



National Manual



**A SAFE, WHOLESOME AND
HEALTHY BEEF SUPPLY**



Beef Quality Assurance™ Manual

“Quality Assurance is everyone’s job, our future depends upon it ... and there are not most valuable players.”

It is every producer’s obligation to utilize management and judgment that ultimately lead to a positive eating experience for the consumer.



Beef Quality Assurance Program (BQA™)

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All materials, including record templates and presentation materials can be downloaded from the BQA Website at: www.BQA.org (This address may change to the State Coordinator’s Portal?)

SECTION I INTRODUCTION

Welcome

Welcome to the Beef Quality Assurance (BQA) program. Those who are familiar with the BQA program will find this a great review. Those not familiar with BQA will find this material helpful as part of a training program designed to help identify and manage areas in beef production operations where defects in quality can occur. The BQA program encourages you to seek and utilize all sources of information; these actions will help accomplish the BQA program's goals and objectives. The BQA program is a cooperative effort between beef producers, veterinarians, nutritionists, extension staff, and other professionals from veterinary medical associations and allied industries.

Cattle managed using BQA guidelines will be less likely to contain a violative residue, contain injection site tissue damage or foreign material such as a broken needle. The program asks everyone involved with beef production to follow the FDA/USDA/EPA guidelines for product use and to use common sense, reasonable management skills and accepted scientific knowledge to help prevent product defects at the consumer level. **Remember, the consumer signs the paycheck, they purchase what they trust and their trust and confidence is the basis of our industry's future, and our children's future.**

As a food producer, your livelihood depends on securing the trust of your consumers. Food safety – or the perception of it – plays a major role in the buying decisions of health-conscious Americans all across the country. Fortunately for beef producers, the public generally perceives beef as a safe and wholesome product. However, there is no such thing as “too” safe when it comes to the food consumers buy for themselves – and their children. After all, the beef you produce is a product that somebody will put in his or her mouth.

Add to that reality the ever-increasing competition for the consumer's protein dollar, and you quickly see how crucial it is for beef producers, of all sizes in every segment, to commit to a management strategy that inspires consumer confidence in the safety of beef products.

In addition to safety, factors affecting cattle quality – and food quality – are also important. At the consumer level, quality attributes such as tenderness, flavor and portion size are important. At the production level, we are concerned with things like performance, health and predictability all through the system.

In both cases, these quality factors can be affected by management decisions throughout the production chain – including management decisions at the cow-calf and stocker levels.

Furthermore, consumers have become more environmentally-conscious. They are more closely scrutinizing agricultural practices that affect air and water quality and animal well-being. Although these factors may or may not directly affect the safety and quality of beef, they impact public perceptions of the beef industry, which may alter consumer acceptance of beef products.

The beef industry is evolving into vertically-coordinated (vs. integrated) production systems, which require all segments – from the cow-calf producer to the consumer – to communicate and share information to assure that beef is safe and wholesome, increase the efficiency of production and help ensure environmental quality.

Beef Quality Assurance is a proven system of sensible management practices that will help further strengthen consumer confidence in beef products. Adopting BQA principles is a proactive way to implement a philosophy of Total Quality Management (TQM) into a beef operation and address quality and safety issues.

BQA can also help a producer become more competitive. Active participation in this program is beneficial as the world's image of beef originating from the United States is enhanced.

The Beef Quality Assurance manual was developed for use in the BQA program to help provide a TQM framework for cow-calf and stocker producers. The information in this manual and the instruction and

support throughout the training sessions will help identify critical points in a beef production operation that may influence safety and quality.

Helping to ensure food safety and quality from the producer to the consumer requires everyone involved with beef production to follow regulatory guidelines for product use and to utilize BQA Best Management Practices (BMPs). The BMPs outlined in this manual are based on accepted scientific knowledge.

The History of Beef Quality Assurance

In the early 1960s, the Pillsbury Company, NASA and the U.S. Army Natick Laboratories (now the U.S. Army Natick Research and Development Center) cooperatively developed a revolutionary quality control program. Its objectives were to help ensure food safety on NASA missions and to reduce the chance of product defects from entering the food chain.

Their program, the Hazard Analysis Critical Control Point (HACCP) system, gained U.S. Department of Agriculture acceptance and is presently the accepted framework for safety assurance programs in processed and fresh foods. HACCP plans are simply prevention plans that identify and help control potential food hazards and monitor critical points of the production process.

Concerned with additional government regulation, beef producers began investigating ways to help ensure that their production practices were safe and would pass the scrutiny of the consumer. In 1982, the USDA's Food Safety Inspection Service (FSIS) began working with the U.S. beef industry to develop the Pre-harvest Beef Safety Production Program.

Between 1982 and 1985, three feedyards cooperated with FSIS to evaluate production practices and assess residue risks. In 1985, after careful analysis and adjustment of production practices, these three feedyards were certified by FSIS as "Verified Production Control" feedyards. What was learned during those three years now serves as the backbone for the Beef Quality Assurance program. (Guidelines for the BQA program are presented in the Appendix on page tbd.)

Because of concerns with additional government regulation, beef producers began investigating ways to ensure that their production practices were safe and would pass the scrutiny of the consumer.

This voluntary program has clearly been successful. BQA practices have helped to nearly eliminate any problems associated with violative residues and significantly reduced incidences of injection site lesions in fed beef cattle (steers and heifers fed in a commercial feedyard). However, residues and injection site lesions are still a significant issue in culled breeding stock - both cows and herd bulls. Market cows and bulls provide approximately 15 to 20 percent of the annual U.S. beef production total.

In the 1990s, the USDA mandated that all meat packing and processing plants develop and implement HACCP programs. To date, similar mandatory regulations do not exist for preharvest segments of the beef industry. However, in order to provide a quality, wholesome product without government regulation, industry groups have developed voluntary safety and quality assurance programs for the preharvest production segments of the industry.

In the mid-1980s a number of cattlemen associations initiated the first state-level BQA programs. These have grown and now incorporate HACCP-like principles addressing food safety concerns and they also further address quality issues by identifying quality control points within the feedyard management system. These programs have helped pave the way toward ensuring the safety and quality of beef.

With this in mind, the BQA program has been developed to assist beef producers as they implement BQA management strategies to help ensure the safety and quality of cattle within their control.

Market cows and market bulls account for approximately 15 to 20 percent of the total annual U.S. beef production.

Why Get Involved?

Other segments of the industry, from feedyards to foodservice, have already adopted HACCP or HACCP-like programs and BQA management principles. These companies are looking to do business with cow-calf producers and stocker operators who utilize similar management philosophies to further help to ensure the safety of products leaving their operations, whether fed cattle or case-ready meat products.

Adoption of BQA principles as a method of doing business helps positioning an operation to take advantage of these opportunities. In other words, making a commitment to Beef Quality Assurance isn't just the right thing to do for the consumer – it's also the right thing for a producer to do in terms of market access.

Participation in the BQA program is one way to show our customers, whether they are cattle buyers or beef consumers, that producers take every possible step to raise beef responsibly. Furthermore, each aspect of a BQA program is part of good business management.

For example, the information gained from recordkeeping in a BQA program can help a producer make better business decisions and help prevent costly production issues. BQA may also be an important resource for producers who may be confronted with additional government regulation and/or possible litigation.

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What is Quality?

“Quality” can be defined in several different ways. One definition is “providing products that meet or exceed expectations and established requirements every time.” Obviously, in the beef industry, established product requirements differ among the various production segments, but there are some common expectations.

For example, the products of a commercial cow-calf operation are weaned calves and culled breeding stock. These calves should possess performance, health and carcass characteristics that satisfy stocker operators and cattle feeders, and they must also meet food safety requirements. Culled breeding stock must meet the requirements of market cow and market bull beef processors for health and food safety as well as expectations for carcass characteristics.

