



Funded by Beef Farmers and Ranchers



NATIONAL MANUAL



CHAPTER 1. INTRODUCTION

1.1 Welcome and Principles of BQA

WELCOME TO THE BEEF QUALITY ASSURANCE (BQA) PROGRAM. THOUGHTFUL, RESPONSIBLE CATTLE MANAGEMENT

This principle has been at the heart of BQA since its inception, and it is just as important now as it was more than 30 years ago. No two cattle operations are exactly the same and, as such, no program could ever list all of the dos and don'ts to ensure food safety, animal well-being, worker safety, and environmental stewardship. Rather, BQA promotes the adoption of a way of thinking — to always approach management decisions with thoughtfulness and an appreciation for the responsibility you have to the animals, consumers, the environment, and to the larger beef industry.

Three quotes from those that helped establish the modern BQA program still resonate today:

“If it’s not right, make it right.”

– Ladd Hitch, past president of National Cattlemen’s Beef Association

“We must make our decisions thoughtfully.

You never have a second chance to make the first right decision.”

– Richard McDonald, former president of the Texas Cattle Feeders Association

“In cattle care, there are no most valuable players; everyone is important.”

– Dr. Gary Cowman, former executive with National Cattlemen’s Beef Association



This is the official manual of the Beef Quality Assurance program and includes the most current set of key practices, guidelines, and suggestions for providing thoughtful and responsible cattle management. The material in this manual serves as a helpful resource and serves as the foundation for training and certification programs offered nationally and by many states.

The BQA program encourages you to seek and utilize all reliable sources of information; these actions will help accomplish the BQA program's goals and objectives. The BQA program is a cooperative effort between beef producers, veterinarians, nutritionists, extension staff, and other professionals from veterinary medical associations and allied industries.

Cattle managed using BQA guidelines will be less likely to contain a violative residue, injection site tissue damage, or foreign material (e.g., a broken needle) among other product quality defects. The program asks everyone involved with beef production to follow the FDA/USDA/EPA guidelines for product use and to use common sense, appropriate management skill(s), and accepted scientific knowledge to produce quality, healthy, and safe products.

1.2 Background of BQA

1.2.1 RATIONALE FOR BQA

From pasture to plate, the beef supply chain has adopted and implemented HACCP-like programs and BQA management principles. These beef supply companies seek to do business with operators who utilize similar management philosophies further ensuring the safety and quality of products leaving their facilities. Adoption of BQA principles as a method of doing business helps position cattle raisers to take advantage of these opportunities. Additionally, implementing BQA can help producers avoid costly production mistakes and unacceptable production defects.

Participation in the BQA program is one way to show our customers, whether they are cattle buyers or beef consumers, that producers take every possible step to raise beef responsibly. Maintaining customer confidence is an essential goal of cattle management. Furthermore, each aspect of a BQA program is economically logical and part of good business management. This responsible management approach can bring positive benefits to the cattle producer including improved resource management and positive returns. Making a commitment to Beef Quality Assurance is the right thing to do for producers and consumers alike.

1.2.2 BRIEF HISTORY OF BQA

» **Early 1960s:**

- The Pillsbury Company, NASA, and the U.S. Army Natick Laboratories (now the U.S. Army Natick Research and Development Center) developed a quality control program called Hazard Analysis Critical Control Point (HACCP) to ensure food safety on NASA missions and reduce product defects in the food chain.
- The U.S. Department of Agriculture accepted the program. HACCP is presently the accepted framework for safety assurance programs in processed and fresh foods. HACCP plans are prevention plans that identify and help control potential food hazards and monitor critical points of the production process.

» **1982:**

- The USDA's Food Safety Inspection Service (FSIS) began working with the U.S. beef industry to develop the Pre-harvest Beef Safety Production Program.

» **1982 to 1985:**

- Three feedyards cooperated with FSIS to

evaluate production practices and assess residue risks.

» **1985:**

- After careful analysis and adjustment of production practices, these three feedyards were certified by FSIS as "Verified Production Control" feedyards. What was learned during those three years now serves as the backbone for the Beef Quality Assurance program.

» **Mid-1980s:**

- A number of cattlemen associations initiated the first state-level BQA programs. These programs incorporated HACCP-like principles addressing food safety concerns and quality issues by identifying quality control points within the feedyard management system. These programs have helped pave the way toward ensuring the safety and quality of beef.

» **1990s:**

- The USDA mandated that all meat packing and processing plants develop and implement HACCP programs. Industry groups

have developed voluntary safety and quality assurance programs (i.e., BQA) for the preharvest production segments of the industry.

» **1990 to 2000:**

- Injection site lesion in fed cattle reduced from 21.6% to 2.5%.

» **1998 to 2017:**

- Injection site lesions reduced from 31% to 7% in beef breeding stock.

» **2000s:**

- Self-assessment resources were developed by the BQA program to aid producers in benchmarking and identifying areas of their operation for improvement.

» **Mid-2000s:**

- The national BQA program increased the reach of the program through online training opportunities. The online classroom became a training resource that is available 24/7/365.

» **Today:**

- The BQA program assists beef producers as they implement BQA management strategies to help ensure the safety and quality of cattle within their control.
- BQA practices have helped to nearly eliminate any problems associated with violative residues and significantly reduced incidences of injection site lesions in beef cattle.

1.3 Goals and Objectives of BQA

BQA GOAL

The goal of Beef Quality Assurance is to assure consumers that all cattle shipped from a beef production unit are healthy, wholesome, and safe; their management has met FDA, USDA; and EPA standards; they meet quality

requirements throughout the production system; and are produced using animal well-being, worker safety, and environmentally-sound production practices.

BQA OBJECTIVES

- » Set production standards for quality and safety that are appropriate to an operation and that producers can realistically meet or exceed. Incorporate key elements influencing the production of defect-free food including biosecurity, animal health and well-being, production performance, and environmental stewardship.
- » Establish data retention and record keeping systems which satisfy FDA/USDA/ EPA guidelines and allow for validation of management activities and fulfill program goals.
- » Provide hands-on training and education to help participants meet or exceed BQA program guidelines and realize the benefits of the program.
- » Provide technical assistance through BQA program staff, veterinarians, extension specialists, and other qualified individuals working with the BQA program.
- » Provide a basis and foundation for the beef industry to share our producers' commitment to continuous improvement and responsible cattle management.

1.4 Program Guidelines and Overview

BQA PROGRAM

The foundation of Beef Quality Assurance is regular, high-quality training and certification for cattle producers on the principles and key practices of BQA. In addition to training and certification, there are other components to the BQA Program:

» Self-evaluation

- 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 Manual

- The manual provides the in-depth reference for cattle producers who want

to further study key topics or prepare additional trainings for their crews.

» Producer Field Guide

- The Producer Field Guide is a mobile-based website with a ready reference of tips and suggestions for producers who are in the field, feedlot, or on the go and want a quick review of key practices.

» 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.

1.4.1 USE OF KEY PRACTICES

The key practices listed in each chapter are collectively known as the BQA Key Practices. These are an update to the BQA National Guidelines listed in the previous version of the BQA Manual. The BQA Key Practices should serve as the foundation for BQA training and certification. More importantly, they should serve as the basis for thoughtful, responsible cattle management by cattle producers. Some of the key practices refer to specific guidelines

informed by FDA or USDA requirements. Other practices are informed by best practice and/or research. It is expected that every cattle producer will apply these practices in a manner that is appropriate for their operation. The BQA Key Practices are not an instruction manual; rather, the practices represent the outcomes that cattle producers should be working toward day in and day out.

1.4.2 TRAINING VIA STATE COORDINATORS OR BQA ONLINE

The BQA program operates using a team approach. BQA program representatives provide information and training support to state and local trainers and producers. BQA program representatives, working with state BQA coordinators, are responsible for the development and maintenance of BQA training

materials and certification and follow-up on any program issues, updates, or modifications. Training certification continues in communities across the U.S. with the assistance of qualified local individuals such as veterinarians and extension educators who have completed the BQA Trainer training.

The BQA program is a voluntary program involving basic training in BQA followed by an exam. The exam is included to 1) help instructors make certain the material was effectively presented to participants and 2) satisfy national guidelines for helping states determine whether their various BQA programs are equivalent to each other. Program variations are typically due to environmental differences (e.g., climate, precipitation, parasites, etc.) that may require management strategies to be adapted to fit specific regions. Equivalency among states is also an important aspect for marketing forces that are driving the dynamic adoption of BQA principles and management. For example, today there are marketing outlets that name particular state BQA programs and equivalent programs

as a specification for the type of feeder cattle (or management) they want to buy. This trend will likely continue to increase.

Following a producer's completion of BQA training and successful completion of the exam, producers will receive a certificate of completion — an opportunity to proudly display their commitment to beef quality and animal well-being. Producers looking to participate in BQA beyond training and certification are encouraged to complete the BQA Self Assessment most applicable to their industry segment. In some states, advanced BQA training opportunities are available to producers looking to enhance their commitment to BQA. Self-assessment guides are available online at www.bqa.org.

1.5 Certification and Recertification Requirements

To earn BQA Certification, cattle producers must either complete BQA online (found at www.bqa.org) or attend a training event held by a state BQA coordinator. Both options require the passing of a quiz that relates to BQA Key Practices.

BQA certification is typically good for three (3) years from the date the original certification was earned; some states may have different requirements if certification is earned through

a state-delivered training. Find the certification information and requirements for your state at www.bqa.org.

Recertification generally requires completing the original BQA training and certification (whether online or via workshop in your state). Some states may offer continuing education opportunities that qualify for BQA recertification. Again, check www.bqa.org for recertification requirements in your state.

1.5.1 RELATIONSHIP TO FARM AND VQA PROGRAMS

Dairy cattle producers that received a satisfactory on-farm evaluation as part of the Dairy FARM Program: Farmers Assuring Responsible Management™ (FARM Program) are automatically eligible to earn BQA certification. Through a working relationship with the FARM Program, that evaluation now includes the essential BQA Key Practices to be considered an equivalent program. Similarly, if veal-only producers have completed the Veal Quality

Assurance training and certification program, they shall also be considered BQA certified. If, however, a producer raises other classes of cattle beyond veal, participation in a BQA training program is required for certification.

1.6 Beef Quality Audit Overview

The importance of beef quality assurance methods being utilized in your management operation can be seen when analyzing the top quality challenges within the beef industry. These quality challenges include injection site blemishes, bruising, rib brands, and other meat quality defects. Every five years a Beef Quality Audit is conducted to benchmark the industry's collective progress in addressing these quality challenges.

Although dramatic improvement has occurred over the last 25 years, improper placement of injections continues to plague the beef industry. It was determined in the "Lost Opportunities in Beef Production" publication that injection site lesions and abscesses cost the industry \$2.42 million.

Utilization of proper cattle handling is key. It can eliminate carcass bruising and the presence of dark cutters. Although the industry has observed a decrease in the presence of carcass bruising according to the 2016 National Beef Quality Audit results, the "2016 Lost Opportunities in Beef Production" publication indicated that carcass bruising cost the industry approximately

\$62.15 million. Additionally, the presence of dark cutters cost the beef industry \$132 million (Pendell et al., 2018).

Another management technique that accounts for the substantial lost opportunities in the beef industry is hot iron rib branding. The 2016 National Beef Quality Audit found that the presence of hot iron branding on the rib has decreased. However, hide discounts attributed to branding still cost the industry \$29.24 million (Pendell et al., 2018).

The National Beef Quality Audit provides management tactics to help overcome reported beef quality shortcomings. These include the elimination of side and multiple brands, proper cattle handling/transport techniques and facility design, and the elimination of improper IM injections. Proper administration of animal health products, branding only in the shoulder or hip areas, marketing cattle at an optimum time, and reducing stress placed on when handling cattle are just some of the management practices that can help prevent quality defects and increase market value. For full results visit www.bqa.org.

¹ Pendell D. L., D. L. VanOverbeke, J. J. White, J. O. Fulton. 2018. Lost opportunities in U.S. beef production. Unpublished.

1.7 Foundational Models of the BQA Approach

1.7.1 TOTAL QUALITY MANAGEMENT

One definition of 'quality' is "providing products that meet or exceed expectations and established requirements every time." In the beef industry, established product requirements differ among the various production segments, but there are some common expectations.

For example, the products of a commercial cow-calf operation are weaned calves and culled breeding stock. Weaned calves should possess

performance, health, and carcass characteristics that satisfy stocker operators and cattle feeders, and meet food safety requirements. Culled breeding stock must meet the food safety and carcass characteristic requirements of market cow and market bull processors.

As products of a stocker operation, feeder cattle should meet the requirements of cattle feeders for performance, health, carcass characteristics

and food safety. Fed cattle must meet the requirements of beef processors for health, carcass characteristics, and food safety. Commodity beef products must meet requirements of beef purveyors for fat trim, marbling, portion size, safety, and lack of defects such as injection site blemishes, dark cutters, etc.

Beef products sold to the consuming public must consistently meet expectations for both food safety and eating satisfaction.

The bottom line is that quality in the beef

industry goes far beyond the parameters of food safety. It also encompasses performance, health, 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 Total Quality Management 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.

1.7.2 HACCP-LIKE CONSIDERATIONS

Overall ideas behind HACCP-like programs include: identifying what can go wrong that can cause a defect, determining how to prevent it from happening, and documenting that you are doing what you set out to do. Defects may be quality or safety related. Safety defects include chemical — such as a violative residue, physical — such as broken needles, or biologic — such as beef measles. Implementation of HACCP-like programs should involve a producer's family, employees, veterinarian, nutritionist, extension specialists, and suppliers — among others.

At the ranch level, a HACCP-like program is as simple as creating a plan ahead of time to deal with something that does not go well. For example, how to deal with a needle breaking off during a vaccination which results in an embedded needle shaft in the calf. Although the seven core HACCP principles are not always specifically referenced, the concepts of control points, critical limits, preventive measures, corrective actions, and monitoring are included in the discussion points throughout the manual. The seven HACCP principles include:

- » Review all management programs to identify production practices that affect food safety, quality, and the environment. More formally, this step is called a “hazard analysis.” For example, instructing everyone involved in working cattle to avoid giving intramuscular injections anywhere but the neck area. Data

shows that intramuscular injections given in the hip at branding cause an identifiable injection site blemish in the steaks from that animal, and it may toughen the meat in an area up to several inches around the injection site.

- » Identify the control points where potential problems can occur, be prevented, and/or controlled. For example, storage of feed and/or chemical products is a control point. To help ensure that feed is not accidentally contaminated, batteries, fuel containers, or paint should never be stored in the same location as feedstuffs.
- » Establish critical limits associated with each control point. For example, identify the proper withdrawal time associated with a drug treatment to determine the earliest date the treated animal is eligible for market.
- » Establish control point monitoring requirements to ensure that each control point stays within its limit. For example, maintaining pesticide use records so that you can check grazing restrictions on a particular field or pasture before turning cattle out.
- » Establish corrective actions necessary to implement if a problem occurs. For example, corrective actions for a drug residue violation might include improving record keeping and employee training.
- » Establish effective record keeping procedures that document that a system is working

properly. For example, using a processing map to record where each injection was given, how much was given, how it was given, and what the injection was is a way to verify your treatment protocol.

- » Establish procedures for verifying that the system is working properly. For example, a periodic review of your animal treatment records, production practices, critical limits, treatment protocols, etc. is a way to help verify that management strategies are occurring according to an operation's management plan.

BQA

1.8 Key Practices

Provide personnel with training/experience to properly handle and care for cattle. (Code of Cattle Care)

Make timely observations of cattle to ensure basic needs are being met.

Provide facilities that allow safe, humane, and efficient movement and/or restraint of cattle. (Code of Cattle Care)

Use appropriate methods to humanely euthanize terminally sick or injured livestock and properly handle carcasses. (Code of Cattle Care)

CATTLE CARE

2.2 Key Practices

Abuse of cattle is not acceptable under any circumstances.

Provide personnel with training/experience to properly handle and care for cattle.

Make timely observations of cattle to ensure basic needs are being met.

Design, provide, and regularly inspect facilities (fences, corrals, load-outs, stations, freestall areas, alleys, etc.) to help ensure safe and easy animal movement and restraint.

Keep feed and water handling equipment clean.

BIOSECURITY

3.2 Key Practices

Evaluate the biosecurity risks on your operation and follow a plan to help mitigate risk.

Recognize and mitigate the biosecurity risks associated with the introduction of new cattle and inter-herd/-operation traffic.

Apply basic sanitation practices to equipment, vehicles, and clothing to decrease the chance of microbial contamination.

Prevent manure contamination of feed and feeding equipment.

HERD HEALTH

4.2 Key Practices

Develop a herd health plan that conforms to good veterinary and husbandry practices that are appropriate for the region where you are raising cattle.

Provide disease prevention practices to protect herd health including access to veterinary medical care.

Follow all FDA/USDA/EPA guidelines and label directions for each product.

Use FDA-approved feed additives including those requiring a veterinary feed directive (VFD) in accordance with label requirements. The FDA requires all VFD records to be retained for two years and available upon FDA request for inspection.

Keep extra-label drug use (ELDU) to a minimum and only when prescribed by a veterinarian working under a Veterinary/Client/Patient Relationship (VCPR).

Properly administer products labeled for subcutaneous (SQ) administration in the neck region.

When available, use products approved for SQ, intravenous (IV), intranasal (IN) or oral administration rather than products administered intramuscular (IM) as all products can cause tissue damage when administered IM.

Always ensure products labeled for IV-only are never be given by any other route of administration because of the potential for causing violative residues at the injection site.

Use, when available, injectable products with low dosage volumes and follow the proper spacing of injections.

Administer products labeled for (IM) in the neck region only — no exceptions, regardless of age.

Do not administer more than 10cc of product per IM injection site.

Use the proper needle size for injections and never reuse a bent needle.

Do not market compromised — terminally ill and/or non-ambulatory cattle.

Humanely euthanize non-ambulatory animals using appropriate methods.

TRANSPORTING

5.2 Key Practices

Knowingly inflicting physical injury or unnecessary pain on cattle when loading, unloading, or transporting animals is not acceptable.

Handle/transport all cattle in such a fashion to minimize stress, injury, and bruising.

Use vehicles to transport cattle that provide for the safety of personnel and cattle during loading, transporting, and unloading.

Follow these guidelines when transporting your own livestock:

- Perform a structural check of trailer/truck and tires prior to loading livestock.
- Inspect trailer/truck for cleanliness (biosecurity) as well as broken gates

that may injure/bruise cattle.

- Check weather and route to ensure a safe and uneventful trip.
- Verify withdrawal on any animals being sold.
- Verify that all animals are fit to ship.
- Back up squarely and evenly to the loading chute.
- Load using Low Stress Handling Practices.
- 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 an organized event.

Follow guidelines when contracting for your livestock to be hauled:

- Establish good communication/logistics with both the trucking company and the receiver of the livestock.
- Request that the truck arrive clean for loading to decrease biosecurity risks.
- Check weather and route to ensure for a safe and uneventful trip.
- Verify withdrawal on any animals being sold.
- Verify that all animals are fit to ship.
- Ensure that the driver backs up squarely and evenly to the loading chute.
- Load using Low Stress Handling Practices.
- Ensure that the driver pulls away from the chute slowly and drives smoothly to allow cattle a chance to gain their balance in transit.
- Encourage the driver to minimize time in transit by limiting stops and using prior preparation to ensure an organized event.
- Ask hauling contractor/driver for proof of BQA Transportation Certification.

RECORD KEEPING

6.2 Key Practices

Employ strict adherence to pre-harvest withdrawal periods on product labels and to extended withdrawals as determined by a veterinarian within the context of a VCPR.

Identify all animals with appropriate individual and/or

group identification methods.

When cattle are treated/processed individually, record the following in the treatment records:

- Individual animal identification
- Date treated
- Product administered and manufacturer's lot/serial number
- Dosage
- Route and location of administration
- Earliest date animal will have cleared the withdrawal period
- Name of individual administering the treatment

When cattle are treated/processed as a group, identify all cattle within the group as such, and record the following information:

- Group or lot identification
- Date treated
- Product administered and manufacturer's lot/serial number
- Dosage
- Route and location of administration
- Earliest date animal will clear the pre-harvest withdrawal period
- Name of individual administering the treatment

Whenever possible, transfer all processing and treatment records with the cattle to next owner or production level.

Inform prospective buyers of any cattle that have not met pre-harvest withdrawal times.

When applicable, keep complete records when formulating or feeding medicated feed rations.

Maintain records of any pesticide use on pasture or crops that could potentially lead to violative residue in cattle.

Keep records for a minimum of two years or longer as required by laws/regulations (e.g., three years for Restricted Use Pesticides).

NUTRITION

7.2 Key Practices

Ensure cattle have access to an adequate water supply and appropriate nutrition (from Code of Cattle Care, modified for sentence structure).

Avoid feed and water interruption longer than 24 hours.

Only use feedstuffs and feed ingredients of satisfactory quality.

Under certain circumstances (e.g., droughts, frosts, and floods), test feedstuffs or other dietary components to determine the presence of substances that can be detrimental to cattle well-being such as nitrates, prussic acid, mycotoxins, etc.

Use only USDA, FDA, and EPA approved products for use in cattle; these products must be used in accordance with the product label.

Analyze suspect feedstuffs prior to use and seek supplier assurance of feed ingredient quality.

Do not feed ruminant-derived protein sources per FDA regulations.

Support feeding of by-product/co-product ingredients with sound science.

ENVIRONMENTAL STEWARDSHIP

8.2 Key Practices

Manage forage and water resources with appropriate principles to optimize production while protecting or enhancing the environment.

Use, store, and dispose of all pesticides with care and according to label directions.

Monitor and manage key environmental control points that affect soil and water resources.

Properly dispose of carcasses.

WORKER SAFETY

9.2 Key Practices

Maintain a safe workplace and use appropriate personal protective equipment when needed.

Train employees and others working in your operation on safe practices in using equipment, handling cattle, handling animal health products, and around potentially hazardous areas.

EMERGENCY ACTION PLANNING

10.2 Key Practices

Develop and maintain an emergency action plan.

Inform everyone involved in your operation what to do in case of an emergency.



CHAPTER 2. BEHAVIOR AND HANDLING



2.1 Introduction

Cattlemen have long recognized and fulfilled the need to properly care for livestock. Sound animal husbandry and 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, Beef Quality Assurance (BQA) training, and professional judgment can serve as valuable resources for providing proper animal care. Additionally, animal behavior knowledge can facilitate proper animal handling to the benefit of handlers and livestock. The following information serves as an educational resource; all production practices should be adapted to specific needs of individual operations.



2.2 Key Practices

- ✓ Abuse of cattle is not acceptable under any circumstances.
- ✓ Provide personnel with training/experience to properly handle and care for cattle.
- ✓ Make timely observations of cattle to ensure basic needs are being met.
- ✓ Design, provide, and regularly inspect facilities (fences, corrals, load-outs, stations, freestall areas, alleys, etc.) to help ensure safe and easy animal movement and restraint.
- ✓ Keep feed and water handling equipment clean.

2.3 Cattle Behavior-Informed Handling

Cattle behaviors result from their innate instincts, sensory perceptions, and experiences that develop conditioned learning. Cattle are 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 animal 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 shipping fever and excess shrink, and/or bruises requiring excess carcass trimming at the time of processing.

