Slide 1

Introduction to Biological Risk Management

For Beef and Dairy Producers

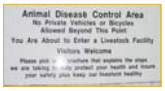
The Center for Food Security & Public Health
IOWA STATE UNIVERSITY

In this overview presentation, we will introduce the concept of biological risk management (BRM) and discuss how it applies to beef and dairy producers.

Slide 2

Biological Risk Management (BRM)

- Overall process of awareness education, evaluation, and management



- Designed to improve disease control
  - Foreign and domestic diseases
- Provide tools to minimize risk

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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 (photo courtesy of: DB Weddle).

Slide 3

Biological Risk Management (BRM)

- Disease risk cannot be totally eliminated
  - Animal, its environment
  - Decrease exposure to disease agents

- Minimize threat to animals and humans
- No one-size-fits-all answer

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BRM recognizes that diseases cannot be eliminated, but that the risk can be managed through effective control measures. As animal caretakers, it is our duty to be knowledgeable of the animal and its environment to minimize the risk of disease. For nearly all diseases there is a relationship between dose exposure and severity of disease. 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. Many different solutions exist and because all cattle 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).

Slide 4

Overview

- Importance of BRM
- Risk perception and assessment
  - Routes of transmission
- Practical management plans
  - General prevention practices
- Increased awareness through communication

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The goal of this presentation is to illustrate the importance of biological risk management (BRM). We will introduce the concepts of risk perception and risk assessment, discuss the various routes of transmission that could introduce disease and provide animal producers/workers with tools to implement practical disease management plans. A review of some general prevention practices will be provided. And finally, this presentation will increase awareness regarding disease introduction and spread through communication.

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Importance of BRM

Let us begin our discussion by addressing the importance of biological risk management.

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Importance of BRM

- Importance of agriculture
- Changing food production practices
- Rise in emerging and re-emerging infectious disease
- Increasing globalization
- Increased interaction with animals

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Why is biological risk management important? There are several reasons – the importance of U.S. agriculture, changing food production practices, the rise in emerging and re-emerging infectious diseases, increasing globalization and increased human interaction with animals.

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Agriculture and Economics

Agriculture is an enormous economic industry. Biological risk management is important in order to minimize the animal health and economic consequences to the nation and agriculture industry should there be an infectious disease outbreak.

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Agriculture and Economics

- 1 in 6 U.S. jobs are ag-related
- Our economy dependent upon agriculture
  - Animal production industry
  - Affects everyone in U.S. in some way

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It has been stated that one in six jobs in America is related to agriculture in some manner. It is understandable then why our economy is heavily dependent on the agriculture sector and within it, the animal production industry. The agriculture industry affects every man, woman, and child in America in some way. The top photo depicts combining corn in South Dakota. Even though all Americans do not work directly in agriculture, we are all affected by the industry in some way, such as buying milk products from the supermarket as the bottom photo depicts (photos source: USDA).

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Agriculture and Economics

- Beef production single largest segment
  - 1.4 million jobs
  - $188.4 billion
  - All 50 states
- Dairy industry
  - 900,000+ jobs
  - $29 billion household
  - $140 billion overall

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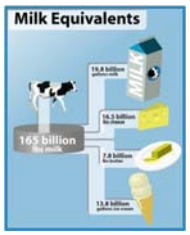
Beef production is the single largest segment of the agricultural industry, accounting for 1.4 million jobs and $188.4 billion dollars of direct and indirect economic activity. Moreover, beef cattle are produced in all 50 states, and thus have an impact on all state and local economies. The top photo depicts one person's involvement in the beef industry, carcass inspection (photo source USDA). The dairy industry also has a significant contribution to the economic impact of agriculture. 2002 estimates 900,000 jobs created $29 billion in household earnings with an overall economic output of $140 billion. Bottom photo depicts two dairy employees working in a milking parlor (photo source USDA - ARS). **Note to presenter: If you have data about your own states beef or dairy production numbers, you could insert a slide after this one to personalize the presentation to your area.**

