Missouri Beef Quality Assurance Program

Meeting the Quality Improvement Needs of Missouri’s Producers, Feeders, and Consumers.
Statement of Purpose
Missouri Beef Quality Assurance Program

Our Mission: The Missouri Beef Quality Assurance Program is designed to meet the quality improvement and preconditioning needs of producers, feeders and consumers, and to comply with government food safety policies. Participation in the program increases producer accountability for quality and safety of the product they sell. The final outcome is increased consumer confidence.

The contents of this handbook and supporting materials were collected from the national BQA program and state BQA programs in Tennessee, Nebraska and Oklahoma. By working together, the beef industry can provide a sound economical system for sustainable production while increasing beef quality and consumer confidence.

The Beef Quality Assurance Program proposes an aggressive plan to assert control over Missouri beef products and regain favorable economic status for state beef producers.

Action Plan Outline:
Cooperators will benefit in the domestic and foreign markets by:

1. Providing a quality-constant product for consumers.
2. Capitalizing on the foreign interest in Quality Beef.
3. Developing current interest in partnership with countries like Korea and Russia.
4. Defining Missouri beef products to fit foreign demand.

Stages of Program implementation are:

1. Inform producers of these opportunities.
2. Recruit members for the effort.
3. Define what the product is and how to produce it on a year-round basis.
# Table of Contents

## Environmental Stewardship ........................................................................................................................................39
- Forage Management .................................................................................................................................................. 39
- Grazing Management .................................................................................................................................................. 40
- Soil Fertility .............................................................................................................................................................. 41
- Water Quality ........................................................................................................................................................... 41

## Animal Care and Husbandry Practices ..................................................................................................................8
- Feeding and Nutrition ............................................................................................................................................... 8
- Disease Prevention Practices and Health Care ........................................................................................................ 9
- Biosecurity .............................................................................................................................................................. 10
- Cattle Handling ..................................................................................................................................................... 11
- Cattle Handling Facilities ....................................................................................................................................... 14
- Transportation ......................................................................................................................................................... 16
- Non-Ambulatory Cattle ......................................................................................................................................... 18
- Heat Stress ............................................................................................................................................................ 19

## Vaccine and Drug Use Practices .............................................................................................................................20
- Avoid Injection-Site Tissue Damage ........................................................................................................................ 20
- Injection Technique .................................................................................................................................................. 20
- Needle Use and Handling ...................................................................................................................................... 21
- Vaccine Management ........................................................................................................................................... 22
- Drug Management ................................................................................................................................................ 22
- Residue Avoidance ............................................................................................................................................... 23
- Drug Classifications .............................................................................................................................................. 23
- Extra-Label Use of Drugs .................................................................................................................................... 24
- Managing Implants ............................................................................................................................................... 26
- Producer’s Guide for Judicious Use of Antimicrobials (Antibiotics) in Cattle ....................................................... 27

## Livestock Feeds and the Feed Supply .......................................................................................................................28
- Purchased Feeds ..................................................................................................................................................... 28
- Feed Storage and Handling .................................................................................................................................. 28
- Pesticide and Petroleum Based Products ............................................................................................................. 28
- Ruminant Feed Ban Regulation ............................................................................................................................ 29

## Carcass Quality ........................................................................................................................................................30
- Quality Grades of Cattle ........................................................................................................................................ 30
- Yield Grades of Cattle .......................................................................................................................................... 31
- Grid Basics ............................................................................................................................................................ 31
- Management Practices to Improve Quality ........................................................................................................... 32
- Quality Assurance of Market Cows and Bulls ..................................................................................................... 35

## Cattle Identification & Records ..................................................................................................................................37

---

Overview of the BQA Program .............................................................................................................................................6

---

Animal Care and Husbandry Practices ..........................................................................................................................8
- Feeding and Nutrition ............................................................................................................................................... 8
- Disease Prevention Practices and Health Care ........................................................................................................ 9
- Biosecurity .............................................................................................................................................................. 10
- Cattle Handling ..................................................................................................................................................... 11
- Cattle Handling Facilities ....................................................................................................................................... 14
- Transportation ......................................................................................................................................................... 16
- Non-Ambulatory Cattle ......................................................................................................................................... 18
- Heat Stress ............................................................................................................................................................ 19

Vaccine and Drug Use Practices .................................................................................................................................20
- Avoid Injection-Site Tissue Damage ........................................................................................................................ 20
- Injection Technique .................................................................................................................................................. 20
- Needle Use and Handling ...................................................................................................................................... 21
- Vaccine Management ........................................................................................................................................... 22
- Drug Management ................................................................................................................................................ 22
- Residue Avoidance ............................................................................................................................................... 23
- Drug Classifications .............................................................................................................................................. 23
- Extra-Label Use of Drugs .................................................................................................................................... 24
- Managing Implants ............................................................................................................................................... 26
- Producer’s Guide for Judicious Use of Antimicrobials (Antibiotics) in Cattle ....................................................... 27

Livestock Feeds and the Feed Supply ............................................................................................................................28
- Purchased Feeds ..................................................................................................................................................... 28
- Feed Storage and Handling .................................................................................................................................. 28
- Pesticide and Petroleum Based Products ............................................................................................................. 28
- Ruminant Feed Ban Regulation ............................................................................................................................ 29

Carcass Quality ............................................................................................................................................................30
- Quality Grades of Cattle ........................................................................................................................................ 30
- Yield Grades of Cattle .......................................................................................................................................... 31
- Grid Basics ............................................................................................................................................................ 31
- Management Practices to Improve Quality ........................................................................................................... 32
- Quality Assurance of Market Cows and Bulls ..................................................................................................... 35

Cattle Identification & Records ..................................................................................................................................37
- Forage Management ................................................................................................................................................ 39
- Grazing Management ............................................................................................................................................ 40
- Soil Fertility ........................................................................................................................................................... 41
- Water Quality ........................................................................................................................................................ 41
Overview of the BQA Program

What Is the Program?
The Missouri Beef Quality Assurance Program was developed to ensure that beef and dairy cattle are managed in a manner that will result in safe and wholesome beef and milk products for the consumer. The program educates participants in animal care and husbandry practices, proper use of vaccines and drugs, feed management, residue avoidance and impact of management practices on carcass quality.

How Does the Program Work?
Producers and veterinarians are all encouraged to become BQA certified. In order to do so, candidates must read this manual then take a short quiz at the end testing their knowledge of BQA principles. The quiz is then submitted to the Missouri Cattlemen’s office at which time the Missouri BQA Committee members will certify and issue a certificate verifying the candidates training. The certification is valid for 3 years and will need to be renewed at that time.

Why Should I Participate In the Program?
Concern over food wholesomeness and safety as well as animal well-being is important to consumers. The level of consumer confidence in beef significantly affects consumer eating habits and impacts the future of our industry. All sectors of the industry—seedstock, cow-calf, heifer growers, and dairy producers to stocker operators, backgrounders, cattle feeders, and points of sale and harvest—must take responsibility for the production of a safe food product through proper animal care, handling and management practices.

The Missouri Beef Quality Assurance addresses what consumers consider to be important by providing producers with standardized principles based on national guidelines and scientific research. This enables beef and dairy producers to enhance their product, maximize marketability and strengthen consumer confidence in beef safety and quality.

The History of Beef Quality Assurance
Consumers have always expected safe and wholesome food. In 1980, because of beef safety concerns, beef producers began investigating ways to ensure that their production practices would pass the scrutiny of the consumer.

The Beef Quality Assurance program is not a new idea. In 1982, the United States Department of Agriculture Food Safety Inspection Service (USDA-FSIS) began working with the beef industry in the United States to develop the Pre-Harvest Beef Safety Production Program. The beef industry now refers to this as Beef Quality Assurance, or BQA.

Because the majority of beef is raised by small independent producers in a vast variety of environmental climates, the BQA program has been modified and adapted to meet the needs of a range of production and marketing circumstances. Presently, a BQA educational program is active in 47 states.
The Missouri Beef Quality Assurance Program is designed to bring best management practices (BMP) to the farm that, along with Hazard Analysis and Critical Control Points (HACCP) principles applied at harvest and processing facilities, will ensure safe, wholesome, uniform, and quality beef products for consumers. The program is driven solely by beef and dairy and is carried out in cooperation with veterinarians, Missouri Cattlemen’s Association, Missouri Beef Industry Council, Missouri Veterinary Medical Association (MVMA) and University of Missouri Extension Service along with other professionals.

Meeting the Industry Quality Challenges

Four national Beef Quality Audits (NBQA) have been conducted between 1991 and 2005. In three of the audits, defects in the hide (from branding and lice) and lack of uniform size of rib eye and other meat cuts were identified. In the 2005 NBQA, inadequate tenderness, excessive external fat, insufficient marbling, and excess carcass/cut weights were identified as the major factors affecting meat quality. For the first time, the 2005 NBQA identified lack of traceability of cattle from feedlots, need for instrument grading, need for clearer market signals, and need for communication among sectors as areas that the industry must address.

Good production practices can reduce, if not eliminate, the occurrence of quality problems. This manual outlines Best Management Practices (BMP) in key areas to help producers meet the industry’s beef quality challenges. These include implementing genetic and production management systems that have been shown to reduce beef quality defects, improve beef eating quality characteristics (such as flavor, tenderness, and juiciness), and ensure food safety.

Potential Value Loss

Today’s estimated potential loss in value due to quality defects continues to exceed $100 for every fed steer and heifer marketed in the United States. The value lost due to management defects can begin to be recovered simply by evaluating and altering the management techniques used in today’s beef and dairy production systems. Current problems that producers have control over include injection-site blemishes, hide damage, bruises, and dark cutters.

Capturing Added Value

As the food industry develops new products and packaging processes, correct injection sites and techniques become even more critical to realizing added value. New beef products have been introduced that add value to traditionally under-utilized chuck and round primals. The popular flat iron steak, cut from the chuck, is one example. It lies 3 to 4 inches in front of the shoulder blade, therefore, producers should give intramuscular shots further forward in the shoulder blade to keep from reducing the value of the flat iron. Furthermore, the use of modified atmosphere (MA) packaging processes for case-ready beef can discolor the meat near an injection site—even if the muscle contains no blemishes from the injection.

Animal health companies continue to research and develop products with BQA friendly routes of administration. Administering animal health products according to label directions, marketing cattle at the optimum end point, reducing stress in cattle handling, and eliminating extremes in size of breeding stock are some of the ways by which quality defects are reduced and the market value of the beef cuts is increased.

Implementing BQA practices provides cattle producers with an important key for avoiding additional government regulation. Producer-driven programs have proven very successful and will continue to allow the industry the flexibility needed to produce safe, wholesome food in an economical manner.
Animal Care and Husbandry Practices

Cattlemen have long recognized the need to properly care for livestock. Sound animal husbandry practices, based on decades of practical experience and research, are known to impact the well-being of cattle, individual animal health and beef quality. Cattle are produced in very diverse environments and geographic locations in the United States. There is not one specific set of production practices that can be recommended for all cattle producers however there are general guidelines that can be followed. In addition, personal experience, training and professional judgment can serve as a valuable resource for providing proper animal care.

Feeding and Nutrition

Diets for all classes of beef cattle should meet the recommendations of the National Research Council (NRC) and/or recommendations of a nutritional consultant.

- Cattle must have access to an adequate water supply. Estimated water requirements for all classes of beef cattle in various production settings are described in the NRC Nutrient Requirements of Beef Cattle.
- Provide adequate feed. Avoid feed and water interruption longer than 24 hours.
- Feedstuffs and feed ingredients should be of satisfactory quality to meet nutritional needs.
- 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 wellbeing, such as nitrate, prussic acid, mycotoxins, etc.
- Producers should become familiar with potential micronutrient deficiencies or excesses in their respective geographical areas and use appropriately formulated supplements.
- 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.

Feeding Guidelines for Beef Cows

Body condition scoring of beef cows is a scientifically approved method to assess nutritional status. Body condition scores (BCS) range from 1 (emaciated, skeletal) to 9 (obese).
- A BCS of 4-6 is most desirable for health and production. A BCS of 2 or under is not acceptable and immediate corrective action should be taken.
- During periods of prolonged drought and widespread shortages of hay and other feedstuffs, the average BCS of cows within a herd may temporarily decline. This is not desirable, but may be outside the cattle owners control until drought relief is achieved.
- During periods of decreasing temperature, feeding plans should reflect increased energy needs.

Feeding Guidelines for Stocker Cattle

Stockers are raised on a wide variety of forages (native pasture, annuals, improved pasture) with minimal additional nutrient supplementation.

- On growing forages, stocking rates should be established that meet production goals for growth and performance.
- On dormant pastures, supplement cattle as needed to meet maintenance or growth requirements for the animal’s weight, breed, and age as established by NRC guidelines and targeted production goals of the operation.

Feeding Guidelines for Feeder Cattle

Feedyard cattle can eat diverse diets, but the typical ration contains a high proportion of grain(s) (corn, milo, barley, grain byproducts) and a smaller proportion of roughages (hay, straw, silage, hulls, etc.). The NRC lists the dietary requirements of beef cattle (based on weight, weather, frame score, etc.) and the feeding value of various commodities included in the diet.

- Consult a nutritionist (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 feces, incidence of digestive upsets (acidity or bloat) and foot health to evaluate the feeding program.
A small percentage of cattle in feedyards develop laminitis or founder. Mild cases do not affect animal welfare or performance; however, hooves that are double their normal length compromise movement. Extreme cases should be provided appropriate care and marketed as soon as possible.

**Disease Prevention Practices and Health Care**

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 early intervention through health management programs. Healthy herds are more productive.

The producer should work with a veterinarian and/or nutritionist to determine the risk of infectious, metabolic and toxic diseases and to develop effective management programs when designing a herd health plan.

Producers and their employees should have the 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.

**Cows**

- It is desirable for cows to have a BCS of at least 4 before the calving season.
- During calving season, cows should be checked regularly for calving difficulties. First-calf heifers may require more frequent observation and care.
- Producers should consider contacting a veterinarian for advice or assistance if cows or heifers have calving difficulties that cannot be corrected by the producer within a reasonable amount of time.
- Cows with mild lameness, early eye problems such as ocular neoplasia, mastitis or loss of body condition should be examined to determine well-being and in some cases be promptly marketed.

**Calves**

- Castration and dehorning are done for the protection of the animal, other cattle in the herd and people who handle the cattle. Castration prior to 120 days of age or when calves weigh less than 500 pounds is strongly recommended.
- When horns are present, it is strongly recommended that calves be dehorned prior to 120 days of age. Dehorning should be done before the diameter of the horn base grows to one-inch in diameter or more.
- 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.

