



BEEF QUALITY ASSURANCE

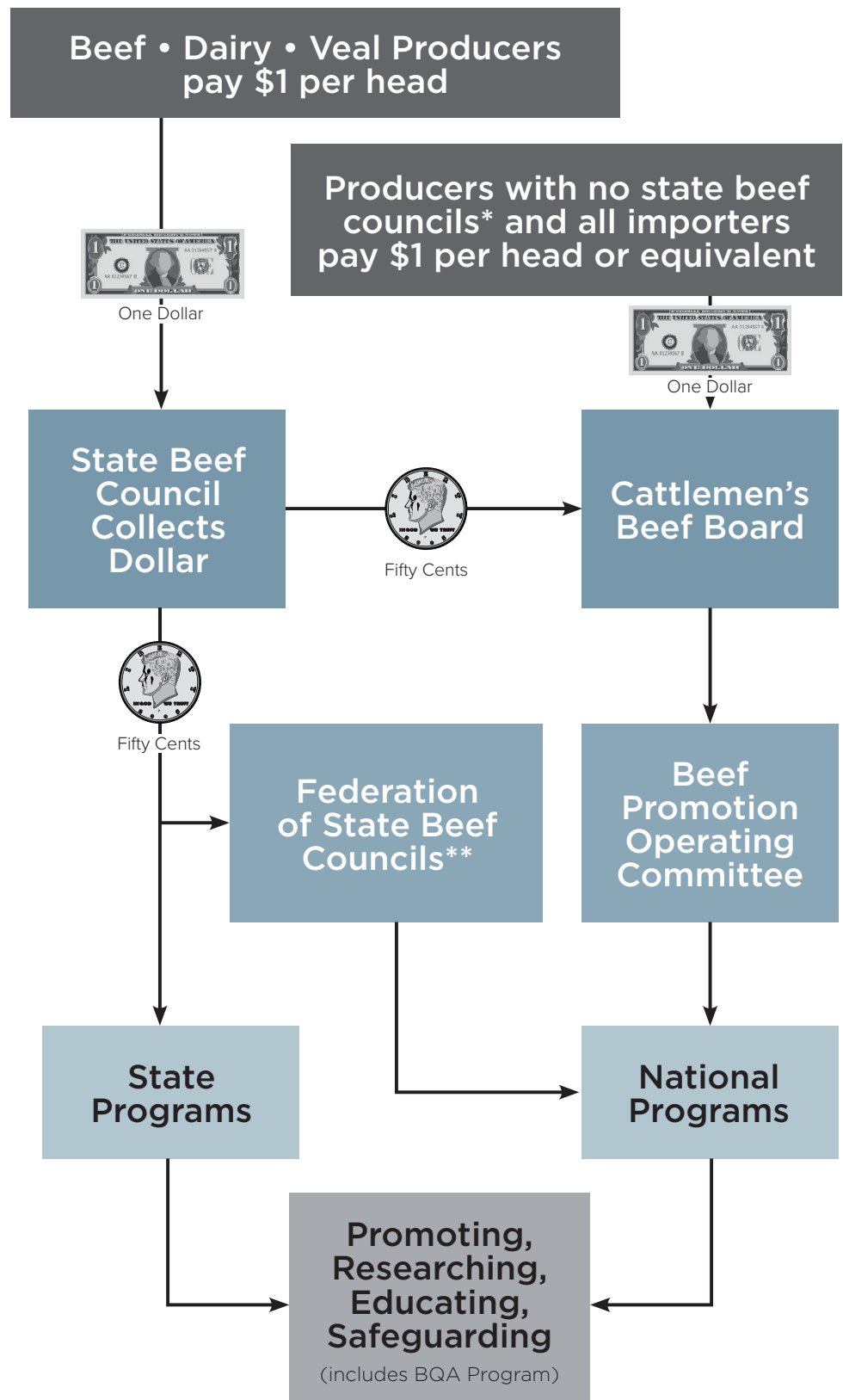
NATIONAL MANUAL



Structure of the National Beef Checkoff

The Beef Quality Assurance (BQA) program is managed by the National Cattlemen's Beef Association, a contractor to the Beef Checkoff. Below illustrates the flow of the national dollar.

- The Beef Checkoff program was established as part of the 1985 Farm Bill.¹ Under the program, producers and beef importers pay a \$1-per-head assessment on animals they market and equivalent on beef they import.
- The Beef Checkoff program is a national marketing and research program designed to increase the demand for beef at home and abroad, which is accomplished through initiatives such as consumer advertising, marketing partnerships, public relations, education, research and new-product development.



* Producers in the seven states with no beef councils – Alaska, Connecticut, Maine, Maryland, Massachusetts, New Hampshire, and Rhode Island.

** States may invest a portion of their 50 cents in national programs through the Federation of State Beef Councils.

¹ Beef Promotion and Research Act of 1985, 7 U.S.C. § 2901-2911 (1985). <https://www.beefboard.org/wp-content/uploads/2020/11/Beef-Promotion-Research-Act-of-1985.pdf>

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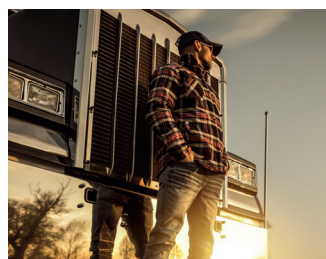
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Links to third-party websites should not be considered an endorsement by the Beef Checkoff of the actual website or the company or organization that owns/manages that website.

Acronym Glossary

AABP	American Association of Bovine Practitioners
AFO	Animal Feeding Operation
AMDUCA	Animal Medicinal Drug Use Clarification Act
ANADA	Abbreviated New Animal Drug Application
APHIS	USDA Animal Plant and Health Inspection Service
AVC	Academy of Veterinary Consultants
AVMA	American Veterinary Medical Association
BCS	Body Condition Score
BLV	Bovine Leukosis Virus
BOE	Base of Ear
BQA	Beef Quality Assurance
BQAT	Beef Quality Assurance Transportation
BRD	Bovine Respiratory Disease
BVD-PI	Bovine Viral Diarrhea-Persistently Infected
CA	Chemically Altered (vaccine)
CAFO	Concentrated Animal Feeding Operation
CBB	Cattlemen's Beef Board
CC	Cubic Centimeter (milliliter)
CCQA	Calf Care & Quality Assurance
CE	Continuing Education
CVI	Certificate of Veterinary Inspection (health certificate)
CVP	Compendium of Veterinary Products
EID	Electronic Identification Device
ELDU	Extra-Label Drug Use (off-label use)
EPA	U.S. Environmental Protection Agency
FAD	Foreign Animal Disease
FARAD	Foreign Animal Residue Avoidance Databank
FARM	National Dairy Farmers Assuring Responsible Management
FDA	U.S. Food & Drug Administration
FMD	Foot-and-Mouth Disease

FSIS	USDA Food Safety Inspection Service
GFI	FDA Guidance for Industry
IM	Intramuscular
IN	Intranasal
IPM	Integrated Pest Management
IV	Intraveneous
MBS	Mobility Score
MLV	Modified Live Virus (vaccine)
NADA	New Animal Drug Application
NBQA	National Beef Quality Audit
NCBA	National Cattlemen's Beef Association
OSHA	Occupational Safety and Health Administration
OTC	Over-the-Counter
PPE	Personal Protective Equipment
RDD	Remote Delivery Device
RDP	Rumen Degradable Protein
RFID	Radio Frequency Identification Device
RUP	Rumen Undegradable Protein
Rx	Prescription
SQ	Subcutaneous
TDN	Total Digestible Nutrients
THI	Temperature Humidity Index
TQM	Total Quality Management
USDA	U.S. Department of Agriculture
VCPR	Veterinarian-Client-Patient Relationship
VDO	Veterinary Drug Order (prescription)
VFD	Veterinary Feed Directive
VQA	Veal Quality Assurance
WOAH	World Organisation for Animal Health (formerly OIE)
WCI	Wind Chill Index



CHAPTER 1
INTRODUCTION

BQA Mission Statement

The Beef Quality Assurance program's mission is to guide producers towards continuous improvement using science-based production practices that assure cattle well-being, beef quality and safety.

Introduction to the BQA program

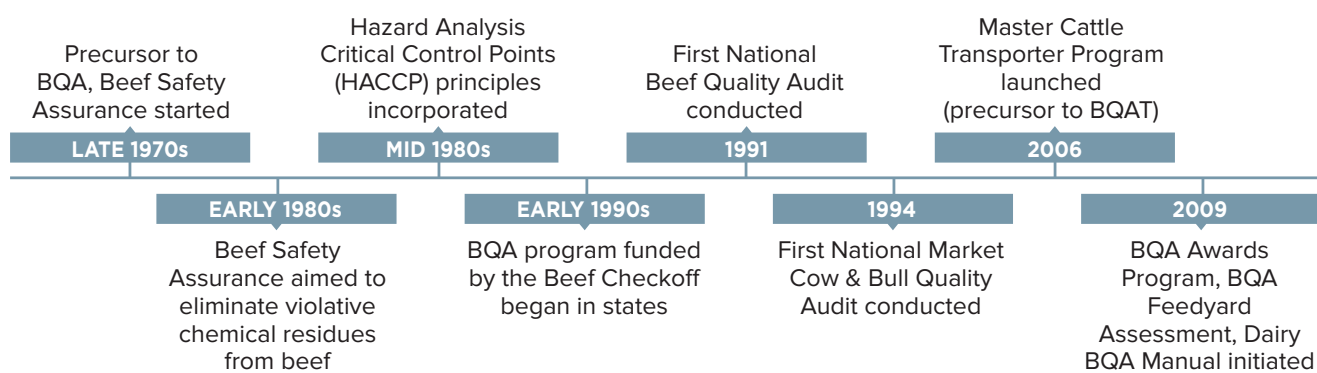
The Beef Checkoff-funded BQA program sets in the forefront of what we do as beef producers, and it serves as the path for sustainability in producing high quality and wholesome beef that consumers are proud to enjoy at the center of their plate. The program provides cattle producers with the resources to enable continuous improvement with the mindset of doing things the right way at the right time.

Attaining BQA certification signifies that cattle producers have been exposed to research-based guidelines, receiving education and training to align with standards set by a collaborative team of cattle producers, veterinarians, animal-care experts, extension specialists, and scientists.

Grassroots-based, voluntary, and backed with science, education, and certification, BQA provides the backbone for cattle care and management practices. This not only improves the production of beef, but also enhances consumer trust and acceptance of the final product. The BQA program provides accountability throughout the supply chain by participant adherence to best management practices, including cattle health & well-being, beef safety, beef quality, worker safety, and environmental stewardship. This program empowers beef producers to maximize their potential to make the most efficient and responsible use of natural resources by creating one of the world's most nutritious and flavorful sources of protein.

Producers and employees from cow-calf operations, dairy farms, grazing operations, and cattle-feeding operations are trained by well-informed and expert educators at face-to-face events and through online training courses. The BQA program is designed to serve cattle producers from every region of the country or any beef production system and marketing program. Today, BQA trainings are also utilized in university classrooms, vocational programs, veterinary education curriculum and in youth agricultural programs including 4-H and FFA. Continued certification opportunities through both in-person and online BQA training provides current and future cattle producers the opportunity to leverage BQA as the platform to earn trust, create transparency, and instill confidence with consumers, ultimately creating lasting demand for beef.

BEEF QUALITY ASSURANCE HISTORY



BQA Program Objectives

The BQA program incorporates key elements influencing the production of defect-free food including biosecurity, animal health and well-being, production performance, and environmental stewardship.

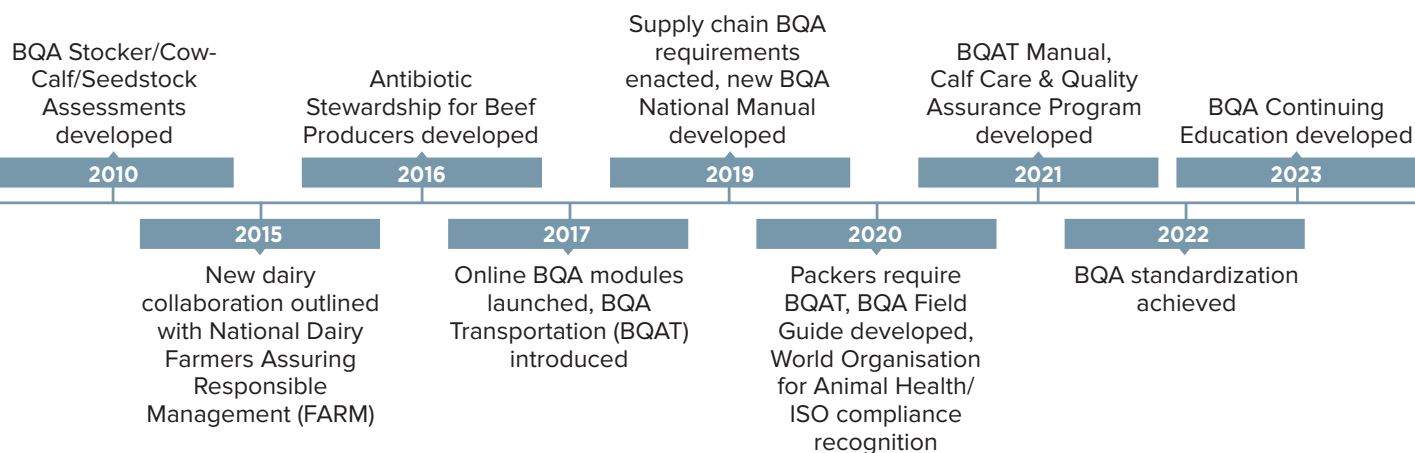
- Provide hands-on training and education to help participants meet or exceed BQA program guidelines and realize the benefits of the program.
- Establish data retention and record keeping systems for operation success, which satisfy federal agency guidelines and allow for validation of management activities and fulfill program goals.
- Provide technical assistance to participants through BQA program staff, veterinarians, extension specialists, and other qualified individuals working with the BQA program.
- Provide a foundation for the beef industry to share producers' commitment to continuous improvement and responsible cattle management.

The BQA program sets production standards for beef quality and safety that are appropriate to an operation and that producers can realistically meet or exceed.

Preventive Approach to Total Quality Management (TQM)

As a result of the findings in the initial National Beef Quality Audit (NBQA) in 1991, supply chain partners and the industry implemented Hazard Analysis Critical Control Point (HACCP) programs to ensure quality and safety. Industry groups have developed programs such as BQA for the preharvest production segments of the industry. HACCP principles include the following.

- Identify the control points where potential problems can occur, be prevented, and/or controlled.
- Establish critical limits associated with each control point.
- Establish control point monitoring requirements to ensure that each control point stays within its limit.
- Establish effective record keeping procedures that document that a system is working properly.
- Establish procedures for verifying that the system is working properly.



TQM encompasses animal health and well-being, performance, carcass characteristics, and eating satisfaction which are results of management decisions made throughout the beef production system. Because factors other than food safety are involved in quality, the material in this manual is oriented toward the TQM concept. This concept establishes that every member of a production team adheres to high standards of work in every aspect of production in order to deliver high-quality products and services.

The bottom line is that quality in the beef industry transcends the parameters of food safety.

National Beef Quality Audit

The National Beef Quality Audit provides an understanding of what quality means to the various industry sectors, and the value of those quality attributes, while providing valuable information about the production of live cattle into beef carcasses and serves as a benchmark for the beef industry. Approximately every five years, the NBQA is conducted to benchmark the industry's collective progress in addressing these quality challenges. This research helps the industry make modifications necessary to increase the value of its products.

Table 1: Key Takeaways from the 2022 NBQA¹

Progress Made in the Industry	Areas for Continuous Improvement
Supply Chain Efficiency	Improving Mobility Scores
Quality of Beef Produced	Minimizing Bruising
Fewer Injection Site Lesions	Eliminating Foreign Objects in Beef
Improved Confidence in Food Safety	Increasing the Number of BQA Certifications

The findings from the 2022 NBQA serve to improve quality, minimize economic loss, and aid in advancements in producer education for the U.S. beef industry. To read the entire NBQA report, visit **www.bqa.org**.

BQA Program Overview

The BQA program comprises multiple areas of education and serves all sectors of the beef industry including cow-calf, stocker/backgrounder, feedyard, transportation, and dairy. The components of the educational program include:

■ **Certification**

- The foundation of Beef Quality Assurance is regular, high-quality training and certification for cattle producers on the principles and management protocols of BQA.
- Producers can obtain a BQA certification through the completion of a training online or in-person through a BQA State Coordinator.

■ **Self-Assessment**

- Self-evaluation is critical to continuous improvement. Producers are encouraged to utilize the BQA self-assessments most relevant to their operation. Self-assessment guides can be found online at **www.bqa.org**.

■ **BQA Educational Resources**

- BQA houses print and video-based educational resources. Visit the National BQA program YouTube channel for videos.

Find BQA Self-Assessments here.



¹ 2022 National Beef Quality Audit Executive Summary. National Cattlemen's Beef Association, Contractor to the Beef Checkoff. <https://www.bqa.org/resources/national-beef-quality-audits>

■ BQA Awards

- These annual awards recognize outstanding beef and dairy producers, marketers, and educators that best demonstrate animal care and handling principles as part of the day-to-day activities on their respective operations. The awards promote the value of BQA principles to other producers and consumers. Visit the National BQA program YouTube channel to learn more about these BQA Award winners and their operations.



BQA YouTube Channel
and the BQA Award
Winner videos.

■ BQA Beyond Producers

- Consumer market research informs us that animal welfare is at the top of consumers' minds when making beef purchasing decisions. How animals are raised for food is a common question consumers ask themselves in regards to eating beef. BQA answers the questions of how cattle are raised for food. Consumer-facing videos about how cattle are raised leverages the BQA program, and the content is resonating well with consumer audiences. Today, having a BQA certification is more important than ever because the full beef supply chain is leveraging the program to ensure the industry's commitment to food safety, cattle well-being and beef quality.
- BQA is woven into the fabric of the beef industry. Examples of industry leaders include Certified Angus Beef promoting BQA certifications in their representation of how cattle are raised, and retail or foodservice companies listing BQA in their beef sourcing guidelines. Also, the Chicago Mercantile Exchange leverages BQA in affidavits representing how live cattle are expected to be managed if delivered under their contracts.

"Today's consumers have greater interest in how their beef is raised and the practices behind it. Programs like BQA help bring our customers and beef community closer together in that understanding, building trust to ensure a sustainable future for our industry."

John Stika
President, Certified Angus Beef

■ International Recognition

- In 2020, the BQA program worked with USDA's Agricultural Marketing Service to evaluate the program's animal welfare standards and assess compliance with the International Organization for Standardization (ISO) and therefore alignment with the World Organisation for Animal Health's (WOAH, formerly OIE) standards of animal welfare, which are the international standards.² Because the BQA program has ISO compliance, customers domestically and abroad can safely trust that their products meet the stringent, internationally-recognized animal welfare standards set forth by the WOAH.

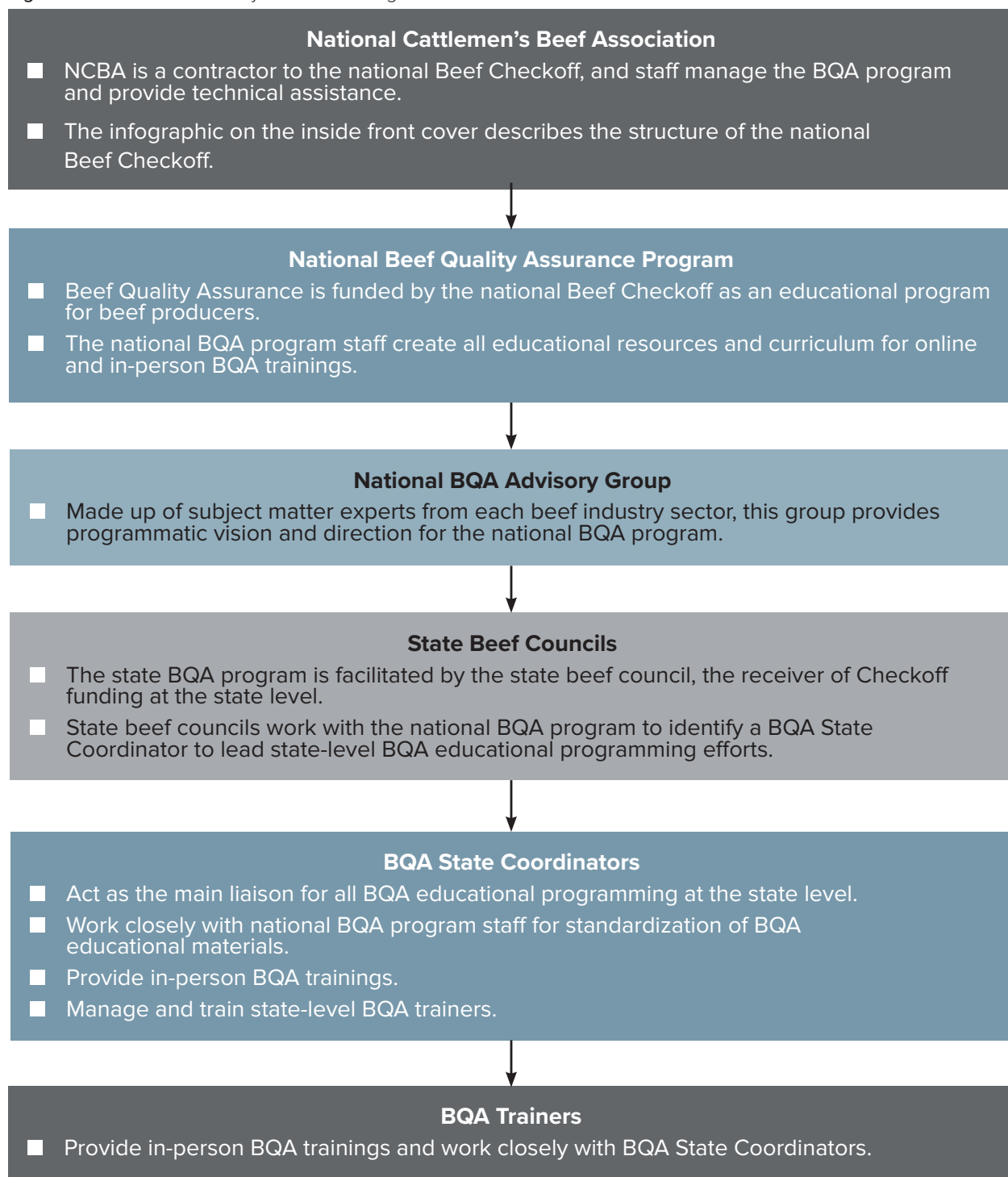


² USDA Agricultural Marketing Service. 2024. *International Organization for Standardization (ISO) Technical Specification (TS) 34700 - Animal Welfare Management/General Requirements and Guidance for Organizations in the Food Supply Chain.* www.ams.usda.gov/services/auditing/awap

Structure of the National BQA Program

The BQA program is only successful because of the national network of people working to make it an industry-wide accepted producer led program (Figure 1). The program is implemented with the help of many state partners including state cattlemen's associations, state beef councils, land-grant universities, extension educators, and veterinarians.

Figure 1: National Beef Quality Assurance Program Structure



Certification and Recertification Requirements

- To earn a BQA certification, cattle producers and caretakers must either complete a BQA training online or in-person, held by a BQA State Coordinator or trainer, as well as pass a test. To complete a BQA certification online or find an in-person training, visit **www.bqa.org**.
- All BQA trainings online or in-person contain a test that must be passed to ensure the rigor and standardization of the BQA program across the country.



- BQA certifications are valid for three years from the date the original certification was earned.

Continuing Education

- BQA now offers Continuing Education (CE) as an option to renew a BQA certification.
- All BQA CE courses are a deeper dive into topics within the BQA manual.
- A producer can participate in CE online or by finding an in-person training by visiting **www.bqa.org**.
- To renew a BQA certification through CE, a producer must obtain three CE credits before their BQA certificate expires.
- To view the CE course library, log into your account on **www.bqa.org**.
- CE is only available to producers who are renewing a BQA certificate.



BQA Equivalents

Cattle enter the food supply as beef through a variety of production systems. To ensure cattle care and consumer confidence in beef products, there are multiple quality assurance programs BQA recognizes as equivalents. Completion of the following programs are recognized as equivalents to the BQA program.



National Dairy Farmers Assuring Responsible Management (FARM)
nationaldairyfarm.com



Veal Quality Assurance Program
veal.org/veal-quality-assurance



Verified Beef Production Plus (VBP)
verifiedbeef.ca



Youth for the Quality Care of Animals (YQCA)
yqcaprogram.org



CALF CARE & QUALITY ASSURANCE



Calf Care & Quality Assurance (CCQA)
calfcareqa.org

While BQAT is not an equivalent of the BQA program, it is a large part of the overall goal of Total Quality Management. BQAT is a separate certification program with the focus of training cattle haulers on research driven guidelines and suggestions for providing thoughtful and responsible cattle management. BQAT is offered both in-person and online. More information can be found in *Chapter 6: Timely Culling, Fitness for Transport, and Transportation*. Additionally, to become BQAT certified or to access the BQAT Manual visit **www.bqa.org**.

The BQA program and its equivalents are designed to serve cattle producers from every region of the country or any beef production system and marketing programs in the U.S. and Canada. The remainder of this manual is designed to assist cattle producers, students and caregivers in delivering excellent care to cattle.



CHAPTER 2 RECORD KEEPING

Objectives

- Understand the types of records that should be kept on an operation for daily management and regulatory reasons.
- Utilize the operation's records to make better management decisions.
- Understand the importance of record keeping relative to maintaining animal health and a safe food supply.

Record keeping is a key element of Beef Quality Assurance and a good business practice in general. A quality record keeping system is one that cattle producers are comfortable using and that maintains accurate, thorough, and timely production records. However, using pen and paper is a feasible option that is better than not having a record keeping system. Maintaining accurate records helps with the management of herd health, biosecurity, worker training, nutrition programs, and overall production costs.

The BQA program recommends keeping records for a minimum of two years, or longer as required by laws/regulations.

- Pesticide records should be kept for three years.
- Veterinary Feed Directive records should be kept for two years.



Throughout the rest of the BQA Manual, you will see this icon pointing out important records cattle producers should consider keeping. There will be a record keeping section at the end of each chapter to further emphasize the types of records that should be kept within the chapter topic.





CHAPTER 3

CATTLE BEHAVIOR, HANDLING, AND FACILITY DESIGN

Objectives

- Understand the basics of cattle behavior and how to use correct pressure to handle cattle.
- Understand various cattle handling techniques and different facility designs to properly move, process, treat, and handle cattle.
- Understand how external factors and stressors affect cattle when handling them.
- Prioritize the importance of both human and animal safety when moving and handling cattle by providing proper training to employees.

Understanding cattle behavior and using proper handling practices, based on decades of practical experience and research, are known to impact the well-being of cattle, individual animal health, and herd productivity. Cattle are raised in very diverse environments and geographic locations in the United States. There is not one specific set of production practices recommended for all cattle producers. Personal experience, BQA training, and professional judgment can serve as valuable resources for providing proper cattle care. Additionally, cattle behavior knowledge can facilitate proper cattle handling to the benefit of handlers and livestock. The following information serves as an educational resource and all production practices should be adapted to specific needs of individual operations.

Cattle Behavior-Informed Handling

Cattle behaviors result from their innate instincts, sensory perceptions, and experiences that develop conditioned learning.

- Cattle are a prey species — relying on their senses to detect and respond to predators. In some scenarios, cattle may perceive humans as predators and react accordingly.
- Cattle have herd instincts and are motivated to remain in physical and visual contact with other members of the herd.
- Cattle respond favorably to routine and may be distressed by frequent or sudden changes in their habits.

Consistently monitor cattle for signs of compromised welfare and quickly address any observed indications. Proper handling management based on sound cattle behavior knowledge will reduce stress and behavior related issues. Improper handling that does not consider cattle behavior may lower conception rates, reduce immune and rumen functions, cause respiratory diseases and excess shrink. It can also cause bruises and other carcass defects, requiring excess carcass trimming at the time of processing.

Principles of Cattle Behavior

- Cattle want to see you
 - Positioning yourself so cattle can easily see you can significantly improve their response to pressure. The blind spot in cattle is directly behind them or underneath their body. Objects are out of focus when they are behind the shoulder and located close to the animal.
- Cattle want to go around you
 - This observed behavior led to the development of curved working systems aimed at taking advantage of this behavior.



- This behavior is the result of cattle wanting to remove pressure and still wanting to see you. If the handler puts pressure on an animal and it walks forward, the handler will get out of focus so the animal will begin to turn in an effort to see the handler.
- If this is not the behavior desired, the handler will have to move out and away from the animal after movement starts. This will change the angle on the eye and keep forward movement straight.
- Cattle want to be with and go with other cattle
 - The herd instinct is beneficial to moving cattle. Take advantage of this behavior by starting movement through the animals at the front of the herd. Once that movement starts handlers can feed additional movement into the herd by working down the side of animals from head to tail. If movement is started in this manner, elicit movement until it is stopped by a physical barrier or by human interaction.
 - This same herd behavior makes it important to avoid isolating cattle if possible. If an isolated animal becomes agitated, when possible, put another animal with it. A gentle animal will often keep an excited animal calm.
- Cattle want to remove pressure
 - This is commonly stated as “cattle want to return to where they have been.” However, the desire to return to where they came from is initiated by additional pressure occurring when they are moved into a more confined environment.
- Cattle can only process one main thought at a time
 - It is the handler’s responsibility to show or position the animal so that they can determine what they are being asked to do. Additionally, it is the responsibility of the handler to keep enough pressure applied so that the animal makes the decision to move forward into what is normally a high-pressure environment such as a processing area or some form of transportation.

Aggressive and Agitated Cattle

- If an animal becomes agitated, it can become aggressive and unpredictable. Once an animal enters this state it takes a minimum of 30 minutes after the source of agitation is removed before the behavior has a chance to return to normal.
- Most injuries and death to humans come from livestock that are in an agitated state. Humans not adapting to the animal’s behavior can also contribute to potential injuries.

Methods to Communicate With Cattle

Like humans, cattle perceive the world using their senses. To practice effective stockmanship, cattle handlers need to understand how cattle respond to external stimuli and be aware that these responses likely differ from how people react to the same stimulus. For example, people have been conditioned to line up directly behind others – whether that be driving a vehicle or waiting in line at a grocery store checkout. Cattle, which prefer to communicate visually, cannot see directly behind them and will respond differently than a person would. These details help form foundational knowledge for cattle handlers to effectively teach animals to tolerate pressure, instead of using force that causes unnecessary stress.

As a prey species that relies on natural herding instincts, cattle typically perceive the world in a manner that is necessary for their survival. Cattle handlers who understand how cattle utilize their senses to perceive external stimuli can take advantage of this knowledge to reduce stress on the animal, and effectively handle cattle regardless of production environment or facility layout. Cattle vision, hearing, reaction to touch, and response to smell are important factors to consider when communicating with cattle.



Video showing how cattle senses work.
National Dairy
FARM Program

Stockmanship is the art and science of using the natural behavior of animals to handle and manage movement of cattle and other livestock to reduce stress and increase safety.

This benefits both the animal and handler.

Vision

Due to the location of their eyes, cattle have a wide-angle vision field in excess of 300 degrees (Figure 1). Their narrow blind spot is located directly behind them.

When cattle focus both eyes on an object in front of them, they have

a binocular vision of about 25-50 degrees. Their perception of depth, distance, and speed is most accurate in their zone of binocular vision. They can see some colors and can distinguish between individuals based on shape and/or color. Cattle have a tendency to move from dark areas to lighter areas, provided the light is not glaring. Cattle's limited depth perception and ability to discriminate light intensity differences can make shadows appear extreme. Handling guidelines related to cattle's vision-based behaviors include the following.

- Keep cattle in visual contact with other cattle to help them remain calm.
- Ensure loading ramps and handling chutes are properly designed to minimize animals seeing distractions outside of the working area. If cattle can see moving objects and people through the sides of a chute, they might balk or become frightened.
- Check for things that may be impeding movement and distracting cattle, such as hanging chains, shadows, backstops, dogs, or people if cattle are not easily moving up the chute.
- Facilitate entry by adding a spotlight directed onto a ramp or other apparatus. Always shine light in the direction cattle need to move.
- Paint handling facilities one uniform color because cattle are more likely to balk at a sudden change in color.
- Avoid leaning over the chute and causing cattle to back up and become agitated while waiting in a single file chute.

Hearing

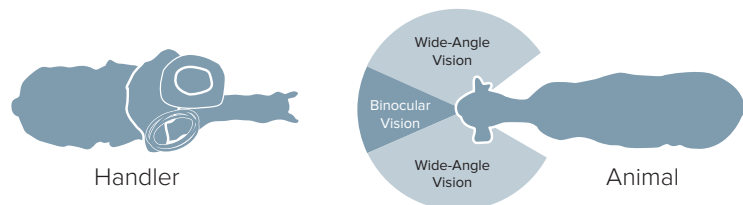
Cattle have a wider range of hearing than humans do. However, their sound localization does not allow them to determine a sound's source as well as human hearing does. Cattle are sensitive to high pitch and frequency sounds. Sudden or loud noises may startle cattle. Handling guidelines related to cattle's hearing-based behaviors include the following.

- Avoid loud noises in cattle handling facilities; small amounts of noise may assist in moving livestock. Yelling and shouting can cause excess stress to cattle and hold up the flow of cattle while working.
- Place rubber stops on gates and squeeze chutes and position the hydraulic pump and motor away from the squeeze chute to help reduce noise.
- Divert pipe exhaust from pneumatically powered equipment away from the handling area.
- Use sound, as needed, to add pressure and move cattle.

Touch

- Touch is usually a secondary means of providing stimulus to cattle to get them to move. Touch can be as simple as placing a hand or driving aid on the animal in order to increase the amount of pressure being applied. If a driving aid is used it should not be used to strike an animal. Driving aids should only be used to guide an animal or to tap or lightly push on the animal.
- The most common use of touch occurs when cattle are confined in a lead-up to a chute or a loadout. Running a hand or handling tool down the back of an animal from the shoulders toward the tail can stimulate forward movement as an alternative to using a hotshot, twisting the tail, or poking with a handling tool.

Figure 1: Binocular Vision of Cattle



- Another use of touch is to use a hand to push the animal on the hip to get them off balance to encourage them to move forward. This can be done anywhere you can safely get close enough to push on the animal.

Smell

- How cattle respond to certain smells

- Cattle have a very refined sense of smell that is key to their survival. Cattle can smell up to six miles away. They are reactive to positive smells such as feed or a handler they trust or negative smells that might indicate something is in the area that is not normal. That could be a different person or animal coming into their environment. Consider their sensitivity to smells and odors when making changes to handling. Abrupt changes in smells will have some effect on cattle behavior.

- Predator smells

- The impact of smell is very evident when cattle are exposed to the scent of predators. Exposure to wolf urine, for example, has shown to significantly alter behavior and stress levels in livestock. Even if the predator is not in the immediate vicinity, just the presence of predator urine or scat will negatively affect behavior.

- New smells

- Any time something novel is introduced into the environment cattle will usually be attracted to it and the first response is to approach and smell the item. This can be seen with the introduction of feeders, gates, dogs, people, etc. If novel items are introduced it should be done at some time in advance of needing to move, work or process cattle. If it is not, it may significantly impact movement of cattle through pastures or facilities.
- Another impact of smell can be seen when cattle are exposed to previously unknown odors or bodily fluids (particularly blood). If cattle have not been previously exposed to swine or sheep the smell of either of these species can significantly affect behavior and therefore handling. Swine feces, particularly swine on grain diets, can cause an adverse reaction in cattle where they may not want to go through or past an area where swine have been housed or penned. This can be very evident in auction facilities or vehicles that market or haul multiple species of livestock. Cattle may not want to voluntarily move past or into areas where swine or sheep have defecated or urinated. Animal blood can also elicit a significant response from cattle. Bulls appear to have a more pronounced and aggressive response to the smell of blood in pasture or corral settings but will affect behavior of all cattle. The key for handling is to allow cattle time to process a novel odor and assess its potential threat before trying to force movement past that distraction.

- Pheromones

- Pheromones are central to the lives of animals. There are a variety of ways that animals use pheromones and how these signals are perceived by smell. Molecules that make up an animal's "individual smell" include its own secretions and also may reflect its environment, food, bacteria, immune system, and molecules picked up from other individuals in its social group. Pheromones are critical in pair bonding and between cows and calves. Any interference in the initial bonding of a cow and calf at birth can negatively affect that bonding and maternal recognition of the calf as her own.
- An emerging area that can potentially impact handling and behavior is the use of pheromones to reduce stress during periods of comingling and transportation. There appears to be an opportunity to reduce aggressive behavior in comingling bulls, to ease stress on freshly weaned calves and reduce stress associated with transportation. Although this is novel technology it warrants careful analysis and adoption if shown to reduce stress in cattle.

Cattle Response to Human Stimuli

■ Flight Zone (Figure 2)

Understanding the animal's flight zone or personal space can reduce stress and help prevent accidents. The size of the flight zone varies depending on how acclimated the cattle are to their current environment and interaction with people.

Handling guidelines related to cattle's flight zone-based behaviors include the following.

- ☐ Determine the edge of an animal's or group of animal's flight zone by slowly walking up to them; they begin to move away when you have entered their flight zone.
- ☐ Work on the edge of cattle's flight zone.
- ☐ Avoid entering the animal's flight zone too deeply or quickly as this may cause them to bolt away or back past you.
- ☐ Retreat from an animal's flight zone if you want it to stop moving.
- ☐ Quietly move cattle using their natural flight zone.
- ☐ In a chute and alley, move cattle forward by moving toward their rear past their eye and shoulder.
- ☐ In a chute and alley, stop cattle by moving forward past their point of balance.
- ☐ Allow cattle to follow one another in the direction that they are facing.
- ☐ Move the leader(s) rather than the rear animals if a group of cattle bunch up.

Figure 2: Flight Zone and Point of Balance

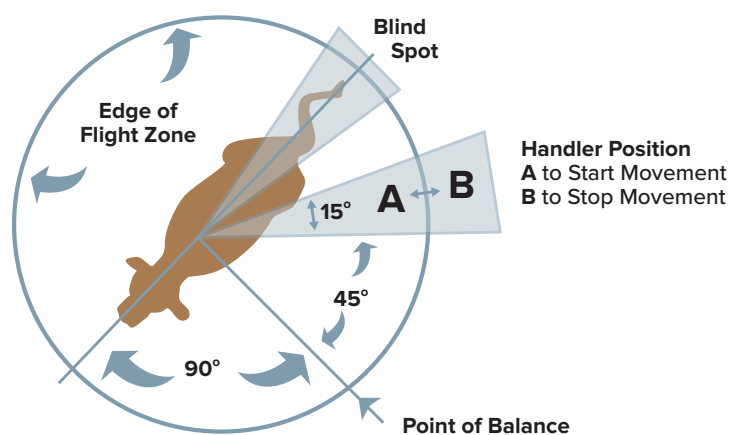
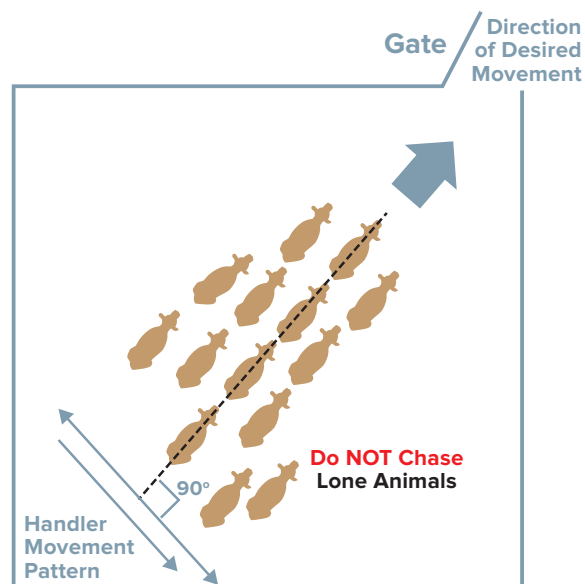


Figure 3: Moving Back and Forth to Move the Herd



■ Point of Balance

- ☐ Point of balance is normally considered to be a static point on an animal but it is not. If an animal is not conditioned to move past a human, the point of balance is usually located around the shoulder. However, the point of balance can be changed much further forward on the animal. If it is moved forward by acclimating cattle to move past a handler it makes processes such as sorting, loading or moving cattle into a chute much easier.



Learn how to move an animal using its flight zone.



Learn how to move an animal using its point of balance.

■ Using pressure

- **Location of pressure** is where you stand in relation to the animal, either on the side or at the rear, avoiding animal blind spots (Figure 3).
- Handlers should **anticipate responses** of the animal based on location of pressure.
- **Have a plan** before you apply pressure – cattle need to have somewhere to go before you apply pressure.
- **Reward** cattle for doing what you want by removing pressure.

■ Handler movement patterns

- **Moving in triangles** is when a handler starts from outside the flight zone, moves into the flight zone parallel to the animal then moves perpendicular to the rear of the animal past the point of balance. This movement draws the animal forward. The handler then returns to the original starting position (Figure 4).
- **With and against the flow of cattle** (Figure 5)
 - ▶ With: Is when the handler moves in the same direction as cattle are moving.
 - ▶ Against: Is when the handler moves against the flow of cattle.

■ Preparing cattle to be handled

- Cattle are **routine** animals. Keep in mind cattle can be trained to work through any system over time, by running cattle through a facility one to three times without processing can create routine.

□ Learned behaviors

- ▶ Human learned behaviors can be the hardest to break, therefore it is important to practice low-stress cattle handling and utilize cattle natural behaviors when moving and working cattle.
- ▶ Cattle remember positive and negative interactions with handlers; therefore, it is imperative that each interaction is positive for the animal.

□ Evaluate temperament

- ▶ Cattle temperament should be evaluated prior to handling and precautions should be used when handling aggressive cattle, for example, leaving adequate space between handler and aggressive animal(s) or not entering facilities with aggressive animal(s). The Beef Improvement Federation has a temperament score scale to adjust handling if needed.

Figure 4: Moving Animals Forward Using Flight Zone and Point of Balance

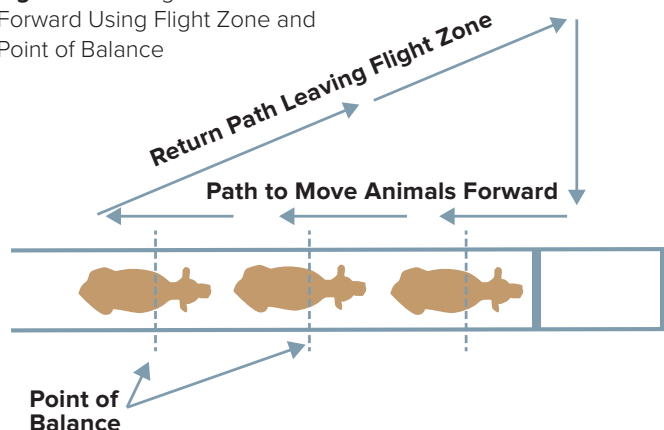
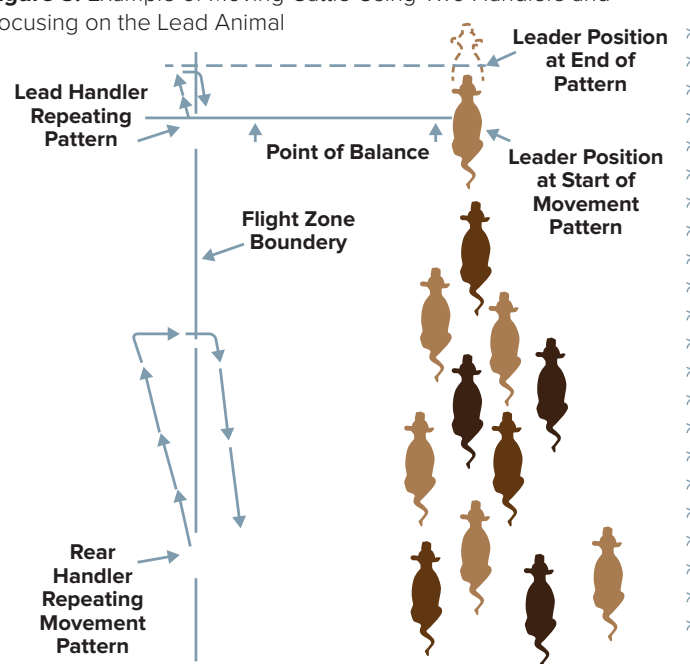


Figure 5: Example of Moving Cattle Using Two Handlers and Focusing on the Lead Animal



Use the temperament score to evaluate cattle docility.
Beef Improvement Federation

Handling Tools

Sometimes handling cattle may require the proper use of a persuading tool. These tools should be considered an extension of the handler's body. The purpose of a handling tool is to increase a handler's presence in wide spaces when moving cattle. They are not intended to strike the animal.

Unacceptable handling tools include any items used in an egregious manner to inflict pain to the animal in order to move them. Purposely whipping, hitting, or prodding cattle with sharp or solid objects, or other forceful actions to cause injury, pain, or harm is considered animal abuse.

Acceptable non-electric handling tools include:

- sorting sticks;
- plastic paddles;
- sorting flags, or a simple bag tied to a stick.

Handlers should use acceptable handling tools to quietly guide and turn cattle. Using firearms to muster cattle is abuse and a food safety issue. Use of any projectile, whether it comes from a firearm, crossbow, bow, darts, or slingshot has the potential to penetrate the skin and embed in the muscle or fat tissue of an animal. Once embedded it will remain in the tissue until the animal is processed for meat. Any metal in muscle tissue is considered an adulterant and must be removed. However, some foreign objects can escape detection in processing and end up in retail product. Any foreign object ending up in the end product can create significant costs and health issues for people consuming that product.



Shotguns are not a handling tool.

The routine use of darts is not an excuse for poor handling facilities.



Examples of product contaminated by birdshot and darts.

Electric Prods (Hotshots)

Electric prods should be used sparingly and not be used as a handler's "first choice/go-to" handling tool. Do not allow anyone working cattle to carry a hotshot as their primary handling tool. The action of stepping away to retrieve a hotshot will remove pressure from the animal. Likely, this action alone will mitigate the situation in which a hotshot was considered and then a hotshot might not be necessary.

- Minimize the use of electric prods for safety and welfare reasons. Under desirable conditions, 90% or more of cattle should flow through cattle handling systems without the use of electric prods.
- When cattle prods must be used, avoid contact with sensitive areas including the eyes, rectum, genitalia, and udder. Use of electric prods in these sensitive areas is considered animal abuse.
- Investigate and correct the reason for continuous balking rather than resort to overuse of electric prods.
- Avoid the use of driving aids powered by AC current unless they are manufactured and labeled specifically for that purpose.