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

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

The bottom line is that quality in the beef industry goes far beyond the parameters of food safety. It also encompasses performance, health, carcass characteristics and eating satisfaction, which can all be affected as a result of management decisions throughout the beef production system. Because factors other than food safety are involved in quality, the material in this manual is oriented toward the Total Quality Management concept.

BQA Goals

To ensure the consumer that all cattle shipped from a beef production unit are healthy, wholesome and safe, their management has met FDA, USDA and EPA standards, they meet quality requirements throughout the production system and are produced with environmentally-sound production practices.

BQA Objectives

1. Set production standards for quality and safety that are appropriate to an operation and that can be met or exceeded. Key elements that influence production of defect-free food include biosecurity, animal health and well-being, production performance and environmental stewardship.
2. Establish data retention and recordkeeping systems which satisfy FDA/USDA/EPA guidelines will help allow for validation of management activities and fulfill program goals.
3. Provide hands-on training and education to help participants meet or exceed BQA program guidelines and help realize the benefits of the program.
4. Provide technical assistance through BQA program staff, veterinarians, extension specialists and other qualified individuals working with the BQA program.

Quality Challenges

The importance of beef quality assurance can be seen when analyzing the top quality challenges within the beef industry. These quality challenges include injection site blemishes, rib brands, excessive external fat, excessive seam fat, dark cutters, inconsistent size of meat cuts, inconsistent cuts and non-uniform cattle.

Injection-site blemishes cost the beef industry \$188 million annually, and cost producers approximately \$7.05 per head, according to the 1995 National Beef Quality Audit (NBQA). In 1991 21.6% of all fed cattle top butts evaluated in the injection-site audit had injection-site blemishes, with a majority of those being fluid-filled. In 1997, also in fed cattle, this defect was down to 6.2%, with 0.7% being fluid-filled. While this is quite an improvement during six years in fed cattle, the results in market cows and market bulls are not quite as pleasing. During the first market cows/bulls audit, conducted in 1994, the percent of injection site blemishes in market cows and market bulls was found to be 28.9% (7.5% fluid-filled) but in the November 1997 audit, the incidence of blemishes had increased to 40.9% (3.9% fluid-filled).

Brands and other hide defects, such as parasite damage, cost the beef industry more than \$648 million annually. Typically, this loss is passed along to all cattle that are sold in the industry through reduced live cattle prices. According to the 1995 NBQA, this was equivalent to \$24.30 per head.

The 1995 NBQA provides management tactics to help overcome reported beef quality shortcomings. These include: eliminate side and multiple brands, remove horns, improve parasite control, improve red meat yield, improve handling/transport techniques, eliminate intramuscular injections (IM), measure traits that impact value and eliminate genetic and management systems that diminish tenderness, juiciness and flavor.

Management practices can help reduce, if not eliminate, the occurrence of these quality challenges. Proper administration of animal health products, branding only in the shoulder or hip areas, marketing cattle at an optimum time, reducing stress placed on cattle and sorting cattle into marketing groups are just some of the management practices that can help prevent quality defects and increase market value.

Involvement: A Team Approach

The BQA program is a beef producer's program and will be supervised by beef producers. BQA program representatives will provide information and training support to state and local trainers and producers. BQA program representatives, working with state BQA coordinators, will be responsible for development and maintenance of BQA training materials, training certification and follow-up on any program issues, updates or modifications. This training will continue in communities across the U.S. with the assistance of qualified local individuals, such as veterinarians and extension educators who have completed BQA Trainer training, serving as BQA Trainers.

Involvement: Economically Logical

The cattle business is tough enough without doing things that don't make economic sense. BQA is economically logical and each component of the BQA program relates to good business management. Information from production records maintained may be used to help prevent costly production mistakes and produce better business decisions. Implementing BQA is an excellent decision, one that can help identify and avoid certain production defects. It is also who we are, it is who our parents are/were and it is who our children will be.

Above all, involvement in BQA is a statement that reminds everyone from cowboy to consumer that we are doing everything possible to produce a defect-free product. Involvement in the Beef Quality Assurance program is one way to show the media and consumers that cattlemen raise beef responsibly. Consumers may lose confidence in beef if they find a defect that escaped a cattleman's facility and entered the food chain. Loss of consumer confidence in beef can cause a significant change in eating habits and impact the future of our industry.

All meat industries face similar challenges and concerns. If there were a time to get involved, it was yesterday. Producers who are not BQA participants are invited to begin participating in the program. The events in the near future could affect production within an operation for generations to come. Will Rogers said, "The world is run by those that show up". *It is time for all of us to show up.*

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How do you participate?

The BQA program is designed to be a voluntary program which will include "basic training" in BQA followed by an exam. Don't worry; this is not a "test" of your skills. The exam does two things. First, it helps instructors make certain the material has been presented to you effectively. Also, it satisfies national guidelines for helping states determine whether their various BQA programs are "equivalent" to each other, even though no two programs are likely to be identical. Program variations are typically due to environmental differences (climate, precipitation, parasites, etc.) that may require management strategies to be adapted to fit specific regions.

Equivalency among states is also an important aspect for marketing forces that are driving the dynamic adoption of BQA principles and management. For example, today there are marketing outlets that name particular state BQA programs and equivalent programs as a specification for describing the type of feeder cattle (or management) they want to buy. This trend will likely continue to increase.

Following a producer's completion of BQA training and successful completion of the exam, a certificate of completion will be provided to proudly display your commitment to beef quality and animal well-being.

The next level of voluntary participation may include helping a producer put together a BQA Management Plan customized for a specific operation. Advanced BQA training at this level should include a review of what was covered during the initial training session and may go into more detail about some of the topics.

Then each producer's operation will be reviewed and assistance provided to help develop individual, operation-specific BQA Management Plans.

Development at this level will require documentation of management procedures, treatment protocols, pesticide use, recordkeeping and more. At this level, the producer will be given the opportunity to sign a Participation Agreement, which simply declares his or her intention to follow the plan developed and adhere to the Best Management Practices recommended in this manual.

The Participation Agreement is a "standard" that is expected of state BQA programs.

The Basic Ideas behind HACCP-like Programs

The basic ideas behind HACCP-like programs include; identifying what can go wrong that can cause a defect, determine how to prevent it from happening, and document that you are doing what you set out to do. The defect may be quality or safety. Safety defects include chemical - such as a violative residue, physical - such as broken needles or biologic - such as beef measles. It should be a team approach that includes a producer's family, employees, veterinarian, nutritionist, extension specialists and suppliers among others.

At the ranch level, a HACCP-like program is as simple as creating a plan ahead of time to deal with something that doesn't go well; for example, an embedded needle shaft resulting from a needle breaking off when a calf is being given injection. The seven core HACCP principles are incorporated in the discussions throughout the manual as HACCP-like programs are described and developed. Although these seven principles are not always specifically referenced, the concepts of control points, critical limits, preventive measures, corrective actions and monitoring are utilized in the discussion points. The seven HACCP principles include:

- 1) **Review all management programs** to identify production practices that affect food safety, quality and the environment. More formally, this is called a "hazard analysis." For example, everyone who helps you work cattle should be instructed to avoid giving intramuscular injections anywhere but the neck area. An intramuscular injection given in the hip at branding has been shown to be able to cause an identifiable injection site blemish in the steaks from that animal, and it may also toughen the meat in an area up to several inches around the injection site.
- 2) **Identify the control points** where potential problems can occur, be prevented and/or controlled. For example, storage of feed and/or chemical products is a control point. To help ensure that feed is not accidentally contaminated, batteries, fuel containers or paint should never be stored in the same location as feedstuffs.
- 3) **Establish critical limits** associated with each control point. For example, identify the proper withdrawal time associated with a drug treatment to determine the earliest date the treated animal could be sold.
- 4) **Establish control point monitoring requirements** to ensure that each control point stays within its limit. For example, pesticide use records should be maintained so that you can check grazing restrictions on a particular field or pasture before turning cattle out.
- 5) **Establish corrective actions** to implement if a problem occurs. For example, corrective actions for a drug residue violation might include improving recordkeeping and employee training.
- 6) **Establish effective recordkeeping procedures** that document a system is working properly. For example, using a processing map to record where each injection was given, how much was given, how it was given and what the injection was is a way to verify your treatment protocol.

