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Biosecurity Practices for Dairy Operations

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Biosecurity measures prevent infectious diseases from affecting a herd. By implementing general management and vaccination practices, producers protect their herds from existing diseases in the United States and from possible foreign animal disease outbreaks.

How Disease Spreads

Disease spreads directly—from an infected animal to a susceptible animal—and indirectly from contact with contaminated objects, equipment, insects or people (Table 1).

Pathogens infect through five primary routes:

- Inhalation: Pathogens are carried through the air in tiny moisture droplets from sneezes or coughs.
- Oral: Susceptible animals consume disease-causing pathogens in contaminated feed and water or lick or chew on contaminated objects.
- Skin: Pathogen enters through breaks in the skin.
- Reproductive: Disease is spread during mating or the fetus is infected *in utero*.
- Blood: An animal is bitten by an infected insect or arthropod or injured by contaminated equipment such as a needle, nose tongs, ear notcher, dehorner or balling gun.

Immunity

Immunity is an animal's ability to resist a disease. An animal is immune if its body prevents a pathogen from develop-

Table 1: Common diseases in dairy cattle.
More information is available at http://aevm.tamu.edu

Disease	Method of spreading	Common symptoms
Anthrax	Oral, inhalation, blood	Staggering, trembling, collapse, terminal convulsions, bloody discharge
Bovine brucellosis	Oral, reproduction	Abortions, stillbirths, weak calves
Bovine leukosis	Blood, reproduction	Enlarged lymph nodes
Bovine paratuberculosis (Johne's disease)	Oral, reproduction	Diarrhea, weight loss, bottle jaw
Bovine tuberculosis	Inhalation	Lesions in organs and body cavity, weight loss
Bovine viral diarrhea (BVD)	Oral, reproduction	Severe diarrhea, fever, abortions
Coronavirus enteritis	Oral	Dark green to black diarrhea
Cryptosporidiosis	Oral	Diarrhea
Infectious bovine rhinotracheitis (IBR)	Inhalation, reproduction	Abortions, cough, eye infections, genital infections
Leptosporosis	Skin, oral, inhalation, reproduction	Abortions, stillbirths, weak calves, fever, decrease in performance
Neosporosis	Oral, reproduction	Abortions
Parainfluenza-3 virus (PI3) pneumonitis	Inhalation	Cough, nasal discharge, increased respiratory rate
Rabies	Skin, blood	Anorexia, apprehension, nervousness, hyperexcitability, altered temperament, death
Salmonellosis	Oral	Diarrhea

ing or counteracts its toxins. Immunity provides an animal with antibodies that destroy a specific pathogen before it causes illness. Immunity is natural, active or passive.

Natural immunity comes from systems, such as the skin and nasal passages, that keep out pathogens. Some cells in the body also attack foreign organisms that could cause disease.

Active immunity is acquired through vaccination or an infection. A vaccine stimulates the production of antibodies without causing the disease. Boosters are needed to maintain this kind of immunity.

Passive immunity is acquired when antibodies are passed from one animal to another, such as *in utero* from the dam to the fetus or when a newborn animal drinks colostrum from its mother's milk. Since antibodies are large molecules, their ability to cross the placenta varies with species. In fact, some types of placentas are impenetrable to antibodies. In those species, newborns must take in about 10 percent of their body weight in colostrum within 24 hours of birth to acquire the antibodies. After 24 hours, a calf's stomach matures and antibody molecules are too large to be absorbed across the epithelium.

Vaccinations

Vaccines can prevent certain diseases in livestock and poultry; however, vaccines are not 100 percent effective. Vaccinations provide the body with antibodies to combat specific pathogens so that if later exposed to the disease, the body will be able to produce more antibodies to combat it.

By law, all vaccines must come with instructions on proper usage. Some vaccines require only a one-time injection; others require two injections several weeks apart and annual boosters to maintain immunity. For best protection, vaccinate animals before, not after, they are exposed to a particular disease. Consult a veterinarian about the proper timing of vaccinations as part of an overall herd health management plan.

Vaccines available in the dairy industry are listed in Table 2.

Vaccine Handling

Vaccines are fragile and must be handled according to label instructions in order to maintain effectiveness and immunity. Follow these guidelines:

- Consult a veterinarian and read the label and/or package insert before vaccinating animals.
- Note the expiration date and the instructions for storage.
- Most vaccines must be refrigerated during storage and use. Keep refrigerator temperature between 36 degrees F and 46 degrees F.
- If vaccines or other medicines do not require refrigeration, store them out of direct sunlight and in a controlled environment.