Hotshots should not be the first option implemented as a handling tool.

Place hotshots two to three feet away from the working facility.

Use of Dogs

Properly trained dogs can be effective and humane tools for cattle handling. However, handlers should ensure that barking or the position of the dog is not impeding cattle movement and flow. Dogs should not be allowed to continuously bite cattle that are restrained or contained in an alley or chute, or by any other means that prevents movement or a way to escape. This is considered unchecked dog biting and animal abuse.



Only properly trained dogs should be used for handling cattle.

Worker Safety and Training

The goal of understanding behavior and livestock handling is to improve safety for the animal and the people handling them. When humans apply pressure to cattle in a method that cattle can understand, and cattle have a place to easily move away from pressure, it occurs in a more predictable manner and is therefore usually safer for the handler.

To achieve the goal of applying pressure in a manner cattle understand, handlers must be trained. The livestock industry has historically relied on livestock handlers coming from an agricultural background and assumed that background provided adequate exposure to proper cattle handling. Even a long history of working livestock does not ensure it is being done in the best manner. Handling skills are usually learned by observation of someone else handling livestock. Handling practices and skills are shaped by history and culture within an area and may not be done in a manner that takes advantage of the handling and behavior principles described above.

To ensure livestock are handled in the most appropriate manner possible, proper training needs to be provided to employees and new hires. Cattle handling skills will develop to represent the acceptable culture of management.

Cattle operations have protocols for how to handle implementation of preventive medicine, nutrition, treatment and breeding but rarely have protocols and expectations for livestock handling. Without a purposeful approach to this aspect of cattle management there will not be a consistent result.

Cattle Handling Facilities and Management

It is especially important to properly design, construct, maintain, and utilize cattle handling facilities. When utilized correctly, facilities and equipment can improve cattle handling and welfare. Keep facilities and equipment clean and maintain working parts to ensure they function properly and are safe for cattle and handlers. Make sure handling facilities are free of sharp edges and protrusions to prevent injury to animals and handlers. Evaluate cattle handling facilities using the BQA self-assessment tools provided at www.bqa.org.

- Cattle handling facilities refer to the entire setup of grazing, holding, sorting, processing and transportation components of an operation. Pasture layout, lanes, holding pens, alleyways, and processing and loading areas should be designed to decrease stress. When taking behavioral tendencies into account cattle can be handled quickly and easily.
- Pasture layout cannot always be done to make movement to holding and processing areas easy but always consider options to rotate or move cattle to pastures that make it easier to corral them on the day of processing or transporting. Although not always practical, the use of lanes can help facilitate movement of cattle across properties to reduce the chance of mixing herds/groups of cattle and reduce the labor needed to gather and corral stock. At a minimum, the pastures should feed into smaller holding traps or pastures close to the corrals.
- When possible, holding pens should be designed to take advantage of natural behavioral tendencies of cattle. Adequate square footage should be provided to minimize overcrowding. Consider needs for sorting cattle in the pens or alleyways to make the process easier and safer for cattle and people.
- Processing facilities can be constructed in several different ways and still work to take advantage of natural movement and behavior of cattle. The type of processing facility design is often dictated by spatial constraints, which may limit some options.
- Keep in mind, all “crowding areas” should be designed and used as a flow-through part of the processing facility and not used to store cattle awaiting processing. Always bring the appropriate number of cattle into the “crowding area” that can easily fit into the crowd alley and chute.



Alleys and Chutes

Moving cattle through alleys and chutes is often a necessary step in performing basic cattle management and care practices. Therefore, it is essential that these are well designed, maintained, and operated. Properly designed and utilized alleys and chutes take advantage of cattle's natural behaviors. Alley and chute guidelines include the following.

- Adjust hydraulic or manual restraining chutes to the appropriate pressure for the size of handled cattle.
- Maintain flooring and avoid slippery surfaces, especially where cattle enter a single file alley leading to a chute or a chute's exit. Grooved concrete, metal grating (not sharp), rubber mats, or deep sand can minimize slipping and falling. Quiet handling is essential to minimize slipping.
- Never fill a crowding pen with more than what can fit comfortably in the alley leading to the chute.

There are numerous names for the single or double alley system that connects the sweep, Bud Box or other types of forcing pen. Some common names are crowd alley, lead up, and race. In this chapter these systems are referred to as crowd alleys.

Crowd alleys leading up to the squeeze chute or headgate can vary in design and construction. There are some preferences for curved crowd alleys that take advantage of the behavior of cattle wanting to be able to see and circle the people working the chute. This design takes advantage of common behavior but is much more difficult to construct and adjust in width. Straight crowd alleys work well in most situations and are much easier to construct and design with width adjustments built in.

Some features to consider in designing a crowd alley are width, length, covering of sides, and features to prevent backup (sliding gates, no back self-setting attachments). Length will dictate the number of cattle that will fit into the crowd alley and the number needed ready for processing in the chute will be dictated by the number of people on the processing crew and the speed at which procedures can be done in the chute.

The minimum recommended length is 20' with the longest crowd alley necessary holding 10 to 15 head. This is a high stress part of the processing area and cattle should not be held in the crowd alley for extended periods of time to help reduce stress. If processing speed is fast the crowd alley needs to be long enough to hold enough cattle so that the person(s) loading the crowding area has time to get additional cattle and have them into the crowd alley before the last one or two from the previous group have been processed. If a continuous feed of cattle can occur through the processing facility it will improve flow and speed of cattle through the system.

When designing a curved crowd alley that attaches to a sweep, box or V, there are some features that should be built in to help cattle flow out of the "forcing pen." Figure 6 shows sweeps that curve at the exit from the sweep and entrance into the crowd alley. This is a common design that creates issues with cattle flow. The crowd alley should extend from the "forcing pen" a minimum of two body lengths of a cow before the curve begins. That will usually be a minimum of 8' and as much as 12' before the curve starts. This gives cattle the ability to see an obvious entrance into the crowd alley.

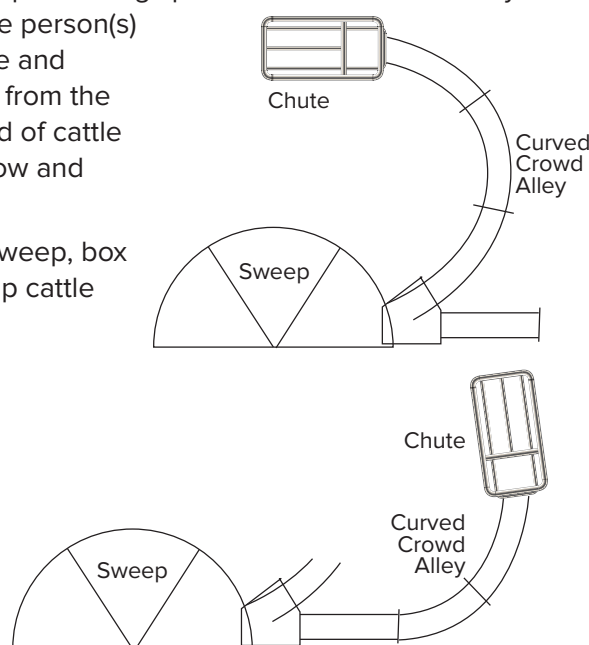
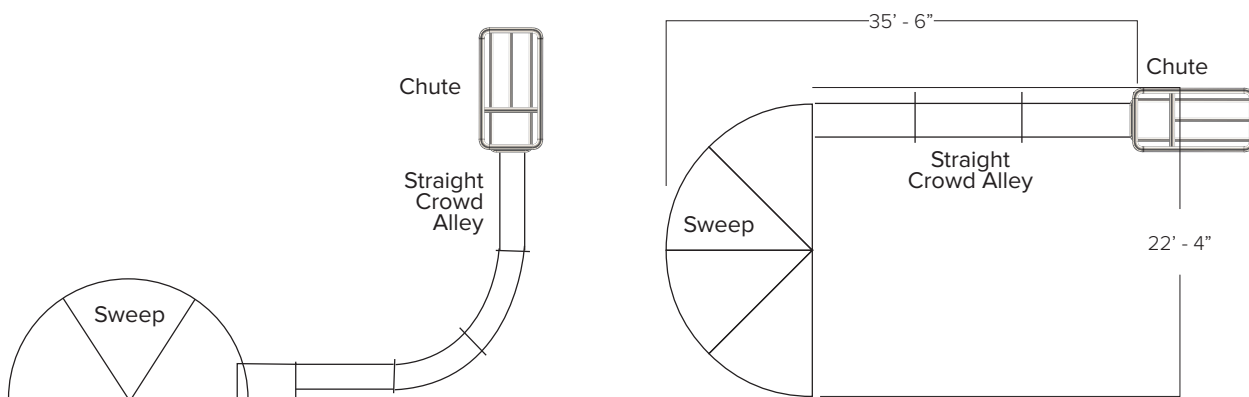


Figure 6: Examples of Curved Crowd Alleys

Figure 7: Examples of Straight Crowd Alleys With Minimum Dimensions of Facilities for Adult Cows

Another feature that improves flow into the chute is for the crowd alley to be straight for at least one body length before it attaches to the chute or headgate (Figure 7). Having cattle lined up straight behind the chute will improve flow into the chute. The area right behind the chute is where most hotshot use occurs and can be virtually eliminated by this design feature.

The curve can be as long as desired, but the ends need to be straight coming out of the “forcing pen” and straight before it attaches to the chute or headgate. Using a curve in a system is often necessary to orient the exit from the chute in the desired direction.

Installing a straight crowd alley is much easier to build and addresses the issues outlined above. The main advantage to a straight crowd alley is the ability to build it so width adjustments can be made easily.

Crowd alley width is dependent on the size of cattle being processed. It can be as narrow as 12” and as wide as 32”. Most cows can easily fit through a 28” crowd alley but some larger bodied cows and bulls may require a 30” or 32” width. A crowd alley that is too wide will encourage/allow cattle to think they can turn around rather than continue to move forward. It should not be so narrow that cows balk thinking they cannot fit into the crowd alley. A slightly wider width at the entrance into the crowd alley can improve flow from the forcing pen into the crowd alley.

A consideration on crowd alleys is the decision to use single or double entry alleyways coming off boxes, sweeps, or V-shaped corrals (Figure 8). There are a couple of considerations in deciding the best design. Cattle work through a single file system easily if the system is designed and used as described above. Use of double entry alleyways should be considered if the processing area has limited space or distance to install a single entry crowd alley. A double entry will allow two to four additional head to be in a given length of crowd alley (Figure 9).

One downside to double entry crowd alleys is that it shifts the pinch point in the system up the crowd alley where the double alleys

**Figure 8:** Examples of Double Alleys

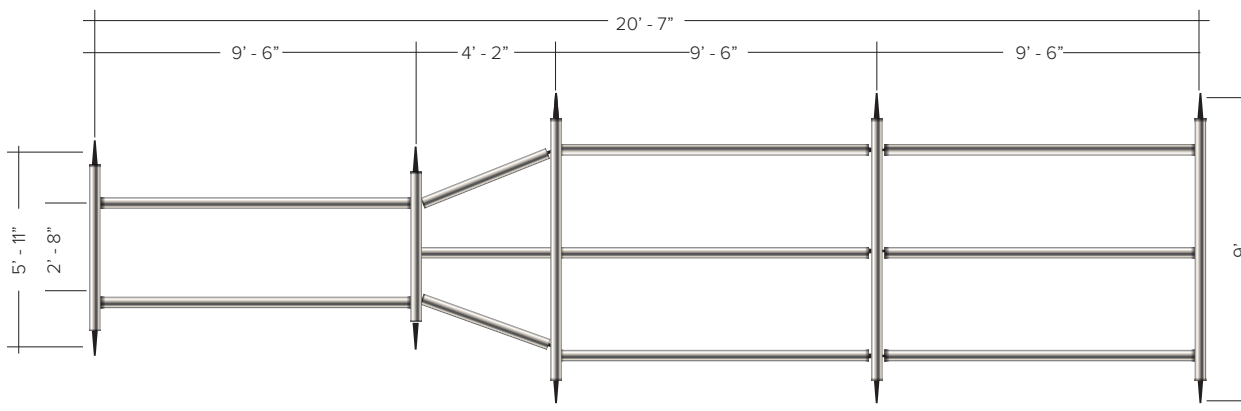


Figure 9: Example of Double Alley With Suggested Dimensions

go back to single file. When cattle balk at that point it requires an additional person to stimulate cattle to move forward. In a single file system, the pinch point is at the entry and can be handled by the person working the box or sweep. When building or purchasing a double entry system it is important that there is room for at least two head in the single file portion of the system ahead of the double alley portion. This helps facilitate flow into the chute.

Bud Box

The Bud Box was designed by stockmanship instructor Bud Williams and is essentially a rectangular pen in which the alleyway leading to the chute is placed at a right angle at the point of entry into the box.¹ The width and depth of a box depends on the size of animals being processed, the number of head necessary to fill or refill the crowd alley or to load a compartment on a truck or trailer. The normal dimensions for a box is 12' wide and 20' to 24' deep (Figure 10). They can be made wider for working larger cattle horseback or deeper for loading trucks. The capacity should match the number that will flow through the box into a truck or crowd alley for processing.

 The red starbursts in the figures indicate the area the handler will normally need to work.

 The green arrows indicate cattle movement.

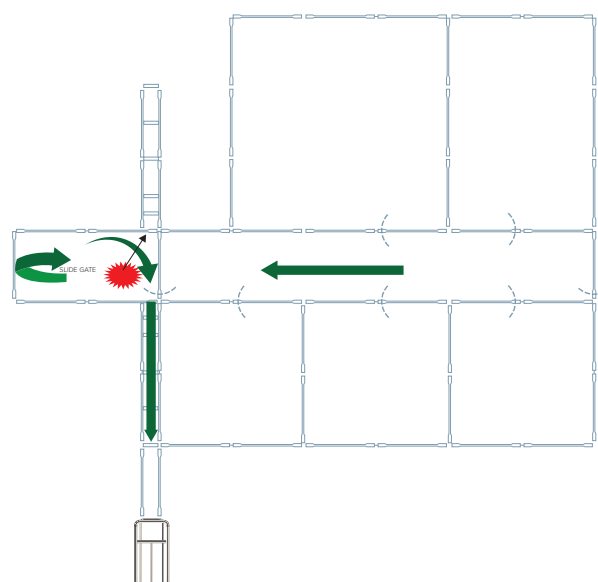
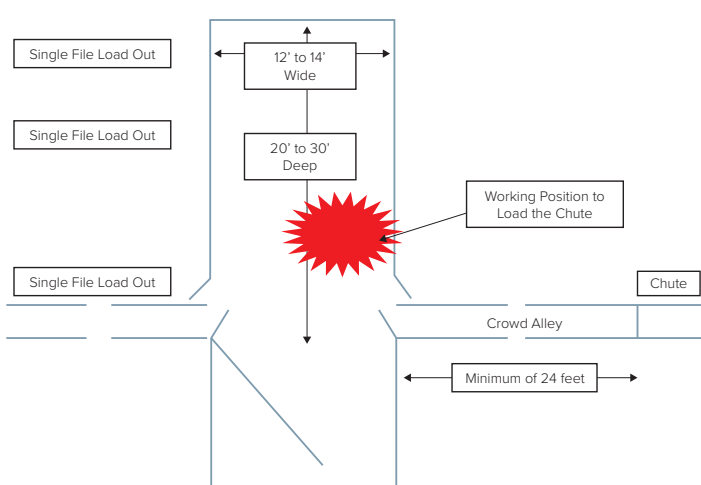


Figure 10: Examples of a Bud Box System

¹ Tarpoff et. al. 2017. *Designing a Bud Box for Cattle Handling*, Kansas State University. https://bookstore.ksre.ksu.edu/pubs/designing-a-bud-box-for-cattle-handling_MF3349.pdf



It is important to note that cattle should not be pushed out of a Bud Box but rather drawn out of a Bud Box.

Some consider a box to be more skill-dependent to use efficiently, and to a degree that is correct because the handler is in with the cattle. Handler skill is critical to making any processing area work smoothly and is necessary to create good flow into and out of a Bud Box. To make a box work smoothly, the handler needs to send or push the cattle to the far end of the box so the cattle want to remove that pressure by turning around and going back the way they came from. This creates the flow necessary to guide the cattle back and around the handler and into the crowd

alley. Working on the side of the animal allows them to flow around the person “working the box.” Pressure needs to be placed on the first animal flowing out of the box and then letting the rest follow the first one into the crowd alley. If cattle have an aggressive response, it is dangerous to be in the box, and cattle can be worked from outside to ensure handler safety.

There are a few requirements during the design process to make sure a box works efficiently. The most important is that it needs to be open-sided on the far side to improve flow in to the box. It needs to be sufficiently deep to allow cattle to flow to the back of the box and the handler to get the gate shut. It is suggested that the gate where cattle enter the box be solid so when cattle come back around the handler, they are not distracted by other cattle in the alley leading to the box. Although not necessary, covering this gate may be beneficial. Whether the sides of the box are covered or not depends on distractions that might impede flow into the box or draw cattle’s eye away from the crowd alley.

All boxes should be designed with an escape door or gate located on the side of the box and close to the entrance into the crowd alley. This serves a couple of safety and convenience features. The person in the box needs to be able to easily get out of the box if cattle are aggressive, if the handler needs to assist in processing, or bring more cattle into the box. A reason for not covering the sides where the handler is positioned is in case of aggressive behavior so the handler can easily climb the fence if needed.

Overview of Bud Box Pros & Cons

Pros	Cons
■ When the handler uses the design as intended it is easy for cattle to understand the pressure and respond accordingly. ■ Lower cost of construction and ease of construction.	■ More skill-dependent than using a sweep system. ■ If cattle handling and employee training is not done as recommended, a Bud Box will not work better than another system. ■ If handlers try to push cattle out of a box (as opposed to guiding them out) it will become more dangerous to use.



Photo courtesy of cowcoinc.com.

Sweep Tub

Sweep tubs, also referred to as crowd tubs and circular forcing pens, have been used for many years to efficiently move cattle into crowd alleys and load outs. Quite often all sweep systems are lumped together when discussing their pros and cons, however, there is tremendous diversity of sweep systems that are used in cattle handling. Many have been designed and marketed that do not take the natural behavior of cattle into account.

A properly designed sweep is constructed to take advantage of the same behavioral tendencies that make a Bud Box work efficiently. Designs developed and promoted by Dr. Temple Grandin take those behavioral characteristics of cattle into account.² Sweep systems that are approximately 210 to 270 degree sweeps allow the cattle to enter the tub and then circle around the pivot post where the sweep gate is hinged; cattle will move down the other side into the crowd alley. A key characteristic of a sweep that is designed with cattle behavior in mind is the movement around this pivot point where the crowd gate is hinged. Figure 11 is designed to have a handler stationed at the pivot point to keep pressure on cattle as they circle the pivot post.

Another commercially available sweep system is the 135 degree sweep (Figure 11). Although it does not have the continuous flow of a 270 sweep, it does send cattle past the pivot post and back around that gate pivot post and into the crowd alley (Figure 12).

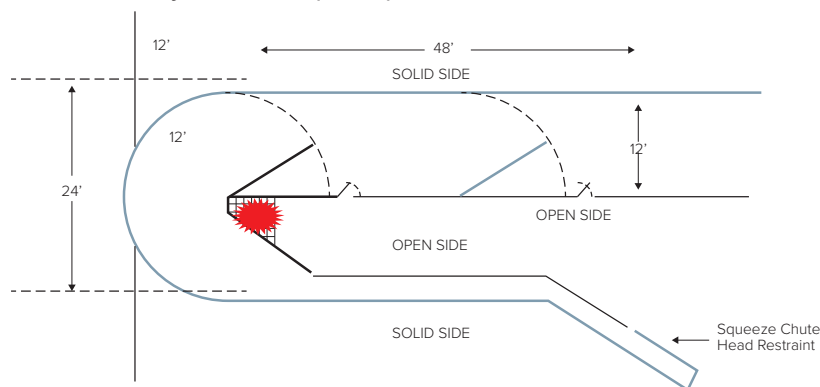


Figure 11: Example of 135 Degree Sweep Tub System

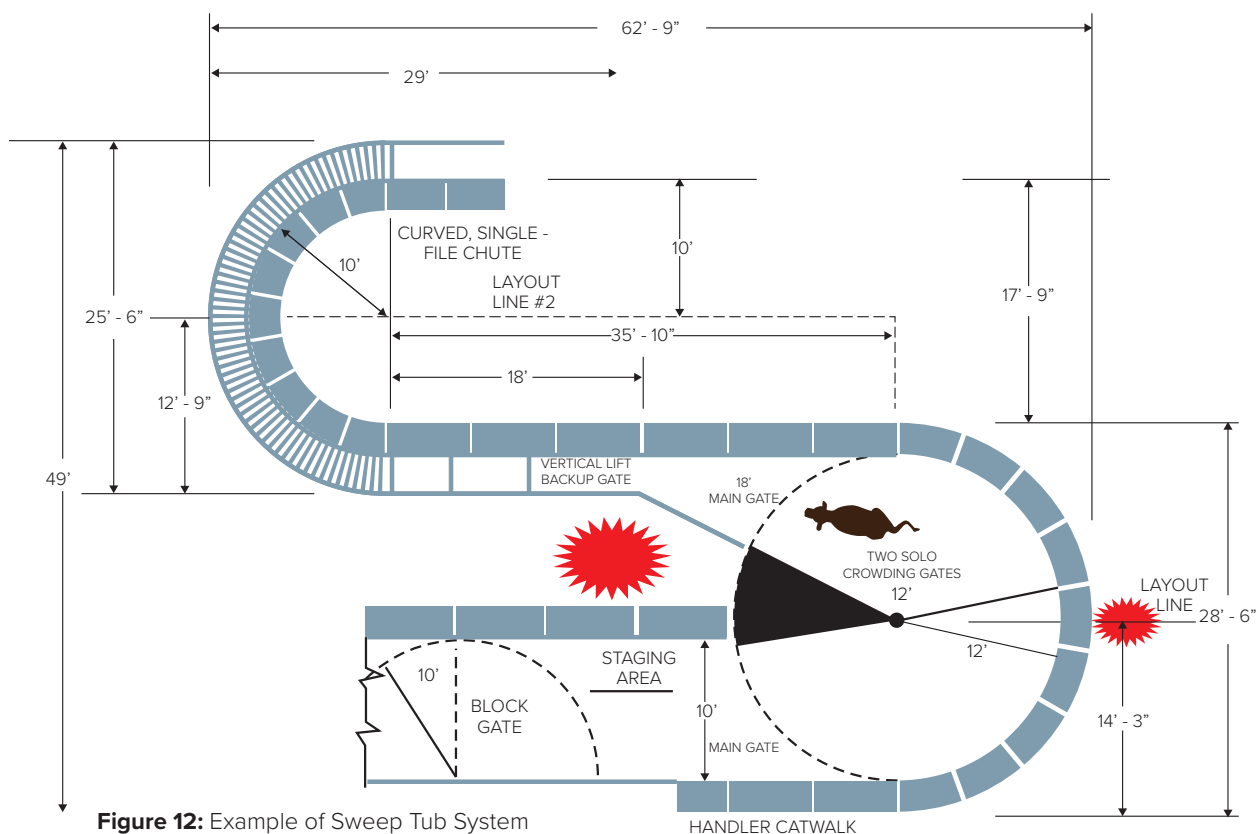
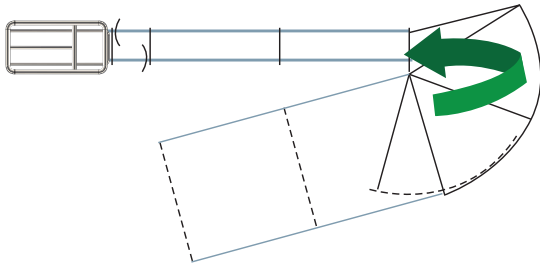


Figure 12: Example of Sweep Tub System

² Grandin 2024. *Livestock Handling Systems, Cattle Corrals, Stockyards, and Races*. <https://www.grandin.com/design/design.html>



There are many 90 to 180 degree sweep systems and all variations in between. They are not designed where cattle move around a pivot point and back into the crowd alley and this requires the handlers to manage cattle into and out of the system differently to get desired flow (Figure 13).

Figure 13: Example of 90 to 180 Degree Sweep System

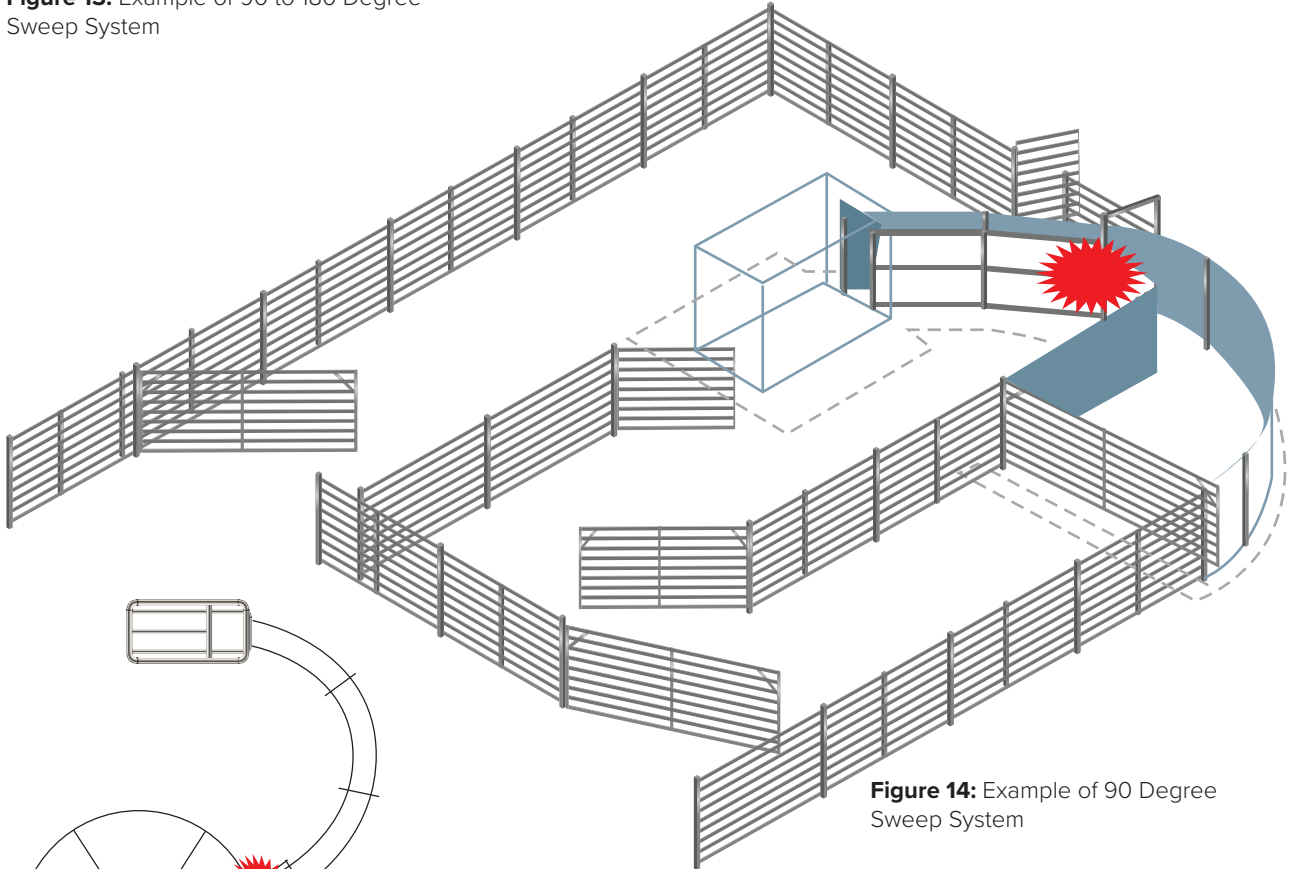


Figure 14: Example of 90 Degree Sweep System

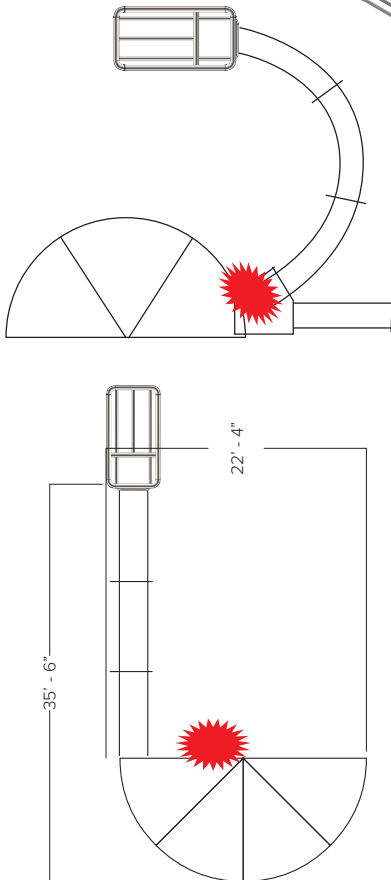
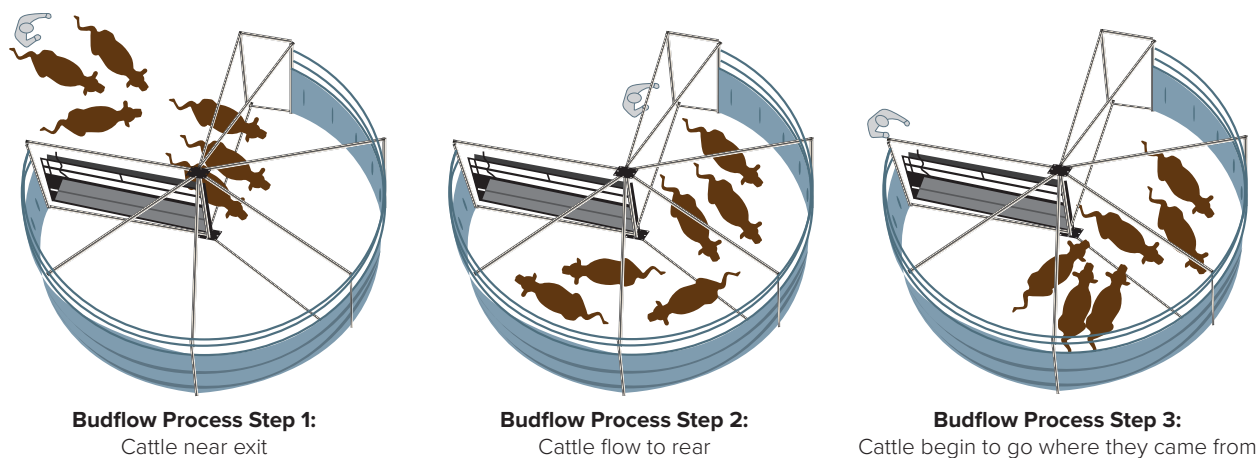


Figure 15: Examples of 180 Degree Sweep System

A common behavior of cattle in these systems is for cattle to go into the sweep and then circle back towards the sweep gate and not go easily into the crowd alley. If the handlers push cattle into any forcing pen, they will always try to come back the basic direction they entered. That behavior is what makes a Bud Box, Grandin-designed sweep and a 135 degree sweep work well. It is also what keeps other designs from working as well. Keep in mind cattle can be trained to work through any system over time. These other sweep systems just require handlers to work them differently than designs usually indicate.

One particular problem with these designs is that the handler ends up behind the cattle when they enter the sweep. If modifications can be done to allow the person working the sweep to be positioned on the side of the cattle as they enter, then the handler can become the pivot point for cattle entering the sweep.

Figure 16: Example of Budflow Process



If that cannot be done it is best to put cattle in the sweep and then stop pushing from behind. Pressure can then be applied from the entrance to the sweep as denoted by the red starbursts in Figures 14 and 15.

There are designs marketed trying to incorporate the concepts behind the Bud Box and sweep tubs (Budflow). These Budflow systems are designed to bring cattle into the sweep on the side closest to the crowd alley and allow them to go to the back of the sweep and then use a sweep gate to bring them back towards the crowd alley to mimic a 270 degree sweep. In reality it would be simpler to just bring them in from the sweep gate side and let the cattle come around the pivot post (Figure 16).

Overview of Sweep Tub Pros & Cons

Pros	Cons
■ A sweep gate helps control animal movement out of the crowding area. When designed properly, the sweep system works similarly to the Bud Box. □ However, most sweep systems are not designed to take advantage of the five behavior principles outlined above. Sweep systems designed by Dr. Grandin, for example, take advantage of these principles. Sweep systems that do not facilitate the flow back past the pivot post do not work on the same principles as a Bud Box.	■ Variety of designs that do not allow the normal behavior of cattle to be used to improve flow through the sweep. ■ Cost of installation.



Other Facility Designs

There are several other types of forcing pens that are routinely used, with the most common being some variation of a V-shaped forcing pen. These systems are easy to construct much like a Bud Box but require the handlers to work them in a combination of techniques used in sweeps and boxes. Like sweeps, once the cattle are placed in the V the handlers should stop pressuring from behind or the cattle will usually turn around to try and exit the direction they entered.

A handler should work the V from the crowd alley entrance side and get cattle to flow around or past them and into the crowd alley. This mimics the handler's position in the Bud Box or the sweep handler working from the side or front of the sweep tub. Figures 17, 18, and 19 indicate where the handler should work once the cattle are in the V or as they enter the V.

Figure 17: Triangle Force Pen

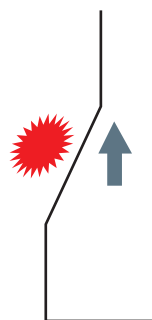


Figure 18: Double Force Pen

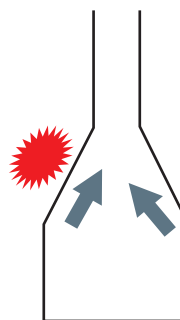
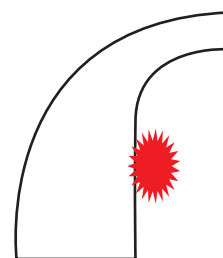


Figure 19: Bugle Force Pen



Basic Cattle Facility Design

There is a wide variation in working facilities among operations, however, every operation regardless of size needs the ability to corral cattle, to restrain them for veterinary care, and to protect human safety. This can be accomplished with low-cost systems that are adequate to contain an animal. At a minimum, the processing facility should have a headgate on any single file crowd alley to facilitate restraint of the animal's head. These can be as simple as a headgate bolted to the end of a crowd alley or a calving stall that provides head restraint and restraint of the body without the construction of a sweep system or box and a crowd alley (Figure 20).

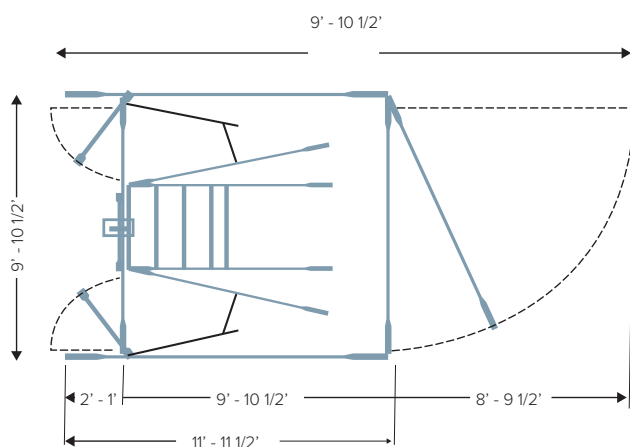


Figure 20: Examples of Adequate, but Minimal, Cattle Facility Design

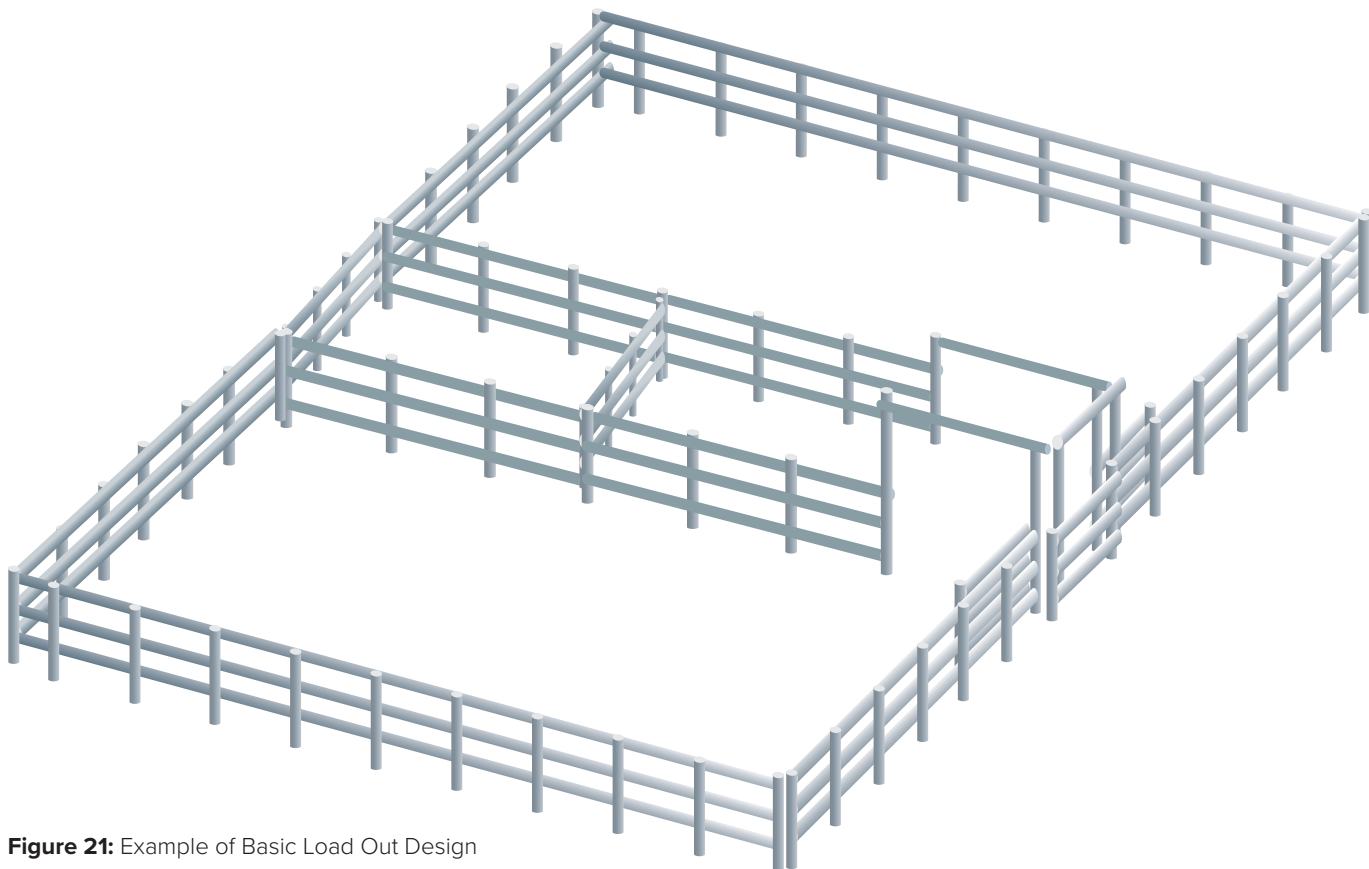


Figure 21: Example of Basic Load Out Design

In addition to veterinary care, facilities are necessary to safely load cattle to take to market or for emergency veterinary care. This can be done with simple construction of some structure that allows a trailer to be backed up for loading (Figure 21).

When loading cattle, it is recommended to have at least two pens to facilitate sorting along with an alley.

Training and Education

It is important to ensure that all personnel are able to understand cattle behavior and properly handle animals. Informally assess management practices every day to ensure that cattle welfare is not compromised. Guidelines to implement a system to verify efforts directed towards cattle care and handling include the following.

- Establish a network of resources on cattle care.
- Record training and education activities.
- Conduct self-audits or external audits of animal care and handling procedures.
- Utilize self-assessment guides available online at www.bqa.org.

Visit www.bqa.org for more information.

Housing

Cattle require the freedom to express normal behavior by providing sufficient space, proper facilities, and company of the animals' own kind. At times, protection from harsh elements may be needed. Additionally, pens and housing should be constructed in a manner that allows for environmental management.

The optimal amount of space and shelter type for cattle will vary depending on the operation's location and goals as well as the type of cattle housed. Ultimately, it is important to address shelter and housing needs to support their well-being and performance. In the U.S., both covered and outdoor cattle housing is utilized. Each of these housing types requires different management methods. However, there are some general guidelines that apply.

- Ensure proper stocking density of confinement pens. Appropriate stocking density of any confinement pen allows for all cattle to lie down at any given time.
- Ensure cattle housing is constructed in a manner that allows for proper drainage that will not violate federal, state, or local laws.
- Ensure cattle housing is constructed in a manner that will allow for ease of manure removal and other environmental management.
- Ensure that all cattle housing is constructed in a manner that allows for an animal's continued access to food and water.
- Consider the need for bedding in confined housing.
- Consider the need for shelter, windbreak structures, shade or bedding in extreme environmental conditions.
- Ensure adequate ventilation of covered housing.
- Allow cattle to utilize natural shelters such as trees when possible.
- Consider the following features when fabricating shelters: adequate ventilation, amount of space per animal, the potential need for bedding, the direction and force of wind, safe use of mechanical/electrical devices, waste removal/drainage, and the animal's continued access to food and water.

Footing Considerations for Facilities

Providing proper footing for cattle is vital to reduce slipping and falling that may cause injury to the animal. Additionally, when deciding which type of footing to use, producers should consider the likelihood of manure buildup and moisture retention, which could cause the flooring to get slick.

Producers should ensure the flooring remains free of ice buildup in the winter months to prevent animals from slipping and injury. Some examples of proper footing to help the animal increase traction with the ground include the following.

- Dirt
- Sand
- Wood shavings
- Rubber mats
- Grooved concrete



Pen Surface Management

Pen surface management can have a significant impact on cattle health and performance. Pens with excessive mud can be a challenge to both animal welfare and employee safety. Mud is more of a problem in the winter with low evaporation rates or improper drainage conditions. Excessive mud in the pen has shown decreases in cattle average daily gain (25 to 37%), dry matter intake (15 to 30%), and feed efficiency (20 to 33%).³ Respiratory problems occur more frequently and treatment costs increase under very dusty conditions. Thus, conditions that are either too wet or too dry are not ideal. Properly drained and maintained pens have shown reduced amounts of mud and/or dust on cattle sent to slaughter which may reduce carcass contamination from the hide.

The amount of mud and manure build-up on an animal's hide should be reduced as much as possible. BQA has established a guideline that >30% of cattle in a pen should not have a mud and manure score of ≥ 3 . See Mud & Manure Scoring to the right.

Guidelines for pen surface management include the following.



Maintain records of pen surface management. These records may identify chronic problem areas and assist in making long-term infrastructure decisions.

- Ensure floors in housing facilities properly drain and provide adequate traction to prevent injuries to animals and handlers.
- Ensure that mud depth is not consistently deeper than the ankles of cattle in pens.
- Monitor the accumulation of mud on cattle as a measure of pen condition and cattle care in relation to recent weather conditions.
- Maintain slopes so that water runs away from the feed bunks and does not pool excessively in the pens.
- Construct an elevated area to give cattle a dry place to lie down if the slope of the pen is not sufficient to facilitate proper drainage.
- Scrape/clean all bunk aprons as needed so cattle do not have to stand in mud to eat from the bunk or drink from troughs.
- Maintain mud and manure removal.
- Maintain the pen floor and bunk apron interface so that cattle do not have to excessively step up to the apron.
- Use dust reduction measures to improve animal performance.

Cattle may need protection from harsh elements. They require space for comfort, socialization, and environmental management. The optimal amount of space and shelter type for cattle will vary depending on the operation's location and goals as well as the type of cattle housed. Ultimately, it is important to address shelter and housing needs to support cattle well-being and performance.

Mud & Manure Scoring

Adapted from Beth E. Doran, 2016,
Iowa State University Extension
and Outreach

Mud & Manure Score 1



Clean hide. (0)

Mud & Manure Score 2



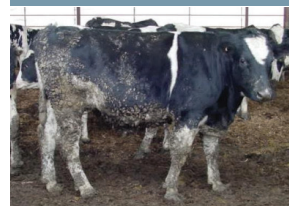
Small lumps of mud on hide in limited areas of the legs, side and underbelly. (5.7)

Mud & Manure Score 3



Small and large lumps of mud in large areas of the legs, side and underbelly. (12.8)

Mud & Manure Score 4



Small and large lumps of mud in even larger areas along the hindquarter, stomach and front shoulder. (N/A)

Mud & Manure Score 5



Lumps of manure on hide continuously on the underbelly and side of the animal from front to rear. (23.2)

() is pounds of mud on animal, Ramsey & Allen, 1975

³ C. Adams, T. C. Nelsen, W. L. Reynolds, B. W. Knapp, Winter Grazing Activity and Forage Intake of Range Cows in the Northern Great Plains, *Journal of Animal Science*, Volume 62, Issue 5, May 1986, Pages 1240–1246, <https://doi.org/10.2527/jas1986.6251240x>

Extreme Weather Considerations

Cattle are usually gathered or processed to fulfill a critical need in the production system such as weaning, treatments, or shipping. If these events take place during inclement weather situations, the work that is performed may be a negative instead of a positive. For example, if vaccines are administered to cattle during periods of heat stress or extreme cold, this may inadvertently cause sickness or reduce vaccine efficacy.

Low-stress cattle handling not only involves the previously mentioned handling techniques but should also include consideration of both daytime and nighttime temperatures as well as wind speed, humidity, and storms. In the housing section above, the topics of how to provide shade, windbreaks, reduce mud, or improve air flow were discussed. Those are important considerations to keep in mind when handling cattle during adverse weather conditions.

During periods of extreme weather, producers should work to ensure cattle remain in their thermoneutral zone. This “zone” is determined by the upper and lower critical temperatures in which cattle exhibit a heat or cold related stress response due to temperatures.