Vision

Due to the location of their eyes, cattle have a wide-angle vision field in excess of 300 degrees. 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:

- » 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 such as hanging chains, shadows, backstops, dogs, or people etc. if cattle are not easily moving up the chute.
- » Facilitate entry by adding a spotlight directed onto a ramp or other apparatus.
- » 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

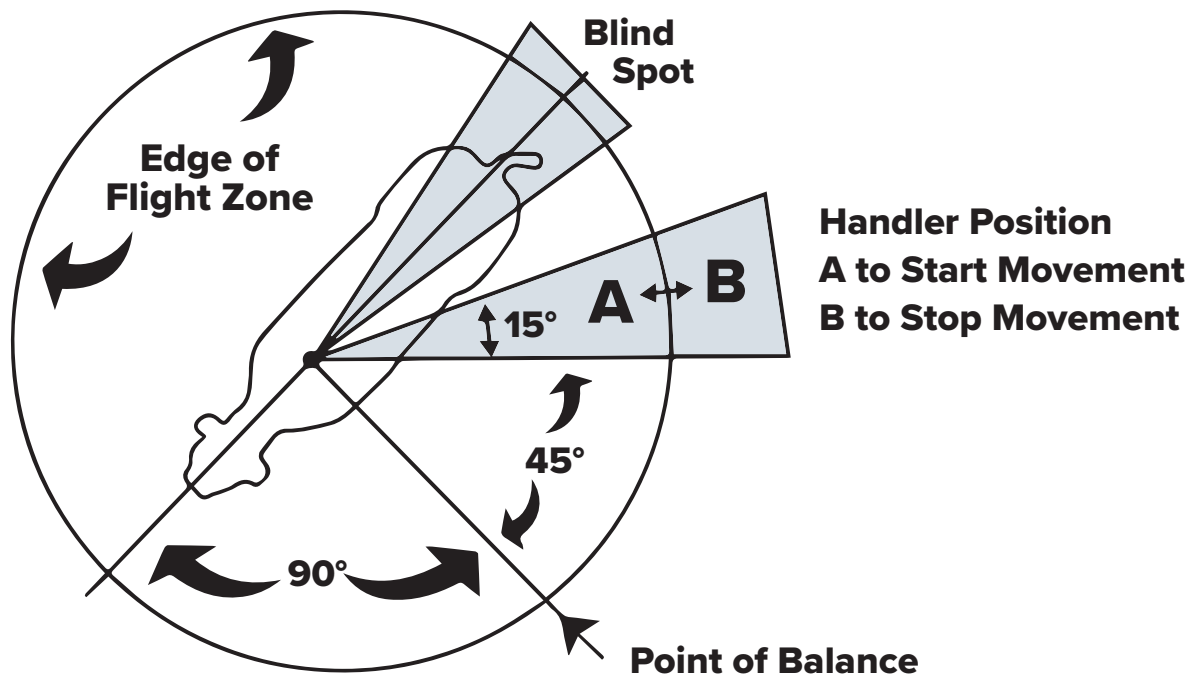
Cattle have a wider range of hearing than humans do. However, their sound localization does not allow them to determine a sound's source as well as human hearing does. Cattle are sensitive to high pitch and frequency sounds. Sudden or loud noises may startle cattle. Handling guidelines related to cattle's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

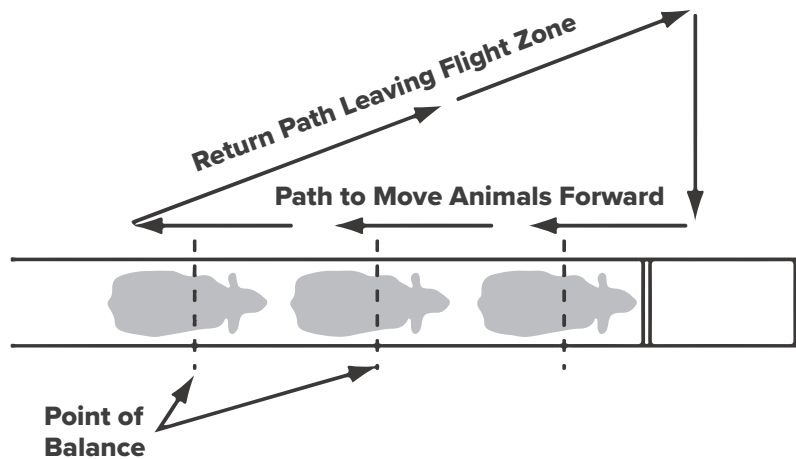
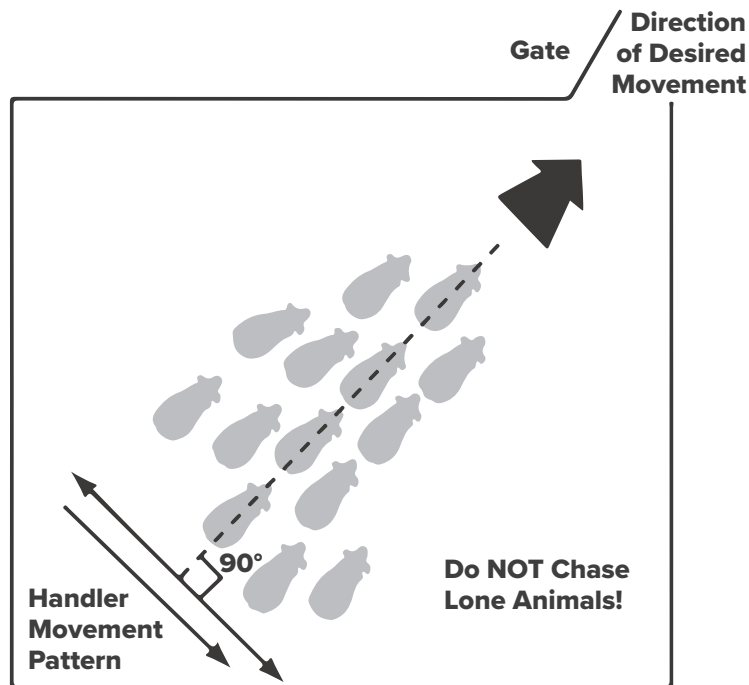
- » Avoid loud noises in cattle handling facilities; small amounts of noise may assist in moving livestock.
- » Place rubber stops on gates and squeeze chutes and position the hydraulic pump and motor away from the squeeze chute to help reduce noise.
- » Divert pipe exhaust from pneumatically powered equipment away from the handling area.

Flight Zone

An important concept of livestock handling is the animal's flight zone or personal space. Understanding the flight zone can reduce stress and help prevent accidents. The size of the flight zone varies depending on how accustomed the cattle are to their current surroundings, people, etc. Handling guidelines related to cattle's flight zone-based behaviors include:

- » Determine the edge of an animal's or group of animal's flight zone by slowly walking up to them; they will 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, move cattle forward by moving toward their rear past their eye and shoulder.
- » In a chute, stop cattle by moving forward past their point of balance.
- » Allow cattle to follow one another in the direction that they are facing.
- » Concentrate on moving the leader(s) rather than the rear animals if a group of cattle bunch up.





CATTLEMEN TRAINING AND EDUCATION

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

- » 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.
- » Participate in BQA training and certification programs.
- » Perform informal self reviews periodically. Individuals responsible for cattle feeding and care should perform these self reviews.
- » Go to www.bqa.org for more information.

2.4 Cattle Handling Facilities and Equipment

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 Assessment tools provided at www.bqa.org.

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:

- » Use handling facilities with curved chutes and round crowding pens.
- » Use loading boxes with double alleys.
- » Use two or more sorting pens in front of the squeeze chute.
- » Facilitate entry by adding a spotlight directed onto a ramp or other apparatus.
- » Adjust hydraulic or manual restraining chutes to the appropriate size of handled cattle.
- » 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 more than three-quarters full; cattle need room to turn around.
- » Under most conditions, no more than 2% of

the animals should fall when exiting 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 white 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, etc.

- » 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.
- » 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.

Handling Tools

Sometimes handling cattle requires the proper use of persuading tools. These tools should be considered an extension of the handler's body. Handlers should use them calmly and sparingly. Guidelines for the use of such tools include:

- » 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.
- » Investigate and correct the reason for continuous balking rather than resort to overuse of electric prods.
- » Quietly guide and turn cattle with the use of non-electric driving aids such as plastic paddles, sorting sticks, flags, or streamers. (affixed to long handles).

- » Avoid the use of AC powered driving aids unless they are manufactured and labeled specifically for that purpose.
- » Properly trained dogs can be effective and humane tools for cattle handling; ensure that barking or impeding cattle flow is minimized.
- » Do not whip, hit, kick, or prod cattle with sharp or solid objects or expose them to other forceful actions that could cause injury, pain, or harm.
- » **Abuse of cattle is not acceptable under any circumstances.**

Pens

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%).¹ 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. Guidelines for pen surface management include:

- » Maintain records of pen surface management. These records may identify chronic problem areas and assist in making long-term infrastructure decisions.
- » Use dust reduction measures to improve animal performance.
- » 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 of 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 waste removal.
- » Maintain the pen floor and bunk apron interface so that cattle do not have an excessive step up to the apron.

Housing

Cattle require 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 cattle's shelter and housing needs to support their well-being and performance. Housing guidelines include:

- » 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.

Temperature Conditions

Cattle must maintain normal body temperature to sustain essential physiological processes. Properly caring for and handling cattle includes supporting their temperature maintenance and ability to adapt to their regional environment. Prevent or address environmental conditions that approach cattle's heat and cold thresholds to maintain optimal performance and health. Additionally, environmental conditions, even if not extreme, should be considered when deciding how and when to handle cattle.

Guidelines to minimize the effects of heat stress as cattle are processed and managed include:

- » Provide adequate water.
- » Consider heat management tools such as shades.
- » 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 (see image below). As an example, when the temperature is 98°F and

the humidity is 30%, then the THI is 83. At a constant temperature, the THI increases as the relative humidity increases. Each one mile per hour increase in wind speed decreases the THI by approximately one point.

- » Work cattle more prone to heat stress first, earlier in the day, or later if conditions are moderate; for example, process larger cattle during periods of lower THI.
- » Limit the amount of time cattle spend in handling facilities where heat stress may be more significant.

Beef Cattle Temperature Humidity Index

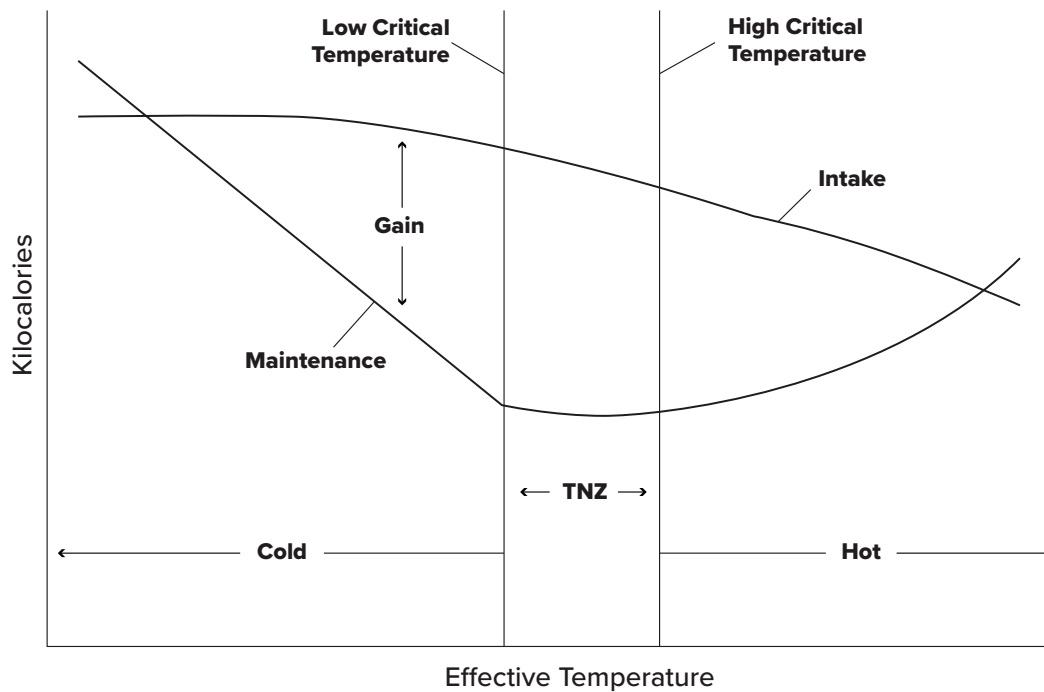
		Relative Humidity (%)											
		30	35	40	45	50	55	60	65	70	75	80	85
Temperature (°F)	100	84	85	86	87	88	90	91	92	93	94	95	97
	98	83	84	85	86	87	88	89	90	91	93	94	95
	96	81	82	83	85	86	87	88	89	90	91	92	93
	94	80	81	82	83	84	85	86	87	88	89	90	91
	92	79	80	81	82	83	84	85	85	86	87	88	89
	90	78	79	79	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					

<https://beef.unl.edu/handling-cattle-through-high-heat-humidity-indexes>

Cattle exposed to cold have increased maintenance energy requirements. Cattle performance will be reduced if action is not taken to maintain or provide for their increased energy requirements in cold weather. Cattle will voluntarily seek available protection from severe weather conditions. Guidelines for reducing winter stress and maintaining performance in cold weather include:

- » Adjust feed and energy rations to match performance requirements when cattle reach low critical temperature.

- » Provide windbreaks and shelters to reduce wind, moisture, and mud.
- » Construct feedlots and buildings in a manner that reduces winter stress due to temperature and moisture.
- » Provide bedding in severe conditions to put a barrier between cattle and the frozen ground.
- » Provide modest protection by either natural or man-made structures to reduce effects of extreme cold by allowing exposure to be intermittent rather than continuous.



Effective of temperature on rate of feed intake, maintenance energy requirement, and gain.
Source: Ames (1980)

¹ Bond, T.E., W.N. Garrett, R.L. Givens and S.R. Morrison. 1970. Comparative effects of mud, wind and rain on beef cattle performance. Paper No. 70-406. Annu. Meeting A.S.A.E.



CHAPTER 3. **BIOSECURITY**



3.1 Introduction

The goal of biosecurity is to protect animals from disease. This is accomplished through disease resistance and prevention as well as minimizing or controlling cross-contamination of bodily fluids. Cross contamination of body fluids can occur directly — animal to animal — or indirectly — animal to feed to animal or animal to equipment to animal. Biosecurity management practices aim to prevent the spread of disease by minimizing the movement of biological organisms such as viruses, bacteria, parasites, etc., within or onto an operation. Biosecurity is more challenging for animals raised outdoors. However, Best Management Practices can reduce cattle's exposure to disease causing agents.

While developing and maintaining biosecurity may be challenging it is likely the cheapest, and the most effective, means of disease control available. Basic biosecurity is a critical key to maintaining a healthy herd. Minimizing exposure to disease pathogens is a critical foundation. This begins by evaluating the biosecurity risks and developing a plan to address them.

3.2 Key Practices

- ✓ Evaluate the biosecurity risks on your operation and follow a plan to help mitigate risk.
- ✓ Recognize and mitigate the biosecurity risks associated with the introduction of new cattle and inter-herd/-operation traffic.
- ✓ Apply basic sanitation practices to equipment, vehicles, and clothing to decrease the chance of microbial contamination.
- ✓ Prevent manure contamination of feed and feeding equipment.

3.3 Spread of Diseases

As the beef industry strives to produce a safe and wholesome product, many areas of quality assurance take on new importance. Contamination of beef with various organisms of importance in human health is an increasingly grave concern. Recognized pathogens such as *E. coli* O157H7, *Listeria* spp., *Salmonella* spp., and *Campylobacter* may enter the beef supply in a number of ways. While we do not have adequate methods today to eliminate microbial contamination in cattle production, attention to basic sanitation practices and proper animal health techniques can decrease the chance of microbial contamination.

Spread of infectious disease may occur by:

- » Introduction of cattle who are
 - Diseased.
 - Recovered from disease but are now carriers.
 - Healthy but incubating disease.
 - Vectoring disease such as through disease agents harbored within organic matter/manure caked on their body.
- » Contact with other animals and pests such as:
 - Horses, dogs, and cats;
 - Wildlife, rodents, birds, and insects;
 - Feral livestock.
- » People who move between herds and their clothing/footwear, etc.
- » Contact with inanimate objects including vehicles and equipment that move between herds, for example an equipment repair vehicle or a delivery truck that is contaminated with disease organisms.
- » Carcasses of dead cattle that have not been disposed of properly.
- » Feedstuffs which could be contaminated with feces or toxins.
- » Contaminated water (e.g., surface drainage water, etc.).
- » Wind carrying disease organisms in dust particles or aerosolized manure.

3.4 Biosecurity Practices

Develop a Biosecurity Resource Group

An important first step to biosecurity 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 that may have special knowledge of biologic organism control. Guidelines for a biosecurity resource group include:

- » Determining the operation's disease risk tolerance and ability to handle disease challenges (e.g., financial, human resources, facilities, etc.).
- » Assess the risk of cattle exposure and the significance of the risk.
- » Evaluate potential to Prevent, Reduce, Control, or Eliminate (PRCE) each risk identified.

- » Develop a biosecurity mitigation plan for the operation's risks.

Biosecurity Guidelines

Biosecurity measures help the cattle industry to maintain animal and human health. Generally, beef operations have been open to vehicle traffic and visitors. Of the possible breakdowns in biosecurity, the introduction of new cattle and inter-herd/-operation traffic pose the greatest risks to cattle health. Properly managing these two factors should be an operation's top priority. Develop a biosecurity plan to meet the specific needs of each operation. Consider the biological hazard, relative significance, and potential risk. Have a plan for commonly seen diseases and an enhanced biosecurity plan for highly contagious diseases.

General Best Management Practices

- » Meet all of the Beef Quality Assurance Best Management Practices and Guidelines.
- » Understand it is more profitable to prevent problems than to correct problems.
- » Agree that doing things right the first time is a critical part of biosecurity.
- » Have an animal identification system in place.
- » Track and validate management practices used on cattle.

Best Management Practices for Strategic Vaccine Use

- » Have a written strategic vaccination plan for each operation.
- » Know when and how to use the vaccines listed in the vaccination plan.
- » Discuss the vaccination history of all cattle purchased before the cattle arrive.

Biosecurity Practices for Preventing Infectious Disease from Entering All Operations

- » Attempt to obtain the health history for the herds from which cattle are purchased.
- » Attempt to obtain the health status of animals brought into the operation and demand a valid health certificate.
- » When possible, ensure the herd veterinarian talks to the seller's veterinarian prior to buying animals.
- » Transport animals in clean vehicles.
- » Have a disease control program for outside animals that could spread disease (e.g., rodents, etc.).
- » Locate the loading area at the perimeter of the operation.
- » Locate the dead animal pickup area so that rendering trucks do not contaminate the operation.
- » Limit people's access to cattle pens, feed mixing/storage areas, feed bunks, and cattle treatment areas.
- » Keep a record of visitors to the operation.

Biosecurity Practices for Disease Containment

- » Provide a clean area for restraint, treatment, and isolation of sick cattle.
- » Prevent cross-contamination of water, manure, feed, or equipment between groups with different health status.
- » Have a plan to manage group size, age distribution, and animal flow to reduce risk of disease.
- » Handle highest health status animals first (i.e., young calves, healthy older cattle and sick animals last).
- » Necropsy selected animals to verify the causes of death.
- » Ensure a veterinarian collects blood samples from all cows that abort.

Biosecurity Practices for Sanitation

- » Clean contaminated vehicles and equipment before use around healthy cattle.
- » Attempt to prevent manure contamination of feed and equipment.
- » Immediately remedy any situation in which manure accidentally contaminates feed or water.
- » Clean treatment, handling, and feeding equipment used on sick animals after each use.
- » Attempt to prevent cross-contamination between healthy and sick/dead cattle.
- » Regularly evaluate the activities on your operation to assess the potential for contaminating cattle.
- » Use disinfectant products according to label instructions.

Biosecurity Practices for Equipment

- » Use different equipment to feed and clean pens, or clean and disinfect equipment between use.
- » Never step in the feed bunk.
- » Never use manure-handling equipment in pens with different animal groups.
- » Clean and disinfect contaminated vehicles and equipment before use around healthy cattle.

- » Routinely clean and disinfect feeding equipment and cattle handling equipment.
- » Routinely clean equipment used to medicate cattle.
- » Routinely clean equipment wash areas.

Biosecurity Practices for Preventing Infectious Disease from Entering Cattle Operations

- » Place cattle that use community pastures in performance evaluation centers.
- » Control fence-line contact with neighboring cattle.
- » Always buy cattle that have tested negative for Johne's Disease.
- » Know the biosecurity, vaccination, and testing program for herd(s) for replacement cattle.
- » Quarantine new arrivals for 21-30 days before allowing them contact with your cattle.
- » Design the quarantine area to prevent cross contamination between cattle.

Biosecurity Practices for Calf Management

- » Have a strategic vaccination and parasite control plan in place for all cattle.
- » Keep newly introduced cattle off of pastures where manure that could pose a disease risk has been spread until risk can be confidently neutralized.
- » Keep replacement cattle separate from other cattle for at least 21-30 days.
- » Provide replacement cattle a separate source of water.
- » Consult with a veterinarian annually about calf care.
- » Ensure the calving area is clean and dry.
- » Ensure all calves are born from cows that have been tested negative for infectious diseases.
- » Ensure all colostrum fed to calves come from cows that have been tested negative for diseases of concern in your herd.

Ensure calves are permanently identified prior to any grouping.

Biosecurity Practices for Controlling Salmonella

- » Realize that visitors and employees can be infected with salmonella from cattle.
- » Isolate sick cattle in hospital area and prevent cross contamination.
- » Discuss proper antibiotic use with a veterinarian.
- » Clean all instruments and equipment used on sick cattle after each use.
- » Test purchased feed for salmonella.
- » Restrict birds, cats, rodents and stray animals from accessing to animal feed and water.
- » Do not allow rendering trucks to access feed or animal areas.

Biosecurity Practices for Controlling Bovine Viral Diarrhea (BVD)

- » Understand persistently infected (PI) animals as they relate to BVD.
- » Do not keep a PI calf as a replacement heifer.
- » Commit to finding BVD PI cattle and removing them from herd.
- » Discuss use of killed virus versus modified live virus vaccines for BVD with your veterinarian.
- » Control fence-line contact with neighboring cattle.

Biosecurity Practices for Controlling Johne's (M. paratuberculosis) Disease

- » Understand how Johne's disease can impact your herd and how it is spread.
- » If Johne's is suspected, screen the whole herd using an antibody ELISA test (measures antibody in blood) and/or fecal culture.
- » Work with your veterinarian to determine detection threshold for culling.
- » Ensure replacement heifers (less than 24 months) are tested prior to introduction to the herd.
- » Remove calves from cows testing positive.
- » Implement a follow-up testing program for Johne's and have it reviewed with herd veterinarian.