Slide 10

Agriculture and BRM

- Provide a safe food source
  - Healthy animals
- Milk supplies 73% of calcium in U.S. food supply



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One of the cattle industry's main focus areas is a safe food source, which comes from healthy animals. In the dairy industry, milk supplies 73% of the calcium in the U.S. food supply. Using the NAHMS 2001 total milk production of 165 billion pounds of milk, this would translate into a total of 19.8 billion gallons of milk which could be converted into 16.5 billion pounds of cheese, 7.8 billion pounds of butter, or 13.8 billion gallons of ice cream! Instituting biological risk management plans in cattle facilities can help mitigate the economic consequences that could be inflicted by endemic diseases on the farm as well as a new or a foreign animal disease (graphic design by C. May).

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Agriculture and BRM

- Realize the impact on the industry
- Provide
  - Income
  - Lifestyle
- Mitigate economic consequences of a disease outbreak

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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 biological risk management plans can help mitigate the economic consequences of a disease outbreak (photo source USDA).

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Food Production Changes

Animal agriculture has changed a lot in the past few decades. This presents opportunities to implement BRM plans.

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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

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Each year the Census of Agriculture reports fewer farms, yet strong growth in the number of animals that remain on some of those farms. This intensity in animal production and species specialization has allowed livestock farmers to efficiently provide food for America and the world. Changes in production animal management present opportunities and challenges that were not a part of raising animals only a few decades ago. With new and re-emerging diseases, susceptible animal populations could be located in a fairly small geographic area so that a single cattle disease could have devastating economic effects. The way we raise and interact with animals has drastically changed; so too must our concept of how to prevent disease introduction to continue to ensure the animal's well-being and a safe food source.

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Beef Production

- Segmented industry
  - Cow-calf numbers steady to increasing
    - Number of farms stable
    - Mostly small operations (<50 head)
  - Increasing intensity in feedlots
    - Fewer feedlots with more animals
- Opportunities and challenges

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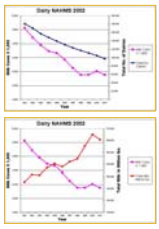
Beef cattle production is a very diverse and segmented industry. Most producers have small operations, particularly on the cow-calf side. Approximately 80% of cow-calf operations own less than 50 head. This often limits the ability to devote significant resources to facilities and management improvement. Feedlots are much larger operations, and as a whole, the feedlot segment is moving toward consolidation. Additionally, feedlots tend to be concentrated in specific geographic areas. Changes in beef cattle management present opportunities and challenges that BRM can help address. The photo shows a large modern feedlot (photo source USDA).

Slide 15

Dairy Production

- Lactating cow and farm numbers decreasing
  - 2001: 9.16 mil cows
  - 97,560 operations
- Increased production
  - Cows and U.S.
  - Increased intensity
- Opportunities and challenges



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The dairy industry has undergone some very similar changes, as the top graph depicts. Over the past ten years the total number of dairy cows in the U.S. (pink, bottom line) has decreased from about 9.83 million in 1991 to 9.16 million in 2001. During the same time, the total number of dairies (blue, top line) has decreased from 180,640 to 97,560 operations. This amounts to a 46% decrease in dairy operations accompanied by only a 6.8% decrease in milk cow inventories during these 10 years. The bottom graph demonstrates the combined effect of less cows (6.8% - pink, bottom line) accompanied by an increased productivity (20.7% - red, top line) resulting in a total U.S. milk production going from 147,697 million pounds of milk in 1991 to 165,336 million pounds in 2001. This is a net increase of 11.9% of milk being produced. There are fewer dairies which have gotten bigger, and each cow is producing more, making our dairy herds more vulnerable to disease introduction or an outbreak. It also means that a breach in BRM will have more costly consequences (NAHMS 2002 data).

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The Rise in Emerging and Re-Emerging Infectious Diseases

Next we will discuss the rise in emerging (newly recognized) and re-emerging (those present previously and reappearing in the same area or a new area or with a new clinical presentation) infectious diseases.