**Stocker and Feeder Cattle**

- All incoming stocker and feeder cattle should be vaccinated against Bovine Respiratory Disease (BRD). Stocker cattle that will be grazing rangeland or pasture should be vaccinated against clostridial diseases. The use of other vaccines and parasite control should be based on risk assessment and efficacy of available animal health products.
- **It is strongly recommended that a local anesthetic (cornual nerve block) be used when the horn base is one-inch or more in diameter.**
- 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.
- 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.
Biosecurity

Biosecurity is a system of management procedures designed to prevent or greatly reduce the risk for introduction of new diseases to a cattle operation. Implementing a biosecurity program is like purchasing an insurance policy for the health and productivity of the herd. Producers should work with their veterinarians to develop a plan. Biosecurity affects beef quality directly in the case of diseases that pose a risk to public health and indirectly by reducing the potential of the meat quality being impacted by the disease or its treatment.

An effective biosecurity plan will involve your employees, veterinarian, and other specialists. It will provide reasonable protocols, which are more likely to be followed, to minimize introduction of new diseases. The plan will require education of farm visitors and may include physical barriers. The biosecurity plan and the actual adherence to the plan must be periodically reviewed and adjustments made as needed.

Sources of New Disease

New diseases can be introduced to your cattle operation in a number of ways, including:

- Cattle, including replacements from other herds, bulls, fence-line contact with neighboring herds, shows and fairs, and strays.
- Manure on footwear and clothing, tractor and equipment tires, trailer, and equipment (foot trimming, etc.).
- Water, including ponds and pools of standing water, which animals may have access to.
- Humans moving between herds or farms.
- Nonlivestock, including pets, birds, deer, coyotes, rodents, ticks, and other insects.
- Feed, especially feed which could be contaminated with feces, urine, molds, or ruminant by-products.

Animals New to Your Herd

- Know the herd health status of herds supplying replacements or bulls.
- Obtain the health/vaccination history of new animals.
- Isolate new animals in a location away from your cattle for a period of time (2 to 4 weeks) before introducing them into your herd. This practice includes not sharing feed or water and no nose-to-nose contact.
- Observe the health status of new animals daily before introducing them into your herd.
- Have your veterinarian speak with their veterinarian regarding the health at the farm of origin.

Animals in Your Herd

- Be a diligent observer of your cattle for signs of disease.
- Know the signs of important foreign animal diseases, which include:
  - Blisters around animals’ mouths, noses, teats, or hooves (FMD)
  - Central nervous system disorders, such as staggering and falling (BSE)
  - Abortions or abnormal discharges
- Report any sudden, unexplained death loss to your veterinarian.
- Have your veterinarian necropsy every dead animal, unless you are certain of the cause of death.
- Report to your veterinarian any severe illness affecting a high percentage of animals.
- Insist that outside individuals coming onto your farm adhere to clean, sanitary practices, such as clean clothing and footwear, clean equipment, and clean trucks.
- Maintain fences to prevent mixing your cattle and your neighbor’s cattle.
- Dispose of dead animals properly:
  - If hauled off the farm, animals should be placed on the outer perimeter of the farm and away from the public view.
  - If composting is utilized, a site should be selected to protect runoff from contaminating water sources and located away from cattle.
• Minimize nonlivestock traffic, including pets, wildlife, rodents, birds, and insects.
• Keep feed storage areas free of all animals.

Animals Returning from Shows or Fairs
• Do not share equipment with other exhibitors.
• Change or wash clothing and shoes worn at the fair before working with animals at home.
• Isolate from other animals for a minimum of 14 days.

Visitors
• Minimize the number of access routes to your operation. Consider locking or obstructing alternative entry sites.
• Require visitors to use plastic boots or disinfectant footbaths.
• Minimize unnecessary direct contact with cattle.
• Place signs describing visiting policies in clear view.
• Keep a record of visitors, including dates.
• Determine if visitors have been on other farms/ranches prior to visiting you. Special care is needed if visitors have recently been in another country.
• Observe for suspicious individuals or abnormal activities.

Vehicles and Equipment
• Designate parking places for visitors. Minimize their crossing tracks with feed suppliers/deliveries.
• Minimize all vehicle traffic in livestock and feed areas.
• Do not contaminate feed with manure.
• Have separate equipment for feed and for manure handling.
• Clean and disinfect equipment used for handling manure and dead animals before handling feed.

Cattle Handling
Cattle are gathered to perform routine husbandry procedures such as veterinary care, weighing, sorting, weaning and transportation to and from pastures, feedlots and livestock markets. Handling procedures must be safe for the cattle and caretakers and cause as little stress as possible. Facilities should be designed and constructed to take advantage of cattle’s natural instincts.

All individuals who work with livestock should have a basic understanding of livestock handling techniques to ensure the welfare of the cattle and people. Training for those who care for and handle cattle should include understanding what affects cattle behavior and methods for reducing stress while handling.

Vision
Cattle rely heavily upon their vision for protection and as such cattle behavior is greatly influenced by handler movement and other objects they are not familiar with or perceive as threatening.

Cattle have 340 degree panoramic vision. This allows them to see all around themselves except directly behind without turning their head. Cattle can see in black and white only. This is important to understand as sharp contrasts between light and dark will cause cattle to balk or spook. Contrasts of light and dark have such a deterrent effect on cattle that in some areas white lines are painted across the highway to take the place of expensive steel cattle guards. Cattle have poor depth perception especially when they are moving with their heads up. To see depth they have to stop and put their heads down.

A solid roof over a work area is often better than a sun shade because the gaps between the panels in the shade create bright stripes of sunlight across pens and alleys. Avoid anything that makes a grid or striped pattern across an area that cattle must move through. Even something as simple as a grate covering a drain in the floor of an alleyway or crowding pen will cause cattle to balk.

Solid sides are preferred over open bars on alleys and crowding pens. The principle of using solid sides in
these areas is like putting blinders on a harness horse. They prevent cattle from seeing distractions outside the pen and balking. These solid sides also tend to provide cattle a sense of security. Solid sides in a working alley allow cattle to see only one escape route which is up the alley.

Curved alleys have often been used as cattle can’t see what is at the end of the chute until they are almost there. A curved working alley with solid sides restricts animal vision so that they can’t see the truck, squeeze chute or handlers until just before entering. Curved alleys also take advantage of the animals natural tendency to circle around anything or anyone they are unsure of.

Other points to consider are:

- Face chutes either in a north or south direction as livestock will balk if forced to look directly into the sun.
- Paint handling facilities a uniform color to prevent cattle from balking at a sudden change in color.
- Cattle will balk if they see a moving or flapping objects in or around alleys or chutes. Remove or secure such objects before processing. In addition, check for broken side rails, protruding fasteners, and nails that could injure livestock.

**Hearing**

Cattle have sensitive hearing and are scared by loud noises coming from handlers or facilities however, small amounts of noise can be used to assist in moving livestock. Reducing noises such as barking dogs, banging gates and clanging metal on metal will help reduce cattle handling problems. In addition, positioning hydraulic pumps and motors away from the squeeze chute will be beneficial.

**Herd Behavior**

All species of livestock will follow the leader and this instinct is strong in cattle. A chute should be long enough to take advantage of the animal's tendency to follow the leader. The minimum length for the single-file chute is 20 feet. At no time should the chute be longer than 50 feet. Problems with downed cattle may result if they are held for over 15 minutes.

Cattle are herd animals and, if isolated, can become agitated and stressed. An animal left alone in the crowding pen after the other animals have entered the single file chute, may attempt to jump the fence to rejoin its herd mates. A large portion of the serious handler injuries occur when a steer or cow, separated from its herd mates, refuses to walk up the single file chute.

**The Flight Zone**

The flight zone is the distance an animal keeps between itself and anything it feels uncomfortable with. This could also be thought of as the animals personal space. When approaching an animal the point where it begins to move away is the edge of the flight zone. The size of the flight zone varies from animal to animal. Range cattle may have a flight zone of 300 feet or more while the flight zone of feedlot cattle may be only 5 to 20 feet. Extremely tame cattle are often difficult to drive as they no longer have a flight zone.

Gently pressuring cattle at the edge of their flight zone will give them the incentive to move slowly away in the direction you want them to go. When cattle panic and attempt to escape you are too far into the flight zone. In this case backing up and giving them more room will usually calm them down. Deep penetration into an animals flight zone when they are already in a stressful area, such as an alley or crowd pen results in a state of panic for the animal. The best results are achieved by working the edge of the zone. Pressuring the flight zone behind the shoulder makes an animal move forward while pressure in front of the shoulder makes them move backward.
Figure 1. The shaded area shows the best position for moving an animal. To make the cow move forward the handler moves into position B that is just outside the boundary of the flight zone. The handler should retreat to Position A if he wants the animal to stop. The solid curved lines indicate the location of the curved single-file chute.

Importance of Handler Patience and Experience
Experienced and trained personnel should operate restraining equipment in the processing of cattle. Processing should never be treated as a race. Avoid overcrowding the crowd pen, and refrain from pushing the crowd gate up on the cattle. Instead, allow them to move forward naturally.

Working cattle too quickly can lead to bruises, injection-site damage, human injuries, and incorrect records. Stress caused by improper handling also lowers conception rates, reduces vaccination effectiveness, and reduces immune and rumen functions.

In addition to bruising losses from improper cattle handling, shipping fever and excess shrink (caused by the stress of mishandling) also lead to severe economic damage to the industry. An understanding of cattle behavior will facilitate handling, reduce stress, reduce bruise defects, and improve both handler safety and animal welfare.

Handling is safer when animals are moved quietly. Handlers should not yell or flap their arms, because this may agitate the animals. Excessive use of electric prods increases animal agitation as well as hazards to handlers. When cattle become agitated and fearful, up to 20 minutes is required for their heart rate to return to normal (Grandin.com). Agitated large animals are easier and safer to move if they are given an opportunity to calm down, perhaps while handlers are on a lunch or coffee break.

Additional Handling Tips
- Avoid slippery surfaces, especially where cattle enter a single-file alley leading to a chute or where they exit the chute. Grooved concrete, rubber mats or deep sand can be used to minimize slipping and falling.
- Quiet handling is essential to minimize slipping and as a rule no more than 2 percent of the cattle should slip outside of the chute. A level of more than 2 percent indicates a review is needed by asking questions such as: Is this a cattle temperament issue or is something in the handling area affecting cattle behavior?
- Take advantage of cattle’s flight zone and point of balance to move them. For safety and welfare reasons, minimize the use of electric prods. Non-electric driving aids, such as plastic paddles, sorting sticks, flags or streamers (affixed to long handles) should be used to quietly guide and turn animals. When cattle continuously balk, cattle handlers should investigate and correct the reason rather than resort to overuse of electric prods.
- 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 the eyes, rectum, genitalia and udder.
- Driving aids powered by AC current should never be used unless manufactured and labeled specifically for that purpose.
- Some cattle are naturally more prone to vocalize, but if more than 5 percent of cattle vocalize (after being squeezed in the chute but prior to procedures being performed), it may be an indication that chute operation be evaluated.
- If more than 25 percent of cattle jump or run out of the chute, a review of the situation should address questions such as: Is this a result from cattle temperament, improper handling or is the chute not operating properly?
- Properly trained dogs can be effective and humane tools for cattle handling. Insure that barking or impeding cattle flow is minimized.
Cattle Handling Facilities

Equipment to restrain cattle is needed on most beef and dairy operations. The equipment should quickly and securely restrain the animal and should allow for the quick release of the animal upon completion of the procedures. Corrals, pens, and chutes should be the proper size for the number and size of animals and the type of processing to be done. Keep equipment clean and in good repair. Proper cattle handling requires the right facilities equipment and attitude.

Planning a Handling Facility

The first step in planning a handling facility is to inventory existing facilities (old handling facilities, barns, sheds, etc.). Some of these might be used in the new handling facility. Consider the layout of pastures and existing facilities when deciding where to build so cattle will have easy access. The availability of water and electricity should also be considered. The proximity to neighboring homes or main roads, where odor, dust, noise, and flies might be objectionable, should be considered.

The breed and size of cattle to be worked will influence how the facility is to be constructed. Larger or more spirited cattle will demand stronger materials be used in construction. Obviously, the number of cattle to be worked will affect dimensions.

The site selected should be on an almost level spot with good drainage. If the site is on a slight slope, be sure cattle will be moved up the slope as they are worked to accommodate normal cattle movement. Cattle are easier to work if they move in a direction that is normal for them.

Consider creating an all-weather loading area that will allow all vehicles to access the facility and turn safely. While trying to make the plan friendly for loading and access, keep in mind the benefits of being able to limit access to the general public so as to decrease the possibility of disease transmission and interference with farm work.

Components of a Good Handling Facility

The size and complexity of a cattle handling facility depends on the number of animals in the herd. A good handling facility should contain the following components: headgate, holding or squeeze chute, working chute, crowding pen, holding pens, scales, and loading chute. These facilities need not be elaborate or expensive. A discussion of each of these components follows.

Headgate

The headgate is the most important part of the entire working facility. It should be sturdy, safe, and easy to operate and should work smoothly and quietly. There are three basic types of headgates. They are self-catching, scissors-stanchion, and full-opening stanchion. The self-catching headgate closes automatically due to the movement of the animal. The scissors-stanchion type consists of two halves that pivot at the bottom. The full-opening stanchion consists of two halves that work like a pair of sliding doors.

The recommended types for small operations are the self-catching and the full-opening stanchion. These are extremely safe and will rarely choke an animal. The disadvantage is that animals can move their heads up and down unless a nose bar is used. Both headgates are available with either straight or curved stanchion bars. The curved-bar stanchion offers more control of the animal’s head but is more likely to choke the animal than the straight-bar type. Thus, curved stanchions are not recommended. No matter which type of headgate is selected, proper adjustment for the type of cattle being worked is necessary to prevent injury to the animals.
Squeeze Chute

The squeeze chute is located immediately behind the headgate and secured to it. The width of the squeeze chute should be adjustable for different sized animals, but should not be any wider than 26 inches. Other desirable characteristics include squeeze action, removable side panels for easier access to the animal, and a floor with a nonslip surface. Squeezes can be manually or hydraulically operated. V-shaped sides are preferred because they support cattle, preventing them from going down and choking.