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

These seven principles may seem complicated at first, but for the most part it is simply a matter of anticipating what can go wrong, and developing preventive solutions prior to the occurrence or reoccurrence of an issue ... before you have a serious problem on your hands.

Control Points

As with any industry trying to build or improve a production system, points in the production chain where challenges could arise must be anticipated. Each such point is called a "control point". Within each segment of the beef industry, there are three broad types of control points that need to be identified. These three types of control points are also the three main areas of emphasis in this manual. They are: Food Safety control points, Quality control points and Environmental control points.

Important Points to Remember

1. Cattlemen cannot foresee all potential challenges. One area at a time should be identified and then a plan should be developed and implemented for assuring quality in that area of production. The experience gained will help make it easier to develop quality assurance in other areas of the operation.
2. Cattle will be free of violative residues and product-related defects if products are administered according to USDA/FDA/EPA standards, withdrawal times are followed and BQA recordkeeping procedures are utilized without exception.
3. There are a number of safeguards integrated into beef production that help the beef industry avoid quality defects. These safeguards include: handling animals on an individual basis, the length (long period) of time required to produce a finished product, and the quality and safety built into modern health-related beef production technologies.
4. Every employee/caretaker must be trained to know, understand and identify areas where with the possibility of violative residues or quality defects may occur. Anyone who supplies services, commodities or products to a producer must also understand the beef operation's quality assurance objectives.
5. Cattlemen must be able to document each step of production. Good production records are necessary to allow for documentation, analysis and improvements in financial decision making.
6. There are points in production that must be monitored to ensure no residue violations or carcass defects occur. The critical points include, but are not limited to: incoming cattle, products and commodities, cattle handling and evaluation of outgoing cattle.
7. There are production areas that have higher residue and carcass defect risks than others. High-risk production areas include, but are not limited to: non-performing cattle, unusual single-source feed ingredients and providers of non-standard supplies.

SECTION II

BEEF QUALITY ASSURANCE NATIONAL GUIDELINES¹

Care and Husbandry Practices

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

Feedstuffs

- Maintain records of any pesticide use on pasture or crops that could potentially lead to violative residue in cattle
- A quality control program is in place for incoming feedstuffs that is designed to help eliminate contamination from molds, mycotoxins or chemicals in incoming feed ingredients. Supplier assurance of feed ingredient quality is recommended
- Analyze suspect feedstuffs prior to use.
- Do not feed ruminant-derived protein sources per FDA regulations
- Support feeding of by-product/co-product ingredients with sound science

Feed Additives and Medications

- Use only FDA-approved medicated feed additives in rations
- Use medicated feed additives in accordance with the FDA current Good Manufacturing Practices (cGMPs)
- Follow Judicious Antibiotic Use Guidelines
- Extra-label use of feed additives is illegal and strictly prohibited
- Strictly adhere to medication withdrawal times to avoid a violative residue
- Where applicable, keep complete records when formulating or feeding medicated feed rations
- Records are to be kept a minimum of two years, or longer as required by laws/regulations
- Assure that all additives are withdrawn at the proper time to avoid a violative residue

Processing/Treatment and Records

- Follow all FDA/USDA/EPA guidelines for each product
- Follow all label directions for each product
- Extra-label drug use shall be kept to a minimum, and used only when prescribed by a veterinarian working under a Veterinary/Client/Patient Relationship (VCPR)
- Strict adherence to extended withdrawal periods (as determined by a veterinarian within the context of a VCPR) shall be employed
- Individual animal or group identification
- When cattle are treated/processed individually, treatment records will be maintained with the following recorded:
 - o Individual animal identification
 - o Date treated
 - o Product administered and manufacturer's lot/serial number
 - o Dosage
 - o Route and location of administration
 - o Earliest date animal will have cleared the withdrawal period
 - o Name of individual administering the treatment

- When cattle are treated/processed as a group, all cattle within the group shall be identified as such, and the following information recorded:
 - Group or lot identification
 - Date treated
 - Product administered and manufacturer's lot/serial number
 - Dosage
 - Route and location of administration
 - Earliest date animal will have cleared the withdrawal period
 - Name of individual administering the treatment
- All cattle (fed and beef or dairy market cows/bulls) shipped to harvest will be checked by appropriate personnel to ensure that animals that have been treated have met label or prescription withdrawal times for all animal health products administered
- All processing and treatment records should be transferred with the cattle to next production level. Prospective buyers must be informed of any cattle that have not met withdrawal times

Injectable Animal Health Products

- Always follow label requirements
- Products labeled for subcutaneous (SQ) administration should preferably be administered in the neck region
- Products cleared for SQ, Intravenous (IV), Intranasal (IN) or oral administration are recommended
- Products with low dosage rates are recommended and proper spacing of injections should be followed
- All products labeled for intramuscular use shall be given in the neck region only (no exceptions, regardless of age)
- All products can cause tissue damage when injected IM. Therefore all IM use should be avoided if possible.
- No more than 10 cc of product is administered per IM injection site

SECTION III

BQA BEST MANAGEMENT PRACTICES (BMPS)

Introduction to BMPs

Biosecurity Basics

The goal of biosecurity is to protect animals from disease. This is accomplished through disease resistance and preventing, minimizing or controlling cross-contamination of body fluids (feces, urine, saliva, respiratory secretions, etc.) either directly - animal to animal, or indirectly - such as animal to feed to animal or animal to equipment to animal. Biosecurity management and practices are designed to prevent the spread of disease by minimizing the movement of biologic organisms, such as viruses, bacteria, rodents, etc., within (internal biosecurity) or onto (external biosecurity) an operation. Biosecurity can be very difficult to maintain due to the complex relationships between management, biologic organisms and biosecurity.

While developing and maintaining biosecurity may be challenging it is likely the cheapest, and the most effective, means of disease control available. No disease prevention program will work without biosecurity. Improving an animal's disease resistance is at the heart of disease prevention and/or a herd health program and must be considered in the Standard Operating Procedures (SOPs) and/or Best Management Practices of all livestock production management. However, improving disease resistance is not possible, or can be over-powered, for many diseases that can affect livestock health and production. Therefore, an understanding of biosecurity basics is an essential complement to a properly designed disease-resistance health program.

INFECTIOUS DISEASES CAN BE SPREAD BETWEEN OPERATIONS BY:

The introduction of cattle who are

- Diseased
- Recovered from disease but are now carriers
- Healthy but incubating disease
- Vectoring disease such as through disease agents harbored within organic matter/manure cached on their body

Other animals and pests

- Non-livestock animals such as horses, dogs, cats
- Wildlife and pests such as rodents, birds and insects
- Feral livestock

- People (including visitors and employees) and their clothing/shoes, etc. who move between herds
- Contact with inanimate objects that are contaminated with disease organisms including vehicles and equipment that move between herds, for example an equipment repair vehicle or a delivery truck
- Carcasses of dead cattle that have not been disposed of properly
- Feedstuffs, especially high risk feedstuffs, which could be contaminated with feces
- Impure water (surface drainage water, etc)
- Aerosol transmission (wind) including aerosolized manure and dust

DEVELOP A BIOSECURITY RESOURCE GROUP

An important first step is to develop a biosecurity resource group/team. The group should include people important to the success of an operation such as the operation's supervisors, veterinarian, nutritionist, extension specialist, suppliers and others that may have special knowledge of biologic organism control.