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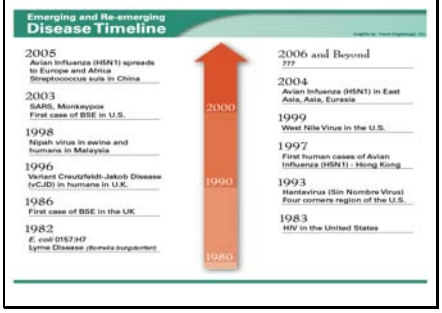

This slide depicts a disease timeline. In the last 25 years, some serious animal and human diseases have emerged or re-emerged. Starting at the bottom in 1982, *E. coli* O157:H7 and Lyme Disease (*Borrelia burgdorferi*) first appeared. Next came the emergence of HIV in the United States in 1983; The first case of Bovine Spongiform Encephalopathy (BSE) was identified in the United Kingdom in 1986; Cat Scratch Fever (*Bartonella henselae*) was recognized in 1992; Hantavirus (Sin Nombre virus) was recognized in the four corners region of the U.S. in 1993. In 1996, variant Creutzfeldt-Jakob Disease (vCJD) appeared in humans in the U.K. Nipah virus emerged in swine and humans in Malaysia in 1998, and West Nile Virus appeared in the United States one year later. In 2003, SARS appeared in humans in Asia and Canada, Monkeypox was transmitted from prairie dogs to humans in the Midwestern U.S and the first case of BSE appeared in the U.S. In 2004, highly pathogenic avian influenza (H5N1) started in East Asia and spread west causing disease and death in poultry, wild

birds and humans. The outbreak continued into 2005 and 2006. By preparing for infectious disease outbreaks through awareness, proper planning and control measures, the impact from these new diseases can be greatly reduced (graphic by Travis Engelhaupt, ISU).

Slide 18

Global Travel and Commerce

Increased globalization through travel and commerce has a significant impact on everyday life. We are able to travel anywhere in the world in less time than it takes for a disease to incubate and appear in animals. This increases the importance of biological risk management for everyone.

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Global Travel and Commerce

- Increase in personal travel
  - Spread of foreign animal disease
    - Within a food product
    - On the traveler's person
- Importation of cattle and animal products
  - Animals may not show signs of disease
- International travel waste

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The increasing global nature of travel and the importation of animals increases the risk of a disease entering the U.S. and disrupting our economy and livelihood. A foreign animal disease, either carried within a food product or on the traveler's person could serve to introduce disease to U.S. animals. Often when we travel abroad, we do not wash our clothes prior to returning to the U.S., so we may be a risk factor for introducing diseases. Additionally, the importation of live cattle and animal products requires strict regulation to minimize the threat of disease introduction. Many infectious diseases can be carried by asymptomatic animals and others may remain viable in animal products for periods of time. In this photo, cattle are going through a tick treatment bath at a USDA APHIS facility in McAllen, Texas (photo source USDA). Finally, the waste or garbage generated on international flights or sea voyages could carry a livestock disease from a foreign country. The USDA APHIS Plant Protection and Quarantine (PPQ) and DHS Customs and Border Patrol (CBP) are responsible for monitoring garbage unloading from the various vessels and airplanes that arrive at approved U.S. ports. All regulated garbage must be placed in sealed, leak proof containers and transported to an APHIS approved facility for incineration to ash, sterilization, or grinding and discharged into an approved sewage system to minimize the spread of disease.

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Global Travel and Commerce

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On any given day, over 1.4 million people and over 38,000 animals enter the United States; 500 million people annually (330 million of which are non-citizens). Approximately 730 million people travel on commercial aircraft each year and 11.2 million trucks and 2.2 million rail cars cross into our country annually. Also, 7,500 ships from foreign countries make 51,000 calls in U.S. ports annually. Each of these modes of transportation poses a risk to introducing a foreign animal disease either within a food product carried by a traveler, the garbage generated during travel from products originating in a country with a FAD, or the traveler harboring a disease that could be spread to U.S. animals. Graphic by Clint May, ISU.