The squeeze chute may be hinged on one side to release the animal if the headgate is not a walk-through type. Some type of see-through blocking gate or bar is needed to prevent the animal from backing up before the head is caught. Also, this will prevent the next animal from moving into the chute before the first animal is released. A 2-foot service gate at the back of the chute is desirable when working at the back of the animal (castrating, pregnancy testing, etc.). A palpation cage can be substituted for the service gate if desired.

Working Chute

The working chute leads cattle from the crowding pen to the squeeze chute. The purpose of a working chute is to hold cattle in a line so that they can enter the treatment or loading area one at a time. Working chute sides should be solid. Solid walls prevent the animals from seeing the squeeze chute, people, and the truck until they are almost there. V-shaped sides are recommended, especially if the facility is used to handle both cows and calves. Sloped sides restrict the animal’s feet and legs to a narrow path, which in turn reduces balking and helps prevent an animal from turning around. Curved chutes work best for animals awaiting treatment. It takes advantage of the cattle’s natural circling behavior.

An alternative to curved chutes is an offset chute. In this case, part of the working chute is offset by 30 degrees (maximum), so that cattle are prevented from seeing the squeeze until they are almost there. Whenever possible, the working chute should be at least 20 feet long regardless of herd size. Size specifications are given in Table 1.

Table 1. Specifications for cattle handling facilities

<table>
<thead>
<tr>
<th>Facility Component</th>
<th>Up to 600 lbs</th>
<th>600 to 1,200 lbs</th>
<th>Over 1,200 lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Holding Pen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space per head (sq ft)</td>
<td>14</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Pen Fence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (in)</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Post spacing (ft)</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Minimum post depth in ground (in)</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td><strong>Crowding Pen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space per head (sq ft)</td>
<td>6</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Post spacing (ft)</td>
<td>4 - 6</td>
<td>4 - 6</td>
<td>4 - 6</td>
</tr>
<tr>
<td>Solid wall height (in)</td>
<td>45</td>
<td>50</td>
<td>50 - 60</td>
</tr>
<tr>
<td><strong>Working Chute</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical sides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (in)</td>
<td>18</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>Minimum length (ft)</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Sloping sides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear width at bottom (in)</td>
<td>13</td>
<td>13 - 16</td>
<td>18 - 20</td>
</tr>
<tr>
<td>Clear width at 48-in height (in)</td>
<td>20</td>
<td>26 - 29</td>
<td>30 - 33</td>
</tr>
<tr>
<td>Minimum length (ft)</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td><strong>Working Chute fence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of solid lower wall (in) (includes 2 – 4 in clearance at bottom for drainage)</td>
<td>48</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Overall height</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top rail, quiet cattle (in)</td>
<td>55</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Top rail, range cattle (in)</td>
<td>68</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Maximum curve angle (degrees)</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>Holding Chute/Squeeze</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (in)</td>
<td>45</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Width</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight sides (in)</td>
<td>18</td>
<td>22</td>
<td>28</td>
</tr>
<tr>
<td>V-shaped side, bottom width (in)</td>
<td>6 - 8</td>
<td>8 - 12</td>
<td>14 - 16</td>
</tr>
<tr>
<td>Length with headgate (ft)</td>
<td>5</td>
<td>5 - 8</td>
<td>5 - 8</td>
</tr>
<tr>
<td><strong>Loading Chute</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (in)</td>
<td>26</td>
<td>26</td>
<td>26 - 30</td>
</tr>
<tr>
<td>Minimum length (ft)</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Rise (inches per foot)</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Ramp height for:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock trailer – 15 in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pickup truck – 28 in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock truck – 40 in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor trailer – 48 in</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To prevent balking, the blocking gate at the junction of the working chute and the squeeze chute should allow an animal to see the animal ahead. “Back up” or “tail gate” bars in the working chute can be used to prevent animals from moving backward.

**Crowding Pen**
The crowding pen is located at the back of the working chute. Size should be about 150 square feet, which will hold six to 10 head of cattle. A circular crowding area with solid sides works best. Funnel-shaped pens are a good alternative to circular crowding tubs for smaller facilities. The funnel-shaped pen should form a gradual V as it approaches the working chute. The cattle will be less apt to bunch up if one side of the V is straight with the working chute and the other side angled out. A solid crowding gate should be used to push animals from the V into the working chute.

**Holding Pen**
Holding pens should be located so they fit conveniently with the rest of the facility. Each holding pen should provide approximately 20 square feet per animal.

**Scales**
Scales are essential for performance testing, evaluating gains, and determining sale weights. A single animal scale (usually portable) is most useful when determining the rate of gain and also in selecting breeding stock or determining how much weight cows are gaining or losing. The scales should be located so cattle can be easily moved on and off.

**Loading Chute**
The loading chute should be located directly off the crowding pen, allowing easy movement of cattle. The loading chute ramp can be either sloping or stepped. The maximum incline should be 30 percent (3½-inch rise per foot of incline). Adjustable ramps are convenient when trucks or trailers of different heights are used. The length of the loading chute depends on the height required; however, it should be at least 12 feet long. The loading chute should be 26 to 30 inches wide.

---

**Transportation**
The movement of cattle to and from farms, ranches, feedlots, and marketing facilities is an important aspect of beef and dairy cattle production. When transporting cattle, avoid undue stress caused by overcrowding, excess time in transit, or improper handling during loading and unloading. In addition to promoting safety and animal welfare, proper handling while sorting, loading, and transporting also contributes to beef quality and producer profitability by reducing defects from bruising, injury, or stress.

**Transportation Quality Assurance Guidelines**
Cattle will perform better and yield higher quality beef when their exposure to stress is limited by careful handling and transportation.

Cattle transporters have many factors to think about before making a haul, including sanitation protocols. Preparation of the vehicle and the cattle being transported are important considerations. Pre-transit planning will help drivers provide quality service that benefits both consumers and the cattle being hauled. Planning on the behalf of producers will help them have healthier cattle delivered to the destination point.

Anyone transporting cattle should observe the following practices:

**Equipment Condition**
- Be sure equipment is in good running order.
- Use properly designed ramps/chutes.
• Consider stocking density and space requirements to avoid overcrowding.
• Use trailer dividers to limit animals to each section. (Figure 3 shows proper loading densities for cattle trailers.)
• Avoid slippery conditions by keeping floors clean and slip resistant.
• Ensure no sharp edges on loading chutes or trailer, and avoid shiny objects in the chute path/trailer, which may scare cattle from moving onto the trailer.
• Adhere to both federal and state weight limits and guidelines.
• Make sure drop gate is securely latched after trailer is loaded.

**Driver Attitude and Professionalism**
• Act responsibly, showing concern for animal welfare.
• Use proper tone of voice and controlled emotions.

**Animal Evaluation Prior to Loading**
• Are cattle physically able to be loaded and unloaded several times?
• Can cattle walk normally bearing weight on all four legs?
• Are any cattle suffering from advanced stages of health disorders such as cancer eye, open wounds, mastitis, emaciation, malnutrition, exhaustion or deformity?
• Can each animal keep up with the rest of the group?
• If cattle have been treated has the withdrawal time passed?
• Do not haul female cattle that are in the late stages of pregnancy.

**Loading/Unloading**
• Schedule loading and unloading times to minimize the amount of time animals spend in the trailer.
• Do not load animals that should not be transported (i.e., borderline non-ambulatory/downer animals).
• Check for signs of stress and adjust stocking density to accommodate tired or stressed animals.
• When loading cattle onto the trailer care should be taken to move the cattle slowly and quietly.
• Use low stress handling techniques when moving, loading and unloading cattle
• Avoid using electric prods and aggressive use of canes, whips and sorting sticks. This will minimize stress, help prevent the animals from getting excited and lessen the degree of shrink.
• Sort cattle into groups based on size, sex and horns. Load different groups into separate compartments
• Load heavier cattle towards the front of the trailer
• Bulls that have not been together should be loaded into separate compartments
• Separate cattle that are purchased from separate sources or different groups. This will prevent them from trying to establish a new social order on the trailer.

---

**Figure 3. Trailer loading recommendations**
Minimize the height that cattle must step onto the trailer by backing the trailer into a slope.

Load cattle at the edge of the operation to help support the biosecurity plan and minimize introduction of health problems.

Allow the cattle to establish a flow onto the trailer. This will reduce a lot of the stress.

**Transit**

- Take precautions for extreme weather conditions in winter and summer and provide appropriate ventilation and/or protection.
- During long-haul transit, stop occasionally to ensure cattle are well dispersed and still standing, and observe appropriate guidelines and regulations for long-haul transit.
- Plan delivery schedules to minimize the number of stops made, and follow the schedule closely.
- To prevent livestock from falling, avoid sudden starts/stops and sharp turns.
- Have an emergency response plan of action for events (i.e., truck/trailer rollover, plant shutdowns).

**Biosecurity Practices**

- Thoroughly clean and wash truck/trailer with hot water after unloading and prior to loading again. (Hot water will remove 90 percent of pathogens.)
- Disinfect regularly.
- Have a written protocol for trailer sanitation.
- Use clean bedding on trailer and chute area.
- Utilize disposable coveralls, boots, and gloves to prevent possible disease cross-contamination.
- Deny entrance of animals exhibiting symptoms of disease onto trailer.

**Additional Resource**

- National Cattlemen’s Beef Association Master Trucker Transporter Guide <www.tbqa.org>

---

**Non-Ambulatory Cattle**

Cattle can become non-ambulatory (commonly referred to as “downers”) for several reasons, including injury, diseases, or nutrition-related disorders.

A prompt diagnosis should be made to determine whether the animal must be humanely euthanized or will respond to additional care. Signs of a more favorable prognosis include the ability to sit up unaided, eating, and drinking.

Care for non-ambulatory cattle is the responsibility of livestock owners and caretakers, who must make every effort to provide proper care. Non-ambulatory cattle should be provided with adequate shade or shelter and access to water and feed in a location that provides good footing. In the event a downer animal must be moved to a different location for proper care, handle the animal very carefully to avoid compromising animal welfare. Dragging downer animals is unacceptable. Likewise, animals should not be lifted with chains onto transportation conveyances. Acceptable methods of transporting downers include a sled, low-boy trailer or in the bucket of a loader. Animals should not be “scooped” into the bucket, but rather should be humanely rolled into the bucket by caretakers.

Cattle that are non-ambulatory cannot be sent to a livestock market or to a processing facility. If the prognosis is unfavorable or the animal has not responded to veterinary care, it should be humanely euthanized.

**Euthanasia**

Euthanasia is humane death without pain and suffering. The producer may need to perform on-farm euthanasia because a veterinarian may not be immediately available to perform the service. The person performing the procedure should be knowledgeable of the available methods and have the necessary skill to safely perform humane euthanasia; if not, a veterinarian must be contacted.
Reasons for euthanasia include:
• Severe emaciation, weak cattle that are non-ambulatory or at risk of becoming downers.
• Downer cattle that will not sit up, refuse to eat or drink, have not responded to therapy and have been down for 24 hours or more.
• Rapid deterioration of a medical condition for which therapies have been unsuccessful.
• Severe, debilitating pain.
• Compound (open) fracture.
• Spinal injury.
• Central nervous system disease.
• Multiple joint infections with chronic weight loss.

When euthanasia is necessary, an excellent reference is the Practical Euthanasia of Cattle guidelines, which can be found at <http://www.aabp.org/resources/euth.pdf>. These guidelines were developed and published by the Animal Welfare Committee of the American Association of Bovine Practitioners. Additional resources including desk cards and wall charts for posting are offered by the University of Florida Department of Veterinary Medicine at <http://www.vetmed.ufl.edu/lacs/humane euthanasia>.

Disposal
Producers should also use proper methods of carcass disposal in accordance with federal, state, and local regulations. If utilizing a rendering service, keep deceased livestock in a screened area away from public view but close to the farm entrance for biosecurity purposes.

Heat Stress
During period of high temperatures and humidity, livestock losses can occur from hot weather stress. Hot weather stress is particularly hazardous to closely confined livestock (those in feedlots, sorting and holding pens and trucks). Even though some heat stress is unavoidable, the effects can be minimized if certain management practices are followed:

• If possible, avoid handling cattle when the risk of heat stress is high. The final decision 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, if possible. As an example, when the temperature is 98°F and the humidity is 30%, 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. More information can be found in University of Missouri Extension publication G2099, “Hot Weather Livestock Stress” at: <http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2099>.
• Work cattle more prone to heat stress first, earlier in the day or later if conditions moderate. For example, larger cattle should be processed during lower stress times of the day.
• Limit the time cattle spend in handling facilities where heat stress may be more significant.
• Heat management tools, such as shades and sprinklers, should be considered if sufficient natural shade is not available.
Vaccine and Drug Use Practices

Use of vaccines and antibiotics in the cattle industry are an integral part of animal care and as such the BQA program addresses appropriate vaccine and drug use practices so animal health products perform to their level of expectations. In addition, proper administration and use reduces costly injection site lesions and reduces the likelihood of violative residues.

Avoid Injection-Site Tissue Damage

Research has shown that when any products are injected into muscle tissue, damage occurs at the site and surrounding tissue. Abscesses may form and cause a meat-toughening blemish that is found in the carcass 10 months after being injected. These blemishes are not always visible, but the consumer can tell the beef is tough when they bite into it.

Common injectable products known to cause long-term muscle damage include bacterins, oil-based virus-vaccines, macrolide antibiotics, long-lasting oxytetracycline, injectable vitamins, injectable mineral products and even sterile saline.

Figure 4. Percent of carcasses with injection-site damage 200+ days after an intramuscular injection of one of the products listed. (MH George, et al. NCBA Report 1997)

<table>
<thead>
<tr>
<th>Product</th>
<th>Sirloin</th>
<th>Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saline</td>
<td>14</td>
<td>31</td>
</tr>
<tr>
<td>Bovishield</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>Naxel</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Clost, 7-Way</td>
<td>62</td>
<td>100</td>
</tr>
<tr>
<td>Vital E-A+ D</td>
<td>62</td>
<td>100</td>
</tr>
<tr>
<td>ViraShield-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tylosin Inj.</td>
<td>56</td>
<td>100</td>
</tr>
<tr>
<td>LA-200</td>
<td>56</td>
<td>100</td>
</tr>
</tbody>
</table>

Less tender beef surrounds the injection site up to a softball-size area (64 cubic inches). Injection-site blemishes have been detected in 7.5% of carcasses. Each required 6 ounces of trimmed beef around the blemish. Based on the 2000 National Beef Quality Audit, injection-site blemishes cost the beef industry $188 million annually. This means producers lost an average of $7.05 per head per year in the value of the steers and heifers marketed.

