Managing Disease Risk

Prevention includes measures that prevent the emergency from happening, reduce the chance of the emergency happening, or reduce the damage of unavoidable emergencies. Awareness and management of disease risk is an important component for Iowa livestock operations so that an animal disease emergency can be prevented. Whether it is part of everyday operations or in the event of an outbreak, awareness of common biosecurity, or biological risk management, protocols is essential to those interacting with animal facilities. Specific prevention steps exist 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.

Overview
- Importance of animal agriculture
- Biological risk management
- Routes of transmission
- Prevention practices
- Summary

Managing disease risk is an important component for the health of Iowa livestock and livestock producers. Today we will discuss the importance of animal agriculture to Iowa’s economy, where biosecurity, or biological risk management can play a key role in prevention, how diseases are spread through various routes of transmission and basic prevention practices to limit disease entry or spread on farm, and also to people.

Animal Agriculture
Iowa 2006
- #1 pork, eggs
  - 17.2 million pigs
  - 51.6 million chickens (layers)
- #2 red meat
  - 6.5 billion pounds
  - 3.9 million cattle
- Cash receipts
  - Turkeys - $123 million
  - Dairy cows - $530 million
  - Sheep, lambs - $22.2 million

Here in Iowa, animal agriculture is a major component of our economy. In 2006, Iowa led the nation in the production of pork and eggs. Over 17 million swine are raised in the state (about 5-1/2 hogs for every person) with cash receipts of $4.15 billion. There are over 51 million egg layers with 13.8 billion eggs produced and a gross income of $407 million. Iowa was second nationally in red meat production (6.5 billion pounds) and cattle account for $2.5 billion in cash receipts from almost 4 million head. Turkey accounted for over 274 million pounds and $123 million in turkey production. There was an average of 205,000 milk cows with 4.13 billion pounds of milk produced and dairy cash receipts of over $530 million and over 235,000 head of sheep and lambs with cash receipts of $22.2 million. [Source: IDALS, Quick Facts about Iowa Agriculture, 2005 Livestock Summary. http://www.agriculture.state.ia.us/2006AgStats/06_76.pdf, www.agriculture.state.ia.us/quickFacts.htm and www.agriculture.state.ia.us/quickFacts2.htm. Accessed 01/02/08. Photo sources: DB Weddle, ISU; Graphic illustration: Andrew Kingsbury, ISU]

Food Production Changes
- Number of farms decreasing
- Animal numbers rising on some farms
- Opportunities
  - Increasing intensity/specialization
  - Efficient food source: U.S. and world
- Challenges
  - Disease control and eradication
  - Devastating economic effects

Despite the large numbers of animals in Iowa, each year the Census of Agriculture reports fewer farms. The changes in animal production (e.g., higher densities) and species specialization has allowed livestock farmers to efficiently provide food for America and the world, but presents opportunities and challenges that were not a part of raising animals only a few decades ago. The introduction of a disease into a facility can spread rapidly based on the high concentration of animals. This highlights the need to prevent disease introduction to continue to ensure the animal’s well-being and a safe food source.

Minimizing Disease Spread
- Occupation may require farm visits
- As a farm visitor, recognize and minimize the risk of introducing a disease
- Farms becoming more concerned about who/what is entering
  - Visitors, employees, animal traffic
- Ask and follow farm biosecurity plan

There are many instances when a visit to an Iowa farm might be part of your daily job routine. It is important to recognize that as a visitor to an animal facility, you pose a risk of introducing disease if certain precautions are not followed. Livestock owners are becoming more aware and concerned with who or what may be entering their farm, be they visitors, employees or animal introductions. It is important to ask about the biosecurity plan prior to arrival and then follow the protocols when on farm.
In order for a farm to develop a biosecurity plan, they must first identify specific disease risks for their operation. Biological risk management (BRM) 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 improve disease control, not only for foreign animal disease threats like foot-and-mouth disease, but domestic diseases, like *E. coli* or *Salmonella* as well. Biological risk management provides the tools to identify and minimize the risk (photo courtesy of: DB Weddle).

BRM recognizes that diseases cannot be totally eliminated, but that the risk can be managed through effective prevention steps. Animal caretakers are knowledgeable about animals and can manage their environment to minimize the risk of disease. For nearly all diseases there is a relationship between exposure dose (number of disease organisms) and severity of disease. By decreasing the animal’s exposure dose through cleanliness, good nutrition, decreased stress and proper vaccinations, there is less risk for the animals getting sick which helps justify the cost of implementing BRM. It is important to remember that many different solutions exist and because all animal facilities are different, there is not a one-size-fits-all answer. Photo depicts cattle in a pasture and the owner walking through them monitoring for illness (courtesy of USDA, taken by Bill Tarpenning).

