

Beef Biological Risk Management

Key Points

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TABLE OF CONTENTS

Introduction.....	3
Importance of Beef BRM.....	3
Risk Perception	4
Using These Materials.....	4
Hazard Identification	4
Risk Assessment	5
Risk Management.....	5
General Management Issues	5
General Management: Cow-Calf	6
General Management: Weaning	6
New Introductions & Animal Traffic.....	6
Cow-Calf: New Introductions	7
Stocker/Backgrounder & Feedlot: New Introductions	7
Visitors and Human Foot Traffic.....	7
Herd Health Protocols	7
Routes of Transmission: Aerosol	8
Routes of Transmission: Oral.....	8
General: Feed.....	8
Cow-Calf: Feed.....	9
Cow-Calf & Stocker/Backgrounder: Feed.....	9
Water	9
Manure and Waste Management	10
Routes of Transmission: Direct Contact	10
Reproductive.....	10
Routes of Transmission: Fomites	10
Iatrogenic	12
Traffic.....	12
Routes of Transmission: Vector	12
Eliminating the Vector	12
Breeding Area Control	13
Separating Host/Vector	13
Preventing Zoonotic Disease Transmission.....	13
Risk Communication	13
Conclusion.....	14

Introduction

Biological risk management (BRM) is an important and complex aspect of producing beef cattle; however, few owners have plans to control the risk of infectious agents. The following highlights the importance of BRM in beef cattle operations through hazard analysis, risk assessment, risk management, and risk communication.

Beef cattle production is a segmented and diverse industry. The most commonly recognized divisions are cow-calf, stocker/backgrounder, and feedlot.

Cow-Calf:

- Largest and most diverse segment
- Management varies with geographic location, resources and production goals
- Most utilize grass for maintaining cows, while deriving majority of income from selling weaned calves
- Seedstock operations breed purebred bulls and cows to sell for breeding purposes
- Most cow-calf operations are small (less than 50 head)
- Finances may not be the primary concern for many producers

Stocker/Backgrounder:

- Purchase weaned calves and feed them, usually on grass, for variable length of time
- Combining calves from multiple sources increases the risks of disease transmission
- Purchase and sell a much larger number of animals than a cow-calf operation

Feedlot:

- Purchase calves, house them in large groups (50 to several hundred) in drylots, and feed a high concentrate diet for finishing
- More likely than cow-calf or stocker/backgrounder operations to be large and managed solely for profit
- Feedlots experience unique biological risk management challenges, because of the large number of animals from a variety of sources that are confined in limited area

Importance of Beef BRM

- Disease prevention is economically beneficial:
 - Lower morbidity and mortality
 - Lower treatment costs
 - May increase marketing options
- Legal and ethical incentives also exist for BRM:
 - Reduce risk of zoonotic disease
 - Prevent introduction/spread of disease to neighboring producers
 - Prevent establishment of disease in wildlife population

Risk Perception

Risk perception of owners, managers, and employees may present obstacles and challenges to educating about risk management.

- Common negative beliefs include:
 - We have always done it this way
 - I've already had most everything on this farm
 - It's too complicated
 - It won't make any difference
 - It's too expensive
 - Our farm is pretty safe
- Effective counter-arguments for BRM include:
 - Infectious/zoonotic disease outbreaks can and do happen
 - Prevention is always less costly than treatment
 - Protecting financial investment and assets from liability is worthwhile insurance

Using These Materials

- Designed to assist veterinarian in serving the BRM needs of his/her clients
- BRM Toolbox contains question sets for assessment, management recommendations, and materials for evaluation and communication
- Focuses on Routes of Transmission, not disease agents
- Risk factors and management suggestions can be customized for each operation
- Can generate reports and graphs upon completion of assessment
 - These serve as visual aid to illustrate potential areas of action
 - Risk factors and management recommendations have not been quantified or prioritized
 - Reports help identify if particular area represents disproportionate risk
 - Help track progress over time

Hazard Identification

To properly assess the risks of disease facing an operation, we must identify what hazards exist. This involves answering the following questions.

- What diseases are already present in the herd?
- What diseases could be introduced to the operation?
- If a disease were introduced, would animals be at-risk?
- If a disease were introduced, would it spread?