Figure 5. Average volume, in cubic inches, of tough steak found around injection-site 200+ days after being injected with product listed. (MH George, et al. NCBA Report 1997)

Injection Technique

To lessen injection-site defects in economically important cuts of beef, the preferred site for all subcutaneous (SQ) or intramuscular (IM) injections is the neck region (See Figures 6 and 7). It is particularly important to use the neck region with IM products, because even the shoulder chuck primal contains “value-added” cuts that should be protected. Whenever possible, choose products formulated and labeled for SQ rather than IM injection.
Subcutaneous Injections
SQ injections are made just under the skin but not into the muscle tissue. The side of the neck is the best area to make injections. To administer, lift the skin with your free hand and insert the needle into the raised fold of skin. This is known as the “tent technique” (Figure 7).

Several animal health products are now approved to be injected into the ear of cattle. This location is excellent from a BQA perspective as ears are removed at harvest and do not enter the food chain. The ear must be clean to avoid infection, and producers should take care to avoid blood vessels. Read product labels carefully. An example of an ear injection technique can be found on the internet at <http://www.excede.com/>.

Intramuscular Injection
IM injections are made directly into muscle tissue of the neck. Insert the needle perpendicular to the neck in order to make an IM injection.

Volume of Product Administered
If intramuscular medications are used, never exceed 10 cc’s per IM injection site. Too much drug in one area can cause significant tissue damage and result in poor absorption of the product. This may reduce treatment response and/or extend the withdrawal period.

If more than 10 cc’s is required split into multiple injections leaving 4 inches in between each injection site. For example, if 24 cc’s is the calculated dose, use three 8 cc injections.

Needle Use and Handling
General Guidelines
- Select a clean injection site.
- Single-use needles are preferred.
- Keep the contents of the vaccine bottle sterile; do not store a syringe and needle in the top of a bottle.
- Do not put a needle back into the vaccine bottle once it has been used for anything else.
- Keep transfer needles in a closed container when at chute-side and after use, boil and place in a clean container.

Selecting the Proper Needle Gauge
Primary considerations in needle selection include route of administration, size of the animal, and site of the injection. Secondary considerations include viscosity of the fluid and volume injected. The needle size used should never be larger than necessary to adequately perform the injection (Table 2; following page).

Changing Needles
- Change needles every 10 to 15 head, or with every automatic dosing syringe refill.
- Change any needle that is bent, or becomes contaminated (manure, dirt, or chemicals), or if the needle point becomes burred.
- To prevent the spread of known blood-borne infectious diseases, use a new needle for each animal.

Note: A broken needle in an animal is an emergency; overtime the needle will migrate farther into the tissues making it harder to find. Under no circumstances should animals with broken needles be sold or sent to a packer.
Vaccine Management

There are numerous explanations for vaccine failures but generally a failure at the ranch level is due to improper vaccine handling and administration. The key is to make sure vaccines are properly handled and stored at all times.

Vaccines are degraded when not stored at the appropriate temperatures (frozen or when exposed to heat or sunlight). Keeping vaccines cool and shaded from sunlight until they are administered to the animal is critical. In addition, some vaccines, such as the modified live viral vaccines (MLV), begin to lose effectiveness once they are mixed. The standard recommendation is to mix only the amount of vaccine you can use within 1 hour. Other vaccine handling recommendations include:

• Vaccines should be reconstituted with a transfer needle. Place one end of the transfer needle into the sterile liquid and the other into the bottle containing the freeze dried cake of vaccine. The vacuum should pull the liquid from one bottle to the next.
• When mixing vaccine the bottle(s) should be rocked back and forth but not shaken.
• Don’t combine vaccines unless the combination is approved: mixing incompatible vaccines can destroy their effectiveness.
• Syringes need to be labeled and the same vaccine used in the same syringe each time. Even a trace amount of a killed vaccine can harm the effectiveness of the modified live if the two vaccines aren’t approved for combined use.
• Syringes should be cleaned with only hot water. Soap and disinfectants can leave a residue in the syringe that may destroy MLV vaccines.

Drug Management

Open and consistent communication between a livestock producer and a veterinarian is needed to assure quality control, animal welfare, and prevention of drug and chemical residues. Using animal health products exactly as they are labeled or prescribed by a veterinarian with whom the producer has a valid veterinarian-client-patient relationship (VCPR) is a requirement of a BQA program. Information about establishing a valid VCPR is contained later in this chapter.

Storage

Antibiotics and other drugs usually have specific storage requirements. Some require refrigeration. All should be stored in a clean place where they cannot become dirty or contaminated. Observe and obey the manufacturer’s recommended storage instructions for each product.

Where refrigeration is needed, be sure the refrigerator is kept clean and located in a safe place that is not likely to be overheated or contaminated by dirt or manure. Do not keep refrigerated drugs in door shelves because of the temperature fluctuation.
Drugs for lactating dairy cows must be stored separately from those used for nonlactating cattle. This helps prevent lactating animals from receiving drugs intended for nonlactating animals, which could cause an illegal residue in milk and meat. This restriction applies to drugs stored both at room temperature and under refrigeration.

Handling Precautions

• Always read and follow label instructions and supply them in Spanish or other languages if needed.
• Post the local poison control center number by all phones.
• Use proper restraints when injecting cattle.
• With injectable medications known to be toxic to humans, avoid using the two handed skin tent technique. Instead insert the needles at a steep angle in order to make an SQ injection. In addition, use extreme caution if using automatic syringes for these medications.

Residue Avoidance

Elimination of illegal residues from chemical and drug use is a main focus in quality assurance programs for all food-animal species. An illegal residue occurs when the concentration of a product in edible tissues is above government standards set for that product. The annual incidence of illegal residues in fed-cattle remains at or near zero. Thus, fed-cattle tissue contamination from drug or chemical residues may be a moot issue. However, unacceptable residues in young calves and cows at harvest continues to be a problem for the industry.

Drug residue in livestock products must be avoided. Consumers are concerned about the drugs used in dairy and livestock production and how they affect the food they eat. The industry can address these concerns by assuring consumers that the necessary steps are taken to prevent drug residues. Consumers expect zero tolerance.

Residue violations and condemnations can be avoided by implementing and following control systems that incorporate the following practices:

• Maintain proper individual animal identification.
• Maintain complete medical records on animals for at least three years.
• Properly store, label, and account for all medication.
• Use animal health products according to the label.
• Maintain a valid Veterinarian – Client – Patient Relationship (VCPR).
• Educate all employees and family members about your control systems, and emphasize the importance of keeping drug residues out of the human food chain.

Drug Classifications

The Food and Drug Administration (FDA) has the responsibility for determining the market status of animal drugs, based in part upon whether it is possible to prepare “adequate directions for use” under which a lay person can use the drugs safely and effectively. The two basic classes of drugs available to livestock producers are discussed below:

Over-the-counter Drugs

Over-the-counter (OTC) drugs do not require a prescription and can be purchased from multiple sources. Producers must use OTC drugs as directed on the label (Figure 8). For example, most procaine penicillin G products are labeled for use at 1 cc/cwt and are given IM. So, a 600-pound calf would get 6 cc IM. Under federal law, producers are not allowed to change the dose or give the drug by any other route than what is listed on the label.

Figure 8. Sample over-the-counter label

Prescription Drugs

A drug that has significant potential for toxicity (or other harmful effects) in humans or animals that may have a unique method of use or which requires other special considerations for its use is usually labeled as
a prescription (Rx) drug. Such products can be used or dispensed only by or on the order of a licensed veterinarian, and the label must contain the legend: “Caution: Federal law restricts this drug to use by or on the order of a licensed veterinarian” (Figure 9).

**Figure 9. Sample prescription label**

<table>
<thead>
<tr>
<th>Name of Drug</th>
<th>BULLMYCIN 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Ingredients</td>
<td>(Wondercine HCl)</td>
</tr>
<tr>
<td>Instructions for Use</td>
<td>Directions for Use: See package insert.</td>
</tr>
<tr>
<td>Prescription Legend</td>
<td>Caution: Federal law restricts this drug to be used by or on the order of a licensed veterinarian.</td>
</tr>
<tr>
<td>Withholding Times</td>
<td>Warning: The use of this drug must be discontinued for 28 days before treated animals are slaughtered for food. Exceeding the recommended dose, or number of days treatment, or 10 ml per injection site may result in antibiotic residues beyond the withdrawal period.</td>
</tr>
<tr>
<td>Quantity of Contents</td>
<td>Net contents: 100 ml</td>
</tr>
<tr>
<td>Name of Distributor</td>
<td>Distributed by: Animal Health</td>
</tr>
</tbody>
</table>

**Veterinarian-Client-Patient Relationship (VCPR)**

Extra-label treatments may only be administered by a licensed veterinarian or under the supervision of a licensed veterinarian, and within the scope of a valid VCPR. A valid VCPR exists when:

- The veterinarian has assumed the responsibility for making clinical judgments regarding the health of the animal(s) and the need for medical treatment, and the client (owner or caretaker) has agreed to follow the veterinarian’s instructions.
- The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s). This means that 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 by medically appropriate and timely visits to the premises where the animal(s) are kept.
- The veterinarian is readily available or has arranged for emergency coverage for follow-up evaluation in the event of adverse reactions or failure of the treatment regimen.

**Penicillin accounts for more than 20 percent of all antibiotic residue violations in beef. It is the most commonly used drug and is routinely purchased over the counter. Gentamicin and streptomycin run a close second in the number of residue violations attributed to these antibiotics.**

**Precautions**

Prior to using or dispensing a drug in an extra-label manner, the veterinarian should take the following precautions:

- Make a careful diagnosis and evaluation of the conditions for which the drug is to be used.
- Establish a substantially extended withdrawal period prior to marketing of milk, meat, or other edible products.
- Institute procedures to assure that the identity of the treated animal(s) is carefully maintained.
- Take appropriate measures to assure that the assigned withdrawal times are met and that no illegal drug residues occur in any foodproducing animal subjected to extra-label treatment.

**Extra-Label Use of Drugs**

Extra-label use is defined as the “actual or intended use of a drug in a manner that is not in accordance with the label.” Under the provisions of the Animal Medicinal Drug Use Clarification Act of 1994, the FDA recognizes the professional judgment of veterinarians and allows the extra-label use of drugs (either OTC or Rx) by veterinarians under certain conditions. Extra-label use is limited to situations where a failure to treat an animal would:

- Threaten the health or life of an animal
- Cause undue suffering

Veterinarians may only consider using drugs in an extra-label manner under the following conditions:

1. There is no approved drug that is labeled for such use and that contains the same active ingredient in the required dosage form and concentration.
2. A currently approved and labeled drug is clinically ineffective for its intended use (e.g., drug resistant bacterial infections).
**Labeling**

Drugs intended for extra-label use must have additional labeling (Figure 10), including at least the following information:

- The name and address of the prescribing veterinarian (not just the clinic)
- The name of the active ingredient(s)
- Instructions for use, including identity of the animal being treated, dosage, frequency and duration of treatment, and route of administration
- Any cautionary statements specified by the veterinarian
- The veterinarian’s specified withdrawal time for meat and/or milk

*Figure 10. Label provided by veterinarian for extra-label*

---

**Limitations**

The extra-label use of drugs is **not** permitted in or on animal feeds. Nobody can use or prescribe drugs for use in feed in any manner except for the approved use and at the approved dosage. Extra-label use of drugs in treating food-producing animals for improving rate of weight gain, feed efficiency, or other production purposes is also prohibited. Some specific drugs are completely prohibited for extra-label use in food-producing animals, including:

- Chloramphenicol
- Clenbuterol
- Diethylstilbestrol
- Dimetridazole
- Ipronidazole
- Other nitroimidazoles
- Furazolidone/Nitrofurazone
- Fluoroquinolones
- Glycopeptides

---

**Drug Withdrawal Times**

A withdrawal time should be indicated on the label of medications. This is the period of time that must pass between the last treatment and the time the animal will be harvested or milk can be sold. For example, if a medication with a 14-day meat withdrawal period was last given on August 1, the withdrawal would be completed on August 15, and that would be the earliest the animal could be harvested for human consumption. Often there are separate withdrawals for milk and meat, and meat withdrawals are always longer.

It is important that you follow withdrawal time directions on the label or as prescribed by your veterinarian. From the day you acquire your animals until the day they leave your care, you should maintain feed and treatment records. This is important for the day-to-day care of your animal and for whoever may later purchase your animal.

Observe label instructions and withdrawal times carefully. When using drugs by extra label, work closely with the veterinarian on dosages and withdrawal times. Never use an approved veterinary drug in an extra-label manner without consulting the veterinarian. Treating animals in an extra-label manner without direction by a licensed veterinarian is illegal.

Unacceptable levels of drug residues detected in edible tissues collected at harvest will result in traceback, quarantine, and potential fines or jail time. Substantial economic losses may result for the individual producer as well as negative publicity for the entire beef industry. Producers are responsible for residue problems and should follow these rules:

- Do not market animals for food until the withdrawal time listed on the label or prescribed by the veterinarian has elapsed.
- Use only medications approved for cattle, and use them exactly as the label directs or as prescribed by your veterinarian.
- If ever in doubt, rely on the VCPR you have established with your veterinarian. Consult your veterinarian with all questions and concerns.
- Keep records that show drug and dosage used, animals treated, and withdrawal time.
All federally approved drugs will include the required withdrawal time for that drug on the product label or package insert. These withdrawal times can range from 0 to as many as 60 days or more. The Compendium of Veterinary Products, published by the North American Compendiums Inc., gives a comprehensive list of drugs approved for use in beef and dairy cattle as well as a description of each drug. In addition, the Compendium includes a chart of the withdrawal times for meat and also includes time of milk withholding. The drug label itself always supersedes the Compendium if there is a discrepancy. It is your responsibility to be aware of the withdrawal times of any drugs that you use on your cattle. More information is available at these websites: <http://www.fda.gov/> and <http://www.farad.org/>.

Managing Implants

Implants may provide an economic advantage in the production of safe and wholesome beef. Beef from implanted cattle has proven to be leaner than beef from nonimplanted cattle, with minute differences in hormone levels (Figure 11). Nevertheless, consumer concern remains high with regard to implanted beef.

Administer implants properly and follow label directions, including proper sanitation and the use of antiseptic on the needle between every use. Proper sanitation results in fewer abscesses in the ear and allows for higher utilization of the implant.