The concept of biological risk management (BRM) looks at all infectious disease agents by their route of transmission – how they enter an animal, or human in the case of zoonotic diseases. While disease agents and the infections they produce vary, they all have one thing in common: the animal, or human, must be exposed to them to develop disease. Minimizing disease risk by focusing on the routes of transmission has the advantage of protecting against new or unanticipated infectious diseases. 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 and put prevention into place. This classification system is effective and easy to understand without requiring knowledge about a wide range of diseases. From a management standpoint, it is easier to identify specific risk areas, such as oral exposure through drinking contaminated water, and then design protocols to minimize exposure.

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. A sixth route, zoonotic, is the transmission of disease between animals and humans. However, the disease agents still get into a person through the same five routes – aerosol, oral, etc. It should be noted that many infectious agents can be transmitted by more than one route of infection. This photo shows cow-calf pairs being herded to another pasture in Oregon (courtesy of USDA, image # 95cs0779, taken by Doug Wilson). **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.
Environmental Contamination

- Disease organism in environment
- Survive in soil, organic material
- Animals and humans can acquire agent(s) through:
  - Inhalation (aerosol)
  - Direct contact
  - Fomites
  - Oral consumption
  - Vectors

Many disease agents can survive for extended periods of time in soil or other organic material like bedding, manure, 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 slides. Therefore, environmental contamination should not be ignored but recognize the routes it uses to get into the animal can be controlled. This photo demonstrates the wide realm of environmental contamination possibilities (photo source DB Weddle). Next we will discuss ways to prevent entry of disease onto a farm — carrying organic matter from the environment is one area that must be controlled.

Preventing Entry

- Some animal viruses can be carried by fomites
  - Truck tires, wheel wells, undercarriage
  - Footwear
- Walking/driving through animal areas
- Pick up viruses/bacteria
- Deposit on the road, next farm
- Proper cleaning and disinfection is important

It is important to recognize that some animal pathogens may be carried on vehicles (truck tires, wheel wells, undercarriage) as well as footwear and clothing. These are all examples of fomites — contaminated inanimate objects that can carry disease from one place to another. Therefore walking or driving through animal areas can contaminate footwear or tires and spread the agent throughout the operation or to the next farm, if proper cleaning and disinfection steps are not taken. We will discuss specific prevention protocols you can put in place to minimize the risk of spreading disease.

Preventing Spread

- Limit contact with animals
- Wear protective clothing, footwear
  - Between animal groups and prior to leaving operation
    - Change soiled protective clothing
    - Wash, disinfect soiled footwear
    - Clean, disinfect soiled equipment
    - Leave trash on farm

In order to prevent disease spread on farm, awareness of where animals are located and minimizing contact with them is important. If animal contact is necessary, wear protective gear that can be removed and cleaned to minimize disease spread. When moving between animal groups, change any soiled protective clothing, especially if the health status of the groups are different (different age, different vaccination status), and wash and disinfect (or dispose of) protective footwear. Equipment used with different groups of animals should be treated the same way — clean/disinfect or dispose if appropriate. Trash that is generated on farm should be left on farm to minimize spread to other operations. If vehicles or equipment become soiled, wash and disinfect soiled surfaces before leaving the farm, again to minimize spread to other operations.

Preventing Zoonosis

- Protective outer clothing
  - Coveralls, water-resistant barriers
  - Footwear
  - Overshoes that can be cleaned, disinfected
  - Disposable
  - Gloves
  - Sick, unknown health status animals
- Remove soiled items before leaving
- Wash hands

Animals may carry disease organisms that can cause disease in humans — referred to as zoonotic diseases. It is important to protect yourself while working with animals, or in the environment of animals, to decrease the risk of becoming ill. Protective outer clothing (coveralls, water-resistant barriers), footwear (cleanable or disposable) and gloves will protect your skin from contacting disease organisms from an animal or the environment. Zoonotic disease organisms can be carried on clothing and footwear and should not be worn away from the animal facility to minimize the spread of disease to family members (especially children and the elderly). Gloves should be worn when working with sick animals or those that you are unaware of their health status (infected animals do not always appear sick). Wearing gloves does not replace good hand washing habits—wash hands in warm water and soap after removing gloves, soiled outerwear and footwear.
Livestock producers have a lot of contact on a daily basis with animals. In most cases, the farmer has been previously exposed to the diseases carried by the animals in the herd and has developed some type of immunity to it. However, this is not the case with foreign animal diseases because their immune system has never seen that disease before. Another consideration is aging or a change in health status – normal diseases could make them ill in this case. Immunocompromised people are more vulnerable to zoonotic diseases. Examples include the elderly, children under the age of 5, pregnant women, chemotherapy patients, organ transplant recipients, persons with HIV/AIDS, and people with chronic diseases such as diabetes. These health conditions are more common today making disease awareness and prevention imperative. The top photo shows an elderly farmer, while the bottom photo shows another susceptible population, an immunocompromised person in a nursing home (photo sources USDA).

During this presentation you have learned that animal agriculture is important to Iowa and keeping animals disease free is essential for animal health, human health and the economy. Also, you have learned that all diseases are transmitted by a few common routes and by managing disease exposure will help decrease the level of disease. While disease risk cannot be completely eliminated, it can be managed. Awareness education is essential for effective disease control and each of YOU play a critical role!