Biosecurity Practices for Controlling Bovine Leukosis

- » Use caution when using needles or palpation sleeves on more than one animal.
- » Avoid feeding colostrum to calves from cows testing positive to bovine leukemia virus.
- » Test purchased cattle during quarantine.

Enhanced Biosecurity Practices for Preventing Foot and Mouth Disease (FMD) during an Outbreak*

- » Designate a Biosecurity Manager to write an operation-specific enhanced biosecurity plan with the assistance of a veterinarian.
- » Ensure the Biosecurity Manager and essential personnel are trained in biosecurity measures to keep FMD out of the herd.
- » Establish a line of separation (LOS) with controlled access points to protect cattle from movement of virus onto the operation.
- » Establish a cleaning and disinfection station for all vehicles/equipment crossing the LOS.
- » Ensure everyone crossing the LOS has showered, is wearing clean clothing and footwear, and signs the log book.
- » Record all animal, semen, and embryo movement.
- » Only accept animals, semen, and embryos from sources with documented biosecurity practices and that have no evidence of current or previous FMD infection.
- » Develop contingency plans for interrupted animal movement (e.g., several weeks).
- » Dispose of carcasses (i.e., normal mortalities) in a manner that prevents attraction of scavengers; the use of rendering trucks may be prohibited during an FMD outbreak.
- » Dispose of manure in a manner that prevents exposure of animals and meets regulations.
- » Establish control measures to minimize interaction between cattle and other animals (e.g., deer, feral pigs, rodents, dogs, cats, etc.).
- » Ensure feedstuffs are delivered, stored, mixed, and fed in a manner that minimizes contamination and feed spills are cleaned up promptly to avoid attracting wildlife.

**These practices are part of the Secure Beef Supply Plan for Continuity of Business during an FMD Outbreak. Producers are encouraged to write an enhanced biosecurity plan and be ready to implement it 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. 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 who have cattle with no evidence of FMD infection prepare to meet movement permit requirements. Visit <http://securebeef.org/> for more information.*

Biosecurity Practices for Controlling Microbial Contamination

- » Evaluate ways to prevent fecal contamination of cattle feed or oral cavity (ingestion).
- » Avoid high-risk feed sources and protect feed supplies from fecal contamination.
- » 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.

Biosecurity Practices for Pest Control

- » Understand that rodents and birds may transmit disease and cause damage to equipment including sensitive electrical connections.
- » Consider employing a certified pesticide applicator or service.
- » Read and follow all label directions for all control products.

Biosecurity Practices for Water Contamination

- » 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.

Characteristics of Selected Disinfectants¹

DISINFECTANT CATEGORY	Alcohols	Alkalís	Aldehydes
Common Active Ingredients	ethanol, isopropano	calcium hydroxide, sodium carbonate, calcium oxide	formaldehyde, glutaraldehyde, ortho-phthalaldehyde,
Sample Trade Names*			<i>Synergize®</i>
Mechanism of Action	precipitates proteins; denatures lipids	alters pH through hydroxyl ions; fat saponification	denatures proteins; alkylates nucleic acids
Characteristics	• fast acting • rapid evaporation • leaves no residue • can swell or harden rubber and plastics	• slow acting • affected by pH • best at high temperatures • corrosive to metals • environmental hazard • severe skin burns; mucous membrane irritation	• slow acting • affected by pH and temperature • irritation of skin/mucous membrane • only use in well ventilated areas • pungent odor • noncorrosive
Precautions	flammable	very caustic	carcinogenic
Bactericidal	+	+	+
Virucidal	± ^a	+	±
Fungicidal	+	+	+
Tuberculocidal	+	±	+
Sporicidal	-	+	+
Factors Affecting Effectiveness	inactivated by organic matter	variable	inactivated by organic matter, hard water, soaps, and detergents

+ = effective ± = variable or limited activity - = not effective ^a = slow acting against nonenveloped viruses (e.g., norovirus)

¹ Adapted with permission from: *Characteristics of Selected Disinfectants*, Center for Food Security and Public Health, Iowa State University, College of Veterinary Medicine, available at: <http://www.cfsph.iastate.edu/Disinfection/Assets/CharacteristicsSelectedDisinfectants.pdf>

Oxidizing Agents			Phenols	Quaternary Ammonium Compounds
Halogens: Chlorine	Halogens: Iodine	Peroxygen Compounds		
sodium hypochlorite (bleach), calcium hypochlorite, chlorine dioxide	povidone-iodine	hydrogen peroxide/ accelerated HP, peracetic acid, potassium peroxymonosulfate	ortho-phenylphenol, orthobenzylpara-chlorophenol	benzalkonium chloride, alkyldimethyl ammonium chloride
<i>Clorox®, Wysiwash®</i>		<i>Rescue®, Oxy-Sept 333®, Virkon-S®</i>	<i>One-Stroke Environ®, Pheno-Tek II®, Tek-Trol®, Lysol®</i>	<i>Roccal-D®, DiQuat®, D-256®</i>
denatures proteins	denatures proteins	denature proteins and lipids	denatures proteins; disrupts cell wall	denatures proteins; binds phospholipids of cell membrane
• fast acting • affected by pH • frequent application • inactivated by UV radiation • corrodes metals, rubber, and fabrics • mucous membrane irritation	• stable in storage • affected by pH • requires frequent application • corrosive • stains clothes and treated surfaces	• fast acting • may damage some metals (e.g., lead, copper, brass, zinc) • powdered form may cause mucous membrane irritation • low toxicity at lower concentrations • environmentally friendly	• can leave residual film on surfaces • can damage rubber, plastic; non-corrosive • stable in storage • irritation to skin and eyes	• stable in storage • best at neutral or alkaline pH • effective at high temps • high concentrations corrosive to metals • irritation to skin, eyes, and respiratory tract
toxic gas released if mixed with strong acids or ammonia			May be toxic to animals, especially cats and pigs	
+	+	+	+	+
+	+	+	+	+ enveloped
+	+	±	+	+
+	+	±	+	-
+	±	+	-	+
rapidly inactivated by organic matter	rapidly inactivated by organic matter	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 detergents

Cattle Viruses

Virus	Enveloped	Virus	Enveloped	Virus	Enveloped
Bluetongue	No	BVD	Yes	BRSV	Yes
Coronavirus (enteric and respiratory)	Yes	Cowpox	Yes	FMD	No
Herpes 1 (IBR and IPV)	Yes	Herpes 2 (Mammatitis)	Yes	Leukemia	Yes
Lumpy Skin Disease	Yes	Malignant Catarrhal Fever	Yes	Papilloma	No
Papular Stomatitis	Yes	PI3	Yes	Pseudocowpox	Yes
Rabies	Yes	Rotavirus	No	Vesicular Stomatitis	Yes

Abbreviations: BVD: Bovine Viral Diarrhea; BRSV: Bovine Respiratory Syncytial Virus; FMD: Foot and Mouth Disease;
 IBR: Infectious Bovine Rhinotracheitis; IPV: Infectious Papular Vulvovaginitis; PI3: Parainfluenza 3

Source: Selected Viral Families, Viruses, and Species Affected, Center for Food Security and Public Health, Iowa State University, College of Veterinary Medicine, available at: <http://www.cfsph.iastate.edu/Disinfection/Assets/VirusFamilyTable.pdf>



CHAPTER 4.
**HERD HEALTH
MANAGEMENT**

4.1 Introduction

THE FOUNDATION OF BQA IS “THOUGHTFUL, RESPONSIBLE CATTLE MANAGEMENT.” CONSIDER EVERY HERD HEALTH MANAGEMENT DECISION CAREFULLY.

Herd health management concepts are straightforward, and their foundation is thoughtful, responsible cattle management. It is critical for cattle raisers and caregivers to establish a team of reliable people on which they can depend to provide them the best information available to help them be a thoughtful, responsible steward. The goal is to allow cattle to reach their genetic growth and reproduction potential, and be responsible stewards of our world. The result is converting resources unusable by humans into high quality, human edible, wholesome protein.

Cattle stewardship requires an understanding of the cattle's environment and available resources cattle have to grow and reproduce as genetically capable. Basic biosecurity is a critical key to maintaining a healthy herd. Minimizing exposure to disease pathogens is a critical foundation. Maintaining health requires cattle to be resistant to infection. Additionally, the cattle's health and nutrition go hand-in-hand. Every rancher or cattle raiser must understand cattle nutrition and how to utilize available feedstuffs to maximize their cattle's nutritional state. Without all of the above key considerations, vaccines provide minimal value to helping cattle maintain health.

Develop herd health plans that consider all aspects of the unique genetic makeup of a cattle herd, the environmental impact on the cattle's health and well-being, impact of available feed and water sources, and the talents of the individuals on the rancher's team.



If the team's planning effort is successful, there will be minimal need for medications. If medications are used the BQA foundation of "thoughtful, responsible cattle management" is again key. The herd veterinarian should help design thoughtful, responsible medication selection and use protocols.

As an overlaying concept to "thoughtful, responsible cattle management," education and training of any cattle handling crew is critical. Rough cattle handling detracts from cattle performance and well-being as well as costing the cattle producer money. Cattle raisers must strive to make every day the best it can be for their cattle. General herd health guidelines include:

- » Follow a Quality Assurance Herd Health Plan that conforms to good veterinary and husbandry practices.
- » Handle/transport all cattle in such a fashion to minimize stress, injury, and bruising.
- » Regularly inspect facilities (e.g., fences, corrals, load-outs, stations, alleys, etc.) to help ensure proper care and ease of handling.
- » Keep feed and water handling equipment clean.
- » Provide appropriate nutritional and feedstuffs.
- » Maintain an environment appropriate to the production setting.
- » Evaluate and enforce biosecurity.
- » Keep records for a minimum of two (2) years or longer as required by laws/regulations (i.e., three (3) years for Restricted Use Pesticides).

4.2 Key Practices

- ✓ Develop a herd health plan that conforms to good veterinary and husbandry practices.
- ✓ Provide disease prevention practices to protect herd health including access to veterinary medical care.
- ✓ Follow all FDA/USDA/EPA guidelines and label directions for each product.
- ✓ Use FDA-approved feed additives, including those requiring veterinary feed directives (VFD), in accordance of the FDA use requirements. The FDA requires all VFD records to be retained for two (2) years and available upon FDA request for inspection.
- ✓ Keep extra-label drug use (ELDU) to a minimum and only when prescribed by a veterinarian working within a Veterinary/Client/Patient Relationship (VCPR).
- ✓ Administer products labeled for subcutaneous (SQ) administration in the neck region ahead of the shoulder slope.
- ✓ Use, when available, products cleared for SQ, Intravenous (IV), Intranasal (IN), or oral administration when available rather than products administered Intramuscular (IM) as all products can cause tissue damage when administered IM.

- 
- ✓ Always ensure products labeled for IV-only are never given by any other route of administration because of the potential for causing violative residues at the injection site.
 - ✓ Use, when available, injectable products with low dosage volumes and following the proper spacing of injections.
 - ✓ Administer products labeled for intramuscular (IM) in the neck region only — no exceptions, regardless of age.
 - ✓ Do not administer more than 10cc of product per IM injection site.
 - ✓ Use the proper needle size for injections and never reuse a bent needle.
 - ✓ Do not market compromised — terminally ill and/or non-ambulatory cattle.
 - ✓ Humanely euthanize non-ambulatory animals using appropriate methods.

4.3 Herd Health Planning

Like other species, cattle are susceptible to infectious diseases, metabolic disorders, toxins, parasites, neoplasia, and injury. Control programs should be based on risk assessment and efficacy of available products. 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/or nutritionist to determine the risk of infectious, metabolic and toxic diseases and to develop effective management programs that fit the herd's health needs. A Veterinarian/Client/Patient Relationship (VCPR) is strongly encouraged. Review/revise the herd health plan at least annually.

Herd health guidelines include:

All Cattle and Production Segments

- » 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.
- » Administer all injections in front of the shoulder, subcutaneously (SQ) if possible, and as indicated on the product label.
- » Identify any animals treated to ensure proper withdrawal time.
- » 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.
- » Control external and internal parasites.
- » When eye cancer is detected, have the eye examined to determine treatment options, or market the animal as quickly as possible and before advanced stages develop — advanced stages of tumor development generally result in the head and sometimes the whole animal being condemned.

- » Consult with herd veterinarian for additional health procedures appropriate to your area.

Breeding Herd

- » Examine the breeding soundness of all bulls annually including testing for transmissible diseases.
- » Booster vaccinations as indicated in the herd health plan.
- » Maintain cows at a body condition score (BCS) of at least 4 before the calving season.
- » 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.
- » Examine cows with mild lameness, early eye problems such as ocular neoplasia, mastitis, or loss of body condition to determine well-being, and/or prompt marketing.
- » Market cull cows between BCS 4 and 5 when possible. Cows with these BCS have better red meat yield and generally bring the highest price per pound at the auction market. When an animal's body condition score (BCS) drops below 5 (on a scale of 1 to 9), there is less carcass lean and fat. Excessively fat cattle (BCS 8 to 9) are also a problem. They often yield cuts that can be salvaged and merchandised for a higher value (e.g., strips, ribs, tenderloins), but there is an excessive amount of waste fat.
- » Check body condition score (BCS) of cows 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 cannot endure a long trip prior to harvest. Consequently, the number of buyers for emaciated cattle is limited.

Calves

Castration and dehorning are done for the protection of the animal, other cattle in the herd, and people who handle the cattle. In all cases producers may seek guidance from a veterinarian and advisability of analgesia or anesthesia for castration and dehorning of beef cattle, particularly in older animals, where development is more advanced.

- » When practical, cattle should be castrated before the age of three months (90 days) or at the first available handling opportunity beyond this age.
- » When practical, cattle should be dehorned while horn development is still at the horn bud stage or at the first available handling opportunity beyond this age. This is because at this stage in development the procedure involves less tissue trauma. The selection of polled cattle is an alternative for horn management.
- » 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.

Heifers and Purchased Breeding Stock Entering the Cow Herd

- » Isolate all stock entering the herd as indicated on the herd health plan.
- » 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, Tuberculosis and/or Johne's disease. Some diseases, such as Johnes, may not manifest for years after purchase. As such, maintain herd records for years so that if these diseases arise, the issue can be reported back to the stock seller.
- » Vaccinate in front of the shoulder for all disease as indicated on your herd health plan (follow label directions).
- » Remember, 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.

Stocker and Feeder Cattle

In all cases, producers may seek guidance from a veterinarian on the advisability of 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.

- » Producers may seek guidance from a veterinarian on the availability and advisability of analgesia or anesthesia for dehorning of beef cattle particularly in older animals, where horn development is more advanced.
- » A local anesthetic should be used when heifers are spayed using the flank approach.
- » High-risk cattle should be checked at least daily for illness, lameness, or other problems during the first 30 days following arrival.
- » Check high-risk cattle at least daily for illness, lameness, or other problems during the first 30 days following arrival.

Cattle Care & Handling Guidelines

- » 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. At all times, these calves must be handled humanely and provided proper nutrition. 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 penmates. Bullers should be promptly removed from the pen to prevent serious injury.
- » Tail docking is not recommended. Increasing space per animal and proper bedding are effective means in preventing tail tip injury and necrosis.

4.4 Vaccinations and Disease Prevention

Every effort should be made to prevent disease and infection in the cattle herd. Biologicals, such as vaccines, can aid in the prevention of common viral and bacterial diseases and lessen the possible need for treatments and residue risk later in the production cycle. Alternatives to antibiotic use should be considered when possible. However, cattle do not always arrive in healthy condition and immediate treatment may be necessary. Preventive herd health plans will consist of herd management and immunization recommendations. Management programs should be made in consultation with your veterinarian. In addition to the considerations listed above, preventive herd health guidelines include:

- » Identify target pathogen(s).
- » Identify recommended vaccine(s) and/or feed additives (if any).
- » Use appropriate timing to protect (vaccinate) against targeted pathogens.
- » Use management considerations to aid in the prevention or reduce the spread of target pathogens.
- » Use management and treatment protocols as needed if prevention efforts fail including an outline of treatment protocols and withdrawal times specified by the herd's veterinarian.

Mixing and Drawing Vaccines

When using vaccines that must be mixed prior to use, such as modified live virus (MLV) products, mix only as much as can be used in one hour or less. MLV products **MUST** be used when mixed and **CANNOT** be stored for later use. Killed vaccines can be stored for short periods of time after initial use, but they should not be kept if anything other than a sterile needle entered the bottle during use. Handle vaccines carefully. Never vigorously shake to mix or expose them to sunlight or temperatures outside the range listed on the vaccine label.

Use a sterile transfer needle when reconstituting MLV and chemically-altered (CA) vaccines. Transfer needles can be sterilized and reused. Transfer needles ensure against product contamination during mixing. 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 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. After proper mixing, the vaccine can be drawn from the vial into the dosing syringe.

Adopt the practice of changing needles before filling or refilling a syringe to keep needles sharp and to prevent contamination of the vaccine.

Label syringes and the cooler box prior to processing to prevent accidental mixing of vaccine when refilling syringes. Accidental mixing will result in under-dosing and may render one or both of the vaccines ineffective. Mixing MLV product with a non-water based Killed vaccine destroys the MLV vaccine immediately.

Use each syringe during herd health procedures for a dedicated purpose. Never use one syringe to administer antibiotics or dewormers one time, and then MLV, CA, or killed products the next time. Any residue will affect the efficacy of the product.

Reading Labels

When possible, select herd health products that have BQA friendly labels. These include low dosing volumes, SQ or intranasal administration, and tissue friendly. Always read label and dosing instructions prior to herd health procedures.

Review these with everyone handling the products to help ensure proper dosing of each product.

Booster vaccines as outlined on the label. To establish immunity, almost all products recommend a second vaccination two (2) to four (4) weeks after the initial vaccination. If a booster is required by the label, one initial dose will not achieve immunity; it will only provide a brief increase in resistance. Increased and sustained levels of immunity can only be established by boosting initial vaccinations. If the initial program is carried out properly, only an annual booster will be required after the first year.

Take time to become familiar with your products. Also, check for side effects and treat according to treatment protocol should they occur. If cattle are affected by anaphylaxis, there may be little time for action before death occurs.

Vaccination Guidelines:

- » Determine target pathogens.
- » Select the most effective vaccine.
- » Prevent exposure of vaccine to heat and UV light.
- » Draw from bottle with a sterile needle.
- » Use quality syringes.
- » Inspect and maintain all working components.
- » Administer proper dose.
- » Use proper needle size.
- » Administer recommended route (e.g., IM or SQ).
- » Administer in recommended site (i.e., in front of shoulder slope).
- » Change needles often to reduce tissue irritation.
- » Change needles immediately if contaminated or damaged.
- » Always follow label directions, including the either 21 or 60 day withdrawal assigned to all USDA approved vaccines.
- » Booster all vaccines when label requires it.
- » Always read directions before starting.
- » Never leave vaccines unrefrigerated.
- » Vaccines should be stored in a dependable refrigeration unit that maintains a temperature as directed by the product label (typically 35-45°F).
- » Never place vaccine in hip or round unless otherwise prescribed by your veterinarian.
- » Never assume anything — always check the directions for use.
- » Never market an animal containing an injection broken needle shaft.

4.5 Judicious Use of Antimicrobials

Responsible antibiotic stewardship is important to ensure that animal health technologies remain viable for cattle raisers and care givers. Following the judicious antibiotic use guidelines 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.

The judicious use of antimicrobials is important to increase and maintain consumer confidence and could result in added profits. When healthy cattle leave the farm and reach the marketplace, the producer, packer, and consumer all benefit. When better quality beef reaches the supermarket, consumers are more confident in the beef they are buying.

VCPR (Veterinarian/Client/Patient Relationship)

For the health and well-being of cattle it is critical for Veterinarian/Client/Patient Relationship (VCPR) to exist between veterinarians, their clients, and their patients. A valid VCPR is required for all prescription medications, extra-label use of non-prescription medications, and all FDA feed medications that require a Veterinary Feed Directive (VFD). The FDA definition from 21 CFR 530 (i) exists when:

1. A veterinarian has assumed the responsibility for making medical judgments regarding the health of (an) animal(s) and the need for medical treatment, and the client (the owner of the animal or animals or other caretaker) has agreed to follow the instructions of the veterinarian;
2. There is sufficient knowledge of the animal(s) by the veterinarian to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s); this means the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s) or medically appropriate and timely visits to the premises where the animal is kept. A VCPR cannot exist based solely on phone, video, or other telemedical interactions.
and
3. The practicing veterinarian is readily available for follow-up in case of adverse reactions or failure of the regimen of therapy. Such a relationship can exist only when the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of examination of the animal(s), and/or by medically appropriate and timely visits to the premises where the animal(s) are kept.
4. The veterinarian provides oversight of treatment, compliance, and outcome.
5. Patient records are maintained.

Veterinarians should regularly evaluate medication records with cattle caregivers to review response to therapy, protocol

compliance including medication withdrawal compliance.

The American Association of Bovine Practitioners (AABP) considers the following areas critical components for establishing and maintaining a valid VCPR:

1. Written Agreement
 - a. A veterinary practice or individual should establish a written agreement with the client that identifies the farm veterinarian who is accountable for drug use and treatments administered to the cattle on the farm operation. If more than one veterinarian or veterinary practice has a working relationship on the operation, then the agreement should establish which one has the overall responsibility for treatment protocols, drug inventories, prescriptions, personnel training, oversight and drug use on the operation. The identified veterinarian is referred to as the Veterinarian of Record.
2. Veterinary Oversight
 - a. The Veterinarian of Record is the responsible party for providing appropriate oversight of drug use on the farm operation. Such oversight is a critical component of establishing, maintaining and validating a VCPR. This oversight should include, but may not be limited to, establishment of treatment protocols, training of personnel, review of treatment records, monitoring drug inventories, and assuring appropriate labeling of drugs.
 - b. Veterinary oversight of drug use should include all drugs used on the farm regardless of the distribution of the drugs to the farm. Regular farm visits are an essential component to providing such oversight, however this can be supplemented through laboratory data evaluation, records evaluation, and telephonic and electronic communication. The timeliness of farm visits should be determined by the Veterinarian of Record based on the type and size of the operation.

3. Relationship With Consultants and Other Veterinarians

- a. If a veterinarian who is not the Veterinarian of Record provides professional services in any type of consultative or advisory capacity, then it is incumbent on that veterinarian to ensure that the Veterinarian of Record is contacted and informed of their findings and recommendations. No protocols or procedures that have been established by the Veterinarian of Record should be changed unless or until there is an agreement by all parties about such changes. The agreement between the Veterinarian of Record and the client should establish which management groups of the farm operation are covered in the agreement. For instance, reproduction, milk quality, young-stock/replacement cattle, feedlot, cow-calf, and sick animal treatments are possible identifiable areas.

4. Treatment Protocols

- a. Protocols and treatment guidelines for commonly occurring, easily recognizable conditions should be established in writing and agreed upon by all parties involved, signed and dated. Training of personnel authorized to use drugs on the operation should be undertaken and periodically reviewed. The frequency of such training and review should be determined by the size and type of the operation, the rate of personnel turnover, and the changes in protocols and procedures. The treatment protocols and procedures should include all drugs used on the operation (over the-counter, prescription, extra-label, Veterinary Feed Directive, water soluble). All protocols should clearly define when to quit treating and seek professional help (poor response, increase in severity of signs).