- Is human exposure a concern?
- What would be the consequences of exposure/disease?

Risk Assessment

- Will be done based on Routes of Transmission, not specific diseases
 - Provides more complete and holistic approach
 - Avoids emphasizing specific disease(s)
 - No recommendations provided as to vaccination, treatment or testing

Producers must acknowledge that some production practices present inherent risks

- Pasture- Reduced control of environment (feed, water, interaction with other animals)
- Confinement (drylot)- Greater stocking density increases risk of disease transmission
- Stage of production: Age and intended use of animal impacts what risks are of concern
 - Unconcerned with reproductive diseases in terminal animals
- Operation goals and activities: The objectives and perceptions of the producer determines what level of risk is acceptable
 - Seedstock producers have greater incentive to protect genetic value of animals

Risk Management

- Attempts to detail practical options, while providing a reference of best known “Standard Operating Procedures” (SOP’s)
- BRM program should be tailored for each producer based upon his/her preferences, resources, risk perception and risk tolerance
 - Management suggestions should be considered as to which ones are most practical, applicable, and economically feasible for a given operation
 - Most recommendations can be implemented independent of others
 - Some suggestions may not be feasible for given facility; but recognizing what is optimum helps establish long term goals

General Management Issues

- Individual ID should be established for each animal
- Records should be maintained to include birth/purchase date, dam, sire, cohorts, diagnoses, treatments, procedures, etc.
- Segregate animals according to source, age and production status
 - Fenceline contact can reduce disease transmission, but separation by multiple fences is preferred
 - Segregation should include separate water and feed sources
- Increased stocking density favors disease transmission via many routes

- Basic recommendations regarding stocking density would include:
 - Limit stocking density to the minimum level feasible
 - Limit areas of congregation (around feeders, water, etc.)
 - Minimize amount of time animals are held in confinement
 - Reduce stress in handling

General Management: Cow-Calf

- Calving should take place in clean, dry environment with minimal stocking density
- The Sandhills Calving System is one method of limiting spread of pathogens throughout the calf crop
- Heifers should be calved prior to cows, and in a separate area
- Eliminate use of foster calves and cows
- Embryo transfer (ET) recipients should come from within the herd, or undergo rigorous pre-screening
- Several options exist for replacement heifer development
 - Dry lots have advantages (control of environment) and drawbacks (increased stocking density)
 - If contract heifer raisers are used, require them to adopt BRM standards comparable to home herd
- Categorize and group animals according to disease susceptibility
 - Generally, pregnant animals are most susceptible, weaned calves bound for terminal markets the least
 - All farm work should proceed from lowest risk-most susceptible populations to highest risk-least susceptible

General Management: Weaning

- Commingling animals from different sources (including within a single operation) increases the risk of disease
- Environment of weaning is very important
 - Fenceline weaning may be preferred
 - Pasture weaning has advantages over dry lot

New Introductions & Animal Traffic

- Maintaining a “closed herd” is most effective way to prevent introducing disease
- Limit animal traffic and new introductions
 - Including animals returning from exhibition, test stations, etc.
 - Treat all returning animals as new introductions
- Locate delivery/loadout facilities at perimeter of property, and clean thoroughly after each load
- Clean transport trucks and trailers after each use

Cow-Calf: New Introductions

- Strict standards should be required for introducing animals to a breeding herd
- Complete health record should be obtained for individual animal and herd of origin
- Source herds should have a BRM plan comparable to or exceeding that of destination herd
- Purchasers need to realize inherent risks associated with purchasing animals of various age groups
 - Calves more likely to introduce scours, BRDC, or be affected by congenital conditions
 - Older animals more likely to introduce chronic or latent diseases
- Producer should consult with veterinarian about testing requirements prior to purchase
- New acquisitions should be quarantined for at least 3 weeks
- Acquire all new introductions at the same time
 - Reduces inconvenience associated with isolation procedures
 - Reduces social stress associated with new introductions
- Vaccinate new introductions according to herd protocol prior to release from quarantine