Heat

- It is ideal to work cattle before the temperature humidity index (THI) reaches 84. As an example, when the temperature is 98°F and the humidity is 30%, then the THI is 83 (Table 1). At a constant temperature, the THI increases as the relative humidity increases.
- Avoid handling cattle when the risk of heat stress is highest, prior to the hottest part of the day.
- Each one mile per hour increase in wind speed decreases the THI by approximately one point. Inversely, if wind speed reduces by 5 mph, the THI will increase 5°F.
- Provide abundant, clean water in holding pens during high temperature events.
- Work cattle more prone to heat stress, such as large or heavy cattle, earlier in the day or whenever conditions are more favorable.
- Limit the amount of time cattle spend in handling facilities where heat stress may be more significant.
- Be mindful of minimizing handling time during periods of potential heat stress on pregnant heifers or cows and avoid when possible.
- When adult cattle and calves are huddled in groups, calves may have reduced airflow compared to mature cattle which could impact regulating body temperature.
- Handling events during high THI periods should be as low stress as possible. Finished cattle are at high risk for the impact of heat stress and may already be experiencing reduced feed intake.
- If night temperatures do not drop below 70°F for at least four hours, cattle have no chance to decrease their core temperature and recover before the next episode of heat exposure, which could be detrimental to the animal if excessive heat events continue day after day.
- Pay close attention to predicted temperatures, especially following rain when humidity can increase, or when wind speeds are going to be less than 5 mph for several days.



Use USDA Agricultural Research Service's Forecast Heat Stress tool here.

Cold

The lower critical temperature of cattle is not only influenced by environmental conditions such as temperature, humidity, and wind speed, but also by animal factors such as hair coat condition and body condition.

Table 2 illustrates how the condition of the animal's coat impacts the estimated lower critical temperature for beef cattle. For example, if the coat is wet or considered a “summer coat” the animal's lower critical temperature is 59°F. Meaning the animal may begin to experience cold stress at 59°F if they are wet (no matter coat thickness) or in a “summer coat.”

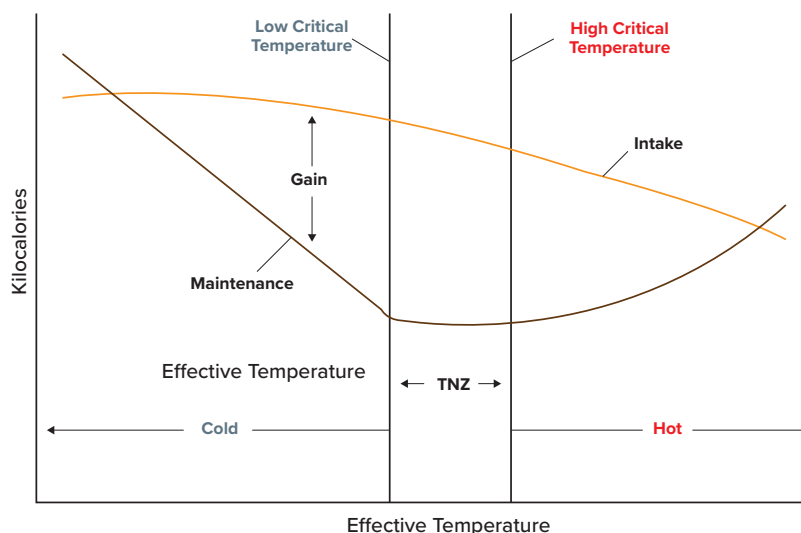
Table 1: Beef Cattle Temperature Humidity Index (THI)

		Relative Humidity (%)											
		30	35	40	45	50	55	60	65	70	75	80	85
Temperature (°F)	100	84	85	86	87	88	90	91	92	93	94	95	97
	98	83	84	85	86	87	88	89	90	91	93	94	95
	96	81	82	83	85	86	87	88	89	90	91	92	93
	94	80	81	82	83	84	85	86	87	88	89	90	91
	92	79	80	81	82	83	84	85	85	86	87	88	89
	90	78	79	79	80	81	82	83	84	85	86	86	87
	88	76	77	78	79	80	81	81	82	83	84	85	86
	86	75	76	77	78	78	79	80	81	81	82	83	84
	84	74	75	75	76	77	78	78	79	80	80	81	82
	82	73	73	74	75	75	76	77	77	78	79	79	80
	80	72	72	73	73	74	75	75	76	76	77	78	78
	78	70	71	71	72	73	73	74	74	75	75	76	76
	76	69	70	70	71	71	72	72	73	73	74	74	75
Temperature Humidity Index (THI)													
		Normal <75			Alert 75-78			Danger 79-83			Emergency >84		

Source: University of Nebraska - Lincoln

As animals begin to experience cold stress, their energy requirements increase. Therefore, producers can mitigate cold stress by increasing the amount of energy dense feeds provided. A common industry practice for an animal with a Body Condition Score (BCS) of 5 is to increase energy requirements by 1% for each degree of temperature below the lower critical temperature. For example: If a producer has a cow with a wet fall coat that is at a BCS of 5, and the temperature is 50°F, then the producer may need to increase the energy provided to that animal by 9%. If additional energy is not supplied, the cow may begin to lose body condition further increasing the impacts of cold stress, such as reducing health and reproductive performance (Figure 22).

Figure 22: How Weather Impacts Cattle Feed Intake



Source: Ames (1980)

Table 2: Critical temperatures for beef cattle are determined in part by the condition of the coat. Below the critical temperature, livestock must expend more energy in order to keep warm. Adapted from D.R. Ames, Kansas State University.

Coat Description	Critical Temperature
Summer Coat or Wet	59°F
Fall Coat	45°F
Winter Coat	32°F
Heavy Winter Coat	18°F

Table 3: Beef Cattle Wind Chill Index (WCI)

		Low Temperature °F																		
		-10	-8	-6	-4	-2	0	2	4	6	8	10	12	14	16	18	20	22	24	26
Wind Speed (mph)	25	-59	-56	-53	-50	-47	-44	-41	-38	-35	-32	-29	-26	-23	-20	-17	-14	-12	-9	-6
	23	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-28	-25	-22	-19	-16	-13	-10	-7	-4
	21	-54	-51	-49	-46	-43	-40	-37	-34	-31	-28	-26	-23	-20	-17	-14	-11	-8	-5	-3
	19	-52	-49	-46	-43	-40	-37	-35	-32	-29	-26	-23	-21	-18	-15	-12	-9	-6	-4	-1
	17	-48	-46	-43	-40	-37	-35	-32	-29	-26	-24	-21	-18	-15	-13	-10	-7	-4	-2	1
	15	-45	-42	-39	-37	-34	-31	-29	-26	-23	-21	-18	-15	-13	-10	-7	-5	-2	1	4
	13	-41	-38	-36	-33	-30	-28	-25	-23	-20	-17	-15	-12	-9	-7	-4	-2	1	4	6
	11	-36	-33	-31	-28	-26	-23	-21	-18	-16	-13	-11	-8	-6	-3	-1	2	4	7	9
	9	-30	-28	-26	-23	-21	-18	-16	-14	-11	-9	-6	-4	-2	1	3	6	8	10	13
	7	-24	-21	-19	-17	-15	-12	-10	-8	-5	-3	-1	1	4	6	8	10	13	15	17
	5	-15	-13	-11	-9	-7	-5	-3	0	2	4	6	8	10	12	14	16	18	21	23
	3	-4	-2	0	2	4	6	7	9	11	13	15	17	19	21	22	24	26	28	30

Source: Kansas State University

Due to their body size, young calves can be more susceptible to the effects of cold weather and maintaining a constant body temperature can be difficult. The thermoneutral zone is the temperature range at which an animal maintains its normal body temperature without needing extra energy. Many factors can influence the thermoneutral zone, including age of the animal, wind, moisture, hair coat length, sunlight, bedding, and rumination. Newborn calves have a thermoneutral zone between 50-78°F while a calf that is a month old can have a thermoneutral zone between 32-78°F. Cold stress in calves can occur when temperatures stay below 50°F. When ambient temperatures fall outside of the thermoneutral zone ranges, the calves need to have extra energy to maintain their body temperature which can come from nutritional and environmental interventions. Providing quality and enough nutrition, managing the environment with good hygiene, and improving biosecurity will help calves manage cold weather.

Additionally, research shows that as the minimum daily temperature decreases, the amount of time grazing for beef cows on native range also decreases. This behavior can lead to an even greater deficit of energy consumption requiring producers to supplement with higher energy feeds.

Other considerations for producers during periods of extreme cold are to increase access to natural or manmade shelters to protect animals from wind chill. Provide bedding when applicable to increase insulation and protection from frozen ground. Ensure fresh, clean water is constantly accessible. If water is limited, it can limit feed intake. Protein requirements must also be met to ensure the energy available in feedstuffs is able to be utilized, but protein requirements do not increase during periods of extreme cold.

Additional Resources

Kansas State University Cold Stress in Cattle

<https://enewsletters.k-state.edu/breetips/2023/12/18/cold-stress-in-cattle/>

South Dakota State University Winter Cow Supplementation and Cold Stress

<https://extension.sdstate.edu/winter-cow-supplementation-and-cold-stress>

Pennsylvania State University Cold Stress in Beef Cattle

<https://extension.psu.edu/cold-stress-and-beef-cattle>

Work cattle before WCI drops below 0°F.
(Table 3)

Processing Cattle Considerations

These current recommendations are the industry standards when working cattle through a chute and should serve as targets for the operation.

- Under most conditions, no more than 2% of the animals should fall when exiting the chute.
- No more than 25% of cattle should jump or run out of the chute. Cattle seldom exposed to processing conditions and equipment may be more inclined to run or jump out of the chute or to vocalize.
- If more than 2% of cattle fall while exiting or if more than 25% jump or run out of the chute, there should be a review of the situation by asking questions such as: is this a cattle temperament issue, a handling issue, equipment issue, or other.
- Some cattle are naturally more prone to vocalize, but if more than 5% of cattle vocalize (after being squeezed but prior to procedures), it may be an indication that chute operation should be evaluated.
- Miscatch is defined as the animal being in any position other than with its head fully outside of the front catch and the balance of the body within the chute (i.e. animals that are caught by the head in front of the ears and not released and/or if an animal is caught in the tail/back gate and not released). There is zero tolerance for treating a miscaught animal.
- Electric prod usage should be 10% or lower. Excess prod usage can cause stress and is considered abuse.

Willful Acts of Abuse

Willful acts of abuse of animals are not tolerated. Willful abuse is defined as acts that intentionally cause pain, injury, or suffering. Willful acts of abuse include but are not limited to the following.

- Dragging of conscious animals by any part of their body except in the rare case where a non-ambulatory animal must be moved from a life-threatening situation.
- Deliberate application of electric prods to an animal that has no place to go.
- Deliberate application of electric prods to animals multiple times in an egregious manner.
- Deliberate application of electric prods to sensitive parts of the animal such as the eyes, ears, nose, anus, vulva, udder, or testicles.
- Deliberate slamming of gates on cattle unless for human safety.
- Malicious hitting/beating of an animal which includes forcefully striking an animal with a closed fist, foot, and/or handling equipment (e.g., sorting paddle or other hard/solid objects that can cause pain, bruising, or injury).
- Deliberate driving of ambulatory cattle on top of one another.
- Tail docking unless on the advice of a licensed veterinarian.
- Abdominal surgery (e.g., rumen fistula, cesarean section, spaying, etc.) conducted by an unqualified, untrained person without anesthetic and analgesia.
- Rectal/vaginal/uterine prolapse replacements with suture or amputations without anesthetic and analgesia.
- Euthanasia by means other than approved methods covered under BQA guidelines.
- During euthanasia by gunshot, failing to immediately deliver additional shots if the first shot does not render the animal insensible and then dead (assuming no secondary kill step was used after rendering insensible by gunshot, such as pithing or jugular exsanguination).

Abuse of cattle is not acceptable under any circumstances. If witnessed, corrective action needs to happen.

- During euthanasia by gunshot, use a caliber that is appropriate for the class of animal as per BQA guidelines (page 82).
- Live animal observed on the dead stockpile.
- Unchecked dog biting cattle in chute with cattle having nowhere to go.
- Live animal frozen to the ground.
- Branding wet cattle.
- Loading cattle unfit for transport as per BQAT guidelines (*Chapter 6: Timely Culling, Fitness for Transport, and Transportation*).

Egregious Acts of Neglect

Egregious acts of neglect are not tolerated. Egregious acts of neglect are defined as purposely not providing adequate amounts of feed, water or other necessary care, which could result in significant harm, illness, or death of an animal. Egregious acts of neglect include but are not limited to the following.

- Failing to follow veterinary protocols related to timely euthanasia of critically ill/distressed or injured animals.
- Failing to euthanize a chronically diseased or injured animal with a BCS < 2 and according to protocols developed in consultation with a veterinarian.
- Failing to follow veterinary protocol related to timely treatment of an injured animal.
- Failing to provide daily feed to cattle within a 24-hour period.
- Failing to provide water to cattle in home feeding pens.
- Failing to provide water to non-ambulatory animals.
- Failing to assist a known calving heifer in a timely manner.
- Failing to assist a newborn calf in distress.
- Failing to immediately assist and provide medical care to a non-ambulatory animal.
- Failing to provide immediate medical assistance to a compromised animal unloaded from a livestock truck, as per BQAT guidelines.
- Loading a compromised animal without special transport provisions, as per BQAT guidelines.



Record Keeping Reminders

- Record training and education activities.
- Maintain records of pen surface management. These records may identify chronic problem areas and assist in making long-term infrastructure decisions.



BIOSECURE AREA
DO NOT CROSS
**ZONA DE
BIOSEGURIDAD**
NO CRUCE

CHAPTER 4
BIOSECURITY

Objectives

- Evaluate the biosecurity risks on the operation and follow a plan to help mitigate risk.
- Recognize and mitigate the biosecurity risks associated with the introduction of new cattle and animal movement.
- Apply proper cleaning and disinfection practices to equipment, vehicles, and clothing to decrease the chance of microbial contamination.
- Understand how diseases are spread and how to prevent animal disease and zoonotic disease transmission.
- Develop herd specific biosecurity plans with a veterinarian.

Biosecurity involves taking necessary steps to prevent the transmission of pathogens, or germs, to animals, humans, and the environment. The main goal of implementing effective biosecurity is to minimize disease spread. This applies to an individual, farm, or any level of the food supply chain and relies on accountability at each of these levels. Implementing these practices protects animals and people from developing disease, improves animal welfare, reduces production loss, and provides a safe product to support a safe food supply. Collaborative and multiple approaches are most effective when addressing biosecurity across livestock industries.

For instance, the practice of quarantining new additions to the herd in a separate pen for 21-30 days will reduce any new illnesses affecting the home herd. Biosecurity also involves biocontainment, or keeping diseases that are already on the farm from spreading. An example is calf scours, where the sick animals are kept separate from the healthier animals so disease does not spread.



Biosecurity includes keeping diseases off the farm through prevention and husbandry practices.

While developing and maintaining biosecurity practices may be challenging, it is the most effective means of disease control available. Cattle producers have the most control over biosecurity on their operations. When working with a veterinarian to understand and evaluate the specific operation's risks, producers can build a biosecurity plan that evaluates the practices being done now and allows for continuous improvement as biosecurity risks evolve. From family members and workers to delivery drivers and livestock haulers, everyone on the operation is responsible for biosecurity.

Biosecurity Basics

The goal of biosecurity is to implement preventive practices to protect animals (and humans) from disease. These practices prevent the introduction and/or spread of disease and can also prepare the animal to defend itself from diseases. Having a solid herd health program including vaccination protocols, stockmanship training, and good nutrition plans help animals' immune systems by priming them for common pathogens and lowering stress. Biosecurity is one part of risk mitigation for the cattle herd and, while zero risk does not exist when it comes to diseases, risk can be minimized on each operation through intentional, everyday practices.

"Biosecurity is a verb, which means it's always adapting to the situation."

Nick Lyons, DVM

An important first step is to develop a biosecurity resource group/team. The group should include people important to the success of an operation such as the operation's supervisors, veterinarian, nutritionist, extension specialist, suppliers, and others. Each cattle operation will need to assess the biosecurity risks and significance of those risks with their resource group. Self-assessments to update biosecurity plans is a useful tool for training and continuing education for the team.



Biosecurity Principles

Understanding how diseases spread is essential to keeping your cattle healthy. Diseases are infectious when they are capable of spreading to others and cause an infection. Outbreaks or epidemics happen when more cases of a disease occur than expected in a group or over a period of time.

Different factors can contribute to pathogen exposure and transmission. These are all interrelated and play a role in identifying, preventing, and treating disease. Understanding these factors and disrupting the connection between the host, pathogen, and environment is how the disease is stopped (Figure 1).

Below is an example of applying these components of disease spread to calf diarrhea (scours). Diarrhea is one of the most likely reasons young beef calves become sick or die. To improve calf health and welfare, it's important to evaluate all factors that can contribute to the disease, as discussed in Table 1.

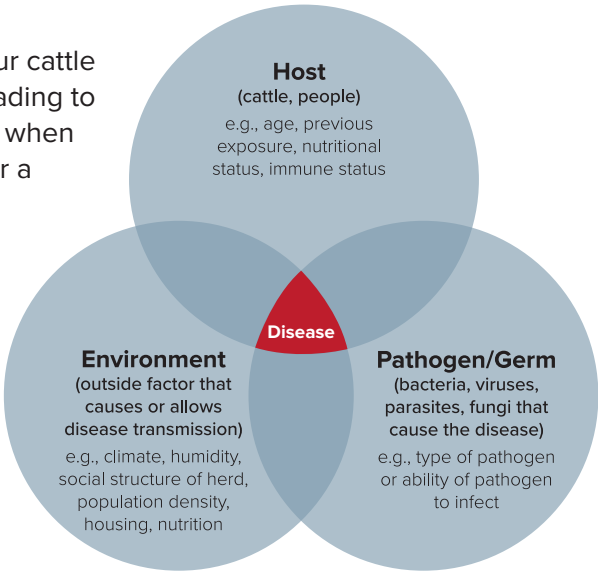


Figure 1: The components of disease spread – host, environment, and pathogen/germ – are important to understand for prevention and how to stop spread of a disease.

Table 1: Factors and Prevention Practices That Contribute to Neonatal Calf Diarrhea (Scours)^{1,2}

Host	Pathogen	Environment
■ Diarrhea (scours) is a common condition that occurs in calves. ■ Receiving good quality and at least 200 g of IgG (antibodies) within four hours of birth helps combat scours. ■ Ensuring cows and heifers are vaccinated for scours during the last trimester of pregnancy can help improve colostrum quality. ■ Calves are sensitive to dehydration so oral electrolytes are critical for treatment. Remember that young calves have very low body fat storage (about 4% at birth), so milk must continue to be provided to calves during treatment of scours. ■ Calves are most likely to become infective and shed the agents in their feces in the first seven to 14 days of age.	■ Scours can be caused by viruses, bacteria, protozoa, nutritional imbalances, or a combination of any of these. ■ Common agents of calf diarrhea include bacteria such as <i>Escherichia coli</i> and <i>Salmonella</i>, viruses such as rotavirus and coronavirus, and protozoa such as cryptosporidia.	■ Fluctuations in moisture (mud, snow) and temperature (excessive heat or cold) can contribute to scours and other health concerns if shelter or dry bedding/ground is not provided. ■ Managing stocking density within calving areas is also important since crowded conditions lead to more contamination in the environment. ■ Use the Sandhills Calving System strategy to rotate pastures/areas so those cows/heifers that have not yet calved are moved to a fresh (clean) area every 10-14 days. This method prevents effective contacts by using clean calving pastures, preventing direct contact between younger calves and older calves, and preventing later born calves from being exposed to an accumulation of pathogens in the environment.

¹ Smith, (2007). Basic principles used in the “Sandhills Calving System” and how they apply to other production environments. <https://beef.unl.edu/beefreports/symp-2007-17-xx.shtml>

² Garry, (2020). Differentiating causes of neonatal calf enteritis to enhance management and prevention. AABP Annual Conference Proceedings. <https://doi.org/10.21423/aabppro20208047>

Biosecurity requires the adoption of behaviors by people to reduce risk in all activities involving animals and their products. Annual biosecurity training for employees and visitors in control practices can reduce the risk of disease spread between animals and humans (zoonotic disease) and prioritizes public health among employees and visitors. These practices can protect the operation from lawsuits, financial loss, and additional regulatory restrictions. The following are key biosecurity principles to remember when evaluating the operation.

- **Exclusion:** Complete removal or elimination of disease risks with no introduction of animals, equipment, or other risk; most effective but most difficult to implement; modern swine and poultry production try to accomplish this.
- **Separation:** Preventing exposure to minimize disease spread.
 - Physical: walls, gates, fences, and distance between animals
 - Time between visits: quarantine, movement restriction
 - Procedural: changing clothing or footwear, clothing dedicated to the operation, employees dedicated to one area (such as the hospital area)
- **Cleaning:** Use scrub brush or pressure washer with detergent to remove organic material and contamination; if available, use hot or warm water; disinfectants cannot kill viruses/bacteria hidden beneath layers of dirt and can be inactivated by organic material.
- **Disinfection:** Proper product selection for the pathogen of concern is critical along with applying at the correct concentration and contact time; use disinfectant products according to label instructions (Table 3 on page 49).

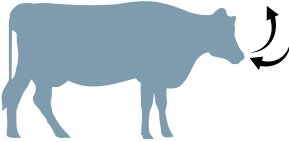
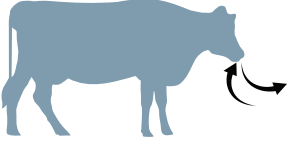
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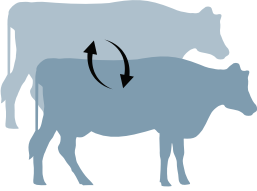
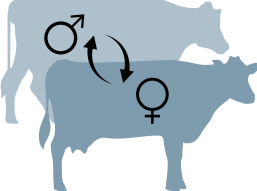
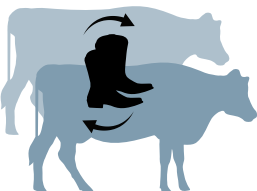
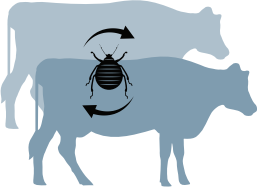
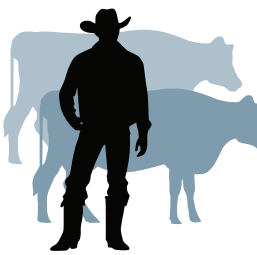
Zoonotic diseases are infections spread between animals and people.

Identifying routes of transmission (or spread) of various pathogens can help protect against new or emerging infectious diseases. An animal must be exposed to these pathogens to develop disease, so understanding the routes of transmission makes it easier to prevent spread or gain control over the spread. To fully assess the herd risk and individual animal risk, it is important to know what pathogens are leaving the operation, entering the operation, and spreading throughout the operation.

Spread of disease agents or pathogens can go from animal to animal or animal to human. Transmission routes include aerosol, oral, direct contact, reproductive/venereal, fomite, and vector-borne (Table 2). Zoonotic diseases can be spread by any of these routes and are especially important to know about so humans can protect themselves while working with animals.

Table 2: Routes of Transmission, Disease Examples, and Prevention Practices

Route	Transmission	Examples (not all inclusive)	Prevention
 Aerosol	Respiratory droplets or via airborne transmission	Bovine viral diarrhea (BVD), bovine respiratory disease complex (BRDC) or pneumonia, influenza, or anthrax	Ventilation, dust, and humidity control to decrease pathogens in air Separation by distance Minimizing overcrowding and managing stocking density Respiratory protection for humans Vaccination
 Oral	Enters through mouth from feed, water, or equipment contaminated with feces, urine, or saliva	BVD, scours pathogens, Johne's disease, Leptospirosis, <i>Salmonella</i> , <i>E. coli</i> , parasites like worms, foot-and-mouth disease, anthrax	Keep feed, water, and surfaces (like troughs or bunks) that can be licked from being contaminated Pasteurizing milk and heat treating colostrum Reduce feed contamination from wildlife and rodents Using parasiticides specific to parasite's life cycle Vaccination Do not eat or put items (needle caps, pens) in your mouth while handling cattle

Route	Transmission	Examples (not all inclusive)	Prevention
 Direct Contact	Exposed through directly touching open wounds, mucous membranes, or skin through blood, nose-to-nose contact, saliva, or bite Calves can also get infected through pregnancy or birth	BVD, Johne's disease, Leptospirosis, tetanus, brucellosis, Q fever, rabies	Separation by gates, space, time, or procedure Separating sick and newly introduced animals from healthy animals (quarantine or isolate) Vaccination
 Reproductive/ Venereal	Subtype of direct contact – spread through mating or to the fetus during pregnancy	Trichomoniasis, Campylobacter/ Vibrio, BVD	Testing for diseases prior to purchasing or breeding (such as breeding soundness exams) Vaccination
 Fomite	Contaminated inanimate objects such as feed, needles, vehicles, trailers, wheels, and boots could transmit disease from one susceptible animal to another, or to a human A secondary exposure route (direct contact or oral) is required	BVD, ringworm, Anaplasmosis or bovine leukosis virus from needles	Proper cleaning, sanitizing, and disinfecting all equipment Single-use needles Have separate equipment for treating sick animals Use separate equipment for handling manure, dead animals, or feed (if not available, clean and disinfect equipment between uses) Clean livestock trailers between hauling different classes of cattle (ages, dairy vs. beef) or after hauling animals from another herd
 Vector-borne	Spread through arthropod vector (ticks or insects) Mechanical: pathogen carried on body (insects) or item (feet or feathers) from one host to another Biological: vector infected by pathogen and carries pathogen from one host to another	Mechanical: Pinkeye, mastitis Biological: Anaplasmosis, Theileria	Eliminating potential vector breeding grounds like standing water sources or cleaning manure and organic material Using topical, injectable, or oral insecticides or parasiticides specific to vector's life cycle Prevent feed contamination by insects or rodents
 Zoonotic	Transmitted between animals and people	Leptospirosis, <i>Salmonella</i>, <i>E. coli</i>, Tuberculosis, Listeria, Cryptosporosis, rabies, influenza	Wash hands after animal contact or touching items contaminated with bodily fluids (blood, saliva, urine, milk, calving fluids, feces) Wash hands before putting anything in your mouth, including needle caps or food Pasteurize dairy products Be careful around stillborn or aborted fetuses Use personal protective equipment (PPE) such as gloves, palpation sleeves, goggles or face shields, masks, closed-toed shoes, or clothing to cover skin (long sleeves or pants) Protect immunocompromised groups (young children, elderly, pregnant, other severe diseases from exposure to contaminated animals, clothing, or fluids)

Zoonotic Disease Prevention

Recognizing how to protect producers and other people working with cattle from zoonotic diseases requires knowing what diseases to be worried about and providing proper training. Suggested training topics are listed in *Chapter 9: Worker Safety*. Operations should work with the herd veterinarian, extension team, or others to develop comprehensive training for the risks on the operation. Personal protective equipment (PPE) can vary depending on the risk. For instance, when working with calving, stillborn, or aborted animals, protect mucous membranes (eyes, mouth, breaks in skin) from reproductive fluids with latex gloves, palpation sleeves, mask, and goggles. This also applies to other bodily fluids like blood, urine, saliva, and feces.

Practicing good hand hygiene and washing hands after contact with animals or their body fluids is a practical prevention step. Do not put items in your mouth when working livestock, including food, chewing material, needle caps, or others.

If inviting guests to the operation, provide visitors with booties, coveralls, gloves, or other PPE to protect them from zoonotic diseases. Provide a handwashing station.

Protecting the Herd

Protecting the cattle herd from diseases starts with education and training. It is important that anyone working with cattle, from employees to family members to visitors, understand how biosecurity protects the animals and how they can protect themselves. Having biosecurity practices that are practical and executable improves the likelihood of implementing and maintaining biosecurity.

Each operation is going to be different and will have different risks. For instance, if there are show or exhibition animals on site, they have a different disease risk than the cow-calf herd due to travel and exposure at shows. If there are multiple species like horses, goats, sheep, or others, that also needs to be considered when evaluating risks.

Prevention practices tend to cover multiple routes of transmission, so one practice could protect against multiple pathogens. Evaluate ways to prevent fecal contamination of cattle feed, water, or oral cavity (ingestion). This includes preventing cross-contamination of feed, water, and equipment between groups with different health status. Below are general considerations for cattle operations.

- Handle or manage healthier animals before sick animals, and work from young to old to protect underdeveloped immune systems. Equipment, such as tubing or drenching equipment, should be cleaned and disinfected after using in sick animals.
- As practically as possible, prevent contact with neighboring cattle to reduce disease transmission risk.
- Use different equipment to feed and clean pens or clean and disinfect equipment between uses.
- Avoid stepping in the feed bunk.
- Observe septic leach fields and fix any broken pipes.
- Educate workers about the importance of personal hygiene near feedstuffs or feed bunks, water tanks, and even pens where cattle could come in contact with tapeworm segments or eggs spread by infected humans.
- Regularly deworm dogs and cats that are in close contact with humans, as they can carry parasites that are zoonotic.
- Prioritize protecting the cattle water supply from contamination (e.g., manure, chemicals, etc.).

Ensure everyone in the beef operation is on constant alert for practices that could cause contamination of the water supply. Report to the operation's manager and address any suspected contamination of a water supply.

There are many ways to protect the cattle herd from diseases that are included in the herd health plan. Strategic vaccination plans can prime the animal's immune system and protect them from common diseases.

Quarantine or Isolation Area

Quarantining new animals such as replacement bulls, heifers, cows, or calves away from the home herd is a key way of preventing disease from entering the operation. Keep replacement cattle separate from other cattle for at least 21-30 days in a pen or area that has separate feed and watering equipment and no shared fence line. This allows enough time to monitor for disease and for potential disease testing to be completed.

For feedlots and stocker/backgrounder operations, it is not practical to quarantine though daily monitoring is recommended to ensure good husbandry (eating and drinking) and to recognize illness early for more effective intervention and treatment. One tactic is to keep stocker/backgrounder animals separate from the home herd without a shared fence line. Another is to place incoming animals in pens next to older animals that have acclimated and are less susceptible to diseases.

The isolation area can also be used for sick animals to be isolated from the rest of the herd and prevent spread of disease. Clean and disinfect equipment like buckets, medication equipment, and areas after use with sick animals.

Animal Disease Testing and Certificates of Veterinary Inspection (CVI)

Testing for diseases is recommended prior to animals entering the operation and may be required for shipping. Talk with the herd veterinarian to determine what diseases are a risk in your region.



Health certificates or CVIs are required for all interstate and some intra-state movements, such as to livestock shows. Schedule time with your veterinarian with plenty of notice before movement so requirements and rules can be determined for each state. Visit

www.interstatelivestock.com for more information or contact the state veterinarian's office for the states of origin and destination.



Maintaining animal movement logs is a key part of record keeping. Individual animal identification contributes to animal health and animal disease traceability as animals move from pasture to pasture or from state to state. Health parameters such as disease management, vaccinations, withdrawal and safe to ship dates, and growth rates can be monitored using identification. USDA has approved official identification methods listed for varying classes of cattle on their website **www.aphis.usda.gov/livestock-poultry-disease/traceability**.



Knowing the vaccine history from purchased cattle can be helpful in assessing risk. Remember that replacement or grafted calves from off the operation are a disease risk. Ask the seller or herd veterinarian about the biosecurity, vaccination, and testing programs for herd(s) or replacement cattle. Examples include the following.

- **Bovine Viral Diarrhea (BVD):** Test to identify and remove persistently infected (PI) BVD animals from the herd. Do not keep a PI calf as a replacement heifer. Discuss use of killed virus versus modified live virus vaccines for BVD with the herd veterinarian.
- **Johne's Disease (*Mycobacterium paratuberculosis subspecies avium*):** The beef and dairy industries should understand how Johne's disease can impact the herd and how it is spread. If Johne's is suspected, work with the herd veterinarian to determine testing methods, threshold for culling positive animals, and long-term testing and surveillance program.
- **Bovine Leukosis Virus (BLV):** BLV can be spread by using needles on more than one animal. Test purchased cattle during quarantine.
- **Brucellosis (*Brucella abortus*):** This disease is regulated by USDA. States around the Greater Yellowstone Area have specific testing procedures that can be verified by the herd or state veterinarian.
- **Tuberculosis:** This disease is regulated by USDA. Specific testing procedures can be verified by the herd or state veterinarian.
- **Trichomoniasis:** Several states require purchased bulls to test negative for trichomoniasis. This is generally completed during a Breeding Soundness Exam. Work with the herd or state veterinarian to determine what is needed.
- Other disease tests may be recommended by the herd or state veterinarian.

Calf Management

Since calves' immune systems are not fully developed until a few months old, it is critical to set the calf up for success by minimizing disease risks. Consult with the herd veterinarian annually about calf care and sooner if health issues arise.



Have two sets of esophageal feeder equipment and dedicate one set to sick calves and one set to healthy calves. Clean and disinfect after each use regardless of group.

Controlling environmental hygiene is one of the most impactful prevention strategies, from ensuring the calving area is clean and dry to providing a clean and dry area or bedding during wet or cold weather. Have a strategic vaccination and parasite control plan in place for all cattle, especially cows and heifers prior to calving. This also means cleaning and disinfecting equipment after each use (calving chains, buckets, esophageal feeders).

Collected colostrum should be heat treated to prevent disease transmission. Providing at least 200 g of IgG (antibodies) to calves within four hours of birth

helps with passive transfer of immunity, nutrition, and temperature regulation.



Permanent identification for calves is helpful in identifying illness, recording treatments and withdrawal times, and monitoring growth parameters.

Pest Control Program

Rodents, wildlife, and birds may transmit diseases to cattle and humans. They could also cause damage to equipment including sensitive electrical connections. Restrict stray or wild animals from accessing animal feed and water. Prevent nesting sites from being built. Consider employing a certified pesticide applicator or service. Read and follow all label directions for all control products, including withdrawal times. Work with wildlife services for control measures.

Carcass Disposal

Preventing cross-contamination between healthy and sick/dead cattle with equipment is a good biosecurity practice. Necropsy animals to verify the cause of death. Wear proper PPE during necropsies. Work with the herd veterinarian for technique and sample collection protocols. Do not allow rendering trucks to access feed or animal areas. Carcasses must be handled and disposed of following local, state, and federal regulations. See *Chapter 5: Herd Health* and *Chapter 8: Environmental Stewardship* for more information.

Livestock Haulers and Transporters

Livestock haulers and transporters play a critical role in delivering a safe product and acting as a stop gap in the spread of disease, both everyday diseases and foreign animal diseases like FMD. There is inherent contamination risk because trucks and trailers are contaminated with feces and bedding. For example, the Porcine Epidemic Diarrhea Virus (PEDV) outbreak in the swine industry from 2013-2015, the disease spread to more than 30 states by the end of the outbreak. Risk factors included, but were not limited to, contaminated trucks, feed, and farm employees.

Follow biosecurity principles discussed in this chapter and recognize that practices need to be practical and executable (which increases likelihood of implementing and maintaining). Each load is going to be different – transporting cow-calf pairs, feeder cattle, or dairy or beef calves have their own risks. Plan out the day or week on what loads are safe(r) to haul in the same day.

The cornerstone of biosecurity is preventing the spread of pathogens to protect animal health and also human health (transporters and families). Using PPE like coveralls or goggles and gloves and boots is one way to separate the manure from handlers. When home, keep work clothes separate from family members' clothes, especially if immunocompromised family members like small children or parents live in the household.

Clean out the cab regularly and maintain as 'clean' space (minimal manure enters). Disinfectant wipes can be used on surfaces. Practice good hand hygiene and wash hands regularly. Deworm pets that travel in the cab or pickup.

Reducing stress to cattle as much as can be controlled will help cattle not shed pathogens in higher amounts. If possible, transport younger animals with developing immune systems in clean trailers and before older cattle. Cleaning trailers will minimize hide contamination for feeder cattle which improves food safety at the plant. It also maintains trailers since manure and urine can degrade flooring inside trailers. Weather, climate, and cleaning facilities determine how often trailers get cleaned.

People Movement Logs



If the operation has visitors or deliveries, keep a log in the office or common area to record when visitors come to the operation. Limit people's access to cattle pens, feed mixing/storage areas, feed bunks, and cattle treatment areas. For agritourism activities, ask visitors to come with clean clothes and footwear. Facilities to change or clean/disinfect should be provided, or coveralls and booties/overboots that stay on the operation can be provided.

Visitors should park in the designated parking area and a clearly labeled map should be provided. Biosecurity protocols should be enforced with all visitors, staff, employees, and family members.

Anyone visiting livestock, wildlife, or other animals outside of the U.S. should follow USDA recommended quarantine from susceptible species upon return to the U.S. For example, for foot-and-mouth disease, quarantine yourself from susceptible species for at least five days.



A sample biosecurity protocol for international and domestic visitors can be found here.

Public Lands

Livestock grazing public lands have different risk factors than other sectors in the livestock industry. Knowing what groups (mining, oil/gas industry, recreation, other livestock, wildlife) have access to the area can help evaluate risks. Setting up the cattle with good nutrition, vaccination programs, and identification can help monitor animal health and potential disease transmission.

For resources specific to livestock grazing public lands, including livestock management options and movement decision criteria guidance during an FMD outbreak, see the Enhanced Biosecurity Practices section.

Building a Daily Biosecurity Plan

Daily biosecurity practices discussed above include some of the most important steps to protecting the cattle herd. BQA partnered with the USDA-funded Secure Beef Supply (SBS) Plan to develop resources for cattle producers on how to properly prepare for cattle diseases. The  BQA Daily Biosecurity Plan for Disease Prevention template offers an introductory, stepwise biosecurity plan for identifying biosecurity risks on cattle operations. Producers can customize plans to their own operation, allowing flexibility for producers and their resource team to evaluate what management practices work best for their situation. Working with the herd veterinarian provides unique opportunities for evaluating current practices and collaborating on steps for improvement.

This plan is a precursor to the SBS Plan, an enhanced biosecurity plan which will be necessary during a potential foreign animal disease outbreak such as with foot-and-mouth disease (FMD). Content sections for both the daily and enhanced biosecurity plans are the same for consistency between plans, allowing producers and veterinarians to build up to more stringent biosecurity steps that are necessary for the SBS plan. As seen in the list below, biosecurity plans are comprehensive and cover many aspects of the cattle operation.

Content Sections Included in BQA Daily Biosecurity Plan for Disease Prevention and Secure Beef Supply Enhanced Biosecurity Plan

1. Biosecurity Manager and Written Biosecurity Plan
2. Training
3. Protecting the Cattle
4. Vehicles and Equipment
5. Personnel
6. Animal Movement
7. Animal Products
8. Carcass Disposal
9. Manure Management
10. Rodent, Wildlife, and Other Animal Control
11. Feed and Water
12. Labeled Premises Map



Enhanced Biosecurity Practices for Preventing Foot-and-Mouth Disease (FMD) During an Outbreak

A critical concern to livestock industries is the potential for an FMD outbreak in the U.S. or North America to occur, which will have major adverse consequences on the U.S. cattle and other livestock industries, both economically and operationally. FMD is the most contagious viral disease that affects cloven-hooved animals (i.e., cattle, pigs, sheep, goats, wildlife). This disease causes blisters in the mouth and on the feet of these animals. It can be shed in saliva, via aerosols, or other body fluids of infected animals. Thankfully, FMD does NOT affect public health or food safety so meat and milk from affected animals are safe to eat and drink. Regardless, the effects on the economy, trade, and way of life would be tremendous if the disease enters the U.S. or North America.

Onset and severity of clinical signs vary between animals. Cattle with FMD may exhibit one or more of the following signs:

- Vesicular lesions (blisters, ulcers, and sores)
 - In the mouth—tongue, lips, dental pad, gums, muzzle/nostrils
 - On the hooves—around the coronary band (top of hoof) and between the toes of the hoof
 - On the teats—especially in lactating cows
- Drooling
- Loss of appetite
- Lameness or reluctance to move
- Nasal discharge
- High fever

Early recognition of FMD signs (see photos on right) and prompt reporting are critical to containing this highly contagious disease. It is important to contact the herd veterinarian or State Animal Health Official to evaluate these clinical signs and rule out FMD or other diseases.

It is important for producers and veterinarians to know that all normal activities would be halted and limited animal movement would be implemented at the start of the outbreak to allow for regulatory officials to identify where the infected animals are and plan for safe movement of animals. Dynamics of the outbreak will change frequently, and each state will rely on their State Animal Health Officials to establish quarantines, enact stop movement orders, and advise on euthanasia and disposal.

For livestock producers, having biosecurity and contingency plans (e.g., communication, managing movements, financial risk management) in place before such an event are tools that will help U.S. producers maintain their businesses if they are unable to market their animals during an FMD outbreak. Producers are encouraged to write an enhanced biosecurity plan and be ready to implement it during an FMD outbreak. Producers have a responsibility to protect their animals and facilities from becoming infected, which includes having an enhanced biosecurity plan, educating



Examples of symptoms of FMD.
Photos courtesy of USDA APHIS Foreign Animal Disease Diagnostic Laboratory and the U.S. Department of Homeland Security (DHS) Primus Visual Information Services at the Plum Island Animal Disease Center (PIADC).

their family and employees, and having a contingency plan to manage through movement restrictions. For operations not directly infected by FMD or another FAD, maintaining continuity of business through an outbreak is essential to mitigate economic impacts.

These practices are part of the Secure Beef Supply Plan for continuity of business during an FMD outbreak. Controlling the spread of this highly contagious animal disease involves stopping animal and animal product (i.e., cattle, pigs, sheep, goats, semen, embryos, manure) movement in the areas around infected animals. Having accurate records of the movement of animals, vehicles, equipment, and people will be integral to the investigation. Once stopped, restarting movement will require a special permit issued by regulatory officials after a producer meets certain requirements, including enhanced biosecurity. The Secure Beef Supply (SBS) Plan provides guidance for producers and transporters who have cattle with no evidence of FMD infection to prepare to meet movement permit requirements. There is information specific to public land grazing, including livestock management options and movement decision criteria guidance. Visit www.securebeef.org for more information.



SBS
SECURE
BEEF SUPPLY



Secure Beef Supply
resources for public
land grazing.

Biosecurity is one thing that the producer has the most control over. Biosecurity can be adapted based on risk assessments for an operation. With the cattle industry continuously looking to improve everyday biosecurity practices on the farm or ranch, it is important producers and veterinarians have practical tools and resources. All producers will start their biosecurity plans at different levels, so emphasizing foundational biosecurity principles is advantageous during development of the plan. Cattle producers in all sectors should strive for continuous improvement in biosecurity planning including record keeping and annual reassessment of their practices.

When biosecurity plans are completed, they should address the following.

- Implement practices that reduce the introduction and spread of disease agents, including viruses, bacteria, and parasites.
- Create an environment where animal care is optimized by reducing the threat of infectious diseases.
- Promote infectious disease control practices among employees and visitors.
- Reduce the risk of zoonotic disease exposure and prioritize public health among employees and visitors.
- Protect the facility from liability and financial loss.
- Maintain client confidence in disease prevention.
- Promote continuous improvement by referring to the goals and principles of biosecurity to further develop and implement practices in the biosecurity plan.
- Print the daily and enhanced biosecurity plans, post them on the operation, and share with employees.

Table 3: Characteristics of Selected Disinfectant Categories and Important Precautions

Disinfectant Category

	Acids	Alcohols	Aldehydes	Alkalies	Biguanides	Oxidizing Agents			Phenols	Quaternary Ammonium Compounds
						Halogens: Chlorine	Halogens: Iodine	Peroxygen Compounds		
Active Ingredients	citric acid, acetic acid	ethanol, isopropanol	formaldehyde, glutaraldehyde, ortho-phthalaldehyde	Calcium hydroxide, sodium hydroxide, ammonium hydroxide, sodium carbonate	chlorhexidine	sodium hypochlorite, chlorine dioxide, calcium hypochlorite	povidone-iodine	hydrogen peroxide/accelerated HP, peracetic acid, peroxymonosulfates	orthophenylphenol	alkyl dimethyl benzyl ammonium chloride (ADBAC)
Sample Products	Vinegar, Citric Acid	N/A	Wavicide®, Synergize®	Lye, Ammonia	Nolvasan®	Bleach, Wysiwash®	Betadine®	Virkon S®, Intervention®, Rescue®, Oxy-Sept 333®	Lyso®, Pine-sol®, Pre-no-Tek II®, Tek-Trol®	Roccal-D®, Synergize®, Diquat®, D-256®
Mechanism of Action	Breaks bonds of nucleic acids, precipitates proteins, alters pH	Precipitates proteins, denatures lipids	Denatures proteins, alkylates nucleic acids	Alters pH through hydroxyl ions, fat saponification	Alters cell membrane permeability	Denatures proteins	Denatures proteins	Denatures proteins and lipids	Denatures proteins, disrupts cell wall	Denatures proteins, binds phospholipids of cell membrane
Characteristics	- Characteristics depend on acid type - Corrosive at high concentrations to metals and concrete	- Fast acting - Rapid evaporation - No residue or residual action - Damages rubber and plastics	- Slow acting - Pungent odor - Non-corrosive	- Slow acting - Corrosive to metals - Effective in presence of organic matter - Environmental hazard	- Widely used - Primarily used as skin antiseptic	- Fast acting - Strong oxidizer - Degrades rapidly once prepared - May damage fabrics, metals, rubber, concrete	- Requires frequent application - Can stain surfaces - May damage fabrics, metals, rubber, concrete	- Fast acting - Strong oxidizer - May damage some metals (aluminum, copper, brass, zinc, steel)	- Strong odor - Stable in storage - Residual film - Can damage rubber, plastic - Non-corrosive	- Stable in storage - High concentrations corrosive to metals
Factors Affecting Effectiveness	Affected by pH, organic matter, water hardness	Inactivated by organic matter	Inactivated by organic matter, hard water, soaps, detergents, pH, and temperature	Affected by pH, soaps, detergents, hard water, and temperature	Inactivated by soaps and detergents, hard water, pH, and organic matter	Rapidly inactivated by organic matter, UV light, and heat; pH also affects	Rapidly inactivated by organic matter, UV light, and heat	Effective in presence of organic matter, hard water, soaps, and detergents	Effective in presence of organic matter, hard water, soaps, and detergents	Inactivated by organic matter, hard water, soaps, and anionic cleaners
Residual Activity	Poor	Fair	Fair	Good	Good	Poor	Poor	Poor	Poor	Fair
Skin or Mucous Membrane Irritation	Severe skin burns	Skin	Both	Both - caustic to skin and footpads	Generally safe for skin contact	Both + eyes	Skin at high concentration	Powder can irritate mucous membranes	Both + respiratory tract; High conc can cause burns	Both + respiratory tract
Health Hazards or Precautions	- High concentrations can cause chemical burns or be toxic in air - Add acids into water	Flammable	- Only use in well ventilated areas with PPE - Formaldehyde is known carcinogen	PPE important	- Limited spectrum - Toxic to fish	Toxic gas if mixed with acids or ammonia	Toxic gas if mixed with acids or ammonia	Low toxicity at lower concentrations	Toxic to animals, especially cats, pigs	- Can accumulate in environment - Toxic to fish
Bactericidal*	+	+	+	+	+	+	+	+	+	+ Gram Positive +/- Gram Negative
Virucidal	+/-	+/-	+/-	+/-	+	+	+	+/-	+/-	+/-
Fungicidal	+/-	+	+	+	Fair to Good	+	+	+/-	+	+/-
Bacterial Spores	+/-	-	+	+	Poor	+	+	+/-	-	-
Common Uses **	CS/E	CS/T	E/P/F	P	E/P/T	CS/E	CS/E/T	E/P	E/P/F	CS/E
Contact Time (Minutes)***	10 to 30	10 to 30	10 to 60	>10	5 to 10	5 to 30	10 to 30	10 to 30	10 to 30	10 to 30

* + = effective; +/- = variable or limited activity; - = not effective

** E = equipment; P = premises; F = footbaths; CS = clean surfaces; T = topical

*** Contact times are concentration dependent for each product. If labeled directions are not followed, contact times will change.