5. Written/Electronic Treatment Records

- a. Written/electronic treatment records of all animals or groups of animals treated are essential components of maintaining and establishing the VCPR and to decrease the risk of violative drug residues. Such records should include, at a minimum,

the date, identification of animal(s), drug(s) used, frequency, duration, dose, route, appropriate meat/milk withdrawal intervals, and the person administering the treatment. Periodic and timely review of the treatment records, drug inventories and usage is an important part of oversight by the Veterinarian of Record.

6. Prescription Drugs

- a. Provision of drugs or drug prescriptions should be for specific time frames appropriate to the scope and type of operation involved and only for the management groups within the operation for which the Veterinarian of Record has direct involvement and oversight. Additionally, failure to follow agreed upon protocols and procedures should be grounds for denial of provision of drugs or prescriptions except for an individual patient needing treatment at the time of examination. Routine examination of drug inventories on farm and product purchase records (pricing information is unnecessary) review are recommended. Cooperation with distributors is encouraged. Establishment of a VCPR for the sole purpose of the sale of drugs or increased sales of a particular brand of drug product is not a valid or ethical reason for having a VCPR.

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

- 1. Prevent Problems:** Emphasize appropriate husbandry and hygiene, routine health examinations, and vaccinations.
- 2. Adhere to FDA guidance:** Follow label instructions and FDA guidance for the use of all antibiotics. The use of antibiotics medically important in human medicine should only be used after careful consideration. If medically important feed grade antibiotics are used, they must be under the guidance of a Veterinary Feed Directive (VFD).
- 3. Select and Use Antibiotics Carefully:** Consult with your veterinarian on the selection and use of antibiotics, under the premise of a valid Veterinarian/Client/Patient/Relationship (VCPR). Have a valid reason to use an antibiotic. Appropriate therapeutic alternatives should be considered prior to using antimicrobial therapy.
- 4. Use the Laboratory to Help You Select Antibiotics:** Cultures and sensitivity test results should be used to aid in the selection of antibiotics, whenever possible.
- 5. Combination Antibiotic Therapy is Discouraged Unless There is Clear Evidence the Specific Practice is Beneficial:** Select and dose an antibiotic to affect a cure.
- 6. Avoid Inappropriate Antibiotic Use:** Confine therapeutic antibiotic use to proven clinical indications avoiding inappropriate uses such as for viral infections without bacterial complication.
- 7. Treatment Programs Should Reflect Best Use Principles:** Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles.
- 8. Treat the Fewest Number of Animals Possible:** Limit antibiotic use to sick or at risk animals.
- 9. Treat for the Recommended Time Period:** To minimize the potential for bacteria to become resistant to antimicrobials.
- 10. Avoid Environmental Contamination with Antibiotics:** Steps should be taken to minimize antimicrobials reaching the environment through spillage, contaminated ground run off, or aerosolization.
- 11. Keep Records of Antibiotic Use:** Accurate records of treatment and outcome should be used to evaluate therapeutic regimens and always follow proper meat and milk withdrawal times. Keep records for a minimum of two (2) years or longer based on state and local regulations.
- 12. Follow Label Directions:** Follow label instructions and never use antibiotics other than as labeled without a valid veterinary prescription.
- 13. Extra Label Antibiotic Use Must Follow FDA Regulations:** Prescriptions, including extra label use of medications, must meet the Animal Medicinal Drug Use Clarification Act (AMDUCA) amendments to the Food, Drug, and Cosmetic Act and its regulations. This includes having a valid VCPR.
- 14. Medically Important Antibiotic use Should be Limited to Treat, Prevent, or Control Disease:** Medically important antibiotics should not be used if the principle intent is to improve performance. Antibiotics that are medically important to human medicine may not be used for performance.

Guidelines developed from AVMA, AABP, and AVC guidance on Appropriate Veterinary Antibiotic Use.

Residue Avoidance

- » All animals treated for problems unique to the individual animal should be recorded by the animal's ID, treatment date, drug and dose administered, product serial/lot number, approximate weight of animal, route and location of administration, and the earliest date the animal would clear the prescribed or labeled withdrawal period. You can record treatments either by individually identifying

each animal in your herd and/or individually identifying each animal when or if they are treated. The ID number should be unique to that animal and tie it to the group from which it came.

- A special note for producers who do not individually identify animals: Identifying each animal individually is not required to participate in this program. Cattle can be identified by group. However, if treated cattle are not individually identified, then the entire group must be managed together until the appropriate withdrawal times have elapsed for every animal in the group. The withdrawal time applies to the entire group of animals.
 - For example, let's say several calves develop scours and numerous calves are treated within a 10-day period. The entire group of calves would receive a withdrawal date based on the last date of administration of the product (to any individual animal) with the longest withdrawal period. The complete history of product use should be available for transfer when the group of cattle is sold or moved to the next production unit within an operation. Otherwise, the buyer (or the foreman of the other unit) will not be aware of when those calves can safely enter the marketing chain. For example, when a stocker operator culls non-performing steers any time during the course of a grazing period, those animals could potentially be sent to a packer. If the stocker operator is unaware that the prior owner treated the animal with an antibiotic whose withdrawal time has not expired, they might have unknowingly contributed to a violative residue problem.
 - All animals treated as part of a group will be identified by group or lot with treatment information recorded. Records should include the animal lot or group identification, processing/treatment date, product serial/lot number, product and dose administered, route and location of administration, name of person who administered it and withdrawal information. Recording animals under this system assumes that every animal in the lot or group received the treatment.
- » All cattle marketed from the operation can potentially go directly to harvest. Therefore,

records for any cattle to be marketed should be checked by personnel to ensure that treated animals will meet or exceed label withdrawal times for all products administered. A release slip should be signed and dated by the person who checks records prior to shipping cattle from the operation. The examination should include processing records, feeding records, treatment records and all other records that may apply. Make sure that all employees are aware of the proper use and administration of antibiotics and withdrawal times, and that they have the ability to check appropriate withdrawal restrictions before moving cattle to market. For example, provide employees with charts or software to help them track withdrawal dates.

- » **Critical Residue Avoidance Key:** Extended withdrawal times should be expected for emaciated or severely debilitated animals. All cattle sold that are not typical of the herd (medicated market cows/bulls and/or animals with a health problem that get culled because they never recover) may be subject to verification of drug withdrawal. Should there be any question about a withdrawal period, the veterinarian will evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank and the animal may have to pass a residue screening test, such as the Live Animal Swab Test (LAST), which tests for antibiotic residues. Residue screening will be performed by qualified personnel under the supervision of a veterinarian. The results will determine whether the animals can be released for shipment, but results cannot be used to shorten the labeled withdrawal time. Attempting to salvage sick animals by treatment and prompt harvest requires an accurate diagnosis and careful selection of drugs.
- » The Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) issues a weekly report of residue repeat violators. This report lists the names of farms or ranches with address and phone number of those that have had more than one reported residue violation in the past 12 months.

Refer to the sections in this handbook on injections and medicated feeds for additional key practices and guidelines related to the use of antimicrobials.

4.7 Product Handling and Storage

Animal health products utilized to protect the health of cattle are vital. It is important to record information that describes how and when products were received and stored.

It is important to maintain a record of lot/serial numbers of products in the event of a recall or holding of cattle if a situation arises. Proper storage and handling are important to ensure that the efficacy of the products is not compromised. Products utilized must not be expired. Products that are out of date should be returned or properly discarded. Through proper record keeping, storage, and handling animal health products remain a vital piece of a comprehensive cattle health and well-being program. Guidelines for animal health product receiving, storage and handling:

- » Establish a Veterinarian/Client/Patient/Relationship (VCPR).
- » Identify a Veterinarian of Record (VOR)
- » Establish VOR's responsibilities. For example: to write treatment guidelines and protocols, process protocols, prescriptions 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.
- » Keep a receiving record for all cattle health products which includes: date, name, quantity, unit sizes, lot/serial numbers, and the expiration dates.
- » Store and handled products as outlined by the manufacturer label or as recommended by the VOR.
- » Inventory all products as often as recommended by the VOR.
- » Insure proper handling of biological and pharmaceutical products during day-to-day activities through employee training. This should be a collaboration between the VOR and all doctoring and processing crews.
- » Protect products from temperature and sunlight exposure.

- » Handle all expired products in accordance with recommendations of the VOR.

Vaccine Handling and Storage

The highest quality vaccine available is useless if it's not handled and administered properly. Even experienced producers overlook many key aspects when preparing and administering vaccines.

Both MLV and CA products must be reconstituted with a sterile diluent prior to being administered. These products are routinely used in the stocker and feeder segments with excellent response. However, the processing speed in these segments is considerably faster than on most cow-calf operations. Additionally, stocker and feeder facilities are more likely to be sheltered from environmental hazards unlike most cow-calf processing scenarios. Ranchers must exercise more caution when handling and administering MLV or CA products. Many common handling techniques can render MLV products inactive and even greatly reduce the effectiveness of Killed (K) vaccines.

Purchase vaccines from reputable distributors. A vaccine will be less than 100% effective if it has ever been stored improperly. Improper storage includes freezing and/or exposure to heat or sunlight. Freezing of any vaccine not only causes loss of efficacy but also causes vaccines to become more stressful, potentially causing illness from antigen toxin release. Maintaining a high level of efficacy is critical to establishing immunity in a majority of vaccinated cattle.

Vaccines should be stored in a dependable refrigeration unit that maintains a temperature as directed by the product label (typically 35-45°F).

4.8 Processing & Injections

Thoughtfully and responsibly consider the management technique decisions chosen for processing or working cows or calves, receiving stocker cattle, weaning calves, and shipping cattle. Key decisions include identification,

immunizations, and surgeries (castration/dehorning). Pay careful attention to the details of correct/proper technique. Improper techniques can have a lasting impact on cattle health, well-being, and carcass quality.

4.8.1 RECEIVING, ACCLIMATION, AND PROCESSING CATTLE

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, acclimation, and processing protocols should be developed and reviewed by your 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 to an operation should be isolated as recommended by your veterinarian. Additionally, follow-up disease testing, as recommended by the operation's veterinarian(s) will be appropriate for some received cattle.

Newly received cattle should be unloaded promptly and allowed to rest as needed before additional handling in a protected pen with ample fresh water and clean hay/feed. 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. For example, most cattle are far more sensitive to hot weather than to cold weather. Therefore during hot weather times, it is important to handle cattle early in morning before the ambient temperature reaches 80°F, always focusing on using Low Stress Handling Practices. 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.

4.8.2 CATTLE IDENTIFICATION, CASTRATION, AND DEHORNING

Cattle Identification

Branding, ear-tagging, ear-notching, tattooing, and radio frequency identification devices (RFID) are common methods of identifying cattle. 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. BQA guidelines recommend branding on the hip area. Do not brand cattle on the face or jaw.

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.

Cattle 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 in the herd. There is no demand for intact males beyond the breeding herd. Intact bull calves should always be castrated at the youngest possible age prior to grazing or feeding. There is no gain advantage of bulls when compared to growth-implanted steers. Calves can be implanted as young as 45 days of age. Management of intact bulls is difficult and potentially unsafe due to aggressive behavior. Meat from intact bulls has a coarser texture, lower marbling scores, and more variable tenderness.

Methods of castration used in cattle include surgical removal of the testes, ischemic methods (banding), as well as crushing and disruption of the spermatic cord.

Producers may seek guidance from a veterinarian on the availability and advisability of analgesia or anesthesia for castration of cattle — 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.

Cattle 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 cause more bruising compared to their non-horned group mates. The USDA requires the removal of bruises observed in the packing plant resulting in lost carcass weight, devalued primal cuts, and reduced carcass value.

The younger the animal is when these procedures are performed, the less the animal is stressed. Research has shown that dehorning or tipping older calves and yearlings is one of the most stressful management practices.

Where practical, cattle should be dehorned while horn development is still at the horn bud stage — 0 to 4 months or at the first available handling opportunity beyond this age. This is because the procedure involves 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.

Producers may seek guidance from a veterinarian on the availability and advisability of analgesia or anesthesia for dehorning of cattle, particularly in older animals, where horn development is more advanced.

Operators performing dehorning of cattle should be trained and competent in the procedure and be able to recognize the signs of complications.

The selection of polled cattle is an alternative for horn management.

Cattle 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.

Cattle tail docking is not recommended.

4.8.3 SYRINGE AND NEEDLE GUIDELINES

When considering equipment choices, keep the “4-Ss” of safety as your foremost consideration: 1) Safety of yourself, 2) Safety of others working around you or the animal, 3) Safety of the animal, and 4) Safety of the food. Never select equipment that could jeopardize 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 with whom you work.

Syringes

Select sterile disposable or multiple-dose, easily cleaned, and heat-sanitized syringes. When using a multiple-dose syringe, never use detergents or disinfectants to clean it as the residues from these can negatively affect vaccine efficacy. Rather, utilize heat-sterilization methods to clean the components. Clean plastic syringes can be heat sterilized in a microwave by wrapping in paper, soaking the paper towels containing the syringe, place the soaked towels with syringe in a plastic bag, then heating in a microwave at a high setting for a sufficient time to boil the water around the syringes. Usually 2 to 3 minutes is sufficient. Sterilized disposable syringes ensure a sterile delivery instrument. These plastic syringes are a very accurate single-dose delivery system.

Carefully handle syringes to allow proper injection technique.

Since the majority of injections given are SQ, focus on selecting syringes and needles that easily accommodate using the tented SQ technique in front of the shoulder slope.

Continuous-feed syringes reduce the chance of contaminating vaccines by accidentally drawing product from the wrong bottle. However, these syringes are harder to clean and it is very difficult to keep all components of a continuous-feed syringe sheltered from exposure to the elements. If continuous-feed syringes are used, protect the bottle, hose, and syringe from

exposure to UV light. Many times, these bottles and syringes are suspended chute-side in direct sunlight and exposed to heat during processing. This deteriorates the vaccine and animals are not immunized adequately. A better use of continuous-feed syringes is for administering less sensitive materials like dewormers.

It is best to utilize a syringe size that closely matches the dose and to draw a single dose for each individual animal. Disposable syringes are often used for multiple-dose delivery resulting in inaccurate dose delivery. For example, a 10cc syringe filled with vaccine is not appropriate for administering a 2cc dose to five head. Administering multiple doses in this manner often leads to over- or under-dosing. The problem is magnified when using larger-dose syringes. When using disposable or single-dose syringes for vaccinations, purchase vaccines in the smallest available bottle size to reduce the risk of contaminating the product.

Lubricate the first vaccine draw with non-petroleum-based products. Petroleum-based lubricants may inactivate MLV or 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.

Always inspect syringes prior to processing. Check the barrels for chips or cracks that would lead to leakage and under-dosing. Check calibration and dosage setting prior to — and continuously throughout — the process. Some multi-dose syringes are not accurate enough for low-dose products.

Even slight changes in working components change dose rates. 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. 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.

Needles

Vaccine dosages typically range from 2 to 5cc and should be given with ½" to ¾" 18 to 16 gauge needles. To help prevent contamination of the remaining vaccine in your working bottle, never enter a bottle with a used needle. When using multiple-dose guns, at a minimum, change the needles each time the syringe is refilled. Change needles between each animal if blood borne diseases such as anaplasmosis or leukosis are a consideration in the herd health plan. Change the injection needle immediately if it becomes contaminated from touching a contaminated surface or is damaged.

Improper use of needles may contribute to injection site defects. Use needles that are no larger than necessary to adequately complete the injection, but large enough to prevent

needle bending or breaking in the animal. The leading cause of needle bending is improper restraint. Using dull, damaged, or poor quality needles may also contribute to the problem. Under no circumstances can animals with broken needles in them be sent to a harvest facility.

General guidelines for needle selection and use include proper cattle restraint and selection of 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 or IV) and injectable product viscosity. BQA requires all injections be given ahead of the shoulder slope (neck region), unless otherwise directed by a veterinarian or label instruction. See the following table for needle gauge recommendations.

Injectable Viscosity	Route of Administration								
	SQ Tented Technique (½ to ¾ inch needles)			IM (¾ to 1 inch needles)			IV (1 to 1 ½ inch needles)		
	Cattle Weight			Cattle Weight			Cattle Weight		
	< 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)

*Currently 14g needles are available in ¾" length, should ½" or ⅝" become available they should be used.

When to Change Needles

- » Immediately if the needle bends (DO NOT STRAIGHTEN OR USE A BENT NEEDLE)
- » If needles become contaminated with feces, blood, dirt, or irritating chemicals
- » If the needle point is damaged or a burr develops
- » Before the needle becomes dull
- » Between cattle with KNOWN bloodborne infectious disease
- » Under the instruction of the herd veterinarian

Needle Care

- » Protect needles from contamination (e.g., feces, dirt, or irritating chemicals).
- » Store unused needles in protected area.

Needle disposal

- » Follow local, state, and federal EPA guidelines for disposal of used needles and other sharps.
- » Seal Sharps container and dispose in an approved land fill.

Disinfectants

- » Select disinfectants carefully with the consultation of your veterinarian.
- » Use all disinfectants carefully as disinfectants can cause severe tissue irritation both to humans and cattle.
- » Do NOT use disinfectants on needles used for fluid injectables which includes all vaccines.

Bent and Broken Needles

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

While very rare, the herd veterinarian and the operation's management must determine how animals will be handled should a needle break off in the neck muscle. A broken needle is an emergency and time will be of the essence. Broken needles migrate in tissue and if not immediately removed will be impossible to find requiring the animal to be destroyed. Under no circumstances can animals with broken needles be sent to a packer. Purchasing high quality needles, changing and discarding damaged needles, and providing proper restraint are all preventative measures.

Broken Needles Guidelines

- » Restrain animals properly and adhere to injection site management as outlined below.
- » Do not straighten and reuse bent needles — replace them immediately.
- » Develop a standard operating procedure for dealing with needles broken off in cattle.
 - If the needle remains in the animal, mark the location where the needle was inserted.
 - 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 part from the cattle tissue.

- If a broken needle cannot be extracted from the tissue, record the animal's ID to ensure that it is never sold or leaves the ranch. At the end of its productive life, the animal should be euthanized and disposed of properly.

Foreign Objects

On rare occasion, rifle bullet fragments and arrow tips have also been found in carcasses. Buckshot contamination of carcasses, while infrequent, continues to be reported by packers, including occurrence in fed cattle. When buckshot is found, the animal is condemned.

Beef producers tend to point their fingers at hunters. However, sometimes producers use shotguns to gather unruly cattle. Regardless of who is at fault, this defect should be prevented with education about the consequences. Other means of animal control and capture must be used. To ensure that foreign objects are not found in carcasses, adhere to the following guidelines:

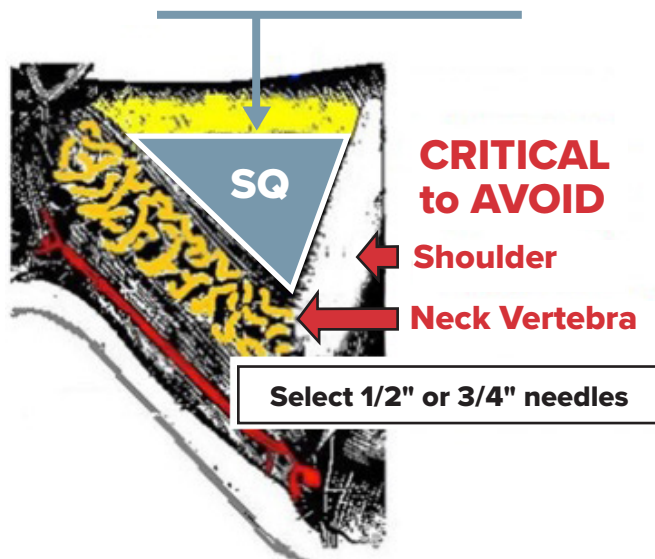
- » Never use a shotgun to gather cattle — if an unruly animal cannot be trapped or gathered by some other means when it reaches the end of its productive life, the animal should be euthanatized on the premise and disposed of properly.
- » Work with hunters to prevent cattle from being shot with any weapon — educate hunters about the potential safety concerns associated with adulterated carcasses.
- » Remove cattle from hunting areas, when possible, to avoid accidental shootings.

4.8.4 INJECTION SITES

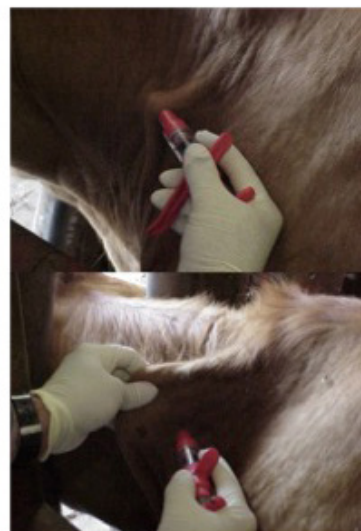
Regardless of animal's age, injections should be given in front of the shoulder slope (unless directed otherwise by a veterinarian or per label instruction); never give an injection in the rump or back leg. In order to avoid adverse tissue reactions, whenever possible restrict administration of drugs to SQ, IV, IN, or oral

use. BQA guidelines advise against giving SQ injections along the ribs or in the elbow region unless the situation requires the use of an emergency medication. 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.

Give all Routine Injections in the Injection Site Triangle



Use Either the Single or Two-Hand SQ technique



If intramuscular medications must be used, administer them in the neck and never exceed 10cc per IM injection site. For example, if 24 cc is the calculated dose, use three 8cc IM injections instead of two 12cc IM injections. Space each injection 2 to 4 inches apart. There are no restrictions to the volume of SQ injections other than as indicated by the product label or as instructed by the herd veterinarian.

Remote Drug Delivery (RDD) systems may create potential issues with the proper administration of animal health products and appropriate injection methods. The most common reasons for the use of RDDs is typically cited as convenience, labor, and time savings; however, this may compromise the ability to adhere to BQA injection site guidelines and FDA requirements for medication use. 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. Contact your veterinarian or state BQA coordinator for additional information on the pros and cons of medication dart use.

Concerns With Utilizing Remote Delivery Device Technology When Administering Animal Health Products

- » 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. This adulterant creates beef quality and safety issues, violates federal food safety regulations,¹ and risks losing consumer confidence.
- » Research has repeatedly demonstrated failure of RDD systems to consistently deliver the intended labeled therapeutic dose of the antibiotics commonly used to treat BRD in beef cattle tested including failure to achieve the FDA intended therapeutic blood and tissue levels of the antibiotic.^{2,3}
- » 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,² or administer the product IM rather than SC or vice versa.

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.

¹ 21 U.S. Code § 342 - Adulterated food

² "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" Coetzee, et-al. J. Anim. Sci. 2018.96:3089–3101

4.8.5 PAIN MANAGEMENT

Part of thoughtful, responsible cattle management includes consideration of pain management for cattle suffering from lameness or pain during or following a surgical procedure such as castration or dehorning. There are very few FDA approved anesthetics or analgesics for cattle. Therefore, it is important to have a VCPR with a veterinarian so that they can advise, provide pain management protocols and supply the prescribed pain management medications.