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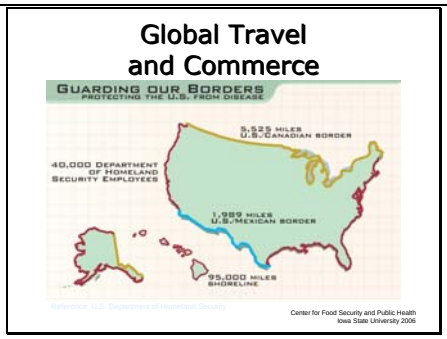

In fiscal year 2000, 14 million animals were imported into the U.S., primarily from Canada and Mexico. Approximately 40,000 people employed by the Department of Homeland Security (DHS) have the charge of protecting our 5,525 miles of border with Canada, 1,989 miles with Mexico and 95,000 miles of shoreline from entry of illegal items and those carrying potentially devastating diseases. It is a daunting task and over 2,000,000 agricultural items are intercepted annually at airports alone. Although the DHS and USDA actively conduct surveillance at our borders and ports, it is impossible to screen each traveler or vehicle for exotic diseases. We must all do our part to be aware of diseases and discuss these topics with cattle producers who may travel or send animals overseas for shows or breeding purposes. This information was obtained from the U.S. Department of Homeland Security website at: http://www.dhs.gov/dhspublic/display?theme=50&content=875 (graphic by Clint May, ISU).

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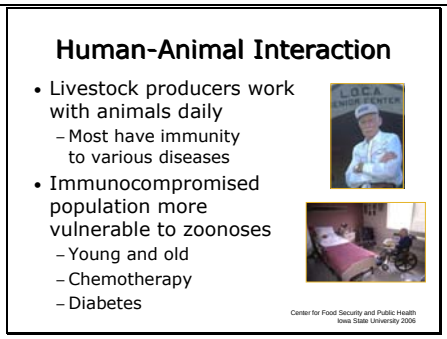
Human-Animal Interaction

Animals have been a part of human lives for centuries. This interaction strengthens the need for a program like biological risk management to protect the people working in the cattle industry from acquiring a disease.

Slide 23



Livestock producers have a lot of contact on a daily basis with animals. In most cases associated with infectious diseases, the farmer has been previously exposed and has developed some type of immunity to it. This is not the case with foreign animal diseases or if their health becomes compromised because normal diseases could make them ill. This immunocompromised population is more vulnerable to zoonotic diseases, those that are spread from animals to humans. Immunocompromised individuals 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. This makes disease awareness 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).

Slide 24

Conducting a BRM Livestock Facility Assessment

Now that we have discussed the importance of BRM, let's learn about the components of conducting a BRM livestock facility assessment.

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Components of BRM

- Risk perception
- Risk assessment
  - Routes of transmission
- Risk management
- Risk communication

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The concept of biological risk management involves multiple components. Before a sound, applicable program for an operation can be established, it is important to first understand what the producer's perception of risk really is. After risk perception is understood, risk assessment, based on the routes of disease transmission, can begin. Once the risks are identified, risk management can begin. To be successful, the BRM plan must be communicated to all involved. Photo depicts cattle in a feedlot (photo source link: http://www.watkinsandco.com.au/livestock/livestock_photos/sale18-6-02.jpg).

Slide 26

Risk Perception

- Different perceptions of risk
  - First identify what is viewed as a threat
- Factors influencing perception
  - Previous experience
  - Media
  - Environment
- Acceptance and tolerance varies

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Risk means different things to different people. It is imperative to first identify what those involved with the operation think about the real and potential risks of infectious and zoonotic diseases. The public often relies heavily on previous experience, the media, and their environment. What risks are deemed acceptable or tolerable also varies between individuals. The inset photo demonstrates the attention directed toward the first US case of BSE in 2003 (source CNN).