Generally, beef operations have been open to vehicle traffic and visitors. Of the possible breakdowns in biosecurity, the introduction of new cattle and inter-herd/inter-operation traffic pose the greatest risks to cattle health. Properly managing these two factors should be an operation's top priority. A biosecurity plan should be developed to meet the specific needs of each operation. The biological hazard, relative significance, and potential risk should be considered.

- Take a close look at what can go wrong ... how can animals become infected?
- Assess the risk of each potential biosecurity challenge and the significance of the risk
- Evaluate potential to Prevent, Reduce, Control or Eliminate (PRCE) each risk identified
 - Resistance in the herd ... Source into and within the herd ... Exposure within the herd

BIOSECURITY HAS FIVE MAJOR COMPONENTS:

A-RITS

1. **A**ssessment
2. **R**esistance
3. **I**solation
4. **T**raffic Control
5. **S**anitation

These five components, when effectively managed, meet one of the principle biosecurity objectives - prevention or minimization of cross-contamination of body fluids directly from animal to animal, or indirectly such as animal to feed to animal or animal to equipment to animal. Think of these components as individual puzzle pieces. Utilized together, these multiple pieces can effectively help protect animals from disease.

Assessment of the potential for disease organisms to enter a livestock herd is the first step. The assessment should include a general evaluation for the potential for contamination of livestock from other/outside livestock, wild animals, pests, contaminated feedstuffs, equipment, etc. A list of specific diseases which may affect a herd should be constructed and the significance of each disease evaluated. Each specific disease of concern should be evaluated as related to the potential for herd exposure, potential impact on the herd, and potential for biosecurity control.

Resistance refers to an animal's ability to reject or contend with an infectious agent. An animal's resistance involves both specific immune training and general metabolic mechanism. Typically, both general and specific components of disease resistance must be properly maintained for an animal's resistance to function properly. General resistance mechanisms are supported by proper nutrition and by minimizing stress (handling, environmental, etc). Specific resistance mechanisms are trained by properly selecting and administering appropriate vaccines. Unfortunately vaccines are not available for most infectious agents that affect cattle. Therefore, the other three components of the biosecurity RITS are extremely important.

Isolation refers to the prevention of contact between animals within a controlled environment. The most important first step in disease control is to minimize commingling and movement of cattle. This includes all new cattle as well as commingling between established groups of cattle. Even in operations that have high cattle turnover such as feedyards, keeping feeding groups from mixing is an important biosecurity measure. Isolate feedyard hospital pen cattle and return them to their home pen as soon as possible. Long-acting therapies have improved the ability to minimize movement of infectious organisms between groups. An important biosecurity action on ranches is to separate cattle by age and/or production groups. Facilities should be properly cleaned and disinfected between groups. Visit with the herd veterinarian about specific isolation management procedures and how they can be applied to control targeted diseases.

Traffic Control includes traffic entering an operation and traffic patterns within an operation. It is important to understand that traffic includes more than vehicles. All people and animals must be considered. Animals (domestic or feral) other than cattle include non-cattle livestock, horses, dogs, cats, wildlife, birds, and pests such as rodents and insects. The degree of control will be dictated by the biology and ecology of the infectious organism being addressed and the control must be equally applied.

For example, attempting to control a disease that is spread only through animal to animal contact by stopping an empty livestock-hauling truck from driving entering your operation may not be extremely beneficial as a biosecurity measure. For some diseases, purchasing cattle from herds that have a verifiable quality vaccination program would be more important for maximizing biosecurity. For other diseases that fit this category, individual animal testing (ex: BVD-PI) or herd testing (ex: Johne's disease) would be more important. Regardless of the disease, it is always important for the transport vehicle and trailer to have been adequately cleaned and disinfected before hauling the cattle. Traffic control can be built into the facility design. For example, cattle loading facilities may be located at the operation's perimeter.

Traffic control within the operation should be designed to stop or minimize contamination of cattle, feed, feed handling equipment and other equipment used with cattle. Pit silos should not be accessible to non-feed handling equipment such as loaders used outside the feeding area or vehicles that travel outside the feed mixing and handling facility. No one - manager, nutritionist, veterinarian, banker - no one, should be allowed to drive onto the surface of a trench silo. The only equipment allowed to enter should be the loader used for handling the feedstuff. In large pits it may be acceptable to allow feed trucks to enter provided they are loaded at least 100 feet away from the working face of the stored feed. If possible, separate equipment should be used for handling feedstuffs and manure. If equipment is used for a non-feedstuff task it must be properly cleaned and disinfected prior to handling feedstuffs again.

Vehicles and employees should not travel from the mortality/dead cattle area without being properly cleaned and disinfected. The dead animal removal area should be located to allow rendering or mortality disposal trucks access without cross-contaminating healthy cattle. Vehicle cleaning areas are becoming more common in commercial feedyards. Unfortunately they are frequently used only for trucks and heavy equipment. Management should consider extending a decontamination policy to other vehicles, especially the vehicle's tires, that cross biosecurity control areas on the operation. The biosecurity resource team should help evaluate traffic control on the operation.

Sanitation addresses the cleaning and disinfection of materials, people and equipment entering the operation and their cleanliness on the operation. The inability to sanitize or disinfect organic matter is an important concept for operation personnel to understand. Equally important is for operation management to understand a basic fact of human behavior - *typically things that are hard to clean...will not get cleaned.*

The first sanitation objective is to remove organic matter, especially feces, to prevent fecal contaminants from entering the oral cavity of cattle (fecal = oral cross-contamination). Blood, saliva and urine from sick or dead cattle should also be targeted. Equipment used which may contact cattle's oral cavity or cattle feed should be a special target. All equipment that is used to handle feed or is introduced into the mouth of cattle should be cleaned, including disinfection as appropriate, before use. Loaders used for manure or mortality handling must be cleaned thoroughly and disinfected before use with feedstuffs. It would be best if different equipment could be used. Minimize the use of oral equipment and instruments such as balling guns, drench equipment and tubes. If used during processing and treatment, thoroughly clean and disinfect between animals. Store cleaned and disinfected equipment in a clean, dry area. Avoid storage in a tank or container of disinfectant.

RISK ASSESSMENT AND RISK MANAGEMENT

Applying a Hazard Analysis Critical Control Point-like System to Biosecurity

The Hazard Analysis Critical Control Point (HACCP) system is a logical, scientific system that can control safety problems in food production. HACCP is now being adopted worldwide. It works with any type of food production system and with any food. It works by controlling food safety hazards throughout the process. The hazards can be biological, chemical or physical. The steps in developing a HACCP-like plan can be used by all animal production operations.

HACCP Development Outline - adapted to biosecurity to focus on Biological Hazard (BH)

Hazard Analysis, Critical Control Point (HACCP): Five Preliminary Steps

1. Bring together your HACCP resources – assemble the HACCP team
2. Describe the production system and method of distribution
3. Identify the intended use, employee safety and consumers of product
4. Develop a process flow diagram – Verify the diagram
5. Meet the requirements for Sanitation Standard Operating Procedures (SSOP) and Best Management Practices standards. (Note: Cross-contamination is a key question in developing the SSOP/BMP)

Seven Specific HACCP Steps:

1. Identify potential hazards: BH risk ranked by significance to the operation
2. Identify critical control points (CCPs): Evaluate the basis for the CCP
3. Establish critical limits (CL) for CCPs
4. Establish CCP monitor procedure
5. Establish corrective actions (CA)
6. Establish recordkeeping procedure
7. Establish verification procedure

Conducting a Hazard Analysis:

1. Assure SSOP/BMPs are in place
2. Review product production and use
3. Evaluate all inputs and movements
4. Evaluate BH potential for each step
5. Could BH reach product or magnify (include chemical & physical hazards)?
6. Could process cause BH contamination (include chemical and physical hazards)?
7. Are hazards addressed by SSOP/BMP?
8. Describe and identify each BH
9. Assess significance based on scientific and technical information
10. Observe the actual operating practices
11. Ensure it is the usual process or practice
12. Evaluate everything for possible cross-contamination
13. Review past BH contamination incidents
14. Likelihood and severity of occurrence of each BH
15. Can preventive measures be built into the process?