An analgesic such as flunixin, considered to be similar to ibuprofen used by humans, is commonly considered to aid in pain control associated with lameness. There are two forms of the medication. One form must be given IV and the other form can be applied topically to the animal. 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 violative residues.

There is an additional oral medication that can be prescribed by your VCPR veterinarians. This oral medication has a prolonged half-life and is therefore more suited for post-operative pain control than either injectable anesthetics or other analgesics. Visit with your veterinarian about these pain management options.

Injectable anesthesia is a potential technique that a cattle raiser 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. It is less useful for pain control during surgical castration.

4.9 Feed Additives and Medicated Feeds

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 their website, [FDA.gov](https://www.fda.gov). In addition to the considerations listed above, the following recommendations relate specifically to the use of medicated feeds.

General guidelines:

- » Use only FDA approved medicated feed additives in rations.
- » Use medicated feed additives in accordance with the FDA current Good Manufacturing Practices (cGMPs).

- » Follow Judicious Antibiotic Use Guidelines.
- » Extra-label use of FDA approved feed additives is illegal and strictly prohibited.
- » 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 (2) years, or longer as required by laws/regulations.

Veterinary Feed Directives (VFD)

The FDA requires a VFD for all feed-use antibiotics that could potentially impact human antibiotic resistance. If a cattle raiser 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. These include some forms of BRD treatment/control and intake control during BRD, some forms

³ Rivera, J., Woolums, A., Giguere, S., Johnson, J., Lutz, A., Tipton, P., Crosby, W. and Hice, I. (2018). Pharmacokinetics of tulathromycin following administration with remote delivery devices. In: AABP Annual Conference. American Association of Bovine Practitioners, p.311.

of scour treatment, liver abscess control, and anaplasmosis control. The longest duration any VFD can have is 180 days. There are no FDA approved VFD medications for treatment, control, or prevention of foot-rot or pink-eye. 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. Notable among these are ionophores and parasite control medications. Visit with your veterinarian for more detailed information.

Feed Manufacture

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. All feed mixing operations, regardless of size or products used, share this responsibility.

In-feed drugs are divided into one of two categories:

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

All medicated feeds are divided into one of three types:

- » TYPE A: Medicated feed 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 feeds are used to produce Type B and Type C feeds.
- » TYPE B: Medicated feeds that usually consist of dilute 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.

- » TYPE C: Medicated feed in its final form that does not require any additional dilution prior to being fed. Usually consisting of top dressings, complete feed, or fed as a free choice supplement. The only regulatory requirements are to follow a relaxed set of cGMPs.

Feed manufacturers that must register with the FDA

Any establishment that uses one or more Type A sources of a Category 2 drug to manufacture or produce medicated feed articles. Registration requires completion of either Form FD-2656 (for first time registrants) or 2656e (for annual re-registration) together with a separate Form FDA-1900 for each of the Type A, Category 2 drugs being used.

All producers of medicated feeds are subject to the same rules. If commercial mills, feedyards, producers, mobile mixers, etc. use only Category 1 products and/or Category 2 Type B drug products, registration with the FDA is not required. These products are subject to follow the relaxed set of cGMPs and are not subject to routine inspections by FDA.

If a firm uses one or more Category 2 Type A medicated articles as drug sources, it must register with the FDA and comply with the full cGMPs and is subject to FDA inspections for compliance with these cGMPs at least once every two years.

Forms used by the FDA

- » FD-2656. Registration of Drug Establishment. This form is required for initial registration with the FDA and must be submitted within five working days after commencement of operation of the facility.
- » FD-2656e. Annual Registration of Drug Establishment. This form is used for annual registration of facilities. The FDA will send this form to your facility on an annual basis.
- » FDA-1900. Medicated Feed Application. This form is used to obtain FDA approval to manufacture or use any Type A Category 2 feed article at your facility. Purchase of a medicated premix or complete feed does not

require a FDA-1900 as the facility that blends and manufactures the feed will have one on file. However, each user is responsible for the correct level of drug contained in the total feed. If your facility does not have a FDA-1900 on file for the proper drugs, your facility must first pass a cGMP inspection conducted by the FDA; then FDA will approve your Medicated Feed Application '1900'.

- » These forms can be obtained by writing to:
 - Department of Health, Education and Welfare; Food and Drug Administration, Bureau of Drugs; Drug Listing Staff
 - (HFD-315); 5600 Fishers Lane, Rockville, MD 20857

Facilities not required to register with the FDA are still required to do the following if feeding medicated feeds:

- » Maintain a record of formulas of all feed rations produced.
- » Maintain production records of all batches or runs including date run, ration name or number, and amount of ration.
- » Maintain a record of any distributions of feeds if not used for consumption at your facility.
- » Keep all records for not less than two (2) years and have the capability of a recall if necessary.

Regulatory Scheme

	Category 1 Drugs	Category 2 Drugs
Manufacture of Type A	Premixes containing drugs at levels greater than permitted in Type B feed FD-356 approved required	Premixes containing drugs at levels greater than permitted in Type B feed FD-356 approval required
Use of Type A	No FDA-1900 required No FDA-2656 or 2656e required No mandatory inspection by FDA Relaxed CGMP No assays	FDA-1900 required FDA-2656 or 2656e required Mandatory inspection over CGMP Full CGMP Three assays per year
Use of Type B or Type C	No FDA-1900 No FDA-2656 or 2656e No FDA inspection Relaxed CGMP No assays	No FDA-1900 No FDA-2656 or 2656e No FDA inspection Relaxed CGMP No assays

Combination Feed Additives and Medications Use

Combining the use of different FDA medications must be approved by the FDA. Up-to-date information on all approved FDA feed medications can be found in the Code of Federal Regulations (CFR) 21.558. Medication

manufactures are also a reliable source of information regarding combining medications they make with medications from other sources. Additionally, reliable information on cattle medication use can be obtained from the Food Animal Residue Avoidance Data Bank (FARAD) website.

4.10 Disease Management

Producers and their employees should have the training and ability to recognize common health problems and know how to properly utilize animal health products and other control measures. When prevention or control measures

are ineffective, the producer should promptly contact a veterinarian for a diagnosis and treatment program to reduce animal suffering and animal losses.

There are three classes of animal drugs: over-the-counter (OTC), prescription (Rx), and veterinary feed directive (VFD). OTC drugs can be sold by any person or establishment without a veterinary prescription. Rx drugs can only be sold to cattle raisers by a veterinarian or pharmacist and only with a veterinary prescription after establishing a VCPR. A VFD applies to a medication intended for use in or on feed. A VFD medication limited by an approved application to use under the professional supervision of a veterinarian who is licensed in the state where the animals are being kept. It is illegal to use any VFD drugs in an extra-label manner.

Treatment Protocol Book

Ask your veterinarian to develop a Treatment Protocol Book specific to your operation. A Treatment Protocol Book should be reviewed regularly and updated as often as appropriate. Keep the Treatment Protocol Book on file and at the treatment facility. As the Treatment Protocol Book is updated, all previous versions should be kept on file in the office. Updating does not require the book to be reproduced, but it must have the veterinarian's signature or initials and date when the book was reviewed. An example Treatment Protocol Book is included in the appendix of trainer's manuals. Contact the National BQA program office if a herd veterinarian needs assistance in creating a Treatment Protocol Book. The National BQA program office can refer herd veterinarians to appropriate veterinary medical association contacts.

Any medication that requires a use other than as directed on the label must have revised administration procedures included in the Treatment Protocol Book. As required by the FDA, ask suppliers to attach revised use labels obtained from the herd veterinarian to each

bottle delivered. These labels must include the veterinarian's name, address, phone number, revised directions for use, and withdrawal time. Having all products that have a withdrawal time listed in your treatment protocol book is a best management practice.

Develop a follow-up plan and/or alternative treatments if the initial treatment doesn't produce the desired result. A Treatment Protocol Book should be reviewed regularly and updated as often as appropriate (e.g., as new information or products become available, if planned treatments aren't working, etc.).

Veterinary Prescription or Veterinary Drug Order

A Veterinary Prescription, also known as a Veterinary Drug Order (VDO) or Veterinary Drug Authorization (VDA), is a veterinarian-approved list of medications used in your operation that fit BQA guidelines. A best management practice is to have the prescription include all products that have a withdrawal time, including vaccines, parasitic drugs, and all injectables (including vitamins). It is useful to remember all vaccines have a withdrawal time (21 days for non-oil adjuvant vaccines and 60 days for oil adjuvant vaccines). In the BQA program, all cattle medications and vaccines should be included on the VDO. The VDO should be updated each time the Treatment Protocol Book is updated. In cow-calf operations, the VDO should be reviewed at least twice a year whereas in feedyards it might be appropriate to review the VDO monthly. Your 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. Never allow anyone to substitute products on the VDO.

4.10.1 EXTRA-LABEL DRUG USE (ELDU)

Extra-label drug use is using a drug either 1) at a dose, 2) by a route, 3) for a condition or indication, or 4) in a species not on the label. Extra-label drug use is not permitted in the feed for food-producing animals. ELDU is only legal if prescribed by a veterinarian within the context of a valid VCPR.

ELDU Requirements:

- » Use for therapeutic purposes only (not for production).
- » Follow rules that apply to individual and water dosage forms (not feed).
- » Avoid violative residues.

- » Use only for FDA approved drugs.
- » Require a valid VCPR.
- » Veterinarian(s) make a careful diagnosis (Dx) in the presence of a valid VCPR.
- » All animals within a group may considered for

ELDU, if all AMDUCA guidelines are met and treated individually or via their water.

ELDU of feed additives/medications is strictly prohibited and VFD guidelines must be strictly followed.

Amduca Extra Label Drug Use (ELDU) Requirement Decision Chart (with additional BQA requirements for ELDU and Intramuscular injections):

ELDU Requirements: Therapeutic purposes only (not for production), Rules apply to individual and water dosage forms (not feed), Must not lead to violative residues, Used only for FDA approved *** drugs, Only permitted with valid VCPR, Veterinarian(s) make a careful diagnosis (Dx) in the presence of a valid VCPR, All animals within a group may considered for ELDU, if all AMDUCA guidelines are met and treated individually or via their water. ELDU of feed additives/medications is strictly prohibited unless an FDA Veterinary Feed Directive (VFD) has been issued and VFD guidelines are strictly followed.

When contemplating ELDU, ask the following question: “Are these food animals?”

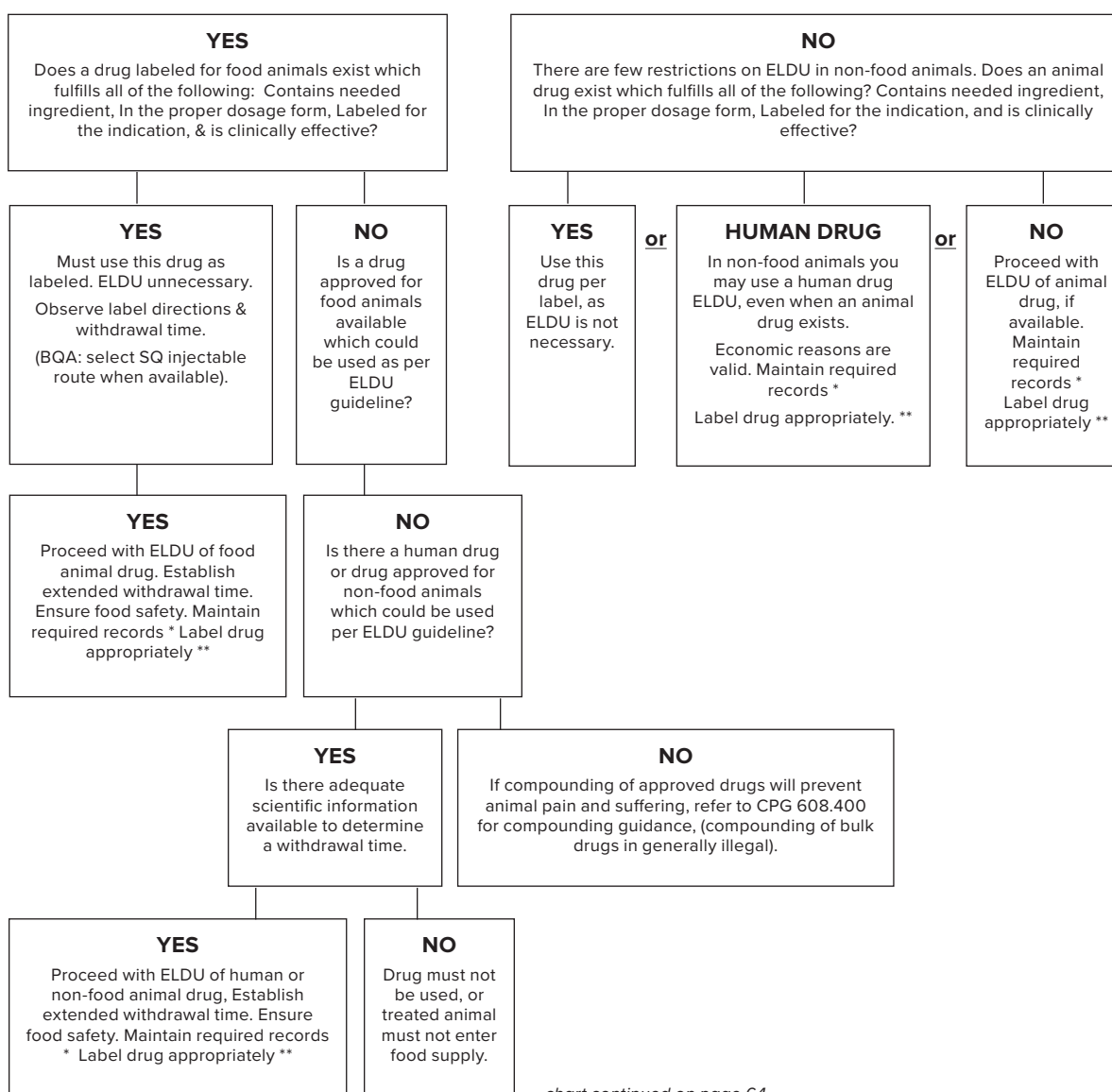


chart continued on page 64

Label Requirements** Vets Name & address, Drug Name, Directions for use (class/species or herd/animal ID) Dosage (amt, freq, route, duration), Cautionary statements, Vet specified withdrawal (WD), HERD NOTES: Dated, time limited & vet signed treatment protocols are acceptable if accompanied by a Veterinary Drug Order = VDO or Veterinary Drug Authorization =VDA All drug units (individual or multiple) labeled "see (name vet) protocol"	Record Requirements* ID of herd/animal, Species, number treated, diagnosis, drug name, dosage, duration, withdrawal time, Records must be FDA accessible for 2 years.	Drug prohibited for ELDU in Food animals*** Chloramphenicol, Clenbuterol, Diethylstilbestrol, Dimetridazole, Iprnidazole, Nitroimidazoles, Furazolidone (non-topical), Sulfonamides (lactating), Fluoroquinolones, Glycopeptides.	BQA Program Regardless of animals age, <u>All intra-muscular (IM) injections must be given in the neck and never exceed 10cc/site</u> (properly space injections). Select SQ injectables when possible. <u>Aminoglycoside(s) ELDU parenterally is prohibited</u> (this is due to the violative residue potential for up to 2yrs post therapy).
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Withdrawal period: the period of time that must pass after the last dose is given until harvest of the animal. The withdrawal period stated on the label allows time for elimination of the drug from the animal or reduction of drug residues to below tolerance levels before harvest.

There are two classes of drugs; over the counter (OTC) and prescription drugs (Rx). OTC drugs can be purchased and used as directed on the label without establishing a relationship with a veterinarian. For example, the label for penicillin G directs 1cc/cwt be given IM. So, a 600 pound calf would get 6cc. Non-veterinarians are not allowed to adjust the dose.

Prescription drugs can be used only on the order of a veterinarian, within the context of a VCPR. OTC drugs become prescription medications if not used precisely as directed on the product label. Adjustment of an OTC drug is only permitted by a licensed veterinarian and medications used in this fashion must be labeled with an additional label that contains the name of the contact veterinarian and instructions given including the withdrawal time. Drug cost is not considered a valid reason for extra label drug use under the Animal Medicinal Drug Use Clarification Act (AMDUCA) or the regulations promulgated to implement the act.

FDA-CVM Criteria for Extra-Label Drug Usage:

- » A careful diagnosis is made by an attending veterinarian within the context of a VCPR.
- » A determination is made that 1) there is no marketable drug specifically labeled to treat the condition diagnosed or 2) treatment at the dosage recommended by the labeling was found clinically ineffective.
- » Procedures are instituted to assure that identity of the treated animal is carefully maintained.
- » A significantly extended period is assigned for drug withdrawal prior to marketing the treated animal. Steps are taken to assure the assigned time frames are met so that no violative residue occurs. The Food Animal Residue Avoidance Databank (FARAD) can aid the veterinarian in making these estimates.

Aminoglycosides

The BQA program does not allow the injectable ELDU use of aminoglycosides (e.g., neomycin, gentamicin, kanamycin) because of the extremely long withdrawal, over two years, and the potential for a violative residue.

4.10.2 COMPOUNDING

Compounding of medications to treat cattle by a veterinarian is strictly regulated by section 530.13 of the Extra-Label Drug Use in Animals and 608.400, Compounding of Drugs for Use in Animals. The FDA-CVM has interpreted the regulations to allow extra label drug use for treating disease or preventing pending disease. The compounded medication must meet strict FDA-CVM guidelines. The FDA-CVM policy states, “The veterinarian will need to be able to defend why the compounded drug works where a labeled product or an extra-label use of a NADA or human compound would not.”

Compounding from bulk ingredients to manufacture other medications for cattle under any circumstance is prohibited by the FDA. There are circumstances, however, where minor compounding might be considered appropriate under the Animal Medicinal Drug Use Clarification Act (AMDUCA) algorithm. 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.

Drugs not approved for cattle or for the production class of cattle being treated should only be used after following AMDUCA regulations. Medications labeled for cattle

or for the production class should always be considered first for treatment, control, and prevention of disease. If the prescribing veterinarian has determined that the labeled medication is or will be clinically ineffective for the disease condition being treated and extra-label use is indicated then, an extended withdrawal period for meat and milk should be adhered to. The Food Animal Residue Avoidance Databank (FARAD) may be of help in establishing these recommendations.

The labeled withdrawal period from the manufacturer does not apply if the drug is used in an extra-label manner such as changing the dose, route, duration, frequency, or production class of animal. The FDA considers the use of medications in a production class of animal not approved on the label to be an extra-label use. When a veterinarian prescribes this extra-label use in an unapproved class of livestock, there is no tolerance in edible tissues or milk. Any detectable level of the medication in such a scenario 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.

4.11 Euthanasia

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. Euthanasia, death induced by methods that do not cause pain or distress to an animal, is the appropriate choice whenever

the above conditions are not met. Cattle raisers are the humane keepers of their cattle. If it is in the best, humane interest of the animal to be euthanized, that task is 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. Avoidance of pain and distress requires that euthanasia techniques cause immediate loss of consciousness followed by cardiac and respiratory arrest that ultimately results in loss of brain function. Reasons for euthanasia include:

- » Fractures 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
- » 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

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 be

technically proficient and have an understanding of the relevant anatomical landmarks and the protocols used for humane euthanasia of animals. For more information refer to www.bqa.org.

Methods of Euthanasia in Cattle

Acceptable methods for conducting euthanasia in cattle include gunshot and penetrating captive bolt with a secondary step to insure death.

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. 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 assure death. Methods used to assure death include a second or third shot if necessary, exsanguination (bleeding out), or use of a pithing rod.

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

¹ .22 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 by-standers in danger.

Anatomical Landmarks for Euthanasia

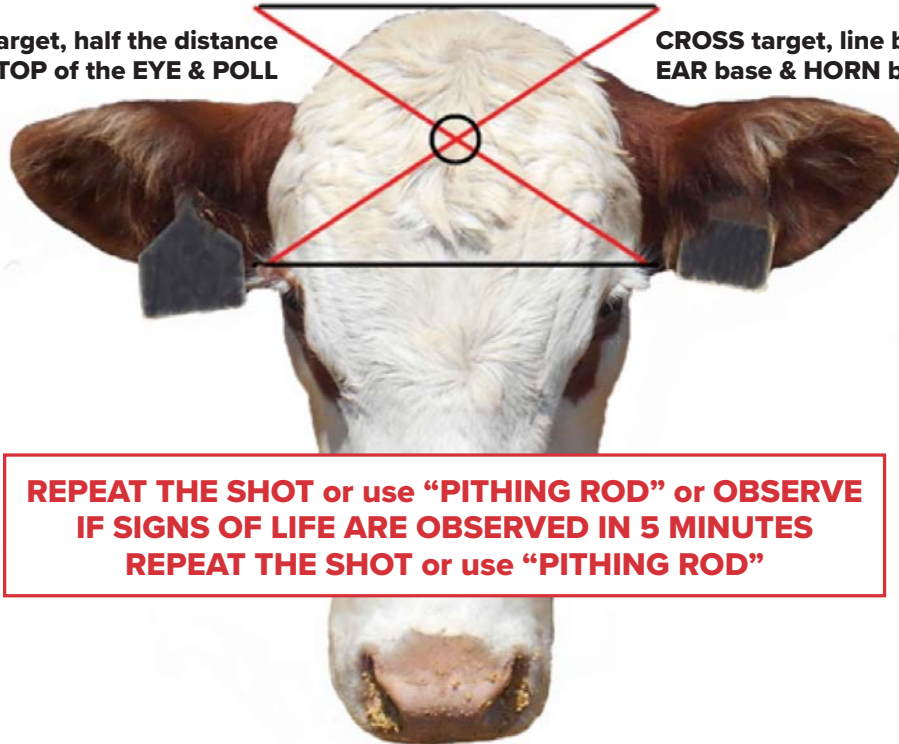
Current information for adult cattle and calves indicates that the point of entry of the projectile should be at (or slightly above) the intersection of two imaginary lines, each drawn from the outside corner of the eye to the center of the

base of the opposite horn. 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. When using penetrating captive bolt, operators are advised to restrain the head so that the captive bolt may be held flush with the skull. See the following images on page 67.

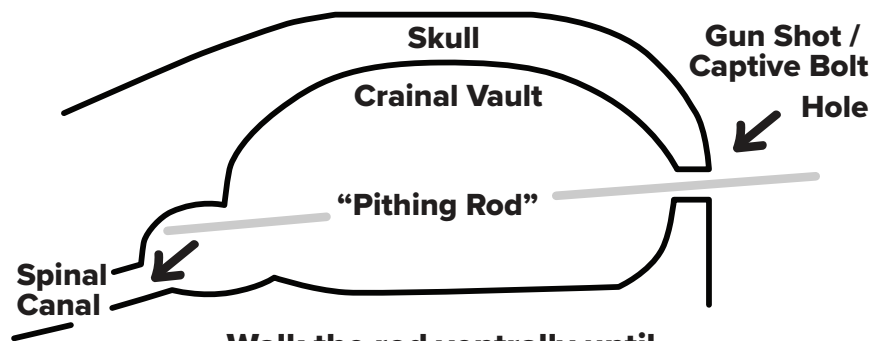
Euthanasia Aiming

**MIDLINE target, half the distance
between the TOP of the EYE & POLL**

**CROSS target, line between
EAR base & HORN base**



**REPEAT THE SHOT or use "PITHING ROD" or OBSERVE
IF SIGNS OF LIFE ARE OBSERVED IN 5 MINUTES
REPEAT THE SHOT or use "PITHING ROD"**



**Walk the rod ventrally until
it slides into the Brain Stem
located in the spinal canal**

Indications of Unconsciousness

When conducting euthanasia procedures one should always observe animals for the following behaviors indicating unconsciousness:

- » Animal collapses immediately when shot and makes no attempt to 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.
- » An absence of vocalization.
- » An absence of eye reflexes and eyelids remain open facing straight forward.
- » Immediate and sustained cessation of rhythmic breathing.