Adapted from: Characteristics of Selected Disinfectants, Center for Food Security & Public Health, Iowa State University, and Purdue University Extension Bulletin PIH80.



Record Keeping Reminders

- Self-assessments to update biosecurity plans is a useful tool for training and continuing education for the team.
- Health certificates or certificate of veterinary inspection (CVI) are required for all interstate and some intra-state movements, such as to livestock shows.
- If the operation has visitors or deliveries, keep a log in the office or common area to record when visitors come to the operation.
- Permanent identification for calves is helpful in identifying illness, recording treatments and withdrawal times, and monitoring growth parameters.
- Maintaining animal movement logs is a key part of record keeping.
- The BQA Daily Biosecurity Plan for Disease Prevention template offers an introductory, stepwise biosecurity plan for identifying biosecurity risks on cattle operations.
- Record movement of animals, vehicles, equipment, and people in the event of a foreign animal disease outbreak.
- The Secure Beef Supply (SBS) Plan provides guidance for producers and transporters who have cattle with no evidence of FMD infection prepare to meet movement permit requirements.





CHAPTER 5
**HERD HEALTH
MANAGEMENT**



THE FOUNDATION OF BQA FOCUSES ON SCIENCE-BASED PRODUCTION PRACTICES THAT ASSURE CATTLE WELL-BEING, BEEF QUALITY, AND SAFETY.

CHAPTER 5

Total Quality Management requires handlers to understand animal welfare to optimize herd health, welfare, and production through continuous improvement. Herd health is linked to other preventive aspects discussed in the BQA program, including biosecurity, nutrition, behavior and handling, and other topics. It is critical for cattle producers to establish a resource team to help them be thoughtful, responsible stewards through herd decision making and development.

Resource teams can include veterinarians, nutritionists, extension agents, industry representatives, or other producers to help tailor a strategy to the specific operation. This resource team can help in understanding the specific risks in the region, their effects on animal health, and multiple methods of prevention and treatment that are important to protecting the herd and minimizing negative consequences.

The herd veterinarian is key to helping design thoughtful, responsible herd health protocols that maintain animal health and welfare. Building a biosecurity plan goes hand in hand with a herd management plan and is critical to maintaining a healthy herd. Without all the above considerations, tools such as vaccines provide minimal value to helping cattle maintain health. Topics in this section are key for worker training in every sector of the cattle industry, improving the understanding of cattle care, handling products, and improving production while providing a safe work environment. Prevention is the foundation for any herd health program.

Objectives

- Understand the importance of a veterinarian-client-patient relationship (VCPR) to develop a herd health plan that conforms to good veterinary and husbandry practices.
- Implement preventive and proactive herd health management and the judicious use of antimicrobials.
- Understand how to read and follow labels of animal health products to ensure proper use, handling, storage, and administration, while following withdrawal times to prevent tissue residues.
- Recognize the importance of administering products in the injection triangle of the neck, in front of the shoulder slope.
- Understand proper landmarks and appropriate methods for euthanasia.

Importance of a Veterinarian-Client-Patient Relationship (VCPR)



Veterinarians are trained to evaluate individual animals within a herd system and provide integrative management plans to prevent diseases or problems from occurring in the future. This can include pregnancy diagnosis, developing vaccine protocols, implementing a biosecurity plan, helping with record keeping, guiding breeding and culling decisions, or training.

Veterinarians are an important team member in any cattle operation.



A VCPR is necessary for veterinary oversight of animal health and proper animal health product use on livestock operations. It is legally defined by state and federal statutes as well as by the American Veterinary Medical Association (AVMA). An established VCPR allows the veterinarian to diagnose animals, prescribe medications and drug therapy to treat, control, or prevent disease, and issue Certificates of Veterinary Inspection (CVIs) or health certificates. Residue avoidance in meat and milk products is a team effort that starts with the VCPR. Written and signed VCPRs are recommended for record keeping.



A sample VCPR can be found here.



VCPRs should be renewed annually, based on state or federal guidelines.

Schedule a yearly consultation with your veterinarian to set goals for the next year and consider areas for improvement.

A valid VCPR is required for producers to use all prescription medications, extra-label use of non-prescription medications, and all Food & Drug Administration (FDA) feed medications that require a Veterinary Feed Directive (VFD). Important elements of a VCPR¹ include the following.

- A veterinarian has assumed the responsibility for making medical judgments for the animal's health and the need for medical treatment.
- The client (owner of the animal(s) or other caretaker) has agreed to follow the instructions of the veterinarian.
- The veterinarian has sufficient knowledge of the animal(s) to provide a general or preliminary diagnosis of the medical condition of the animal(s); the veterinarian has recently seen and is familiar with the care of the animal(s) through physical examination(s) or medically appropriate and timely visits.
- The practicing veterinarian assumes responsibility for follow-up care, including adverse reactions and/or therapy failure. Such a relationship can exist only when the veterinarian has recently seen and is familiar with the keeping and care of the animal(s) through physical exams and/or by medically appropriate and timely visits to the premises where the animal(s) are kept.
- Veterinarians regularly evaluate medication and treatment records with cattle producers to review response to therapy and protocol compliance including medication withdrawal compliance.

BQA collaborates with the American Association of Bovine Practitioners (AABP) in establishing and providing animal health guidelines. Additional VCPR considerations for veterinarians and other guidelines can be found by using the QR code to the right.



AABP Guidelines and Position Statements can be found here.

¹ *Extralabel Drug Use in Animals*, 21 C.F.R. § 530.3 (2024). <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-E/part-530/subpart-A>

Herd Health Protocol Development and Areas for Training

Working with a herd veterinarian and resource group to develop operation-specific protocols can improve management, record keeping, and provide employee training opportunities. Sample protocols can be found at www.bqa.org. Producers and their employees should have training to recognize common health problems and know how to properly use animal health products and other control measures. When prevention or control measures are ineffective, the producer should promptly contact a veterinarian for diagnosis and treatment to reduce animal suffering and animal losses.



Keep management and treatment protocols on file and at the treatment facility where workers can review them.

- Updates should have the veterinarian's signature or initials and date when the protocols are reviewed.
- Any medication that requires a use other than as directed on the label must have revised administration procedures included in the management and treatment protocols.
- Per state-specific regulations, ask suppliers to attach revised use labels obtained from the herd veterinarian to each product delivered. These labels must include the veterinarian's name, address, phone number, revised directions for use, and withdrawal time.



Having all product withdrawal times listed in a treatment protocol book is a best management practice.

- ☐ All vaccines have a withdrawal time (21 days for non-oil adjuvant or water-based vaccines and 60 days for oil adjuvant vaccines).
- ☐ An adjuvant is an ingredient that enhances the immune response to a vaccine.
- Develop a follow-up plan and/or alternative treatments if the initial treatment does not produce the desired result.

Withdrawal Time: The time that must pass between the last dose of an animal health product (vaccine, antibiotic, dewormer, or other) given and when it is safe and legal to harvest the animal or its products.

- The animal will metabolize the product in this time frame and then it is safe to enter the public food supply.
- All FDA approved products in food-producing animals have labeled meat and milk withdrawal times that caretakers are legally required to follow. The withdrawal time only applies if the drug is used according to label directions.



Work with the herd veterinarian to confirm and record withdrawal times. Keep records of all treatments.

Prescription or Veterinary Drug Orders (VDO)

A Prescription/Veterinary Drug Order (VDO) is a veterinarian-approved list of medications used on the operation that is issued to authorized veterinary supply companies or pharmacists to dispense supplies to an operation. For example, the veterinarian may send in a VDO to an online vet supply company. Discuss with the herd veterinarian other products or supplements that fit the herd's care plan.

State laws will determine how often a VDO needs to be reviewed and renewed. A veterinarian may need to specify brand name as well as the generic name on the VDO because the drug withdrawal time and route of administration may be different for similar medications and vaccines. Only the herd veterinarian may change or update the VDO.

Animal Medicinal Drug Use Clarification Act (AMDUCA) and Extra-Label Drug Use (ELDU)

Veterinarians can prescribe ELDU (or off-label use) of certain approved new animal drugs and approved human drugs for animals under certain conditions (when health of animal is threatened or failure to treat may result in suffering or death). Under the AMDUCA regulations, any extra-label use of an approved new animal or human drug must be by or on the lawful order of a veterinarian within the context of a VCPR.² Treatment records including withdrawal times are critical.

ELDU, or off-label use, is using a drug:

- at a dose not listed on the label.
- by a different route not listed on the label.
- for a condition or indication not listed on the label.
- in a different frequency and duration not listed on the label.
- in a species not listed on the label.

For ELDU in food animals, the following must be true.

- ELDU is only legal if prescribed by a veterinarian(s) who makes a careful diagnosis in the presence of a valid VCPR.
Producers cannot make this decision on their own.
- Use for therapeutic (including prevention, control, and treatment of disease) purposes only. ELDU to enhance production is illegal. Drug cost is not considered a valid reason for ELDU under AMDUCA.
- ELDU is legal only for FDA approved drugs. No ELDU of Environmental Protection Agency (EPA) products is allowed.
- Rules for ELDU must adhere to regulations for dosing, formulations, and in-feed drugs that apply to individual and water dosage forms.
 - ☐ ELDU is not permitted in the feed for major food-producing species (cattle, swine, turkeys, and chickens).
 - ☐ VFD guidelines must be strictly followed.



Veterinarians and producers have accurate treatment records and extended withdrawal times for all animals treated. Records must be FDA accessible for two years.

- ☐ Withdrawal times are extended to avoid violative residues. The labeled withdrawal period from the manufacturer does not apply if the drug is used in an extra-label manner. When a veterinarian prescribes ELDU in an unapproved class of livestock, there is no tolerance in edible tissues or milk.
- ☐ Any detectable level of the medication is a violative residue. Therefore, the withdrawal time for meat and milk must be significantly extended to ensure there is no detectable level of residue in the animal product. When an appropriate withdrawal time cannot be established, use of the drug precludes the animal or its products from entering the food chain.



If extra-label drug use is indicated by a veterinarian's prescription, that veterinarian must establish and document appropriate withdrawal periods.

Categories of Animal Health Products

- **Over-the-Counter (OTC)** products do not require a veterinary prescription for purchase or use but cannot be used extra-label unless directed by a veterinarian. Many antibiotics that were previously available OTC have transitioned to prescription only.
- **Prescription (Rx)** drugs require a VCPR and are restricted by federal law to use by or on the order of a licensed veterinarian.
- A **Veterinary Feed Directive (VFD)** requires a valid VCPR and is required for any medically important antibiotic that is administered via feed in any food animal species.

² U. S. Food and Drug Administration. 2024. Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA). <https://www.fda.gov/animal-veterinary/guidance-regulations/animal-medicinal-drug-use-clarification-act-1994-amduca>

Veterinarians use a university-based resource called the Food Animal Residue Avoidance Databank (FARAD, **www.farad.org**) to calculate scientifically based recommendations for safe withdrawal intervals of drugs and chemicals in food-producing animals. Another resource for animal health products, label instructions, and withdrawal times is the Compendium of Veterinary Products (CVP), available as a mobile app or online. Producers can also use these resources.

Drugs Prohibited for ELDU in Food-Producing Animals

- Chloramphenicol
- Clenbuterol
- Diethylstilbestrol
- Fluoroquinolone antibiotics
- Glycopeptide antibiotics
- Nitroimidazoles (Dimetridazole, Iprnidazole, Metronidazole)
- Nitrofurans (Furazolidone, Nitrofurazone)
- Phenylbutazone (female dairy cattle >20 months old)
- Sulfonamides (lactating dairy cattle or dairy cattle >20 months old)
- Cephalosporins may be used for an off-label indication in major food animal species, but regimen cannot be altered. One exception is cephalixin, an intramammary first generation cephalosporin. These cephalosporin ELDU prohibitions do not apply to minor food animal species.



Aminoglycoside Use in Cattle

Aminoglycoside antibiotics (e.g., neomycin, gentamicin, kanamycin) should not be used in cattle, except as specifically approved by FDA. This is supported by the cattle veterinarian organizations AABP and the Academy of Veterinary Consultants (AVC) because these have historically been a top residue cause in cattle.

The BQA program does not support the ELDU of aminoglycosides because of the extremely long withdrawal (over two years) and the potential for a violative residue.

Compounding

Compounding is the combining, mixing, or altering ingredients of a drug product beyond what is described on the product label. Compounding of medications to treat cattle and other food-producing animals by a veterinarian is strictly regulated.³ Using compounded medications is considered ELDU. The AMDUCA regulations state that compounded preparations are required to be prepared from FDA approved animal or human drugs and that, if possible, an animal-labeled drug is to be used for compounding rather than a human-labeled drug.

The veterinarian must calculate or recommend a withdrawal interval for any compounded or ELDU product. If there is not sufficient data to establish a withdrawal interval, then the veterinarian must assure that the animal and its products never enter the food chain.

Judicious Use of Animal Health Products

Responsible antimicrobial stewardship is important to ensure that animal health technologies remain viable options for better disease management. Cattle producers and caretakers should understand preventive strategies that minimize disease risk, including husbandry, biosecurity, routine examinations, and vaccination.

Antimicrobial Resistance

Antimicrobial resistance happens when bacteria, viruses, fungi, or parasites change over time and resist the effects of antimicrobials, which are designed to kill the microorganisms. Drugs that were once effective become less effective at treating infections, leading to health and welfare concerns for both humans and animals. Antimicrobial resistance poses a threat to disease control throughout the world and is a primary concern for human and animal health.

³ Extralabel use from compounding of approved new animal and approved drugs, 21 C.F.R. § 530.13 (2024). <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-E/part-530/subpart-B/section-530.13>

The U.S. Food and Drug Administration's Center for Veterinary Medicine requires increased veterinary oversight for use of medically important antibiotics that are important in human medicine and have a valid use in animals.^{4,5,6} This guidance supports judicious use of antibiotics by removing the use of antibiotics for growth purposes (which has been illegal in the U.S. since 2017), transitioning over-the-counter antibiotics to veterinary prescription, and promoting the partnership or the VCPR between a veterinarian and the cattle producer.

Following the judicious antibiotic use guidelines (page 58) and medication use protocols developed for the BQA program is critical so that cattle are responsibly treated and are never marketed with violative residues. Marketing cattle with a violative residue, even unintentionally, is illegal and can result in significant consequences — both legally and financially.

Antiparasitics such as dewormers, fly tags and other parasite controls are important and useful tools for the cattle industry, however, parasite resistance to antiparasitics is becoming more common. Parasite management varies by region with differences in climate, environmental conditions, host susceptibility, and farm/ranch management practices.

Best Practices for Parasite Management

- Have accurate weights so animals are not underdosed, leading to worms that are not completely killed, and giving resistant worms a higher chance of surviving.
 - Average purchase weights of groups are not sufficient.
- Proper application of all antiparasitic products is crucial to their function.
 - Topical pour-on products must be applied from the withers to the tailhead.
 - Oral drenches must be administered over the lump of the tongue to ensure product is swallowed.
 - Administer injectables following all BQA principles.
 - In-feed/mineral use must be fed and used per label directions.
- Only use antiparasitic products for parasites listed on the label (do not use dewormer for fly control).

The EPA has specific labels and regulations for each topical antiparasitic. Be sure to read the label of each product and use it for its intended parasite.

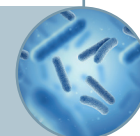
Because of parasite resistance, treatment protocols are more complex than giving a single product and require veterinary consultation. Fecal Egg Count Reduction Tests (FECRT) can be used as a screening test with the help of a veterinarian and are designed to measure the efficacy of the antiparasitic treatment.⁷ Work with a veterinarian to design a protocol for the herd. Fecal testing may help decide if the herd needs dewormed or not.

Did You Know?

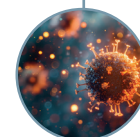
Antimicrobials are medicines used to prevent, control, and treat infections caused by microorganisms. Different types include:



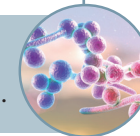
Antibiotics
Therapy against bacteria.



Antivirals
Therapy against viruses.



Antifungals
Therapy against fungi.



Antiparasitics
Therapy against parasites such as dewormers or parasite control.



⁴ Center for Veterinary Medicine. (2012, April). *The judicious use of medically important antimicrobial drugs in food-producing animals*. (GFI #209). Food and Drug Administration. <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-209-judicious-use-medically-important-antimicrobial-drugs-food-producing-animals>

⁵ Center for Veterinary Medicine. (2013, December). *New animal drugs and new animal drug combination of products administered in or on medicated feed or drinking water of food-producing animals: Recommendations for drug sponsors for voluntarily aligning product use conditions with GFI #209*. (GFI #213). Food and Drug Administration. <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-213-new-animal-drugs-and-new-animal-drug-combination-products-administered-or-medicated-feed>

⁶ Center for Veterinary Medicine. (2021, June). *Recommendations for sponsors of medically important antimicrobial drugs approved for use in animals to voluntarily bring under veterinary oversight all products that continue to be available over-the-counter*. (GFI #263). Food and Drug Administration. <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-263-recommendations-sponsors-medically-important-antimicrobial-drugs-approved-use-animals>

⁷ Kaplan et al. 2023. *World Association for the Advancement of Veterinary Parasitology (W.A.A.V.P.) guideline for diagnosing anthelmintic resistance using the faecal egg count reduction test in ruminants, horses and swine*. *Veterinary parasitology*, 318, 109936. <https://doi.org/10.1016/j.vetpar.2023.109936>

A Beef Producer's Guide for Judicious Use of Antibiotics in Cattle

Cattle producers are committed to antimicrobial stewardship and promotion of judicious use of antibiotics. Responsible antibiotic stewardship is important to ensure that animal health technologies remain viable for producers. These guidelines are intended to support responsible antibiotic use in the cattle industry, using preventive health programs as outlined in the BQA program and with the oversight of the herd veterinarian.

1. **Prevent Problems:** Emphasize appropriate husbandry, hygiene, biosecurity, routine health examinations, nutrition, and vaccinations to prevent animal health concerns and reduce the need to use antimicrobials. Train cattle caretakers to recognize and diagnose issues early for better outcomes. Work with the herd veterinarian to design prevention and training protocols to maintain animal health and welfare.
2. **Adhere to FDA Guidance:** Follow label instructions and FDA guidance for the use of all antibiotics and animal health products. The use of antibiotics medically important in human medicine should be used only after careful consideration with the veterinarian. If medically important feed grade antibiotics are used, they must be under the guidance of a Veterinary Feed Directive (VFD). There is no allowed extra-label use of feed grade antibiotics.
3. **Select and Use Antibiotics Carefully:** Using a valid veterinarian-client-patient relationship (VCPR), consult with the veterinarian on the selection and use of antibiotics including post-treatment intervals and drug rotation. Veterinarians may elect to use a diagnostic test such as culture and susceptibility to aid in selection. Have a valid reason to use an antibiotic. Appropriate preventive and therapeutic alternatives should be considered prior to using antimicrobial therapy.
4. **Combination Antibiotic Therapy is Discouraged Unless There is Clear Evidence the Specific Practice is Beneficial.**
5. **Avoid Inappropriate Antibiotic Use:** Limit therapeutic antibiotic use to proven clinical indications. Avoid inappropriate uses such as for viral infections without bacterial complication.
6. **Treatment Programs Should Reflect Best Use Principles:** Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles. Follow the veterinarian's instructions including treating for the recommended dosage, route of administration, time frame, and following withdrawal times.
7. **Treat the Fewest Number of Animals Possible:** Limit antibiotic use to sick or at-risk animals. The use of antimicrobials should be based on an evaluation of animal-specific risk factors for disease.
8. **Properly Dispose of Animal Health Products:** Follow all applicable local, state, federal, and tribal regulations and guidelines for disposal of pharmaceutical waste. Never pour or flush products down drains or toilets nor burn waste unless permitted by authorities. Expired medications should not be used.
9. **Keep Records of Antibiotic Use:** Accurate records of treatments and outcomes should be used to evaluate efficacy of therapeutic regimens. Always follow proper meat and milk withdrawal times. Keep records for a minimum of two years or longer based on state and local regulations.
10. **Follow Label Directions:** Follow label instructions and never use antibiotics other than as labeled without a valid veterinary prescription. Handle and store animal health products according to label instructions.
11. **Extra-Label Antibiotic Use Must follow FDA Regulations:** Prescriptions for extra-label use of medications can only be prescribed by a veterinarian and must meet the Animal Medicinal Drug Use Clarification Act (AMDUCA) amendments to the Food, Drug, and Cosmetic Act and its regulations. The producer must have a valid VCPR and expect an extended withdrawal time.
12. **Medically Important Antibiotic Use Should be Limited to Treat, Prevent, or Control Disease:** Antibiotics that are medically important to human medicine cannot be used to improve performance. Veterinary oversight of antimicrobial use should be based on clinical and epidemiological knowledge.



Residue Avoidance



Good record keeping and protocol development are essential to avoiding residues in meat and milk from food-producing animals. The National Residue Program is a collaborative interagency program among USDA Food Safety Inspection Service (FSIS), FDA, EPA, and other agencies that was established to protect public health by ensuring products such as meat, milk, and eggs are safe for human consumption.

USDA FSIS conducts tests for chemicals such as antibiotics and other drugs, pesticides, and environmental chemicals in inspected packing plants. One way is through an annual surveillance sampling program that tests a scheduled random sampling of tissue from healthy appearing food animals. Another is implemented at slaughter facilities and identifies the animals most likely to have drug residues and targets them for testing.

Animals that arrive at the processor emaciated, severely debilitated, or with signs of illness or recent surgery will likely be labeled as 'Suspect' on antemortem (pre-slaughter) inspection by a USDA inspector. These animals would be subject to verification of drug withdrawal through tissue sampling and testing by the USDA FSIS.⁸



Violative residues or residue violations occur when levels of drug residue are present in meat or milk that exceed tolerance levels set by FDA or action levels set by EPA. FDA may conduct an inspection into violations and producers could be fined for violations. Records can help with a residue investigation. USDA FSIS issues a weekly report of residue repeat violators (this report lists the names of farms or ranches that have had more than one reported residue violation in the past 12 months in the USDA database called the Red Book).

If a drug is used in an animal production class not on the label, there is **NO TOLERANCE** for that drug – any detectable amount, even below the target testing/tolerance level for the labeled class, and is a violation. VCPR and veterinarian involvement is essential to identifying treated animals, maintaining good records, and following labeled withdrawal times to avoid these violative residues.

- Individual record treatments can be done by identifying each animal in the herd and/or identifying each animal when or if they are treated. The identification number should be unique to that animal and tie it to the group from which it came.
- All animals treated as part of a group will be identified by group or lot with treatment information recorded and records assume that every animal in the lot or group received the treatment.
- If multiple products are administered to the group, the withdrawal time will be based on the product with the longest withdrawal period and on the last date of product administration to any individual animal.

All cattle marketed from the operation can potentially go directly to harvest. Therefore, records for any cattle to be marketed should be checked to ensure that treated animals will meet or exceed label withdrawal times for all products administered.



“Preventing violative residues is an important management practice, and instills consumer confidence in beef.”

Bob Smith, DVM and BQA
Advisory Group Member

⁸ U. S. Department of Agriculture Food Safety and Inspection Service. 2024. Ante-Mortem Livestock Inspection. <https://www.fsis.usda.gov/policy/fsis-directives/6100.1>

Animal Health Product Handling and Storage

Animal health products, including vaccines, anti-inflammatories, medications, dewormers, vitamin and mineral supplements, and others, are vital to protect the health of cattle. They are tools that cattle producers use at strategic times throughout the year, depending on their management system. Cattle producers have the responsibility to understand what products they are using, why the products are needed, and how to properly handle them to optimize effectiveness.

Animal health products are approved by FDA, USDA, or EPA depending on the product after evaluation for safety and efficacy. For food-producing animals like cattle, there is an additional food safety requirement the agency must complete to prove the use of the product does not present a risk to human health. There are many safeguards in place to optimize animal health and improve food safety including following withdrawal times. Withdrawal times for all veterinary drugs, including antibiotics, vaccines, and dewormers, are set by the agency approving the product.

Receiving Product, Proper Storage, and Handling



Proper record keeping, storage, and handling of animal health products are important to ensure efficacy of the products and are key to a cattle health program.

- Work with the herd veterinarian to develop accurate record keeping, processing protocols, treatment guidelines and protocols, and a list of withdrawal times for products used in the cattle health program.
- Determine who will be responsible for receiving biological and pharmaceutical products.



Record product information including the receiving date, name, quantity, unit sizes, lot/serial numbers, and expiration dates in receiving and inventory records. This could be important if a product is recalled, or cattle have an adverse reaction.

- Store and handle products as outlined by the manufacturer label or as recommended by the herd veterinarian.
- Maintain the cold chain during delivery, transportation, and storage of vaccines and other refrigerated products, which should be stored in a dependable refrigeration unit that maintains a temperature as directed by the product label (typically 35-45°F).
- Assure proper handling of biological (such as vaccines) and pharmaceutical (such as antibiotics, antiparasitics) products during day-to-day activities through employee training. This should be a collaboration with the herd veterinarian and all doctoring and processing crews.
- Even experienced producers overlook many key aspects when preparing and administering animal health products. Consider a brief annual training for all employees involved to minimize mistakes.
- Never mix two antibiotics, two vaccines, or other products in one syringe. An undesired chemical reaction may occur, destroying each product's effectiveness, causing a painful injection that can result in a larger tissue lesion, and unknown safe withdrawal times. This could be considered compounding, which only veterinarians can decide.



Place a thermometer in the vaccine refrigerator or product cabinet and check/record temperature periodically.



The highest quality vaccine or animal health product available is useless if it's not handled and administered properly.

- Protect animal health products from extreme temperatures and sunlight exposure.
 - Extreme temperatures can alter the vaccine to limit its effectiveness, inactivate it, or cause it to be toxic.
 - Freezing of any vaccine not only causes loss of efficacy but also causes vaccines to become more stressful, potentially causing illness or death from antigen toxin release.
 - ▶ For example, modified live vaccines (MLV) can be inactivated with high temperatures or sunlight exposure while clostridial vaccines, if frozen, can release excess toxins and should not be used.
 - Dewormers, mineral supplements, medications, and other products will also lose efficacy if exposed to varying temperatures and sunlight exposure.
 - It is recommended to store different classes of products (e.g., vaccines, dewormers, antibiotics, others) on separate shelves to minimize the risk of choosing the wrong product. Label shelves to better organize and find products.
- Expired products should not be used because they have lost efficacy, could cause adverse reactions, and are considered adulterated by the FDA. Properly discard or return out-of-date products according to the state or local medical waste disposal guidelines.
- While rare, cattle can develop anaphylaxis when administered vaccines or medications. Work with the veterinarian to understand signs and potential treatments.



Use a vaccine cooler to protect against sunlight and extreme temperatures during processing such as the examples above.



Use a thermometer in the refrigerator such as this one to monitor temperature ranges for animal health products.



Tips for Reading Product Labels (Figure 1)

- Always read label and dosing instructions on all animal health products prior to herd health procedures. If the label does not specify the dose volume, administer a maximum of 10 cc per injection site.
- Review these instructions with everyone handling the products to help ensure proper dosing of each product.
- Administer booster vaccines as outlined on the label, generally two to four weeks after initial vaccination. Failure to follow label recommendations for administering a booster dose of vaccine could result in a poor immune response and less protection from the disease. If the initial program is carried out properly, an annual booster may be required after the first year depending on the pathogen.

Figure 1: Example of Animal Health Product Label

Oxytetracycline Injection 200 (oxytetracycline) is a sterile, ready-to-use solution for the administration of the broad-spectrum antibiotic oxytetracycline by injection.

Caution: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian. When administered to cattle, muscle discoloration may necessitate trimming of the injection site(s) and surrounding tissues during the dressing procedure.

Residue Warnings: Cattle and swine intended for human consumption must not be slaughtered within 28 days from the last treatment. Milk taken from animals during treatment and for 96 hours after the last treatment must not be used for food.

Precautions: Exceeding the highest recommended dosage level of drug per lb of body weight per day, administering more than the recommended number of treatments, and/or exceeding 10 mL intramuscularly or subcutaneously per injection site in adult beef and dairy cattle, and 5 mL intramuscularly per injection site in adult swine, may result in antibiotic residues beyond the withdrawal period.

Dosage:
Cattle: A single dosage of 9 mg of oxytetracycline per lb of body weight (4.5 mL/100 lb) administered intramuscularly or subcutaneously is recommended in the treatment of the following conditions: 1) bacterial pneumonia caused by *Pasteurella* spp. (shipping fever) in calves and yearlings; 2) infectious bovine keratoconjunctivitis (pink eye) caused by *Moraxella bovis*.
Swine: A single dosage of 9 mg of oxytetracycline per lb of body weight (4.5 mL/100 lb) administered intramuscularly in the neck region is recommended in the treatment of bacterial pneumonia caused by *Pasteurella multocida* in swine.

Refer to Package Insert for Complete Directions
Storage: Store at room temperature 59° to 86°F (15° to 30°C). Keep from freezing.
Restricted Drug – Use Only as Directed

Hexomycin®
 (oxytetracycline injection)

Antibiotic

Each mL contains 200 mg of oxytetracycline base as oxytetracycline dihydrate.

For the treatment of disease in beef cattle; dairy cattle; calves, including preruminating (veal) calves; and swine.

For animal use only.

Net Contents: 250 mL

Not for Human Use
This label is for learning purposes only and is not approved by FDA.

1 Product name and active ingredient

5 Duration of therapy

9 Storage temperature

2 Animal species/class approved (treat only classes of cattle approved on label)

6 Route of administration (if changed from label, withdrawal times will be extended)

10 A statement, “Approved by FDA under NADA # XXX-XXX” if the drug is an approved and marketed brand name animal drug; or the statement, “Approved by FDA under ANADA # XXX-XXX” if the drug is an approved and marketed generic animal drug

3 Dosage

7 Cautions and warnings such as side effects

4 Labeled diagnosis or disease

8 Residue warning and withdrawal times for meat and milk

Injection Site Management, Vaccinations, and Cattle Processing

A strong herd health program includes processing cattle by routine administration of vaccines and other animal health products at strategic points in the calendar year. Proper animal care and product administration contributes to healthy cattle and a quality wholesome product.

Crews processing cattle should also be trained in cattle behavior and handling techniques that minimize stress to the cattle within the system being worked. Review *Chapter 3: Cattle Behavior, Handling, and Facility Design* prior to handling and moving cattle. It is important to have good neck access for human safety and injection efficacy.

All cattle producers and crews should be trained on proper needle selection for the product given and size of animal receiving it, dosage, route of administration (see box below), and issues resulting from mishandling.

Injection Sites and Techniques

Responsible product use involves following label directions regarding route of administration, injection location on animal, and at labeled dose.

Regardless of animal's age, injections should be given in front of the shoulder slope (unless directed otherwise by a veterinarian or per label instruction).

- Injections in the neck prevent costly damage to economically important beef cuts.
- To avoid adverse tissue reactions, inject products in the neck subcutaneous (SQ) whenever possible, or choose products that can be given intravenous (IV), intranasal (IN), or orally.

BQA Injection Site Triangle

(Figure 2)

- Upper border is below nuchal ligament (2" below topline)
- Lower border is above neck vertebrae
- In front of the slope of the shoulder

Routes of Administration

- Subcutaneous (SQ) – Under the skin; given at 35-45° angle to neck (Figure 3)
- Intramuscular (IM) – In the muscle; given perpendicular to muscle; 90° to neck (Figure 4)
- Intravenous (IV) – In the vein
- Intramammary (IMM) – In the mammary gland and does not use a needle
- Base of ear (BOE) – Under the skin
- Intranasal (IN) – In the nose (without a needle)
- Topical – On skin, transdermal

Figure 2: BQA Injection Site Triangle

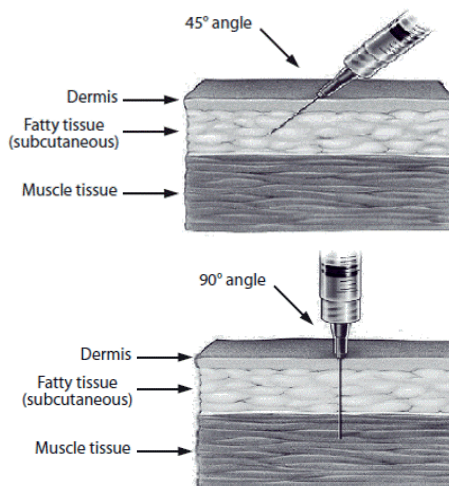
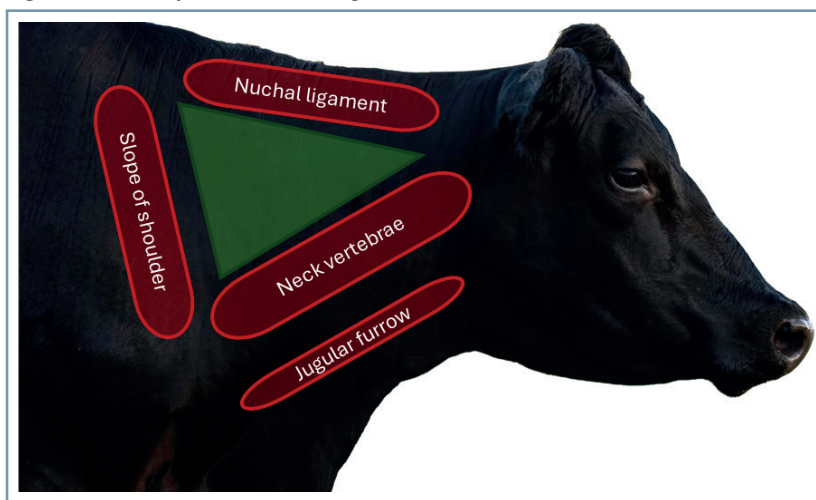


Figure 3:
Subcutaneous (SQ)
Injection With Needle
Angle at 45°

Figure 4:
Intramuscular (IM)
Injection With Needle
Angle at 90°

Illustrations courtesy of Colorado BQA Program.

Properly restraining animals assures good neck access and proper injection technique, minimizes risk of needles breaking or bending, and minimizes risk of human or animal injury. Depending on the chute and neck access, it is recommended to use the one-handed technique over the two-handed technique for SQ products to prevent hand injury.

- The one-handed technique involves using the injection needle tip to lift the skin after initial skin penetration. After popping through the skin at a 35-45° or flatter angle to the neck, push the plunger to administer the product. The flat angle helps avoid hitting the muscle layer (Figure 5).
- If the two-handed technique can be safely done, use one hand to pull the cattle's skin away from the neck to make a skin tent, and use the other hand to insert the needle under the skin and inject into the pocket created. Be careful not to accidentally inject the tenting hand, which is why animal restraint is important (Figure 6).

Figure 5: One-Handed Injection Technique



Figure 6: Two-Handed Injection Technique



Regardless of route of injection, the area should be clean and free from manure or mud to reduce the risk of abscesses developing. Other injection guidelines include the following.

- Space injections at least 4 inches apart (about a hand's width). This reduces the risk of the products mixing together which could cause a reaction or inactivate the products. If giving multiple injections, the highest volume should be given in the bottom of the injection triangle, so product drainage does not interfere with other injections. Use both sides of the neck if accessible.
- If intramuscular medications must be used, administer them in the neck and never exceed 10 cc per IM injection site. For example, if 24 cc is the calculated dose, use three 8 cc IM injections instead of two 12 cc IM injections.
- Limit the volume of SQ injections as indicated by the product label or as instructed by the herd veterinarian. If the label does not specify the maximum volume per injection site, the maximum volume per injection site should be limited to 10 cc.
- Some animal health products are approved for injection at the base of the ear or on the backside of the ear (Figure 7). The ear must be very clean, and care must be taken to avoid blood vessels. Always read product labels carefully including withdrawal times. If route of administration is changed for BOE products, it is considered ELDU and will extend the withdrawal period to more than eight weeks.
- Administer antibiotics and vaccines on opposite sides of the neck so vaccines are not inactivated.

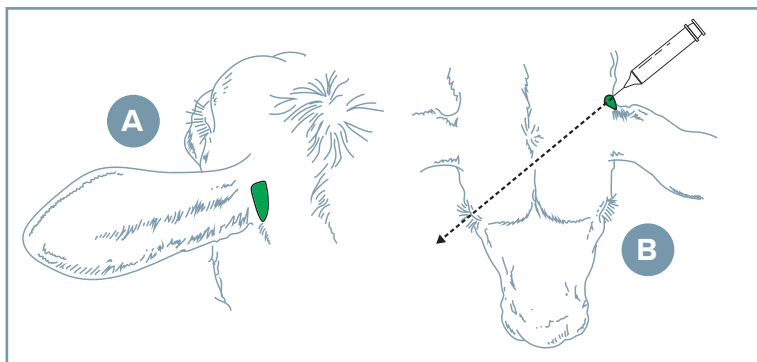


Figure 7. (A) Injection location for subcutaneous administration of animal health products in the base of ear. Animal restraint is critical. (B) Toward the opposite eye technique: Hold the syringe and needle behind the ear so they point toward the animal's opposite eye. Insert needle through skin and inject. See additional techniques in the labeled product insert.
Adapted from Zoetis.

- BQA guidelines advise against giving SQ injections along the ribs, behind the elbow, or in the armpit (axilla) region. There are nerves and vessels in this area that can be damaged and cause irreparable injury to the animal, such as paralysis. In addition, if an injection site abscess were to occur in this area, there is not a good way to treat the abscess so it should be avoided.
- Giving injections above the curve of the ribs could cause excessive trim in the area of the rib-roll or prime rib cut of meat. This is not an approved injection site.

Syringe and Needle Guidelines

Syringes

There are many types of syringes for use in cattle. Using clean syringes is important for product efficacy and minimizing local irritation or abscess formation.

Choose a syringe size that closely matches the dose to draw a single dose for each individual animal. Disposable syringes used for multiple-dose delivery can result in inaccurate dose delivery like over- or under-dosing. For example, a 10 cc syringe filled with vaccine is not appropriate for administering a 2 cc dose to five head.

Individual plastic syringes are sterile, disposable, and an accurate single-dose delivery system. These are designed to be single-use and should be discarded after use to prevent contamination.

Continuous-feed syringes reduce the chance of contaminating the vaccine by accidentally drawing product from the wrong bottle. However, it is hard to keep the bottle, hose and barrel sheltered from UV light, heat, or freezing temperatures that harm the vaccine. Many times, these bottles and syringes are suspended chute-side in direct sunlight and exposed to heat during processing. This deteriorates the product, and animals are not immunized adequately. These systems are better for less sensitive products.

If using a multi-dose, repeater, or pistol-grip syringe, lubricate the O-ring with non-petroleum-based products, as recommended by the manufacturer. Petroleum-based lubricants may inactivate MLV or chemically-altered (CA) product. These products may also alter the quality of killed products. If the plunger and stopper are difficult to move without a lubricant, replace the syringe or, at least, the stopper. Other points to consider:

- Always inspect syringes prior to processing. Check the barrels for chips or cracks that could lead to leakage and under-dosing.
- Dosage gauges on some multi-dose syringes can accidentally change volume settings, leading to under- or over-dosing. Adjust the tension on the plunger to prevent leakage.
- Check calibration and dosage setting prior to (and continuously throughout) the process. Some multi-dose syringes are not accurate enough for low-dose products.
- Always keep spare parts available in case something happens to the working syringe.
- Keep a supply of extra disposable syringes as a backup delivery system.

4-S's of Needle and Syringe Safety

When considering equipment choices, keep the “4-S’s” of safety as your foremost consideration:

- **Safety** of yourself.
- **Safety** of others working around you or the animal.
- **Safety** of the animal.
- **Safety** of the food.

Never select equipment that could risk any of the critical safety considerations.

An easy way to remember these principles is to think S.A.F.E., where “S” is for self, “A” is for animal, “F” is for food, and “E” is for everyone working with you.



Learn the importance of labeling syringes by watching this short video.



Whichever syringe type used, it can be helpful to label syringes with one product type (e.g., MLV, killed, antibiotic, dewormer) to prevent contamination with other products. Never use one syringe to administer antibiotics or dewormers one time, and then vaccines the next time. Any residue will negatively affect the efficacy of the product.

- Disposable syringes are sterile out of the package and should be changed if the inside of the barrel or tubing becomes contaminated with dirt, blood, or body fluids. If the plunger becomes stiff and does not move smoothly, the syringe should be replaced.

There are many ways to clean and sanitize syringe systems. Training is needed whether using a microwave, hot water, autoclave, or pressure cooker as the cleaning and sterilization procedure (pressure, time) is different for every model. While the herd veterinarian or animal health representative may have other options, below are considerations.

- For cleaning multi-dose or repeater syringes, clean the exterior surfaces with soap, water, and a brush. Rinse well before disassembling as soap can leave residues inside the barrel and inactivate future vaccines.
- After cleaning the external components, rinse the internal components with distilled or deionized or sterile water that is warmer than 180°F (82.2°C) by drawing the water into the syringe interior (barrel and/or tubing) and squirting it out several times. Rinse three to five times.
- Never use soap or disinfectants to clean the inside of syringes or internal components as the residues can negatively affect vaccine efficacy.
- If necessary, disassembly should be performed on a clean work surface.
- Store the clean syringe in a dust free, dry (low humidity) environment. It can be stored in a new resealable plastic bag in the freezer. If stored in the freezer, metal syringes should be rinsed with hot (>180°F) water by pulling boiled water into the syringe three to five times and allowed to reach room temperature before using.^{9,10}

Needles

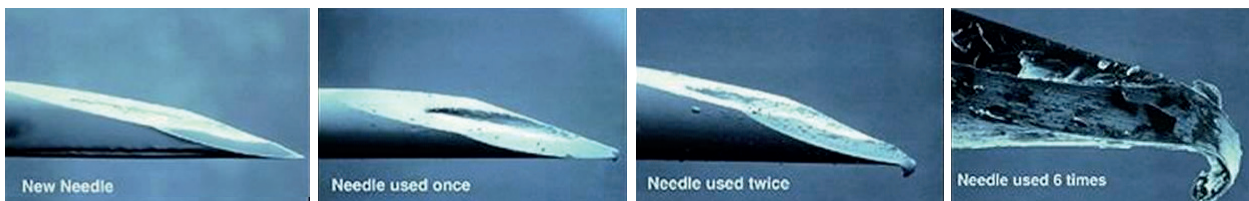
Use proper cattle restraint and select high-quality needles that are sized, both in gauge and needle length, to fit the cattle, required product route of administration (i.e., SQ, IM, IV, or BOE) and injectable product thickness (viscosity). Having a clean, sharp needle for every injection reduces the risk of contamination, tissue irritation, and animal discomfort.

Changing needles between each animal prevents bloodborne diseases, such as anaplasmosis, Johne's disease, or bovine leukosis virus (BLV), from transferring on the needle from one animal to the next.

Adjust length of needle based on skin thickness of the cattle. Young calves and Brahman or dairy influenced breeds will have thinner skin. Needles that are too long are at greater risk of breaking.

Figure 8: Damage on a 21 Gauge Needle at a Microscopic Level

Burring can occur when needles are used multiple times. *Courtesy of North Carolina Harm Reduction Coalition.*



⁹ Griffin et al. 2002. Care of veterinary vaccine syringes. University of Nebraska-Lincoln Extension. https://digitalcommons.unl.edu/extensionhist/224/?utm_source=digitalcommons.unl.edu%2Fextensionhist%2F224&utm_medium=PDF&utm_campaign=PDFCoverPages

¹⁰ Stuttgart 2023. Cleaning and sanitizing multi-dose syringes and transfer needles. University of Wisconsin-Madison Extension. <https://livestock.extension.wisc.edu/articles/cleaning-and-sanitizing-multi-dose-syringes-and-transfer-needles/>

Only use clean, sterile needles to enter a bottle of animal health product. This protects the product from contamination. Never enter a bottle with a used needle. Do not inject leftover product back into the bottle as the product will no longer be sterile and can lead to abscesses.

Rubber stoppers will dull needles quickly, so it is recommended to draw up the product with one clean needle and use a new needle to inject in the animal. Do not store an animal health product with a needle in the rubber stopper, as dust can enter the needle and contaminate the product.

If not using single-use needles, disposable needles should be changed every 10 to 15 injections (at a minimum) or immediately if burred, bent, or dirty (Figure 8).

- There are newer technology needles that are detectable by magnetic resonance for detection in meat for improved food safety. These needles have a higher level of durability due to the thick-walled design of the needle shaft. These should be changed every 20 injections (at a minimum) or immediately if burred, bent, or dirty.
- When using multi-dose or repeater syringes, change the needles each time the syringe is refilled (at a minimum).
- General Needle Selection Tips (Table 1)
 - Confirm with the herd veterinarian on needle size recommendations for the operation.
 - Select a short needle (1/2" to 3/4") for SQ injections. Recommend 1/2" needles for cattle less than 400 lbs, 5/8" needles for older cattle, and 3/4" for thick-hided animals.
 - IM injections require at least a 3/4" needle to get into the muscle. Thick-hided animals may require 1" needles.
 - The smaller 18 gauge needles are good for cattle less than 400 lbs, while 16 gauge needles work for cattle larger than 400 lbs.
 - Extremely thick (viscous) products require a needle with a gauge larger than 16 gauge (such as 14 gauge x 5/8" and 14 gauge x 3/4").
- When to Change Needles
 - Immediately if the needle is bent, burred, or dirty with feces, blood, dirt, or irritating chemicals (Figure 9).
 - **DO NOT STRAIGHTEN OR USE A BENT NEEDLE.**
 - Between cattle with KNOWN bloodborne infectious disease.
 - Every 10 to 15 injections for disposable needles (at a minimum).
 - Under the instruction of the herd veterinarian.



Figure 9: Bent needles should be immediately discarded in a sharps container and not reused or straightened.

