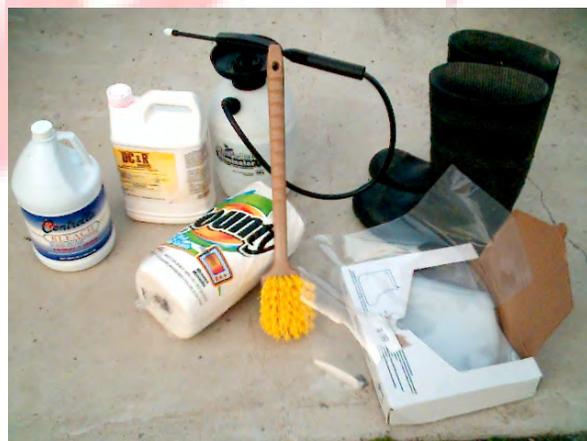


Consider points where disease could enter the ranch/farm, and how they could be spread. Traffic control within the operation should be designed to stop or minimize contamination of animals, feed, and equipment. It is important to remember traffic includes more than vehicles. All animals and people should be considered when addressing the issue of traffic. Restrict people to only places where they need to be and control people's access to others. Visitors to a ranch/farm operation present several issues. Consideration

should be given to 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 should 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.

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. 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 would be optimal. If the same equipment is utilized for manure and feed handling; thorough cleaning and disinfection should be performed. 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 diseases 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 animal to human, 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 animal to human. 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.

(Graphic designed by Clint May, ISU)



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 as well as to 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

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

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

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. The left photo depicts dairy cattle drinking from different sides of a water tank- if it becomes contaminated, all of the animals in those pens could be exposed (photo courtesy of DB Weddle, ISU). The right depicts calves eating silage at a wooden feed bunk, a potential source of bird, rodent, or dog contamination (photo source USDA).



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 from the environment through inhalation or aerosolization, oral consumption, direct contact, or via fomites as discussed in previous sections. Therefore, environmental

contamination should not be ignored but recognize the routes it uses to get into the animal can be 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.



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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 from 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 an individual with the intent to do harm.

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 very 1st 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 extremely important aspects 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. Consideration should be given to, where is the enterprise 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 put into place on livestock enterprises the job is not through. Vigilance to the BRM strategies and security measures must be made. Time and resources are wasted if implementation of plans is not fully followed through, 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, suspicious people, and to “harden” their operation so that their ranch would be a difficult target for people that would do them harm.

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, lower 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 (FMD).
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.
8. Quarantine new animals for a minimum of three weeks before introduction 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 hand washing stations to reduce contamination and improve sanitation.
11. Do not use feed equipment for manure handling because of likely fecal contamination.
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 www.cfsph.iastate.edu/BRM

National Biosecurity Resource Center for Animal Health Emergencies
<http://www.biosecuritycenter.org>

GMP for Controlling Disease <http://ianr.uln.edu/pubs/animaldisease/g1411.htm>

Centers for Disease Control <http://www.cdc.org>

USDA, Animal and Plant Inspection Service
<http://www.aphis.usda.gov/lpa/issues/fmd/findbiose.html>

American Association of Bovine Practitioners <http://www.aabp.org>



GENERAL PREVENTION PRACTICES FOR BEEF AND DAIRY PRODUCERS

Minimizing or preventing disease entry and spread on farms is the goal of an effective Biological Risk Management plan. To accomplish this, there are several general management practices that every farm could implement with minimal cost. If done properly, they can help prevent and control a variety of diseases. It is important to consult your herd veterinarian and seek his/her input while implementing disease control strategies. By working together, you will be able to identify and implement steps to “fit” your operation.

The following management recommendations address disease prevention and control without requiring you to know details about specific diseases. Simple and basic considerations include knowing what is in the area of your farm perimeter (e.g. farms, visitors, neighboring livestock and wildlife), individual animal identification, animal health protocols, recognizing and dealing with sick animals, isolation/quarantine, supply handling and neonatal management.

Farm Entrance and Perimeter

- **Limit access to your farm.**
 - The entrance to your farm is a major control point.
 - Have only one gated entrance to the animal areas on your farm to better control and monitor all visitors and vehicles arriving at your farm.
 - Lock gates to prevent unwanted human or animal entry.
- **Maintain fences to keep your animals in and others out.**
- **Limit contact between your animals and others that may present a risk of disease.**
 - Coordinate with neighbors to avoid fence line contact between herds.
 - Minimize contact between domestic animals, wildlife and birds.
 - Keep cats and dogs from roaming between farms.
- **Minimize visitors and traffic on your farm.**
- **Post signs at the farm entrance to inform visitors of procedures to follow on your farm. (See Appendix A)**
 - Stay off this farm unless given permission to enter.
 - Check-in with farm personnel upon arrival. (Direct visitors to “where” they should check-in).
 - Follow farm biosecurity procedures.
 - Wear protective clothing (coveralls, boots) while on this farm. (Be sure to guide visitors to where protective clothing is located).

- **Delivery vehicles and personnel should follow your established farm biosecurity guidelines regarding parking, driving and animal contact.**
 - Inspect delivery vehicles for cleanliness prior to entering and provide a wheel well, tire and undercarriage wash station in case they are soiled.
 - Require feed deliveries to your farm be the first delivery of the day.
 - Require that all other deliveries be left at the perimeter of the farm.
 - To prevent vehicle entry, animal load out and delivery should occur at the perimeter of the farm.
 - Require delivery personnel to follow farm biosecurity procedures like all other visitors.
- **Take measures to prevent runoff from other operations from entering your operation.**
 - Exposing your cattle to contaminated water or waste from other operations can introduce disease.
 - Restrict animal access by fencing off water or waste from neighboring operations that accumulates from run-off following rainfall.