Identify Critical Control (Management) Points (CCPs):

"A point, step/procedure at which control can be applied to prevent, reduce, control or eliminate a hazard to acceptable levels." The following questions must be asked: Is the criteria supported by research? Is the criteria specific, quantifiable, provides a Yes or No answer? Is there a technique available at reasonable cost? Can monitoring be continuous and auto-adjustable? Is there a favorable history of control? Is the potential hazard prevented and/or eliminated?

Steps to Identify CCP:

Q1: Do preventive measures exist (evaluate and rank the basis/proof) for BH?

... if Yes, go to Q2,

if No, is required for safety? if No = not CCP, if Yes, modify process

Q2: Does this step eliminate/reduce the likely occurrence of BH hazard to an acceptable level?

... if Yes = CCP

if No go to Q3

Q3: Could unacceptable BH contamination occur?

... if Yes go to Q4

if No = not CCP = stop

Q4: Will subsequent step eliminate the BH?

... if Yes = not CCP

if No = CCP

Establish CCP Critical Limits (CLs)

"The maximum or minimum value that must be controlled for each biological, chemical or physical (BCP) hazard for each CCP."

Biosecurity focuses on BH. Critical Limits may be regulated by USDA-APHIS. Critical Limits may be important to the operation. Different situations may require different CL. Document/file the CL for each BH.

Establish CCP Monitoring Procedures

Establish the "Who - What - When - How" for each monitoring procedure. There should be a planned sequence of observations/measurements. Clearly identify people responsible of monitoring and train the people doing the monitoring why what they are monitoring is important, how to monitor, and what to do if something goes wrong or is outside the CL established. Provide training on how to document what they monitor and have them sign all records. Keep a record of monitoring activities on a CCP Monitoring Summary Review Sheet.

Establish Corrective Procedures (CP)

Train people to know corrective procedures at each CCP. They need to be critical evaluators of how contamination is most likely to occur. Procedures should be worked out in advance for correcting the cause of "non-compliance" to prevent recurrence at a CCP and establish a method for demonstrating the CCP is being controlled. Corrective action should/must be documented and recorded on a Summary Review Sheet.

Establish Recordkeeping Procedures

Review current records and determine which ones adequately address CCPs. Develop records/forms for identified CCPs and for corrective actions. Identify and train people to work with records. All documents should be dated and signed. A list of records kept for CCP should be included on the Summary Review Sheet.

Establish Verification Procedures

Verification, a double check, must be ongoing and is in addition to monitoring activities. Establish a method for verifying CCP control/monitoring and establish the frequency for which the CCP control/monitoring is verified. Document verification procedures: date, sign and list verification on the Summary Review Sheet.

Validate the HACCP Plan

"Validation is the scientific and technical basis for CCP determination and CL identified and which control hazards." Validation should include a third party review and should be done on a regular basis, at least annually. Validation should assess/reassess potential new hazards. Evaluate all production steps, suppliers, equipment use and maintenance, isolation procedures, traffic control and sanitation.

Specific biosecurity information is important

Visit with the herd veterinarian or extension specialist for more detailed and specific information about applying biosecurity principles to your operation.

Beef Quality Assurance Herd Health Plan Guidelines

Preventive Herd Health Plan

The most effective way to reduce the potential for antibiotic residues is to control the need to use antibiotics. Every effort should be made to prevent disease and infection in the cattle herd. One herd health plan will not fit every operation; a herd health plan needs to be developed for each individual operation.

Preventive herd health plans will consist of herd management and immunization recommendations. Work with the herd veterinarian to develop a herd health program and review/revise it at least annually.

A preventive herd health plan should include:

1. Target pathogen(s)
2. Recommended vaccine(s)
3. Recommended feed additives (if any)
4. Appropriate time frame to protect (vaccinate) against targeted pathogens
5. Management considerations to aid in the prevention or reduce the spread of target pathogens
6. Management and treatment protocols for use if prevention efforts fail, including an outline of treatment protocols specified by the herd veterinarian

Management and treatment considerations will need to be discussed and developed for each operation. The herd veterinarian will need to develop the treatment protocols with the operation's management so that both are comfortable with the recommendations.

The preventive herd health plan, treatment protocols and veterinary drug orders need to be developed together to complete a herd health program.

For all cattle and production segments

- Provide appropriate nutritional feedstuffs
- Handle cattle to minimize stress and bruising
- All injections administered in front of the shoulder
- Identify any animals treated to ensure proper withdrawal time
- Make records available to the next production sector
- Always read and follow label directions
- Keep records of all products administered including: date, animal identification, product used, serial number, amount administered, route of administration, person administering and withdrawal time
- Consult with herd veterinarian for additional health procedures appropriate to your area

Heifers and purchased breeding stock entering the cow herd

- Vaccinate in front of the shoulder for viral and clostridial diseases (follow label directions)
 - Two vaccinations, two to three weeks apart
- Control external and internal parasites

Cow Herd

- Control external and internal parasites
- Annually booster vaccinations, inject in front of the shoulder

At Pre-weaning, Weaning and/or Backgrounding

- If implanting, administer implants properly in a sanitary manner
- Vaccinate in front of the shoulder for viral and clostridial diseases (follow label directions)
 - Two vaccinations, two to three weeks apart
- Perform all surgeries such as dehorning and castration in a humane manner
- Control external and internal parasites
- Wean cattle (45 days recommended) to ensure cattle health and producer return on health management investment

BIOSECURITY BMP CHECKLISTS:

Review the checklists below and discuss each item with herd veterinarian. In the notes column rank the biosecurity importance of each item (0=not important, 5= very important) and indicate yes (Y) or no (N) if the biosecurity item is being addressed. Add additional items to the checklists as appropriate.

General Best Management Practices Checklist

- Notes** **Rank importance of each BMP in biosecurity and note if being addressed:**
Meet all of the Beef Quality Assurance Best Management Practices and Guidelines.
Understand it is more profitable to prevent problems than to correct problems.
Agree that doing things right the first time is a critical part of biosecurity.
An animal identification system in place.
Can readily track and validate management practices used on cattle.

BMP Checklist for Strategic Vaccine Use

- Notes** **Rank biosecurity importance of each strategic vaccine item and note if being addressed:**
Have a written strategic vaccination plan for each operation.
Know when and how to use the vaccines listed in the vaccination plan.
Discuss the vaccination history of all cattle purchased before the cattle arrive.

BMP Checklist for Preventing Infectious Disease from Entering All Operations

Notes **Rank biosecurity importance of each disease entry item and note if being addressed:**

- Always know the health history for the herds from which cattle are purchased.
- Always know the health status of animals brought into my operation / demand a valid health certificate.
- My veterinarian talks to the seller's veterinarian prior to buying animals.
- Sometimes bring in animals without knowing their vaccination history.
- Buy animals from a herd that has mixed origin cattle.
- Transport animals in clean vehicles.
- Have a control program for outside animals which could spread disease (rodents, etc.).
- Loading area is located at the perimeter of the operation
- Dead animal pickup area located so that rendering trucks do not contaminate my operation.
- Limit people's access to my cattle pens, feeding mixing and storage area, and treatment area.
- Keep a record of visitors to my operation.