Table 1: BQA Needle Size Recommendations for Cattle Injections

Injectable Viscosity	Route of Administration								
	Subcutaneous (SQ) (1/2 to 3/4 inch needles)			Intramuscular (IM) (3/4 to 1 inch needles)			Intravenous (IV) (1 to 1 1/2 inch needles)		
	Cattle Weight (lbs)			Cattle Weight (lbs)			Cattle Weight (lbs)		
	< 300	300-700	> 700	< 300	300-700	> 700	< 300	300-700	> 700
Thin Example: Most Vaccines	18 gauge	18 - 16 gauge	16 gauge	20 - 18 gauge	18 - 16 gauge	18 - 16 gauge	18 - 16 gauge	18 - 16 gauge	16 - 14 gauge
Thick Example: Thick Antibiotics	18 - 14 gauge	18 - 14 gauge	16 - 14 gauge	18 - 16 gauge	18 - 16 gauge	16 gauge	18 - 16 gauge	18 - 16 gauge	16 - 14 gauge
SELECT THE NEEDLE TO FIT THE CATTLE SIZE (USE THE SMALLEST PRACTICAL SIZE WITHOUT FEAR OF BENDING)									

■ Needle Care

- Protect needles from contamination with feces, dirt, or irritating chemicals.
- Use case or holder to protect syringes and needles during processing such as a vaccine cooler with syringe holder.
- Protect cattle handlers from accidental needle sticks by being aware of surroundings and understanding the risks of the vaccines or products being used.
- Store unused needles in area protected from moisture, temperature and contaminants.

Figure 10: Puncture-proof containers with a secure lid should be available for sharps disposal to improve human safety.



■ Needle Disposal (Figure 10)

- Needle sticks can be a human safety risk, especially if the vaccine or product is hazardous to human health.
- Place in a puncture-proof container with a secure lid.
- Follow local, state, and federal EPA guidelines for disposal of used needles and other sharps.
- Work with the herd veterinarian for proper sharps disposal recommendations.

■ Disinfectants

- **DO NOT** use disinfectants on needles used for fluid injectables, especially MLV.
- Replace needles rather than disinfect.
- Recommended for cleaning implanting gun needle between animals.

Mixing and Drawing Vaccines

It is important to handle all vaccines carefully and according to label instructions. Never vigorously shake to mix or expose vaccines to sunlight or temperatures outside the range provided on the vaccine label. To maximize product quality and minimize contamination, only sterile needles should enter vaccine vials.

When using vaccines that must be mixed prior to use, such as MLV products, mix only as much as can be used in **one hour or less**. Once mixed, protect reconstituted MLV products from sunlight or warm temperatures. These vaccines **CANNOT** be stored for later use as their efficacy decreases quickly after mixing.

Killed vaccines can be stored for short periods of time after initial use in the refrigerator if clean needles were used in the vial. Keep the rubber stopper clean between uses.

Learn how to mix vaccines by watching this short video.



Use a sterile transfer needle when reconstituting MLV, CA, and IN vaccines. These vaccines are packaged with one vial of sterile diluent and one vial with dessicated (dried) vaccine cake that is vacuum sealed. Read and follow label instructions for each product.

Both MLV and CA products must be reconstituted with a sterile diluent prior to administration. Many common mishandling practices can render MLV products inactive and greatly reduce effectiveness of killed vaccines.

Once reconstituted, administer IN vaccines using the provided nasal cannula or syringe with needle removed. Cannulas should be changed out every 10 to 15 head.

Learn how to properly use transfer needles by watching this short video.



Transfer Needles (Figure 11)

Transfer needles, which are used to transfer animal health products from one bottle to another, reduce the risk of product contamination during mixing.

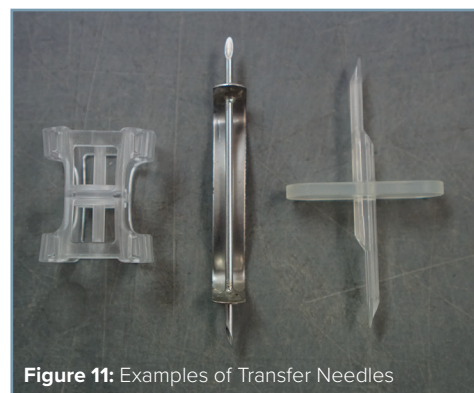


Figure 11: Examples of Transfer Needles

If a transfer needle is not available, use a sterile syringe to draw out the diluent for placement in the vial containing the desiccated vaccine cake.

When using a transfer needle, always place the transfer needle in the stopper of the diluent (liquid) bottle first. Then invert the needle and diluent as the other end of the transfer needle is placed in the stopper of the vial containing the desiccated vaccine cake. This allows the vacuum to draw the diluent into the second vial. After proper mixing, the vaccine can be drawn from the vial into the dosing syringe.

Never refill a syringe or vial using a needle that has been used in an animal as this may introduce contaminants into the vaccine. Change needles before filling or refilling a syringe to keep needles sharp and to prevent contamination of the vaccine.

Transfer needles can be sterilized and reused. Do not use the same transfer needle for multiple products as contamination can occur.

Bent and Broken Needles

Improper animal restraint is the cause of most bent and broken needle problems. If a needle bends, stop immediately and replace it. Do not straighten it and use it again.

Broken needles migrate in tissue and if not immediately removed will be impossible to find. Purchasing high quality needles, changing damaged needles, and providing proper restraint are all preventive measures. If a needle is broken off in an animal, immediately stop working and attempt to locate and remove the needle.

If a broken needle cannot be removed at the ranch, contact a veterinarian immediately to have the needle surgically removed. Many veterinarians have ultrasound units that can allow for rapid and precise location of a broken needle shaft which aids in efficient removal of the needle from the cattle tissue.



If the broken needle is not located, the herd veterinarian and the operation's management must determine how animals will be handled. Mark the area where the needle was inserted and record in the animal's record.

Growth Promotants (Implants)

Implants contain natural or synthetic compounds that produce physiological responses in the animal similar to natural hormones. They are small pellets that contain a growth stimulant that is slowly released over a period of time. The safety of implants is assured when FDA approved products are used according to their labels. Each type and brand of implant has a specific implant gun necessary to administer the implant.

Crews implanting should be trained on how to administer implants cleanly and efficiently. Work with the herd veterinarian or animal health company representative to ensure the correct product is given to the correct class of cattle (e.g., lactating, pre-ruminating, others).

Animals should be properly restrained to prevent head movement. The pellet (implant) should be placed under the skin in the middle third of the backside of the ear (Figures 12 and 13). The ear should be clean to minimize the risk of abscessing. Any ears with visible manure, that are wet, or that are dirty should be scrubbed prior to implanting. The needle should be sharp and sanitary technique (wiping the needle on sponge with disinfectant) should be used between each use. If the needle "skips" and/or you have to "try again" – wipe the needle first. The needle should remain in contact with the sponge.



Learn how to transfer vaccines with a syringe by watching this short video.



Animals with broken needles should never enter the public food supply or be sent to a livestock market. Work with a custom packer to responsibly harvest the animal. The animal should be accurately identified, and the packer should be notified of the broken needle at processing.



The only approved site for implants is subcutaneously in the middle one-third of the back of the ear.



For guidance on implant products, visit FDA's website here.

It is recommended to use a sponge soaked in 2% chlorhexidine disinfectant at a rate of 200 ml/gallon of water for disinfecting the implant needle. Change the solution every 50-100 animals implanted depending on the cleanliness of the ears. Proper sanitation is important for improved performance.

Implants have no slaughter withdrawal since the ear is removed during the slaughter process. Read label directions for class of cattle and reimplanting protocols. Follow manufacturers recommendation for storage, but in general implants should be stored in a clean, dry place and specific implants (i.e., TBA) need to be stored in a refrigerator after opening. As with other needle care, replace if burred or bent.

Figure 12: Correct Location for Implants¹¹
Courtesy of Oklahoma State University Extension

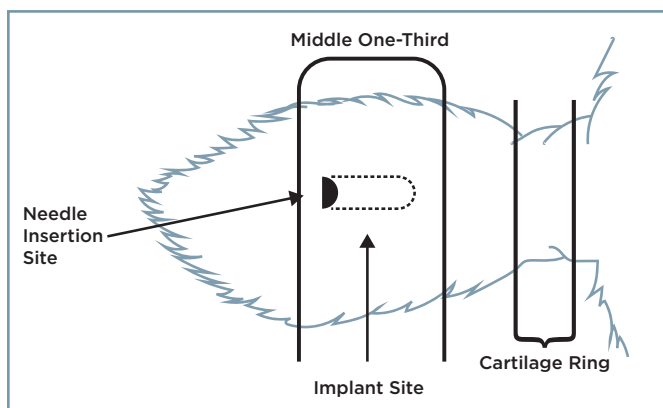
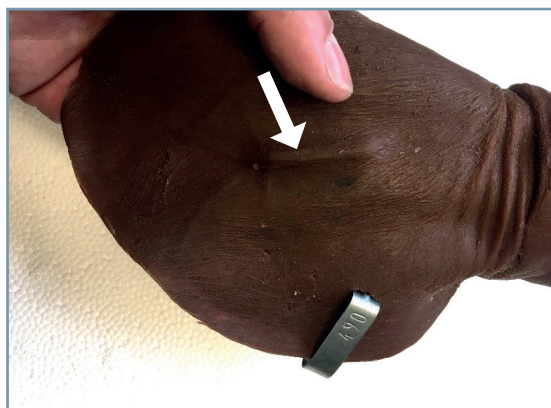


Figure 13: Placement of Implant Administered Subcutaneously on Back of Ear
Courtesy of AJ Tarpoff, DVM



Foreign Objects

Foreign objects in beef are an important food safety and consumer confidence issue with animal welfare and sustainability concerns. The beef industry has lost millions of dollars due to foreign object contamination, including buckshot, birdshot, needles, wire, darts, and other contaminants since product must be destroyed. All of these are considered adulterants by the USDA FSIS and by the FDA.¹² Products containing foreign object contamination cannot be sold for human consumption and entire animals can be condemned at the plant (Figures 14-17).

According to the 2022 National Beef Quality Audit,¹³ every packing plant surveyed reported finding foreign objects during the harvest and fabrication of market cows and bulls, and a majority of surveyed plants (53.3%) reported instances of customers finding foreign objects in their products. While plants have installed metal detectors and x-rays to help prevent adulterated product from reaching the consumer, foreign objects remain a problem throughout the beef supply chain. Based on interviews with processors, this issue is not regional nor is it specific to one sector of the industry.

Any abuse of animals is not tolerated. Using birdshot and/or buckshot to control or move cattle, whether they are the neighbor's cattle or your own, is not acceptable. If an unruly animal cannot be trapped or gathered by some other means when it reaches the end of its productive life, the animal should be euthanized on the premise and disposed of properly.

While hunting may play a small role in this problem, producers can work with hunters to prevent cattle from being shot — educate hunters about the potential safety concerns associated with adulterated carcasses. Remove cattle from hunting areas during approved hunting seasons, when possible, to avoid accidental shootings.

¹¹ Beck et al. 2022. *Implants and Their Use in Beef Cattle Production*. Oklahoma Cooperative Extension Service. <https://extension.okstate.edu/fact-sheets/print-publications/afs/implants-and-their-use-in-beef-cattle-production-afs-3290.pdf>

¹² *Adulterated Food*, 21 C.F.R. § 342 (2024). <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=109&showFR=1&subpartNode=21:2.0.1.1.9.1>

¹³ National Cattlemen's Beef Association. 2023. *2022 National Beef Quality Audit Executive Summary*. https://www.bqa.org/Media/BQA/Docs/nbqa-executive-summary-2022-updated_v1-compressed.pdf

Embedded remote drug delivery (RDD) systems such as darts are routinely recovered during carcass fabrication. BQA does not support the routine use of RDD for treatment purposes. While difficult to provide best management practices related to dart use, users should recover all darts to prevent further injury to animals.



Figure 14: Birdshot in Hamburger

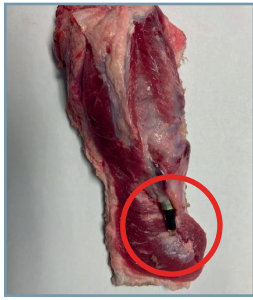


Figure 15: Dart Embedded in Chuck Flap



Figure 16: Dart Embedded in Tenderloin

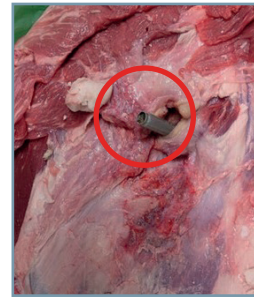


Figure 17: Dart Embedded in Round

Concerns With Using Remote Drug Delivery (RDD) Systems When Administering Animal Health Products

RDD systems are used to administer medication to or chemically restrain animals that cannot be caught or there is a human safety concern with their handling. Dart guns are a common type used in the cattle industry. The most common reported reasons for the use of RDDs include convenience, labor, and time savings.

RDD technology creates issues with the proper administration of animal health products and appropriate injection methods, depending on charge of device, distance to animal, environmental components, and skill of the person.

Darts delivered with an RDD can inadvertently strike sensitive tissues, such as the nose or eye; deliver the product into a non-BQA compliant area (i.e., round, loin, shoulder) rather than the injection triangle of the neck; or administer the product IM rather than SQ or vice versa.

Research has repeatedly demonstrated failure of RDD systems to consistently deliver the intended labeled dose of the antibiotics commonly used to treat BRD in beef cattle tested.^{14,15,16} Underdosing or not injecting the full amount leads to failure to achieve the FDA approved levels of the antibiotic. This contributes to treatment failure and potential antimicrobial resistance due to underdosing.

Entire darts or dart components embedded in the muscle tissue from cattle have and continue to be found during fabrication of carcasses in packing plants. In university and independently sponsored studies, antibiotics injected into the rounds of beef cattle using an RDD caused visible lesions and loss of tenderness in muscle tissue and those effects last beyond the treatment period.

It is recommended that anyone utilizing RDD technology complete an appropriate firearm or RDD safety training course and seek guidance and training on the specific device being used from the device manufacturer.

In situations in which remote delivery of medication must be used, it should comply with BQA guidelines for injection site selection (in the injection triangle of the neck), routes of administration (SQ preferred), and needle selection. Treated animals should have clear identification and treatment records to avoid residue violations and foreign object contamination.

While BQA recognizes RDD use in emergency situations when chemical restraint is necessary for human or animal safety, BQA does not support the routine use of RDD for treatment purposes.

¹⁴ Coetzee et al. 2018. Pneumatic dart delivery of tulathromycin in calves results in lower antimicrobial concentrations and increased biomarkers of stress and injection site inflammation compared with subcutaneous injection. *J. Anim. Sci.* 96:3089-3101. <https://doi.org/10.1093/jas/sky222>

¹⁵ Rivera et al. 2019. Pharmacokinetics of tulathromycin following administration to stocker cattle with remote delivery devices. *J. Anim. Sci.* 97:4482-4487. <https://doi.org/10.1093/jas/skz311>

¹⁶ Hairgrove et al. 2021. Effects of delivery via pressure-adjustable pneumatic gas-powered dart gun of three antimicrobial drugs (ceftiofur crystalline free acid, tildopirosin, and tulathromycin) on drug disposition and meat quality in cattle. <https://peerj.com/articles/11822/>

Vaccination Guidelines

- Work with a veterinarian to determine appropriate vaccines for the herd based on region, age of cattle, and disease risk.
- Prepare with the processing crew prior to starting by gathering adequate supplies and assigning roles.
- Prevent exposure of all vaccines to heat, UV light, and freezing.
- Draw from bottle with a sterile needle.
- Use quality syringes and needles.
- Inspect and maintain all working components of syringes.
- Label syringes in the vaccine cooler prior to processing to prevent accidental mixing of vaccine when refilling syringes.
- Read product label to administer proper dose and labeled route and understand contraindications.
- Use proper needle size for size of animal, thickness of skin, and viscosity of product.
- Only administer vaccines and products in the injection triangle of the neck. Remember to use both sides of the neck if needed.
- Change disposable needles at least every 10 to 15 head to reduce tissue irritation.
- Change needles immediately if contaminated or damaged.
- Always follow label directions, including withdrawal times.
- Booster all vaccines as label recommends.
- Store vaccines in a dependable refrigeration unit or vaccine cooler that maintains a temperature as directed by the product label (typically 35-45°F).
- Never assume anything — always read product directions prior to use.

Feed Additives and Medicated Feeds

Federal regulations require that a VFD is issued in compliance with the VCPR as defined by the state.¹⁷ For states that do not define key elements of a valid VCPR, the VFD must be issued in compliance with elements of the federally defined VCPR. The FDA Center for Veterinary Medicine maintains a list of states that require a state-defined or federally defined VCPR in order to issue a VFD.

The term ‘medicated feed’ includes feeds containing FDA approved medications intended by the FDA to be included in animal diets. This includes medications such as chlortetracycline (CTC) used in mineral supplements fed to control anaplasmosis, antibiotics used in concentrate feeds (grain mixtures) and premix feeds (concentrated medications mixed with additional roughage or concentrates to control liver abscesses), and medicated complete feeds that are fed during preconditioning, weaning, or receiving/arrival.

For more detail on FDA regulations concerning feed additives and medicated feeds, visit **www.FDA.gov**. Work with the herd veterinarian to discuss the use and documentation of medicated feeds. In addition to the considerations listed above, the following recommendations relate specifically to the use of medicated feeds.

¹⁷ *Veterinary feed directive drugs, 21 C.F.R. § 558.6 (2024).* <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-E/part-558/subpart-A/section-558.6>

- Use only FDA approved medicated feed additives in rations.
- Follow Judicious Antibiotic Use Guidelines (page 58).
- Extra-label use of FDA approved feed additives is illegal and strictly prohibited in major food animal species (cattle, swine, turkeys, and chickens). ELDU may be prescribed in minor food animal species (sheep, goats, others) by a veterinarian according to instructions in compliance policy guideline 615.115.¹⁸
- Strictly adhere to medication withdrawal times to avoid a violative residue.

 Where applicable, keep complete records when formulating or feeding medicated feed rations. Records are to be kept a minimum of two years, or longer as required by laws/regulations.

Veterinary Feed Directive (VFD)

The FDA requires a VFD for all feed-use antibiotics that could potentially impact human antibiotic resistance. If a cattle producer needs to use a VFD feed medication, they must obtain the VFD from their veterinarian with which they have a VCPR. The veterinarian must be licensed to practice in the state in which the cattle are located. The only FDA approved VFD feed medications are those used for treatment or control of specific diseases. The longest duration any VFD can have is 180 days unless specifically limited by the label.

There are no FDA approved VFD medications for treatment, control, or prevention of footrot or pinkeye. It is a violation of federal law to use any FDA approved feed medication other than as approved by the FDA. All VFD records must be kept and be available for inspection for two years

 by the issuing VCPR veterinarian, the cattle producer, and the feed mill distributing the VFD medication.

There are several FDA approved feed medications that do not require a VFD. However, if used in feed at the same time as a VFD drug, that concurrent use must be authorized and approved on the VFD. Notable among these are ionophores and parasite control medications. Visit with the veterinarian for more detailed information.

Feed Manufacturers

An important responsibility of a feed manufacturer is to assure that the feed produced — whether medicated or non-medicated — meets all legal and intended specifications.¹⁹ All feed mixing operations, regardless of size or products used, share this responsibility.

In-feed drugs are divided into two categories:

- **CATEGORY 1:** Drugs that have no required withdrawal time when used at lowest usage level.
- **CATEGORY 2:** Drugs that either have withdrawal times at lowest usage level or are regulated because of a “no residue” tolerance level.

All medicated feeds are divided into three types:

- **TYPE A:** Medicated articles that usually consist of highly concentrated forms of the drug in the form of mill premixes, super-concentrates, and fortifiers that have a higher potency than permitted in Type B or Type C feeds. Type A articles are used to produce Type B and Type C feeds. Type A medicated articles may be purchased without a VFD but must have a VFD to feed them in the form of a Type C feed. It is illegal to feed a Type A medicated article as a top dress.

¹⁸ U. S. Food & Drug Administration. 2024. Extralabel Use of Medicated Feeds for Minor Species. <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cpg-sec-615115-extralabel-use-medicated-feeds-minor-species>

¹⁹ FDA 21 C.F.R. § 558.3 (2024). <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-E/part-558/subpart-A/section-558.3>

- **TYPE B:** Medicated feeds that consist of diluted drug premixes, some feed concentrates, supplements, and other mixtures that require further mixing with one or more feed ingredients to achieve final dilution before being fed as a Type C medicated feed. Type B medicated feeds may not be fed directly to the animal without incorporation into a Type C medicated feed.
- **TYPE C:** Medicated feed in its final form that does not require any additional dilution prior to being fed. Type C medicated feeds may be top dressed, fed as a complete feed, or fed as a free choice feed. In order to be fed as a top dress or as a free choice feed, the Type C feed must be specifically approved for this application.

Feed manufacturers must register with the FDA. If mixing a medicated feed containing a VFD drug and selling this complete feed to another entity (such as another operation), the business is considered a feed manufacturer and must adhere to FDA regulation.

Combining the use of different feed medications must be approved by the FDA. Medication manufacturers are also a reliable source of information regarding combining medications they make with medications from other sources.

Herd Health Planning

Cattle producers should have animal welfare top of mind when designing cattle care and herd health programs. These programs should be based on risk assessment and prevention practices including good husbandry, stockmanship and animal handling, nutrition, biosecurity, vaccination programs, and other aspects of cattle care. Working with the herd veterinarian and resource group improves cattle care. Like other species, cattle are susceptible to infectious diseases, metabolic disorders, toxins, parasites, neoplasia, and injury. Economic losses are reduced by prevention and/or early intervention through health management programs. Healthy herds are more productive. Producers should work with a veterinarian and nutritionist to determine the risk of infectious, metabolic and toxic diseases and to develop effective management programs that fit the herd's health needs. This section considers herd management including pain mitigation, cattle identification, castration, dehorning, and euthanasia guidelines before providing sector specific guidelines.

Disease Management

Every effort should be made to prevent disease and infection in the cattle herd. Management programs should be made in consultation with a veterinarian. When monitoring for disease or problems in the herd, if any signs are detected at an increased rate, call a veterinarian quickly. The earlier diseases can be diagnosed, the better the outcome.



Parasite control programs should be developed with the help of the herd veterinarian or a parasite specialist. It is recommended to review/revise the herd health plan at least annually.

Vaccinating calves and adult cattle at strategic times throughout the year is a key component of a disease prevention program. The major pathogen groups producers can vaccinate against are included in Table 2.

Table 2: Common Pathogens to Consider for Cattle Vaccination Programs

Respiratory Pathogens	Other Pathogens
■ Parainfluenza Virus (PI3)	■ Clostridium family (may cause blackleg, tetanus, others)
■ Infectious Bovine Rhinotracheitis (IBR)	■ Leptospirosis
■ Bovine Viral Diarrhea Virus (BVDV)	■ <i>Campylobacter</i> (formerly <i>Vibrio</i>)
■ Bovine Respiratory Syncytial Virus (BRSV)	■ Others based on herd's unique risk
■ <i>Mannheimia haemolytica</i>	

Pain Management

Managing pain throughout an animal's life is an integral part of BQA's internationally recognized standards on animal welfare. Work with a veterinarian to help plan and select pain management medications that best fit the needs of the cattle operation.

Pain management should be considered at all stages of cattle production. Although there are very few FDA approved anesthetics or analgesics (pain medications) for cattle, veterinarians can design pain management protocols and prescribe pain management medications. Producers must follow the veterinarian's



instructions for all drug use, including ELDU, following extended withdrawal times, maintaining records, and identifying treated animals.

Producers may consider pain management for such things as castration, dehorning/disbudding, lameness, calving or dystocia, mastitis, footrot, other hoof issues, eye infections such as pinkeye, diarrhea, and others that the veterinarian may recommend.

There are many types of pain management including injectable, topical, local anesthesia, and systemic pain relief provided orally.

- An analgesic such as flunixin, similar to ibuprofen used by humans, is a recognized anti-inflammatory drug. There are two forms of the medication. The IV form is labeled to treat fever and inflammation from BRD and mastitis. The topical (transdermal, pour-on) form is labeled to treat fever from BRD or mastitis and control of pain from footrot. The IV formulation must NEVER be given SQ or IM as it causes tremendous pain and tissue damage that traps the medication and is responsible for residue violations. Flunixin is also available in combination with antibiotics. There are other injectable anti-inflammatories that can be discussed with the veterinarian.
- There are multiple oral medications that can be prescribed by the herd veterinarian. One oral medication has a prolonged half-life to provide pain relief for more than 24 hours and is therefore more suited for post-operative pain control than either injectable anesthetics or other analgesics. It can be given at the time of procedure and provide pain relief. Visit with a veterinarian about these pain management options.
- Injectable anesthesia is a potential technique that a cattle producer can use. With one-on-one instruction, cattle caregivers can be taught how to administer lidocaine, a prescription drug, to aid in pain control during dehorning and castration.
- Lidocaine impregnated castration bands have been recently introduced and provide pain control for more than two weeks after banding.



Not all over-the-counter products are legal to use in food animals. Read the label carefully or consult with the herd veterinarian before using them to avoid violative residues or illegal use of medications.

Receiving, Acclimating, and Processing

Receiving, acclimating, and processing incoming cattle are key components of cattle management. Useful receiving and processing protocols depend on an accurate designation of low- or high-risk cattle. The health risk of newly purchased cattle varies considerably and is influenced by such factors as age, time weaned, source, backgrounding, commingling, prior vaccination, nutrition, and fetal programming. Receiving, acclimating, and processing protocols should be developed and reviewed by the herd veterinarian and nutritionist to address specific health-risk levels.



All receiving facilities, unloading ramps, gates, pens, waterers, and chutes should be carefully examined prior to receiving a group of cattle. Newly received cattle should be isolated as recommended by a veterinarian. Additionally, follow-up disease testing, as recommended by the operation's veterinarian(s) is appropriate for some received cattle.

Follow VFD guidelines if in-feed medication is needed. All medicated feeds, with the exception of ionophores, antiparasitics, and coccidiostats, require a VFD.

Selecting the correct mineral supplement is important for maintaining healthy animals and optimal growth and reproduction. Requirements will change based on nutrition plan and type of operation (grazing vs. confined).

Newly received cattle should be unloaded promptly and allowed to rest as needed in a protected pen with ample fresh water and clean hay/feed before additional handling. Cattle should be observed closely as they unload and after they are penned for evidence of injury or disease. Post arrival processing health and well-being protocols should be developed by a veterinarian and should consider handling modifications as needed to protect cattle from weather extremes.

Use low-stress cattle handling techniques when working cattle. Keep cattle as quiet as possible and minimize the use of electric prods to less than 10% of cattle worked. When electric prods must be used, avoid contact with sensitive areas including the eyes, rectum, genitalia, and udder.

Avoid handling cattle when the risk of heat stress is high. Decisions to handle cattle must consider temperature, humidity, wind speed, phenotype, and cattle acclimation. If cattle must be handled, a general rule is to work them before the temperature humidity index (THI) reaches 84 (*Chapter 3: Cattle Behavior, Handling, and Facility Design*).

Cattle Identification



Cattle identification (ID) contributes to quality record keeping and has many management and production benefits. Individual animal identification supports the tracking of animal health events such as a food safety incident or foreign animal disease outbreak. The more effective the national system of animal identification is, the faster livestock producers can get back to normal business during any potential quarantine or movement restrictions in an animal health event. Individual animal identification can also support tracking of an animal's performance characteristics such as reproductive status, growth, health, age, and offspring performance. These performance indicators may be important as cattle raisers make cull/keep, purchasing or breeding decisions.

Branding, tattooing, ear-notching, and ear-tagging with a silver/metal bright, orange official calfhood vaccination, or electronic identification (EID) tag are all common methods of identifying cattle individually (Figure 18).

Any of these methods may be used voluntarily by producers to identify their animals on the farm or ranch. Official animal identification goes a step further, referring to a specific system that enables

animal health officials at the state and federal level to trace animals that move interstate. USDA APHIS issues unique identification numbers to manufacturers, to use on metal eartags and EID tags (Figure 19). Once an animal is tagged, it becomes permanently associated with the unique number on that individual tag, providing a means for identifying the animal in a food safety or animal disease event.

In 2013, APHIS instituted their first rules on what types of methods and devices count as official animal identification under their animal disease traceability regulation.²⁰ While metal tags were previously acceptable, as of November 5, 2024, all **new** eartags being applied for the purpose of complying with the regulations must be both visually and electronically readable. Metal tags applied to any animals **before** that date are grandfathered in and do not need to be retagged. Brands, tattoos, other identification methods acceptable to breed associations for registration purposes, or group/lot identification are also still accepted as official identification. All cattle moving interstate must be accompanied by an interstate CVI or health certificate. Check with your state if electronic CVIs are recommended or required.

Using official identification can be considered a responsibility to the industry in case of a foreign animal or reportable disease outbreak. Note that brisket tags, wattles, ear notches, and group ear tags are not recognized as official identification.

Hot iron or freeze branding may be the only practical method of permanently identifying cattle in some locations. These methods are legally required in some areas of the U.S. If cattle are hot iron or freeze branded, it should be accomplished quickly, expertly, and with the proper equipment. Pain medications should be considered. BQA guidelines recommend branding on the hip area if possible. Do not brand cattle on the face or jaw unless state or federal programs require.

Operators performing hot iron or freeze branding procedures may seek the guidance of a veterinarian and should be trained and competent in the procedure as well as able to recognize the signs of complications.

Castration

Castration of cattle is performed in many production systems to reduce inter-animal aggression and injuries, improve human safety, and avoid the risk of unwanted pregnancies.

The most appropriate method should be determined by the veterinarian based on the best interest of the health and well-being of the animal within the environment in which it is being raised. Age of castration will vary between production systems and should be based on recommendations of the veterinarian of record in discussion with farm/ranch management. Calves should be restrained for castration in a way that minimizes stress and the risk of injury to the animal and the operator.

When possible, intact bull calves should be castrated at the youngest possible age prior to grazing or feeding (0-3 months if possible). The procedure may be delayed in some production systems (i.e., extensively managed commercial beef herds, seedstock operations).



Figure 18: Examples of Ear Tags

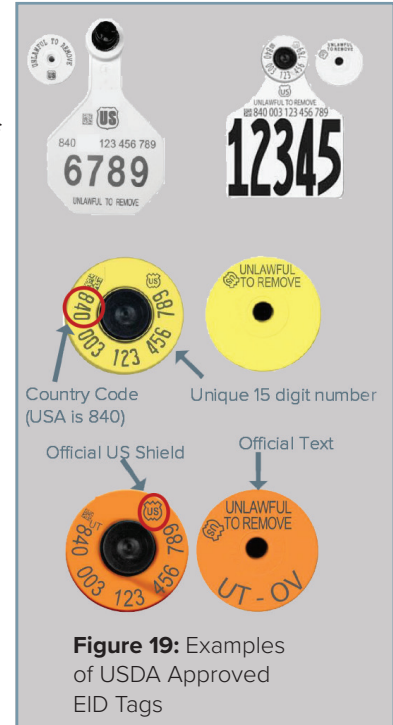


Figure 19: Examples of USDA Approved EID Tags

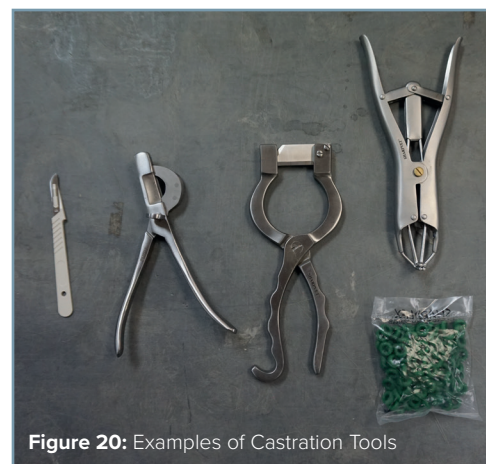


Figure 20: Examples of Castration Tools

²⁰ USDA APHIS. 2024. Animal disease traceability. <https://www.aphis.usda.gov/livestock-poultry-disease/traceability>

Management of intact bulls is difficult and potentially unsafe due to aggressive behavior. There is no demand for intact males beyond the breeding herd. Meat from intact bulls has coarser texture, lower marbling scores, and more variable tenderness. There is no gain advantage of bulls when compared to growth-implanted steers and castration should not be delayed for this purpose. Calves can be implanted as young as 45 days of age.

Methods of castration used in cattle include surgical removal of the testes (knife castration), ischemic methods (banding), as well as crushing and disruption of the spermatic cord (Figure 20). All of these methods result in acute and chronic pain, which should be mitigated in the most appropriate and practical ways possible.

All methods of castration cause pain. Producers should seek guidance from a veterinarian on the availability and advisability of analgesia or anesthesia for castration of cattle at any age, but particularly in older animals. Operators performing castration of cattle should be trained and competent in the procedure used and be able to recognize the signs of complications. Training and education should be reviewed and updated when needed.

Dehorning (Including Disbudding)

Horned cattle are commonly dehorned to reduce animal injuries and improve human safety. Dehorning can be as, or more stressful, than castration. Cattle with horns may cause more bruising compared to their non-horned group mates. The USDA FSIS requires the removal of bruises observed in the packing plant to pass inspection. This results in lost carcass weight, devalued primal cuts, and reduced carcass value.

Animals should be restrained for dehorning in a way that minimizes stress and risk of injury to the animal or operator. Operators performing dehorning of cattle should be trained and competent in the procedure and be able to recognize the signs of complications.

Dehorning should be completed when the calf is young and at the youngest age possible. Dehorning or tipping older calves and yearlings is one of the most stressful management practices. The selection of polled cattle is an alternative for horn management.

Where practical, cattle should be dehorned while horn development is still at the horn bud stage — 0 to 3 months or at the first available handling opportunity beyond this age. There is less tissue trauma when done earlier in life.

Methods of disbudding at the horn bud stage include removal of the horn buds with a knife or dehorning spoon, thermal cautery of the horn buds, or the application of chemical paste to cauterize the horn buds (Figure 21). Disbudding is achievable prior to two weeks of age and may be performed as early as the first 24 hours of life.

All methods of disbudding and dehorning cause pain. Producers should seek guidance from a veterinarian on the availability and advisability of analgesia or anesthesia for dehorning of cattle at any age, but particularly in older animals where horn development is more advanced.

Tail Docking

Tail docking has been performed in cattle to prevent tail tip necrosis in confinement operations. Research shows that increasing space per animal and proper bedding are effective means in preventing tail tip necrosis.



Figure 21: Examples of Dehorning and Disbudding Tools

Routine tail docking of cattle is not recommended. If tail docking is required due to injury, a veterinarian should be involved and proper analgesia and anesthesia should be discussed.

Calf Management

It is important for calves to receive colostrum within the first four hours of birth as it will protect the calf from infectious diseases through passive immunity and provide nutrition for warmth. Colostrum replacement products generally have 100 grams of Immunoglobulin G (IgG, antibodies) per dose versus colostrum supplement products which have less than that amount. Calves should receive a minimum of 200 grams of IgG within the first four hours of birth.

Heat-treating colostrum (heat to 140°F or 60°C for 60 minutes) from other farms is recommended for biosecurity purposes.

Castrate and dehorn as previously described while considering pain management.

Weaning is one of the most stressful times of an animal's life. Weaning methods include abrupt weaning, fence line weaning, nose flap weaning, intermittent separation, or a combination of the above. Weaning can be less stressful by castrating and dehorning calves early in life, vaccinating against respiratory diseases prior to weaning, and providing proper pre-weaning nutrition.

Consider a preconditioning program for calves to improve health in the next stage of production. Preconditioning practices could include: keeping the calf on the operation for at least 45 days after weaning; dehorning (if horned); castrating bulls; deworming; using low-stress weaning techniques (including fence line weaning and nose flaps); administering appropriate vaccines +/- boosters; transitioning to feed bunk and drinking water from a tank. Talk with buyers or auction markets about their value-added programs. Note that a true preconditioning program requires more than just vaccines given before weaning.



Breeding Herd

Examine the breeding soundness of all bulls annually including testing for transmissible diseases and vaccinating prior to turnout. Provide booster vaccinations as recommended by the label or according to the advice of a veterinarian.

- Pre-calving vaccines: Administering vaccines 6-8 weeks prior to calving will boost immunity in the cow and prepares antibodies in the colostrum.
- Pre-breeding vaccines: These vaccines are generally given 4-6 weeks prior to breeding in either natural service or assisted reproductive technology herds. Heifers will need a booster so timing the last dose for 30 days prior to breeding is important.

Maintain cows at a body condition score (BCS) of at least 5, on a scale of 1-9, before the calving season. Heifers should have a BCS of 5-6. This may have regional variation.

Check cows regularly for calving difficulties during the calving season. First-calf heifers may require more frequent observation and care. Consider contacting a veterinarian for advice or assistance if cows or heifers have calving difficulties that cannot be corrected within a reasonable amount of time.

See **Chapter 7: Nutrition** to learn more about Body Condition Scores and to see photos.

Examine cows early that have mild lameness, early eye problems such as ocular neoplasia (cancer eye), mastitis, or loss of body condition. Considering short- and long-term animal health and welfare is integral to understanding care, treatment, or marketing decisions.

Market cull cows with a BCS between 4 and 5 (on a scale of 1 to 9) when possible. Cows with these BCS have better red meat yield and generally bring the highest price per pound at the auction market.

Check BCS of cows and breeding bulls in the herd on a regular basis. Emaciated animals are more prone to bruising because they have no fat to serve as padding. They are also more likely to be disabled upon arrival at the packing plant. Thin cows ($BCS \leq 2$ on either beef or dairy scale) cannot endure a long trip prior to harvest, bruise easier, and are at higher risk of becoming non-ambulatory during transport. They are not considered fit for transport.

Heifers and Purchased Breeding Stock Entering Herd

Follow biosecurity procedures and isolate/quarantine all stock entering the herd as indicated on the herd health plan. Quarantine new animals 21-30 days before allowing contact with the home herd, ideally with a separate fence line, feed bunk, and water source.

Test all stock entering the herd for diseases that could jeopardize the herd. This could include testing for persistent infection with BVD (or BVD-PI), brucellosis, bovine leukosis virus (BLV), tuberculosis, and/or Johne's disease. Some diseases, such as Johne's, may not manifest for years after purchase.

Vaccinate animals as recommended by a veterinarian and follow BQA guidelines. Most vaccines require two doses, as specified on the product label and have either a 21- or 60-day withdrawal time.

Breeding bulls should be tested for trichomoniasis. Discuss whether a Breeding Soundness Exam is needed for new bulls with the herd veterinarian.

Stocker and Feeder Cattle

Producers may seek guidance from a veterinarian on receiving and vaccination protocols for incoming stocker and feeder cattle based on environmental and rearing conditions. The use of vaccines and parasite control should be based on risk assessment and efficacy of available animal health products.

As castration, dehorning, and branding are painful, pain mitigation should be considered and discussed with the herd veterinarian.

If heifers are flank spayed, a local anesthetic should be used and systemic pain relief considered. Note that the AVMA and AABP do not support the use of electroimmobilization for animal restraint.

High-risk cattle should be checked at least daily for illness, lameness, and other problems during the first 30 days following arrival.

Pregnancy in immature heifers can result in calving difficulties and subsequent trauma to the birth canal, paralysis, or death of the heifer. For these reasons, it is often more humane to abort pregnant heifers. This should be done under the direction of a veterinarian.



If heifers in the feedyard or a stocker operation deliver a full-term, healthy calf, it should be allowed to nurse to obtain colostrum or promptly fed a colostrum replacer. At all times, these calves must be handled humanely and provided proper nutrition and colostrum. Compromised calves or fetuses should be promptly euthanized and disposed of according to local regulations.

‘Bulling’ is a term to describe aggressive riding of a steer by one or more pen mates. Bulls should be promptly removed from the pen to prevent serious injury.

Euthanasia

Cattle producers play a critical role in following best management guidelines and ensuring the welfare of cattle. When decisions to cull, slaughter, or euthanize an animal are considered, it should not be taken lightly, and long-term welfare and comfort of the animal should be a priority. Timely euthanasia should be considered if animals are deemed unfit for transport or slaughter.

Euthanasia is the intentional ending of an animal’s life by an acceptable method to relieve pain and suffering. Euthanasia techniques should cause immediate loss of consciousness followed by cardiac and respiratory arrest (heart beat and rhythmic breathing stops) that ultimately results in loss of brain function.

It is important to be proactive in culling or marketing decisions to improve animal welfare and business operations. See *Chapter 6: Timely Culling, Fitness for Transport, and Transportation* for more information. Not all culled animals are suitable to enter the food chain.

Some compromised cattle should not enter intermediate marketing channels because of animal well-being concerns. Instead, these cattle should be sold directly to a processing plant or euthanized, depending upon the severity of the condition, processing plant policy, and state or USDA regulations.

Important Considerations

The loss of productive function due to disease or injury in livestock presents at least two options: slaughter or euthanasia. Slaughter should be considered for animals that are not in severe pain, freely able to stand and walk, capable of being transported, and free of disease and drug residues that would constitute a public health risk. Humane euthanasia is the appropriate choice whenever the above conditions are not met. If euthanasia is the best option, the task should be accomplished with kind, caring consideration.

Euthanasia is an animal welfare issue and should be utilized when an animal’s condition is such that additional treatment options will not be effective and/or if failing to euthanize the animal will extend its suffering and/or when there is little or no hope of improvement.

To that extent, it is the responsibility of all who own or work with livestock to have the proper equipment and knowledge to conduct this procedure effectively, in a timely manner when necessary, and with a focus on avoidance of pain and distress for the animal. Reasons for euthanasia include the following (not all inclusive).

- Fractures or paralysis of the legs, hip, or spine that are not repairable and result in immobility or inability to stand.
- Emergency medical conditions that result in excruciating pain that cannot be relieved by treatment.
- Animals that are too weak to be transported due to debilitation from disease or injury or emaciation (too thin).
- Paralysis from traumatic injuries or disease that result in immobility.
- Disease conditions where no effective treatment is known, prognosis is terminal, or a significant threat to human health is present; this could include painful congenital or acquired conditions that cannot be managed adequately by medical or management methods.

- Loss of production and/or failure to perform and/or failure to thrive (i.e., declining quality of life such as with advanced age, severe mastitis, etc.).
- Potential or known exposure to toxins (such as lead toxicity) that would likely result in a food safety issue if sent to slaughter for human consumption.
- Extended drug withdrawal time for clearance of tissue residue.
- Behavior or temperament issues which render an otherwise fit animal to be unsafe.
- Poor prognosis or prolonged expected recovery.
- Diseases that could threaten herd health (i.e., BVD or others).
- Failure to respond to treatment.



Record keeping components are critical to note reasons or causes of death. Employees should have annual training for euthanasia methods used on the operation including cleaning and maintenance of tools. Producers or veterinarians should necropsy selected animals to verify the cause(s) of death.

The producer will most likely perform on-farm euthanasia because a veterinarian may not be immediately available to perform the service. Persons who perform this task must have received appropriate training, know the relevant anatomical landmarks, and understand the protocols used for humane euthanasia of animals. Ensuring human and animal safety during the process is essential.

Methods of euthanasia are dependent on training of personnel, resources, environment, and animal temperament. Acceptable methods for conducting euthanasia in cattle include gunshot, penetrating captive bolt with a secondary step to ensure death, and injectable barbiturate (only under veterinary supervision; rendering services will not accept dead animals euthanized with barbiturates).

Gunshot is the most common method used for on-farm euthanasia of cattle. Effectiveness depends upon selection of the appropriate caliber of firearm, type of bullet or shot/shell, and accuracy of aim (Table 3). Never select a hollow point or other fragmenting bullet for euthanasia.

Captive bolt guns are designed to cause damage to the brain sufficient to cause an immediate loss of consciousness. However, death is not certain in all cases. Therefore, use of penetrating captive bolt should be followed with a secondary step to ensure death.



Records should be maintained in accordance with the state's requirements for medical records. Records should also be kept for the euthanasia equipment including gun or captive bolt cleaning and service logs. Properly functioning equipment is critical to rendering the animals immediately insensible. Euthanasia tools should be cleaned after every use as recommended by the manufacturer.

Table 3: Suggested Firearm, Caliber, and Bullet Types for Euthanizing Different Sizes of Cattle ^{21,22,23,24}

	Handgun	Rifle	Shotgun
Calves	 .32 to .45 caliber Solid-point bullet (within 1-3 feet)	 .22 LR caliber or larger Solid-point bullet	 .410 to 12 gauge #4-6 bird shot or slug (within 3-6 feet)
Adult	 .38 to .45 caliber Solid-point bullet (within 1-3 feet)	 .22 magnum or higher caliber Solid-point bullet	 20 to 12 gauge #4-6 bird shot or slug (within 3-6 feet)



When possible, restrain animal before euthanasia is carried out. A 22 long rifle (LR) is discouraged for use in euthanasia of adult cattle because it lacks sufficient ballistic energy to yield consistent results. Higher caliber rifles should be avoided as bullets may exit the body and place bystanders in danger.

Anatomical Landmarks for Euthanasia

Current information for adult cattle and calves indicates that the point of entry of the projectile should be at (or slightly above) the intersection of two imaginary lines (Figure 22A - dashed lines), each drawn from the outside corner of the eye to the center of the base of the opposite horn (or where the horn should be). An alternate method is to aim on midline between the base of the ears at the level of the ear canal (Figure 22A - solid line). Angle should be directed perpendicular (Figure 22B) or slightly downward (no more than 45 degrees).

An alternate method for cattle with Brahman or Holstein genetics (more elongated skulls) is to place the shot midway between a line connecting the outside corner of the eye and the poll on midline (Figure 22C).

If a firearm is used it should be used within three feet of the target when possible and positioned so that the muzzle is perpendicular to the skull to avoid ricochet. It is unsafe to place the firearm flush with the skull.

When using penetrating captive bolt, operators are advised to restrain the head so the captive bolt may be held flush with the skull. A secondary method to ensure death is **REQUIRED** and includes a second shot in the original frontal or poll location, a third shot if necessary, exsanguination (bleeding out), use of a pithing rod to destroy the brain and spinal cord (Figure 23), or injectable solution (based on veterinarian recommendations).