People and Vehicles

- **For the safety of your animals and the people who handle them, require that all individuals wash hands with soap and warm water before AND after animal contact.**

Employees

- **Require that employees who have contact with livestock at other locations (including their own home) use the same biosecurity measures as visitors on your farm.**
- **Educate yourself and train your employees to recognize and report diseases.**
 - When all employees know what to look for regarding sick animals, a reporting system allows those in charge to make treatment decisions or decide if the herd veterinarian should be contacted.
 - Early identification of serious diseases can help minimize the risk of disease spread on your farm.
 - If unusual illness or signs are noticed, contact your herd veterinarian immediately.
- **Maintain a written Biological Risk Management Plan and have regularly scheduled meetings to educate and update those involved.**
 - This is critical to make sure everyone is current on your operation’s practices and provides the opportunity to make changes if needed.

GENERAL PREVENTION PRACTICES FOR BEEF AND DAIRY PRODUCERS (CONT'D)



Neighbors

- **Take steps to prevent disease spread from your neighbors' operation to yours.**
 - Do not share equipment or vehicles between farms.
 - If equipment must be shared, all manure and bedding should be removed, the equipment washed with warm water and soap, rinsed, disinfected and rinsed again before using it with animals from your farm.
 - Always wear clean clothes or coveralls, gloves, hats, boots, etc. when coming in contact with animals.
 - Wash and disinfect boots, change gloves, hats, and clothes or coveralls before returning to your farm.

Visitors and Vehicles

- **Post warning signs telling visitors to only enter your farm with permission. (See Appendix A)**
- **Provide a phone number at the farm entrance for visitors to call and make an appointment.**
 - Biosecurity measures can be explained at that time and posted near the phone number for all to see.
- **Prevent off-farm vehicles from driving in areas where animals travel.**
 - Require visitors and vehicles to park in designated areas at the entrance to your farm away from all animal areas.
 - Use only on-farm vehicles for transporting visitors within your operation.
- **All visitors should be accompanied by someone from the farm at all times.**
- **Provide clean coveralls and disposable or disinfected rubber boots.**
 - Post signs to direct visitors to a designated area where these are available.
 - Require that these items be worn by all visitors at all times while in animal areas.
 - Make sure boots are clean before entering animal areas; provide a well-maintained foot bath OR clean disposable boots and a receptacle near the entrance to the animal facility.
 - After exiting animal areas, wash and disinfect boots OR remove them and dispose of them properly.
 - When leaving your farm, visitors should remove all protective clothing and footwear provided by the farm and leave it in the designated area.
- **Visitors should avoid livestock areas and restrict them from contacting or handling your animals (unless absolutely necessary).**

Record Keeping

- **Traffic on or off your farm should be closely monitored and recorded. (See Appendix B)**
 - Maintain a log sheet to record all visitors and vehicles that enter your farm.
- **Maintain thorough and accurate records of animal movement.**
 - Document all animal movements, including the dates of introduction into the herd, where they came from and movements between separate units.
 - Each farm location must be treated as a separate unit or premises.

Animals

Animal Identification

- **Individually identify every animal.**
 - Individual animal identification is essential for proper record keeping (e.g. vaccinations, treatments, pregnancy status, etc.) which is an integral part of managing animals and minimizing disease risk on your farm.
 - If more than one person works on your operation, individual animal identification is imperative for proper communication of health status, treatment needs, antibiotic withdrawal/residue prevention status and location.

Animal Health

- **Keep health records on every animal.**
- **Review and update your vaccination and treatment protocols with your veterinarian at least twice a year.**
- **Monitor and inspect animals at least daily for signs of illness.**
 - Investigate all animals with unusual signs or those unresponsive to treatment, especially those that die suddenly.
- **Clean equipment, boots and change clothing between animal groups with different health status.**
- **Promptly euthanize animals that are not going to recover.**
 - Chronically infected animals can serve as an ongoing source for many disease causing organisms.
 - Properly dispose of the carcass (e.g. render, compost, bury or burn) according to local and state laws.

GENERAL PREVENTION PRACTICES FOR BEEF AND DAIRY PRODUCERS (CONT'D)



- **Have your veterinarian necropsy animals that die from unknown causes.**
 - This may help identify a potentially infectious disease before it becomes widespread on your farm.
- **Promptly remove dead animals from your operation as they can serve as a reservoir for many disease organisms.**
 - Render, compost, bury or burn dead animals in a timely manner so predators, wild birds and other animals do not spread disease.
- If equipment must be shared, wash in warm water and soap to remove visible contamination, rinse, disinfect and rinse before removing from one location and moving it to another.
- **Immediately isolate sick animals from the herd to minimize disease spread.**
 - Prevent direct contact between isolated animals and others.
 - Prevent sharing ventilation, feed/water and equipment to minimize the risk of disease spread.

