Managing disease risk is an important component for Iowa livestock operations. Whether it is part of everyday activities or in the event of an outbreak, awareness of common biosecurity, or biological risk management, protocols is essential to those interacting with animal facilities.

Managing disease risk must be done on a daily basis to ensure the health of Iowa livestock and livestock producers. However, there are specific prevention steps for certain diseases, and control practices relate to how the disease is actually spread. The five routes of transmission will be further explained but include aerosol, direct contact, fomite, oral and vectors. There are commonalities in disease prevention, but some diseases will require additional specific responses to prevent and control spread. Heightened biosecurity will be needed during an animal health event and afterwards to minimize or eliminate disease spread.

There are many general prevention steps that every farm could implement that would help prevent against a variety of diseases that are transmitted in various ways. Two of the biggest risks for disease entry include animals and traffic (vehicles and people). Posting signs with clear instructions regarding your farm policy for visitors and locking gates will help limit unauthorized access to your animals, feed, and equipment. Restrict access to your farm to only those with appointments or people you know. All visitors should sign in and disclose their last known contact with other livestock species. Also, besides introducing the same species to a facility, it is important to limit contact with other animals – neighboring livestock on common fence lines, wildlife and birds. Cats and dogs should be prevented from roaming between farms. Photo courtesy of: Bryan Buss, DVM, ISU.

As mentioned previously, animal introductions are one of the highest risks for introducing disease. If animals are purchased, they should come from a known source with a health status similar to the home herd/flock and from a limited number of sources. Newly introduced animals, including animals taken to a show, trail ride or veterinary clinic for treatment, may be carrying diseases that the home herd/flock is not immune to. Quarantine is recommended for a period of time, commonly 2-4 weeks. Ill animals should be removed from the rest of the herd/flock immediately and placed in an isolation area where ventilation, feed/water, and other equipment are not shared and direct contact with other animals does not occur to minimize disease spread. Time spent in isolation and quarantine varies depending on the risk so this should be determined together with your herd veterinarian. Before taking animals out of isolation or quarantine, they should be tested for key diseases (determined together with your herd veterinarian) to make sure they are not carrying diseases that could be introduced into the home herd.
Daily Practices
- Keep health records on every animal
- Train farm personnel to report sick animals
- Inspect animals daily
  - Clean equipment, boots, clothing
- Investigate unusual signs, unresponsive cases
  - Neurologic, downers, sudden death

To monitor health status and effectiveness of treatments and vaccination protocols, it is imperative to keep health records on every animal. There are many computer programs out there that can simplify this for producers as the photo depicts (courtesy of Dale Moore, UC Davis VMTRC). By establishing and educating all employees on what to look for regarding sick animals and having a reporting system so that those in charge can make treatment decisions or the veterinarian can be contacted, serious diseases can be identified early on and minimize the risk of disease spread. It is important to clean any equipment, boots or clothing that is used between groups of animals with differing health status. Producers should work with their veterinarian to investigate those animals that present with unusual symptoms or are unresponsive to treatment, especially neurologic cases, downers and those that die suddenly.

Prevention Based on Disease Spread

There are specific prevention steps for certain diseases, and control practices relate to how the disease is actually spread. Recommended prevention practices for the five routes of transmission will be further explained.

Disease Transmission
- Animals may not exhibit obvious clinical signs of disease
- Essential
  - Disease prevention
  - Awareness of how disease is transmitted
- Develop strategy to minimize disease risk for livestock operation

It is important to remember that disease transmission can occur without animals exhibiting obvious clinical signs of disease. That is why daily disease prevention and awareness of how diseases are transmitted are essential when developing a strategy to minimize the risk of disease for a facility or operation. (Photo source: DB Weddle, DVM, Iowa State University)

Routes of Transmission
- Spread of disease agents
  - Animal → animal
  - Animal → human “zoonotic”
- Different modes of transmission
  - Aerosol → Oral
  - Direct contact → Vector-borne
  - Fomite → Zoonotic

Disease agents can be spread from animal to animal, or animal to human (known as zoonotic disease), through five main routes – aerosol, direct contact, fomite, oral and vector borne. Zoonotic diseases involve the transmission of disease pathogens from animals to humans. The disease agents entry into a person goes through the same five routes of transmission as in animals – aerosol, oral, etc. It should be noted that many infectious agents can be transmitted by more than one route of infection. (Photo courtesy of DB Weddle, DVM, Iowa State University)