BMP Checklist for Disease Containment

Notes **Rank biosecurity importance of each disease containment item and note if being addressed:**

- Facilities provide a clean area for restraint, treatment and isolation of sick cattle.
- Facilities prevent cross-contamination of water, manure, feed, or equipment between groups.
- Have a plan to manage group size, age distribution, and animal flow to reduce risk of disease.
- Handle highest health status animals first (young calves, health older cattle and sick animals last).
- Everyone uses strict sanitation practices.
- All animals that die are examined by a veterinarian (necropsy).
- Veterinarian collects blood samples from all cows that abort.
- Have visitors observe our strict sanitation practices.
- Clean contaminated vehicles and equipment before use around healthy cattle.

BMP Checklist for Sanitation

Notes **Rank biosecurity importance of each sanitation measure and note if being addressed:**

- Attempt to prevent manure contamination of feed and equipment used orally.
- Always clean equipment used orally between animals.
- Attempt to prevent cross-contamination between healthy and sick/dead cattle.
- Regularly evaluate the activities on my operation to assess the potential for contaminating cattle.
- If manure accidentally contaminates feed or water, an immediate remedy is provided.

BMP Checklist for Equipment

Notes **Rank biosecurity importance of each equipment item and note if being addressed:**

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

BMP Checklist for Preventing Infectious Disease from Entering Cow/Calf Operations

Notes **Rank biosecurity importance of each disease entry item and note if being addressed:**

- Cattle use community pastures, or are placed in performance evaluation centers.
- Cattle share fence lines with neighbor's cattle.
- Purchase, borrow, or use loaner bulls from other farms.
- Always buy cattle from a certified Johne's disease-free farm.
- Limit purchases to open heifers.
- Know the biosecurity, vaccination, and testing program for herd(s) for my replacement cattle.
- Quarantine new arrivals for 21-30 days before allowing them contact with my cattle.
- Quarantined area is designed to prevent cross-contamination between cattle.

BMP Checklist for Calf Management

- Notes** **Rank biosecurity importance of each calf management item and note if being addressed:**
- Have a strategic vaccination and parasite control plan in place of all cows.
 - Replacement cattle are kept off pastures for six months where manure has been spread.
 - Replacement cattle are kept separate from other cattle for at least six months.
 - Replacement cattle have a separate source of water.
 - Consult with veterinarian annually about calf care.
 - Calving area is clean and disinfected.
 - All calves are born from cows that have been tested clean of infectious diseases.
 - All colostrum fed to calves comes from cows that have been tested clean of infectious diseases.
 - Calves are permanently identified prior to any grouping.

BMP Checklist for controlling Salmonella

- Notes** **Rank biosecurity importance of each Salmonella control item and note if being addressed:**
- Realize that my family and employees can be infected with salmonella from cattle.
 - Isolate sick cattle in hospital area and prevent cross-contamination.
 - Discuss proper antibiotic use with my veterinarian.
 - Clean all instruments and equipment used on sick cattle between cattle.
 - Provide dry, clean, disinfected calf and maternity pens.
 - Test purchased feed for salmonella once a year.
 - Restrict birds, cats, rodents and stray animals from access to my operation's animal feed & water.
 - Do not allow rendering trucks to access feed or animal areas.

BMP Checklist for controlling Bovine Viral Diarrhea (BVD)

- Notes** **Rank biosecurity importance of each BVD control item and note if being addressed:**
- Understand "persistently infected" (PI) animals as they relate to BVD.
 - Am not willing to live with one or more PI calves in my herd.
 - Am not willing to keep a PI calf as a replacement heifer.
 - Am committed to finding BVD PI cattle and removing them from herd (PI Immunohistochemistry testing).
 - Have discussed killed versus modified live virus MLV vaccines for BVD with my veterinarian.
 - Control fence-line contact with neighboring cattle.

BMP Checklist for controlling Johne's (M. paratuberculosis) Disease

- Notes** **Rank biosecurity importance of each Johne's control item and note if being addressed:**
- Understand how Johne's disease can impact my herd and how it is spread.
 - Whole herd is screened using an antibody ELISA test (measures antibody in blood).
 - Whole herd is tested using a fecal culture.
 - Animals testing positive are culled. (Johne's is a reportable disease in some states.)
 - Replacement heifers are tested prior to introduction to the herd.
 - Calves from cows testing positive are removed to a feedyard.
 - Implemented follow-up testing program for Johne's and have reviewed with herd veterinarian.

BMP Checklist for controlling Bovine Leukosis

Notes Rank biosecurity importance of each Leukosis control item and note if being addressed:

- Are needles and sleeves are used on more than one animal?
- Are cows which provide colostrum for your calves tested for bovine leukosis?
- Purchased cattle are tested during quarantine

BMP Checklist for controlling Foot & Mouth Disease (FMD)

Notes Rank biosecurity importance of each FMD control item and note if being addressed:

- Train employees to be able to identify potential FMD lesions.
- Demand proper health papers for all incoming cattle.
- Isolate incoming cattle.
- Disinfect all working facilities between incoming groups of cattle.
- Limit entry & travel of outside vehicles to planned areas of the operation.
- Question all visitors about travel activities outside USA. Outerware disinfected or provided since travel.
- Prohibit visitors who have traveled outside USA in previous 10 days.
- Do not allow entry of products or materials from foreign countries that may be contaminated with FMD.

Disinfectant Selection Table

Compound	Chlorine 0.01-5%	Iodine Iodophor 0.5-5%	Chlorhexidine 0.05-0.5%	Alcohol 70-95%	Oxidizing 0.2-3%	Phenol 0.2-3%	Quaternary Ammonium 0.1-2%	Aldehyde 1-2%
Examples	Clorox	Tincture / Provodine	Novalsan		VikronS	Lysol	Roccal-D	Wavicide
Bactericidal	Good	Good	Very Good	Good	Good	Good	Good	Very Good
Viricidal	Very Good	Good	Very Good	Good	Good	Fair	Fair	Very Good
Envelope Viruses	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Non- Envelope Viruses	Yes	Yes	No	No	Yes	No	No	Yes
Bacterial Spores	Fair	Fair	Poor	Fair	Fair-Good	Poor	Poor	Good
Fungicidal	Good	Good	Fair to Good	Fair	Fair	Good	Fair	Good
Effective in Organic Matter	Poor	Fair	Fair	Fair	Poor	Good	Fair	Good
Inactivated by soap	No	No & Yes	No	No	No	No	Yes	No
Effective in Hard water	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Contact Time (minutes)	30-May	30-Oct	10-May	30-Oct	30-Oct	30-Oct	30-Oct	10-600
Residual activity	Poor	Poor	Good	Fair	Poor	Poor	Fair	Fair

Cattle Viruses with and without Viral Envelopes

Virus	Envelope	Virus	Envelope	Virus	Envelope
Bluetongue	No	Malignant Catarrhal Fever	Yes	PI3	Yes
Rotavirus	No	Enteric Coronavirus	Yes	Rabies	Yes
Papillomatosis	No	Respiratory Coronavirus	Yes	Herpes Mammillitis	Yes
Leukemia	Yes	BVD	Yes	Cowpox	Yes
Papular Stomatitis	Yes	BRSV	Yes	Pseudocowpox	Yes
Vesicular Stomatitis	Yes	IBR / IPV	Yes	Lumpy Skin Disease	Yes

Note: *Foot & Mouth Disease (an Aphthovirus) is a Non-Enveloped RNA virus.
BSE Prion denatured by 5.25% Na Hypochlorite & 275° (F) at 48.5 lbs pressure for 20 minutes.*

BEST MANAGEMENT PRACTICES - FEEDSTUFFS AND SOURCES

Products, such as pesticides and conditioners, used on raised feeds must be FDA/USDA/EPA approved. Store all equipment, fluids, solvents, etc. in an area separate from the feed storage and feed production areas. Follow manufacturer's directions for use and disposal and keep a Material Safety Data Sheet (MSDS) file available. As required by the federal Worker Production Standard (WPS), proper training for pesticide handling should be available to all who work with these products. The training should include personal safety, handling accidental spills and preventing contamination of the feed and water supply.