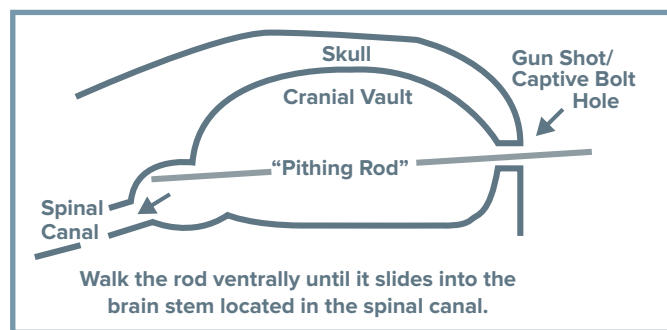
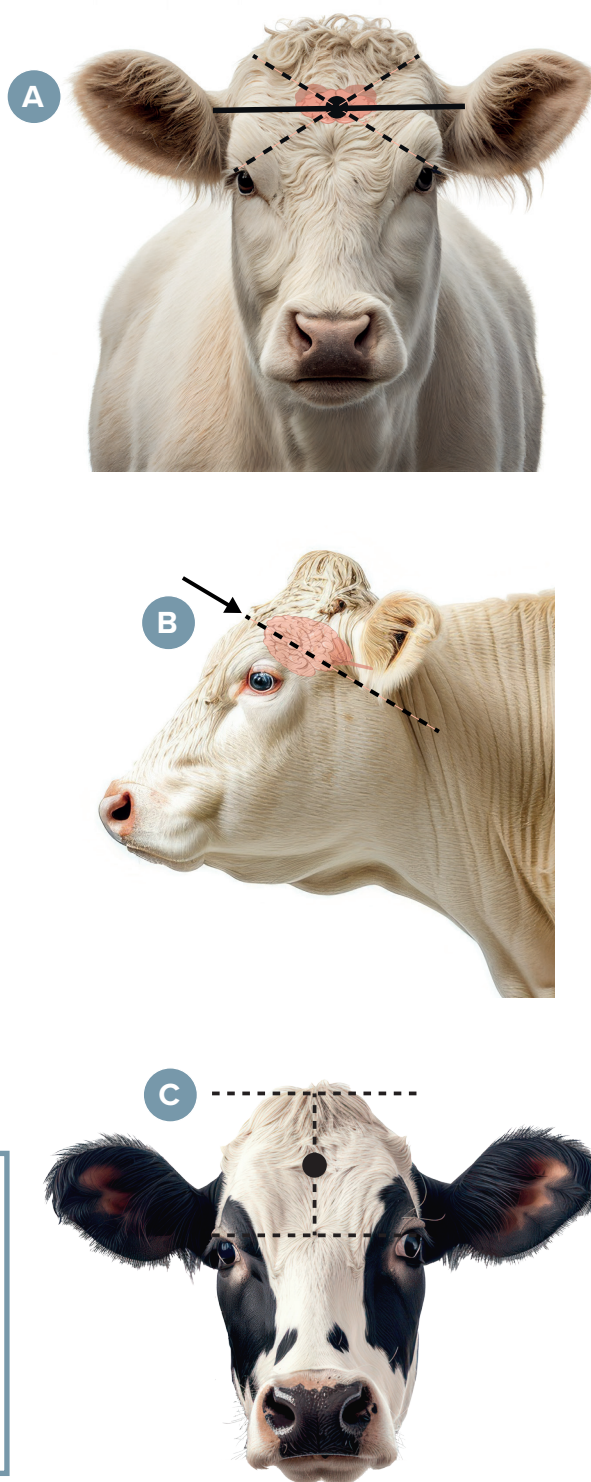


Figure 23: Example of Using Pithing Rod

Figure 22: Landmarks for Euthanasia of Cattle²⁴



²¹ 2022. AVMA Guidelines for the Euthanasia of Animals: 2020 Edition. American Veterinary Medical Association. <https://www.avma.org/resources-tools/avma-policies/avma-guidelines-euthanasia-animals>

²² Shearer, J., Griffn, D., Cotton, S. (2018). Humane euthanasia and carcass disposal. *Veterinary Clinics of North America: Food Animal Practice*, 34(2), 355-374. <https://doi.org/10.1016/j.cvfa.2018.03.004>

²³ Thomson, D. U., Wileman, B. W., Rezac, D. J., Miesner, M. D., Johnson-Neitman, J. L., Biller, D. S. (2013). Computed tomographic evaluation to determine efficacy of euthanasia of yearling feedlot cattle by use of various firearm-ammunition combinations. *American Journal of Veterinary Research*, 74(11), 1385-1391. <https://doi.org/10.2460/ajvr.74.11.1385>

²⁴ American Association of Bovine Practitioners. 2023. Guidelines for the Humane Euthanasia of Cattle. https://www.aabp.org/Resources/AABP_Guidelines/EUTHANASIA-2023.pdf

Indications of Unconsciousness

When conducting euthanasia procedures, the person must be prepared to immediately reapply an acceptable euthanasia technique if any sign of consciousness is detected. They should always observe animals for the following behaviors indicating unconsciousness.

- Absence of corneal reflex (eye reflexes gone, eyelids remain open, eyes facing straight forward, dilation of the pupil; check by touching the surface of the eye and no reaction should occur).
- Absence of vocalization.
- Absence of gag reflex (no voluntary tongue movements or swallowing).
- Lack of rhythmic respiration.
- Animal collapses immediately when shot and makes no coordinated attempt to rise or right itself.
- Body and muscles become rigid immediately upon collapse followed by relaxation of the body, brief tetanic spasms and eventually uncoordinated hind limb movements.

These signs should be observed and monitored in all animals for which euthanasia procedures have been applied. Animals that attempt to right themselves, vocalize, blink with their eyes, or begin rhythmic breathing are likely returning to a conscious state. In these cases, one should immediately recheck the anatomical site used and reshoot or reapply the captive bolt.

Confirmation of Death

Confirmation of death following a euthanasia procedure is absolutely essential regardless of what method of euthanasia is used. Criteria to be used for confirmation of death include the following.

- Lack of pulse.
- Continued cessation of rhythmic breathing.
- Absence of corneal reflex (eye reflexes gone, eyelids remain open, eyes facing straight forward, dilation of the pupil; check by touching the surface of the eye and no reaction should occur).
- Failure to detect/hear respiratory sounds or heartbeat by use of a stethoscope under left elbow.
- Rigor mortis (carcass is stiff).

Other than rigor mortis, none of these signs are reliable indications of death. After initial confirmation of death, rechecking the animal for these parameters after a period of 20 minutes is a very useful method for confirmation of death.

This document does not cover all situations. When situations arise that are not addressed in the guidelines, the well-being of the animal should be evaluated and appropriate actions should be taken. A veterinarian may use other acceptable methods.

Carcass Disposal

Carcass disposal is a critical consideration when selecting a euthanasia technique. Carcasses must be handled and disposed of following state and federal regulations. Animals euthanized with barbiturates should be buried or burned since they will not be accepted at rendering facilities due to contamination of rendered product. Composting does not eliminate barbiturate residues and can be a hazard for scavengers or the environment.

Several options for carcass disposal are available for livestock, including burial, incineration, rendering, and composting. Producers may contact the local waste disposal facility or landfills to determine if carcasses are accepted.

Under no circumstances should dead cattle be disposed of by dumping in areas where water and air quality might be jeopardized. See *Chapter 8: Environmental Stewardship* for more information. It is important to remember that even in death, animals deserve respect, and dead animals should be handled with this in mind.



Herd Health Highlights for all Cattle Production Segments

- Conduct at least annual trainings of employees and cattle caretakers on topics such as cattle handling and behavior, biosecurity, animal health product management, identifying illness, and other preventive practices.
 - Meet appropriate nutritional needs with safe, well-managed feedstuffs.
 - Practice low-stress handling practices to minimize stress and bruising.
 - Always read and follow label directions for animal health and pesticide products.
 - Administer all injections in front of the shoulder, subcutaneously (SQ) if possible, and as indicated on the product label.
 - Consider pain management in all production stages.
 - Identify any animals treated to ensure the proper withdrawal time is followed.
 - Make records available to the next production sector.
-  Keep records of all products administered including date, animal identification, product used, serial number, amount administered, route of administration, person administering, and withdrawal time.
- Use a parasite control program that addresses external and internal parasites in your region.
 - Consult with herd veterinarian for additional health procedures appropriate to the region.
 - At least two people on the operation should be trained on humane euthanasia techniques and proper carcass disposal.
 - Performing a necropsy of cattle that have died can be valuable for diagnosis and future management. Work with a veterinarian for training on anatomy and sample collection. Necropsies are most valuable within hours of death or at least within the first 24 hours.



Record Keeping Reminders

- A veterinarian-client-patient relationship (VCPR) is necessary for veterinary oversight of animal health and should be renewed annually, based on state or federal guidelines.
- Management and treatment protocols should be kept on file and at the treatment facility where workers can review them.
- Having all product withdrawal times listed in a treatment protocol book is a best management practice.
- Veterinarians and producers have accurate treatment records and extended withdrawal times for all animals treated. Records must be FDA accessible for two years.
- If extra-label drug use is indicated by a veterinarian's prescription, that veterinarian must establish and document appropriate withdrawal periods.
- Accurate records of treatments and outcomes should be used to evaluate efficacy of therapeutic regimens.
- Good record keeping and protocol development are essential to avoiding residues in meat and milk from food-producing animals.
- Records can help with a residue investigation.
- Proper record keeping, storage, and handling of animal health products are important to ensure efficacy of the products and are key to a cattle health program.
- Record product information including the receiving date, name, quantity, unit sizes, lot/serial numbers, and expiration dates in receiving and inventory records. This could be important if a product is recalled, or cattle have an adverse reaction.
- Place a thermometer in the vaccine refrigerator or product cabinet and check/record temperature periodically.
- Always label syringes.
- If a broken needle is not located, the herd veterinarian and the operation's management must determine how animals will be handled. Mark the area where the needle was inserted and record in the animal's record.
- Where applicable, keep complete records when formulating or feeding medicated feed rations. Feed additive and feed additive records are to be kept a minimum of two years, or longer as required by laws/regulations.
- All VFD records must be kept and be available for inspection for two years by the issuing VCPR veterinarian, the cattle producer, and the feed mill distributing the VFD medication. Producers must follow the veterinarian's instructions for all drug use, including ELDU, including following extended withdrawal times, maintaining records, and identifying treated animals.
- Parasite control programs should be developed with the help of the herd veterinarian or a parasite specialist. It is recommended to review/revise the herd health plan at least annually.
- Cattle identification contributes to quality record keeping and has many management and production benefits.
- Record keeping components are critical to note reasons or causes of death. Producers or veterinarians should necropsy selected animals to verify the cause(s) of death.
- Records should be maintained in accordance with the state's requirements for medical records. Records should be kept for euthanasia equipment including gun or captive bolt cleaning and service logs.
- Keep records of all products administered including date, animal identification, product used, serial number, amount administered, route of administration, person administering, and withdrawal time.



CHAPTER 6

TIMELY CULLING, FITNESS FOR TRANSPORT, AND TRANSPORTATION

Objectives

- Evaluate cattle before they are transported for their fitness for transport.
- Make timely culling decisions before Body Condition Score decreases, mobility worsens, or health deteriorates.
- Prioritize correct transportation strategies for human and animal safety.



Producers and livestock haulers should work together to determine if an animal is fit for transport. The rigors of transport include the distance, temperature, and stocking density the animal will be subjected to during the entire trip.

Fitness for transport is an important concept that applies to all cattle stages, from calves to feeders to cull cows and bulls. Evaluating an animal is critical in deciding whether an animal can withstand the rigors of transport, keeping in mind the fact the animal may be standing for long periods of time. The most visible aspect of the cattle industry is when cattle are moved across the country on roads every day. All stakeholders, from the cattle owner to the transporter, should strive for responsible transport decisions.

It is critical to identify animals that may not make this journey. These decisions not only impact the welfare of the cattle but may have implications that will prevent the animals from passing preslaughter inspection at the harvest facility.

People making fitness for transport decisions should have training on identifying illness and determining fitness for transport when considering the rigors of transport.

Decisions to Cull, Market, Slaughter, or Euthanize

Cattle producers play a critical role in following best management guidelines and ensuring the welfare of cattle.

Considerations when making the decision to cull, market, slaughter, or euthanize:

- Animal welfare and comfort are the top priorities.
- Everyone on the operation has a responsibility to make timely decisions in caring for injured or sick cattle.
- Timely marketing of cattle means selling or shipping an animal before it is too compromised to transport.
- Timely euthanasia should be considered if an animal is deemed unfit for transport.
- Market cull animals as early as possible, only if all drug withdrawal times are met, and the animals are fit for transport.

Transportation Considerations

- During transport, cattle well-being and human safety are the top priorities.
- Proper animal care and handling have a positive effect on the health status of the animal and the quality of meat.
- It takes effective communication among all individuals involved during each phase of transportation, this includes scheduling, loading, unloading, and while on the road.
- Prioritizing safety reduces injury to people and cattle, ensuring a high-quality beef product, and showcasing the important role cattle transporters play in the industry.

The Beef Quality Assurance Transportation (BQAT) program is the transportation standard for the entire cattle industry. Anyone hauling cattle is encouraged to get BQAT certified.



Cull Cattle

Cull cattle are animals that are departing from the herd because of sale, slaughter, salvage, or death. The decision to cull is an everyday management process. Regardless of herd size, all beef cow operations will have to cull animals. Good culling management improves the herd and adds value to the operation and industry.

Cull animals are not only cows and bulls, but also cattle from grow and feedyards such as railers. A railer is a feedyard animal that fails to thrive and is underperforming compared to the rest of the animals in the pen. This animal will cost more to feed than the return of the carcass value when harvested.

Poor culling management forgoes any added value and may contribute to unacceptable product defects and public health concerns, creating liability for the producer and industry. Not all culled animals are suitable for processing into higher-value products. Some compromised cattle should not enter intermediate marketing channels because of animal well-being concerns. Instead, these cattle should be sold directly to a processing plant or euthanized (*Chapter 5: Herd Health*), depending upon the severity of the condition, processing plant policy, and state or USDA regulations.

! Culling strategies can differ at each operation. General guidelines include selling cattle that are no longer producing, or their condition is declining.

It is important to ship an animal sooner rather than later. If culling is delayed, it allows for a longer time period for health and/or condition to decline.

Culling Guidelines:

- Do not market culled animals that pose a public health threat, for example an animal with a viral zoonotic disease (*Chapter 4: Biosecurity*).
- Be certain that ALL animals shipped to market have cleared withdrawal times.
- Do not market culled animals that have an advanced terminal condition.
- Do not send disabled culled animals to market, they must at least be a mobility score 2.
- Market culled animals BEFORE they become a BCS of 2 or less.

Fitness For Transport

Compromised Cattle

A compromised animal is an animal with reduced capacity to withstand transportation, but when transported with special provisions its condition is less likely to deteriorate. Identify “special needs/compromised” cattle such as those with mobility issues, low body condition score, or suspected/confirmed disease issues.

- Special needs/compromised animals that have conditions that increase the likelihood of becoming non-ambulatory (downer) because of commingling in transport should be either left at the farm or transported in a separate compartment without contact with other animals.
 - Special needs/compromised cattle should be protected on the trailer and be loaded on the back of the trailer to make it easier for them to unload (loaded last/unloaded first).
- If injured cattle that are still able to walk and stand must be transported, they should not be mixed with other cattle. Injured cattle should only be transported to a veterinary facility or for emergency slaughter at a packing plant capable of handling such animals.
 - Provide extra care during loading, unloading and handling of injured cattle, that are still able to walk and stand, to prevent further injury.

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Evaluating Fitness for Transport

The first and most important decision to be made is each animal's fitness for transport. Having the knowledge to make this decision is essential for animal well-being. There are multiple considerations to keep in mind as you make decisions on whether an animal is fit for transport or not.

Fitness for Transport Guidelines for Cattle Mobility

Lameness compromises cattle well-being and is a management priority for the herd. Additionally, lame and disabled cattle are perception problems for the industry. Many problems with lame cattle are easily avoidable if producers cull animals before they develop feet and leg problems. When evaluating mobility/lameness, it is common to use the four-point mobility scoring system.



Scan this code to
view an instructional
video about BCS.
American Angus Association

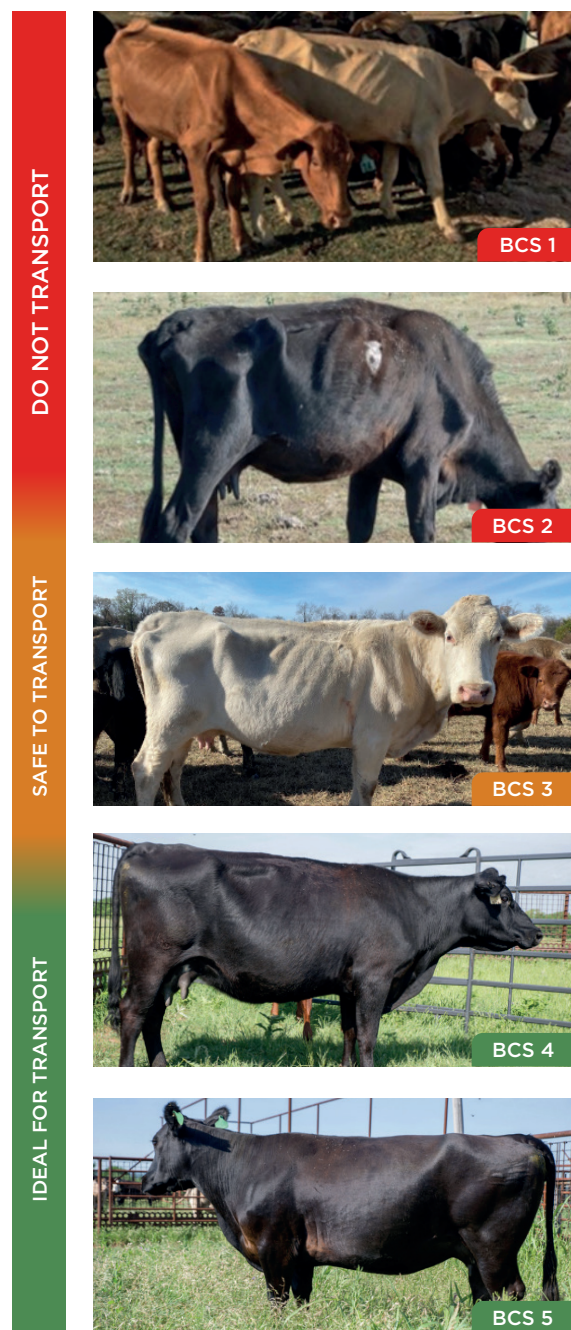
Figure 1: Mobility Score Scale

- 1 Mobility Score 1**
 - Normal
 - Walks easily
 - No apparent lameness
 - No change in gait
 - **Fit for transport**
- 2 Mobility Score 2**
 - Exhibits minor stiffness
 - Shortness of stride
 - Slight limp
 - Keeps up with normal cattle in the group
 - **Fit for transport**
- 3 Mobility Score 3**
 - Exhibits obvious stiffness
 - Difficulty taking steps
 - Obvious limp and/or discomfort
 - Lags behind normal cattle walking as a group

Cattle with a mobility score 3 should be strongly scrutinized and evaluated for their ability to make the full trip to their end destination and in shape to walk into the processing plant. These are considered compromised cattle, and it is likely for them to deteriorate and go from a mobility score 3 to a mobility score 4 on the trip or become non-ambulatory (downer). If mobility score 3s must be transported, travel the shortest distance possible and consider building a relationship with a local packing plant as a marketing outlet. Additionally, take measures to ensure the journey is made more comfortable, this may include adding bedding and putting the animal in its own compartment of the trailer.

- 4 Mobility Score 4**
 - Extremely reluctant to move even when encouraged by a handler
 - Statue-like
 - **Not fit for transport**

Figure 2: Body Condition Score and Fitness for Transport



Fitness for Transport Guidelines for Cattle Body Condition Score

Use the common Body Condition Score (BCS) system to evaluate the overall condition of cattle. BCS is a range from 1-9 (Figure 2 and page 103), 1 being extremely emaciated and 9 being morbidly obese. Cattle with extremely low BCS do not have the energy to withstand the rigors of transport.

DO NOT transport cattle with a BCS of 2 or less.

Fitness for Transport Guidelines for Cattle Health

Cattle management starts with the foundational health of the herd. It is inevitable that all cattle will reach the end of their productive lives while in the producer's care, but if the animal's health is maintained throughout its lifetime, the cow will have better outcomes when it is time to be culled from the herd. If the health of the animal does not improve, consider humane euthanasia (*Chapter 5: Herd Health*).

DO NOT

- Transport heifers or cows that are close to calving. Stress from transportation may cause early labor.
- Transport cattle that require mechanical assistance (e.g., hip lifts or hobbles) to rise and walk except for veterinary treatment. When using any handling device, abuse is not tolerated.
- Transport cattle with significant bone fractures or injuries (e.g., broken limbs, injured spine, broken jaw). Animals suffering from these injuries should be humanely euthanized.
- Transport cattle to a packing or processing facility until all proper treatment withdrawal times have been followed.
- Transport cattle that pose a public health threat, such as animals showing neurological signs or zoonotic disease symptoms.
- Transport cattle with conditions that will not pass pre-slaughter inspection at a packing or processing facility.¹

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DELAY

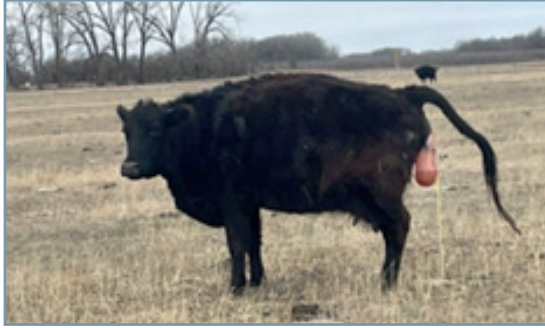
- Transport of any cattle that appear to be exhausted or dehydrated until the animal is rested, fed, and rehydrated.
- Transport and reassess if the health of the animal is deteriorating and consider treatment options (*Chapter 5: Herd Health*).

Scan this code to view
an instructional video on
mobility scoring for cattle.
The Meat Institute



¹ Food Safety Inspection Service. (September 21, 2016). Ante-mortem inspection. United States Department of Agriculture. https://www.fsis.usda.gov/wps/wcm/connect/04739d5f-6342-4b24-bcdf-1f55f77a3420/PHVt-Antemortem_Inspection.pdf?MOD=AJPERES

EXAMPLES OF WHEN NOT TO SHIP



Imminent Calving



Advanced Cancer Eye



Prolapse



Injury Impairing Mobility



Non-Ambulatory (Downer)



Emaciated Cattle (BCS Score ≤ 2)



Examples of Broken Limb, Severe Limb Injury, or Spinal Injury.

Emergency Slaughter

Emergency slaughter is the act of harvesting an animal that is fit for human consumption prior to the expected harvest date or under conditions that are not normal for the operation to capture any value of the animal without jeopardizing animal welfare and human safety.

Emergency slaughter may be considered for animals where recovery is unlikely or incomplete, treatment facilities are inadequate or there is insufficient time available for effective treatment and full recovery. It becomes an option when there is a nearby harvest facility that is capable of handling compromised animals or any other situation where emergency slaughter would be deemed appropriate and necessary. Additionally, considerations of transport to such facilities must be made to ensure the welfare and comfort of the animal. A veterinarian may need to be consulted for advice on the fitness of the animal for transport. Strong consideration should be given to the animal's existing level of pain and distress and what might happen should the process not go according to plan. The animal must be free of any residues (i.e., animal health products), have a low likelihood of being condemned, and be fit for the journey.

Non-Ambulatory (Downer) Cattle²

A non-ambulatory animal (commonly referred to as a 'downer') is unable to stand up or walk, even if assisted. Manage and monitor cattle to prevent infections and injuries that cause cattle to become non-ambulatory. In the event an animal becomes non-ambulatory, manage and care for it in a humane manner. Marketing cattle promptly before this issue occurs will promote a better quality of life for the animal and be more efficient for the operation.

- Promptly diagnose non-ambulatory animals and determine whether the animal should be humanely euthanized or receive treatment.
- Provide adequate fresh feed and water to non-ambulatory cattle that is easily and readily accessible at least twice daily.
- Move downed animals using acceptable methods to avoid compromising animal welfare.
 - Acceptable methods of transporting downers include a sled, low-boy trailer, or in the bucket of a loader. Animals should not be scooped into a front-loader bucket but rather humanely rolled into the bucket and restrained by caretakers. Hip lifts should only be used to help an animal rise, not to move the animal.
- Humanely euthanize animals who refuse to eat or drink and/or are unable to sit up unaided (i.e., lie flat on their side) for 24-36 hours.
- Euthanize downed animals that do not respond to treatment and their condition continues to deteriorate.

Transport Direct to Emergency Processing Facility ASAP

- Bloat
- Hardware disease with localized signs
- Intestinal accidents
- Recent injury
- Urethral blockage (acute)
- Broken jaw

Key Considerations for Emergency Slaughter

- Destination is equipped to handle a compromised animal for emergency slaughter.
- Develop a relationship with a local locker in advance to potentially take cattle for emergency slaughter.
- The animal has been deemed fit for transport; consult with a veterinarian to make these decisions.
- The animal can withstand further handling after transport.
- Carcass condemnation is unlikely.

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² American Association of Bovine Practitioners. 2020. Care and disposition of non-ambulatory and injured ambulatory cattle. https://www.aabp.org/Resources/AABP_Guidelines/non-ambulatory2020.pdf

**DO NOT Transport Non-Ambulatory Cattle.
When Handling Non-Ambulatory Animals:
NEVER ...**

- Drag non-ambulatory animals.
 - In some emergency situations it is necessary to drag animals a short distance to protect human and animal safety. However, it should only be done according to an approved protocol where animal welfare is considered.
- Drag a non-ambulatory animal off the trailer.
- Use an electric prod to stimulate an injured or disabled animal to get up.
- Use chains, rope, or cables to lift, suspend, or move the animal unless necessary to prevent further injury or death, if allowed by state/federal regulations.
 - Always use straps under the front legs/chest and hind legs/flank to lift animals.
- Let a non-ambulatory animal remain in any area where they may get walked on or trampled.

Transportation

Pre-Trip and On the Road

Every time cattle are hauled, risks are involved. Mitigating common risks can prevent many accidents. Common risks include adverse weather, equipment failure, distracted and impaired driving, as well as driver fatigue.

Guidelines When Transporting Your Own Livestock

- Do a structural check of trailer/truck and tires prior to loading livestock.
- Inspect trailer and truck for cleanliness (*Chapter 4: Biosecurity*).
- Inspect trailer gates and flooring to be sure they are structurally sound. Gates should close completely, and all hinges and handles must shut and latch completely. Flooring should not have any weak spots or holes. Damaged flooring and gates can injure and bruise cattle.
- Check the weather and route to ensure a safe trip.
- Verify drug withdrawal times on any animals being sold.
- Verify that all animals are fit for transport.
- Back up squarely and evenly to the loading chute.
- Calculate correct loading density (Tables 1-2).
- Load using low-stress handling practices (*Chapter 3: Cattle Behavior, Handling, and Facility Design*).
- Pull away from the chute slowly and drive smoothly to allow cattle a chance to gain their balance in transit.
- Minimize time in transit by limiting stops and using prior preparation to ensure a safe event.
- Consult **www.interstatelivestock.com** and ensure drivers have proper animal documentation when transporting cattle.

Pre-Planning Checklist

Driver

- ☐ Be adequately rested, healthy and alert
- ☐ Know hours-of-service regulation
- ☐ Know livestock state import requirements

Route Planning

- ☐ Consider traffic and road conditions
- ☐ Communicate route and approximate arrival times
- ☐ Anticipate weather during travel

Paperwork Needed

- ☐ Specific locations of load pickups and drop-offs
- ☐ Health and animal ID paperwork, when required
- ☐ List of important phone numbers

Equipment Inspection

- ☐ Fuel up before loading
- ☐ Review relevant legal requirements
- ☐ Clean trailer
- ☐ Check fluid levels (including fuel)

Trailer Inspection

- ☐ Ensure ramps function properly
- ☐ Check for sharp edges/protrusions
- ☐ Clean out traps and trailer
- ☐ Inspect safety chains
- ☐ Inspect lights
- ☐ Inspect brakes
- ☐ Inspect safety latches and gates
- ☐ Inspect axles and tires

Weather

- ☐ Check the weather and plan accordingly
- ☐ Add weather-specific provisions to trailer

Loading and Unloading

Transportation is a stressful event. An animal's loading and unloading experience can have a significant impact on cattle health if the destination is a farm, ranch, dairy, or feeding operation and carcass quality if the final destination is a packing facility. Using proper and effective animal handling techniques during loading and unloading can help minimize stress, thereby allowing cattle to remain healthier and more quickly acclimate to their new environment. It is not acceptable to intentionally cause physical injury and/or unnecessary pain on cattle when loading, unloading, or transporting. Handle/transport all cattle in a manner to minimize stress, injury, and bruising.

Loading and Unloading Guidelines³

- Do not ship cattle that are unable to withstand the rigors of transportation.
- NEVER knowingly inflict physical injury or unnecessary pain on cattle when loading, unloading, or transporting them.
- Properly design and maintain loading facilities for easy and safe animal movement.
- Locate sorting and holding pens near the loading/unloading facility.
- Ensure sorting and holding pens are suitable for herd and load size.
- Ensure cattle sorting and holding pens allow handling without undue stress.
- Ensure sorting and holding pens have non-slip footing.
- Provide water for cattle in the holding pens especially during times of heat stress.
- Ensure all personnel properly use loading facilities to assure the safety of both cattle and cattle handlers.
- Ensure all vehicles used to transport cattle provide for the safety of personnel and cattle during loading, transporting, and unloading.
- Ensure ramps and chutes are strong and solid, provide non-slip footing, and have sides high enough to keep cattle from falling or jumping off — a ramp angle of 25 degrees or less will improve cattle movement.
- Ensure there is not a gap between the ramp, its sides, and the vehicle that would allow injury to an animal.
- Ensure vehicle doors and internal gates are sufficiently wide to permit cattle to easily pass through without bruising or injury.
- Strictly adhere to safe loading density levels with regard to animal weight and space allocation.
- Provide adequate space for cattle in trailers. Cattle should have sufficient room to stand with little risk of being forced down because of overcrowding.
- Load, unload, and move cattle through facilities with patience and as quietly as possible to reduce stress and injury.
- Use cut gates in trailers and in trucks to provide stability for the cattle and the vehicle.



³ Food Safety Inspection Service. (2016). *Inhumane handling of livestock in connection with slaughter by persons not employed by the official establishment*. National Register, 81(207) 74280-74281. www.govinfo.gov/content/pkg/FR-2016-10-26/pdf/2016-24754.pdf

Guidelines for Contracting Livestock Haulers

- Use a BQAT certified transport company that is knowledgeable about cattle care expectations and provides for the safety and comfort of the cattle during transport.
- Ask hauling contractor/driver for proof of a valid BQAT certification.
- Establish good communication/logistics with both the trucking company and the receiver of the livestock.
- Require trucks to arrive clean and bedded with wood chips or shavings, when applicable, before loading to decrease biosecurity risks.
- Encourage the driver to minimize time in transit by limiting stops and using prior preparation to ensure an organized event.

Transportation Tips to Prevent Risks

- Plan the safest route.
 - Be aware of alternate routes in case something goes wrong.
 - Determine if routes are appropriate based on the truck and trailer weight.
 - Anticipate traffic, number of stops, number of sharp turns, and road width.
 - Keep the animals comfortable and safe. Constantly monitor the comfort and condition of the animals during any delay.
- In case of an accident or breakdown.
 - Estimate how long the repairs will take.
 - If the repairs cannot take place at the site of the breakdown, or they will take an extended period of time, arrange for another truck to be sent to take the trailer. If the problem is with the trailer, determine if the animals must be moved or not.
- Avoid distractions and follow traffic laws.
 - DO NOT eat, drink, talk on the phone, text, check email, look at your phone, read, and/or reach for items on the floor or across the seat.
 - Always follow posted speed limits, load limits, and other signs and drive defensively.
 - Never tailgate, pass illegally, or attempt to beat traffic lights or railroad crossings.
 - Stay alert at all times; pay attention to those driving nearby.
 - Never drive impaired.
- Stay healthy and alert.
 - Manage the schedule to allow for the proper amount of sleep. The driver's health and the load's well-being depend on it.
 - If driving during the night, ensure the schedule allows for a quiet, restful sleep during the day.
 - Allow fresh air into the cab; playing music is a good strategy to stay awake.
 - Take a break to stop and stretch for five minutes. This is also a good time to do a quick check of the animals on board.
 - If experiencing symptoms of fatigue — pull over and call the dispatcher.

Table 1: Calf Hauling Loading Density Guidelines



		Calf Weight (lbs)		
		200	400	600
		Sq/Ft Per Animal		
		3.5 ft ²	6.5 ft ²	8.5 ft ²
Trailer/Compartment Size	Square Feet	Number of Head		
14 ft x 6 ft	84	24	13	10
16 ft x 6 ft	96	27	15	11
18 ft x 6 ft	108	31	17	13
20 ft x 6 ft	120	34	18	14
22 ft x 6 ft	132	38	20	16
24 ft x 6 ft	144	41	22	17
26 ft x 6 ft	156	45	24	18
30 ft x 6 ft	180	51	28	21
10 ft x 7 ft	70	20	11	8
12 ft x 7 ft	84	24	13	10
16 ft x 7 ft	112	32	17	13
20 ft x 7 ft	140	40	22	16
24 ft x 7 ft	168	48	26	20
28 ft x 7 ft	196	56	30	23
32 ft x 7 ft	224	64	34	26
24 ft x 8 ft	192	54	29	22
20 ft x 8 ft	160	45	24	18
28 ft x 8 ft	224	64	34	26
32 ft x 8 ft	256	73	39	30
12 ft x 8 ft	96	27	14	11
12 ft x 8.5 ft	102	29	15	12

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*Not all trailer sizes are included in the chart.

Calculations are based on FASS Guidelines⁴ for square foot per 100 lbs of animal needed:

200 lbs = 1.75 ft², 400 lbs = 1.6 ft², 600 lbs = 1.4 ft²

- Total weight should not exceed capacity of truck or trailer and/or legal load requirements.
- Shape of cattle and frame score factor into how cattle fit into compartment.

⁴ Federation of Animal Science Societies 2020. Guide for the care and use of agricultural animals in research and teaching. https://www.asas.org/docs/default-source/default-document-library/agguide_4th.pdf?sfvrsn=56b44ed1_2

Table 2: Mature Cattle Hauling Loading Density Guidelines



 TRANSPORTATION		Mature Cattle Weight (lbs)				
		800	1,000	1,200	1,400	1,600
		Sq/Ft Per Animal (Polled)				
		10.4 ft ²	13 ft ²	15.6 ft ²	18.2 ft ²	20.8 ft ²
Trailer/ Compartment Size	Square Feet	Number of Head				
14 ft x 6 ft	84	8	6	5	5	4
16 ft x 6 ft	96	9	7	6	5	4
18 ft x 6 ft	108	10	8	7	6	5
20 ft x 6 ft	120	11	9	7	6	5
22 ft x 6 ft	132	13	10	8	7	6
24 ft x 6 ft	144	13	11	9	7	6
26 ft x 6 ft	156	15	12	10	9	8
30 ft x 6 ft	180	17	14	12	10	9
10 ft x 7 ft	70	7	5	4	4	3
12 ft x 7 ft	84	8	6	5	5	4
16 ft x 7 ft	112	11	9	7	6	5
20 ft x 7 ft	140	13	10	9	7	6
24 ft x 7 ft	168	16	13	10	9	8
28 ft x 7 ft	196	19	15	13	11	9
32 ft x 7 ft	224	21	17	14	12	10
24 ft x 8 ft	192	18	14	12	10	9
20 ft x 8 ft	160	15	12	10	8	7
28 ft x 8 ft	224	21	17	14	12	10
32 ft x 8 ft	256	24	19	16	14	12
12 ft x 8 ft	96	9	7	6	5	4
12 ft x 8.5 ft	109	9	7	6	5	4

**Not all trailer sizes are included in the chart.*

Calculations are based on FASS Guidelines⁴ for square foot per 100 lbs of animal needed:
mature/fed cattle = 1.3 ft²

- For horned cattle, increase ft² per animal by 5%.
- Total weight should not exceed capacity of truck or trailer and/or legal load requirements.
- Shape of cattle and frame score factor into how cattle fit into compartment.

Emergency Transport Situations

Being prepared for an accident before it happens will keep the driver and the livestock safe. When accidents occur with a loaded trailer, the accident can turn more serious if animals escape onto the roadway.

- When able, immediately call 911.
- Put out emergency triangles showing an accident has occurred.
- Document the incident with photographs to provide to the insurance company and employer.
- Assess the situation to determine if it is life threatening for the driver, any other party involved, bystanders, or the livestock.
- NEVER open a contained trailer to release livestock unless animal containment and an alternate livestock transportation method is in place.



Scan code for
transportation
regulations by state.
[Interstatelivestock.com](https://www.interstatelivestock.com)

Transporting Cattle Regulations

It is the hauler's responsibility to know and understand the most current state and federal laws. All workers at the processing facility are required to adhere to the USDA Federal Handling Regulations. A cattle hauler needs to understand the plant's expectations of animal handling.

Federal Transportation Regulations

- On the Road⁵
 - Cattle can only be on the trailer for 28 hours without feed, water, or space to rest – provide 5 hours of rest time after 28 hours of confinement.

Federal Packing Plant Regulations

- Loading Pens⁶
 - Provide good footing, protect from extreme weather, and ensure there are minimal sharp corners.
 - Check the condition of driveways, ramps, and trailers.
 - Be sure to move cattle at a walking speed with minimal use of prods – never use items that could cause injury.⁷



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⁵ Twenty Eight Hour Law, 9 C.F.R. § 89 (2024). www.ecfr.gov/current/title-9/chapter-I/subchapter-C/part-89?toc=1

⁶ Livestock Pens, Driveways and Ramps, 9 C.F.R. § 313.1 (2024). www.ecfr.gov/current/title-9/chapter-III/subchapter-A/part-313/section-313.1

⁷ Handling of Livestock, 9 C.F.R. § 313.2 (2024). www.ecfr.gov/current/title-9/chapter-III/subchapter-A/part-313/section-313.2



Record Keeping Reminders

- Keep herd health papers if selling livestock or transporting across state lines.
- Maintain brand inspection papers.





CHAPTER 7
NUTRITION

Objectives

- Ensure cattle have access to an adequate and quality water supply, as well as appropriate nutrition. Avoid feed or water interruption for longer than 24 hours.
- Test feedstuffs - especially those suspected feedstuffs that could be detrimental to cattle well-being, such as nitrates, prussic acid, mycotoxins, etc.
- Only use feedstuffs and feed ingredients of satisfactory quality that are USDA, FDA, and EPA approved products for use in cattle; these products must be used in accordance with the approved product use guidelines.
- Do not feed ruminant-derived protein sources per FDA regulations.

Beef cattle producers have many different management decisions to take into consideration in order to have a profitable system. As ruminant animals, cattle excel at converting human inedible feeds (e.g., forage and byproducts from other industries) to a human-edible protein with a greater biological value. To do this, cattle require access to adequate nutrients.

Cattle nutrition is a broad category involving management of cattle's energy, protein, vitamins, minerals, and water intake. Properly managing these things is important because an animal's nutritional status has a direct impact on production efficiency, immunity, and carcass characteristics. Many factors affect an animal's nutrient requirements such as breed, type, weight, body condition, sex, age, environment, health, reproduction status, and purpose in the beef supply chain. As such, feeding strategies vary greatly across the U.S., but each should fit the animal's nutrient requirements and performance expectations. For local recommendations and advice, contact a state agricultural extension agent or nutritional consultant.

An excellent reference and guide with details on beef cattle requirements and nutritional concepts is available in the 2016 National Academies of Sciences, Engineering, and Medicine Nutrient Requirements of Beef Cattle.



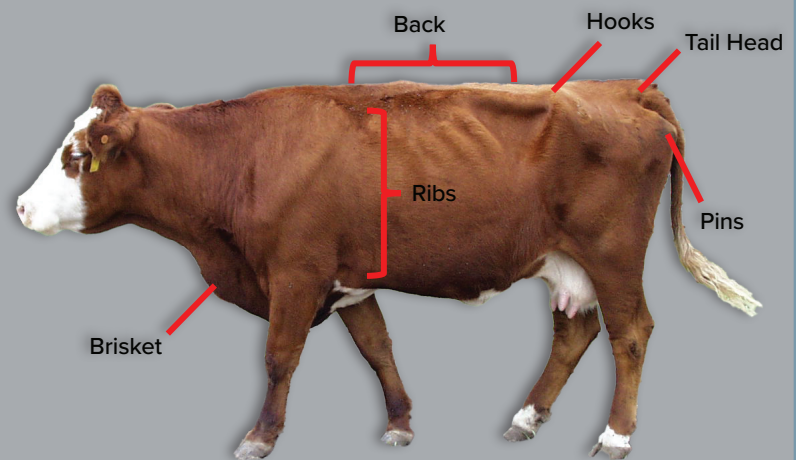
Cow Body Condition Scoring

Nutritional management of the cow herd includes utilizing a scientifically proven method called Body Condition Scoring (BCS) to monitor herd nutritional status. When cows are deficient in energy or protein, they will lose weight which usually initially consists of fat. A cow's BCS reflects the amount of energy stores in her body (i.e., fatness) at a given point in time. BCS at calving is an indicator of reproductive success in the coming production year. BCS in beef cattle range from 1 (emaciated) to 9 (obese). Targeting a BCS between 5 and 6 for cows at calving promotes optimum reproduction and calf health. Average BCS may change based on breed and regionality.

Cows that calve in lower BCS can have reduced pregnancy rates. Also, cows calving in lower BCS may produce a lower volume and quality of colostrum and less milk which can result in reduced

disease resistance and growth in the calf. Calves birthed by thin cows have increased risk of morbidity and mortality during the first two to four weeks of life.

Figure 1: Common Evaluation Points for Body Condition Scoring Cattle as Seen on This BCS 3 Cow



**Beef BCS
tutorial video.**
American Angus
Association



**Dairy BCS
information.**
National Dairy
FARM Program



Body Condition Scores



BCS 1

Cattle in this score are extremely rare and are usually affected by a disease and/or parasitism.



BCS 2

Muscle tissue appears severely depleted through the hindquarters and shoulder.



BCS 3

Some muscle depletion appears evident through the shoulder and hindquarters.



BCS 4

The cow appears thin, with ribs easily visible and the backbone showing. The spinous processes (along the edge of the loin) are still sharp but barely visible individually. Muscle tissue is not depleted through the shoulders and hindquarters.



BCS 5

The cow is severely emaciated and physically weak with all ribs and bone structure easily visible.

The cow appears emaciated, similar to BCS 1 described above, but not extremely weakened.

The cow is very thin with no fat cover on ribs or in the brisket and the backbone is easily visible.

The cow appears thin, with ribs easily visible and the backbone showing.

The spinous

The cow may be described as moderate to thin. The last two ribs may be seen and little evidence of fat is present in the brisket, over the ribs, or around the tail head. No muscle depletion is seen in the hindquarter or shoulder areas. The back is now smooth with the backbone no longer identifiable.



BCS 6

The cow has a smooth appearance throughout. Some fat deposition is present in the brisket and over the tail head. The back appears rounded and fat can be palpated over the ribs and pin bones.



BCS 7

The cow has apparent fat cover throughout the body and the hook and pin bones are difficult to

distinguish. The brisket is full, the tail head shows pockets of fat and the back appears square because of fat. The ribs are very smooth and covered with fat.



BCS 8

The cow is obese. Her neck is thick and short and her back appears very square because of excessive fat. The brisket is distended and she has heavy fat pockets around the tail head.



BCS 9

These cows are very obese and are rarely seen. They can be described as similar to 8 but taken to greater

extremes. They also have a heavy deposition of udder fat.

BCS scoring of beef cows adapted from Oklahoma State Cooperative Extension Service.

Body Condition Scoring involves visual appraisal of the cow. The hindquarter, shoulder, backbone, ribcage, and top line between the ribcage and hip bones are common evaluation points (Figure 1). For example, observe the last half of the ribcage. If more than two ribs are easily discernible, then BCS is probably less than 5. Another example, if the individual vertebra in the backbone are visually apparent, expect the cow to have a body condition score of 4 or lower.

Some producers ask whether cows need to be felt to determine fatness or if they can simply be looked at to assess condition scores. A recent study indicated that cows can be separated equally well by palpation of fat cover or by visual appraisal, but the average score may vary slightly depending on the method used. For cattle with long hair, handling may be of value, but when hair is short, handling is unnecessary. Keep in mind that shrink can alter the look and feel of the cattle as much as one score. Animals in late pregnancy also tend to look fuller and a bit fatter.

Critical Nutrients for Beef Cattle¹

Energy

Energy is the most important nutritional consideration that constitutes the majority of diets. Energy can be provided through carbohydrates (starch and fiber), oil or fat, or can be from protein (diet or muscle degradation). For cow-calf and backgrounded/stocker beef producers, laboratories can calculate the energy value of forages by measuring their fiber content. The energy calculations are usually expressed as total digestible nutrients (TDN) and/or net energy (NEm: net energy for maintenance; NEg: net energy for gain). One of the greatest attributes of beef cattle is the ability to convert forages to human edible protein.

Protein

Cattle require protein and it is the second most important nutrient. Protein nutrition is a bit complex for beef cattle as there are actually two requirements to consider when evaluating dietary supply relative to requirements — those of the animal and also the requirements of the rumen microorganisms. Feed sources provide one of two sources of protein, to either the microbes in the rumen (rumen degradable protein; RDP) or protein that ‘bypasses’ the rumen and is not degraded or changed in the rumen (rumen undegradable protein; RUP).

Microbes that are digesting feed in the rumen are releasing energy from feeds often that cattle could not utilize on their own, such as fiber in forages. The protein supplied to the animal comes from the protein in the rumen microbes as they are digested after flowing from the rumen and also from RUP. For producers, diets may need supplementation and the source of the protein supplement matters as sometimes RDP is needed and sometimes feeds that are a source of RUP are required. Understanding which type and amount of protein is necessary for supplementation is important to manage costs and productivity.

Minerals and Vitamins

Minerals and vitamins have various roles in the body and need to be considered after sufficient energy and protein are supplied. One critical decision producers need to make is whether or not to provide cattle with a supplemental vitamin and mineral source. To make that decision, determine the amount supplied by the diet and whether that supply alone is sufficient to meet the cattle requirements at their stage of production (Table 1).

Producers can evaluate the mineral status of their herd through blood or tissue (liver) sample collection. However, for some minerals, a “perfect” method of determining mineral status of an animal has not been identified. Additionally, some tissues (including blood) are not good indicators of status. In most cases, historical status is unknown and is not evaluated until major health or performance outcomes are compromised and then status of the cattle is evaluated.

An alternative method to determine adequacy of mineral intake is to evaluate feedstuffs and water

¹ Stewart, L. (2017, April). *Mineral Supplements for Beef Cattle*. University of Georgia Extension <https://extension.uga.edu/publications/detail.html?number=B895&title=mineral-supplements-for-beef-cattle#:~:text=Beef%20cattle%20require%2010%20microminerals,are%20shown%20in%20Table%202>

(page 113) for mineral content. It is important to keep in mind that not all minerals in forages are high in bioavailability.