NOTE TO PRESENTER: This would be the place to distribute the Transmission Routes Handout so participants can learn the definition of each of the routes of transmission. For brevity, here are quick explanations: aerosol – breathing in contaminated particles; direct contact – disease agent entering through blood, breeding, mucous membranes like eyes/gums/open wounds; fomite – contaminated inanimate object carries disease agents and enters animal directly or orally (example – needles, buckets, boots); oral – consumption of contaminated feed, water; vector-borne – insects acquire disease agent from one animal/human and spread to another animal/human.
Aerosol transmission occurs when infected droplets are passed through the air from one animal (infected) to another animal (susceptible). There are various prevention steps that can help ensure aerosol transmission of disease does not occur. One essential step is to increase the distance between sick and susceptible animals. Another is to maximize ventilation so that fresh air is provided to all animals and humidity and odors do not build up. These basic steps will go a long way in preventing aerosol disease transmission. Graphic designed by Clint May, ISU.

An essential step in aerosol prevention is to isolate all sick animals immediately so that they do not contact other susceptible animals. For aerosol spread diseases, distance is extremely important. Air space should not be shared between sick and healthy animals as is depicted in this photo with the horse isolated by herself in an pen (photo courtesy of DB Weddle, DVM, Iowa State University).

There are various prevention steps that can help ensure direct contact and fomite transmission of diseases are minimized. This begins with visitors and vehicles on farm – limit or restrict access, require clean clothing/footwear/vehicles, and restrict access to animals on farm. Another essential step in prevention is to isolate all sick animals immediately so that they do not contact other susceptible animals (discussed previously). Keep the animal housing environment as clean and dry as possible to minimize risk of environmental exposure. Finally, keep equipment clean so that it does not act as a fomite and spread disease to the next animal (discussed previously). These basic steps will go a long way in preventing direct contact and fomite disease transmission. (Photo source: DB Weddle, DVM, Iowa State University)

Minimize vehicular traffic on farm by loading/unloading animals and keeping rendering piles only at the perimeter of the operation. Rendering trucks can visit several farms in one day picking up animals that may have died from contagious diseases. By having the dead pile at the perimeter of the operation, the risk of disease introduction is minimized. Another way to minimize the disease introduction is to designate certain vehicles for use on-farm only and other vehicles for off-farm only. If this is not possible, vehicles used off-farm should be cleaned and disinfected appropriately before coming into contact with animals or their travel paths on farm. Do not share equipment with other farms, such as tractors for cleaning barns or livestock trailers, because the risk for disease introduction increases. If equipment is shared, it should be inspected for cleanliness and cleaned appropriately (washed down, soap washed, rinsed, disinfected and allowed to dry) before use. It is also good to prevent feed and fuel truck drivers from crossing animal paths on on-farm vehicle paths. Photo courtesy of Bryan Buss, DVM, Iowa State University.
Prevent: Direct Contact, Fomites
- Require prior authorization before entering premises
- Sign in and disclose recent animal contact
  - No animal contact for people traveling to foreign countries previous 7-10 days
- Require clean clothes, clean footwear
  - Provide if necessary

Since visitors and sales people have had unknown animal contact prior to visiting your farm, require them to make appointments prior to their visit. Have visitors sign in and disclose their last known animal contact so you can decide what, if any, animal contact they should have on your farm. Collecting this information is also important with regard to disease tracking, should an outbreak occur on your farm or in your area. By limiting access of people who have recently (last 7-10 days) been to a foreign country, the risk of disease introduction is minimized; often times a devastating disease. Clean clothes and footwear should be required of anyone entering your operation and if not, entry should be denied as the risk of disease introduction increases. By providing clean clothing (coveralls, tyvek suits) and clean boots (disposable or rubber) to all persons, including employees and herd veterinarians, you can help ensure they will not introduce disease organisms. Photo courtesy of: Sandy Amass, DVM, Purdue University.