New Introductions & Returning Animals

- **Limit the frequency and number of new introductions.**
- **Limit purchases to a few sources with known and trusted herd health programs.**
 - Obtain a complete herd health history prior to introducing new animals.
 - Request copies of vaccination and treatment records for all purchased animals.
 - Vaccinate newly acquired animals prior to receiving them.
- **Handle all animals that temporarily leave your operation as new introductions when they return.**
 - Limit their contact with other animals during their time off your farm.
 - Do not share stalls, tack, feed or water with animals from other operations.
 - Do not share trailers, grooming supplies, reproductive equipment, needles or syringes with other farms.
 - Prevent reproductive contact with animals from other herds.
- **Place animal delivery and load out facilities on the perimeter of the farm.**
- **Quarantine all newly acquired animals or reintroduced animals.**
- **Use separate facilities, equipment and staff to handle isolated livestock.**
 - If this is not possible, at a minimum, handle or visit the isolated animals LAST.
 - Clean and disinfect all equipment, clothing, boots, etc. that come into contact with ill and isolated animals.
- **Any animals that have recently been purchased or returned to the farm should be quarantined.**
 - New or returning animals (e.g. shows and competitions) can be infected with a disease without showing signs right away.
 - Quarantine allows time for a disease to develop in the animal, without exposing your entire herd to the disease agent.
 - Do not allow new additions and animals returning to share water, feed, facilities or bedding with your other animals.
 - Ideally animals should be quarantined at a separate location (premises).
- **Time spent in isolation and quarantine varies depending on the disease risk so this should be determined together with your herd veterinarian.**
 - It is a good risk management plan to test for key diseases before taking animals out of isolation or quarantine to make sure they are not carrying diseases that could be introduced into your herd.
 - Work with your herd veterinarian to establish what tests are appropriate for your animals.

Isolation and Quarantine

- **Isolation of sick animals is necessary to minimize disease exposure of others in your herd and quarantine is required to prevent exposure of your herd to new or returning animals.**
 - In addition to being removed from all other animal areas, isolation and quarantine facilities should be separate from one another.
 - Equipment (feed, treatment, milking) should not be shared between isolation and quarantine animals.

Neonatal Management

- **Ensure adequate ingestion of disease-free colostrum within the first 6 hours of life.**
 - Adequate ingestion of colostrum is the most important consideration for a calf's resistance to disease and all calves should receive colostrum within 6 hours of birth.
 - A calf's immune system depends on the antibodies in colostrum. After 6 hours of life, the calf's ability to absorb antibodies from colostrum diminishes.

GENERAL PREVENTION PRACTICES FOR BEEF AND DAIRY PRODUCERS (CONT'D)



- Once a calf is born, cows begin to produce milk which will dilute colostrum and require the calf to consume more volume for maximum antibody absorption and immune function.
- **Prevent contact of newborns with older animals and contaminated environments.**
 - This will decrease disease exposure to the calf and give the colostrum the ability to provide protection.

Wildlife and Other Animals

- **Prevent contact with free roaming animals (e.g. wildlife, cats, dogs, etc.).**
- **Control of wildlife may be difficult, but should be attempted.**
 - Keep farm access routes, parking areas, yards and storage areas clean and tidy to avoid attraction of birds or rodents.
- **Minimize bird contact and nesting in your operation.**
 - Birds are disease carriers and while it is nearly impossible to eliminate them from animal housing areas, steps should be taken to discourage their nesting and roosting.
 - Contact your local extension office or herd veterinarian for approved control methods in your area.
- **Maintain a rodent control program.**
 - Rodents harbor many diseases that can affect cattle and can readily contaminate feed.
 - Contact your local extension office or herd veterinarian for approved control methods in your area.
- **Secure all feed storage areas and clean up spilled feed to minimize access by pests.**
 - These steps will help minimize the number of pests by limiting available food sources.

Supply Handling

- **Always read and follow label directions for proper storage of vaccines and medications.**
 - Sunlight deactivates some vaccines and can render antibiotics worthless, causing poor protection or response to treatment when used in your animals.
 - Vaccines and medicines that need to be refrigerated are susceptible to changes in temperature and may not work if they get too warm (greater than 46°F) or too cold/frozen (less than 36°F).

- Products that do not require refrigeration should be properly stored in a cabinet or other enclosure to restrict access by unauthorized individuals and minimize environmental exposure (e.g. sunlight and temperature extremes).

- **Monitor your supply refrigerator at least monthly to help ensure the products are adequately stored (36-46°F).**
- **Work with your veterinarian to teach proper procedures to all people who handle vaccines and medicines.**
 - Restrict access to only trained personnel.
 - Training should include proper handling and administration of these products plus when to use them.
 - Improper handling and storage can cause contamination which could cause disease.
 - Improper use of vaccines and medicines can make them ineffective and some can even be harmful to the person.
 - Prudent antibiotic use helps maintain effectiveness in treating disease.
 - Improper use of antibiotics can lead to the development of resistance and illegal residues.

Cleaning and Disinfection

General Recommendations

- **Thoroughly clean all objects to remove any visible debris (manure, dirt, bedding) before applying a disinfectant.**
 - Most disinfectants are ineffective when dirt, manure and other debris are present.
 - These materials prevent the chemicals in the disinfectant from contacting and killing the disease causing agents.
- **Use the proper concentration of any disinfectant (always mix according to the product label).**
- **Always allow a disinfection solution contact time to "sit" and work.**
 - To be effective, disinfectants need time to kill the microorganisms present.
 - Refer to the product label to determine the amount of time recommended (usually at least 5 minutes).

GENERAL PREVENTION PRACTICES APPENDIX A



Sample signs to post at the farm entrance.

(Available from your state livestock extension specialist or the CFSPH web site at www.cfsph.iastate.edu)



Additional signage available from private companies (Those listed below are available from Gempler's).



GENERAL PREVENTION PRACTICES CHECKLIST



General Precautionary Measure

Y N Do you require that all individuals wash hands with soap and warm water before AND after animal contact?

Farm Entrance and Perimeter

Y N Do you limit access to your farm?

Y N Do you have only one gated entrance to the animal areas on your farm to better control and monitor visitors and vehicles?

Y N Do you keep the gate locked when not in use?