Monitoring Feedstuffs

It is essential to monitor feed sources. Operations purchasing outside feeds should set up a sampling program to test for quality specifications in feedstuffs. This could include moisture, protein, foreign material, etc. Inform suppliers of your involvement in the BQA program and that sampling of products delivered will occur. A good business practice is to require all products to be accompanied by an invoice, which includes the date, amount and signatures of both the person who delivered the product and the person who received the product. Also be certain that suppliers understand that grain protectants can have withdrawal times.

Most good suppliers have a quality control testing program of their own. Bonded suppliers often test for: polychlorinated biphenyls, chlorinated hydrocarbons, organophosphates, pesticides and herbicides, heavy metals, and microbes (such as Salmonella). Ask suppliers for these tests – reputable suppliers will be glad to provide them.

A quality control program for feedstuffs aids in preventing chemical residues and ensures high quality feeds. Visual inspection of feeds can be effective in avoiding some problems. Create a checklist which includes such items as color (typical, bright, and uniform), odor (clean and characteristic), moisture (free flowing, no wet spots and percent moisture), temperature (no evidence of heating), evidence of foreign material and no evidence of bird, rodent or insect contamination.

It is neither efficient nor economically feasible to test every load of grain or forage for contaminants. However, it makes good sense to obtain and store a representative sample of each batch of newly purchased feed. Commonly, investigation of suspected feed related problems is hampered because no representative sample is available for testing. If feed sampling and storage is done on a routine basis and a suspected feed-related problem occurs, a sample for appropriate laboratory testing will be available. One suggestion for purchased grains, supplements or complete feeds is to randomly sample each batch of feed in five to ten locations and pool the individual samples into a larger sample of two to five pounds. The pooled sample can be placed in a paper bag or small cardboard box, labeled and frozen. Dry samples can be labeled and kept in a dry area. Higher moisture samples should be frozen. A feed tag can be attached to the sample for future reference if needed.

Forage samples should also be collected and stored. If multiple bales of hay are purchased, representative samples should be obtained from several bales and mixed together prior to storage. Coring implements should be used if possible to obtain representative samples, particularly from large-round and large-square bales of hay. Most hay samples can be placed in a labeled paper bag. Store labeled samples in a clean, dry area.

High Risk Feeds

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

Ruminant By-Products

The Bovine Spongiform Encephalopathy (BSE) agent is not easy to test for in rendered by-products. BSE has never been found in U.S. cattle. Therefore, **no ruminant-derived protein sources** can be fed in the BQA program. The USDA has formulated rules and regulations that deal with feeding ruminant derived products. There are several ruminant derived products that are acceptable under the BQA program. These include tallow and blood by-products, pure porcine and equine meat and bone meals. More information on ruminant derived by-products is available in the appendix.

Ruminant By-Products Guidelines.

1. Do not use ruminant-derived protein sources in manufacturing ruminant feeds.

Potential Feed Toxins

Since the environment may contain a number of potential poisons, it is important that producers have some knowledge about the relative toxicities to livestock of the chemicals used so that extremely toxic chemicals such as soil insecticides can be handled and stored properly.

The best advice to producers to avoid accidental livestock poisonings is to treat all chemicals as potential hazards and to store them away from feed storage and mixing areas. If a feed-related poisoning is suspected, it is critical for the producer or veterinarian to contact a diagnostic laboratory for assistance in confirming the suspicion. For example, in Nebraska, all poisoning incidents must be reported to the State Veterinarian.

Mycotoxins are naturally occurring chemicals produced by molds. Mycotoxins can be found in grains and forages and, if present in sufficient concentrations, can cause reduced feed consumption, poor production and adverse health effects. The environmental conditions that are conducive to the growth of molds and the production of mycotoxins are quite variable. Mycotoxins can be produced in feedstuffs prior to harvesting or during storage. Mycotoxins found in the Upper Midwest include vomitoxin, zearalenone and fumonisins in grain, primarily corn and salframine in red clover. Ergot alkaloids can be found in either grain or grass hays. Feedstuffs originating from other areas of the country may contain mycotoxins such as aflatoxin not normally found in Nebraska.

Suggestions to prevent mycotoxin-related problems include storing feedstuffs in a manner appropriate for the feedstuff and avoiding feeding moldy feed. It is important to keep in mind that mycotoxins can be present in feeds without visible mold growth and conversely, visibly moldy feed may not always contain detectable mycotoxins.

Feed Toxins Guidelines.

1. Store feedstuffs in a manner to prevent mold formation and avoid feeding moldy feed.
2. Maintain a quality control program for incoming feed ingredients in an attempt to eliminate contamination. It is important to keep in mind that mycotoxins can be present in feeds without visible mold growth; conversely, visibly moldy feed may not always contain detectable mycotoxins. (For more information on mycotoxins in feeds see your local Cooperative Extension specialist or other expert.)

Fats

Just as with grain and forage, steps should be taken to ensure that purchased fats and oils do not contain a residue. Discuss the quality of product with suppliers and request information concerning the quality, stability, efficacy, and consistency of the product. Beef operations may be approached by sellers who offer a cheaper source of feed-grade fats. The potential for contamination increases with these cheaper sources of fats.

A reputable dealer should already be testing his product for the following contaminants: Polychlorinated Biphenyls (PCBs), Chlorinated Hydrocarbons (CHCs), pesticides, heavy metals, Salmonella and Tall Oil (Hydrocarbon). Before purchasing any fat or oil, ask the supplier if the product is tested. It is your responsibility to assure the safety and the quality of the product purchased.

Fluid Leakage

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

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

Products used for bird and rodent control are another potential problem. While no residues have been reported from these products, they are toxic substances. While the chance of these products entering the feed source is small, care needs to be taken. Adhering to the guidelines on the next page can reduce the risk of residues from contaminated feed.

Best management practices include building feed handling facilities that reduce the risk of feed contamination with chemicals, foreign materials and disease causing infectious agents. Store all chemicals (pesticides, lubricants, solvents, medications, etc) away from feed supplies. Regularly check all feed handling equipment for fluid leaks and avoid storing feedstuffs under transformers to avoid chemical contamination. Protect feedstuffs from contamination of foreign material (metal, etc). Dual purpose equipment, such as a loader (including shovels) which may handle feed and other materials (such as manure or dead animal removal), must be thoroughly cleaned (washing bucket, tires and undercarriage) and disinfected before handling feed. Avoid driving ANY vehicle into silage pits other than feed handling equipment. Designate specific areas next to feed pits where feed trucks can be loaded without contaminating the feed supply. The most common source of infectious agent contamination comes from animal or human feces. If possible, protect feedstuffs, feed troughs and water supplies from contamination of chemicals, foreign material and feces. Protecting from wild/feral animal and bird fecal contamination may be difficult – the best that can be accomplished is regular evaluation and cleaning. As you renovate or make new purchases, try to select equipment that will be harder for animals/birds to contaminate and/or be easier to keep clean. Visit with nutritional advisors, veterinarians and extension educators for practical ways to protect feed supplies.

Feed Contaminants Guidelines.