Table 2: Causes and treatments of common diseases.
More information is available at http://aevm.tamu.edu

Disease	Organism causing	Vaccine available	Treatment
Anthrax	Bacterium	Yes	Yes
Bovine brucellosis	Bacterium	Yes	Yes
Bovine leukosis	Virus	No	No
Bovine paratuberculosis (Johne's disease)	Bacterium	Not in Texas	No
Bovine tuberculosis	Bacterium	No	No
Bovine viral diarrhea (BVD)	Virus	Yes	Yes
Coronavirus enteritis	Virus	No	Yes
Cryptosporidiosis	Protozoan	No	Yes
Infectious bovine rhinotracheitis (IBR)	Virus	Yes	Yes
Leptosporosis	Bacterium	Yes	Yes
Neosporosis	Protozoan	Yes	No
Parainfluenza-3 virus (PI3) pneumonitis	Virus	Yes	Yes
Rabies	Virus	Yes	No
Salmonellosis	Bacterium	Yes	Yes

- Give the right vaccine to the right species of animal. If the label indicates it is for use in cattle, do not use it in swine. This off-label use is illegal.
- Give the proper dosage, in the recommended area on the animal and with the recommended technique.
- Do not insert a used needle back into an opened bottle. Always use a clean needle or a transfer needle.
- Use a clean needle for each animal to prevent disease transmission.
- When finished vaccinating for the day, properly dispose of the remaining vaccine. Once a vaccine vial is opened, the expiration date is void.
- Do not use chemical sterilants to disinfect syringes for modified live vaccines.
- Properly dispose of used needles in a puncture-proof container.
- Give boosters when required.

General Dairy Practices

Not all biosecurity practices will be feasible or necessary for every operation. Individual producers must assess their own risks when deciding which biosecurity practices to adopt.

Disease Risk Assessment

- Determine which diseases are the greatest risk to the operation.
- Determine the cost-benefit ratio of biosecurity for the operation.
- Identify how the transmission or introduction of disease on the premises could occur.

General Animal Practices

- Permanently identify all animals on the dairy.
- Keep health records on each animal, including vaccinations, calving, illness and treatments.
- Record the success or failure of treatments and any unusual symptoms.
- Review vaccination and treatment protocols each year and modify them when new risks are identified or treatment is unsatisfactory.
- Provide a balanced ration that contains energy, protein, vitamins and minerals necessary for efficient milk production and strong immune systems.
- Check feed for mycotoxins.
- Milk animals with mastitis last.
- Prevent manure contamination of feed or equipment that is used orally.
- Prevent cross contamination between healthy and sick or dead animals.
- Never step in the feed bunks.
- Use separate equipment for manure handling and feeding.
- Have a veterinarian examine all dead animals.
- Have a veterinarian collect laboratory samples from all animals that abort.
- Follow Dairy Beef Quality Assurance guidelines when injecting and handling cattle.
- Disinfect reusable equipment, such as tattooers, nose

tongs, hoof tools, implant guns, ear notchers and side cutters, between animals.

- Remove animals that are "reservoirs" for certain diseases. These animals continue to shed the pathogen and infect other animals.
- Develop a carcass disposal plan that designates approved burial sites, recommended transportation routes and composting and incinerating plans.

Pre-weaned

To protect calves:

- Vaccinate the dam during the dry period so immunity transfers to the calf in the colostrum.
- Provide a dry, clean, well-ventilated area for calving. Avoid areas with heavy fecal contamination, mud or standing water.
- Remove calves immediately after birth. Make sure calves get at least 10 percent of their body weight in colostrum within the first 12 hours after birth so they absorb needed antibodies.
- Dip the calf's navel in iodine immediately after birth.
- Feed only colostrum from disease-free dams. Wash the udder before collecting colostrum, and test with a colostrometer to ensure adequate quality.
- Check the serum total protein of 2-day-old calves. A serum total protein level of less than 5.0 grams per 100 milliliters means the calf is not adequately absorbing colostrum antibodies. Check colostrum quality, quantity and feeding times to determine what changes need to be made.
- Keep calves separated from older animals.
- Clean and disinfect equipment between calves.
- Pasteurize waste milk to be fed to calves.
- Sanitize obstetrical chains between uses.
- Develop a vaccination program to protect calves against diseases known to affect the herd. If they test positive for certain diseases, such as BVD, cull them immediately.

- Prevent surface runoff from adult cow areas from coming into contact with calves.