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

Criteria to be used for confirmation of death include lack of pulse, lack of breathing, lack of corneal reflex, lack of response to firm toe pinch (as with a hoof tester), failure to detect/hear respiratory sounds or heart beat by use of a stethoscope, graying of the mucous membranes, and rigor mortis. Other than rigor mortis, none of these signs are reliable indications of death. After initial confirmation of death, rechecking of the animal for these parameters after a period of 20 minutes is a very useful method for confirmation of death.

The 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 licensed veterinarian may use other acceptable methods.



CHAPTER 5. TRANSPORTATION



5.1 Introduction

Cattle transportation occurs at several junctures throughout the production process. During transport, animal well-being along with human safety is a top priority. Improper animal care and treatment will have a negative effect on the quality of meat. A reduction in meat quality impacts the consumer, the production operation, and the trucking business by reducing financial opportunities. These are all reasons why animal well-being is so important. Proper animal treatment is the right thing to do, and it can lead to better financial returns.

Cattle transport is a team event. It takes effective communication between all individuals involved. Having consistent and appropriate communication about safe transportation practices facilitates implementation of these practices to reduce potential harm to the people and cattle involved, to ensure a quality product, and to make consumers aware of the important role cattle transporters play in the cattle industry.

5.2 Key Practices

- ✓ It is not acceptable to knowingly inflict physical injury or unnecessary pain on cattle when loading, unloading, or transporting animals is not acceptable.
- ✓ Handle/transport all cattle in a manner to minimize stress, injury, and bruising.
- ✓ Use vehicles to transport cattle that provide for the safety of personnel and cattle during loading, transporting, and unloading.
- ✓ Follow guidelines when transporting your own livestock:
 - Do a structural check of trailer/truck and tires prior to loading livestock.
 - Inspect trailer/truck for cleanliness (biosecurity) as well as condition of flooring and broken gates that may injure/bruise cattle.
 - Check weather and route to ensure for a safe and uneventful trip.
 - Verify drug withdrawal times on any animals being sold.
 - Verify that all animals are fit to ship.
 - Back up squarely and evenly to the loading chute.
 - Load using Low Stress Handling Practices.
 - 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 an organized event.
- ✓ Follow guidelines when contracting for your livestock to be hauled:
 - Establish good communication/logistics with both the trucking company and the receiver of the livestock.
 - Request that the truck arrive clean for loading to decrease biosecurity risks.
 - Check weather and route to ensure for a safe and uneventful trip.
 - Verify drug withdrawal times on any animals being sold.
 - Verify that all animals are fit to ship.
 - Ensure that the driver backs up squarely and evenly to the loading chute.
 - Load using Low Stress Handling Practices.
 - Ensure that the driver pulls away from the chute slowly and drives smoothly to allow cattle a chance to gain their balance in-transit.
 - Encourage the driver to minimize time in-transit by limiting stops and using prior-preparation to ensure an organized event.
 - Ask hauling contractor/driver for proof of BQA Transportation Certification.

5.3 Loading and Unloading

Apart from severe weather, transportation can be one of the most stressful events for cattle in their lifetime. An animal's loading and unloading experience has a significant impact on total transportation stress. Quiet and low stress animal handling techniques used for loading and unloading significantly reduces animal stress, thereby allowing cattle to remain healthier and more quickly acclimate to their new environment. Further, Food Safety and Inspection Service (FSIS) has announced it holds livestock owners, transporters, haulers, and other persons not employed by an official establishment responsible if they commit acts involving inhumane handling of livestock in connection with slaughter when on the premises of an official establishment.¹ Loading and unloading guidelines include:

- » NEVER knowingly inflict physical injury or unnecessary pain on cattle when loading, unloading, or transporting them.
- » Ensure cattle sorting and holding pens allow handling without undue stress.
- » Locate sorting and holding pens near the loading/unloading facility.
- » Ensure sorting and holding pens are suitable for herd size.
- » Provide water for cattle in the holding pens especially during times of heat stress.
- » Properly design and maintain loading facilities for easy and safe animal movement.
- » Ensure all personnel properly use loading facilities to assure the safety of both cattle and cattle handlers.
- » 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 all vehicles used to transport cattle provide for the safety of personnel and cattle during loading, transporting and unloading.
- » 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.
- » Do not ship cattle that are unable to withstand the rigors of transportation.
- » Safely partition cattle into smaller areas to provide stability for the cattle and the vehicle.
- » 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.
- » Load, unload, and move cattle through facilities with patience and as quietly as possible to reduce stress and injury.

¹ <https://www.federalregister.gov/documents/2016/10/26/2016-24754/inhumane-handling-of-livestock-in-connection-with-slaughter-by-persons-not-employed-by-the-official>

5.4 Fitness for Transport

One of the most important decisions in transporting cattle is to determine if an animal is fit to be transported, if transport should be postponed to allow for treatment, or if euthanasia should be carried out instead. 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 if an animal is fit for transport. They are the health of the animal, the mobility of the animal, and the body condition of the animal. Fitness for transport guidelines include:

- » DO NOT move non-ambulatory cattle to market under any circumstances.
- » Make the decision to treat, to cull, or to euthanize cattle promptly.
- » Delay transport of any cattle that appear to be exhausted or dehydrated until the animal is rested, fed, and rehydrated.
- » Use a BQA Transportation certified transport company that is knowledgeable about your cattle care expectations and provides for the safety and comfort of the cattle during transport.
- » DO NOT transport cattle to a packing or processing facility until all proper treatment withdrawal times have been followed.
- » DO NOT transport cattle with a poor body condition score (i.e., a body condition score of less than 2).
- » DO NOT transport heifers or cows where calving is imminent and likely to occur during the transportation or marketing process.
- » DO NOT transport cattle that require mechanical assistance (e.g., hip lifts) to rise and walk except for veterinary treatment. When using any handling device, abuse must not be tolerated.
- » DO NOT transport cattle with bone fractures of the limbs or injuries to the spine. Cattle with a recent fracture unrelated to mobility should be culled and transported directly to a packing or processing facility if they are ambulatory and can withstand the rigors of transport.
- » DO NOT transport cattle with conditions that will not pass pre-slaughter inspection at a packing or processing facility.¹

¹ https://www.fsis.usda.gov/wps/wcm/connect/04739d5f-6342-4b24-bcdf-1f55f77a3420/PHVt-Antemortem_Inspection.pdf?MOD=AJPERES

5.4.1 CULL CATTLE

The overwhelming majority of cattle are marketed in good health and physical condition. Regardless of herd size, all beef cow operations will have some culled animals. Good culling management adds value to the operation and industry. Poor culling management forgoes this 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 (see euthanasia section), depending upon

the severity of the condition, processing plant policy, and state or USDA regulations. Culling Guidelines include:

- » Do not market culled animals that pose a public health threat.
- » Be certain that ALL animals shipped to market have cleared mandated withdrawal times.
- » Do not market culled animals that have an advanced terminal condition.
- » Do not send disabled culled animals to market.
- » Market culled animals BEFORE they become severely emaciated.
- » Do not market culled animals that have an advanced eye lesion.

5.4.2 MARKETING GUIDELINES

Lameness

Lameness seriously compromises well-being and is a management priority for the herd. Additionally, lame and disabled cattle are a perception problem for the industry. Some of these problems are unavoidable particularly with bulls. However, many problems with lame cattle are easily avoidable if producers cull animals before they develop feet and leg problems due to old age. The packer is required to remove all tissue associated with an arthritic joint. Additionally, excessive bruising results in large trim losses. Disabled cattle should either be marketed directly to the packer or humanely euthanized.

Non-ambulatory (Downer) Cattle

A non-ambulatory animal (commonly referred to as a 'downer') is unable to stand up or walk, even if assisted. Design and conduct all procedures to prevent cattle from becoming 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. Guidelines for non-ambulatory animals include:

- » Promptly diagnosis non-ambulatory animals and determine whether the animal should be humanely euthanized or receive additional care.
- » Provide adequate feed and water to non-ambulatory cattle at least once daily.
- » Move downer animals very carefully 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 by caretakers.

- » Humanely euthanize animals within 24-36 hours of initial onset which refuse to eat or drink and/or are unable to sit up unaided (i.e., lie flat on their side) when treatment is attempted.
- » **Do not send non-ambulatory cattle to a livestock market or processing facility.**

DO NOT DO ANY OF THE FOLLOWING AT ANY TIME TO A NON-AMBULATORY ANIMAL

- » NEVER drag non-ambulatory animals.
- » NEVER use an electric prod to stimulate an injured or disabled animal to get up unless essential to prevent further injury or death.
- » NEVER use chains, rope, or cables to lift, suspend, or move the animal unless necessary to prevent further injury or death, if allowed by state law.
- » NEVER let a non-ambulatory animal remain in any area where they may get walked on or trampled.

5.5 Travel Considerations/Factors

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

Check the weather forecast for the anticipated route prior to loading/leaving, and while in route. Always be aware of alternate routes in case something goes wrong. Determine if routes are appropriate based on the truck and trailer weight. In determining routes, consider the amount of anticipated traffic, number of stops, number of sharp turns, and road width. The well-being and safety of the animals must be considered at all times. It is your responsibility to do your best to keep the animals comfortable and safe. Constantly monitor the comfort and condition of the animals during any delay.

If the truck breaks down, determine the nature of the breakdown and 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, the animals must be transferred to another unit to complete the journey.

Distractions must be avoided at all times. This includes: eating, drinking, talking on the phone, texting, checking email, looking at your phone, reading, and reaching for items on the floor or across the seat. Always follow posted speed signs and drive defensively. Never tailgate, pass illegally, or attempt to beat traffic lights or railroad crossings. Stay alert at all times to your driving and those driving nearby. Never drive impaired.

Seven and a half hours is commonly recognized as the normal amount of required sleep. Work with management to be sure their schedule allows for the proper amount of sleep. If you drive during the night, ensure your schedule allows for a quiet, restful sleep during the day. Taking power naps lasting 15-20 minutes can be beneficial. Allowing fresh air into the cab and playing music is a good strategy to stay wakeful. Taking frequent breaks to stop and stretch for five minutes is a good strategy to stay wakeful. This is also a good time to do a quick check of the animals on board. However, if you are still experiencing symptoms of fatigue — pull over and call your dispatcher.

Being prepared for an accident before it happens will keep you and your livestock safe. When accidents occur with a loaded stock trailer they can become especially serious if injured or scared animals escape onto the roadway. Document the incident with photographs to provide to the insurance company and your employer. Assess the situation to determine if it is life threatening for you, any other party involved, bystanders, or the livestock. If necessary, call 911.

A man wearing a white cowboy hat, glasses, and a red and white striped shirt is looking down at a clipboard he is holding. He is standing in a field of tall green grass. The background is slightly blurred, showing more of the field and some yellow flowers.

CHAPTER 6. **RECORD KEEPING**



6.1 Introduction

Record keeping is a key element of Beef Quality Assurance and a good business practice in general. Many software programs on the market serve both commercial and purebred cattle operations. However, even pen and paper use is a feasible option that is better than not having a record keeping system. A quality record keeping system is one that cattle raisers are comfortable using and that maintains accurate, thorough, and timely production records. These records have many uses such as to help cattle raisers:

- » **Manage a herd health program.**
 - Determine what treatments are being used and their success rates.
 - Track the application of treatment recommendations.
 - Adjust treatment protocols as needed.
 - Adhere to withdrawal times.
- » **Manage a nutrition program.**
- » **Control production costs.**
- » **Make well-informed decisions about marketing cattle.**
- » **Inspire consumer confidence through an ability to document the responsible use of products and management of risk factors that may have residue potential.**
- » **Provide process documentation in the event of a herd's inspection by any state or federal agency.**



- » **Adhere to the remarks and safety restrictions with regard to withdrawal times and animal types (e.g., pregnant, lactating, etc.) that should not be treated or exposed to treated areas.**
- » **Provide documentation in the event of a residue citation.**
 - **Thorough records may provide evidence that the animal in question does/did not belong to the herd or was not given a particular drug. These records should include what, where, how much, and how a product was given to an animal to accurately determine compliance with withdrawal times.**
 - **The ability to demonstrate appropriate training, inventory control, product use, animal identification, withdrawal, and disposal is necessary to avoid liability from a residue contamination.**
- » **Manage the use of pesticides, herbicides, and other chemicals.**
- » **Communicate accountability to effective, ethical, thoughtful, and responsible cattle raising practices.**

6.2 Key Practices

- ✓ Employ strict adherence to withdrawal periods on product labels and to extended withdrawals as determined by a veterinarian within the context of a VCPR.
- ✓ Identify all animals with appropriate individual and/or group identification methods.
- ✓ When cattle are treated/processed individually, record the following in the treatment records:
 - Individual animal identification
 - Date treated
 - Product administered and manufacturer's lot/serial number
 - Dosage
 - Route and location of administration
 - Earliest date animal will have cleared the withdrawal period
 - Name of individual administering the treatment
- ✓ When cattle are treated/processed as a group, identify all cattle within the group as such and record the following information:
 - Group or lot identification
 - Date treated
 - Product administered and manufacturer's lot/serial number
 - Dosage
 - Route and location of administration
 - Earliest date animal will have cleared the withdrawal period
 - Name of individual administering the treatment

- 
- ✓ **Transfer all processing and treatment records with the cattle to next production level.**
 - ✓ **Inform prospective buyers of any cattle that have not met withdrawal times.**
 - ✓ **When applicable, keep complete records when formulating or feeding medicated feed rations.**
 - ✓ **Maintain records of any pesticide use on pasture or crops that could potentially lead to violative residue in cattle.**
 - ✓ **Keep records for a minimum of two (2) years, or longer as required by laws/regulations (e.g., three years for Restricted Use Pesticides).**

6.3 Cattle Identification

Cattle identification, and its associated contributions to quality record keeping, can facilitate many management and production benefits. Individual animal identification supports the tracking of animal's performance characteristics such as reproductive status, growth, health, age, and offspring performance etc. These performance indicators may be important as cattle raisers make cull/keep, purchasing or breeding decisions. Additionally, an emphasis on animal identification, record keeping, and proper handling has supported the beef industry's excellent prevention of violative drug residues. Branding, ear-tagging, ear-notching, and radio frequency identification devices (RFID) are methods of identifying cattle. Perform all used identification methods quickly, expertly and with the proper equipment. Guidelines for cattle identification include:

Branding

- » Brand on the hip area to preserve hide value.
- » Ensure brands are of appropriate size to achieve clear identification.
- » Consider using brands to establish legal and permanent proof of cattle ownership. In some locations, branding is mandatory as is registering the brand registration with the county clerk in each county where cattle are housed. Check with your local county clerk's office regarding branding, registration, and re-registration requirements.
- » Do not brand with a brand that is too hot or leave the brand on the hide for too long — these may result in scar tissue and tightening of the underlying muscle.
- » Do not re-brand feeder cattle when entering a feedlot unless required by law.

Ear-tagging

- » Place the tag in the middle third of the ear between the rises in auricular cartilage.
- » The tag should include a number that identifies each animal to its group and, if possible, an individual number unique only to that animal.

Ear-notching

- » Leave at least ¼ inch between notches.
- » Avoid notching too close to the tip of the ear.
- » Avoid making notches too shallow as they may close or become difficult to read.

RFID Devices

- » Place the tag within the first quarter (from the head) of the animal's ear between the rises in auricular cartilage.
- » Securely close the tag.
- » Use compatible front and back tag components.

Wattling, ear splitting, and other surgical alterations for identification are strongly discouraged. A special note for producers who cannot individually identify animals prior to weaning:

- » Identifying each animal individually prior to weaning is not required to participate in the BQA Program. Group identification of cattle is acceptable. BQA recommends recording the date an animal within a group was treated, the identification of the group, the drug, vaccine, pesticide, etc. used, the amount given, and the withdrawal time for the product. The withdrawal time will apply to the entire group of animals. For example: if several calves break with scours and numerous calves are treated within a 10 day period, the entire group of calves would receive a withdrawal date based on the last date of administration of the product with the longest withdrawal period. Transfer a complete history of the product's use when transferring cattle to the next production unit.

6.4 Types of Records

Herd Health Records

An old adage states, “A goal without a plan is just a wish.” Goals provide critical benchmarks for continuous improvement on farms and ranches; working with veterinarians to keep good herd health records creates a plan to ensure that producers raise and market healthy animals.

Keep all records for at least two (2) years from the date of transfer or sale of cattle. In case a problem arises later, these records will aid in tracking the treatment history of the animal prior to its transfer or sale. A copy of the appropriate records should be made available to the buyer of your cattle or as they are transferred from one unit of your ranch to another. Records should include all individual and group treatment processing history and other information as deemed appropriate. Guidelines regarding what to include in treatment records are:

- » Treatment date
- » Animal or group identification
- » Approximate weight of animal or group average
- » Product administered
- » Product lot/serial number
- » Earliest date the animal could clear withdrawal time
- » Dose given
- » Route of administration (IM, SQ, etc.)
- » Location of injections
- » Name of person who administered the drug

Examples of Animal Treatment Records:

- » Treatment Record for Individual Cattle
- » Mass Medication Pen Record
- » Premise Pesticide Use Record
- » Mass Medication in Feed Group/Pen Record

Feed Records

Guidelines for Feed Records:

- » Keep all feed records for at least two (2) years from the date of transfer or sale of the cattle. In case of a problem, documents will prove what feed(s) were offered to cattle.
- » Require an invoice that includes the date, amount, lot/batch number, and signatures of both the person who delivered the product and the person receiving the product to accompany all feed products.
- » **Obtain a valid/current Veterinary Feed Directive (VFD) for each product before offering cattle feed additives that require a VFD.**

Health Product Records

Health product records show origin and expiration dates of products utilized. Most systems fall into one of two categories: receiving records or inventory records. The most common type of system is a receiving record of all animal health products. A calculated or theoretical usage calculation cannot be determined by a receiving record. However, it will allow for tracing product origination and expiration dates.

Some facilities employ an inventory record system which allows processing medications and implants to be recorded under a running or beginning and ending inventory. This also allows for product usage calculation. Such a record can prove to be a great benefit when charging and billing customers.

Several pharmaceutical companies, land-grant universities, and private companies have developed computer programs to manage animal health product inventory records. These record products at the chute during administration via a chute-side computer terminal or via a handwritten system consisting of an individual treatment card or a processing work order form.

Chemical Records

Purchasing restricted-use chemicals requires a pesticide applicator license. Additionally, state departments of agriculture require licensed personnel to keep records of any applications of restricted-use chemicals. Non-restricted

chemical applications should also be recorded. Records should track the date and time used, product name, name of applicator and EPA product number. Check with your pesticide supplier and extension educator for additional information and to determine if additional information needs to be recorded.

6.5 Residue Avoidance

A residue refers to the presence of veterinary drugs or pesticides in meat. These residues are usually measured in parts per million or parts per billion. The overwhelming majority of meat products contain no residues or residues within the government prescribed tolerance levels. Veterinary drug tolerances are established by the U.S. Food & Drug Administration (FDA) under the Federal Food, Drug, and Cosmetic Act. The Environmental Protection Agency (EPA) establishes tolerances for registered pesticides under the Food Quality Protection Act.

The FDA approves veterinary drugs and the specific dosage rates to treat specific diseases or conditions. Farmers, ranchers, and veterinarians are required by law to follow the FDA-approved label to administer the drug appropriately and correctly. Animal health companies must prove that their veterinary drugs are safe and effective for the intended animal patient, much like the drug approval process for human antibiotics. If the intended patient is a food-producing animal, there is an additional requirement to prove that the use of the antibiotic does not present a risk to human health.

The prevention of illegal antibiotic residues is a continuous, coordinated effort between government agencies, veterinarians, and livestock producers that begins before the antibiotic is ever used in animals. The drug approval process, on-farm antibiotic use measures and the U.S. National Residue Program are all specifically designed to prevent animal products with illegal drug residues from entering the food supply.

The FDA also sets withdrawal times for all veterinary drugs, including antibiotics. The withdrawal period is the time between the last dose of the antibiotic and the time when the animal can be safely slaughtered for food (or, with dairy cattle, the milk can be safely consumed). Practically, the withdrawal time is the amount of time required for the drug to be reduced to a safe tolerance level; the withdrawal time depends on the drug; but typically ranges from zero to 60 days.

Minimum Withdrawal Times

Establish a minimum withdrawal time for newly processed cattle. The minimum withdrawal time is the longest withdrawal time required for any product given. Animals recovering from illness may have some organ damage and may not be clearing medications from their system normally. These non-performing animals are a high risk for causing a violative residue problem. Have the veterinarian and manager review all of these animal's records before releasing them to salvage. Establish a residue screening program for non-performing animals (i.e., medicated market cows/bulls, realizer feeder cattle). Also, consider that even if you have not treated an animal, it may have been treated before it arrived — this is another reason to establish a minimum withdrawal time and a residue-screening program for all non-performing animals. A residue-screening test such as the LAST test may offer a margin of comfort if these cattle need to be shipped soon after their prescribed withdrawal date.

Calculating Withdrawal Times

Each withdrawal day is a full 24 hours after the last treatment. For example, if the last time the animal was treated was at 6 a.m. on Monday with a drug having a 6-day withdrawal, the withdrawal period would conclude at 6 a.m. on Sunday.

In the case of an animal offered medicated feed or water, the withdrawal time begins after physical removal of the entire product and/or cleaning and flushing of the water supply.

Steps to Prevent a Violative Residue

- » Identify and segregate all animals treated.
- » Record all treatments: date, animal ID, serial/lot number, dose given, route of administration, the person who administered the treatment, and the withdrawal time.
- » Strictly follow label directions for product use.
- » Use newer technology antibiotics when possible.
- » Reduce unwanted depot effect — select a low volume product when available.
- » Select generic medications and vaccines with an animal health professional.
- » Avoid inferior products, they may cause performance loss or damage quality.
- » Select with short withdrawal when antibiotic choice is equivalent.
- » Never give more than 10cc per IM injection site.
- » Avoid Extra-Label Drug Use (ELDU) of antibiotics.
- » Use label dose and route of administration under a valid VCPR.
- » Avoid using multiple antibiotics at the same time.
- » Don't mix antibiotics in the same syringe.
- » Check all medication/treatment records before marketing.
- » Do not market cattle with less than 60 withdrawal days without examining their treatment history.

