This presentation will review some key points of biological risk management, general prevention steps that can be applied to every farm to decrease the risk of disease introduction and spread, and specific steps to reduce the chance of oral transmission on farm.

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 infection or 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).

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 cow-calf pairs being herded to another pasture in Oregon (courtesy of USDA, image #95cs0779, taken by Doug Wilson).

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. This photo depicts Hereford calves eating silage at a wooden feed bunk, a potential source of bird, rodent, or dog contamination (photo source USDA).
Algunas enfermedades que se propagan por vía oral

Enfermedades exóticas
- Fiebre Aftosa
- Melioidosis
Existentes en EE.UU.
- Antrax
- BVD
- Cryptosporidiosis
- E. coli
- Enfermedad de Johne
- Listeriosis
- Rotavirus
- Salmonella

Transmisión por fomite
- Objeto inanimado contaminado
- Transporta a los patógenos hacia otros animales
  - Instrumentos para administrar medicinas
- Tráfico
  - Vehículos, remolques, personas

Vías de transmisión
- Atañen a todos los agentes infecciosos
- El animal tiene que estar expuesto para contraer la enfermedad
- Comprender las distintas vías de transmisión = obtener el control
- Es necesario identificar las áreas de riesgo
  - Diseñar protocolos para minimizar la exposición

Transmisión de la enfermedad
- Es posible que los animales no muestren signos evidentes de la enfermedad
- El conocimiento de todas las vías de transmisión es esencial
  - Formular una estrategia que minimize el riesgo de enfermedad en la operación ganadera

There are many diseases transmitted by the oral route, both diseases that are foreign animal diseases (FADs) and those that are present in the US (endemic). Some examples of the foreign animal diseases include foot and mouth disease (FMD) and melioidosis (pronounced: MEE-lee-oyd-OH-sis). Examples of diseases that are already present in the US include anthrax, bovine viral diarrhea (BVD), cryptosporidiosis, *E. coli*, Johne’s, listeriosis (circling disease), rotavirus, and *Salmonella*. The main point to drive home is that they are all transmitted by the same route and prevention practices aimed at one will protect against others. For a complete listing of all diseases transmitted by the aerosol route, please refer to the Bovine Routes of Transmission Handout- Oral.

A component of oral transmission is fomites. A fomite is an inanimate object that can carry pathogenic agents from one susceptible animal to another. Examples of fomites include contaminated balling guns (top photo courtesy of DB Weddle, ISU), clothing, feed or water buckets (middle photo courtesy of DB Weddle, ISU), and shovels. These items must be managed as fomites but they will transmit disease when they have direct contact with a susceptible animal. Traffic transmission is a type of fomite transmission in which a vehicle, trailer, or human spreads organic material to another location.

Every disease has to enter into an animal by some route, so looking at disease prevention through the routes of transmission makes sense. One advantage to this approach is that it will also help protect against new or unexpected infectious diseases. This classification system is effective and easy to understand without requiring knowledge about a wide range of diseases, like all those listed at the beginning of this presentation. 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 by various routes of transmission (i.e. aerosol, oral, fomite, direct contact, vector), it is easier to gain control over them. From a management standpoint, it may be easier to identify risk areas, such as fomites, and then design protocols to minimize exposure.

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).
Pasos preventivos generales

1. Panorama general
   - Perímetro de la explotación agropecuaria
   - Identificación de los animales
   - Salud animal
   - Anfibios enfermos/muertos
   - Aislamiento/cuarentena
   - Administración del abastecimiento
   - Manejo neonatal

2. Identifiquen individualmente a los animales
   - Comunicar su estado de salud
   - Las necesidades de tratamiento
   - Investiguen síntomas poco usuales, casos que no responden al tratamiento
   - Neurologicos, animales caídos, muerte súbita

3. Lleven registros del estado de salud de cada uno de los animales
   - Revisen los programas de vacunación y tratamientos
   - Anualmente, semestralmente
   - Protocolo comparado con la realidad
   - Llevar registros

4. Capaciten al personal de la explotación para que reporte a los animales enfermos
   - Inspeccionen a los animales diariamente
   - Equipo, botas, vestimenta limpios

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.

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 DB Weddle, ISU.

To monitor health status, it is imperative to keep health records on every animal. It is important to work with your veterinarian 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.

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, 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
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 is 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 as pictured here, 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. Photo courtesy of DB Weddle, ISU.

Sunlight deactivates vaccines and can render antibiotics ineffective, causing inadequate protection or treatment when used in your animals; make sure you read the label and store 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.
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. (Photo courtesy of USDA, image # 95cs0931, taken by Fred S. White).

Now that we have discussed some general prevention steps, let us look specifically at oral and fomite transmission and control measures you can apply on your beef operation to minimize disease spread.

There are various prevention steps that can help ensure oral and fomite transmission are minimized, and this presentation will discuss these. One essential step in prevention is to isolate all sick animals immediately so that they do not contact other susceptible animals. 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. These basic steps will go a long way in preventing oral and fomite disease transmission.
Feed and water can become contaminated with feces and urine if not properly handled both before and after feeding. Do not allow people to step into feedbunks with manure on their boots- install man-passes at the end of feedbunks to allow entry/exit. Feed should be offered in elevated troughs or mangers, but protected in such a way so that feces and urine cannot contaminate it, as pictured here (courtesy of Bryan Buss, ISU). Feed stuffs should be examined routinely for contaminants such as manure, mold, or foreign material (carcasses during ensiling), and overall quality. Ruminant protein is a contaminate and should not be fed to cattle- monitor feed tags and delivery of commodities to help prevent this as a source of disease on your farm.