Y N Do you maintain fences to keep your animals in and others out?

Y N Do you limit contact between your animals and others that may present a risk of disease?

Y N Do you keep cats and dogs from roaming between farms?

Y N Do you minimize visitors and traffic on your farm?

Y N Have you posted signs at the farm entrance to inform visitors to stay off your farm unless absolutely necessary?

Y N Have you posted a visitor biosecurity sign that clearly lists specific measures to follow when on your farm?

Y N Do you require visitors to follow your farm's biosecurity procedures?

Y N Do you require visitors to check-in with farm personnel upon their arrival?

Y N Do you require delivery vehicles and personnel to follow your farm biosecurity guidelines regarding parking, driving and animal contact?

Y N Do you require that all deliveries be left at the perimeter of your farm?

Y N Are your animal load out and delivery facilities located at the perimeter of your farm?

Y N Do you take measures to prevent runoff from other operations from entering your operation?

GENERAL PREVENTION PRACTICES CHECKLIST (CONT'D)



Employees

- Y N Do you require that employees that have contact with livestock at other locations (including their own home) use strict biosecurity measures while on your farm (e.g. provide them with clean boots and coveralls to wear)?
- Y N Have you educated yourself and trained your employees to recognize and report diseases?
- Y N Do you maintain a written Biological Risk Management Plan and have regularly scheduled meetings to educate and update those involved?

Neighbors

- Y N Do you restrict the sharing of equipment or vehicles between farms?
- Y N If equipment must be shared, do you remove all manure and bedding, wash the equipment with warm water and soap, rinse, disinfect and rinse again before using it with animals from your farm?
- Y N Do you always wear clean clothes or coveralls, gloves, hats, boots, etc. when coming in contact with animals?
- Y N After contacting your neighbors livestock, do you wash and disinfect boots, change gloves, hats, and clothes or coveralls before returning to your farm?

Visitors and Vehicles

- Y N Have you posted warning signs telling visitors to only enter your farm with permission?
- Y N Do you provide a phone number at your farm entrance for visitors to call and make an appointment?
- Y N Do you require visitors and vehicles to park in designated areas at the entrance to your farm and away from all animal areas?
- Y N Do you use only on-farm vehicles for transporting visitors within your operation?
- Y N Are all visitors accompanied by someone from the farm at all times?

GENERAL PREVENTION PRACTICES CHECKLIST (CONT'D)



- Y N Do you provide clean coveralls and disposable or disinfected rubber boots and require that these items be worn by all visitors at all times while in animal areas?
- Y N Do require visitors to avoid livestock areas and restrict them from contacting or handling your animals (unless absolutely necessary)?

Record Keeping

- Y N Do you maintain thorough and accurate records of animal movement?
- Y N Is each farm location treated as a separate unit?
- Y N Do you maintain a log sheet to record any visitors or vehicles that come onto your farm?

Animal Identification

- Y N Do you individually identify every animal?

Animals- Animal Health

- Y N Do you keep health records on every animal?
- Y N Do you review and update your vaccination and treatment protocols with your veterinarian at least twice a year?
- Y N Do you monitor and inspect animals for signs of illness at least daily?
- Y N Do you investigate all animals with unusual signs or those unresponsive to treatment, especially those that die suddenly?
- Y N Do you clean equipment, change clothing, and change or clean boots when handling animals from groups with different health status?
- Y N Do you promptly euthanize animals that are not going to recover?
- Y N Does your veterinarian necropsy animals that die from unknown causes?
- Y N Do you promptly remove dead animals and dispose of the carcass (e.g. render, compost, bury or burn) according to local and state laws?

GENERAL PREVENTION PRACTICES CHECKLIST (CONT'D)



Animals- New Introductions and Returning Livestock

- Y N Do you limit the frequency and number of new introductions?
- Y N Do you limit purchases to a few sources with known and trusted herd health programs?
- Y N Do you obtain a complete herd health history prior to purchasing and introducing new animals?
- Y N Do you request copies of vaccination and treatment records for all purchased animals?
- Y N Do you vaccinate newly acquired animals prior to receiving them?
- Y N Do you handle all animals that temporarily leave your operation as new introductions when they return?
- Y N Do you limit the contact of your animals with others during their time off your farm?
- Y N When animals are off your farm, do you prevent the sharing of stalls, tack, feed or water with animals from other operations?
- Y N When animals are off your farm, do you prevent the sharing of trailers, grooming supplies, reproductive equipment, needles or syringes with other farms?
- Y N When animals are off your farm, do you prevent reproductive contact with animals from other herds?

Animals- Isolation and Quarantine

- Y N Are your isolation and quarantine facilities removed from all other animal areas and separate from one another?
- Y N Do you prevent the sharing of equipment (feed, treatment, milking) between isolation and quarantine animals?
- Y N If equipment must be shared, do you wash it in warm water and soap to remove visible contamination, rinse, disinfect and rinse it again before removing it from one location and moving it to another?
- Y N Do you immediately isolate sick animals from the herd to minimize disease spread?
- Y N Do you prevent direct contact between isolated animals and others?
- Y N Do you prevent the sharing of ventilation, feed/water and equipment between isolated or quarantined animals and others?

GENERAL PREVENTION PRACTICES CHECKLIST (CONT'D)



- Y N Do you use separate facilities, equipment, and staff to handle isolated livestock?
- Y N If it is not possible to use separate facilities, equipment and staff, do you handle or visit the isolated animals LAST?
- Y N Do you clean and disinfect all equipment, clothing, boots, etc. that come into contact with ill and isolated animals?
- Y N Do you quarantine all animals that are recent purchases or those that return to your farm?
- Y N Do you prevent new additions and animals returning from sharing water, feed, facilities or bedding with your other animals?
- Y N Have you determined together with your herd veterinarian the appropriate times for animals to spend in isolation and quarantine?
- Y N Do you test for key diseases before taking animals out of isolation or quarantine?