Stocker/Backgrounder & Feedlot: New Introductions

- All animals destined for a common cohort should be acquired at the same time (all-in, all-out), from as few sources as possible
- Purchase from sources with a known and trusted health history
- Producers should understand inherent risks associated with various types of cattle
 - Highest risk: Livestock market- unknown history, commingled
 - Medium risk: Livestock market- known history (Pre-conditioned sale, etc.)
 - Lowest risk: Purchased on-farm from reputable source

Visitors and Human Foot Traffic

- Limit foot traffic
- Visitors should sign a visitors log and be informed of off-limits areas
- Require visitors to wear clean coveralls and overboots
- Disposable overboots can be provided inexpensively
- A bootbath can be beneficial, but must be maintained properly

Herd Health Protocols

- Create written herd health protocols with input from Quality Assurance programs and veterinarian
- These should include Standard Operating Procedures (SOPs) for:
 - Identifying, examining, separating and treating sick animals
 - Scheduling and execution of health procedures (vaccinations, castration, etc.)
 - General husbandry procedures

- Appropriate instructions for storage, handling, use and disposal of biologicals
- Animals should be observed frequently to identify sick individuals
- Sick animals should be examined, treated appropriately, and isolated
 - Duration of isolation will depend on disease, operation and facilities
- Producer should be educated about appropriate response if diagnosis is uncertain or a foreign animal disease (FAD) is suspected
 - Immediately stop animal movement
 - Request veterinarian examine affected animal(s), perform necropsies and submit diagnostic samples
- Establish separate handling facilities for treatment of sick cattle vs. processing healthy animals
 - Clean and disinfect facilities after each use
 - All treatment items should be disinfected or properly disposed
- Perform all procedures involving sick animals after all other animals have been cared for
- Establish acceptable means for carcass disposal; options include:
 - Incineration
 - Burial
 - Composting
 - Rendering
 - Consult with local extension and environmental officials
 - Carcasses should never be left for scavenging

Routes of Transmission: Aerosol

- Ensure adequate air exchange when building calving shelters, sick facilities, etc.
- Pathogen concentration decreases exponentially with distance
- Stocking density greatly influences aerosol transmission - Keep at minimum level acceptable for each operation
- Limit stress when handling cattle - Excitement and dust facilitate disease transmission
- Minimize congregation points- Provide multiple feed and water sources, for example

Routes of Transmission: Oral

Oral transmission can result from contaminated feed, water or environment.

General: Feed

- Evaluate all consumed products for potential to transmit disease
- Feed suppliers should provide documentation of Quality Assurance programs to prevent potential contamination
- Feed must be stored appropriately
 - Prevent access and contamination by any animals (including wildlife, pets and other livestock)

- Protect from weather conditions that may result in spoilage or pathogen growth
- Clean up all spilled feed promptly
- Most feeds should be used in a first in-first out manner
- Feed must be utilized appropriately
 - Feed appropriate amounts to prevent soiling or spoilage before it is consumed
 - Do not pile new feed on top of old feed
 - Clean feeders on a regular basis
 - Minimize access of wildlife, vermin and other animals to feed and feeding areas
 - Maintain feeders (feed and debris accumulate in cracks, fostering pathogens)
 - Move feeders or clean feeding areas regularly to minimize environmental contamination

Cow-Calf: Feed

- All calves should receive colostrum **from the dam** within 6 hours of birth
 - Less desirable option is colostrum from healthy, older cow from same herd
 - Pooled colostrum from another herd should be source of last resort
- Keep cows in a dry, clean environment to minimize soiled teats
 - Move feeders frequently in severe weather
 - Restrict access to ponds, streams and marshes

Cow-Calf & Stocker/Backgrounder: Feed

Various feeding practices can affect disease risk.