Regulations governing the use of implants are set by the FDA. Always read and follow the manufacturer’s directions before implanting any cattle. The growth promotant implants approved for use in the United States are extremely safe for both production and consumption. There is no required withdrawal time for slaughter with FDA approved implants.

The only approved location for implant administration is the middle third of the backside of the ear. All implants must be located SQ within this area (Figure 12). Implants should never be placed in locations other than the ear.

Routine inspection of implant sites should be done every time animals are handled through a chute. Document the results of the inspection for future reference in implant management decisions.

Figure 11. Hormone levels in beef

<table>
<thead>
<tr>
<th>Small Amounts Found in Beef</th>
<th>The difference in levels of estrogen found in beef from cattle raised with or without growth promotants is miniscule.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth promotants vs. no growth promotants (in nanograms of estrogen)*</td>
<td></td>
</tr>
<tr>
<td>3-ounce serving of beef from a steer treated with growth promotants</td>
<td>1.9</td>
</tr>
<tr>
<td>3-ounce serving of beef from a steer raised without growth promotants, such as certified organic beef</td>
<td>1.3</td>
</tr>
<tr>
<td>FDA-Approved Safe Levels</td>
<td>One serving of beef from a steer implanted with a growth promotant has nearly 20 times less estrogen than what the FDA permits, and thousands of times less than the amount our bodies naturally produce, not to mention a fraction of the phytoestrogen levels present in foods such as soybean oil, cabbage and grains.</td>
</tr>
<tr>
<td>Hormones in the Human Body</td>
<td>The human body naturally produces hormones in quantities much greater than could ever be consumed by eating any food. In fact, the average man or woman daily produces 35,000 times more hormones than could be present in beef or other food.</td>
</tr>
<tr>
<td>Male vs. Female (in nanograms of estrogen)*</td>
<td></td>
</tr>
<tr>
<td>Male child</td>
<td>41,500</td>
</tr>
<tr>
<td>Female child</td>
<td>54,000</td>
</tr>
<tr>
<td>Male adult</td>
<td>136,000</td>
</tr>
<tr>
<td>Female adult</td>
<td>460,000</td>
</tr>
<tr>
<td>Female adult (pregnant)</td>
<td>3,415,000</td>
</tr>
</tbody>
</table>

* A nanogram is one billionth of a gram, which is analogous to one blade of grass in an entire football field.

Sources: Food and Drug Administration; Hoffman and Evers; Scanga et al.; FSIS-USDA; Dr. Harlan Ritchie, Michigan State University.
Although there is no withdrawal period for implants, there are quality considerations in the timing. Aggressive implant strategies that maximize the response to the implant in growth and feed efficiency can compromise carcass grade. A conservative approach may not pay, however, when the Choice and Select price spread is too narrow to offset the lost value in feed efficiency and gain, which implants provide. It is as much an economic decision as it is a quality decision. The objective is to know your options, then plan and keep records to evaluate your decisions.

**Producer’s Guide for Judicious Use of Antimicrobials (Antibiotics) in Cattle**

1. **Prevent problems.** Emphasize appropriate husbandry and hygiene, routine health examinations, and vaccinations.

2. **Select and use antibiotics carefully.** Consult with your veterinarian on the selection and use of antibiotics. Have a valid reason to use an antibiotic. Therapeutic alternatives should be considered prior to using antimicrobial therapy.

3. **Avoid using antibiotics important in human medicine as first-line therapy.** Avoid using as the first antibiotic those medications that are important for treating strategic human or animal infections.

4. **Use the laboratory to help you select antibiotics.** Cultures and susceptibility test results should be used to aid in the selection of antimicrobials, whenever possible.

5. **Avoid using broad spectrum. Use narrow spectrum antimicrobials whenever possible.** Combination antibiotic therapy is discouraged.

6. **Avoid inappropriate antibiotic use.** Confine therapeutic antimicrobial 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.** This practice will 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. Always follow proper withdrawal times.

12. **Follow label directions.** 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. These regulations require a valid VCPR.

14. **Subtherapeutic antibiotic use is discouraged.** Antibiotic use should be limited to prevent or control disease and should not be used if the principle intent is to improve performance.

Source: Guidelines 1 through 13 adapted by NCBA, from AVMA, AABP, and AVC Appropriate Veterinary Antibiotic Use Guidelines.
Livestock Feeds and the Feed Supply

Sound feeding and management practices are an integral part of raising wholesome meat and milk products for consumers. Cattle should be provided a clean, readily accessible source of water from tanks or watering devices free from bacterial or nutrient contaminants. Producers should feed nutritionally balanced diets composed of quality forages and feedstuffs harvested and stored to prevent contamination. Provide a high quality mineral to improve effectiveness of vaccines and other medications. To prevent contamination of the meat and milk produced, no harmful residues should be allowed to enter the feed supply when cattle are fed.

Purchased Feeds

- Federal law prohibits the use of ruminant-derived animal protein in any feed fed to cattle (ruminants). At press time, an expanded version of this feed rule is under review. The producer is responsible for knowing and complying with regulations as they are amended.
- Several medicated feeds and feed additives are approved for use in cattle. However, medicated feeds must be used according to the label directions, and withdrawal times must be followed.
- Extra-label use of medicated feeds or feed additives by nutritionists or veterinarians is illegal and prohibited.
- Feeds (grain mixes as well as commodities) should be purchased from suppliers who have quality control programs in place and who stand behind their products.
- When purchasing commodities and/or by-products, ask for assurances that they do not contain contaminants (i.e., pesticides), which can cause meat residue problems.
- Maintain records of feed purchases to indicate source, date, and amount purchased for at least three years.

Feed Storage and Handling

- Do not use pesticide or insecticide containers to store feed or to feed cattle.
- Do not store crop chemicals, petroleum products, or other hazardous material in areas where feed is stored, mixed, or processed.
- Do not allow cattle access to areas where chemicals or other hazardous materials are stored.
- Do not allow moisture, rodents, and birds to contaminate the feed supply.
- Do not contaminate feeds with manure during feeding.

Pesticide and Petroleum Based Products

To avoid residue problems in cattle, pesticides (both insecticides and herbicides) need to be used according to the directions on the label. These labels contain directions on the time that must elapse before the crop is harvested, as well as the crops and intended purpose of those crops (i.e., grazing, forage, or grain crop). Be especially careful during years with drought, hail, or flood damage when grain crops are used as forages to feed to cattle.

If feeds are purchased, ask if pesticides were used and at what time in the growing/harvesting season they were applied. A producer is responsible for making sure all feeds are of high quality and are residue-free.
• Do not store full or empty pesticide containers in areas accessible to cattle.
• Do not store pesticide containers where feed is stored, mixed, or fed.
• Do not use pesticide containers to store feeds or to feed cattle.
• Do: Routinely check equipment for leaks of hydraulic fluid.

Ruminant Feed Ban Regulation
Purpose and Scope
The U.S. 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 with the goal of minimizing any risk to animals and humans. The final rule went into effect on August 4, 1997.

The regulation establishes certain requirements for renderers, protein blenders, feed manufacturers, distributors (including haulers), and individuals and establishments that are responsible for feeding ruminant animals.

The Ruminant Feed Ban regulation prohibits the use of proteins from ruminants in feeds intended for ruminant consumption. There are, however, certain exceptions to the rule at this time, including:

• Pure porcine or pure equine protein
• Blood and blood by-products
• Gelatin
• Milk products (milk and milk protein)
• Inspected meat products that have been cooked and offered for human food and further heat processed for animal feed use

Requirements for Producers Feeding Animal Proteins
This regulation applies to establishments, both large and small feeding operations, and to individuals who are responsible for feeding ruminants. Producers are required to keep the following records for 36 months:

1. 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 nonprohibited 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 nonprohibited sources.
2. Copies of labeling for feeds received, which contain permissible animal protein products. The agency 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, the placard for each shipment should be retained.
• Feed may also be received in bags or other containers that have attached labeling. In those instances, the labeling should be removed and retained. However, maintenance of only one such labeling piece is necessary from each shipment that represents a different product.
• 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.

Records should be legible and easy to retrieve. Producers must make copies of both invoices and labeling available for inspection and copying by the FDA if audited.

Can U.S. beef meet all the demands based on consumer's preferences and supply a good eating experience every time? Success can be measured by tracking personal consumption trends over a number of years. Through the '90s consumer demand appeared to decrease. However, it rebounded slightly in 1998. Since then it has stabilized and even increased into 2001. It is each producer's job to make certain that every customer is satisfied. To meet this goal the beef industry needs to produce calves that will hit the targets, fit the box and provide each customer with a great eating experience.

Consumer satisfaction (an enjoyable eating experience) is predicted by quality grade and yield grade. Currently, cattle are bought and sold on harvest weights with quality and yield grade scores.

### Quality Grades of Cattle

USDA quality grade is based on the amount of intramuscular fat in the ribeye muscle and age of the animal. As higher Quality Grade beef is cooked, the fat marbling melts and increases the juiciness of the meat. This also adds flavor and increases the perceived tenderness of the meat.

Quality grades of beef carcasses are based on two major factors: degree of marbling and maturity or the animal’s physiological age. Lean color, texture, and firmness are also considered in determining final quality grade. The quality grades for beef are: USDA Prime, Choice (young beef only-[A] maturity only), Select, Standard (young beef only-[A+B] maturity only), Commercial, Utility, Cutter, and Canner (older beef).

**Marbling**

This is the amount and distribution of fat within muscle. It is estimated in the loin muscle between the 12th and 13th ribs after the muscle is cut and exposed to air for at least 10 minutes (bloom time). Ten degrees of marbling are used in quality grading from lowest to highest: (1) devoid, (2) practically devoid, (3) traces, (4) slight, (5) small, (6) modest, (7) moderate, (8) slightly abundant, (9) moderately abundant, and (10) abundant.

The amount of marbling is used as an indicator of eating quality. Research indicates that marbling score explains only about 10 percent of the variation in tenderness. Marbling, however, is the primary measurable carcass trait related to tenderness.

**Maturity**

Maturity refers to the physiological age of the animal rather than its calendar age. The five maturity classifications from youngest to oldest are: A, B, C, D, and E. Degree of maturity, or physiological age as determined from bone and lean maturity, may not be the same as the actual age of the animal. However, approximate chronological age groupings for maturity degrees are as follows:

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>9-30 months</td>
</tr>
<tr>
<td>B</td>
<td>30-42 months (2½-3½ years)</td>
</tr>
<tr>
<td>C</td>
<td>42-72 months (3½-6 years)</td>
</tr>
<tr>
<td>D</td>
<td>72-96 months (6-8 years)</td>
</tr>
<tr>
<td>E</td>
<td>over 96 months (over 8 years)</td>
</tr>
</tbody>
</table>
Skeletal maturity is evaluated by assessing ossification of cartilage at various carcass locations, shape of ribs, and bone color. Lean maturity is assessed by evaluating muscle color. As animals age, some cartilage changes to bone, the color of muscle becomes darker due to accumulation of myoglobin, and muscle texture becomes coarser.

**Yield Grades of Cattle**

Yield grade is a prediction of amount of fat in a carcass. Hot carcass weight, backfat thickness, ribeye area and percent internal organ fat determine how many pounds of beef can be sold from a carcass. USDA yield grades range from 1 (leanest, most amount of meat) to 5 (fattest, least amount of meat).

Yield grades are numerical values between 1 and 5. These translate to estimates of the cutability of the carcass. Yield grade number corresponds to the yield of boneless, closely trimmed (about .3 inch), retail cuts from the round, loin, rib, and chuck. These four wholesale cuts represent over 75 percent of carcass weight and about 90 percent of carcass value.

Fat thickness is measured at a point (over the ribeye) perpendicular to the outer surface of fat and three-fourths the lateral length of the ribeye. This measurement may be adjusted to reflect unusual amounts of fat on other regions of the carcass. Ribeye area is determined by placing a grid directly on the flat surface of the ribeye.

Hot carcass weight is obtained at harvest just before the carcass is placed in a cooler. Kidney, pelvic, and heart fat are estimated in pounds for each carcass side, totaled, and divided by carcass weight to arrive at a percentage.

Quality and yield grades can work against one another. It is not enough to have a good yield or quality grade. Both must hit the target for customer satisfaction.

**Table 4. Relationship between yield grade number and carcass cutability.**

<table>
<thead>
<tr>
<th>Yield Grade</th>
<th>Cutability, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>54.6</td>
</tr>
<tr>
<td>2</td>
<td>52.3</td>
</tr>
<tr>
<td>3</td>
<td>50.0</td>
</tr>
<tr>
<td>4</td>
<td>47.7</td>
</tr>
<tr>
<td>5</td>
<td>45.4</td>
</tr>
</tbody>
</table>

Complete elimination of fat is not desirable. Fat in the muscle gives it flavor and juiciness and provides body stores of energy in the live animal. A ranch needs to monitor adequate fat cover and select animals that provide efficient amounts but eliminate the excessively fat animal.

**Grid Basics**

Most cattle are purchased on some type of grid (grade and yield basis) by the major packers in the West. Therefore, a basic understanding of the factors that affect carcass quality and yield grade is essential.

Generally, carcasses are rewarded for yield grades number 1 and 2 and discounted for those with a yield grade of 4 and 5. Also, carcasses with a quality grade of choice and Prime are usually worth more than those grading Select.

The dollar-value difference between Choice and Select carcasses vary with the season and demand. The spread can be $12 per hundred pounds or near zero. Usually there is a $4 to $5 spread in favor of those carcasses that grade Choice and Prime.
Management Practices to Improve Quality

Improving quality and consistency begins with understanding the industry targets for carcass traits. As always, targets for carcass defects are zero.

To improve quality and consistency, it is necessary to receive feedback on the performance of cattle that leave the production unit. Use this information as a basis for setting goals. By making adjustments, the consistency of meat products can be improved. Areas to evaluate include the rate of gain of cattle and feed conversion rate, and carcass grade.

Importance of Genetics

Cutability, the percentage of boneless, closely trimmed retail cuts from a beef carcass, is reduced by both excessive external fat and inadequate muscling.

Muscling is more than a beef-quality issue; it is also a feedlot efficiency issue. Feeding practices that allow for the full expression of lean tissue (muscle) growth and development prior to finishing will also positively impact carcass cutability, even in lighter muscled cattle. Finally, muscle growth is energetically more efficient than fat accumulation, and this fact translates into better overall feed efficiency and a lower cost of gain in cattle with more muscle. Cow-calf producers must understand that their breeding and selection practices significantly impact muscling, as it is one of the most highly heritable genetic traits.