Oral, Fomite
- Basic prevention steps involve:
  - Isolating sick animals
  - Keeping feed and water clean
  - Managing manure
  - Keeping equipment clean
  - Feeding, treatment, vehicles

There are various prevention steps that can help ensure oral and fomite transmission of diseases are minimized. One essential step in prevention is to isolate all sick animals immediately so that they do not contact other susceptible animals (discussed previously). Keeping feed and water clean by minimizing fecal and urine contamination is extremely important. Another is to manage animal manure so that it does not contaminate young stock areas or contaminate grazing areas. Finally, keep your equipment clean- feeding, treatment equipment and delivery trucks especially (discussed previously). These basic steps will go a long way in preventing oral and fomite disease transmission. Photo depicts an esophageal feeder that can administer electrolytes to a sick animal – if not cleaned appropriately, this fomite could introduce disease to another animal orally. (Photo source: DB Weddle, DVM, Iowa State University)

Prevent: Oral, Fomites
- Elevate feed, prevent stepping into feed bunks with contaminated boots
- Examine feed for contaminants, quality
  - Manure, mold, carcasses
- Monitor feed tags, deliveries
- Test, control access to water sources
  - Fencing to prevent animal entry and contamination

Feed and water can become contaminated with feces and urine if not properly handled both before and after feeding. Elevate feed and prevent people from stepping into feed bunks with manure on their boots. Feed stuffs should be examined routinely for contaminants such as manure, mold, or foreign material (carcasses during ensiling), and overall quality. Monitor feed tags and delivery of commodities to ensure quality products are being fed to animals. If a natural water source, such as a pond or stream, is the main drinking water for the herd, test it periodically for quality purposes and control access so that animals can drink from it but not enter and potentially contaminate it. This can be done with strategic fencing and a concrete or gravel rock pad leading into the water source. (Photo source: USDA ARS)

Vector Control
- Basic prevention steps include:
  - Source reduction
  - Prevent egg laying
  - Control adults
  - Insecticides
  - Minimize animal interaction
  - Screens on buildings
  - Animal treatment
  - Mowing long grasses

Vector control begins with an understanding of the insect’s life cycle. Insect life stages vary and so do effective control measures. For instance, the egg laying grounds for flies are different than that of mosquitoes and midges and one approach does not work for all. We will discuss options in future slides. Controlling adult insects, be it flies or mosquitoes, often involves the use of insecticides. This is often less effective, so more effort should be focused on reducing the source. Finally, minimize the opportunities for insects to interact with animals through the use of screens on barns, animal treatment with approved chemicals, and mowing long grasses. Strategies will be discussed in the next slides. Photo depicts insecticide spray and screens on the animal building. (Photo source: DB Weddle, DVM, Iowa State University)
The adult female fly lays her eggs in organic matter, be it manure, feed or wet bedding. One way to decrease the prevalence of flies is to minimize areas where they can lay their eggs by disturbing the piles of organic matter weekly and cleaning up spilled feed. Control could involve the use of parasitic wasps, predatory mites and beetles because they feed on developing flies (pupae/larvae) living in manure, bedding, vegetation. Certain insects can only be used in certain areas because they may feed on other beneficial insects, so check with your local extension specialist for recommendations. Chemicals that kill a fly on contact or sprayed on shaded surfaces (barn walls, ceilings) where flies rest to kill them through contact may also be effective. Baits and fly traps work against house flies but should be part of an integrated pest management system for best efficacy. Insecticides should be used according to label directions and only for approved animal species. The photo depicts an excellent area for flies to lay their eggs- old feed (courtesy of DB Weddle, DVM, Iowa State University).

Biting midges, or no-see-ums, lay their eggs in decaying vegetation or wet soil or mud, and larvae need moisture and organic matter to survive. Adults stay pretty close to their breeding sites, so manage those areas by agitating settling ponds and minimize stagnant water. It is more difficult to manage the larval sites due to their vastness and hard to treat regions. Photo is a biting midge, courtesy of Ed T. Schmidtmann, USDA/ARS http://creatures.ifas.ufl.edu/aquatic/Biting_midges_02.htm

The most effective treatment for mosquitoes is source reduction - eliminating larval habitats or making them unsuitable for larval development. Low-lying, flood-prone areas can be good egg-laying grounds for some mosquitoes, and non-chemical methods can be applied that specifically targets mosquito larva. One example is called BTI (*Bacillus thuringiensis israelensis*) pronounced ba-SILL-us thur-in-GEN-sus iz-REEL-en-sus. It is available in two different forms – granules for a large area and dunks for stock tanks. (Top photo source: http://pics4.city-data.com/cpic/cfiles33406.jpg) By minimizing standing water through agitating or circulating lagoons or water tanks, a lot can be done to minimize mosquito egg-laying areas. Another problem on farms is containers that hold water or old tires used for silage piles, as pictured on the bottom (courtesy of DB Weddle, DVM, Iowa State University). Insecticides are often the least efficient control program for mosquitoes and often require multiple applications. Not only do mosquitoes transmit disease to animals, but to humans too and a farm walk through to identify and eliminate trash containers is good prevention.