- Feeding practices can congregate animals and increase disease risk
- Winter feeding practices may create wet, contaminated environment. This can be reduced by:
 - Dispersing feed
 - Moving feeding areas frequently
 - Minimizing the number of animals per area
 - Scraping mud and manure from feeding areas frequently
 - Providing good drainage from feeding areas
- Pastures should be designated for use by specific production groups (For example, replacement heifers should not be in a pasture previously used by mature cows)
- Minimize pasture contact with other species (sheep, swine, horses, dogs, cats or wildlife)

Water

- Controlled water sources (troughs) are preferred over natural sources
- Troughs should be inspected and cleaned of all organic debris on a regular basis
- If natural sources are used (ponds, streams), limit access to prevent animals from urinating, defecating and standing in water

Manure and Waste Management

- Any operation where waste deposition is quicker than biodegradation needs a method of collection, storage and disposal
- All manure handling should be done with designated equipment that will not contact feed, water or animals
- Much of disease risk posed by manure can be reduced by drying or composting
- Spreading fresh manure on crop land early in growing season is generally safe but could transmit persistent organisms
- Spreading fresh manure on pasture or crops approaching harvest carries greater risks
- Intensive grazing can increase fecal burden on pasture
- Disperse fecal pats by dragging pastures
- Control exposure of animals to waste from other operations by streams, waterways or direct runoff

Routes of Transmission: Direct Contact

- Can be controlled more easily than most other routes of transmission
- Isolate and promptly treat affected animals
- Limit fence line contact with animals from other groups (including neighboring operations)
- Stocking density should be kept at lowest acceptable level

Reproductive

Diseases can be transmitted through coitus or while in-utero.

- The risk of venereal diseases can be reduced through artificial insemination (AI)
- When bulls are used, purchase only young, virgin animals and use only within herd
- A complete breeding soundness exam can identify infections of testes and accessory sex glands, and warts on the penis
- In-utero transmission may result from chronically infected dam or exposure of dam during a critical stage of gestation
 - Pregnant cows are most susceptible group on an operation
- Test and cull strategies should be considered for certain diseases
 - This can involve testing herd or suspect animals (aborters, hard breeders, etc.)
 - Test dam and offspring of animals that are diagnosed with a disease that can be transmitted vertically
 - Test bulls when low conception rate is achieved or if a disease is diagnosed in the bull's service herd

Routes of Transmission: Fomites

Disease transmitted by inanimate objects which carry a pathogen from one susceptible animal to another.

- Isolate and promptly treat infected animals
- Handle/treat sick animals after all other animals have been handled

- Any item that has direct contact with an animal should be considered a fomite - These must be sanitized or disposed of properly after use
 - Examples include feeders, buckets, stomach pumps and balling guns (oral); halters, grooming items, needles/syringes, tattoo and dehorning equipment (direct contact)
- Vehicles, equipment and implements that are used in multiple settings can transport infectious material from one group to another
- Equipment that has been in contaminated areas should not run over or through water or feed or be used in other sensitive areas
- Immovable objects can also present a risk - fence panels, buildings and trees
 - Designate areas for use by only a specific group of animals
- Humans can serve as fomites through contaminated clothing, shoes or even skin
 - Require clean or disposable coveralls and boots when around animals; change between groups
- The risk posed by fomites is influenced by the locations where these items were potentially exposed to diseases
 - **High risk** locations: Large number of animals of unknown health status congregate from a variety of sources (livestock auctions, slaughter plants, feedlots, veterinary clinics)
 - **Medium risk** locations: Congregate healthy animals from a single or limited number of sources (shows, fairs)
 - **Low risk** situations: Travel without direct animal contact
- Standard operating procedures can be developed to limit risk of fomite transmission
- Examples of SOPs that should apply to all operations include:
 - No disposable items that were used on other operations should be re-used on different farm
 - All equipment should be cleaned and disinfected between uses at different operations
 - All personnel who contacted animals at another location should change clothes or put on clean coveralls. Boots should be changed or disinfected, or disposable covers used
- Specific SOPs that may vary between operation would include:
 - For animals on the same operation, are needles, OB and rectal sleeves used on multiple animals or single use?
 - Is equipment sanitized between each animal?
 - Are employees required to change coveralls and disinfect footwear between groups of animals?
 - Are employees and visitors required to use bootbath prior to entering premise?
 - Are vehicles cleaned and sanitized prior to entry?

Iatrogenic

- Use aseptic technique when drawing medication from multi-dose bottles
- Always use a clean needle to draw doses from a container
- The presence of carrier animals within a herd increases potential for iatrogenic transmission
 - Consistent application of stringent BRM standards can reduce risk (single use of needles, OB sleeves; disinfection of equipment between uses)
 - Test and cull strategies or establishment of test-positive animal groups can limit iatrogenic transmission

Traffic

Vehicles entering an operation presents a serious risk of introducing disease.