Slide 27

Risk Perception

- Common beliefs
  - "We have always done it this way"
  - "I've had most everything on this farm"
  - "It's too expensive"
- New beliefs
  - Disease outbreaks can and do happen
  - Prevention is less costly than treatment
  - Too much is financially invested to lose
  - Prevention through awareness and management

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This is also the period where one may encounter many of the obstacles and challenges to educating about risk management. Common negative beliefs include: "I already know this stuff", "We have always done it this way", "I've already had most everything on this farm", "I don't have enough time to mess with this", "It's too expensive", and "Our animals were tested once and we found nothing, it was just a waste of money".

While it is difficult to prove and measure the benefit of things that **don't** happen, counter-arguments tend to fall into three categories: there is a risk, it is economically worthwhile to prepare, and the overall impact must be considered. Some beliefs that may require a change of mindset include: "Infectious/zoonotic disease outbreaks can and do happen", "Prevention is less costly than treatment", "Protecting your financial investment and your future assets from liability is worthwhile insurance" and of increasing importance is the "Prevention of disease through awareness and management".

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Risk Assessment

- Objective evaluation
- Identify strengths, weaknesses
  - Change over time

- Disease prediction is complicated
  - Underlying disease risks are not
  - Cattle's vulnerability is influenced by:
    - Cleanliness, stress, nutrition
    - Things that can be *managed*

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After an understanding of risk perception has been established, the risk assessment can begin. This provides an objective look at the operation to evaluate the various strengths and weaknesses related to a disease entering and spreading. Risk assessments can change over time depending on the situation at hand. There will be challenges, but this is the first step in the right direction. It is important to remember that living systems are variable and predicting illness or disease can be a complex series of conditional events. Disease predictions are not as simple as yes or no, but the various risks that predispose to disease development often are. Cattle's vulnerability to disease is influenced by cleanliness, stress, nutrition, and other management factors; these are all aspects that can be managed. Photo shows a veterinarian with the manager and owner of a dairy facility having a group discussion at the farm site (photo source USDA – ARS).

Slide 29

Routes of Transmission

In order to perform the risk assessment, it is important to examine how diseases can be acquired and transmitted.

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Routes of Transmission

- Apply to all infectious agents
- Animal must be exposed to develop disease
- Understand different routes of transmission = Gain control
- Risk areas must be identified
  - Design protocols to minimize exposure

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The approach that was taken in the development of these biological risk management tools was to look at diseases 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.

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Routes of Transmission

- Spread of disease agents
  - Animal ⟷ animal
  - Animal ⟷ human

- Different routes of transmission
  - Aerosol
  - Direct contact
  - Fomite
  - Oral
  - Vector-borne
  - Zoonotic

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Disease agents can be spread from animal to animal, or animal to human, through a variety of transmission routes. For the purposes of the biological risk management materials, 5 main routes were identified: aerosol, direct contact, fomite, oral and rector-borne. The sixth route, zoonotic, can be spread from animals to humans through one of the 5 previously listed routes. Many infectious agents can be transmitted by more than one route of infection. This photo shows several dairy cows grazing in a pasture (photo source USDA – ARS). **Note to presenter:** This next section will review each route of transmission; this is where you could hand out the Transmission Route Definitions handout to the audience and have them follow along.

Slide 32

Aerosol Transmission

- Disease agents contained in droplets
  - Pass through air

- Most agents not stable in droplets
  - Close proximity required
  - Infected and susceptible animals

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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. Top photo depicts a tunnel ventilated dairy building; aerosol transmission is of concern if not properly ventilated (photo source DB Weddle). The bottom photo shows a situation where cattle are always in close proximity to one another- a feedlot (photo source USDA).