While source reduction will help decrease numbers of insects in the area, often times it is necessary to minimize the interaction with animals. This could involve environmental management such as mowing pastures, as the top picture depicts, to reduce tick habitats to applying chemical treatments to animals with acaracides (tick killing chemicals) every 2-4 weeks during tick season. Other ways to minimize interaction is to confine the animals to an insect proof structure. In the case of vesicular stomatitis outbreaks or bluetongue, it is necessary to confine the animals in a stall as the bottom photo illustrates, until the insect season has passed. This can be difficult to do depending on the farm or types of animals raised. But if it is the only way to prevent disease, temporary structures could be put up. Both photos were found at: http://www.equestrianservicesllc.com/gallery.cfm
There are various disease prevention and control methods that must be applied during and after an animal health event and those will be discussed next.

If a major animal disease is reported in Iowa, movement restrictions could be put in place to minimize spread until more information is known. The State Veterinarian, under the authority of the Iowa Secretary of Agriculture, may implement embargos, voluntary hold orders, or quarantines, depending on the needed response. Animals or their products may not be allowed to go to market or for further processing. The only individuals allowed on/off operations could be essential personnel or state authorities. Deliveries may be halted as well depending on the disease detected or suspected. People movement may also be limited initially until more is known about the disease and how it is spread.

In the event of an animal disease emergency, strict biosecurity measures should be implemented and will serve as a means of preventing the further spread of the disease. Access to the farm should be restricted to only those personnel necessary for the function of the farm. Signs (like the one shown) should be posted at the farm entrance restricting access (Graphic design by Clint May, CFSPH). Any traffic (vehicle, people) allowed should be CLEAN, closely monitored and recorded in a log book. Animals should be closely and frequently monitored for signs of illness or unusual behavior. If identified, the herd veterinarian should be contacted immediately. Note to presenter: Do Not Enter Sign is available in your resources.

When on the farm during an animal disease event, personal protective equipment such as gloves, coveralls, and boots should be worn at all times. These materials should be disinfected or removed and properly disposed of following the procedure to prevent cross contamination between different areas of the farm and farm-to-farm. Additionally, hands should be washed with soap and water after contacting animals to prevent spread of disease to animals or humans if the disease is zoonotic. Depending on the specific disease, protective eyewear and a mask or respirator may also be necessary. State and Public Health Officials will provide guidance to those working with animals regarding proper protection. Vaccination or treatment of animals is very disease specific, and dependent upon the availability of a safe, effective product. Again, State Animal Health Officials will provide guidance to those working with livestock producers and veterinarians as to the best approach in an animal health event.

In order to control disease, proper cleaning and disinfection of all vehicles on and off the farm, plus animal housing areas may be necessary. An essential step is cleaning - removing all organic matter (manure, feed, dirt, etc.) prior to application of any disinfectants. Most disinfectants are inactivated by organic material. Additionally, this debris can allow microorganisms “hiding” from the action of disinfectants. Always read the label instructions to determine to concentration needed. More is not always better. Another often overlooked step is to allow for proper contact time after application of the disinfection solution. The chemicals need time to do their job. In the event of a disease outbreak, the best disinfectant of choice will likely be determined by animal health officials. Photo courtesy of: Danelle Bickett-Weddle, DVM, ISU.
Summary

- Daily biosecurity minimizes disease exposure
- Prevention steps based on how disease spreads
- Heightened biosecurity protocols during, after an event
- Follow guidance of State Officials
- You play a critical role!

During this presentation you have learned that biosecurity practices must be implemented everyday to minimize disease exposure to livestock. Since all diseases are transmitted by a few common routes, focusing prevention practices based on how the animal gets exposed is one way to prevent spread. Heightened biosecurity measures will be implemented by the State of Iowa in the event of an animal health emergency. At this time, stricter biosecurity plans will need to be implemented to decrease the spread of disease. Follow the guidelines put forth by State Officials as they will be most informed of what is occurring and how to manage the disease. Each of YOU play a critical role to ensure livestock operations remain safe!

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