Purchasing Animals

To improve or expand herds, cattle sometimes must be purchased from outside sources. To protect the herd:

- Quarantine newly purchased animals and animals returning from shows or growers for at least 2 weeks.
- Create a vaccination and disease-testing program for new arrivals to blend in with the primary herd's health program.
- Ask about the herd health history of any newly purchased animals.
- Consult a veterinarian about testing the animals for diseases before purchasing.

Replacement Heifers

- Keep replacement heifers isolated.
- Develop vaccination programs for new animals.
- Prevent manure contamination.
- Quarantine animals returning from growers for at least 2 weeks.

Lactating Cows

Lactating cows are more susceptible to disease because of the stress of milk production, but daily observation means these symptoms can be quickly identified.

- Use different equipment for the primary herd and the quarantine herd to minimize the risk of disease exposure.

- Create isolation areas for sick animals so they have little or no contact with the rest of the herd.
- House fresh cows separately from the hospital pen. Because of the stress of calving, the fresh cow's immune system is compromised, making her more susceptible to disease.

Dry Cows

Dry cows are resting before calving and starting the cycle over again. Watch these animals closely before their return to production.

- Use dry cow treatments to reduce the incidence of mastitis.
- Consider teat sealants if mastitis continues.
- Vaccinate cows around dry-off or during the dry period.
- Avoid vaccinating within 2 weeks of calving.
- Create separate areas for dry cows away from sick animals.
- Give dry cows a balanced ration to enhance immune function.

Bulls

When using bulls to service cows naturally, make sure they are protected.

- Before purchasing, test bulls for contagious diseases.
- Test bulls frequently for venereal diseases such as trichomoniasis and vibriosis.
- Implement a vaccination program for bulls.

Semen Importation

Since most dairies use artificial insemination, monitor semen tanks and use these biosecurity practices:

- Purchase semen from known sources with certified production techniques.
- Buy semen, embryos or bulls from suppliers who have control programs for infectious diseases.
- Know the bulls' health history.
- Keep semen tanks locked and allow only qualified people to handle semen.

Product Safety

With the increased threat of terrorist activity, the milk transportation industry must take steps to ensure the safety and the quality of the U.S. milk supply. To protect

the bulk tank on the farm:

- Culture new animals' milk to check for infectious organisms.
- Routinely culture bulk tanks for infectious organisms.
- Allow only essential personnel into milk storage areas. Lock this area when the owner or employees are not around.
- Completely sanitize the tank and milk trucks to prevent contamination.
- Monitor cooling and cleaning to ensure the quality of the milk in the tank.
- Add video surveillance equipment and alarm systems that monitor for equipment malfunctions.

General Biosecurity Practices

Visitors

- Designate one area where visitors enter and congregate without coming into contact with animals, equipment or barns.
- Limit the number of people who enter the premises, and keep a log of everyone who comes and goes, including consultants, salesmen, deliverymen, maintenance workers and veterinarians.
- Require that oilfield, power, pipeline and seismic crew vehicles be cleaned and disinfected before entering or leaving the property.
- Ask visitors to log any animal contact they have had in the 48 hours preceding their visit to your property.

- Keep feed and other products away from visitors and monitor closely.
- Require proper identification of all visitors.
- If foreign visitors are expected, require that they have been in the United States at least 5 days and have had no animal contact.
- Provide tire disinfectant baths or sprays for visiting vehicles.
- Provide disposable boots or disinfectant footbaths for visitors at entry.
- Never allow visitors unlimited access to the premises and facilities.
- Do not allow other animal owners to come into physical contact with your animals.

Owner Practices

- Keep a clean pair of shoes to wear only around the animals on one premise. If the operation has multiple premises, keep shoes at each one, or thoroughly clean and disinfect shoes before traveling to other premises. Insist that all personnel adopt this practice.
- Carry disposable boots when visiting other premises and dispose of them before leaving that site.
- Wash hands with soap and water for at least 20 seconds, or use a 60 percent alcohol gel, before touching any animals.
- If you have been off-site, change clothes and footwear before visiting your animals.
- Provide disinfectant footbaths and tire baths for employees to walk and drive through.
- Spray tires with a disinfectant before leaving or re-entering the premises.
- Clean and disinfect all feed delivery equipment between deliveries and between farms.
- Test bulk feed such as corn and whole cottonseed for mycotoxins.
- Know your neighbors and set up a crime watch program.
- Don't advertise the times when you will be away from the premises.
- Ask local law enforcement agencies to randomly drive by your premises and look for unusual behavior.