Animals- Neonatal Management

- Y N Do you ensure that all calves ingest adequate amounts of disease-free colostrum within the first 6 hours of life?
- Y N Do you prevent contact of newborns with older animals and contaminated environments?

Animals- Wildlife, Other

- Y N Do you prevent your animals from having contact with free roaming animals (e.g. wildlife, cats, dogs, etc.)?
- Y N Do you keep farm access routes, parking areas, yards and storage areas clean and tidy to avoid attraction of birds or rodents?
- Y N Do you minimize bird contact and nesting in your operation?
- Y N Do you maintain a rodent control program?
- Y N Do you secure all feed storage areas and clean up spilled feed to minimize access by pests?

Supply Handling

- Y N Do you always read and follow label directions for proper storage of vaccines and medications?

GENERAL PREVENTION PRACTICES CHECKLIST (CONT'D)



- Y N Are products that do not require refrigeration properly stored in a cabinet or other enclosure to restrict access by unauthorized individuals and minimize environmental exposure?
- Y N Do you monitor your supply refrigerator at least monthly to help ensure the products are adequately stored (36-46°F)?
- Y N Have you worked with your veterinarian to teach proper procedures to all people who handle vaccines and medicines?
- Y N Do you restrict vaccine and medicine access to only trained personnel?
- Y N Does your personnel training include proper handling and administration of vaccines and medicines plus when to use them?

Cleaning and Disinfection- General Recommendations

- Y N Do you thoroughly clean all objects to remove any visible debris (manure, dirt, bedding) before applying a disinfectant?
- Y N Do you always use the proper concentration of any disinfectant and mix according to the product label?
- Y N Do you always allow a disinfection solution contact time to "sit" and work?
- Y N Do you refer to the disinfectant label to determine the amount of contact time that is recommended?

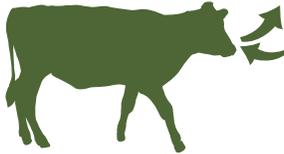
Conclusion

Total number of: Yes responses _____ No responses _____

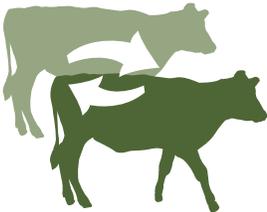
If you have 1 or more No responses, you have identified areas for improvement on your farm. Not all questions are equal in their risk of disease transmission, so it is important to work with your veterinarian to develop a management plan addressing the biggest risks first. This will help minimize the chance of diseases entering your farm. Each farm will be unique in their ability to prevent disease transmission because management styles, herd sizes and finances vary.

TRANSMISSION ROUTE DEFINITIONS

Disease causing agents can be spread from animal-to-animal or animal-to-human and vice versa, through a variety of transmission routes.



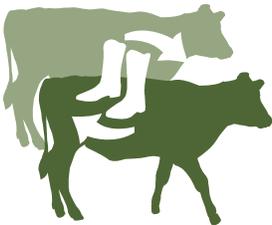
- **Aerosol** — Droplets are passed through the air from one animal to another.



- **Direct contact** — A susceptible animal becomes exposed when the disease agent directly touches open wounds, mucous membranes, or the skin through blood, saliva, nose to nose contact, rubbing, or biting.

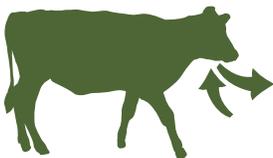


- **Reproductive** — A subtype of direct contact that includes diseases spread through mating or to the fetus during pregnancy.

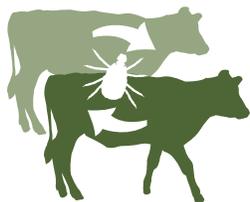


- **Fomite** — An inanimate object carrying a disease agent from one susceptible animal to another.

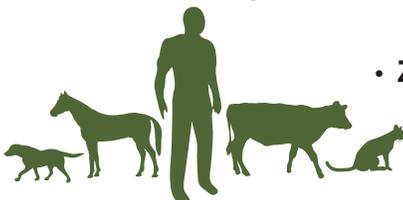
- **Traffic** — A subtype of fomite transmission in which a vehicle, trailer, or human spreads organic material to another location.



- **Oral** — Consuming disease causing agents in contaminated feed, water or licking/chewing on contaminated environmental objects.



- **Vector-borne** — An insect acquires a disease agent from one animal and transmits it to another.



- **Zoonotic** — Diseases transmitted from animals to humans.

Environmental contamination must always be taken into consideration.

AEROSOL TRANSMISSION CONTROL



Aerosol transmission occurs when disease agents contained in droplets, like those in the picture below, are passed through the air from one animal and breathed in by another.

Respiratory diseases cause cattle to cough and blow out mucus from their nose. This spreads disease particles through the air and other animals breathe it in and become exposed.

Some diseases that cause diarrhea can also be spread through the aerosol route. Some of the disease agent in the loose stool can attach to moisture droplets or par-

ticles in the air and expose another animal in the same area when they breathe in the contaminated droplets.

Fortunately, most disease agents do not survive for long periods of time within the aerosol droplets because sunlight and air dries them out.