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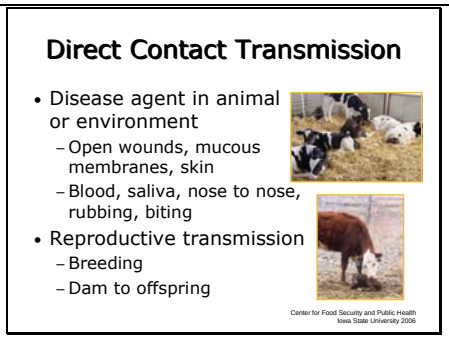
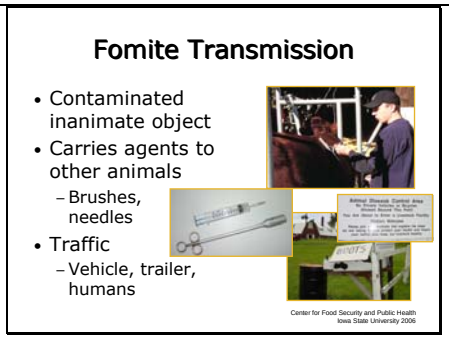


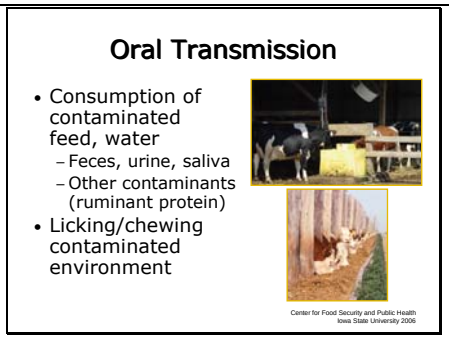
Transmission by **direct contact** requires the presence of an agent or organism in the environment or within an infected animal. A susceptible animal becomes exposed when the agent directly touches open wounds, mucous membranes, or the skin through blood, saliva, nose to nose contact, rubbing or biting. 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. The top photo shows a group of calves together in a pen with ample opportunities for direct contact transmission (photo source DB Weddle, ISU). The bottom photo shows a young heifer licking her newborn calf (photo source USDA).

Slide 34



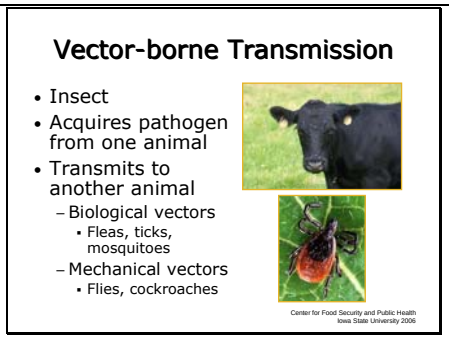
A **fomite** is an inanimate object that can carry disease agents from one susceptible animal to another. Examples of fomites include contaminated brushes, clippers, needles, balling guns (middle picture; photo source DB Weddle) clothing, milking units, teat dip cups, feed or water buckets, and shovels. The top photo depicts a situation in which disease transmission may occur via a fomite, grooming equipment (photo source USDA). **Traffic transmission** is another special type of fomite transmission in which a vehicle, trailer, or human spreads organic material to another location. The bottom photos show the entrance to a dairy with a sign stating the premise's visitor restrictions, as well as a handy place for boot distribution and collection at the entrance to the farm (photos source DB Weddle).

Slide 35



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 top photo depicts a Holstein and an Ayrshire 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 bottom depicts Hereford calves eating silage at a wooden feed bunk, a potential source of bird, rodent, or dog contamination (photo source USDA).

Slide 36



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. The top photo shows a calf with two old insecticide ear tags and numerous face flies, while the bottom photo shows an adult deer tick, *Ixodes scapularis* capable of spreading Lyme disease (photo source USDA).

Slide 37

Environmental Contamination

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

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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 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).

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Disease Transmission

- Animals may not exhibit obvious signs of disease
- Awareness of all routes of transmission is essential
  - Develop strategy to minimize disease risk for livestock operation

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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. The photo shows a calf lying in a pasture (photo source USDA).

Slide 39

The Risk Management Plan

Once a facility has been assessed, it is now essential to develop a management plan.