- Know who brings vehicles onto the operation, what vehicles, where have they been, where (on the farm) they go, why, and how often
- Scrutiny should apply to all people, including owners, employees, buyers, veterinarians, delivery and service vehicles
- Examine all vehicle types, including tractors and farm implements, portable chutes and any mobile object
- Require all visitors to sign a visitors log
- Visitors should contact operator prior to arrival, and have someone meet them at the appropriate time
- Create and maintain SOP signage to make all visitors aware of protocols
- Locate animal load-out and delivery facilities on the perimeter of the property
- Create a designated parking area on the perimeter of the farm
 - This should be a well maintained gravel, asphalt or concrete surface. Ensure appropriate drainage to keep contamination away from animal areas
- Restrict visitors to use of farm-owned vehicles
- For service providers (feed and supply deliveries, equipment service, renderers) the “target of interest” (dead stock, equipment) should be brought to perimeter area
- When vehicles have to enter the operation, they should be required to meet minimum standards for cleanliness
 - Prevent contact between visitor vehicles and animals or feed and water supplies
 - Wash-down or tire washing facilities can be provided for vehicles that must enter

Routes of Transmission: Vector

Vectors can transmit disease biologically or mechanically. They can be controlled by eliminating vector or preventing access to animal.

Eliminating the Vector

- Chemical
 - Direct treatment of animal
 - Treatment of environment
- Biological (Parasitic wasps, insect-eating birds)

Breeding Area Control

- Elimination of wet, muddy areas
- Elimination of decaying organic matter

Separating Host/Vector

- Fence off low-lying, marshy areas or areas heavily infested with ticks
- Test and cull carrier animals, or establish test positive animal groups

Preventing Zoonotic Disease Transmission

There are numerous diseases that beef cattle can transmit to humans

- The risk of this occurring is greatest for certain at-risk individuals
 - Children under the age of five
 - Pregnant women
 - Elderly
 - Immune compromised individuals
- With the average age of farmers increasing, immunocompetency becomes greater concern
- All children that contact animals should be taught proper hygiene and precautions to prevent disease transmission
- Immigrant workers often come from countries with high prevalence of diseases that can result in compromised immune systems. These can predispose to zoonotic diseases

Risk Communication

Risk communication is an integral and ongoing part of the BRM process.

- Risk management plans must be understood, supported, and adopted by every employee for effective implementation
- Characteristics of effective risk communication:
 - Adapted to the audience. If bilingual information is required, provided it
 - Present important information in multiple ways (visual and auditory)
 - Emphasize a maximum of three main points
 - Limit meetings to maximum of 45 minutes
 - Information should be timely so participants can apply information immediately
 - Sessions should cover what, when, where, how, by whom, and why
 - Limit groups to 20 people. It is easier to interact with smaller groups
 - Give participants the opportunity to discuss, share information, and provide input
 - Schedule meetings earlier in the day
- Education programs can take many forms
 - Face to face/group meetings

- Newsletter or bulletin
- Videos, CD's or web-based instruction
- Posted signs or information panels placed around the workplace
- Employee questions and suggestions (question/answer board, suggestion box, question period during meetings, etc.)
- Mentoring of new employees by experienced employees
- Knowledge testing
- Recognition or incentive program that rewards employees when BRM goals are reached

Numerous addendums, handouts and visual aids have been included to assist in developing, implementing and communicating the BRM program. These can be accessed through the following web site: www.cfsph.iastate.edu/BRM .

- For assessment:
 - Pre-farm questionnaire
 - Online database
- For communication:
 - Handouts showing diseases and routes of transmission
 - Visual aid demonstrating potential to introduce a novel disease through new animal purchasing (Probability Graph)
 - Sample visitor log and questionnaire
 - Graphs, management recommendations, and current practices reports can be created from the online database

Conclusion

- BRM is an essential component of keeping any beef cattle operation as secure and successful as possible
- Risks cannot be completely eliminated, but basic hygienic and BRM principles can effectively manage and reduce risks