There are ways to decrease the risk of an aerosol spread disease, such as:



graphic by Clint May, ISU

- Increasing the distance between sick and healthy animals
 - Never calve animals in pens with sick animals
- Maximizing ventilation in animal housing areas
 - Provide fresh air to all animals
 - Decrease humidity and odor build up
 - Control dust in dry lots; use water in limited amounts
- Calving heifers separately from cows

CONTROL OF DIRECT CONTACT DISEASE TRANSMISSION FOR BEEF AND DAIRY PRODUCERS

Transmission by **direct contact** requires the presence of a disease causing agent or organism in the environment or within an infected animal. Exposure occurs when this agent directly touches open wounds, mucous membranes or the skin of a susceptible animal. Transmission can occur from contaminated blood or saliva, nose to nose contact, rubbing or biting. It is important to note that direct contact transmission is possible with some diseases between animals of different species as well as to humans.

Two specific types of direct contact transmission deal with breeding and pregnancy. **Reproductive transmission** is the spread of pathogenic agents from animal-to-animal and can occur in two ways. The first is through **breeding**, either naturally with bulls or artificially and the second is **in-utero**, when the dam infects the offspring during pregnancy.

Fomites are also a component of direct contact transmission. A fomite is any inanimate object that can carry disease agents from one susceptible animal to another. Such objects include contaminated brushes, clippers, needles, balling guns, clothing, feed or water buckets, shovels, and others commonly found on livestock operations. These items should be managed as fomites but it is important to remember that they can transmit disease when they contact an infected animal first and then have direct contact with a susceptible animal.

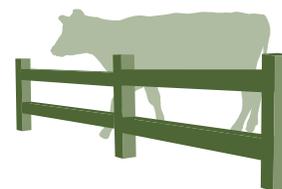
Traffic transmission is a type of fomite transmission in which a vehicle, trailer or human spreads contaminated material from one location to another. These routine movements can spread disease to other locations on farm or to other farms. For specific information on limiting disease transmission by properly managing fomites, please refer to the Fomites- Managing Them to Minimize Disease Spread handout.

The following list highlights a few easy and inexpensive practices that are especially important for controlling direct contact transmission.

ANIMAL TRANSMISSION



- Prevent fence line contact between your animals and neighboring livestock.
 - This reduces the risk of disease spread by direct contact with neighboring animals.
- Maintain fences to minimize the risk of your animals escaping or other animals entering.
 - Mixing other livestock or wildlife species with your herd increases the risk of disease exposure.
 - Wildlife can transmit many diseases to cattle and contact should be minimized.
- Prevent contact between animals of differing ages and immune status on your farm.



- Calves are generally more susceptible than older cattle to diseases spread by direct contact and other routes.
- Prevent contact of newborns with older animals and contaminated environments to minimize their disease exposure.
- Calve heifers separately from cows.
- Ensure that calving takes place on clean, dry bedding or pasture.
 - During calving, disease organisms can be shed into the environment; it is a significant disease risk period for both the cow and calf.
 - Calving pens should be deeply bedded with an absorbent material (e.g. straw, sand, wood shavings or paper) to drain birthing materials away from the newborn calf and minimize its contact with contaminated materials (e.g. manure, urine, dirty tail, legs, and udder of its dam).
 - Calving pens should be cleaned and fresh bedding added between animals.
- Dip the navel of newborn calves with a 7% tincture of iodine immediately after birth.
 - The umbilical cord provides direct access to a calf's body and iodine helps dry it out to prevent disease agents from entering.
- Provide a dry place for cows to lie down so their udders do not become covered with mud or feces.
 - This will limit the risk of mastitis and reduce the disease exposure to the calf.
- Decrease stocking density and minimize congregation of animals.
 - Increasing the distance between animals will reduce direct contact between healthy ones and those that may be carrying disease.
 - Always ensure adequate space for the number of animals that utilize feed, water, and shade sources.
 - Work with your local livestock extension specialist and herd veterinarian to determine the ideal stocking density for your pastures/pens.
- Clean or move congregation sites frequently to prevent accumulation of waste.
 - Moving feeders, shade structures, and other areas where animals congregate will minimize build-up of disease organisms in the environment.
- Isolate all sick animals immediately so that they do not contact other susceptible animals.

REPRODUCTIVE TRANSMISSION



- Limit the sources and number of replacement bulls and females that you purchase.
 - Only purchase those that have tested negative for diseases of concern.
 - Quarantine replacement females and bulls prior to allowing reproductive contact with other animals in your herd.
 - Consult your herd veterinarian to establish appropriate protocols for testing and quarantine.
- Verify that semen used in your artificial insemination programs is checked for quality and is from bulls that test negative for diseases of concern prior to collection.
 - Semen can carry disease causing organisms resulting in unbred cows, infected calves or cows, abortions, and other fertility problems.
- Work with your herd veterinarian to develop and maintain a vaccination program for reproductive diseases.



FOMITE/TRAFFIC TRANSMISSION



- Post signs with clear instructions regarding your policies for visitors.
- Lock gates to limit unauthorized animal contact or access to your feed and equipment.
- Require visitors to park in a designated area at your farm entrance and away from animal traffic areas.
- Clean clothes and footwear should be required and provided for ANY-ONE entering your operation or deny their entry to animal areas.
- Minimize on-farm traffic by placing animal delivery/load out facilities and rendering piles at the perimeter of the farm.
 - Cattle hauling trailers sometimes gather animals from multiple sources.
 - Rendering trucks can visit several farms in one day picking up animals that may have died from contagious diseases.
 - By keeping them off your farm, you minimize the risk of introducing diseases.
- Do not share equipment or vehicles between farms.
 - If equipment must be shared, all manure and bedding should be removed, the equipment washed with warm water and soap, rinsed, disinfected and rinsed again before using it with animals from your farm.