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Risk Management

- Facility/operation evaluated
  - Challenges identified
- Tailored management plan
- Prioritize
  - Easy to implement
  - Inexpensive yet yield rewards
- No common formula

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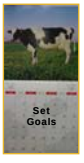
Once a facility or operation has been evaluated, the challenges to implementing a successful BRM plan can be identified. Only then can a tailored management plan be proposed and implemented. When first working on change, prioritize those items that are relatively easy to implement, inexpensive, yet yield rewards. There is no common formula for what that entails, and rewards will be different for everyone. Simply reducing exposure could be beneficial. The photo shows a large feedlot in Texas (photo source DB Weddle).

Slide 41

Risk Management

- Management plan reflects
  - Immediate challenges
  - Short-term goals
  - Long-term goals
- Many possible solutions exist
- Remain open to suggestions
  - Recommendations vary based on individual's experience, knowledge



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Just like the risk assessment is a living document, the management plan should be modeled to reflect immediate challenges, short and long-term goals (as illustrated by the calendar- source DB Weddle). The full BRM assessment program available on-line includes a number of possible implementation strategies for each of the areas for improvement identified. Just as the question set is not 100% comprehensive, these are possible solutions, realizing many more exist. Everyone should remain open to suggestion and realize that recommendations can vary between individuals for the same facility, based on the reviewer's experience and knowledge.

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General Prevention Steps

Overview
- Farm perimeter
- Animal identification
- Animal health
- Sick/dead animals
- Isolation/quarantine
- Supply handling
- Neonatal management

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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. Things such as knowing what is in the area of your farm perimeter- farms, neighboring livestock, wildlife; individual animal identification, animal health protocols, recognizing and dealing with sick and dead animals, isolation/quarantine, supply handling, and neonatal management. This next section will provide some general prevention recommendations for those areas. **Note to presenter:** This next section will review general prevention practices; this is where you could hand out the *General Prevention Practices* document and *Checklist* to the audience and have them follow along. The checklist can be taken home so they can evaluate their own operation.

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General Prevention Steps

- Limit contact with animals
  - Neighbor's livestock
  - Wildlife, birds
  - Roaming cats, dogs
- Maintain fences
- Establish biosecurity protocols for delivery vehicles, personnel
- Lock gates

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Limit contact with animals that may present a disease risk by coordinating with your neighbors to avoid fence line contact between herds. Prevent cats and dogs from roaming between farms. By maintaining fences (repairing/replacing posts, tightening wires), you minimize the risk of animals escaping, or other animals entering, and mixing with other livestock or wildlife species, which increases their risk of disease exposure. You should establish biosecurity protocols for delivery vehicles and personnel to follow on your farm. Gates are installed as a barrier to human entry and should be locked to prevent animal contact and subsequent disease exposure. Photo courtesy of: Bryan Buss, ISU.

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General Prevention

- Identify individual animals
- Important for:
  - Communicating health status
  - Treatment needs
  - Location on farm
  - Record keeping

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If more than one person works on an operation, individual animal identification is imperative for proper communication of health status, treatment needs, antibiotic withdrawal/residue prevention status, and location on farm. Individual animal identification is imperative to proper record keeping (vaccinations, treatments, pregnancy status) which is an integral part of managing animals and minimizing disease risk on farm. Keeping treatment records is an integral part of minimizing disease risk on farm because protocols can be tracked over time with your veterinarian and used to determine whether things are working in various disease situations. If these black Angus heifers did not have identification tags in their ears, it would be hard to communicate health status to someone else because they all look alike (photo source: DB Weddle, ISU).

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General Prevention Steps

- Keep health records on every animal
- Review vaccination and treatment programs
  - Annually, bi-annually
  - Protocol versus actual
- Investigate unusual signs, unresponsive cases
  - Neurologic, downers, sudden death

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To monitor health status, 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). It is important to work with your clients to review treatment and vaccination records so alterations can be made to the animal health protocols on farm; this will also help ensure what you think is happening is actually happening. 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.