Security

- Keep doors and gates locked at all times.
- Post "No Trespassing" and "Do Not Enter" signs on the premises and buildings. Replace or repair signs as needed.
- Conduct random security checks. Look for signs of unauthorized activity or entry.
- Remove shrubs and other objects from around barns and buildings to eliminate hiding places for people or unwanted animals.
- Keep areas around and inside buildings well lit. Install emergency backup lighting.
- Install alarms, motion detector lights, cameras and other security equipment.
- Maintain good perimeter fences.
- Secure feed, nutrients and hazardous materials such as pesticides and fertilizers.
- Secure water sources and identify alternative sources.
- Maintain an accurate, up-to-date inventory of hazardous materials, including anhydrous ammonia, ammonium nitrate, bulk urea, pesticides and herbicides.
- Secure storage areas for hazardous chemicals and drugs according to state and national codes. Lock the chemical containers in these storage areas even if empty.
- Install locks on all doors, including those to the water supply, chemicals, equipment and other supplies. A deadbolt lock with a minimum 1.5-inch throw is recommended.
- Inventory farm vehicles and equipment regularly. Lock all vehicles left outside.
- Ask feed suppliers about their sources, safety precautions and pest management methods.
- Clean all feed storage facilities before restocking.
- When possible, keep wildlife, especially feral swine, off the premises.

Transportation

- Use a disinfectant such as bleach to kill viruses and bacteria. A mixture of 1 part bleach to 10 parts water is sufficient. A pump-up sprayer is ideal for applying disinfectant in most situations.
- Instruct cleaning and disinfecting crews to wear clean, waterproof clothing and boots.
- Sweep out trailers to remove loose dirt, hay and grain, cobwebs, trash or debris. Remove and sweep under mats.

- Scrape or scrub mud and manure from both the interior and exterior of the trailer, truck and equipment.
- Remove all feeders, panels and grooming or cleaning equipment so the trailer can be cleaned thoroughly.
- Soak and wash vehicles and equipment with water and detergent or disinfectant. Use a brush or pressure washer if necessary.
- When washing the outside of vehicles and trailers, start at the top and front. Working from top to bottom and front to back helps wash pathogens out of the vehicle.
- Wash the wheels, wheel arches, mud guards and undercarriages of vehicles and trailers.
- When washing the inside of vehicles and trailers, start with the ceiling and work down the walls and to the floor, beginning at the front of the trailer and working toward the back.
- Clean and disinfect tailgates, lifts and ramps.
- Wash and disinfect mats in trailers and vehicles, as well as foot pedals in vehicles.
- Leave disinfectants on surfaces for 20 to 30 minutes to kill all pathogens.
- Rinse vehicles, trailers and equipment thoroughly to remove detergents and debris. Allow everything to dry completely.

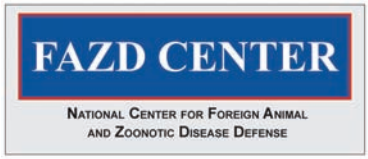
Employees

- Train employees to report sick animals, suspicious activity or people, and unusual events.
- Keep keys in a safe place and have employees check them in and out as needed.
- Conduct safety and security meetings with everyone who lives or works on the premises.
- Provide employees with specific guidelines for sanitation procedures if they have animals at home.
- Develop a policy for employees returning from travel in other countries.

When Disease Happens

If a disease outbreak occurs on your premises, contact a veterinarian immediately. Stop all movement of animals, people and milk, both on and off the premises. The first 24 hours of a disease outbreak are critical in controlling the spread of the disease. Be prepared by completing these steps in advance:

- Create an emergency contact list of resource people in the community. Post copies of this list near telephones and on bulletin boards. Have employees put these numbers into their cell phones.
- Make sure critical information—such as maps of the premises, types and locations of chemicals, and number of animals—is readily accessible to any first responders.
- The U.S. Department of Agriculture recommends having a facility map that includes emergency contacts and other information for first responders, including:
  - The name, address and phone number(s) of the owner
  - The relationship of the farm to adjacent fields and structures
  - A site map with buildings and other structures labeled and numbered, including houses, barns, greenhouses, nurseries, shops, outbuildings, silos, grain bins, and chemical and fertilizer storage/pits. Include sizes and locations of entrances.
  - Transportation routes, including access roads, highways, crossroads and other roads
  - Storage areas for machinery, equipment and airplanes
  - Fences and gates and their dimensions
  - Well and/or municipal water supply, hydrants, ponds, streams, rivers, lakes and wetlands
  - Electric, gas and telephone lines and shutoff locations
  - Septic tanks, wastewater systems and cisterns
  - Drainage ditches, culverts and surface drains
  - Fields and pastures
  - Fuel storage tanks
  - Areas where animals and/or crops of concern are located. Include the average number of animals housed in these locations.



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