Use EPD Values for Carcass Selection

Quality grade is a function of age and the ability to marble. Since age is relatively constant (above 14 months), genetics control the animal’s ability to produce a desirable product. Use carcass EPD's (expected progeny difference) to identify sires that have the ability to marble. Improvements can then be made in the industry for carcass quality grade and yield grade.

Carcass data are now available to the producer through various programs. In most breeds, carcass EPDs are available for carcass weight, marbling, ribeye area, and fat thickness. Other economic traits such as reproductive performance cannot be ignored while emphasis is placed on carcass traits.

Collect Carcass Data

Heritabilities are moderate to high for carcass traits (Table 2). Collecting and using carcass data is an excellent way to make herd improvements. Pasture mating or artificial insemination with individual sires allows identification of sires that produce desirable carcasses. In programs of multi-sire breeding, carcass data evaluations apply to the whole herd and are more difficult to effect genetic change.

Carcass data can be collected several different ways. The National Cattlemen's Beef Association (NCBA) has a carcass collection program arranged with several packing plants where either individual or group carcass data can be collected. USDA tags can be used to collect carcass information. Some custom feedlots will also offer carcass data collection as a service.

Most packing plants provide a detailed report on quality and yield grades of carcass lots. Regardless of the collection method, it is the producer's responsibility to make sure well in advance that the packing plant and the feeder understand that carcass data will be collected on a particular set of cattle.

Table 5. Heritability estimates for carcass traits

<table>
<thead>
<tr>
<th>Trait(s)</th>
<th>Heritability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass weight</td>
<td>.50</td>
</tr>
<tr>
<td>Quality grade</td>
<td>.40</td>
</tr>
<tr>
<td>Marbling</td>
<td>.35</td>
</tr>
<tr>
<td>Fat depth</td>
<td>.45</td>
</tr>
<tr>
<td>Ribeye area</td>
<td>.40</td>
</tr>
<tr>
<td>Yield grade</td>
<td>.30</td>
</tr>
<tr>
<td>% retail cuts (% cutability)</td>
<td>.30</td>
</tr>
<tr>
<td>Retail product weight</td>
<td>.40</td>
</tr>
<tr>
<td>Estimated retail cuts</td>
<td></td>
</tr>
<tr>
<td>Per day of age</td>
<td>.30</td>
</tr>
<tr>
<td>Fat trim weight</td>
<td>.50</td>
</tr>
<tr>
<td>Frame</td>
<td>.45</td>
</tr>
<tr>
<td>Muscling</td>
<td>.45</td>
</tr>
<tr>
<td>Tenderness</td>
<td>.50</td>
</tr>
</tbody>
</table>
Establish Permanent Individual Identification System

Identification of individuals that produce target genetics is a long-term process. Knowing which animal produces which group of calves and following them through the packing plant is mandatory. A permanent ID system needs to be established on each ranch to accomplish this.

Reduce Carcass Bruising

Carcass bruising costs the beef industry $22 million annually in carcass trim. The 2007 Market Cow and Bull Beef Quality audit indicated 12% of cow and 12% bull carcasses had major bruises, 31% and 20% of cows and bulls had medium bruises and 37% of cows and 32% of bulls had minor bruises.

Animals running into a protruding object is a significant cause of bruising but rough and careless handling causes more than 50% of all bruises. Observing proper cattle handling practices will reduce bruise defects and improve animal well-being. The following are additional actions that may be taken to reduce bruising:

- **Horns** - Groups of horned cattle have more bruises than polled cattle. Tipping will not reduce bruising. Dehorning of cattle, manual or genetic, is recommended. Over-crowding horned cattle on a truck will increase bruising.
- **Gates** - A common cause of loin bruises is throwing a gate into the side of an animal. A bruise will result if the animal becomes wedged between the end of the gate and the fence.
- **Protruding Objects** - Broken boards, nails, and exposed bolts should be eliminated from working facilities. Check facilities by looking for shiny, rubbed spots, or tufts of hair. Sliding gates (vertical or horizontal) should be padded with large-diameter hose. Corners can be padded by cutting strips from old tires or conveyor belts.
- **Fencing** - Planks, sheet metal, or other fencing materials should be installed on the side of posts toward the cattle. If animals are being handled on both sides of the fence, install a belly rail to prevent them from catching hips on the posts. The area from 28 inches to 52 inches from the floor is the hazard zone.

- **Flooring** - In new facilities with concrete floors where cattle are handled, score the concrete with an 8-inch diamond pattern with grooves one inch deep. In existing facilities, roughen the concrete, use rubber tire mats, or make a grid from 1-inch steel bars.

Even after healing, bruised muscles have scars in them that will still be tough eating for the consumer.

Avoid Excessive External Fat

Excessive external fat costs producers $50 per head of fed cattle marketed (2000 NBQA). Typically, the cost of this loss plus the carcass quality defects discussed in other sections of this BQA manual, are passed along to all producers because packers figure lost value into the prices paid for all cattle sold. In addition to average lost value to the market, excessive external fat creates less desirable yield grades, thus creating individual carcass discounts. Carcasses with adequate muscling and without excess external fat are rewarded for quality—particularly when sold on a grade and yield basis. National Beef Quality Audits indicated that beef quality improved with closely trimmed beef, heightened producer awareness of quality problems, improved cutability, and extended shelf-life or retail case-life of beef products. At the same time, the results of the audits show that more work remains to be done to improve eating quality and consistency.

Avoid Dark Cutters

Dark-cutting beef carcasses (dark cutters) produce meat that is dark, firm, and dry, and result in significant economic losses in the United States. Dark cutters are caused by preharvest stress, which
Depletes muscle glycogen stores. Without sufficient glycogen in the carcass, lactic acid cannot be produced to reduce the pH of the meat. Disease, weather, growth promotants, genetics, disposition, and handling practices before harvest all play a role in causing dark cutters.

**Feedlots:**
Mean percentages of dark cutters per pen differed between individual feed yards. This finding indicates that the incidence of dark cutters was in part due to different management philosophies or the structural attributes of the feed yards. The percentage of dark cutters may also be affected by when cattle are harvested during the week. Cattle that are “startup” cattle for the week can be expected to have more dark cutters because they may have more time to stand around than other sets of cattle brought in during the week.

**Environment:**
The occurrence of dark-cutting beef is highest during very cold weather combined with precipitation. These conditions increase the rate of body-heat loss and elicit shivering, which depletes glycogen stores. The incidence of dark cutters is high in hot weather or when large fluctuations in temperature occur over short periods of time (i.e., when temperatures fluctuate more than 10 degrees in a 24-hour period).

**Mixing Different Groups of Cattle:**
Don’t mix strange animals. Fighting to establish a new social order 24 to 48 hours prior to slaughter can increase the incidence of dark cutters. Bulls should be kept separate because mixing bulls with other cattle can cause dark cutters within 90 minutes.

**Crowding:**
Crowding can increase the incidence of dark cutters.

**Genetics:**
Temperament appears to be inherited. Producers are encouraged to add disposition as a selection criteria.

**Implants**
Cattle tend to have a lower incidence of dark cutters per pen when the time from reimplantation to harvest is longer than 100 days.

---

**Critical Management Points to Enhance Uniformity & Consistency**

1. Narrow the carcass weight variation in your herd by removing cattle that do not meet quality-product targets.

2. Aim for an optimum carcass weight range between 700 pounds to 800 pounds to provide the most flexibility.

3. Reduce the maximum carcass limit to less than 900 pounds and impose severe price discounts for carcasses that are too heavy.

4. Cull the cow herd by removing the extremes in cow size. This practice, over time, will lead to more uniformity in the calf crop.

5. Choose replacement heifers with average to high average frame scores rejecting those below average and those that are too large. The big fancy heifer will be the outlier of the future.

6. Bulls should be selected to fit a uniform target. When evaluating a bull battery, look for uniformity of type and size.

7. Calve in a short period of time. Thus calves marketed as a group should be relatively the same age, and uniformity of product will be increased.
Quality Assurance of Market Cows and Bulls

The sale of market cows and bulls accounts for 25 percent of all U.S. beef consumption. Beef and dairy producers must realize the value these animals contribute to the industry. Whole muscle products are fabricated and sold to foodservice operators as entrees in family steak houses and “quick-to-fix” supermarket beef products such as fajitas. Fast-food roast beef sandwiches and “Philly steak” sandwiches are also examples of products that result from market cow beef.

National Market Cow and Bull Quality Audits show that producers lose market value on every beef and dairy cow they sell from product defects such as: bruises, injection site lesions, hide damage, poor condition (lame cows, poor doers), and excess fat. In addition to these industry losses, individual producers lose much more when their own cull animals are condemned due to antibiotic residues and systemic diseases (i.e., bovine leukosis virus).

These economics are important at the individual farm level when considering the revenue cull animals provide for both the beef cow/calf and the dairy producer. According to the National Animal Health Monitoring Service (NAHMS), the income from the sale of cull animals provides 15 to 20 percent of gross herd revenue. This means the Best Management Practices found in this BQA Manual are just as important in culling and management for dairy and cow-calf producers as they are in marketing and management for steers and heifers. Today, the stakes are even higher because:

- Producers must demonstrate proper care for cull animals to be marketed.
- Producers must educate the public that cull animals are handled humanely.
- Public attention is focused on food safety and quality.
- More potential value is found today in defect-free subprimal cuts from market cows and bulls, which can be utilized as higher-value whole muscle cuts instead of ground beef.

Producers must think of their cows and bulls as part of the food supply and treat them accordingly. This is the necessary mindset that adds value to beef, builds consumer confidence, and safeguards the public image of the beef and dairy industries.

The profit gained from the sale of cull animals is dependent on the quality assurance practices used by producers. Beef and dairy producers must do a quality job of managing, transporting, and marketing their cows and bulls. The industry has seen a significant increase in trim losses due to arthritic joints (severe lameness) and injection-site blemishes (improper injection site and/or technique).

Quality assurance must be used in the production, management, and marketing of cows and bulls to maintain the highest profits possible for all segments of the beef industry. Quality control guidelines are easy for producers to use and adhere to. Most of the guidelines simply require common sense. Beef and dairy producers who implement these practices will find they pay dividends in other areas of productivity, herd health, and profitability—in addition to producing a more valuable market cow or bull for the beef industry.

Herd Culling

The Beef Improvement Federation defines culling as the process of eliminating less productive or less desirable cattle from a herd. Culling is used by beef and dairy producers to improve herd productivity and efficiency. Culling impacts revenue on a farm and contributes to the value of the total beef supply. To improve culling management and income, cattle producers should use the following methods:

- Establish strategic culling methods to identify reasons to cull individuals based on production and economics.
- Understand and practice quality assurance.
- Establish sound management practices for those identified cull cows and bulls.
Quality Control
Some quality control points require changes in current management practices, for instance:

- Giving injections in the neck instead of the hip.
- Reading and following meat and/or milk withdrawal times on product labels.
- Locating brands high on the hip instead of on the rib cage to prevent damage to the more valuable areas of the hide.

Bruises frequently have been cited by packers as a quality problem. An NCBA audit revealed there were about five times more bruises on cows than on bulls. Proper care and nutrition of cattle saves value in terms of saleable meat as well as reduced bruising. Cattle should be marketed in good body condition. When producers allow cattle to become emaciated, bruising occurs more easily and more frequently. Bruising can also be greatly reduced by using good dehorning practices.

The three largest quality losses in market cows and bulls are excess external fat, inadequate muscling, and whole cattle/carcass condemnation. With an improvement in management techniques, these quality losses can be minimized or even eliminated. By incorporating best management practices, beef and dairy producers improve beef value, the industry’s public image, and their bottom line.

Prevent Condemnations
Prevent drug residues and injection-site lesions by ensuring proper administration and observance of meat withdrawal times for all animal health products.

- Don’t: Market treated animals before the drug withdrawal time for meat has expired (In many cases this is a longer period of time than required for milk withholding.)
- Don’t: Market significantly lame cattle
- Don’t: Market animals that are emaciated
- Do: Euthanize disabled cattle and those with advanced or terminal conditions
- Do: Market animals with physical disorders in a timely way to avoid condemnations
- Do: Improve beef safety by implementing practices that reduce bacterial condemnations.

The Bottom Line for Quality Assurance of Market Cows and Bulls

- Manage cattle to minimize defects and quality deficiencies.
- Monitor the health and condition of market cows and bulls to improve herd profitability and produce a better end beef product to get a better price.
- Market in a timely manner and more expeditiously in terms of timing and season to lessen occurrences of disabled cattle, cancer eye, lameness, and emaciation.

Strategies for Marketing Cull Cows
Prevent Damage to Hide and from Bruising

**Bruising**
- Dehorn cattle at an early age.
- Correct deficiencies in facilities and transportation equipment.
- Use proper cattle handling techniques.

**Hide Damage**
- Use external parasite (lice, grubs, etc.) control practices.
- Use proper branding methods or permanent identification alternatives.

**Market at Adequate Body Condition**
Evaluate body condition because better condition means better price. Producers can improve the end product by:

- Marketing before cattle get too lean, too fat, and too thinly muscled and before they become emaciated.
- Feeding cull animals for a brief period prior to marketing to improve poor body condition.
- Preventing severe lameness by promoting foot health, monitoring cattle for early signs of lameness, and addressing conditions promptly before they progress to severe lameness.
- Providing dry-off time before marketing lactating cows.
Cattle Identification & Records

Individual identification of beef cattle has taken on a new life relative to the American beef industry. Emphasis on carcass quality, consumer satisfaction and awareness, and trace back needs have provided reasons for each and every beef animal to have a unique I.D. for its entire lifetime. The following four reasons outline the need for individual animal identification.

- Monitor annual performance
- Provide carcass data through the packing plant
- Assure quality and safety through the food chain
- Verify quality when a “trace back” is needed

Annual Performance Records

Traditionally, individual I.D. has been necessary to trace within herd performance for each heifer and cow. Traits that are monitored for the growth and reproduction performance of cows and calves are:

- Body Condition Score
- Pregnancy occurrence
- Calving ease
- Birth weight (date)
- Weaning weight (date)
- Yearling weight
- Frame score

These efforts have led to tremendous changes in beef performance, particularly growth, in the last two decades. Breed associations have been able to provide reliable estimates of performance (Expected Progeny Differences) as a result of these efforts. Commercial producers are less excited about individual I.D. because some lower performance animals can be noted and culled by other methods. However, they have used EPDs in sire selection to their advantage.