The most common reason to evaluate an animal's trace mineral status is because the performance of the animal is below normal. However, clinical symptoms, due to mineral deficiency or excess, are not always clearly identified by a producer. Even though symptoms may not be present, the animal may have a reduction in growth, reproduction, immunity, or feed efficiency. The purpose of mineral supplementation is to prevent or stop a deficiency problem from occurring.

Macrominerals

Minerals are classified into two different categories: macro- and microminerals. Macrominerals are required by the animal in a larger concentration and are usually included as a percentage of the diet. Calcium (Ca), Chloride (Cl), Magnesium (Mg), Phosphorus (P), Potassium (K), Sodium (Na), and Sulfur (S) compose the macrominerals.

Microminerals

Microminerals, also known as trace minerals, are required in the diet at small concentrations, usually as parts per million. Cobalt (Co), Copper (Cu), Iodine (I), Iron (Fe), Manganese (Mn), Molybdenum (Mo), Selenium (Se), and Zinc (Zn) are trace minerals and considered essential for beef cattle due to the fact that they play a role in various functions within the body.²

It is important for a cow in late gestation to be at adequate status for microminerals because milk is a poor source of microminerals to a newborn calf. Calves receive their initial stores of microminerals in utero from the dam. These stores need to be sufficient for the calf until the calf begins consuming feedstuffs containing trace minerals.

Selenium and EDDI (organic iodine) are the only minerals regulated by the FDA, with maximum allowable levels at 3 mg and 49.9 mg per head per day for Se and EDDI, respectively. Selenium deficiencies can occur, but excess Se can be toxic and the window for adequacy and toxicity is narrow.

Mineral Antagonists

A mineral interaction or antagonist is when one mineral prevents the absorption or use of another mineral. There are several different types of interactions which include competition for absorption sites in the body, negative effects on ruminal absorption, or the formation of insoluble complexes preventing absorption. In the situation where antagonists exist, mineral supplementation is usually warranted. An example is the combination of sulfur in water and molybdenum in forage affecting copper availability. Excesses of certain minerals can reduce availability of others, so balanced diets are important.

Mineral Linked Disorders

Grass Tetany is caused by a deficiency in Mg or Ca. Generally, it occurs when cattle graze lush, cool season grasses. This is because of the rapid forage growth where the forage has elevated K or Nitrogen (N). This elevated intake of K and/or N causes a reduction in Mg absorption in the rumen. A preventive measure is to feed high Mg mineral during the grazing of quick growing cool season grasses.

Urinary calculi, which can lead to water belly, are caused when hard mineral deposits occur in the urinary tract of cattle. Most commonly observed in feedlot cattle or cattle consuming high P diets. A preventive measure is to ensure a dietary calcium-to-phosphorus ratio of 2:1.

Vitamins

Vitamins are classified as either fat soluble or water soluble. The fat-soluble vitamins include vitamins A, D, E, and K. The water-soluble vitamins include vitamin C and B-complex vitamins. Generally, actively growing forages contain many of the vitamins that cattle need. However, when cattle are grazing dormant pastures or stored forages, supplementation of vitamins A and E may be necessary.

Macrominerals

11 Na Sodium	12 Mg Magnesium
15 P Phosphorus	16 S Sulfur
17 Cl Chlorine	19 K Potassium
20 Ca Calcium	

Microminerals

26 Fe Iron	42 Mo Molybdenum
34 Se Selenium	30 Zn Zinc
29 Cu Copper	27 Co Cobalt
25 Mn Manganese	53 I Iodine

² National Academies of Sciences, Engineering, and Medicine. 2016. *Nutrient Requirements of Beef Cattle: Eighth Revised Edition*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/19014>.

Table 1: Micromineral Requirements and Maximum Tolerable Levels for Beef Cattle²

Mineral	Unit	Requirements			Maximum Tolerable
		Cows			
		Growing and Finishing Cattle	Gestating	Early Lactation	
Chlorine	%	-	-	-	-
Chromium	ppm	-	-	-	1,000
Cobalt	ppm	0.10	0.10	0.10	10
Copper	ppm	10.00	10.00	10.00	40
Iodine	ppm	0.50	0.50	0.50	50
Iron	ppm	50.00	50.00	50.00	1,000
Magnesium	%	0.10	0.12	0.20	0.40
Manganese	ppm	20.00	40.00	40.00	1,000
Molybdenum	ppm	-	-	-	5
Nickel	ppm	-	-	-	50
Potassium	%	0.60	0.60	0.70	3
Selenium	ppm	0.10	0.10	0.10	2
Sodium	%	0.06-0.08	0.06-0.08	0.10	-
Sulfur	%	0.15	0.15	0.15	0.40
Zinc	ppm	30.00	30.00	30.00	500

Feeding Guidelines for Classes of Cattle

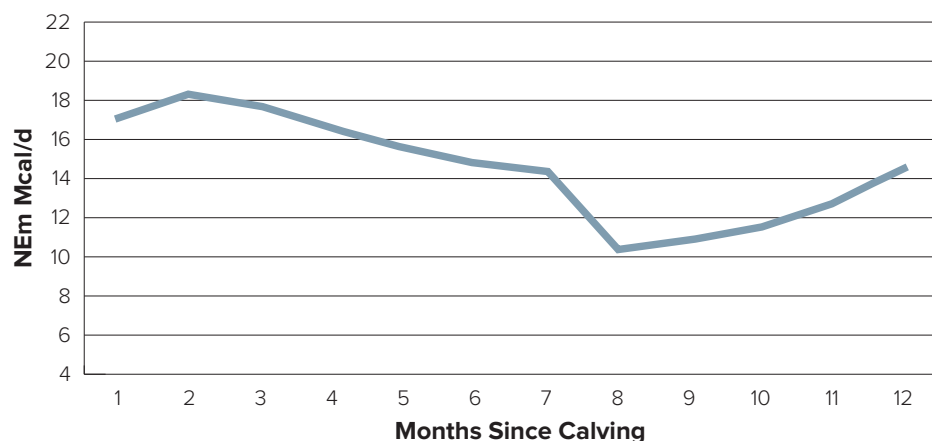
Beef Cows and Heifers

As previously mentioned, dietary requirements are affected by a multitude of factors. However, the change in requirements over time as they are affected by stage of production is important to understand. Cow and heifer requirements begin increasing exponentially in late gestation and continue to increase after calving until peak lactation (Chart 1). As milk production begins to decline after peak lactation, requirements decline gradually and are markedly lower after weaning.

Proper nutrition management requires an understanding of the supply of nutrients from grazed or fed feeds and the requirement of the animal. Attention to mismatches in nutrient supply versus demand at critical times such as late gestation and during the breeding season is important to maintain optimum production. Feeding and supplementation plans can be developed to make sure these mismatches are not resulting in significant declines in BCS. The effects of extreme heat and cold on animal requirements must be considered to avoid nutrient deficits and significant loss of BCS in key times during the production year.

Nutrition plans should be designed to provide adequate energy, protein, macrominerals, and trace minerals during the year. Supplementation of grazing cattle is a tool that can be used if nutrient mismatches are significant. Cattle grazing forages that are very low in protein (like dormant forages) may respond to protein supplements offering RDP. In late gestation or in cases of significant nutrient deficits in early lactation, grazing cattle may respond to supplements providing energy and RUP. Cattle managers are encouraged to seek the advice of a nutrition expert in designing rations that meet requirements and to help design appropriate supplementation programs for the cow herd. Ultimately, production metrics can help producers understand if there are mismatches in the nutrition program that need remedied.

Chart 1: Cow Energy Requirements (Net Energy for maintenance, pregnancy, and lactation; NEm)
Across the Production Year (assume weaning between 7 and 8 months after calving)



Bulls

Proper management and nutrition of bulls is critical to a cow-calf operation's reproductive efficiency and genetic improvement of the calf crop. It is important to develop bulls appropriately through puberty and to maintain their health throughout their productive lives. This may vary by breed, region, and management goals. The following resources have more detailed information on bull management and nutrition. Producers are encouraged to work with their resource group including nutritionists, extension specialists, veterinarians, or others.

Stocker and Backgrounding Cattle

Stocker and backgrounding cattle are raised on a wide variety of forages (e.g., native pasture, annuals, improved pasture, hays, silages, etc.) with varying nutrition and corresponding amounts of nutrient supplementation. Producers grazing stockers should first establish stocking rates that meet production goals for animal growth and performance, while not sacrificing soil and plan health. See *Chapter 8: Environmental Stewardship* for more information.

The stocker industry is a transitional sector that adds value to the beef cattle production chain by improving calf health prior to feedlot entry, adding weight to calves through use of seasonal forage supplies such as wheat pasture grazing, and leveling the seasonality in calf supplies created by the cow-calf sector. Access to feed is important throughout this phase and especially in the receiving pen. Time of year and feed availability determine grazing and feeding strategies with stocking densities being an important consideration for any system.

Cattle can then be supplemented as needed to meet maintenance or growth requirements for the targeted production goals of the operation, whether that be energy-based or protein-based supplementation strategies (or both). The goal in a typical stocker or backgrounder system is to maintain a positive plane of nutrition throughout the growing phase.

Feeder Cattle

Rations for feedyard cattle can contain a variety of ingredients depending on the region of the country and prevailing commodity prices. Regardless of the region, a typical ration contains a high proportion of grain(s) and/or grain byproducts and smaller proportions of roughages (e.g., hay, straw, silage, hulls, etc.), feeds supplying protein, and a supplement providing protein (if supplemental protein required), minerals, and vitamins.

Consult a nutritionist (e.g., private consultant, feed company consultant, or university extension personnel) for advice on ration formulation and feeding programs that ensure performance goals are met, including animal health outcomes. Monitor and evaluate mixing of finishing diets to ensure uniformity.

Cattle require adaptation to high-grain (starch) finishing diets to avoid acidosis and associated disorders. Most adaptation programs gradually replace forage or fiber with grain over a 21-to-28-day period. In addition, changes are occurring within the rumen relative to microbial populations, but those adjustments are generally much more rapid than 28 days. Cattle that experience ruminal acidosis may present similar symptoms as cattle experiencing BRD or other ailments so proper understanding of disease symptoms and accurate diagnosis are critical to prevent mistreatment.

Deliver feed on regular intervals to avoid hunger and over consumption of high-grain diets by finishing cattle. Cattle are trained to be fed daily at a consistent time which emphasizes management challenges when disruptions like weather prevent timely feed delivery. Avoid sudden changes in ration composition or amount of ration offered.

Maintain adequate bunk management systems/regimen and provide small proportion of the diet as forages (roughage) to minimize risk of rumen upsets. Monitor changes in feed consumption, feeding behavior, fecal consistency, incidence of digestive upsets (acidosis or bloat), and foot health to help evaluate the feeding program.

A percentage of cattle on feed may develop laminitis or founder. Mild cases do not affect animal welfare or performance; however, excessive hoof growth can compromise movement. In these instances, provide the individual animal appropriate care and market it as soon as possible.

Additional Feeding Guidelines Resources

Bull Nutrition and Management, Ohio State University

<https://agmr.osu.edu/sites/agmr/files/imce/pdfs/Beef/BullNutritionAndManagement.pdf>

Bull Management and Nutrition from the Range Beef Cow Symposium XXI

<https://beef.unl.edu/c1b25e74-a509-4323-ac84-0f0c5e725c7a.pdf>

Stocker Cattle Receiving Management, Mississippi State University Extension

https://extension.msstate.edu/sites/default/files/publications/publications/P2506_web.pdf

Stocker and Backgrounding Cattle Management and Nutrition, Kansas State University

https://bookstore.ksre.ksu.edu/pubs/stocker-and-backgrounding-cattle-management-and-nutrition_C723.pdf

Management of Early Weaned Calves, University of Nebraska-Lincoln Extension

<https://extensionpubs.unl.edu/publication/g2047/2011/pdf/view/g2047-2011.pdf>

Nutrition and Management Considerations for Preconditioning

Home Raised Beef Calves, Oklahoma State University Extension

<https://extension.okstate.edu/fact-sheets/print-publications/afs/nutrition-and-management-considerations-for-preconditioning-home-raised-beef-calves-afs-3031.pdf>

Diet Formulations Tools

Oklahoma State University Cowculator: Tool for Nutritional Management of Mature Cows

<https://extension.okstate.edu/fact-sheets/cowculator-v2-0-beef-cow-nutrition-evaluation-software.html>

Iowa Beef Center Beef Ration and Nutrition Decisions Software (BRaNDS)

<https://www.iowabeefcenter.org/software.html>

University of Georgia Basic Balancer

<https://extension.uga.edu/publications/detail.html?number=B1371&title=uga-basic-balancerOthers>

Weaning Nutritional Management

One of the most stressful periods in a calf's life occurs during the weaning process. Stress suppresses the immune system. Removal from the cow, introduction to a new environment, and commingling with cattle of different origins are stressful events.

This stress is accompanied by reduced feed and water intake and exposure to pathogens. These stressors result in the greatest risk of freshly weaned calves requiring treatment for BRD. These risks are decreased if calves are weaned and held at the ranch for a minimum of 45 days.

The feeding of weaned calves requires planning and monitoring. Freshly weaned calves will consume about 1.5% of their body weight to begin with and this should increase to >2.5% of their body weight by 28 days after weaning. To begin, weaned calves should be fed good quality hay (legume/grass hay mix or better) and have access to clean water. Later, various energy and protein sources can be added to increase weight gains.

Weaned Calf Diets

Proper nutritional management of calves post-weaning supports their sustained health and ability to realize their genetic growth potential. Calves must be adapted to new feedstuffs after weaning from their dam's milk. It is best to do this in a step manner, starting with adding additional feeds to feedstuffs calves are already accustomed to such as grass and creep.

Nutrition Tips for Post-Weaned Calves

- Introduce calves to rations they'll be offered post-weaning prior to removing from dams when possible. For best results, introduce feed in bunks so calves learn to eat from troughs (i.e., bunk broke). Feeds can also be introduced via a creep feeder as a way to transition to post-weaning diets.
- Replace the high-quality nutrients in cow's milk with high-quality forages and possibly supplement grain or byproducts when available. The amount of grain should be managed to avoid calves growing rapidly and fattening if the operation's goals are to prevent calves from being 'fleshy' or having too much fat cover relative to growing frame (muscle and bone growth as primary target).
- Provide trace minerals as these play an important role in the calf's immune function.
- Provide unlimited fresh water. If the water source is new, make accommodations to familiarize calves with it such as letting it overflow a little at first.
- Determine targeted weight gain goals for calves and adjust feed offered (or energy concentration) as appropriate.
- Ensure calves weaned in a drylot have adequate bunk access (minimum 16-18 inches/head).
- Avoid fermented feeds such as silage until calves are eating well post-weaning then step them up to high silage diets.
- Limit high-starch energy sources to ensure calves cannot overload on starch from grain, which may result in acidosis, founder, laminitis, and other ailments that can often present similar symptoms as respiratory disease such as lack of appetite, lethargy, or poor performance.

Many different options are available for weaning programs relative to nutrition. Weaning at the ranch of origin and different management practices can ease this critical transition phase and minimize BRD risk. Calf intakes may be quite low during this initial weaning phase so ensuring the amount of nutrients provided in the diet are meeting requirements is critical. This means inclusion of protein, minerals, and vitamins that are necessary in the diet may be included at concentrations greater than commonly recommended. Knowing intake and requirements is important during this phase in terms of diet formulation and delivery of nutrients.

Preconditioning Calves

Preconditioning is the process by which calves are weaned and conditioned before moving them to grass or a backgrounding yard for growing or sending them straight to a feedyard for finishing. The preconditioning process improves the likelihood that a calf can deal with future stressors and exposure to pathogens without health complications. See *Chapter 5: Herd Health* for more information.



Calves that have fewer health problems after they leave the ranch require less medication which reduces costs and lowers the potential for injection site lesions and residues; suffer less death loss; perform more efficiently; and potentially have higher-valued carcasses. Preconditioning is a value-added management practice. Consider the following when preconditioning calves.

- **Plan:** Locating markets, allocating pasture, shopping for feed and health products, scheduling other farm and ranch activities, and, finally, the preconditioning process itself takes time. So, allow adequate time to plan, evaluate, and implement a program.
- **Identify a market:** A key to realizing the benefit of preconditioned calves is finding the outlets that have buyers seeking preconditioned calves and pursuing those markets. These may be auction venues or direct sales to buyers. This effort must start well in advance of the time calves are weaned.

Bovine Spongiform Encephalopathy (BSE): Ruminant Protein Ban³

Purpose and Scope of Regulation

Bovine spongiform encephalopathy is a progressive and fatal disease of the nervous system in cattle. The FDA adopted the Animal Proteins Prohibited from Ruminant Feed regulation to prevent the spread of BSE in the United States through feed and, thereby, minimize any risk to animals and humans. The regulation prohibits the use of protein derived from mammals in ruminant animal feed. There are, however, certain exceptions to the rule including:

- Pure porcine or pure equine protein
- Blood and blood byproducts
- Gelatin
- Inspected meat products which have been cooked and offered for human food and further heat-processed for animal feed use
- Milk products (e.g., milk and milk protein)

³ Food and Drug Administration. (2024, March 29). *Feed Ban Enhancement: Implementation Questions and Answers*. <https://www.fda.gov/animal-veterinary/bovine-spongiform-encephalopathy/feed-ban-enhancement-implementation-questions-and-answers>

Regulatory Requirements for Feeding Ruminant Animals

This regulation applies to establishments, both large and small feeding operations, and individuals that are responsible for feeding ruminants. Establishment requirements:

-  Maintain copies of all purchase invoices for all feeds received that contain animal protein.
 - ☐ If a feed intended for ruminants contains animal protein, the protein can consist only of non-prohibited material. The regulation requires maintenance of invoices for all feeds containing animal protein so that the FDA can verify if necessary that the animal protein contained in the ruminant feed is from non-prohibited sources.
-  Maintain copies of feed labels containing animal protein products that are received.
 - ☐ The FDA recognizes that bulk shipments of feed are commonplace, and that labeling information typically is contained in the invoices for bulk shipments. In those instances, maintenance of the invoice is sufficient. If the only labeling for a bulk product is on a placard, retain the placard for each shipment. If feed is received in bags or other containers that have attached labeling, remove and retain the label. If the label cannot be removed from the bag or other container, maintenance of a representative bag or a transposed copy of the label information from a container that cannot feasibly be stored will suffice.
-  Make copies of the invoices and labeling available for inspection and copying by the FDA.
-  Maintain the records for a minimum of one year from the date of the receipt of the product.

Additionally, there are requirements for protein blenders, feed manufacturers and distributors that separate prohibited material and non-prohibited material. A distributor is any firm or individual that distributes or transports feeds or feed ingredients intended for animals. Haulers who transport both prohibited material and non-prohibited material, including blended animal protein products, are subject to the separation or clean-out procedures described below. Haulers of complete and intermediate feeds are “distributors.”

The FDA suggests that for all equipment, including that used for storage, processing, mixing, conveying, and distribution that comes in contact with feeds containing prohibited material and non-prohibited protein, reasonable and effective procedures to prevent contamination of manufactured feed should be followed.

The steps used to prevent contamination of feeds often include one or more of the following, or other equally effective procedures.

- Physical means (vacuuming, sweeping, or flushing and/or sequential production of feeds).
 - ☐ If flushing is utilized, the FDA recommends that the flush material be properly identified, stored, and used in a manner to prevent contamination of other feeds. The volume of flushed material should be sufficient to equal the operating volume of the shared equipment.
- If sequential production is utilized, the FDA recommends that it be on a predetermined basis designed to prevent unsafe contamination of ruminant feeds. An example of appropriate sequencing would be swine feed containing prohibited material, followed by a swine or poultry feed not using prohibited material, followed by a ruminant feed containing non-prohibited material. For more information visit www.FDA.gov.

Feed Additives

The federal veterinary feed directive (VFD) stipulates that medically important antibiotics are prohibited for use as growth promotants and cannot be fed without a veterinary prescription.⁴ An explanation and overview of what a VFD is and how it is utilized in a cattle operation are included in *Chapter 5: Herd Health*. The feed additives listed below are available over-the-counter, which means no direct veterinary prescription is required, unless labeled for feeding in combination with a VFD medication.

■ Ionophores

- Ionophores are another class of antimicrobial compounds and some are not medically important drugs for humans, and thus do not require a VFD. The compounds were not affected by the changes in the VFD status of other feed-grade antibiotics. They increase feed efficiency by improving the fermentation process in the rumen and decrease the risk of acidosis, bloat, and coccidiosis.

■ Prebiotics

- These feed ingredients enhance microbial fermentation by rumen microbiota and may contain specific compounds or fermentation byproducts.

■ Probiotics

- These are beneficial bacteria — usually lactic acid bacteria such as *Lactobacillus*, *Bifidobacterium*, and *Enterococcus*. They stabilize intestinal microflora and decrease the colonization by pathogenic bacteria.

■ Fermentation Products

- These may improve dry matter intake and weight gain in cattle.

■ Enzymes

- These feed additives improve digestion by degrading plant cell walls with enzymes from fungal fermentation. Sometimes these are used in natural-fed cattle where ionophores can not be used.

■ Coccidiostats

- Amprolium and Decoquinate are drugs used to treat or prevent coccidiosis in cattle.

Feed Safety

Potential Feed Toxins

Forages used for grazing and hay can contain potential toxins (Table 2). High levels of nitrates in grazed or fed forages can be lethal to cattle. Certain feeds such as small grains, warm season annuals (such as sorghum, some millets, corn plants) and broadleaf weeds can have nitrate levels that are detrimental to cattle. Forages that have been stressed, such as by frost or hail, are more

likely to contain high nitrate levels. High nitrogen levels in the soil (from fertilization or manure application) can also lead to forages being high in nitrates. Avoiding grazing/haying after stressful events for the plant can reduce the chance of animals ingesting toxic levels of nitrates, although some plants retain the high nitrate levels into maturity. High nitrate feeds can be diluted in cattle diets with forages or other feed ingredients low

in nitrates to result in a safe ration for cattle.

Prussic acid (hydrogen cyanide poisoning) in certain forages can be lethal to cattle. Grain sorghums, certain millets, sudan grass, or sorghum-sudan hybrids are known to potentially

Learn more about nitrates in livestock feeding.
University of Nebraska - Lincoln



⁴ Veterinary feed directive drugs, 21 C.F.R. § 558.6 (2024). <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-E/part-558/subpart-A/section-558.6>

contain prussic acid. As described with nitrate poisoning, events that cause plant stress can cause elevated levels of prussic acid. Managing timing of grazing and testing forages (both grazed and harvested) for potential toxins is the best way to avoid toxicity issues.

Learn more about managing endophyte-infected fescue. Virginia Cooperative Extension



Endophyte-infected tall fescue can be an issue in grazed forages in certain regions. Endophyte is a fungus that produces toxic compounds that can affect animal performance and health. There are many resources available from local extension offices and other sources on management of cattle in areas where endophyte-infected fescue is an issue.

Mycotoxins are naturally occurring chemicals produced by molds. Mycotoxins can be found in grains and forages prior to harvest or during storage. If present in sufficient concentrations, mycotoxins can cause reduced feed consumption, poor production, abortions and other adverse health effects. Suggestions to prevent mycotoxin-related problems include storing feedstuffs in an appropriate manner and avoiding feeding moldy feed. It is important to keep in mind that mycotoxins can be present in feeds without visible mold growth and, conversely, visibly moldy feed may not always contain detectable mycotoxins. Many laboratories can test for the presence of mycotoxins in high-risk feedstuffs.



Learn more about mycotoxin-contaminated feeds. University of Nebraska - Lincoln

It is also important to make sure feedstuffs grazed or fed to cattle do not contain dangerous chemicals. Care to avoid chemical contamination of feedstuffs is important, such as storing chemicals away from areas where feed is stored. Also, it is important to follow label directions for safe deferment times for grazing or harvesting crops that have received chemical application (such as pesticides and herbicides). It is important to note that chemical contamination of feedstuffs can cause unsafe residues in beef as well as potentially affecting animal health and performance.

Clean Water Tanks

Water is the most important nutrient for general animal well-being. If water or water tanks are not clean, cattle may refuse to drink from them. Cattle that don't drink will be stressed, dehydrated, and have decreased feed intake. This is a preventable problem through the regular monitoring and cleaning of water tanks. The receiving period is often a critical time to ensure the adequate supply of fresh water as calves are often dehydrated when they arrive.

Water accessibility, particularly for drylot cow-calf, or young small calves is important. Abundant supply of water is also a critical management strategy to combat heat stress. Cattle may double water intake in periods of heat stress. Water intake may also be depressed in periods of severe cold stress. Producers should check water supply for total dissolved solids, fecal coliforms, and any potential toxicities from sulfur, nitrate or other minerals (Table 3).

Table 2: Limits for Some Potentially Toxic Substances⁵

Substance	Safe Upper Limit of Concentration	Substance	Safe Upper Limit of Concentration
Aluminum (Al)	5 ppm	Cobalt (Co)	1 ppm
Arsenic (As)	0.2 ppm	Copper (Cu)	0.5 ppm
Boron (B)	5 ppm	Fluoride (F)	2 ppm
Cadmium (Cd)	0.05 ppm	Lead (Pb)	0.05 ppm
Chromium (Cr)	1 ppm	Mercury (Hg)	0.01 ppm
		Nitrate + Nitrite	100 ppm

⁵ Rasby, R. & Walz, T. (2011). *Water Requirements for Beef Cattle*. University of Nebraska-Lincoln. <https://extensionpubs.unl.edu/publication/g2060/na/html/view>

Table 3. Desired And Potential Levels of Pollutants In Livestock Water Supplies

Substance	Desired Range	Problem Range
Total bacteria per 100 milliliters	<200	>1,000,000
Fecal coliform per 100 milliliters	<1	>1 for young animals >10 for older animals
Fecal strep per 100 milliliters	<1	>3 for young animals >30 for older animals
pH	6.8 to 7.5	<5.5 or >8.5
Dissolved solids, milligrams per liter	<500	>3,000
Total alkalinity, milligrams per liter	<400	>5,000
Sulfate, milligrams per liter	<250	>2,000
Phosphate, milligrams per liter	<1	not established
Turbidity, Jackson units	<30	not established

Note: 1 milligram per liter (mg per L) is approximately equal to 1 part per million (ppm).

Agricultural Waste Management Field Handbook, pages 1 to 16.

While rare, stray voltage may inhibit water consumption and should be monitored if cattle stop drinking. The first sign of water consumption problems is dramatic decreases in feed consumption (50% or more decrease in intake with a day or two and little-to-no feed consumption within a few day period).

Water Quality Guideline Resources

University of Nebraska - Lincoln Water Requirements for Beef Cattle

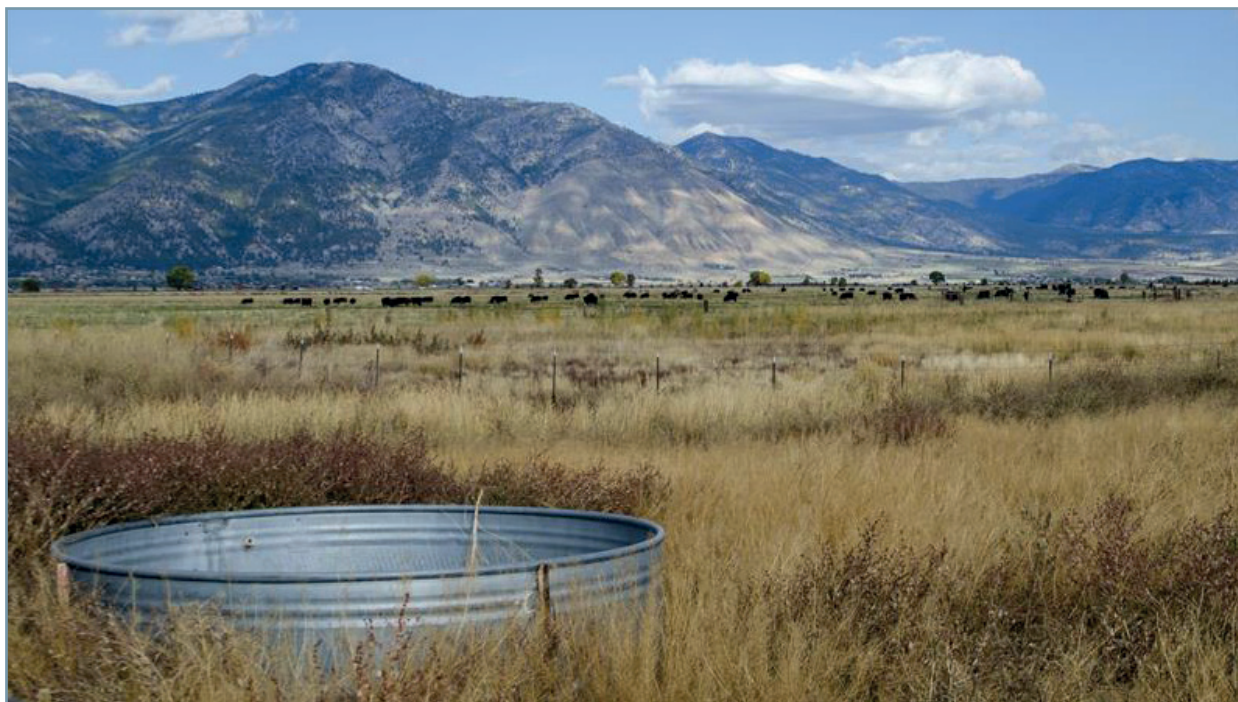
<https://extensionpubs.unl.edu/publication/g2060/html/view>

North Dakota State University Extension Livestock Water Quality

<https://www.ndsu.edu/agriculture/sites/default/files/2022-08/as1764.pdf>

University of Missouri Extension Water Quality for Livestock Drinking

<https://extension.missouri.edu/publications/eq381>



Feed Contaminants Prevention

- Maintain a quality control program for incoming feed ingredients in an attempt to eliminate contamination resulting from molds, mycotoxins, chemicals, and other contaminants.
 - Store feed in a manner that prevents development of molds and mycotoxins and exposure to chemicals and other potential contaminants.
 - Submit any feed ingredient suspected of contamination for analysis by a qualified laboratory prior to usage.
-  Maintain records of any pesticide use on pasture or crops that could potentially lead to violative residue in cattle.
- Treat all chemicals as potential hazards. Never store chemical products where leakage or breakage can contaminate feed products or where cattle can directly consume a contaminant. For example, don't store batteries, fuel containers, or paint in the same location as feedstuffs.
 - Regularly check all feed-handling equipment for fluid leaks.
 - Clean up spills to prevent potential contaminants from causing residues, illness, or death in cattle.
 - Contact a diagnostic laboratory for assistance in confirming the suspicion of a feed-related poisoning.
 - Monitor purchased fats and oils for potential contamination. Letters of guarantee from companies supplying these materials may be requested that state these materials have been tested.

The Food Safety Modernization Act

The Food Safety Modernization Act (FSMA) was signed into law on January 4, 2011. The stated goal of the act is to prevent contamination of U.S. food, including animal food. FSMA is transforming the nation's food safety system by shifting the focus from responding to foodborne illness to preventing it. This rule requires that animal food facilities have a food safety plan in place that includes an analysis of hazards to determine which ones need control and risk-based preventive controls to minimize or prevent those hazards. The FSMA and BQA are connected through a shared approach of enhancing consumer confidence in the beef supply chain by prioritizing food safety and wholesomeness.



For more information, see FAQ on FSMA.



Record Keeping Reminders

- Maintain copies of all purchase invoices for all feeds received that contain animal protein.
- Maintain copies of feed labels containing animal protein products that are received.
- Make copies of the invoices and labeling available for inspection and copying by the FDA.
- Maintain the records for a minimum of one year from the date of the receipt of the product.
- Maintain records of any pesticide or other contaminant used on pastures or crops that could potentially lead to violative residue in cattle.





CHAPTER 8

ENVIRONMENTAL STEWARDSHIP

Objectives

- Discuss how to manage natural resources responsibly while providing for cattle nutrition needs.
- Recall how to properly use, store and dispose of all pesticides, in accordance with label instructions.
- Recognize how to properly dispose of a mortality.

Proper Grazing Management Outcomes

- Improved soil health and water quality.
- Reduced erosion.
- Increased animal nutrition and efficiency.
- Improved animal health and well-being.
- Better ranch productivity.
- Improved biodiversity.

The relationship between cattle producers and the environment has long been a bond characterized by gratitude and respect. Proactive environmental stewardship exists because the value of continuous improvement in conservation and ecology. This has been passed from generation to generation and that core value ensures that future generations have the same opportunity to participate in cattle production. It is through modern stewardship practices that healthy landscapes produce healthy animals as well as support the very production systems they encompass.

By constantly measuring and managing the land for continuous improvement, the entire beef supply chain, as well as society at large, benefit. Cattle producers are trusted with producing safe, wholesome, high-quality beef and through science-based management practices, the forages, soil, water and biodiversity experience a dynamic and productive life cycle that benefits us all.

Forages and Grazing

Current best practices seek to optimize cattle production in a manner that conserves and/or enhances environmental conditions in a socially responsible and economically viable manner. Grazing production systems vary across the country; therefore, every grazing management plan should be site-specific with input from a team of professionals that may include livestock or forage extension specialists, rangeland management experts, and/or public land managers in the area.

Maintaining the integrity of forage and soil resources is an important part of environmentally sound and sustainable beef production. Beef production utilizes both irrigated and non-irrigated pasture systems and native and/or introduced plant species. Management strategies are generally different between the two systems due to environment, soil type, and recommended rest. Irrigated forage production systems, and those in areas with heavier rain fall, often use fertilizer and pastures are usually managed according to agronomic principles with agricultural inputs. Whereas, non-irrigated production systems, like rangelands and forests, are natural systems managed by ecological principles on private and/or public lands.

Key Aspects of Forage Management

Stocking rate is the relationship between the number of animals and the grazing management unit utilized over a specific time period. It can be expressed as animal units per unit of land with regard to forage health and production. An animal unit is a 1,000-pound cow—dry or with a 6-month-old calf—with an average dry matter forage intake of 26 pounds per day. Of all the aspects associated with livestock production (under the control of the manager), stocking rate is the most important. On either rangeland or irrigated forage pastures, heavy grazing pressure for an extended period of time may reduce animal performance and decrease plant vigor.

Adequate, permanent ground cover, maintained by appropriate stocking rates and fertility programs on introduced forage species, is essential. The results are higher soil organic matter content, better soil structure, and a barrier that prevents detachment of the soil. On properly stocked pastures, healthy forage stands reduce runoff allowing water to infiltrate into the soil for use by plants or for recharge of groundwater aquifers.

Roots also act as binding agents that reduce the potential for soil detachment. Properly stocked rangeland and properly stocked and/or fertilized forage pastures contain higher root numbers that help maintain or enhance site integrity. Thus, a vigorous stand of permanent ground cover stabilizes and maintains site integrity and reduces soil erosion.

Successful beef cattle operations depend upon healthy, productive grazing lands and cattle that are well adapted to their environment. Well-adapted cattle paired with proper grazing management can reduce variable input costs, such as herbicide, fertilizer and purchased feed.

Consider developing a written grazing management plan to assist in challenges on the operation, and observing, monitoring and tracking pasture or range improvements over time. Obtain input from a team of professionals that may include livestock and/or forage extension personnel, range management experts in the operation's state or region, and/or public land managers.

Remember, every grazing land situation is unique depending on the region, so every grazing management plan should be site-specific.

Additional Resources



U.S. Roundtable for Sustainable Beef Grazing Management Module



USDA Natural Resources Conservation Service (NRCS) Range & Pasture



USDA NRCS Pasture Management



Grassland Productivity Forecast – Great Plains and Southwest U.S.



Amazing Grazing – North Carolina State University



Sustainable Rangelands Roundtable



NCBA Grazing Management Planning Workbook





Pesticide Use

It is important to monitor products applied to the land and products applied directly to the animal. An area of concern is the accidental or negligent exposure to feed, water, soil, or other materials contaminated with hazardous materials. Animals that consume forage or feedstuffs that have had a pesticide applied could have meat residue if labeled guidelines are not followed. Remember that the label is the law and adhere to the instructions and gain clarification to prevent residues. The following are chemical residue guidelines.

- Use only agricultural chemicals approved for application to land grazed by livestock or on land where feedstuffs are grown.
- Follow label directions and observe grazing restrictions on pastures, rangeland, and crops treated with pesticides.
- Prevent accidental exposure to agricultural chemicals by properly storing and disposing of containers.
- Do not use the same sprayer to apply agricultural chemicals to pasture or rangeland that is used to apply livestock pesticides directly to cattle.
- Only use approved products for control of internal and external parasites of cattle in a control program with a veterinarian or parasite specialist.



Document usage and observe all appropriate withdrawal times before marketing cattle.

- Prevent consumption of hazardous chemicals and heavy metals by proper storage and disposal of paint, batteries, chemical containers, used petrochemical products, and other materials; make sure cattle don't have access to petrochemical production sites.
- Prevent contamination of feedstuffs by chemical compounds through proper storage of chemicals and proper treatment of stored feed products with insecticides and fungicides — these should not be stored in the same location as approved animal-use products.



Record dates of application, areas, animals and/or feedstuffs treated, products used, product serial and lot numbers, appropriate withdrawal periods, etc. Producers may request a letter of guarantee from the feed supplier that the feed is below violative levels for residues and mycotoxins.

- Request more pesticide information from local extension educators or university beef specialists as needed.
- Know and understand state and federal regulations pertaining to pesticide application.

Internal and external parasites are a constant economic threat to beef production. Parasites directly affect animal performance, transmit disease, and affect the wholesomeness of beef produced.

Deviating from the product label can lead to residue contamination, feed contamination, byproduct contamination and environmental damage. Only EPA, FDA, and USDA approved pesticides can be used for cattle treatment. Use these products in compliance with label directions.

Pesticides (including parasiticides and insecticides) have proven to be effective when utilized at label dosages and approved routes of administration. Improper dosage levels or routes of administration excessively stress cattle and affect withdrawal periods. These chemicals can be persistent and remain in the systems of cattle for extended periods, making correct withdrawal times unpredictable.



Keep a record of pesticide use including product ID, serial/lot number, date used, amount used, person who administered the pesticide, the animal or animals exposed to the pesticide, and withdrawal time. When using a pesticide, such as a pour-on used at processing, the record of its use can be included on the processing record for the group of cattle. If a premise pesticide is used, a record of its use can be included on a Premise Pesticide Use Record. Restricted Use Pesticides require records be kept for two years after application date.¹

EPA and FDA require all hazardous chemicals be stored away from feed and feed storage areas. Specifically, insecticides must be stored separately from feed additives.^{2,3}

Several incidents of deadly feed contamination have resulted from careless handling and storage of pesticides. These chemicals must be stored in original containers or in properly marked storage bins. Placing a pesticide in an improperly marked or labeled container is very risky; improper use of the product may result in regulatory action.⁴

Deal with a reputable feed commodity supplier to avoid buying a residue problem with a load of manufactured feed, grain or byproducts. In addition, ask suppliers about their use of grain protectants during storage and their monitoring procedures.

Proper use of parasiticides and insecticides includes removal of old pesticide ear tags as well as following label directions for pour-ons, injectables, dusts, sprays, and other types of products. To maximize efficacy and minimize resistance development, timing and judicious use are critically important.

Contamination may lead to animal or carcass condemnations resulting in a loss of value to the beef industry and potential enforcement action. Contamination may also lead to harmful, if not deadly, residue problems in pet foods as well as in other byproduct materials.

¹ USDA. (n.d.). *Pesticide Record Keeping. Rules and Regulations*. <https://www.ams.usda.gov/rules-regulations/pesticide-records>

² *Current Good Manufacturing Practice for Medicated Feeds*, 21 C.F.R. § 225.35 (2024). <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-C/part-225>

³ *Current Good Manufacturing Practice for Medicated Feeds*, 21 C.F.R. § 225.135 (2024). <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-C/part-225>

⁴ EPA. *Pesticide Containers. Pesticide Worker Safety* (2024). <https://www.epa.gov/pesticide-worker-safety/pesticide-containers>

Herbicide Use

An Integrated Pest Management (IPM) approach seeks to use routine management practices to minimize the use of herbicides on a regular basis. Guidelines for these practices include the following.

- Use an appropriate stocking rate for the grazing management unit, this minimizes the number of unwanted weed species in the pasture environment and, thus, the routine application of herbicides.
- Use relevant grazing systems that allow for biological control of unwanted, but palatable and nutritious, weed species, this again minimizes the routine application of herbicides.
- Use appropriate fertility programs on introduced forage pastures, this encourages the growth and vigor of desirable forage species that can challenge less desirable weed species.
- Use prescribed burning programs to promote healthy and desired grassland composition.
- Adhere to label directions to optimize target species control and eliminate negative effects to the environment — to use herbicides in a manner not consistent with label directions is a violation of state and federal laws.



Pesticide Storage and Disposal Guidelines

- Do not stockpile products because they will lose efficacy over time.
- Always store pesticides in their original containers.
- Store pesticides out of reach of children and pets.
- When disposing of pesticides, check with the local landfill, solid waste management authority, local health department, or state department of agriculture to find out whether the community has a hazardous waste collection program for getting rid of unwanted pesticides.
- Contact the state department of agriculture if there is any doubt about proper pesticide use and disposal.
- Never dump water that is used to rinse pesticide containers on the ground or down a drain, it must be added to the sprayer tank and used on the site in a manner for which the pesticide is labeled.
- Do not pour leftover pesticides down the sink, into the toilet, or down a sewer or street drain.

Pesticides may interfere with the operation of wastewater treatment systems or pollute waterways. Many municipal systems are not equipped to remove all pesticide residues. If pesticides reach waterways, they can harm fish, plants, and other living things.



Steps for Triple-Rinsing Pesticide Containers⁵

1. Remove the cap or lid from the pesticide container, measure the pesticide as the container is emptied into the sprayer tank, and let the container drain into the sprayer tank for 30 seconds.
2. Fill the container 10-20% full of water.
3. Secure the cap or lid on the container and shake to rinse the inside.
4. Remove the cap or lid and add the rinse water from the container to the sprayer tank.
5. Let the container drain into the sprayer tank for 30 seconds or more.
6. Repeat steps 2-4 two more times.
7. Put the cap or lid back on the pesticide container and dispose of the container according to label directions. Do not use empty containers to store any other liquids.

Soil Fertility

Many forage species used in livestock production systems are introduced from other parts of the world and have been selected for improvements in dry matter production, tolerance to grazing, cold tolerance, drought tolerance, insect tolerance, and/or disease tolerance, etc. Generally, these introduced forage species offer improved characteristics only when fertilized appropriately. Fertilizers can be expensive production system inputs and can prove to be water pollutants if not applied appropriately. Animal wastes, such as poultry litter or manure, have been shown to be effective fertilizers. Many of the same concerns relating to nutrient overload and potential effects on water quality apply when using manure, as well as commercial fertilizers. Soil fertility guidelines include the following.

- Use soil testing to determine the level of nutrients required for the optimum production of the target forage species or crops.
- Apply fertilizer materials based only on soil test recommendations.

The use of soil testing to determine fertilizer requirements reduces the potential for both soil and surface water contamination due to over-application of fertilizer nutrients. Soil testing and fertilizing according to recommendations are critical when using animal waste as fertilizer.



Record all applications (rate and nutrient composition) of fertilizer, regardless of source, and the area to which it was applied.

Soil Conservation

Erosion is the loss of topsoil because of either rain or wind. The more bare soil present, the larger raindrop impact and the more erosion the land will experience. Likewise, bare soil exposed to wind reduces air quality as soil particles are detached and transported away by wind currents (dust). Topsoil forms at extremely slow rates, often requiring hundreds of years.

Additional information on soil management can be found through USDA NRCS Soil Facts.



Thus, the loss of topsoil due to erosion can affect site productivity for several generations. Besides loss of topsoil itself, important soil nutrients, such as Nitrogen, Phosphorus and Potassium, are also removed.



Additional EPA training for pesticide handlers is available through the pesticide applicator certification process.

⁵ EPA. (2023, August 23). *Rinsing Procedures for Dilutable Pesticide Products in Rigid Containers. Pesticide Worker Safety.* <https://www.epa.gov/pesticide-worker-safety/rinsing-procedures-dilutable-pesticide-products-rigid-containers>

Water Quality Guidelines

- Use elemental scans to determine which salts are potential problems if high levels of total dissolved solids are detected.
- Develop water sources using gravity, solar, wind, or electric power to prevent cattle from watering in streams.
- Limit cattle access to streams and sensitive riparian areas; fence critical management areas with temporary or permanent fence.
- Provide vegetative filter/buffer strips between corrals and streams — width of the strip is dependent on soil type and slope.
- Install runoff diversions above livestock holding areas or corrals to keep up-slope runoff from mixing with runoff from corrals.
- Install dikes and/or sediment ponds below livestock holding areas or corrals and streams.
- Seal all old and abandoned wells and protect active wells from being a source of contamination to groundwater.
- Provide windbreaks and/or shade, which draw animals out of riparian areas.

Water Quality Properties

Biological: bacteria, viruses, protozoa, and worm eggs

Physical: color, turbidity, sediment, temperature, odor, algae (blue-green can produce deadly toxic effects)

Chemical: pH, total dissolved solids (TDS), nitrates/nitrites, phosphates, sodium, sulphates



Feedlots or Other Dry Lot System

If a facility is classified as a concentrated animal feeding operation (CAFO),⁶ runoff control and manure (whether liquid, solid or slurry) management plans may be required by state and federal guidelines. Adequate control and monitoring of runoff ponds is required for CAFOs and usually includes water utilization through irrigation and provides valuable nutrients for crop production.⁶ In addition, manure nutrient management plans may be required to ensure excess nutrients are not building up on crop acres thus increasing risk for nutrient loss through leaching or surface runoff. In most cases, manure nutrients are regulated to ensure Phosphorus is not excessive or a risk for surface waters. When utilized appropriately, manure provides greater fertility, improves soil conditions and water holding capacity, and offsets synthetic fertilizer from Nitrogen and Phosphorus.

For operations classified as animal feeding operations (AFO) where cattle are housed in pens and devoid of vegetation or cover for more than 45 days per year,⁷ developing runoff control systems to prevent surface water contamination is important. Avoid constructing pens or corrals in any man-made conveyance or surface water flows.