- » Extend the withdrawal time if the route or location of administration is altered.
- » Extend the withdrawal time to the longest withdrawal period of all products given.
- » Extend the withdrawal for all penicillin given at doses which exceed the label dose.
- » Note that testing urine may not detect injection site residues that will test positive by the USDA-FSIS.
- » Never inject gentamicin or neomycin, the estimated withdrawal is more than 24 months.
- » Testing urine may not detect a kidney that will test positive by the USDA-FSIS.
- » Don't market cattle that have relapsed without examining the treatment history.
- » Don't market cattle with suspected liver or kidney damage without examining the treatment history.
- » Don't market cattle with antibiotic injection site knots without examining the treatment history.
- » Cattle that appear to have a compromised health status and/or metabolic disease may require additional time beyond the labeled withdrawal time to metabolize animal health products. Consult a veterinarian to assess violative residue risk in these situations.

Screen the urine of all cattle identified in the above steps for antibiotics. It is best to use broad spectrum microbial inhibition test such as the Pre-harvest Antibiotic Screening Test (PHAST) a microbial growth inhibition test which uses *B. megaterium* as the test organism. Test results should be compared to FDA-Center for Veterinary Medicine (CVM) violative residue tolerances (Maximum Residue Limit).

Residue Monitoring

The final step in protecting and preventing illegal antibiotic residues from entering the food supply is surveillance testing conducted by the United States Department of Agriculture (USDA) Food Safety Inspection Service (FSIS). The agency conducts tests for chemicals — including antibiotics and various other drugs, pesticides and environmental agents — in meat, poultry,

and egg products destined for human consumption. The surveillance program consists primarily of two tiers of testing: scheduled and inspector generated. Scheduled antibiotic residue testing is pre-planned to provide a large sample across different food animal industries (beef cattle, veal calves, swine, poultry, dairy, etc.), and locations.

The development of scheduled sampling plans is a process that proceeds in the following manner:

- » Determine which compounds are of food safety concern
- » Use algorithms to rank the selected compounds
- » Pair these compounds with appropriate production classes
- » Establish the number of samples to be collected

Inspector generated samples are collected from animal carcasses that show signs of

previous disease or medical treatments — animals that may present an above average risk for illegal antibiotic residues.

In the rare cases when an illegal drug residue is confirmed, the beef product is considered adulterated and is never allowed to enter the food supply. The USDA and FDA then initiate a cooperative effort to investigate the reasons for the illegal use. Depending on the severity of the residue, the intent, and history of the violations, the investigation may lead to a variety of outcomes for the animal owner — from a warning letter to injunction to criminal prosecution.

The FSIS Hazard Analysis Critical Control Points (HACCP) program implemented at slaughter facilities identifies the animals most likely to have drug residues. Animals that display lameness, injection site lesions, or signs of illness are targeted for testing. If there is any doubt about the potential for drug residues in an animal, the animal should not be market.

Tissue Risk Assessment Checklist

Low Risk	High Risk
» Animal history is documented, recorded, and available. » Animal never treated with drugs. OR » Single drug administration of lactating/non-lactating animal approved drug. AND » Followed drug label information for dose, route of administration, duration of therapy, and withholding time. OR » Veterinary oversight of the use of drugs in an extra-label manner.	» Animal is displaying lameness, injection sites, surgical evidence, or has signs of illness. AND Any of the below apply: » History of animal treatment has not been documented or not communicated to person sending cattle to market. » Route of administration that was used is not as prescribed on the label. » Multiple drug administrations done without veterinary oversight. » Drug not approved for animal status (e.g., lactating). » Doses or withholding times not followed or unknown. » Duration of therapy not followed. » If any of the above high risk attributes exist, consult pharmaceutical, veterinary, or screening test experts to determine status of animal before offered for sale.

Repeat Violators List

Producers who market animals that test positive for chemical residues more than a single time are placed on the publicly available USDA FSIS Residue Repeat Violator List. FSIS maintains a “Repeat Residue Violator List for Use by FSIS Inspection Personnel” that contains the names and addresses of producers who have more than one meat residue violation in a 12-month period in animals presented for slaughter. Specific information about the violation can also be found in this list including the plant where the violation was determined, the drug residues discovered, and their concentrations and tolerances. Violators listed may have had multiple violations documented in the same

processing facility or separate facilities. This list is intended to aid inspectors in discovering residue tolerance violations before they reach consumers. FSIS provides a user guide that explains the information contained in the list.

FSIS also maintains a “Residue Repeat Violator List for Use by Livestock Markets and Establishments” that contains similar information intended to assist plant owners and operators in identifying residue history of livestock suppliers. This second list documents only the source name and address information of repeat violators, so that livestock marketers and buyers may use precaution when marketing and processing animals from listed suppliers.

Food Animal Residue Avoidance Databank (FARAD)

FARAD is a national, USDA-sponsored, cooperative project, with a primary mission to prevent or mitigate illegal residues of drugs, pesticides, and other chemicals in foods of animal origin. Producers should work with the veterinarian with whom they have a valid VCRP for drug residue information first. The veterinarian is the ideal resource to discuss FARAD-specific information regarding withdrawal times especially for extra-label drug use.

FARAD provides the following services:

- » Advice on residue avoidance or mitigation
- » VetGram search for required withdrawal times for approved food animal drugs
- » FARAD-recommended withdrawal intervals for extra-label use of approved food animal drugs

Visit www.farad.org for more information.

A row of large, rectangular hay bales in a field under a clear blue sky. The bales are made of dry, golden-brown grass, with some green grass visible on the left side. The bales are arranged in a line, receding into the distance. The sky is a solid, clear blue.

CHAPTER 7. **NUTRITION**



7.1 Introduction

As ruminant animals, cattle excel at converting human inedible energy(i.e., forage and bi/co-products 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 cattle’s nutritional status has a direct impact on production efficiency, immunity, and carcass characteristics. Many factors affect an animal’s nutrient requirements such as the animal’s 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 your state agricultural extension agent or a nutritional consultant as potential resources.

7.2 Key Practices

- ✓ Ensure cattle have access to an adequate water supply and appropriate nutrition (from Code of Cattle Care, modified for sentence structure).
- ✓ Avoid feed and water interruption longer than 24 hours.
- ✓ Only use feedstuffs and feed ingredients of satisfactory quality.
- ✓ Under certain circumstances (e.g., droughts, frosts, and floods), test feedstuffs or other dietary components to determine the presence of substances that can be detrimental to cattle well-being, such as nitrates, prussic acid, mycotoxins, etc.
- ✓ Use only USDA, FDA, and EPA approved products for use in cattle; these products must be used in accordance with the approved product use guidelines.
- ✓ Analyze suspect feedstuffs prior to use and seek supplier assurance of feed ingredient quality.
- ✓ Do not feed ruminant-derived protein sources per FDA regulations.
- ✓ Support feeding of by-product/co-product ingredients with sound science.

7.3 Cattle Nutrition

Cow Body Condition Scoring

Nutritional management of the cowherd includes utilizing a scientifically proven method called Body Condition Scoring (BCS) to monitor herd nutritional status. A cow's BCS reflects the amount of energy stores in her body at a given point in time. BCS at calving is an indicator of reproductive success in the coming production year. BCS range from 1 (emaciated) to 9 (obese). Targeting a BCS between 5-6 for cows at calving promotes optimum reproduction and calf health. Cows that calve in lower BCS 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. Immunocompromised calves have an increased risk of sickness when exposed to stress and pathogens throughout their life. Below is a resource for BCS scoring beef cows from Oklahoma State Cooperative Extension Service.

Body Condition Scoring involves visual appraisal of the cow. The hindquarter, shoulder, backbone, ribcage, and the transverse spinous processes (lateral extensions from the vertebra) between the ribcage and hip bones are common evaluation points. For example, observe the last half of the ribcage. If more than two ribs are easily discernible, then BCS is probably less than five. Another example, if the tips of the transverse spinous processes and the individual vertebra in the backbone are visually apparent, expect the cow to receive a body condition score of four or lower. Descriptions by the nine condition scores follow:

- » BCS 1. The cow is severely emaciated and physically weak with all ribs and bone structure easily visible. Cattle in this score are extremely rare and are usually affected by with a disease and/or parasitism.

- » BCS 2. (Figure 2) The cow appears emaciated, similar to BCS 1 described above, but not weakened. Muscle tissue appears severely depleted through the hindquarters and shoulder.



Figure 2. BCS 2.

Photo courtesy of Arkansas Extension Service.

- » BCS 3. (Figure 3) The cow is very thin with no fat cover on ribs or in the brisket and the backbone is easily visible. Some muscle depletion appears evident through the shoulder and hindquarters.



Figure 3. BCS 3.

Photo courtesy of Arkansas Extension Service.

- » 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. (Figure 4)



Figure 4. BCS 4.

- » BCS 5. (Figure 5) 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 area. The transverse spinous processes are now smooth and no longer identifiable.



Figure 5. BCS 5.

- » BCS 6. (Figure 6) The cow has a good 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.



Figure 6. BCS 6.

- » BCS 7. (Figure 7) The cow is in very good flesh. 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.



Figure 7. BCS 7.

- » 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 eight but taken to greater extremes. They also have a heavy deposition of udder fat.

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 could 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 looks and feel of the cattle as much as one score. Animals in late pregnancy also tend to look fuller and a bit fatter.

Vitamins and Minerals

Nutritional stress will reduce production and can increase health risks by impairing immune function. A critical nutritional consideration is protein and energy status. Vitamins and minerals play a vital role in all areas of nutrient metabolism, physiological functions, and immune function.

When evaluating vitamin and mineral status, dietary protein and energy are a first concern because adequate status promotes microbial

activity in the ruminoreticulum and enhances feed digestion and mineral absorption. Also, adequate levels of most B vitamins are synthesized by ruminal microbes when ruminal fermentation activity is normal. Fat soluble vitamins A, D, E, and K are usually adequate in feeds during predictable times of the year and some are stored in the body during times of excess intake and mobilized when dietary levels are below requirements. Growing green feed is high in vitamin A, beta-carotene (a vitamin A precursor), vitamin E, and vitamin K. Vitamin D is abundant in dry forage and cattle can manufacture vitamin D in their skin when exposed to sunlight.

Macro- and trace minerals are necessary for optimum digestion of forage in the rumen and production of protein and energy by the ruminal microbes that is eventually utilized by the beef animal. These elements also play an important role in metabolic pathways, neurological function, reproductive function, and immune system function. Imbalances in mineral intake can interfere with these functions even when adequate levels of protein and energy are supplied.

Trace minerals of importance are copper (Cu), zinc (Zn), selenium (Se), iodine (I), iron (Fe),

manganese (Mn), and cobalt (Co). The proper balance of mineral elements in the diet is an important consideration because imbalances can interfere with absorption and utilization of the mineral elements. Also, antagonistic interactions between elements can impede availability and utilization. So, although dietary levels may appear adequate, deficiencies can occur because of reduced absorption and utilization. For example, dietary levels of Ca, S, Fe, or Mo can interfere with the absorption of Cu.

Trace mineral intake by the cow during the last trimester of pregnancy affects development of the fetus and stores of trace minerals deposited in the fetal liver and tissues. Milk is an inadequate source of many important trace minerals for the newborn calf so the liver, and tissue stores present at birth are the main supply of these elements for the newborn calf.

As with minerals, vitamins play a vital role in nutrient metabolism, immune function, endocrine function, and the neuro/musculo/skeletal systems.

The table below, includes mineral requirements and maximum tolerable concentrations (in Percentage or PPM of Diet Dry Matter).

Mineral	Unit	Requirements			Maximum Tolerable Concentration
		Growing and Finishing Cattle	Cows		
			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

Adapted from Table 5-1 in Nutrient Requirements of Beef Cattle, National Research Council, 1996.

7.3.1 FEEDING GUIDELINES FOR COWS, STOCKER CATTLE, AND FEEDER CATTLE

Beef Cows

Across the production year, the BCS of a cow may range from a BCS 3 to a BCS 7 depending stage of production of the cow, forage conditions, and environmental conditions. Weight and BCS will approach an annual low point about 3-5 months post-calving and should approach the annual peak in late gestation. A BCS of 5-6 at calving is optimum for mature cows while the target for first calf heifers is a BCS 6-7. One BCS represents about 75-100 pounds of weight depending on mature body size of the cow. Therefore, to move a cow from a BCS of 4 to a BCS of 5 would require a weight gain of 75-100 pounds. Observe BCS of cows periodically during the production year to allow adequate amount of lead time if it becomes necessary to impose management practices to increase BCS leading up to calving.

» During prolonged periods of drought or reduced forage availability, the average BCS of cows within a herd may be lower than observed without the environmental stressor. From a production efficiency standpoint this may not be desirable but may be beyond the control of management until drought conditions ease.

- » Ensure supplemental feeding plans account for increased energy needs during periods of cold stress.
- » Meet the cow's protein and energy requirements necessary to achieve the targeted BCS objectives during the year. In most cow-calf production systems, protein is the first limiting nutrient. Insufficient protein intake affect total forage intake and digestion which decreases energy, protein, and vitamins supplied to the cow by reducing microbial fermentation, microbial protein synthesis, and vitamin synthesis by rumen microflora.
- » Ensure cows have adequate mineral intake during the production year. The last trimester of pregnancy is one focal period to ensure that adequate stores of minerals are supplied to the developing fetus prior to birth.
- » The table below provides some guidance to estimate forage intake by cattle. Voluntary forage intake is not constant but varies depending on the quality of the forage. Total digestible nutrients (TDN%) and crude protein (CP%) in forages are two indicators of intake. As TDN% increases forage intake potential increases; as CP% declines then forage intake potential can decline.

Estimated Maximum Intake based on Forage Quality

Forage Quality	Example	MDMI % BW	Pounds of Dry Matter For a 1,000 lb. Cow
High	Alfalfa hay Corn silage Pasture	2.5%	25 pounds
Medium	Meadow hay	2.0%	20 pounds
Low	Corn stover Straw	0.8—1.4%	8-14 pounds

Maximum Dry Matter Intake for various cow weights

Forage Quality	DMI as % Body Weight	1,000 lb. cow
High	2.5%	25
Medium	2.0%	20
Low	0.8—1.4%	8-14

Intake As Fed basis versus Dry Matter Intake

Feed	% Dry Matter	As Fed Basis 25 pounds dry matter
Alfalfa Hay	90 %	27.8 pounds
Corn silage	35%	71 pounds
Irrigated Pasture	18 %	139 pounds

» Note the possibility of estimating intake via the neutral detergent fiber (NDF) content of forage sources. A cow can fit a limited amount of forage bulk, represented by NDF in her rumen. As such, it is possible to estimate a cow's intake by knowing 1) the percent of NDF in the forage and 2) the cow's body weight.

For more information on this intake estimation approach, consult the full fact sheet available through the University of Missouri Extension and/or observe the table included below illustrating maximum intakes for cows eating diets of 50 percent forage or more:

Body weight, pounds	Forage NDF, %	NDF Intake, pounds	Forage dry matter intake, pounds
1,000	40	9.9	24.8
	50	9.9	19.8
	60	9.9	16.5
1,200	40	11.9	29.7
	50	11.9	23.8
	60	11.9	19.8
1,400	40	13.9	34.7
	50	13.9	27.7
	60	13.9	23.1

Stocker Cattle

» Note that stockers are raised on a wide variety of forages (e.g., native pasture, annuals, improved pasture) with varies amounts of additional nutrient supplementation.

» Establish stocking rates that meet production goals for growth and performance.

» Supplement cattle as needed to meet maintenance or growth requirements for the targeted production goals of the operation.

» Maintain positive plane of nutrition throughout the growing phase.

Feeder Cattle

- » Rations for feedyard cattle can contain a diversity 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 by-products and a smaller proportions of roughages (e.g., hay, straw, silage, hulls, etc.), feeds supplying protein, and a vitamin/mineral supplement.
- » Consult a nutritionist (i.e., private consultant, university, or feed company employee) for advice on ration formulation and feeding programs.
- » Avoid sudden changes in ration composition or amount of ration offered.
- » 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.
- » Note that a percentage of cattle on feed will 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.

The following resources may be helpful tools for diet formulations:

- » Oklahoma State University Cow-culator: tool for nutritional management of mature cows; available through the University of Missouri Extension
- » Iowa Beef Center BRaNDs Software: several applications for beef cattle management are in the software; available for purchase through the University of Missouri Extension

7.3.2 WEANING NUTRITIONAL MANAGEMENT

One of the most stressful periods in a calf's life occurs during the weaning process. Stress suppresses the immune system. Commonly, calves are sold or shipped to market within 24 hours of removal from the cow. 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 a high percentage of freshly weaned calves requiring treatment for respiratory disease. These problems can be managed 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 post weaning. To begin with, 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 will support 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. Some excellent web-based resources, providing in-depth information regarding practical diets for weaned calves, is available through the University of Missouri Extension.

Additionally, information from some of the sites is summarized below:

- » Introduce calves to rations they'll be offered post-weaning prior to their weaning when possible for example via a creep feeder.

- » Replace the high quality nutrients in cow's milk with high quality forages and possibly supplement grain when available.
- » Provide trace minerals for calves as these play an important role in the calf's immune function.
- » Provide unlimited fresh water to calves. If the water source is new, make accommodations to familiarize calves with it such as letting it overflow a little at first.
- » Establish weaning/pre-weaning vaccination/antiparasitic protocols designed to match disease risks and desired post-weaning outcomes — consult your local veterinarian for detailed direction.
- » Determine targeted weight gain goals for calves and adjust feed offered as appropriate.
 - For example, the nutrient content of native range may decline in the fall — in which case, additional supplementation may be necessary for calves weaned on this forage.
- » Ensure calves weaned in a drylot have adequate bunk access (1.5-2ft/head) and can reach the water and feed — adding fill dirt around bunks may be necessary.
- » Expose calves to bunk feeding prior to weaning when possible.
- » Consider offering drylot weaned calves high quality, long stem grass hay for the first few days since it may be more familiar to them and the large particle size encourages proper rumen function.
 - Deliver subsequent dry lot diets as a total mixed ration or by top dressing the energy feed on the hay.
- » Avoid fermented feeds such as silage until calves are eating well post-weaning.
- » Limit high starch energy sources to 50% or less of the dietary dry matter of calf rations.
- » Consider holding hay offered to calves constant at 0.5% of their body weight while increasing offered supplement from 0.5% to 1.8% of their body weight over an 8 day adaptation period.

Example drylot diets, based on 500pound calves eating 13 pounds of dry matter per day and gaining 1.5 pounds per day, by day 14 of adaptation to the diets are included in the table below:

Weaning adaptation diets	Day 1-3 (of adaptation to the diet)		Day 4-8		Day 9-14	
	% Dry Matter	% actual feed	% Dry Matter	% actual feed	% Dry Matter	% actual feed
Grass Hay	100	100	90	83.5	80	65.0
Corn	0	0	5	4.5	5	4.0
Wet Distillers Grain	0	0	5	12.0	15	31.0
Crude Protein	10	-	11	-	13	-
NEg Mcal/lb	0.26	-	0.32	-	0.38	-
TDN	55	-	61	-	68	-
Actual lb Feed/hd/d	-	14.6	-	15.9	-	18.1

Table from University of Nebraska Extension

Example starter rations for early-weaned calves are included in the table below:

Ingredient	Ration 1	Ration 2
Rolled corn, barley, milo	64%	56%
Soybean meal	20%	22%
Soybean hulls	10%	-
Molasses	5%	5%
Ground hay	-	-
Ground alfalfa	-	15%

Table from South Dakota State University Extension

Example starting rations for three different calf types are included in the table below:

Average	400 lb. highly-stressed long-hauled calves			400 lb. pre-conditioned or low stress calves			800 lb. backgrounded yearlings		
	concentration, lb average	Feed intake, lb	% concentration	concentration, lb	Feed intake, lb	% concentration	concentration, lb	Feed intake, lb	% concentration
Week 1	3	4	75	4	8	60	6	15	40
Week 2	5.5	8	75	6.6	11	60	10	17	60
Week 3	7	10	75	7.5	12.5	60	14	20	70
Week 4	8.5	12	75	8.4	14	60	17	23	74
Final Ration	8.5	14	60	8.5	14	60	20	25	80

Table from Iowa Beef Center

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.

Calves that have fewer health problems after they leave the ranch will 1) require less medication which reduces costs but also lowers the potential for injection site lesions and residues; 2) suffer less death loss; 3) perform more efficiently; and 4) potentially have higher-valued carcasses. Preconditioning is a value-added management practice. The following are a few of the things to consider about 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 your program.
- » Identify your market. A key to realizing the benefit in 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.

7.3.3 BSE: RUMINANT PROTEIN BAN

Purpose and Scope of Regulation

The Food and Drug Administration (FDA) adopted the Animal Proteins Prohibited from Ruminant Feed regulation to prevent the establishment of Bovine Spongiform Encephalopathy (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 by-products
- » Gelatin
- » Inspected meat products which have been cooked and offered for human food and further heat-processed for animal feed use
- » Milk products (i.e., milk and milk protein)

Requirements and Guide for Establishments and Individuals that are Responsible for Feeding Ruminant Animals

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

- » 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 labeling for feeds 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 labeling. If the labeling cannot be removed from the bag or other container, maintenance of a representative bag or a transposed copy of the labeling 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 (1) year from the date of the receipt of the product.

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 are included in this definition. Haulers who haul 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 [FDA.gov](https://www.fda.gov).

7.4 Feed Additives (Non-medicated)

A new federal veterinary feed directive (VFD) has stipulated that antibiotics can't be used in animal feeds without a veterinary prescription. The feed additives listed below are available over the counter, which means no direct veterinary prescription is required.

- » Ionophores
 - Ionophores are another class of antibiotic-like compounds that don't include medically important drugs for humans. 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.
- » Vitamin and Mineral Packs
 - These provide essential vitamins and minerals to correct deficiencies in other feed sources. They are sometimes used in calves that are highly stressed from weaning, transportation, or poor conditioning.
- » Prebiotics
 - These feed ingredients are usually a non-digestible starch such as an oligosaccharide.
- » 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. How they do it is somewhat unknown.
- » Enzymes
 - These feed additives improve digestion by degrading plant cell walls with enzymes from fungal fermentation. Sometimes they are used in natural-fed cattle where ionophores can't be used.

7.5 Feed Safety

Monitor Feed Sources

It is essential to monitor feed sources.

Operations purchasing outside feeds should set up a sampling program to test for quality specifications in feedstuffs. This could include moisture, protein, foreign material, etc.