Carcass Data

Society today is demanding a consistently high-quality product to eat. Animals often change hands more than once before they reach the consumer. Further, genetics (at conception) often determine the quality eating experience. Branded beef marketing groups, delivering a specific beef product based on carcass information, have been increasing in number. The need to monitor individual animals producing superior and inferior eating experiences dictate those animals be identified for their life. Cow/calf, stocker and feeder operators all need feedback on the carcass merit of animals going through the system.

Food Chain Assurances

Food safety concerns, (pathogen elimination or reduction) coupled with traditional quality information leads to a life long partnership for producers (cow-calf and feedlot), packers, purveyors, and retailers. Contamination of product can occur in any segment including the consumer's kitchen. In order to respond, correct and continue production, these partners need not point the finger of blame at anyone else. Each segment must work together to eliminate any problems, hopefully before they happen. Again, permanent animal I.D. is the central element needed for this to happen.
“Trace Back”
Whenever a food-safety issue occurs, such as a violative residue, all attempts are made to find the source. Responsibility falls down through the food chain until someone accepts the error or the blame sinks to the bottom of the chain, the cow-calf producer. The only insurance against this type of false-incrimination will be to, 1) follow critical management practices, 2) document what you did, and 3) present evidence when challenged. For this to occur, animals need permanent, life-long I.D.

Types of Permanent Identification Available
- Freeze branding
- Hot-iron branding
- Ear Tattoo
- Ear Tags
- Electronic ear tags
- Electronic implants

Records
To ensure consumer confidence and maintain market share, beef and dairy producers must be able to document the safety of their product. Through appropriate written documentation of products and processes used in managing beef and dairy cattle, producers can prevent residue problems. As a result, consumer confidence is strengthened. In addition, records showing and verifying the age and source of cattle are essential for value-added export markets.

Meat and milk products are routinely tested for violative residues by the U.S. Food and Drug Administration and the U.S. Department of Agriculture. If a problem is detected, good records can help demonstrate responsible management. Effective documentation shows compliance with BQA training, proper animal identification, and effective and responsible use of drugs, pesticides, and herbicides. All records must be maintained in a permanent or written format for a minimum of three years. Producers and commercial haulers of cattle are responsible for ensuring that cattle are free of potential residues.

Various record keeping forms can be found on the internet and can be used as is or as a reference for developing a good record keeping system. Computerized systems make extensive evaluation easy and efficient; however, hand-kept record systems are still very effective. Each system has its own merits. The important thing is to be consistent in keeping records that are legible, easily retrieved, and maintained for a period of at least 36 months.

Maintaining Proper Records
Cattle producers must be able to document all the steps of production. Good production records allow for documentation, analysis, and improved financial decisions. Maintaining a permanent record of all animal treatments is crucial for keeping drug residues out of meat and milk. Records should also provide a history so you and your veterinarian can better prescribe meaningful therapy and ensure that animals do not get sold for harvest or milk is marketed before the withdrawal time has expired. Records also serve as protection in case of regulatory follow-up.

It is important that all information recorded be maintained for at least three years.

The treatment record should contain the following basic information:
- Treatment date
- Animal or group or lot identification
- Withdrawal time to slaughter for medication given
- Product used and manufacturer’s lot/serial number
- Dosage given
- Route of administration (SQ, IM, etc.)
- Individual who administered the drug

Treatment record forms, found at the end of this manual, can help record your cattle treatments.
Environmental Stewardship

Beef cattle production depends upon our bountiful natural resources. Caring for these resources helps ensure that cattle production is ecologically and socially sustainable. Natural resources must be monitored to learn whether or not current management needs to be adjusted.

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. That information can then be used to defend current management when questioned by critics.

The most important resources for ranchers to manage are vegetation, streambanks/riparian areas and water quality. Each of these areas has specific environmental control points that can be managed and monitored.

Forage Management

Livestock have been produced for centuries around the world. This fact alone demonstrates that livestock can be produced in an environmentally sound – and sustainable – manner. Both rangeland and introduced pastures are utilized in livestock production systems.

Management strategies are generally different between the two systems due to environment, soil type, relief and the fact that fertilizer is a common input associated with introduced forage production systems. Rangelands are natural systems managed by ecological principles, while pastures (which can be made up of native or introduced forages), are usually managed according to agronomic principles with cultural inputs.

While abuses have occurred in the past that degraded both forage and soil resources, current Best Management Practices seek to optimize livestock production in a manner that protects and/or enhances the environment.

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.

The following brief discussion illustrates those aspects of forage management and production that can have the greatest negative impact on the environment, as well as Best Management Practices for minimizing those impacts.

Stocking Rate

Stocking rate is defined as the relationship between the number of animals and the grazing management unit utilized over a specified time period. Stated more simply, it is the number of acres required per animal unit for the grazing season that can be sustained on a long-term basis without forage resource degradation.

A useful term in helping define stocking rates based on forage demand is the animal unit. 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. Using appropriate stocking rates for the system being managed is related to the following aspects of environmental quality.

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.

Under these conditions, carrying capacity is diminished, animal performance is reduced and the potential for profit is eliminated. Input costs (such as increased herbicide use and increased winter feeding costs) associated with the livestock production enterprise are increased, thus making a bad situation worse.

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.

Water quality and conservation
As a result of overstocking, earlier seral stage plant species (weeds) that increase in abundance generally do not provide adequate ground cover. 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.

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 storage 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.

Soil conservation
Loss of topsoil, either as a result of rain or wind, is known as erosion. Bare soil exposed to raindrop impact (splash) dislodges topsoil particles, which are lost from the site as sediment trapped in the runoff. In other words, the more bare soil you have, the larger the impact of the “splash” 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. 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.

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
1. More pastures and smaller pastures increase management flexibility and provide greater opportunity to control the timing, frequency and severity of grazing.
2. 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%
3. 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.
4. Shrub utilization should not exceed 50-60% during the growing season.
5. Stubble height at the end of winter grazing should be at least 2 to 4 inches for most grasses.
6. 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.
7. Plants recover faster when more leaf area remains after grazing.
8. Grazing an area more often and for shorter periods (i.e. 3 weeks at a time or less) is preferable to fewer and longer grazing periods.
9. When environmental damage from cattle grazing occurs, it is often a result of poor cattle distribution or too many animals.
10. Prevent cattle from congregating near surface water. Fencing, alternative water sources, supplemental feeding and salt and mineral placement can promote dispersion of cattle away from water sources.
11. 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.

**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 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.

**Soil Fertility Guidelines**

1. Use soil testing to determine the level of nutrients required for the optimum production of the target forage species.
2. 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. Animal wastes, such as poultry litter or manure, have been shown to be effective fertilizers.
3. 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 testing and fertilizing according to recommendations is critical when using animal waste as fertilizer. (Also, spreading raw manure on pastures can create potential sources of cattle disease problems.)
4. Record all applications (rate and nutrient composition) of fertilizer, regardless of source, and the area to which it was applied.

**Water Quality**

Water quality can be thought of in three categories: biological, physical and chemical.

- Biological – things such as bacteria, viruses, protozoa and eggs of worms.
- Physical – color, turbidity, sediment, temperature, odor, algae (blue-green can produce toxic effects).
- Chemical – pH, total dissolved solids (TDS), nitrates/nitrites, phosphates, sodium, sulphates. If high levels of total dissolved solids are detected, use elemental scans to determine which salts are potential problems.

**Water Quality Guidelines**

1. Develop water sources using gravity, solar, wind or electric power to prevent cattle from watering in streams.
2. Limit cattle access to streams and sensitive riparian areas. Fence critical management areas with temporary or permanent fence. Electric fence works well.
3. Provide vegetative filter/buffer strips between corrals and streams. Width of the strip is dependent on soil type and slope.
4. Install runoff diversions above livestock holding areas or corrals to keep up-slope runoff from mixing with runoff from corrals.
5. Install dikes and/or sediment ponds below livestock holding areas or corrals and streams.
6. Seal all old and abandoned wells and protect active wells from being a source of contamination to groundwater.
7. Portable windbreaks will draw animals out of riparian areas and are especially good in winter.
Proper Injection Site and Administration Techniques

1. Place all injectable products in the neck area forward of the shoulders.
2. Choose to administer injectable products SubQ whenever the product label allows.
3. If an intramuscular product is required, place injection into muscles in front of the shoulder region only.
4. Use sharp, sanitary needles, between 16 gauge and 18 gauge and 1 inch to 1½ inches, for all intramuscular injections.
5. For adult animals, inject no more than 10 cc of product per site and separate injection sites by at least four inches.
6. For calves and light weight cattle, reduce the volume of product per site and maintain separation of sites.
7. Be aware of additive offset of certain products on young animals.
8. Change needles often, i.e. every 15 animals to 20 animals and/or whenever the syringe needs to be refilled. Be certain to sanitize the needle between each injection.
9. Avoid giving injections when animals are wet and/or injection sites are covered with dirt, mud, manure or any other contaminating material.
Missouri Beef Quality Assurance (BQA)
Self-Study Certification Questions

Note: Those certified through the Missouri Stocker Feeder Quality Assurance Program or MFA HealthTrack, are automatically BQA certified and need not complete this test.

Name _____________________________________________________ Date _____________________

Record your answers on the answer sheet following these questions. Please remember to include the date, name, address and phone number. Return to: Missouri Cattlemens Association, 2306 Bluff Creek Drive, Columbia, MO 65201.

1. (True/False). One purpose of the BQA is to protect consumer confidence in beef safety and quality. (Page 6)

2. The BQA Program is driven by: (Page 7)
   d. None of the above  e. All of the above

3. When administering medications, which is the preferred route? (Page 20)
   a. Orally  b. IM  c. Sub-Q  d. IV

4. (True/False) No one, including a veterinarian or nutritionist, is allowed to adjust the dose of feed additives or medications outside of label indications. (Page 25)

5. (True/False) Over the counter drug dosage can be adjusted by a veterinarian within the context of a valid veterinary/client/patient relationship. (Page 25)

6. For IM injections, if a calculated dose of 36 cc is to be given, which of the following is the most appropriate? (Page 21)
   a. Use 4, 9cc injections  c. Use 2, 18cc injections
   b. Use 3, 12cc injections  d. Use 1, 36cc injection IV

7. All records must be kept for a minimum of _____ years from the day of transfer of the cattle from the operation. (Page 23 & 38)
   a. One  b. Three  c. Ten  d. Twenty

8. Of the following feedstuffs, which would be considered high risk? (Page 29)
   a. Fat  c. Corn
   b. Rendered ruminant by-product  d. None of the above
   e. A and B

9. The dosage of an injectable antibiotic may be altered from the label dosage by: (Page 24)
   a. Veterinarian  c. The Producer
   b. No One  e. A and C

10. (True/False) Bruising as a result of improper cattle handling costs the industry approximately $61 million annually in carcass trim. (Page 33)

(continued on page 44)
11. If five cattle in a group of 50 need to be treated but cannot be individually identified: (Page 38)
   a. They cannot be treated.
   b. They must be treated with an over-the-counter medication.
   c. They can only be treated with a feed or water medication.
   d. The withdrawal time for the treated animals is applied to the entire group.

12. The extra-label drug usage policy of FDA-CVM specifies that:
   a. A determination must be made that there is no marketable drug specifically labeled to treat the condition diagnosed.
   b. A careful diagnosis is made by an attending veterinarian within the context of a valid veterinarian/client/patient relationship.
   c. Procedures are instituted to assure that identity of the treated animal is carefully maintained.
   d. All of the above.

13. When using a thick SubQ injectable on a 600 pound steer the following needle is recommended: (Page 22)
   a. 1-inch, 18 gauge
   b. 1/2-inch, 18-16 gauge
   c. 3/4-inch, 16-14 gauge
   d. 1 1/2-inch, 16 gauge

14. An animal that has been injected with any product in the rump or hind leg: (Page 20)
   a. Will have an injection site blemish
   b. Is acceptable if it is a vitamin injection
   c. Will have toughened muscle tissue
   d. Is unacceptable within BQA
   e. ONLY a, c and d

15. Exceptions to the federal Mammalian Protein Ban include:
   a. Pure porcine and pure equine protein
   b. Blood and blood by-products
   c. Gelatin
   d. All of the above

Please identify who will be on your BQA team:
Certification
Self-Study Answer Sheet

Name: ____________________________________________ Date: _________________________

1. ______________
2. ______________
3. ______________
4. ______________
5. ______________
6. ______________
7. ______________
8. ______________
9. ______________
10. _____________
11. ______________
12. ______________
13. ______________
14. ______________
15. ______________

BQA Team:
_________________________________________
_________________________________________
_________________________________________

*See note at top of test on page 43.

Please continue to page 46 to complete certification
Missouri Beef Quality Assurance Program
Training Program Checklist and Personal Contract

(Please answer the following questions YES or NO as they relate to BQA.)

1. A quality feed control program will be maintained for all incoming ingredients. This program will analyze any suspect contamination and eliminate any contaminated products as a result of molds, mycotoxins, or chemicals. qYES qNO

2. Only FDA-approved medicated feed additives will be used in rations and they will be used in accordance with the FDA label, including administration procedure, dosage, and withdrawal time. Extra label drug use of feed additives will not be used at any time or for any reason. qYES qNO

3. Records will be maintained for at least two years and will contain the batches of feed produced, which contain the additive, date run, ration number or name, and amount produced. qYES qNO

4. All individual treatments will be given in the neck region regardless of being administered subcutaneously or intramuscularly. qYES qNO

5. All individual treatments will strictly follow only FDA/USDA/EPA guidelines and products which cause tissue damage will be avoided. qYES qNO

6. Products will be administered at the lowest dosage recommended and will be administered in such a manner where there will not be more that 10cc per IM site administered. qYES qNO

7. Treatment procedures will comply with either label directions or as prescribed by a veterinarian with a valid Veterinarian/Client/Patient relationship. qYES qNO

8. All treatments administered extra label will be kept to a minimum and when extra label treatments are given, they will comply with the prescribed extended withdrawal time. qYES qNO

9. Treatments will either be recorded on a group/pen basis if given to a pen, or if given to animals pre-weaning, and on an individual basis if given to an animal post weaning. Records will consist of date, pen/individual identification, product used, amount given, route and location given, and withdrawal time. qYES qNO

10. All cattle shipped will be checked to verify withdrawal times have been met and a release slip will be signed, dated, and sent with those cattle verifying this information. qYES qNO

11. Should there be any question about withdrawal periods being met, veterinarians will evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank and the animal will be subject to pass a residue screening test. qYES qNO

12. All records will be kept for two years and transferred with the cattle as they move from one operation to another and will also be available for inspection by Missouri Cattlemen’s Association staff or other named individuals in order to determine compliance. qYES qNO

13. The operation will strive to prevent bruising during animal handling. qYES qNO

14. Should previous owner request performance information of cattle, all information available will be relayed back to them. qYES qNO

I understand the importance of the above items in the Missouri Beef Quality Assurance Program and agree to follow the recommended production practices.