DIRECT CONTACT TRANSMISSION SUMMARY

There are many diseases that are present in the U.S. that are transmitted by the direct contact route. Some examples include anthrax, brucellosis, bovine viral diarrhea (BVD), infectious bovine rhinotracheitis (IBR or red nose), leptospirosis, mastitis, Q fever, and rabies. In addition, the direct contact route is involved with many foreign animal diseases (FADs) including foot and mouth disease (FMD), contagious bovine pleuropneumonia (CBPP), malignant catarrhal fever (MCF), and rinderpest. Prevention practices aimed at one disease can help to protect against others because they are transmitted in the same manner. For a complete listing of all diseases transmitted by the direct contact route, please refer to the Bovine–Direct Contact Transmission and Bovine–Reproductive Transmission handouts.

This handout complements other Biological Risk Management materials. To develop the most comprehensive and effective disease management plan for your operation, it is important to utilize all resources available and work with your local extension livestock specialist and herd veterinarian.

FOMITES

Managing them to Minimize Disease Spread

Fomites are inanimate objects that can become contaminated with manure, blood, urine, saliva, or fetal fluids. If not cleaned and disinfected between uses, these objects could spread diseases to the next animal, or a person, that comes in contact with it. This handout serves as a guide to the many fomites found on a farm that could spread disease if not handled properly.

The phrase 'the solution to pollution is dilution' should be remembered when handling fomites on farm. Washing the item(s) first with water and soap removes all visible material. This allows disinfectants to do their job better and kill the germs left behind.

When cleaning, water quality is important to keep in mind. Hard water can interfere with the cleaning

action of soaps and also disinfectants. Water temperature can also affect how well organic matter is removed and the effectiveness of disinfectants. By using large amounts of warm or tepid water (100.4°F), 90% of the organisms can be removed. Then before disinfecting, read the product label to see if you need to use cold or hot water for them to work effectively.

Proper Cleaning Procedures

1. Wear personal protective wear—gloves, long pants, long sleeves, and possibly a mask if you are cleaning an area that will generate dust.
2. Dry clean—remove all visible material by brushing, scraping, sweeping and hauling to a central disposal area. The waste material should be handled in such a way to prevent contamination of other areas such as feed, water or other animals.
3. Soak—soak the area with hot water and a detergent or cleaning agent. Be sure to wash and soap down all equipment in the area- waterers, feed troughs, pails, etc.
4. Wash—wipe, spray or scrub the area, starting with the dirtiest or highest area (ceiling), after it has soaked for a period of time. This step can be enhanced by the use of pressure washers when cleaning wood, cement, or other porous surfaces. Use caution when using high pressure washers (200-1000 psi) as they can aerosolize disease organisms and spread them to other areas or expose the person cleaning.
5. Rinse—remove all detergent residue by applying a low pressure water rinse on all surfaces, starting with the highest area and working your way to the floor. Certain disinfectants (quaternary ammonium compounds, bleach- see page 3) are inactivated by detergents and soaps.
6. Dry—it is important to allow the area to dry completely before applying a disinfectant so that it can work effectively.

fomite_management

Proper Disinfecting Procedures

1. Read the product label—this is important to make sure the solution is handled correctly. Personal protective wear (gloves, mask) may be needed when mixing up solutions. Other considerations to review before applying solutions to fomites include specific dilutions, water temperature, environmental temperature, ventilation and the disease organisms killed by the disinfectant.
2. Disinfect—apply the product at the correct dilution and let it "sit and work" for the suggested amount of time.
3. Final rinse—remove all disinfectant by applying a low pressure water rinse on all surfaces, starting with the highest area and working your way to the floor.
4. Dry—it is important to allow the area to completely dry before allowing animals to have contact with the area or item that was just cleaned and disinfected.

Proper Storage

If the equipment or area will not be used immediately, it is important to avoid contamination between uses. Small items can be placed into plastic bags and sealed; larger items can be placed into closed cabinets. Equipment and housing areas are more difficult to protect for long periods of time and may need to be rinsed again before contact with animals.

When managing disease risk on farm, use the list of fomites on page 2 as a reminder of some of the things that may need special attention when cleaning and disinfecting.



DRY CLEANING



WASHING



DISINFECTING

FOMITES—Managing them to Minimize Disease Spread

When managing disease risk on farm, use this list of fomites as a reminder of some of the things that may need special attention when cleaning and disinfecting.

Vehicles/Equipment		
Trucks	Tractors/Skid loader	Loader buckets
Trailers	Feed wagon/hay wagon	4-Wheelers

Personnel		
Boots	Gloves	Hats
Coveralls	Rain suit	Hands
Other clothes		

Feed/Water Equipment		
Feed buckets/pans	Water troughs/Tanks	Hay Feeders
Pails	Feed bunks	Bottles, nipples
Shovels		

Animal Handling		
Chute	Brushes	Ropes
Crowding panels	Clippers	Nose tongs
Alley way	Halter	Whips
Loading chute (Portable)	Lead rope	Sorting sticks

Animal Treatment		
Balling gun	Needles**	Straps
Oral/vaginal speculum	Syringes**	Fetotome/ OB wire
Stomach tube	Calf jack	Dehorner
Drench gun	OB chains	Castration knife
Esophageal feeder**	Snares	Implant gun
IV tubing**		

Milking		
Milking unit- liners	Teat dip applicators	Towels

Animal Housing		
Calf hutches	Fences	Gates
Neck tethers		

Types of material that need to be cleaned:

Some of the materials fomites on farm are made out of are listed below. Differences in porosity (braided cotton, cement, nylon, wood) will mean more soaking or scrubbing to make sure all visible material is removed. Smooth surfaces (metal, glass, plastic) will stand up to a variety of cleaning and disinfecting steps. Keep in mind the type of material being cleaned and disinfected to ensure all visible material is removed to allow the soap or disinfectant to penetrate and kill the disease organisms.