Guidelines for monitoring feed sources include:

- » Inform suppliers of your involvement in the BQA program and that sampling of products delivered will occur.
- » Require all products to be accompanied by an invoice which includes the date, amount, and signatures of both the person who delivered the product and the person who received the product.
- » Any grain protectants should be specified on the label and/or invoice and this information should include all chemicals, their respective concentrations, and withdrawal times of the protectants.
- » Note that most good suppliers have a quality control testing program of their own. Bonded suppliers often test for: polychlorinated biphenyls, chlorinated hydrocarbons, organophosphates, pesticides and herbicides, heavy metals, and microbes (such as *Salmonella*). Ask suppliers for these tests — reputable suppliers will be glad to provide them.
- » Visually inspect feeds. A quality control program for feedstuffs aids in preventing chemical residues and ensures high quality feeds.
 - Create a checklist, which includes such items as color (typical, bright, and uniform), odor (clean and characteristic), moisture (free flowing, no wet spots and percent moisture), temperature (no evidence of heating), evidence of foreign material and no evidence of bird, rodent, or insect contamination.
- » Obtain and store a representative sample of each batch of newly purchased feed. If feed sampling and storage is routine and a suspected feed-related problem occurs, a sample for appropriate laboratory testing will be available.
 - One suggestion for purchased grains, supplements, or complete feeds is to randomly sample each batch of feed in five to ten locations and pool the individual samples into a larger sample of two to five pounds.
 - Consider placing the pooled sample in a labeled paper bag or small cardboard box before freezing the sample. Label and keep dry samples in a dry area. Freeze higher moisture samples. Attach a feed tag to the sample for future reference if needed.
- » Collect and store forage samples.
 - If multiple bales of hay are purchased, representative samples should be obtained from several bales and mixed together prior to storage.
 - Use coring implements to obtain representative samples, particularly from large-round and large-square bales of hay. Store labeled samples in a clean, dry area.
- » Ensure products, such as pesticides and conditioners, used on raised feeds are FDA/USDA/EPA approved.
- » Store all equipment, fluids, solvents, etc. in an area separate from the feed storage and feed production areas.
 - Follow manufacturer's directions for use and disposal and keep a Material Safety Data Sheet (MSDS) file available.
 - Provide proper training for pesticide handling to all who work with these products. The training should include personal safety, handling accidental spills, and preventing contamination of the feed and water supply.

High-risk Feeds

High-risk feeds are single loads or batches fed to cattle over a prolonged period. Examples of high-risk feeds include fats, rendered by-products, plant by-products, supplements, and additives. Typically, these feedstuffs are only a small percent of the total diet and are very expensive to test. Make sure suppliers understand BQA concerns and ask them to provide quality specifications with the product. It is best to do business with a bonded supplier. Find and utilize dependable suppliers.

Potential Feed Toxins

Since the environment may contain a number of potential poisons, it is important that producers have some knowledge about the relative toxicities to livestock of the chemicals used. To avoid accidental livestock poisonings, treat all chemicals as potential hazards and store them away from feed storage and mixing areas. If a feed-related poisoning is suspected, it is critical for the producer or veterinarian to contact a diagnostic laboratory for assistance in confirming the suspicion.

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, can cause reduced feed consumption, poor production, and adverse health effects. The environmental conditions that are conducive to the growth of molds and the production of mycotoxins are quite variable. Suggestions to prevent mycotoxin-related problems include storing feedstuffs in a manner appropriate for the feedstuffs 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.

Fats

Just as with grain and forage, steps should be taken to ensure that purchased fats and oils do not contain a residue. Discuss the quality of the

product with suppliers and request information concerning the quality, stability, efficacy, and consistency of the product. Beef operations may be approached by sellers who offer a cheaper source of feed-grade fats. The potential for contamination increases with these cheaper sources of fats.

A reputable dealer should already be testing his product for the following contaminants: polychlorinated biphenyls (PCBs), chlorinated hydrocarbons (CHCs), pesticides, heavy metals, salmonella, and tall oil (Hydrocarbon). Before purchasing any fat or oil, ask the supplier if the product is tested. It is your responsibility to assure the safety and the quality of the product purchased.

Fluid Leakage

The leakage of transmission and transformer fluid poses a potential problem in residue avoidance. Both types of fluid contain polychlorinated hydrocarbons which can leave a violative residue in cattle. While the occurrence of PCB residue from this source is small, the possibility still exists.

Another potential problem is transmission/hydraulic or radiator fluid that leaks from farm equipment and contaminates the feed. Lead and other heavy metals may be picked up through spills and leaks; batteries, paint, and other materials may inadvertently contaminate feed or be picked up elsewhere by cattle.

Products used for bird and rodent control are another potential problem. While no residues have been reported from these products, they are toxic substances. While the chance of these products entering the feed source is small, it is important to use them with care.

Best management practices include:

- » Build feed handling facilities that reduce the risk of feed contamination with chemicals, foreign materials, and disease causing infectious agents.
- » Store all chemicals (e.g., pesticides, lubricants, solvents, medications, etc.) away from feed supplies.

- » Regularly check all feed handling equipment for fluid leaks and avoid storing feedstuffs under transformers to avoid chemical contamination.
- » Protect feedstuffs from contamination of foreign material (e.g., metal, etc.).
- » Thoroughly clean and disinfect dual-purpose equipment, such as loaders (including shovels) which may handle feed and other materials (such as manure or dead animal removal), before handling feed.
- » Avoid driving ANY vehicle into silage pits other than feed handling equipment.
- » Designate specific areas next to feed pits where feed trucks can be loaded without contaminating the feed supply.
- » Protect feedstuffs, feed troughs and water supplies from contamination with chemicals, foreign material, and feces. Protecting from wild/feral animal and bird fecal contamination may be difficult — regular evaluation and

cleaning is helpful. As you renovate or make new purchases, try to select equipment that will be harder for animals/birds to contaminate and/or be easier to keep clean.

- » Visit with nutritional advisors, veterinarians, and extension educators for practical ways to protect feed supplies.

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 intakes. 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.

7.5.1 FEED CONTAMINANTS GUIDELINES

- » 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.

7.5.2 FSMA

The Food Safety Modernization Act (FSMA) became law on January 4, 2011. The stated goal of the act is to prevent contamination of U.S. food including animal food.

According to the American Feed Industry Association (AFIA), “four of the seven final FSMA rules affect the animal food industry: preventive controls for animal food; foreign supplier verification program; accreditation of third-party auditors/certification bodies; and sanitary transportation. The largest of the rules that affect animal food is the preventive controls for animal food; formally known as ‘Current Good Manufacturing Practice, Hazard Analysis, and Risk-based Preventive Controls for Food for Animals,’ which was published Sept. 17, 2015.”

For more information regarding the history of FSMA, current Good Manufacturing Practices, and rules, you can access AFIA and Feedstuffs four-part webinar series online available through the University of Missouri Extension.

For Food and Drug Administration updates on FSMA, visit and sign up at the FSMA webpage available through the University of Missouri Extension.

CHAPTER 8.
ENVIRONMENTAL
QUALITY
CONTROL POINTS



8.1 Introduction

Cattle raisers strive to be ecologically and socially responsible by caring for the natural resources beef production depends upon. Monitoring natural resources allows producers to know if and/or when current management needs adjusting. Information collected from natural resource monitoring will usually identify problems before damage occurs and put in place preventative measures. Monitoring information may also confirm that current management practices are appropriate and that information can defend current management when questioned by critics.

The most important resources for ranchers to manage are vegetation, stream banks/ riparian areas, and water quality. Each of these areas has specific environmental control points that can be managed and monitored. Additional processes, control points and potential environmental concerns are listed in the table below.



Process	Control Point	Potential Environmental Concern
Forage Management	Stocking Rate	Deteriorating Range/Pasture Riparian Areas Air and/or Water Quality Soil Erosion
Soil Fertility	Fertilizer Application Animal Waste Application	Water Quality Transfer of Disease
Pasture Chemical Use	Herbicide and Pesticide Use Container Disposal	Water Quality Soil Contamination
Disposal of Dead Stock	Composting, Burial, Burning	Air and/or Water Quality Transfer of Disease
Confined Cattle	Water Runoff Control	Air/Water Contamination Transfer of Disease

8.2 Key Practices

- ✓ Manage forage resources with appropriate principles to optimize production while protecting or enhancing the environment.
- ✓ Use, store, and dispose of all pesticides with care and according to label directions.
- ✓ Monitor and manage key environmental control points that affect soil and water resources.
- ✓ Properly dispose of carcasses.

8.3 Forages and Grazing

Current Best Management Practices seek to optimize livestock production in a manner that protects and/or enhances the environment. Maintaining forage and soil resources is an important part of environmentally sound and sustainable beef production. Beef production utilizes both rangeland and introduced pastures. Management strategies are generally different between the two systems due to environment, soil type, and relief. Introduced forage production systems often use fertilizer. Pastures (made up of native or introduced forages) are usually managed according to agronomic principles with cultural inputs. Whereas, rangelands are natural systems managed by ecological principles.

The following brief discussion illustrates key aspects of forage management and production.

Stocking Rate

Stocking rate is the number of acres required per animal unit for the grazing season which can be sustained on a long-term basis without forage resource degradation. An animal unit is a 1,000-pound cow with an average dry matter forage requirement of 26 pounds per day through the production cycle. Of all the aspects associated with livestock production (under the control of the manager), stocking rate is the most important.

On properly stocked pastures, healthy stands of forage significantly reduce runoff allowing water to infiltrate into the soil for use by plants or for recharge of groundwater aquifers. As a result of overstocking, earlier seral stage plant species (weeds) that increase in abundance generally do not provide adequate ground cover. 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.

Roots also act as binding agents that reduce the potential for soil detachment. Properly stocked

rangeland and properly stocked and/or fertilized introduced forage pastures contain higher root number which help maintain or enhance site integrity. Thus, a vigorous stand of permanent ground cover stabilizes and maintains site integrity and improves air quality.

On overstocked sites, there is little forage to impede precipitation runoff. Subsequently, much of the precipitation is lost from the site thus reducing forage production potential. Overstocked pastures can also experience soil compaction of more clay-type soils. This can lead to further reduction in infiltration rates and increased runoff.

Sediment production from overstocked pastures decreases water quality and reduces the capacity of surface water reservoirs. The use of proper stocking rates on rangeland and the use of appropriate stocking and fertility programs in introduced forage pastures helps to maintain adequate, permanent ground cover and reduces erosion potential which, thereby, serves to maintain water quality and reservoir capacity.

Forage Conservation

Too high of a stocking rate places excessive grazing pressure on forage resources. On either rangeland or introduced forage pastures, heavy grazing pressure of desirable plants reduces animal performance; but more importantly, it decreases forage plant vigor. A reduction in plant vigor reduces desirable plant frequency and abundance. Plant species composition shifts as an invasion of less desirable or undesirable species occurs. This species composition change results in an overgrazed condition and a degradation of range condition with reduced potential for introduced forage pastures.

These conditions diminish carrying capacity, reduce animal performance and eliminate the potential for profit. Input costs (such as increased herbicide use and increased winter-feeding costs) associated with the livestock production enterprise are increased.

Generally, the level of forage harvest efficiency is higher for introduced forage pastures compared with rangeland. Therefore, stocking rates can be higher for introduced forage pastures – if adequate moisture is received during the growing season and appropriate levels of fertilizer are used.

Grazing Management

Profitable beef cattle ranches depend upon healthy, productive, grazing lands. Well-managed grazing is compatible with a healthy environment, but improper grazing can increase soil erosion, encourage weeds, degrade water quality, and decrease plant yield and diversity. Whether environmental impacts from cattle grazing are beneficial, harmful, or benign depends entirely upon how the grazing is managed — its timing (when grazing occurs), frequency (how often grazing occurs), and severity (how much vegetation is removed).

Every grazing land situation is unique, so every grazing management plan should be site-specific. The following guidelines are starting points for developing grazing plans that will sustain the plant and water resources.

Grazing Guidelines:

- » More pastures and smaller pastures increase management flexibility and provide greater opportunity to control the timing, frequency, and severity of grazing.
- » Sustainable levels of grass utilization depend upon when and how often grazing occurs. Rotational grazing systems allow increased utilization. Proper use: Season-long grazing 40-50%, Deferred rotation 55-60%, Rest rotation 65-70%.
- » An adequate stubble height (3 to 12 inches depending on forage species) at the end of the growing season is necessary to sustain most grasses.
- » Shrub utilization should not exceed 50-60% during the growing season.
- » Stubble height at the end of winter grazing should be at least two to four inches for most grasses.

- » Before allowing cattle to re-graze an area, provide recovery periods of 30 to 60 days in riparian areas and 60 to 120 days on upland range.
- » Plants recover faster when more leaf area remains after grazing.
- » Grazing an area more often and for shorter periods (i.e., three weeks at a time or less) is preferable to fewer and longer grazing periods.
- » When environmental damage from cattle grazing occurs, it is often a result of poor cattle distribution or too many animals.
- » Prevent cattle from congregating near surface water. Fencing, alternative water sources, supplemental feeding, as well as salt and mineral placement can promote dispersion of cattle away from water source.
- » Use cattle accustomed to the grazing land environment. For example, cattle raised on flat, open grasslands often do not disperse well when relocated to steep or timbered grazing land.

Every grazing land situation is unique, so every grazing management plan should be site-specific. Extension forage specialists and range management experts in your state or region may provide additional information and resources.

8.4 Pesticide Use

Pesticide or herbicide residue is not a major problem in the beef cattle industry. However, it is important to monitor products applied to the land and products applied directly to the animal. A third area of concern would be accidental or negligent exposure to feed, water, soil, or other materials contaminated with hazardous materials. The following guidelines are recommended to avoid potential risk of residues:

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 you use to apply livestock pesticides directly to cattle.
- » Only use approved products for control of internal and external parasites of cattle.
- » Apply topical, oral, and/or injectable livestock pesticides at label dose rate.
 - Overdosing constitutes extra-label usage with unknown withdrawal times. Individual animal weights can help determine appropriate calculation of doses.
- » 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 your local extension educator or university beef specialist as needed.

Parasiticide and Insecticide Use

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. Improperly handled pesticides can lead to residue contamination, feed contamination, by-product 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.

Keep a record of pesticide 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 (RUP) require records be kept for three years.

Pesticides 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. This creates an economic hazard as well as a potential for residue contamination at slaughter time. These

chemicals can be persistent and remain in the systems of cattle for extended periods, making correct withdrawal time's unpredictable.

EPA and FDA both require all hazardous chemicals be stored away from feed and feed storage areas. Specifically, insecticides must be stored separately from feed additives (Refer to cGMPs, Part 225.35 (b); and Part 225.135). 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 to your operation; improper use of the product may result in regulatory action.

To make sure you do not buy a residue problem along with a load of manufactured feed, grain, by-products, or crop residues deal with a reputable feed commodity supplier. In addition, you may wish to ask suppliers about their use of grain protectants during storage and their monitoring procedures.

Proper use of insecticides includes removal of old pesticide ear tags as well as following label directions for pour-ons, injectables, dusts, sprays, and other types of insecticides. Contamination reduces value of the animal by-products, which constitute about 12% of the value of slaughter cattle. Contamination may lead to harmful, if not deadly, residue problems in pet foods as well as in other by-product materials.

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:

- » 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, this can reduce competition from many weed species, especially those that are woody in nature.
- » Adherence 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

General guidelines:

- » Don't stockpile products.
- » Always store pesticides in their original containers.
- » Store pesticides out of reach of children and pets.
- » When disposing of pesticides, check with your local landfill, solid waste management authority, local health department, or your state department of agriculture to find out whether your community has a hazardous waste collection program for getting rid of unwanted pesticides.
- » Contact your state department of agriculture if you have 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 Containers:

1. Remove the cap or lid from the pesticide container, measure the pesticide as you empty the container 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.
8. Do not use empty containers to store any other liquids.

8.5 Soil

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 these 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:

- » Use soil testing to determine the level of nutrients required for the optimum production of the target forage species.
- » 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 is 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 you have, the larger raindrop impact and the more erosion your 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. 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.

8.6 Water Quality

Water quality is broken into three categories: biological, physical, and chemical

- » Biological: bacteria, viruses, protozoa, and eggs of worms
- » 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

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's 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.
- » Portable windbreaks will draw animals out of riparian areas and are especially good in winter.

8.7 Mortality Disposal

The disappearance of rendering plants in rural areas is a concern and has become a national trend in recent years. High disposal prices combined with the disappearance of rendering plants have resulted in challenges for some producers.

These challenges have created concerns about:

- » Solid waste management
- » Water quality
- » Air quality
- » Public sensitivity
- » Sources of animal disease

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.

Researchers are studying the feasibility of on-site composting of carcasses as a means of environmentally sound disposal. Composting is routinely done in the poultry and swine industries and is being adopted by feedyard/backgrounding operations to economically dispose of mortalities. Guidelines are available to aid producers in developing composting facilities. Other options, such as cooking carcasses for animal feed (done in swine and poultry industry), are not an option with cattle

because of the ban on feeding ruminant-derived proteins back to ruminants.

Disposal of mortalities is not a major concern for cow-calf producers. However, for larger backgrounding and stocker operations, timely disposal of mortalities becomes an environmental concern. On-site burial of carcasses may be the best disposal option for cow-calf producers currently available. However, regardless of the size of your operation, no dead animal is to be buried on-site unless you have checked with applicable local and state authorities and have received approval to do so.

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.

Under no circumstances should mortalities be disposed of by dumping in areas where water and air quality might be jeopardized.

A group of men in cowboy hats and work clothes are gathered outdoors, possibly on a construction site or farm. One man in a red shirt and straw hat is holding a large white sheet of paper, and another man in a plaid shirt and straw hat is looking at it. Other men in the background are also wearing hats and work clothes. The scene is set under a large black tarp structure.

CHAPTER 9. WORKER SAFETY



9.1 Introduction

The Occupational Safety and Health Administration (OSHA) requires that all employees be made aware of any hazardous chemicals to which they may be exposed. In addition, managers must be sure that a Material Safety Data Sheet (MSDS), which contains information such as the proper use of each chemical, accompanies all shipments of hazardous materials. The distributor of the chemical should provide the MSDS. Many chemicals, which may not normally be considered hazardous, such as household bleach, are required by OSHA to have an MSDS on file. The MSDS must be on file and readily accessible to all interested employees. Regular training updates (approximately every year) are important for all employees whose work is associated with pesticide use.

The Federal Worker Protection Standard law (40 CFR Part 170) requires all workers who handle or are exposed to either general use and restricted use pesticides be trained for handling, protective equipment, notification, decontamination, restricted-entry intervals, and emergency assistance. Contact a local extension agent for more information.

A group of men wearing cowboy hats and plaid shirts are gathered outdoors, looking at and discussing documents. The scene is set in a rural or farm environment with trees and a fence in the background. The image is overlaid with a semi-transparent blue filter.

9.2 Key Practices

- ✓ Maintain a safe workplace and use appropriate personal protective equipment when needed.
- ✓ Train employees and others working in your operation on safe practices when using equipment, handling cattle, handling animal health products, and around potentially hazardous areas.

9.3 Safety in Beef Production Situations

Manure Pits

- » Provide employees working around manure pits documented training on hazards of working around pits.
- » Clean pits regularly.
- » Inform employees of toxic fumes from deep pit structures.

Fumes in Areas With Poor or No Ventilation

- » Inform all employees that poorly ventilated areas such 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.
- » Ventilate working in areas where grains, manure, etc. are stored 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.

Injuries From Handling Animals

- » Ensure documented training of all individuals handling animals occurs using the Cattle Care and Handling Guidelines set forth by BQA.
- » Train animal handlers on how to handle excited or aggressive cattle.

- » Ensure animal handlers always consider human safety first when handling cattle.
- » Animal handlers should avoid entering small and confined areas with excitable animals.
- » 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 comingling with calmer animals when handling, especially if facilities do not allow for the safe handling of aggressive animals.
- » Handle cattle in groups rather than as individuals when possible.
- » Always wear non-permeable gloves when exposed to animal body fluids and properly wash body and clothing after exposure.

Health Product and Pesticide Handling and Storage

- » Know and understand Standard Operating Procedures for handling animal health products.
- » Read and understand labels for human safety precautions.
- » Properly dispose of needles in puncture proof containers.
- » During an injection:
 - Beware of finger and hand locations.
 - Stay focused and attentive.
 - Report all accidental injections immediately.
 - Seek medical help immediately if accidental ingestion 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.
- » Remove contaminated clothing and wash affected skin as soon as possible if exposed to animal health products that can cause health problems in humans, such as anthelmintics or pesticides.
- » Read label directions on how to deal with accidental exposure or human injection with animal health products.
- » 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 tilmicosin.
 - Provide any worker using tilmicosin the following document from the CDC available through the University of Missouri Extension.
- » Store products according to label in designated areas that are available 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.
- » Do not leave animal health products around the premises; always store them in designated areas.

A photograph of a ranch scene. In the foreground, a herd of brown and black cattle is gathered in a grassy field. A person is riding a horse on the left side of the frame. In the background, a white horse trailer is parked on a grassy hill. The sky is overcast with grey clouds.

CHAPTER 10. EMERGENCY ACTION PLANNING



10.1 Introduction

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.

Beef producers have, intuitively and with direction from a multitude of agencies, generally prepared themselves well to deal with these infrequent but often dangerous situations.

The first step is to develop an emergency action plan for your operation. If it is written down, you will use it. The next step is to make sure that plan is available at critical access points where you, your crew, or others can find it and use to contact help. 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. The final step is to ensure that you review your action plan with your crew on a regular basis and update it when changes are required.

10.2 Key Practices

- ✓ Develop and maintain an emergency action plan.
- ✓ Inform everyone involved in your operation what to do in case of an emergency.

10.3 Emergency Action Plans

All operations — feedlots, stockers, cow-calf ranches — should have a written emergency action plan (EAP). It does not have to be a set of complex documents — depending on the size of an operation, it could be as simple as filling out the sample emergency action plan form found in the Appendix.

An Emergency Action Plan should include:

- » Name of This Site
- » Premise ID Number (PIN)
- » Owner Name and/or Operator Name
- » Farm Services (FSA) Number
- » GPS Coordinates
- » Site Physical Address (911 address)
- » Directions to the Site From Nearest Town(s)
- » Important Telephone Numbers and Contact Information
 - 9-1-1
 - Owner
 - Herd Manager
 - Cattle Handlers
 - Local Doctor's Office
 - Local Emergency Room
 - Local Poison Control
 - Fire Department(s)
 - Police Department(s)
 - Local Police
 - Sheriff
 - Highway Patrol
 - State Police
 - Utilities
 - Electric Company
 - Water Company
 - Natural Gas
 - Telecommunications/Internet

The following contacts may also be useful to include with your EAP:

- » Operation Veterinarian
- » Nutritionist
- » Insurance Company (if the cattle are insured)
- » Equipment Suppliers
- » Plumber
- » Propane Provider
- » Electrician
- » Other Government Agencies
 - Extension Personnel
 - Brand Inspector
 - Department of Transportation
 - County Road Department
 - Department of Natural Resources/Environmental Quality
 - State Animal Health Official

Posted maps

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 will be valuable to emergency response teams.

- » Building Layout to Include:
 - Emergency Exit Locations
 - Fire Extinguishers
 - Severe Weather Shelter Area
 - Emergency Equipment Location (i.e., AEDs, first aid kits, etc.)
- » Operation Layout Should Include a Diagram Showing the Location of:
 - 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/Access Points

Transportation Emergencies

- » Engage all employees that transport livestock in the BQA Transportation Program, they can participate online at www.BQA.org or through an in-person program.
- » Encourage local first responders to participate in the Bovine Emergency Response Plan (BERP).
- » Consider conducting a mock emergency drill to practice the chain of phone calls or practice responding to a stranded trailer loaded with cattle.
- » Consider who will administer euthanasia and how if it becomes necessary due to a transportation emergency.

Animal Health Emergencies

- » Contact state animal health official.
- » Visit securebeef.org for more information on identifying foreign animal diseases and what to do in the event of an outbreak.

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