Nutrient Management Planning Resources
Livestock and Poultry
Environmental Learning Community



USDA-NRCS Conservation Resources by State

⁶ EPA. (2023, October 12). NPDES AFO's Policy Documents. National Pollutant Discharge Elimination System (NPDES). <https://www.epa.gov/npdes/npdes-afos-policy-documents-0>

⁷ EPA. (2024, May 1). Animal Feeding Operations (AFO's). National Pollutant Discharge Elimination System (NPDES). <https://www.epa.gov/npdes/animal-feeding-operations-afos>

Mortality Disposal

Whenever feasible and possible, rendering is a preferred option for a mortality disposal given the benefits of utilizing those carcasses. In cases of necessary euthanasia, the method of euthanasia should be evaluated to ensure carcass utilization is allowable. If barbiturates or barbiturate derivatives are used to euthanize an animal, the carcass cannot be rendered.⁸ Access to rendering facilities and disposal costs are challenges for producers, which have created concerns about:

- Solid waste management
- Water quality
- Air quality
- Public sensitivity
- Sources of animal disease

When rendering is not plausible, then other methods may alleviate these challenges if managed properly. For livestock, several options for carcass disposal are available including burial, incineration, and composting. Incineration of large animals requires special facilities which may be impractical for cow-calf and stocker producers.

On-site composting of carcasses may be considered as a means of disposal. Guidelines are available to aid producers in developing composting facilities from the government and many land-grant universities.⁹ Other methods, such as cooking carcasses for animal feed, are not options with cattle because of the ban on feeding ruminant-derived proteins back to ruminants.¹⁰

Timely disposal of mortalities is an environmental concern. On-site burial of carcasses may be the best disposal option for cow-calf producers currently available due to a lack of rendering facilities in many communities. However, regardless of the size of the operation, no dead animal is to be buried on-site unless local and state regulations have been checked to determine what is allowed. Many state land grant universities or state departments of agriculture provide education on allowable methods in their states.

Some municipal solid waste landfills will accept dead animals if they can be covered immediately with three feet of other solid waste or at least two feet of soil. Producers should contact the local waste disposal facility to determine if carcasses are accepted.

Over the centuries cattle producers have grown in their understanding of cattle husbandry and environmental stewardship. The objectives covered in this chapter, if developed or improved upon for the farm, ranch or feedyard, can improve the quality of life for cattle and people involved.

 Under no circumstances should mortalities be disposed of by dumping in areas where water and air quality might be jeopardized.¹¹

⁸ AABP. (2023, March). *Guidelines for the Humane Euthanasia of Cattle*. American Association of Bovine Practitioners Guidelines. https://www.aabp.org/Resources/AABP_Guidelines/EUTHANASIA-2023.pdf

⁹ United States Department of Agriculture. (2017, August 15). *Livestock Mortality Composting Protocol*. www.aphis.usda.gov/sites/default/files/livestock-mortality-compost-sop.pdf

¹⁰ *Animal Proteins Prohibited in Animal Feed*, 21 C.F.R. § 589.2000 <https://www.ecfr.gov/current/title-21/section-589.2000>

¹¹ EPA. (2023, November 1). *Agriculture and Carcass Disposals*. Agriculture. <https://www.epa.gov/agriculture/agriculture-and-carcass-disposal>



Record Keeping Reminders

- Keep a record of pesticide use including application date, areas, animals and/or feedstuffs treated, products used, product ID, serial/lot number, date used, amount used, person who administered the pesticide, the animal or animals exposed to the pesticide, and withdrawal times.
- When using a pesticide, such as a pour-on used at processing, the record of its use can be included on the processing record for the group of cattle.
- If a premise pesticide is used, a record of its use can be included on a Premise Pesticide Use Record.
- Restricted Use Pesticides require records be kept for two years after application date.
- Record all applications (rate and nutrient composition) of fertilizer, regardless of source, and the area to which it was applied.





CHAPTER 9
WORKER SAFETY

Objectives

- Learn about safety precautions on beef production operations.
- Train employees and others working on the operation on safe practices when using equipment, handling cattle, handling animal health products, and around potentially hazardous areas.
- Customize training protocols to each operation.
- Develop a safety culture and mindset that begins with leadership on each operation.

It is the responsibility of each operation to cultivate a culture of safety and to provide training and support to everyone in the facility, from managers to feeders to family members, including children. Incorporating worker safety training on a monthly, semi-annual, or annual basis can include many aspects of cattle care such as how to improve human interaction with animals and equipment in a safe work environment.



Ensuring worker safety and providing appropriate training is critical to every cattle operation.

According to the 2022 U.S. Bureau of Labor Statistics,¹ workers in the agriculture, forestry, fishing and hunting industry experienced one of the highest fatal injury rates at 20 deaths per 100,000 full-time workers in 2021, and 23.5 deaths per 100,000 full-time workers in 2022. This is compared to a rate of 3.6 deaths per 100,000 workers for all U.S. industries (Chart 1).

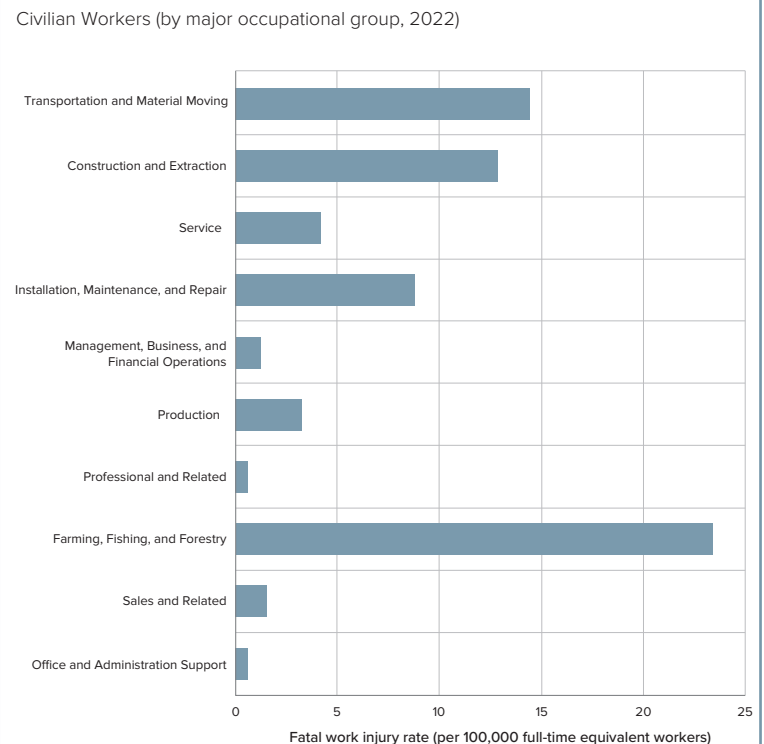
Transportation incidents, which include tractor overturns and roadway crashes, were the leading cause of death for these farmers and farm workers. Other leading

causes were contact with objects and equipment, violence by other persons or animals, and falls, slips, and trips.

Finally, in 2021,¹ almost two-thirds (65%) of deaths in the agriculture, fishing and forestry industry occurred to workers 55 years of age and older. Because the agriculture and farming industries are documented to be some of the most dangerous occupations, it is important for agricultural operations and teams to recognize the inherent risks of the job and use education and training to minimize injuries and deaths as much as possible.

Accessing, hiring, and retaining qualified labor continue to be top concerns for the agricultural industry, including the cattle industry. To ensure safe environments, employee training in topic areas for the entire team should be emphasized and developed.

Chart 1: Number and Rate of Fatal Work Injuries



Source: U.S. Bureau of Labor Statistics

¹ Bureau of Labor Statistics. (2023). National census of fatal occupational injuries in 2022. [USDL-23-2615]. U.S. Department of Labor. <https://www.bls.gov/news.release/pdf/cfoi.pdf>

Safety on Beef Production Operations

Worker Training

Communication about safety and the importance of safe work environments should be developed for the specific routines on the farm or ranch. Customizing protocols and trainings to caretakers and workers on the operation and what duties are expected of them is important and should be reviewed on an annual basis (at a minimum).

- Several organizations provide guidance on worker safety training and topics that should be covered. There are regulatory expectations for employee training and safety that may be state specific. Check with your state’s department of labor or extension service to determine what is needed. These regulatory procedures necessitate proper record keeping for employees, training completed, and details within those training sessions.
- Safety trainings should be held at least annually for all cattle caretakers including owners, managers, employees, family members, neighbors, or anyone in the operation.
- Trainings should be provided in a language that the employee understands and multiple ways of providing that information, such as written, oral communication, or video, should be explored to cover various types of learning.
- Onboarding and trainings for new employees are especially important so safety is upheld and fewer injuries occur.

“Nothing we do is worth getting hurt over.”
Jerry Wulf,
Riverview LLP/Wulf Cattle



To help ensure overall care of cattle, consider having those working with cattle sign the BQA Cow Care Agreement. This resource can be found in Resources on www.bqa.org.

Table 1 describes suggested trainings for cattle operations and is not all-inclusive.

Table 1: Worker Safety Training Areas of Focus

GENERAL SAFETY	EQUIPMENT AND FACILITY SAFETY
First Aid & CPR	ATV Use
Personal Protective Equipment (PPE)	Feedmill Safety
Record Keeping and Training Records *	Firearm or Captive Bolt Safety & Maintenance
Reporting Injuries and Workers’ Compensation	Gate Safety
Stress and Mental Health	Ladder Safety
Youth Safety	Lockout/Tagout
	Manure and Commodity Storage (Fumes in areas with poor or no ventilation)
WORKING WITH LIVESTOCK	
Animal Handling Safety (Cattle and Horses) *	Slips, Trips, and Falls
Animal Health Product Safety *	Tractor and Loader Safety – Power take off (PTO) and Rollover Protective Structures (ROPS)
Biosecurity and Zoonotic Diseases *	Transportation Safety *
MISCELLANEOUS	
	Chemical Safety
	Emergency Action Plan *
	Extreme Weather

The BQA Manual provides information on many of these areas (noted with *).

Record Keeping and Training Records



Record keeping is an important piece to a successful cattle operation. Training records ensure that all members of the team, including family members, are aware of their responsibilities and how to keep themselves safe. Each operation will have different best management practices (BMP) established for minimum training requirements. Employee training logs will help with these requirements. For additional guidance, see *Chapter 2: Record Keeping*.

- Training is recommended for every employee at least once a year and must be verified by a trainer. Additional training may be needed with written materials, online videos, veterinarian or nutritionist discussion, or continuing education events. Employees should receive documented training in the area(s) of their responsibility.

General Safety

First Aid & CPR

Safety training is an investment in the employees and operation. A first-aid kit should be available, easily accessible, and regularly inspected to ensure it is fully stocked with items that have not exceeded expiration dates.

All employees should know basic first-aid, CPR, and how to use an automated external defibrillator (AED). These should be easily accessible on the operation. Recertification on an annual basis is recommended.

Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) is equipment worn to minimize exposure to hazards in the workplace. The regular use of PPE can reduce the likelihood of workplace illness or injury. Each operation and situation will require different PPE. PPE may include the following items:

- Eye protection such as safety glasses or face shields
- Gloves or sleeves (rubber, leather, vinyl, latex, other)
- Closed-toe work boots that may be steel toe or composite toe
- Noise & hearing protection such as ear plugs or muffs
- Respiratory protection such as masks or respirators
- Coveralls
- Safety vests and clothing

Reporting Injuries and Workers' Compensation

All farms are responsible for meeting applicable Occupational Safety and Health Administration (OSHA) regulations and standards which includes reporting injuries, providing safety information on hazardous materials, and other topics. OSHA mentions that many states operate their own occupational safety and health programs for private sector and/or state and local government workers. Reporting requirements may vary by state, although all states must have or be in the process of developing requirements that are at least as effective as OSHA's. It is the operation's responsibility to understand if they are under state and/or federal guidance.



However, OSHA enforcement² – in other words, inspecting farms – is limited to farms with 11 or more employees during the previous 12-month period, or those that have an active temporary labor camp during that period. Cattle operation owners and managers should understand that being exempt from an OSHA inspection (due to having fewer than 11 workers) does not equate to being exempt from compliance with OSHA regulations. All farms should be in compliance with applicable OSHA standards.

In some states, workers' compensation coverage is required for all agricultural workers without exception. The operation should be familiar with their state's requirements and share that information with employees. Visit **www.osha.gov** for more information and for training resources.

Stress and Mental Health

A healthy operation cannot continue to do business without healthy farmers and ranchers. Farming and ranching are inherently demanding jobs that are affected by weather, economics, and isolation. Stress and mental health are directly related to physical health. It is important to understand how the stress of working on a cattle operation can be mitigated or managed. Addressing mental health challenges is important in all communities, especially agriculture.

Many mental health resources are available for the agricultural community. Check with state extension offices for state-specific resources.



If you or a loved one is experiencing a crisis, dial 988. The Lifeline provides 24/7, free and confidential support for people in distress, prevention and crisis resources for you or your loved ones, and best practices for professionals in the U.S.

Youth Safety

Agriculture has a strong youth presence in helping care for cattle. Operations must consider the education, training, and safety of younger farm hands, children, and grandchildren to prevent accidents and avoid injury. Youth workers may perform the same tasks as adults but do not have the experience, size or strength, or attention to perform the task. Work with local community organizations including 4-H and FFA to ensure safety trainings and education are implemented.

Many online resources and programs exist for youth ag safety including but not limited to:

Youth for the Quality Care of Animals

<https://yqcaprogram.org/>

AgriSafe Network Resources for Young Workers

<https://www.agrisafe.org/healthcare/young-workers/>

Cultivate Safety Developed by National Farm Medicine Center and National Children's Center for Rural and Agricultural Health and Safety

<https://cultivatesafety.org/>

University of Vermont Extension Resources for Youth Farm Safety

<https://www.uvm.edu/extension/youth/youth-farm-safety>

² Occupational Safety and Health Administration. (n.d.). Chapter 10 Industry sectors. Field operations manual. <https://www.osha.gov/enforcement/directives/cpl-02-00-163/chapter-10>

Working with Livestock

Animal Handling Safety

Cattle and horses are large animals and can cause severe injury or death to themselves or their handlers. It is important that all animal caretakers, regardless of experience, receive training on cattle behavior and low-stress handling, as emphasized in *Chapter 3: Cattle Behavior, Handling, and Facility Design*.

- Ensure documented training of all individuals handling animals occurs using the cattle behavior and handling guidelines set forth by BQA.
- Ensure animal handlers always consider human safety first when handling cattle and horses.
- Train animal handlers on how to handle excited or aggressive cattle.
- Animal handlers should avoid entering small and confined areas with excitable animals.
- Caretakers expected to ride horses should be trained on basic equine behavior and handling prior to riding. Riding experience and instruction should try to match the horse's experience and temperament. Horses should be trained to their job function to ensure safety of the rider and animals. Tack and equipment should be safe, well-conditioned, and in good working order.
- Ensure working facilities allow employees the ability to escape enclosed areas should an animal become aggressive.
- Give excited or aggressive animals time to calm down or come inle with calmer animals when handling, especially if facilities do not allow for the safe handling of aggressive animals.
- Evaluate temperament of animals before handling.
- There are breed differences on how animals respond (for example: Angus vs. Brahman animals) and handlers should adjust to the cattle's behavior.
- Handle cattle in groups rather than as individuals when possible.

Facility design, as well as understanding how cattle move through the system, is important for work efficiency and human safety. Prior to handling cattle or processing, these points can help train and prepare the crew.

- Facility walk-through: look for human passageways, protrusions in gates or fences, defects in floor or sides of facility.
- Chute: evaluate neck access, test equipment before animals enter, check electricity flow.
- Maintenance of equipment: ensure parts are greased/oiled, and gates are functioning correctly.
- Ensure that gates are placed to work with the flow of cattle and that they are conducive with working facilities while prioritizing human safety.
- Experience levels of each person will vary, ensure they are trained for the areas they are expected to work.



Communication is key to human safety when handling large animals such as cattle. Before the cattle handling event, prepare all employees and team members who will be helping that day.



Equipment and Facility Safety

Firearm or Captive Bolt Safety and Maintenance

- The producer will most likely perform on-farm euthanasia because a veterinarian may not be immediately available to perform the service. Using a firearm or captive bolt are common methods for euthanasia of cattle.
- Persons who perform this task must have received appropriate training, know the relevant anatomical landmarks, and understand the protocols used for humane euthanasia of animals.
- Ensuring human and animal safety during the process is most important.
- Best practices include:

- ☐ At least two trained individuals should be identified to euthanize with firearm or captive bolt in any given work shift.
- ☐ At least two firearms or approved euthanasia tools should be identified and appointed to use for euthanasia purposes.



Firearms or captive bolts should be cleaned regularly and maintenance logs of cleaning should be kept.

- ☐ Firearms and captive bolt guns should be responsibly and securely stored when they are not in use.
- ☐ All employees should be aware of euthanasia protocols including safety precautions for both humans and animals.

Gate Safety³

Gates, and the improper use of gates, when moving livestock are far too often a major source of injury to employees and livestock. The following guidelines and best practices can reduce risk of injury.

- Livestock handlers should be trained in the proper use of gates.
- Gates should be in good working order, swinging, with no obstruction.
- Modify sharp corners and repair any broken welds, boards, loose nails, bolts, or other objects that may result in sharp edges or protrusions.
- Never throw a gate to stop an animal. Throwing gates can cause bruising and injury to animals and the risk of bounce back is a major risk factor for injury to employees.
- Do not stand directly behind a gate while loading a pen. Even if latched, gates may break free and result in injury.
- Do not stand at the end of a gate where it is possible to get caught between the gate and an opposite fence or structure as it may result in being crushed.
- Stand clear and do not hook an arm or elbow in the gate as sudden movement could result in injury.
- Gate safety signage should be posted and visible to all employees.

Learn the importance
of gate safety by
watching this video.



³ Livestock Marketing Association (2023). Guide to animal handling and sustainable practices. Membership Services. www.lmaweb.com/Membership/Services/animal-handling-sustainable-practices

Manure and Commodity Storage

It is critical to regularly review safety plans with everyone working near manure and commodity storage areas. This includes having specific PPE available for each area. More guidance for different types of storage is discussed below.

■ Managing Silage in Bunker Silos or Drive-Over Piles⁴

- A silage accident can occur anywhere, anytime, in any bunker or pile, in a fraction of a second, and without warning. We cannot totally prevent accidents from happening, but we can provide training to increase employee awareness and understand the risks. Every farm, feedlot, dairy, digester plant, and silage-harvesting contractor should have silage safety policies and procedures for their silage team members, and they should schedule regular meetings with all their employees to discuss safety. If a silage program is not safe, nothing else about it really matters.
- To prevent being crushed by an avalanche or collapsing silage:
 - ▶ Do not fill bunkers and build piles more than a maximum height of 10 to 12 feet unless safety precautions are taken.
 - ▶ When filling bunker silos, do not exceed the height of the safety rail on the walls or the maximum height at which unloading equipment can remove silage from the feed-out face safely.
 - ▶ Never allow people to approach the feed-out face. Building the feed-out face at an angle may reduce risk of collapse.
 - ▶ Never stand closer to the feed-out face than three times its height.
 - ▶ Suffocation is a primary concern and a likely cause of death in many silage avalanches, so follow the 'buddy rule' and never work alone in a bunker or pile.
 - ▶ The top edge of the feed-out face is highly unstable so use caution when removing plastic or oxygen-barrier film, tires, tire sidewalls or gravel bags.
 - ▶ Never ride in a front-end loader bucket.
 - ▶ Never park vehicles or equipment near the feed-out face.
 - ▶ Never drive the unloader parallel to and in close proximity of the feed-out face in an over-filled bunker or pile.
 - ▶ Do not walk close to the top edge of the feed-out face.
 - ▶ Post warning signs around the perimeter of bunkers and piles saying, 'Danger! Silage Face Might Collapse.'
 - ▶ Avoid being complacent and never think that an avalanche cannot happen to you.

"It's really not about shrink loss, feed conversion, cost of gain, a close out, or milk over feed cost. It's about sending everyone in your silage program home to their family safe...EVERYDAY."

Keith Bolsen, PhD,
Professor Emeritus, Kansas
State University, Founder,
Bolsen Safety Foundation



Courtesy of: Keith Bolsen Silage Safety Institute

⁴ Bolsen, R. E. & Bolsen, K. K. (2019). *Silage Safety Practices that Save Lives [Abstract]*. Keith Bolsen Silage Safety Institute. <https://www.asi.k-state.edu/doc/beef/safetyinsilage.pdf>

■ Manure Pits and Lagoon Safety

- Post signs and barriers indicating the area is a hazard zone separating it from non-hazardous zones.
- Provide employees working around manure pits documented training on hazards of working around pits.
- Manure pits and lagoons have the potential for atmospheric hazards including toxic gases, engulfment potential and configurations that could trap or asphyxiate a worker. Inform employees of toxic fumes from deep pit structures.
- Employees should be taught how to protect themselves with PPE and to identify signs of injury or illness including eye/nose/throat irritation, headache, dizziness, drowsiness/confusion, nausea/vomiting, or difficulty breathing.
- Clean pits regularly.
- Keep flotation device readily accessible for emergencies.
- Follow state and national regulations pertaining to management of manure pits and lagoons.



■ Grain Storage

- Post warning signs on bins and at all entry points to identify hazards.
- Restrict access to bins so unauthorized people and youth cannot enter.
- Work from outside the bin and above the highest point of grain.
- Aim for zero entry into the grain bin.
- To reduce injury or death from falls, upgrade ladders with cages or use staircases, wear a safety belt when working around or going inside a grain storage facility, and work in pairs if possible.

■ Fumes in Areas With Poor or No Ventilation

- Inform all employees that poorly ventilated areas such as pits, grain bins, silos, etc. may contain toxic fumes which can be deadly.
- Inform all employees that exposure to toxic fumes can also occur when working with chemicals, such as pesticides.
- Inform all employees that handling dusty and moldy feed can expose workers to inhalation of particles that can be harmful to the respiratory system causing short-term sickness or long-term disease.
- Train all employees on how to safely work in poorly ventilated areas.
- Ensure areas where grains, manure, etc. are stored are ventilated before employees enter these areas.
- Provide proper respiratory protection gear (e.g., respirators) to all employees if their entry into poorly ventilated areas is necessary prior to adequate ventilation.
- Ensure individuals wear dust masks or respirators when continuous or frequent exposure to molds and feed dusts or chemical fumes are incurred.

Transportation Safety

Transportation safety applies to tractors, semitrailers, automobiles, ATVs, skid steers, and other equipment used on the cattle operation. Safety belts should be used in all vehicles. Persons driving equipment should be appropriately trained and understand when problems can arise.



Become BQAT
certified here.



Road safety applies to being on the farm, also. Being aware and communicating well when driving is important for the safety of the driver and humans outside of the vehicle. Follow all state and interstate laws when operating vehicles or equipment.

Areas of transportation training opportunities:

- Pre-trip planning
- Evaluating fitness for transport
- On the road, arriving, and unloading
- Transportation emergencies



The BQAT modules and manual provide detailed preparation and safety guidelines. Refer to *Chapter 6: Timely Culling, Fitness for Transport, and Transportation* for more information.

Animal Health Product Safety (Table 2)

Animal health products, including vaccines, anti-inflammatories, medications, dewormers, and others, are vital to protect the health of cattle. Cattle producers have the responsibility to understand what products they are using, why the products are needed, and how to properly handle them to optimize effectiveness. Properly restraining animals assures good neck access and proper injection technique, improves human safety, minimizes risk of needles breaking or bending, and minimizes animal injury.

- Know and understand protocols for handling all animal health products.
- Read and understand labels for human safety precautions.
- Properly dispose of needles in puncture-proof containers.
- While administering an injection:
 - ☐ Beware of finger and hand locations within equipment and near moving animals.
 - ☐ Stay focused and attentive.
 - ☐ Report all accidental injections immediately.
 - ☐ Seek medical help immediately if accidental ingestion or needlestick occurs.
- Thoroughly wash hands after handling animal health products.
 - ☐ Use warm water and soap.
 - ☐ Lather then scrub hands for 20 seconds.
 - ☐ Rinse under clean warm water.
- Wear plastic gloves at all times when handling medications, insecticides, or when in contact with animal fluids.
- Read package inserts, labels, and safety data sheets for any medications administered to cattle.
- Read label directions on how to deal with accidental exposure or human injection with animal health products.

- Use products only as prescribed and directed on the package or as recommended by the herd veterinarian.
- Post emergency contact information in or near areas where animal health products are handled.
- Ensure special precautions and training for handling products lethal to humans such as the antibiotic tilmicosin.

- If the operation uses tilmicosin, all workers should be trained on how to use it safely as it can have toxic effects of the heart and can be deadly. Exposure can occur through needlestick injuries, skin cuts, puncture wounds, or contact with skin or mucous membranes. It is important to wear gloves and be aware during use.



Find CDC resources on handling tilmicosin and safety precautions here.

- Store products according to label in designated areas that are cool and dry and accessible only to workers who are trained to use the products.



Keep an inventory of all products and frequently check product expiration dates.

- Properly dispose of expired products.

Needlestick injuries can occur when the animal being vaccinated, treated, or processed suddenly jumps or moves. There is a higher risk of needlestick when using the two-handed tented technique for administering injections to cattle. To prevent this from happening, these guidelines should be followed:

- Never straighten a bent needle.
- Do not carry open needles in your pocket.
- Use caution when climbing over a pen with a needle in your hand.
- Never remove needle covers by using your mouth.
- Do not recap needles after use.
- Use the appropriate needle size.
- Use proper animal restraints.
- Dispose of used needles in a puncture-proof sharps container.
- Do not place used needles on shelves or counters where others may injure themselves.

In case of accidental needlestick or injection, take these precautions to help keep you and your co-workers safe:

- Remove the needle: be sure that it is not broken off in the wound.
- Immediately wash the area with soap and water for at least two minutes and report the needlestick.
- If you or a co-worker is accidentally injected with a medication and has a severe reaction, immediately call 911 for professional emergency medical services.
- If seeing a doctor for product exposure, bring the label or bottle of product with you.

Animal Health Products and Safety Steps

- If exposed to any animal health product, remove contaminated clothing and wash affected skin or injected area as soon as possible with soap and water.
- People with known allergies to certain medications (such as penicillin) should not work in areas where animals are being treated.
- Wash contaminated clothing to prevent further skin exposure.

Table 2: Safety Precautions for Selected Animal Health Products (Adapted from Dee Griffin, DVM)

PRODUCT TYPE	DESCRIPTION	MINIMAL RISK	DANGEROUS RISK	SAFETY ACTION IF EXPOSED
Vaccines	Modified Live Vaccines (MLV) or Killed (virus/bacterial)	Most fit in this category.	None	• Wash exposed/injected area and treat with a topical antibacterial ointment. • See a doctor if swelling or pain develops.
	Modified Live Bacterial	None	All have potential to cause disease in humans.	• See a doctor immediately and take the label/bottle of vaccine with you. • The doctor will likely begin treatment with an antibiotic.
Medications (antibiotics, reproductive hormones, supplements, others)	Injectable & Oral	• Most fit in this category. • A potential allergic reaction in some individuals.	Tilmicosin (Micotil) – HUMAN INJECTIONS HAVE BEEN ASSOCIATED WITH FATALITIES • Do not load syringe until the animal is properly and adequately restrained. • Use the “one hand” SQ tented technique for giving injections.	• If Micotil is accidentally injected, this is an extreme emergency – CALL 911, apply ice to injection site, rush person to Emergency Room and take label to ER. • There is no known antidote.
	PRODUCTS WITH INCREASED RISK FOR PREGNANT WOMEN AND WOMEN OF CHILDBEARING AGE • Can be absorbed through skin. • Pregnant women and all women should not handle bottles or touch equipment that has been contaminated. • All people should wear gloves when handling.		Prostaglandin – PREGNANT WOMEN CAN/WILL ABORT OR GO INTO LABOR IF EXPOSED • Readily absorbed through skin and may cause abortions and/or respiratory problems.	• Spillage on the skin should be washed off immediately with soap and water. • Wash exposed/injected area and treat with a topical antibacterial ointment and see a doctor if swelling or pain develops. • Pregnant women see a doctor immediately.
			CIDR (and other prostaglandins)	• Spillage on the skin should be washed off immediately with soap and water. • Wash exposed/injected area and treat with a topical antibacterial ointment and see a doctor if swelling or pain develops.
			Dexamethasone (steroid) – PREGNANT WOMEN CAN POTENTIALLY ABORT OR GO INTO LABOR IF EXPOSED.	• Wash exposed/injected area and treat with a topical antibacterial ointment and see a doctor if swelling or pain develops. • Pregnant women see a doctor immediately.

PRODUCT TYPE	DESCRIPTION	MINIMAL RISK	DANGEROUS RISK	SAFETY ACTION IF EXPOSED
Antiparasitic (dewormers, lice control, ear tags, others)	Injectable	• Most fit in this category. • No known allergies.	None	• Wash exposed area and contaminated clothing.
	• Pour-On • Topical • Oral	• Most fit in this category. • Wear protective gloves when using all of these products. Organophosphates potentially can be a serious hazard if handled improperly.	• Only organophosphates are considered dangerous unless an allergic like response develops.	• Newer generation synthetic pyrethroids can cause a severe tingling or numbing in some people depending on location of exposure. • Wash exposed area and contaminated clothing. • Consider applying pour-ons and topical treatments as last activity to prevent human exposure.

Biosecurity and Zoonotic Diseases

As discussed in *Chapter 4: Biosecurity*, the goal of biosecurity is to protect animals from disease by minimizing the movement of pathogens/germs such as viruses, bacteria, and parasites within or onto an operation. Biosecurity is important to animal, human, and business health. Preventive biosecurity practices are the cheapest and most effective means of disease control. This in turn promotes animal health and minimizes the time and labor resources required to treat a sick animal. Daily biosecurity practices are those everyday practices that keep animals and people healthy.

- Dedicate workers to one area of the farm (such as the calf area at a dairy) to prevent spreading disease to young animals.
- Wash soiled clothing separately from other laundry.
- Regularly wash hands with soap and warm water.
- Wear PPE like gloves, closed-toe shoes, and others.
- Change coveralls often.

Zoonotic diseases are diseases that can be transmitted between animals and humans, such as *Salmonella* or rabies. Cattle can transmit diseases to humans through their bodily fluids (such as blood, saliva, manure, and reproductive fluids) through direct contact or indirectly with the environment. Training cattle handlers on what diseases they could contract and how to protect them from zoonotic diseases should be part of the training program. Biosecurity practices should be listed for the operation, as recommended in *Chapter 4: Biosecurity*.



Zoonotic disease prevention guidelines:

- Place signs at the entrance and in visiting areas.
 - Signs should tell visitors to minimize contact with animals, and to follow any posted instructions.



Provide a guest sign-in sheet to log all visitors.

- Wear non-permeable gloves, goggles, or masks when exposed to animal body fluids.
- Regularly wash hands with soap and warm water.
- Don't put things in your mouth (like needle caps, food, others) while working cattle.
- Be careful around stillborn or aborted fetuses.



Find Secure
Beef Supply
Plan resources here.



As a reminder, cleaning is an impactful intervention step that removes organic debris using soap and water (preferably hot). This allows the disinfectant to work more effectively to kill any remaining pathogens. It's important to choose the correct product, apply at the correct concentration, and for a sufficient contact time. Read the labels of all products used.

All employees should be trained on basic biosecurity principles and the operation's biosecurity plan. This should include an enhanced biosecurity plan that focuses on foreign animal disease preparedness.

Miscellaneous

Chemical Safety

Producers possessing a Pesticide Applicator License should follow all guidelines pertaining to that certification. Always read packaging labels on any chemical product, including cleaning products, pesticides, pour-on products, herbicides, and others.



Record use and purchase of products. Records of pesticides should be kept for at least two years.

- Adhere to label directions for proper handling, storage, use, and withdrawal periods (if applicable). Products, such as pesticides and chemicals, used on raised feeds must be FDA/USDA/EPA approved.
- As required by the federal Worker Production Standard, proper training for pesticide handling should be available to all who work with these products. OSHA requires that all employees be made aware of any hazardous chemicals to which they may be exposed. In addition, all chemicals used on the operation should have an accompanying Material Safety Data Sheet (MSDS), which contains additional health hazard warnings and handling instructions.
- Check chemical application before use and use appropriate personal protection equipment (PPE) for the product. PPE could include chemical-resistant gloves, closed toed shoes, coveralls, hats, respirators, goggles, face shields, or others. Clothing with chemicals on them should be washed separately from other laundry.
- Regular training updates (at least annually) are important for all employees whose work is associated with pesticide use.

Emergency Action Plan (EAP)

An emergency action plan identifies and organizes employer and worker responsibilities in preparation for and when responding to a workplace emergency or disaster. As discussed in *Chapter 10: Emergency Action Planning*, preparing a plan before the disaster happens and communicating that plan to all workers on the operation is key to an orderly and quick response.

EAPs and biosecurity plans can use the same information including the site map to demonstrate roads on and off the operation. At a minimum, the EAP should include:

- Emergency escape procedures and routes.
- Procedures to account for workers.
- Procedures for workers who remain on site after the alarm sounds.
- Duties for workers designated to perform rescue and medical functions.
- The preferred means for reporting emergencies.
- Contact(s) for further information or explanation of duties under the plan.



EAP and biosecurity plans should be reviewed when new workers are hired, the plan is developed or changed, or the worker's workplace responsibilities or designated actions under the plan change.

Additional Worker Safety Resources

AgriSafe Network. Agricultural occupational health services and safety trainings.
<https://www.agrisafe.org/>

American Farm Bureau. Think F.A.S.T. (Farm & Ag Safety Training) program for youth.
<https://www.fb.org/initiative/farm-bureau-safety-health-network/think-f-a-s-t>

National Dairy Farmers Assuring Responsible Management
Worker Safety & Human Resources with external resources.
<https://nationaldairyfarm.com/producer-resources/worker-safety-human-resources/>

National Farm Medicine Center and National Children's Center for Rural and Agricultural Health and Safety. Cultivate Safety for Hired Agricultural Youth Work Guidelines.
<https://cultivatesafety.org/hired-youth/>

National Institute for Occupational Safety and Health (NIOSH)
Centers for Agricultural Safety and Health.
[https://www.cdc.gov/niosh/extramural-programs/php/about/ag-centers.html?](https://www.cdc.gov/niosh/extramural-programs/php/about/ag-centers.html?CDC_AAref_Val=https://www.cdc.gov/niosh/oep/agctrhom.html)
[CDC_AAref_Val=https://www.cdc.gov/niosh/oep/agctrhom.html](https://www.cdc.gov/niosh/oep/agctrhom.html)

U.S. Roundtable for Sustainable Beef. Employee Safety & Well-Being.
[https://learning.usrb.org/sl_modules/producers_workersafety/story_content/external_files/](https://learning.usrb.org/sl_modules/producers_workersafety/story_content/external_files/USRSB_ToolKit_FinalPDF_EmployeeSafety&Well-being.pdf)
[USRSB_ToolKit_FinalPDF_EmployeeSafety&Well-being.pdf](https://learning.usrb.org/sl_modules/producers_workersafety/story_content/external_files/USRSB_ToolKit_FinalPDF_EmployeeSafety&Well-being.pdf)

Occupational Safety and Health Administration (OSHA). Standards, compliance assistance, training tools, and education centers.
<https://www.osha.gov/training> & <https://www.oshaeducationcenter.com/>

Safety Made Simple. Training developed by Safety Professionals in the agriculture industry.
<https://safetymadesimple.com/>

University of Minnesota Extension. Farm Safety Resources.
<https://extension.umn.edu/safety/farm-safety>

Washington State Department of Labor and Industries
Create a workplace safety and health program.
<https://lni.wa.gov/safety-health/preventing-injuries-illnesses/create-a-safety-program/>



Record Keeping Reminders

- Keep proper records for employees, training completed, and details within those training sessions per state and federal regulations.
- To help ensure overall care of cattle, consider having those working with cattle sign the BQA Cow Care Agreement. This resource can be found in Resources on www.bqa.org.
- Record keeping is an important piece to a successful cattle operation. Training records ensure that all members of the team, including family members, are aware of their responsibilities and how to keep themselves safe. Each operation will have different best management practices (BMP) established for minimum training requirements. Employee training logs will help with these requirements.
- Firearms or captive bolts should be cleaned regularly and maintenance logs of cleaning should be kept.
- Keep an inventory of all products and frequently check product expiration dates.
- Biosecurity practices should be listed for the operation for employees to see.
- Provide a guest sign-in sheet to log all visitors.
- Record use and purchase of chemical products. Records of pesticides should be kept for at least two years. Regular training updates (at least annually) are important for all employees whose work is associated with pesticide use.
- EAP and biosecurity plans should be reviewed when new workers are hired, the plan is developed or changed, or the worker's workplace responsibilities or designated actions under the plan change.





CHAPTER 10

EMERGENCY ACTION PLANNING



Objectives

- Develop and maintain written emergency action plans specific to the operation.
- Inform and train everyone involved in the operation what to do in case of an emergency.

The threat of emergencies always exists in agriculture — everything from a severe weather event, a trailer rollover or traffic accident involving cattle, to an animal disease outbreak, or other emergencies and accidents involving fire or machinery (Table 1).



The first step is to develop an emergency action plan (EAP) for the operation. An EAP is a written framework that guides producers through the planning, actions, and documentation of an emergency response plan for unexpected and emergency events. A comprehensive plan includes key people and their responsibilities, a communication plan including training, exit routes, handling procedures, and emergency contacts. This framework should be flexible enough to meet local needs yet rigid enough to cover important tenets of an emergency action plan.



At a minimum, plans should include a communication tree, emergency escape procedures and routes, a method for accounting for people, and a designated meeting place. Information within an EAP varies based on each operation.

Emergency Action Plan – Why is it Needed?

Emergency action plans and preparedness are important to overall business continuity during emergencies. All operations should have a written EAP. Keeping family members and employees safe is the responsibility of the operation and extra preparedness also helps first responders. EAPs minimize damage as the operation and team are prepared for emergencies. There may not be much to control during a natural disaster or other emergency, yet having and implementing a preparedness plan allows the team to mitigate damage to the animals, equipment, facilities, and environment. These plans can function as business continuity plans because the operation understands what to do after the situation is diffused and the employees are able to return to work. As with other aspects of the BQA program, EAPs serve as prevention steps to minimize the occurrence of an emergency and help teams respond and act quickly during an emergency through preparation.

If the operation does not have an EAP, today is a good day to start. EAPs take time to develop and are invaluable as preparation steps. Assessing the operation during a normal workday can provide the start of the plan. Remember, business will NOT be normal during and after an emergency, so planning for contingencies is best to do beforehand.

Creating a Plan

Partner with the operation's managers, family, and employees to develop a plan. Assessing the risk for the operation will depend on the region of the country, time of year, and business type. Think through the five Ws: who, what, where, when, and why for each type of emergency. There may be other questions, too, though this is a start.

- **Who:** Who should be involved? Who is most at risk in case of a natural disaster? Who needs to receive workplace safety training? Who will conduct the trainings?
- **What:** What do you need to do? What will employees need to be safe, protected, and supported?
- **Where:** Where should you go? Where can employees learn about these plans?
- **When:** When should you plan? When should employees be trained? When should they be alerted to a disaster?
- **Why:** Why should you plan? Why are you implementing these policies?

Each emergency type will have different answers to these questions, so it is important for the operation to discuss and plan for the specific risks. EAPs should be shared with family, employees, first responders, and local/state emergency management teams.

Communication

Communication is key before, during, and after an emergency. All family members and employees should be trained with the operation's EAP and know where to find important information. During the planning process, work with local first responders and other organizations to help the operation cover various situations.



Written plans should be easily accessible and posted in visible areas where they can be quickly accessed. For example, a copy should be in the office and where employees are frequently working. A copy should also be available in remote locations and in the glove compartment of vehicles.

In some emergencies, cellular or satellite service may be disrupted or may have poor service. It is important to have alternative communication methods such as landlines, walkie talkies, weather radios, satellite communicators, or people to get messages out. Ensure phones can receive wireless emergency alerts from public safety officials. Make sure everyone has access to emergency phone numbers.

Review your action plan with your crew on a regular basis and update it when changes are required. This could be done in team meetings, in common spaces, or through messaging. Practice runs or EAP walkthroughs are an important learning tool for the team.

Table 1: Potential Hazards for Rural Communities and Cattle Operations

Natural Disasters	Floods
	Severe thunderstorms
	Tornadoes
	Excessive heat
	Drought
	Severe winter storms
	Wildfires
Biological Emergencies (human, animal and/or crop health emergency)	Public health (epidemics, other)
	Foreign Animal Diseases
	Emerging and zoonotic diseases
	Emerging crop diseases and pests
	Food safety recalls
	Injury/medical emergency
	Transportation emergency
Technological Threats	Bio- and Agro-terrorism
	Agrochemical issues (hazardous material spills)
	Power outages
	Fires
Other Threats	Protests, demonstrations, and incidents of activists
	Workplace violence/active shooter

Adapted from www.prep4agthreats.org.

Operation Map and Layout

Operations may choose to add information such as a site map/layout of the operation and a diagram that shows where equipment, controls, and potentially hazardous items such as medicines, chemicals, and fuel are located. These details are valuable to emergency response teams. The premises map that is part of the operation's biosecurity plan can also be used for the EAP. These should be printed and saved digitally to be made available for employees or first responders in case of an emergency.

Building layouts should include locations of emergency exits, fire extinguishers, severe weather shelter areas, and emergency equipment (e.g., AEDs, first aid kits, others).

The operation layout should include a diagram, with a legend or key, showing the location of:

- Buildings
- Equipment (one example is the location of temporary fence/panels)
- Transportation equipment/stock trailers
- Controls (utility shut offs and electric panels)
- Medicines
- Chemicals
- Animal locations (including number and purpose)
- Severe weather shelter areas
- Safe meeting point (following storm)
- Property lines, fences
- Roads or access points

Employee Information and Training

It is the responsibility of each operation to ensure there is emergency contact information for each employee. A list of workers or work schedule can be used to provide a head count during a response and should be readily available.

Employee training on EAPs and other duties should occur upon hiring and at least annually to adapt to changing work conditions. In the event of an emergency, employees should contact local law enforcement and describe the location, nature of emergency, and include information about the operation and situation. Each worker should be trained on directions for sheltering in place, where safety equipment or information is kept, where to find the EAP and how to respond. First aid training and certification, including CPR (cardiopulmonary resuscitation) and AED (automated external defibrillator), can be incorporated in training along with sharing where local clinics and hospitals are located. Assemble a disaster supply kit of essentials that can be taken quickly — one for your family and employees and one for livestock and pets.

In addition to the risk for physical injury and potential property losses, it's important to attend to emotional health and well-being both during and after crises. Following an emergency, debriefing by discussing what processes went well (enough) and what could have been improved can be a learning tool for future emergencies. Psychological debriefing is often a good step for helping people process involvement with traumatic events and knowing when to ask for help.

Transportation

If animals need to be loaded before or during an emergency, training and practicing what to do in that situation is important for animal and human safety. For instance, teaching horses to load prior to an emergency can reduce the risk of injury. Having enough equipment such as trailers, halters, or panels to move animals is a good preparation step.

Engage all employees who transport livestock in the BQAT program which teaches about multiple areas including pre- and post-trip planning, driving safety, cattle behavior, and other topics. BQAT resources can be found online at www.bqa.org or through an in-person program.

Check with the state department of agriculture or state veterinarian to see what emergency response programs are available. Local emergency management teams may have training workshops that employees and family members can join. Consider conducting a mock emergency drill to practice the chain of phone calls or practice responding to a stranded trailer loaded with cattle.

If euthanasia needs to be conducted during transportation or on a trailer, consider how cattle will be euthanized safely to avoid any ricochet inside a trailer.



Watch this video and learn how to make a premises map.



Review the CDC's page on coping with a disaster or traumatic event.

Animal Health Emergencies



Protecting livestock during a disaster requires some planning prior to the event. Having access to food, water, veterinary care, and handling equipment at evacuation destinations is necessary. Often fairgrounds are used, though planning for other arrangements in advance is recommended. Livestock identification – photographs, brand inspection, registration papers, microchip numbers, or others – should be visible. Up-to-date records and copies of the identification either on paper or electronically aid in returning animals. Plan for alternative sources of water and power if those are disrupted.

Biosecurity practices, as discussed in *Chapter 4: Biosecurity*, are key training tools that are implemented on a daily basis to protect animal and human health. For animal health emergencies such as a disease outbreak or food safety investigation, cattle producers should understand enhanced biosecurity steps that may need to be taken. In the event of a FMD outbreak, the Secure Beef Supply plan, an enhanced biosecurity plan, will be required to protect animals from FMD.



The Secure Beef Supply (SBS) Plan provides guidance to producers and transporters who have cattle with no evidence of FMD infection prepare to meet movement permit requirements. Having accurate records of the movement of animals, vehicles, equipment, and people is integral to the investigation and protection of cattle. Visit **www.securebeef.org** for more information.

All producers are encouraged to know who their State Animal Health Official (SAHO) is and how to contact them in case of an animal disease emergency. State veterinarian offices will have information on their websites and be able to provide state-specific recommendations.

Suspect an FAD such as FMD?

Report a suspected or diagnosed disease to the USDA APHIS Assistant Director for your state or your SAHO at **www.aphis.usda.gov/nvap/area-vet**.

You can also call the USDA Emergency numbers at **(800) 940-6524** or **(866) 536-7593** (24 hours) for assistance.

Information will be kept confidential during the investigation.

Customized EAP for Each Operation

Each operation is unique in structure, management, people, and animals. It is the responsibility of the operation to develop an EAP specific to the business. For more information on types of disasters or events to plan for, visit the following websites.

Prep 4 Ag Threats

<https://www.prep4agthreats.org/index.php>

The Center for Food Security & Public Health

<https://www.cfsph.iastate.edu/emergency-response/>

Ready AG Workbook

<https://extension.psu.edu/readyag-workbook>

Protecting Livestock During a Disaster

<https://www.aphis.usda.gov/animal-emergencies/protecting-livestock-during-disaster>

Emergency Farm Plan Electronic Template

[https://www.canr.msu.edu/uploads/resources/pdfs/emergency_planning_for_the_farm_-_livestock_operations_\(e2575s\).pdf](https://www.canr.msu.edu/uploads/resources/pdfs/emergency_planning_for_the_farm_-_livestock_operations_(e2575s).pdf)



Record Keeping Reminders

- Develop an emergency action plan (EAP) for the operation. An EAP is a written framework that guides producers through the planning, actions, and documentation of an emergency response plan for unexpected and emergency events.
- Written plans should be easily accessible and posted in visible areas where they can be quickly accessed. For example, a copy should be in the office and where employees are frequently working. A copy should also be available in remote locations and in the glove compartment of vehicles.
- Up-to-date records and copies of the identification either on paper or electronically aid in returning animals during a foreign animal disease outbreak.
- The Secure Beef Supply plan provides guidance to producers and transporters who have cattle with no evidence of FMD infection prepare to meet movement permit requirements.



THE
RIGHT WAY
IS
THE ONLY WAY.



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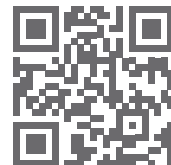
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SCAN THIS CODE for more
Beef Quality Assurance resources
and online training modules





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