Braided cotton	Cement	Cloth
Fiberglass	Glass	Leather
Metal	Nylon	Plastic
Rubber	Silicone	Skin
Vinyl	Wood	

In an outbreak situation, specific disinfectants may be recommended for use because of their killing action against a specific disease organism. These products may be caustic or cause damage to certain objects being disinfected. However, during an outbreak situation, it is more important to destroy and control the disease organism than to protect the fomites. Consult with your veterinarian to choose a disinfectant that is most appropriate in a specific disease situation.

***If the item being cleaned will be used for antibiotics, electrolytes or hormones, special precautions must be taken. Certain disinfectants have a lasting action that will inactivate medication. See the "Care of Veterinary Vaccine Syringes" publication by University of Nebraska- Lincoln on the CD Rom or at www.cfsph.iastate.edu*



FOMITES—Managing them to Minimize Disease Spread

Characteristics of Selected Disinfectants*

Disinfectant Category	Alcohols	Aldehydes	Biguanides	Halogens: Hypochlorites	Halogens: Iodine Compounds	Oxidizing Agents	Phenols	Quaternary Ammonium Compounds (QAC)
Sample Trade Names	Ethyl alcohol Isopropyl alcohol	Formaldehyde Glutaraldehyde	Chlorhexidine Nolvasan® Chlorhex®	Bleach Clorox®	Betadine® Povidone®	Hydrogen peroxide Peroxyacetic acid Virkon-S®	One-Stroke Environ® Tek-trol® Pine-Sol® Lysol®	Roccal-D Plus® Parvasol®
Advantages	<ul style="list-style-type: none"> • Fast acting • Leaves no residue 	<ul style="list-style-type: none"> • Broad spectrum 	<ul style="list-style-type: none"> • Broad spectrum 	<ul style="list-style-type: none"> • Broad spectrum • Short contact time • Inexpensive • Effective in the presence of hard water 	<ul style="list-style-type: none"> • Stable in storage • Relatively safe 	<ul style="list-style-type: none"> • Broad spectrum 	<ul style="list-style-type: none"> • Non-corrosive • Stable in storage • Effective over large pH range • Effective in the presence of hard water 	<ul style="list-style-type: none"> • Stable in storage • Non-irritating to skin • Effective at high temperatures and high pH (9-10)
Disadvantages	<ul style="list-style-type: none"> • Rapid evaporation 	<ul style="list-style-type: none"> • Irritating to mucous membranes (eyes) and tissues • Efficacy is reduced in the presence of hard water 	<ul style="list-style-type: none"> • Only works in limited pH range (5-7) 	<ul style="list-style-type: none"> • Inactivated by sunlight and some metals • Requires frequent application • Corrodes metals • Irritating to mucous membranes (eyes) and skin 	<ul style="list-style-type: none"> • Stains clothes or treated surfaces • Inactivated by QACs • Requires frequent application • Corrosive 	<ul style="list-style-type: none"> • Damaging to some metals 	<ul style="list-style-type: none"> • Cause skin and eye irritation 	<ul style="list-style-type: none"> • Inactivated by hard water
Precautions	<ul style="list-style-type: none"> • Flammable 	<ul style="list-style-type: none"> • Can cause cancer • Use in well ventilated areas 	<ul style="list-style-type: none"> • Toxic to fish (environmental concern) 	<ul style="list-style-type: none"> • Never mix with ammonia- a toxic chlorine gas will form 			<ul style="list-style-type: none"> • Toxic to animals, especially cats and swine 	<ul style="list-style-type: none"> • Toxic to fish (environmental concern)
Efficacy with soaps or detergents	Unknown	Reduced	Inactivated	Inactivated	Effective	Unknown	Effective	Inactivated

* Disinfectants undergo testing to determine what bacteria or viruses they will kill. Some disinfectants can be harmful for certain materials. When selecting a disinfectant, read the label and select a product that has been tested against the disease agent you are concerned about killing.

DISCLAIMER: Use of trade names does not in any way signify endorsement of a particular product. For additional product names, please consult your veterinarian.

TRANSMISSION ROUTES OF ZONOTIC DISEASES

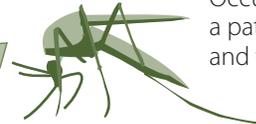
Aerosol

Occurs when droplets are passed through the air from an infected animal and are breathed in by a person. Most exposure occurs when droplets are created from birthing tissues (placenta, birthing fluids), soil contaminated with feces, urine or bacteria and a person breathes in the dust particles.



Vector

Occurs when an insect acquires a pathogen from one animal and transmits it to a person.



Oral

Occurs by ingesting food or water contaminated with a pathogen. This can occur if animal products, such as milk or meat, are not pasteurized or cooked properly. Eating or drinking after handling animals without washing your hands could also lead to oral zoonotic disease transmission.

Direct Contact

Requires the presence of a pathogen in the environment or within an infected animal. A person becomes exposed when the pathogen directly touches open wounds, mucous membranes or the skin.



Fomite

A fomite is an inanimate (non-living) object that can carry a pathogen from an animal to a person. Examples of fomites include contaminated obstetrical (O.B.) chains, brushes, needles, clothing or bedding (straw, shavings).

graphic created by Clint May, CFSPH