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General Prevention Steps

- Train farm personnel to report sick animals
  - Inspect animals daily
  - Clean equipment, boots, clothing
- Euthanize terminally ill animals promptly and appropriately
  - Removed or rendered
- Necropsy animals that died from unknown causes

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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. Animals that are not going to recover can serve as a reservoir for many disease organisms and should be euthanized humanely and in a timely manner. Dead animals can also serve as a reservoir for many disease organisms and should be promptly removed from the operation. Dead animals need to be rendered, composted or buried in a timely manner so predators, wild birds, etc do not spread disease. By having a veterinarian necropsy animals that die of undetermined causes, a diagnosis may be obtained by sending samples into a diagnostic laboratory. Unusual diseases may not present in a manner you are used to, so involving a veterinarian may help identify a potentially infectious disease before it becomes widespread on your facility. Photo depicts an Ayrshire calf being necropsied and samples being collected for diagnostic testing (photo courtesy of: UC Davis VMTRC).

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General Prevention Steps

- Isolate ill animals immediately
  - No shared ventilation, direct contact with other animals
- Quarantine newly introduced animals
  - New purchases, returning animals
- Time determined with veterinarian
- Test for key diseases before placing with rest of herd

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Cattle that are identified as ill should be removed from the rest of the herd 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 in order to minimize the risk of disease spread. Newly introduced animals, including show cattle/calves that have been away from the farm, may be carrying diseases that your home herd is not immune to, so quarantine them for a period of time. 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, it is a good risk management plan to test them for key diseases (determined together with your herd veterinarian) and make sure they are not carrying diseases that could be introduced into the home herd.

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General Prevention Steps

- Store non-refrigerated vaccines and antibiotics out of sunlight as it can deactivate them
- Monitor refrigeration temperature monthly
  - Ideal temp 36-46ºF
- Restrict access to medication to only properly trained personnel

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Sunlight can deactivate vaccines resulting in inadequate protection; it can also reduce effective treatment by rendering antibiotics ineffective. When using these in your animals, make sure you read the label and store them properly. Vaccines and medicines that need to be refrigerated are susceptible to changes in temperature and may not be effective if they get too warm (greater than 46 degrees Fahrenheit) or too cold/frozen (less than 36 degrees Fahrenheit); monitoring your refrigerator at least monthly can help ensure the products are adequately stored. Work with your veterinarian to teach proper handling procedures to all people who routinely deal with vaccines and medicine and restrict access to only trained personnel. The photo depicts a refrigerator on a dairy farm with a thermometer- purchased for less than $3 at a large retail store (photo courtesy of: DB Weddle, ISU).

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General Prevention Steps

- Ensure adequate ingestion of disease-free colostrum in first 6 hours of life
- Prevent contact with older animals, contaminated environments

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Adequate ingestion of colostrum is the most important consideration for 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. Once a calf is born, subsequent milk production in the cow will dilute colostrum and therefore require the calf to consume more for maximum antibody absorption and immune function. Another good practice is to prevent contact of the neonate with older animals and also contaminated environments. This will decrease the pathogen load to the newborn and give the colostrum the ability to provide protection. The photo depicts colostrum in a freezer that is stored in palpation sleeves (with the fingers tied off), labeled with the cow ID number and dated. This allows for easy thawing and making sure the calf gets colostrum from one cow (photo courtesy of DB Weddle).

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Risk Communication

- Communication is key!
- Plan must be understood and supported to be effective
- Success of BRM plan depends on:
  - How plan is carried out
  - Who is responsible for changes
  - Incorporation into daily activities

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The cornerstone of the biological risk management plan is effective communication of risk with all those involved. A good plan, poorly communicated will benefit no one. A program must be understood and supported by everyone in order to be effectively implemented. The success of the plan lies in how it can be carried out, who is responsible for making changes happen and incorporation into daily activities. This photo is of a sign reminding visitors to wash their hands after petting the animals both in English and Spanish (photo source DB Weddle).

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Conclusion

In conclusion, let us review some key learning objectives that were discussed throughout this overview regarding biological risk management.

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Key Learning Objectives

- Biological risk management is important
- All diseases are transmitted by a few common routes
- Disease risk can be managed
- Awareness education is essential
- You play a critical role!

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Throughout this presentation, we have stressed that biological risk management is important. 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!

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