Clean waterers at least once a week (more often if needed) to avoid buildup that allows disease organisms, like *Salmonella*, to grow. Install rails around waterers with 2 feet of clearance to allow their heads to pass through but prevent cattle from stepping or defecating into the trough. If a natural water source, such as a pond or stream, is the main drinking water for the herd, control access so that cattle 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.

As stated earlier, the greatest threat for exposure to orally transmitted disease is ingestion of disease causing agents in the environment or in feed and water contaminated by other animals. Rodents can carry diseases that affect cattle and can readily contaminate feed with their feces and urine. Every operation should have a rodent control program. Control measures that should be considered include the use of deterrents, baits/poisons and traps as pictured- closed box top photo, open box bottom photo. These boxes would benefit by having a bit of water added to them to attract the rodents to the bait. In addition, attempts should be made to secure all feed storage areas, clean up spilled feed, and avoid having excess feed available to any animals (e.g. wildlife, birds, vermin, dogs, cats, horses, cattle, sheep). For specific information about rodent control, refer to the Bird and Rodent Control Measures handout. Photos courtesy of DB Weddle, ISU.

Birds are also disease carriers, *Salmonella* for instance, and while it is nearly impossible to eliminate them from animal housing areas, steps should be taken to discourage their nesting and roosting. There are legal regulations in many areas, so check with your local extension office for recommendations. The risk of feed contamination by birds may be as important as that by rodents so it is important to limit their access and cleaning up spilled feed so it is not an attractant. Top photo depicts a farm yard with hundreds of birds roosting on the roof and fence (courtesy of http://ianrpubs.unl.edu/wildlife/graphics/ncr451p1.GIF) and the bottom photo is a common scene on many farms where the birds are eating right out of the feedbunk with cattle (courtesy of http://whyfiles.org/193prion/images/feedlot.jpg).
Because oral transmission of disease is generally dependent on contamination by infected animals, manure management is very important. For cattle being fed on pasture or in dry lots, scrape areas around troughs/feeders frequently to minimize feces build up and move them, if possible, to clean ground. If feeding and/or watering sources are on concrete pads, scrape these regularly to remove debris as it builds up. Photos courtesy of Bryan Buss, ISU.

Manure storage must be done in such a way to limit exposure to animals. Composting will kill many disease organisms, if done properly, while preserving the nutrient value of the manure. Lagoon storage, as pictured here, allows for long term storage but it should be built to prevent spills or overflows that could contaminate water sources or crop ground, and thus exposing animals or humans. If manure is spread on crop or pasture ground, prohibit animals from grazing the field for a sufficient length of time (this will vary with weather conditions, age of animals grazing, and diseases of concern). While sunlight has killing action on organisms, penetrating thick manure does not always occur and the disease risk, especially for Johne’s, will be present for months. Photo courtesy of Paul Hester, ISU.

Another consideration is the risk that manure presents on pastures. Breaking up manure on pastures by dragging with a tractor exposes the disease agents to sun and wind, which will kill them more quickly (not as done by hand in Nepal as seen in this picture). It is important to monitor forage availability to prevent overgrazing, which can result in cattle grazing closer to the ground and nearer to fecal pats. Cattle will typically avoid grazing close to fecal pats, but will graze closer when feed is limited and this increases the risk of ingestion of potential disease causing agents in the manure. (Photo source: Nepal School Project at http://www.nepal-school-projects.org/village_life_in_pictures.htm)

Using different loader buckets for mixing feed and scraping manure is perhaps the best way to minimize the risk of transmitting diseases orally to the herd. If separate buckets are cost prohibitive, then the loader bucket, tires and anything else that has manure on it must be washed with warm water, scrubbed to remove organic matter, rinsed and allowed to completely dry in the sun to avoid fomite spread to animals. (Photo source University of Iowa, College of Public Health).

Animals that are ill often need supportive treatment with electrolytes, fluids, or medication. Equipment used to treat these animals can become contaminated with disease causing organisms. After use on an animal, this equipment should be washed in warm water, and if it is not used for antibiotics, disinfected and hung up to dry in an area where it will not be contaminated. (Disinfectants can have residual effect and deactivate antibiotics). Photo depicts an esophageal feeder often used to tube a calf with electrolytes- this should be cleaned after each use (courtesy of DB Weddle, ISU).
By having a designated parking area away from animal traffic areas with posted signs, visitors and employees have no reason to drive personal vehicles onto the farm and introduce disease agents on their tires, wheel wells. Any vehicle coming into an operation could introduce disease agents that can be transmitted orally. Minimize vehicular traffic on farm by loading/unloading animals and keeping rendering piles only at the perimeter of the operation. It is also good management to prevent milk or feed truck drivers from driving in areas where animals will cross the tire path or come into contact with the truck. (Photo courtesy of DB Weddle, ISU).

Oral disease transmission does occur on farms with everyday diseases like and cryptosporidiosis (crypto), Johne’s disease (*Mycobacterium avium ssp paratuberculosis*), and leptospirosis. Should a foreign animal disease occur in the US, such as Foot and Mouth Disease (FMD) can be spread through oral transmission. Taking some of the basic prevention steps as described in this presentation can help you decrease your risk of disease introduction and spread on your farm.

Throughout this presentation, we have stressed that biological risk management is important. All diseases are transmitted by a few common routes and 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!