Print Name: ____________________________ Operation: __________________________
Address: __________________________________________________________________________
City: ____________________________ State: _______ Zip: _______
Phone: ____________________________ E-mail: __________________________
Signature: ____________________________ BQA Trainer: __________________________

Return this page to: Missouri Cattlemens Association, 2306 Bluff Creek Drive, Columbia, MO 65201.
Cow-Calf Checklist

This checklist will assist in the identification of Best Management Practices where problems commonly occur.

**Individual Treatments**

- Written records are kept, including individual identification, date of treatment, product used, amount given, route and location of administration, withdrawal time, serial number (for vaccines), tentative diagnosis, and outcome of treatment.

- All cattle receiving treatment are individually identified.

- All injections are given in the neck region (or as specified by the product label).

- All injections are given subcutaneously (SQ) if possible.

- All medications and drugs are used according to label directions.

- Extra care is taken to select injection sites free of manure and dirt.

- Extra care is taken to see that needles are sharp, changed after 10 to 15 animals, and to avoid broken and burred needles.

- Needle size used is never larger than necessary to adequately perform the injection.

- Label directions are followed for maximum volume per injection site (maximum 10 cc per site).

- Methods of administration—IV (intravenous), IM (intra-muscular), SQ (subcutaneous), or IN (intranasal)—are followed according to label directions.

- Needles and rectal sleeves can be changed between each animal to prevent the spread of blood-borne infectious diseases (i.e., Bovine Leukosis Virus (BLV) and anaplasmosis.)

- Chemical disinfectants (i.e. rubbing alcohol) are avoided when using modified live viral products.

- When extra-label animal health products are administered, their use and drug withdrawal time is based on a veterinarian’s recommendation. This information should be provided on a label by the prescribing veterinarian. (Should there be any question about withdrawal period, veterinarians can evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank.)

- All animal health procedures and products are periodically reviewed by a veterinarian.

**Feed Supply**

- Only feedstuffs manufactured in compliance with the Ruminant Feed Ban are utilized.

- Records are kept for purchased concentrate or grain mixes indicating source, date, and amount purchased, and are maintained for at least 36 months when animal byproducts are used.

- Feed additives are used at recommended usage levels and appropriate products (i.e., free-choice mineral).

- All pesticides used on crops fed to cattle are applied according to label directions and withdrawal times are followed.
- Pesticides are stored in a room separate from feed supplies and feed additives.
- All feeds are checked at regular intervals for changes in color, temperature, odor, moisture, and presence of foreign matter.

**Livestock Insecticides**
- All insecticides are applied on the basis of label dosages and routes of administration.
- All insecticides are stored in a designated area away from the feed supply and are not accessible to cattle.
- All insecticides are appropriately labeled.

**Facilities and Transportation of Cattle**
- All cattle are handled in a manner that minimizes bruises.
- Loading facilities ensure quick and safe loading and unloading with no bruising.
- Adequate shade and shelter provided and mud minimized around feeding areas.
- Clean areas are provided at calving.
- All farm personnel who handle cattle have been informed about proper processing techniques and provided with training to understand cattle behavior and recommended handling techniques.
- Non-ambulatory (or downer) cows are euthanized humanely.

**Herd Management**
- Bulls are removed from the cow herd and pregnancy exams are performed to maintain a 60-day calving interval.
- Health management includes biosecurity evaluation and planning.
- New additions and show animals are isolated (no nose-to-nose contact) from herd for minimum of two weeks.
- Cows are culled on a regular basis to prevent the marketing of over-fat cows, extremely thin cows, lame cows, and cows with advanced physical problems.
- If branding is used, they are placed high on the hip and as small as possible.
- Do not mix too much vaccine at one time. Modified live vaccines (MLV) begin to degrade after about an hour in the heat and sunlight. Therefore, place in a cooler with a cool pack and cover.
Dairy Herd Checklist

This checklist will assist in the identification of Best Management Practices where problems commonly occur.

**Individual Treatments**

- Written records are kept, including individual identification, date of treatment, product used, amount given, route and location of administration, withdrawal time, serial number (for vaccines), tentative diagnosis, and outcome of treatment. Dry eraser boards can be used in the milking parlor to identify cows treated, however these records must be transferred to a permanent written record.

- All cattle receiving treatment are individually identified.

- All injections are given in the neck region (or as specified by the product label).

- All injections are given subcutaneously (SQ) if possible.

- All medications and drugs are used according to label directions.

- Extra care is taken to select injection sites free of manure and dirt.

- Extra care is taken to see that needles are sharp, and use of broken and burred needles is avoided.

- Needle size used is never larger than necessary to adequately perform the injection.

- Label directions are followed for maximum volume per injection site (maximum 10 cc per site).

- Methods of administration—intramammary, IV (intravenous), IM (intra-muscular), SQ (subcutaneous), or IN (intranasal)—are followed according to label directions.

- A new needle and rectal sleeve is used for each animal to prevent the spread of blood-borne infectious diseases (i.e., Bovine Leukosis Virus [BLV] and anaplasmosis.)

- Chemical disinfectants (i.e. rubbing alcohol) are avoided when using modified live viral products.

- When extra-label animal health products are administered, their use and drug withdrawal time is based on a veterinarian’s recommendation. This information should be provided on a label by the prescribing veterinarian. (Should there be any question about withdrawal period, veterinarians can evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank.)

- All animal health procedures and products are periodically reviewed by a veterinarian.

**Feed Supply**

- Only feedstuffs manufactured in compliance with the Ruminant Feed Ban are utilized.

- Records are kept for purchased concentrate or grain mixes indicating source, date, and amount purchased, and are maintained for at least 36 months when animal byproducts are used.

- Feed additives are used at recommended usage levels and appropriate products.

- All pesticides used on crops fed to cattle are applied according to label directions and withdrawal times are followed.
Pesticides are stored in a room separate from feed supplies and feed additives.

All feeds are checked at regular intervals for changes in color, temperature, odor, moisture, and presence of foreign matter.

**Livestock Insecticides**

- All insecticides are applied on the basis of label dosages and routes of administration.
- All insecticides are stored in a designated area away from the feed supply and are not accessible to cattle.
- All insecticides are appropriately labeled.

**Facilities and Transportation of Cattle**

- All cattle are handled in a manner that minimizes bruises.
- Loading facilities ensure quick and safe loading and unloading with no bruising.
- Adequate shade and shelter provided and mud minimized around feeding areas.
- Clean areas are provided at calving.
- All farm personnel who handle cattle have been informed about proper processing techniques and provided with training to understand cattle behavior and recommended handling techniques.
- Non-ambulatory (or downer) cows are euthanized humanely.

**Herd Management**

- Cows are observed regularly for body condition score, mastitis and early signs of lameness and are treated or culled in a timely manner to prevent the marketing of over-fat cows, extremely thin cows, lame cows and cows with physical problems.
- Cows that are to be culled are given dry-off time before marketing.
- Do not mix too much vaccine at one time. Modified live vaccines (MLV) begin to degrade after about an hour in the heat and sunlight. Therefore, place in a cooler with a cool pack and cover.
Stocker/Backgrounder/Feedlot Checklist

This checklist will assist in the identification of Best Management Practices where problems commonly occur.

**Individual Treatments**
- Written records are kept, including individual identification, date of treatment, product used, amount given, route and location of administration, withdrawal time, serial number (for vaccines), tentative diagnosis, and outcome of treatment.
- All cattle receiving treatment are individually identified.
- All injections are given in the neck region (or as specified by the product label).
- All injections are given subcutaneously (SQ) if possible.
- All medications and drugs are used according to label directions.
- Extra care is taken to select injection sites free of manure and dirt.
- Extra care is taken to see that needles are sharp, changed after 10 to 15 animals, and to avoid broken and burred needles.
- Needle size used is never larger than necessary to adequately perform the injection.
- Label directions are followed for maximum volume per injection site (maximum 10 cc per site).
- Methods of administration—IV (intravenous), IM (intra-muscular), SQ (subcutaneous), or IN (intranasal)—are followed according to label directions.
- Needles and rectal sleeves can be changed between each animal to prevent the spread of blood-borne infectious diseases (i.e., Bovine Leukosis Virus (BLV) and anaplasmosis.)
- Chemical disinfectants (i.e. rubbing alcohol) are avoided when using modified live viral products.
- When extra-label animal health products are administered, their use and drug withdrawal time is based on a veterinarian’s recommendation. This information should be provided on a label by the prescribing veterinarian. (Should there be any question about withdrawal period, veterinarians can evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank.)
- All animal health procedures and products are periodically reviewed by a veterinarian.

**Feed Supply**
- Only feedstuffs manufactured in compliance with the Ruminant Feed Ban are utilized.
- Records are kept for purchased concentrate or grain mixes indicating source, date, and amount purchased, and are maintained for at least 36 months when animal byproducts are used.
- Feed additives are used at recommended usage levels and appropriate products (i.e., free-choice mineral).
- All pesticides used on crops fed to cattle are applied according to label directions and withdrawal times are followed.
- Pesticides are stored in a room separate from feed supplies and feed additives.
All feeds are checked at regular intervals for changes in color, temperature, odor, moisture, and presence of foreign matter.

**Livestock Insecticides**
- All insecticides are applied on the basis of label dosages and routes of administration.
- All insecticides are stored in a designated area away from the feed supply and are not accessible to cattle.
- All insecticides are appropriately labeled.

**Facilities and Transportation of Cattle**
- All cattle are handled in a manner that minimizes bruises.
- Loading facilities ensure quick and safe loading and unloading with no bruising.
- Adequate shade and shelter provided and mud minimized around feeding areas.
- All farm personnel who handle cattle have been informed about proper processing techniques and provided with training to understand cattle behavior and recommended handling techniques.
- Non-ambulatory (or downer) cows are euthanized humanely.

**Herd Management**
- Health management includes biosecurity evaluation and planning.
- Isolate (no nose-to-nose contact) new additions from other cattle for minimum of 2 weeks.
- If branding is used, they are placed high on the hip and as small as possible.
- Do not mix too much vaccine at one time. Modified live vaccines (MLV) begin to degrade after about an hour in the heat and sunlight. Therefore, place in a cooler with a cool pack and cover.
Veterinary/Client/Patient Relationship Validation Form

I. Producer

Producer Name:________________________________________

Address:___________________________________ City:_________________ Zip:______

Farm Name and Location:________________________________________

Section:_______________ Township:_______________ County:__________

Certified Status:

Verified:________________________________________ Review Date:_______________

Expiration Date:_______________

Type of Operation Certified: (circle all that apply)

1. Cow-Calf 2. Dairy Production (cull cows)

3. Beef and/or Dairy Beef Grower 4. Beef and/or Dairy Beef Grower-Finisher

II. Veterinarian

Name:________________________________________, DVM

Address:___________________________________ City:_________________ Zip:______

Farm Name and Location:________________________________________

SD License No. ______________________ USDA Accreditation No. ______________________

I hereby certify that a valid Veterinarian/Client/Patient/Relationship (VCPR) is established for the above listed owner and will remain in force until canceled by either party or the verification expiration date is reached.

Veterinarian’s Signature:________________________________________

Date:________________________________________
# Individual Animal Treatment Record

(Records should be maintained for at least 3 years)

| Year: | Farm name/Owner: |

<table>
<thead>
<tr>
<th>Date</th>
<th>Animal ID</th>
<th>Problem/Diagnosis</th>
<th>Product</th>
<th>Dosage</th>
<th>Route Given*</th>
<th>Site</th>
<th>Meat Withdrawal</th>
<th>Notes</th>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time [days]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Route of administration: SC, IM, oral, topical, IV, or intramammary.
**Processing/Treatment Map**

Name: ____________________ Address: ____________________

City: ____________________ State: ____ Zip: _____________ Ph: _____________

**Identify Brand and Indicate Location**

List “Procedure Number” on the line above which corresponds to the side of the cattle the injection was given. Give all injections within the Injection Triangle.

When possible select SQ products, and never give injections in rear leg or top butt.

**List of Common Procedures:**
- Respiratory Virals
- Clostridials
- Pasteurella
- Brucella
- Internal Parasites
- Coccidiostat
- External Parasites
- Antibiotics
- Creep/Bunk Broke
- Micro-Nutrients
- Implants
- Medicated Feed

Circle procedure performed and list on numbered line in table below AND list number on line above that corresponds to the side of the cattle the injection was given.

**NOTE:** Use the Injection Triangle for all shots.

<table>
<thead>
<tr>
<th>Procedure / Procedure #</th>
<th>Lot or Serial #</th>
<th>Company</th>
<th>Date Given</th>
<th>Date Withdrawal</th>
<th>Route Admin</th>
<th>Dose</th>
<th>Booster N/Y-when</th>
<th>Crew Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of Cattle: _________ Date Weaned: _________ Dehorned (Yes / No)

Bulls _______ Steers ______ (method _______ ) Heifers _______ (Spayed: No/Yes = method _______ )

ID: Right Ear or Left Ear/Group color and number: _________ /Individual (as appropriate):_________

Description / Comments:

Owner’s Signature: ____________________ Date: ____________________

Veterinarian’s Signature: ____________________ Phone: ____________________
I have checked the Health Maintenance, Feeding, and Treatment records for Group/Pen/Lot identification(s) or Individual animal identification listed below. All the cattle have been managed to meet the recommendations and comply with all the requirements which apply to this operation in the National Beef Quality Assurance program.

<table>
<thead>
<tr>
<th>Head</th>
<th>Group / Pens / Lot</th>
<th>Individual animal numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date:_________________ Signature:__________________________

Manager and/or Owner ______________________________________________________________________________________

Name of Operation _________________________________________________________________________________________

Phone (Day and Evening) __________________________________________________________________________________

Address _________________________________________________________________________________________________

City/State/Zip __________________________________________________________________________________________
Keep up with the Beef Industry

www.mobeef.org
www.beef.org
www.bseinfo.org
www.beefusa.org

Missouri Beef Industry Council
2306 Bluff Creek Drive #200
Columbia, MO 65201
573-817-0899/ beefinfo@mobeef.com

Funded through the $1 per head beef checkoff program.