1. Maintain a quality control program for incoming feed ingredients in an attempt to eliminate contamination resulting from molds, mycotoxins, chemicals and other contaminants.
2. Store feed in a manner that prevents development of molds and mycotoxins and exposure to chemicals and other potential contaminants.
3. Prior to usage, submit any feed ingredient suspected of contamination for analysis by a qualified laboratory.
4. To avoid accidental livestock exposure, treat all chemicals as potential hazards. Never store chemical products where leakage or breakage can contaminate feed products or where cattle can directly consume a contaminant. For example, don't store batteries, fuel containers or paint in the same location as feedstuffs.
5. Regularly check all feed-handling equipment for fluid leaks.
6. Spills should be cleaned up to prevent potential contaminants from causing residues, illness or death in cattle.
7. If a feed-related poisoning is suspected, it is critical for the producer or veterinarian to contact a diagnostic laboratory for assistance in confirming the suspicion.
8. If purchasing fats and oils, monitor for potential contamination. Letters of guarantee from companies supplying these materials may be requested that state these materials have been tested.

BEST MANAGEMENT PRACTICES - FEED ADDITIVES AND MEDICATIONS

The public appears to believe that the beef industry is feeding tetracycline and penicillin at sub-therapeutic levels. However, penicillin is not approved for or used as a feed additive. Tetracycline products are approved for use as feed additives and are safe if label directions are followed. Serious consequences, both practical and legal, may result from misuse of feed additives and medications.

The term “medicated feed” includes all medicated feed products intended to be a substantial source of nutrients in the diet of an animal. The term includes products commonly referred to as supplements (CTC mineral fed for anaplasmosis), concentrates (grain mixture that contains medication), premix feeds (concentrated medications mixed with additional roughage or concentrates) and base mixes, and is not limited to complete feeds (preconditioning chow for used at receiving/weaning).

For more detail on FDA regulations concerning feed additives and medicated feeds, see Appendix, page tbd. In addition to the considerations listed above, the following recommendations relate specifically to the use of medicated feeds.

Product Use

Use only FDA-approved products and administer them as directed on the label. All directions for the use of a medicated feed additive will be on the label attached to the bag or will be supplied with a bulk order. **NO ONE, including a veterinarian, can legally prescribe the use of any feed additive other than as directed on the product label.** Extra-Label Drug Use (ELDU) does not apply to feed additives or feed medications. Veterinary Feed Directives (VFD) does not apply to ELDU. VFD is a new regulation pertaining to the use of specific medicated feeds, but presently no products have been approved for use in beef cattle. Water medications are not considered feed medications, therefore can be used under the ELDU guidelines provided by the FDA-CVM.

A most important responsibility of a feed manufacturer is to assure that the feed produced - whether medicated or non-medicated - meets all legal and intended specifications. All feed mixing operations, regardless of size or products used, share this responsibility. The term "medicated feed" includes all medicated feed products intended to be a substantial source of nutrients in the diet of an animal. The term includes products commonly referred to as supplements, concentrates, premix feeds and base mixes and is not limited to complete feeds. Medicated feeds must contain the proper drug level and be fed at appropriate levels. The Federal Food, Drug and Cosmetic Act provides that a medicated feed containing an animal drug is considered adulterated if not produced in conformance with current Good Manufacturing Practices (cGMPs). Adulterated feeds and manufacturers are subject to regulatory action. Refer to the end of this section for the cGMPs for both registered and non-registered facilities.

Larger beef operations, which use certain highly concentrated medications, may require registering with the FDA via a FD-1900 permit. Pre-mix or formulated supplements typically used by many smaller beef operations and most cow-calf operations do not require FDA registration of any type. Please contact the National BQA program office with questions about operations that may need FDA registration.

Medicated Feeds Guidelines.

1. Only FDA-approved medicated feed additives can be used in rations.
2. Feed only at recommended rates. Exercise caution when calculating rates for medicated feeds.
3. All medicated feed additives will be used in accordance with the FDA approved label. Extra-label use of feed additives is strictly prohibited by federal law. No one has the authority to adjust the dose as labeled, including veterinarians. All directions for the use of a medicated feed additive will be on the label attached to the bag or will be supplied with a bulk order. Water medications are not considered feed medications; therefore, they can be used under the extra-label drug use guidelines provided by the Center for Veterinary Medicine.
4. Ensure that all additives are withdrawn at the proper time to avoid a violative residue.
5. For operations formulating and mixing rations on site, such as stocker operators, medicated feed additives will be used in accordance with the FDA current Good Manufacturing Practices. These include a formula record of all medicated feed rations produced and production records of all batches of feed produced that contain medicated feed additives. Production records must include additive used, date run, ration name or number, the name of the person adding the additive or responsible for mixing the feed and amount produced. Use separate mixers for mixing medicated feeds and non-medicated feeds, or clean mixers between batches of each.
6. Pre-mixed or formulated supplements typically used by many smaller beef operations and most cow-calf operations do not require FDA registration of any type. Larger beef operations that use certain highly concentrated medications may be required to register with the FDA via a FD-1900 permit.
7. Identify treated individuals or groups as described in the antibiotic use section.

BEST MANAGEMENT PRACTICES - ANIMAL TREATMENTS AND HEALTH MAINTENANCE

Management

The beef industry is doing an excellent job of controlling violative drug residues. It has been accomplished by placing emphasis on the identification and handling of individually treated cattle. This includes identifying each animal treated; accurately recording the treatment, treatment date and treatment dosage; and following prescribed withdrawal times.

All processing products (vaccines, dewormers, pour-ons, etc.) need to be recorded as well. The record should include the date, product used, serial/lot number(s) of the product(s), dosage given, route and location of administration and the withdrawal time assigned to each product.

A good method of recording treatments is individually identifying each animal in the operation. The tag should include a number that identifies each animal to its group and if possible, an individual number unique only to that animal.

A special note for producers who cannot individually identify animals prior to weaning: IDENTIFYING each animal individually prior to weaning is not required to participate in the BQA Program. Cattle can be identified by group. It is required to record the date an animal within a group was treated; the identification of the group, the drug, vaccine, pesticide, etc. used; the amount given and the withdrawal time for the product. The withdrawal time will apply to the entire group of animals. For example: several calves break with scours and numerous calves are treated within a 10 day period. The entire group of calves would receive a withdrawal date based on the last date of administration of the product with the longest withdrawal period. The complete history of product use must be transferred with the group of cattle when moved to the next production unit.

Aminoglycosides

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

Veterinarian Assistance

Find and use a veterinarian who is willing to be involved with the beef quality assurance program. A herd veterinarian must understand that each animal carries the reputation of your business and the beef industry. A veterinarian must be a team player. Allowing anyone to jeopardize a beef production business or the beef industry for a single animal is not acceptable. Be cautious about cattle treatment advice from anyone who is not highly acquainted with the operation. Ask the herd veterinarian to find medications that meet all BQA guidelines.

Treatment Protocol Book

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

Any medication that requires a use other than as directed on the label must have revised administration procedures included in the Treatment Protocol Book. Ask suppliers to attach a revised label obtained from the herd veterinarian to each bottle delivered. These labels must include the veterinarian's name, address, phone number, revised directions for use and withdrawal time. Having all products that have a withdrawal time listed in your treatment protocol book is a best management practice.

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

Veterinary Prescription or Veterinary Drug Order

A Veterinary Prescription, also known as a Veterinary Drug Order (VDO) or Veterinary Drug Authorization (VDA), is a veterinarian-approved list of medications used in your operation that fit BQA guidelines. A BMP is to have the prescription include all products that have a withdrawal time, including vaccines, parasitic drugs and all injectables (including vitamins). In the BQA program, all cattle medications and vaccines should be included on the VDO. The VDO should be updated each time the Treatment Protocol Book is updated. In cow-calf operations the VDO should be reviewed at least twice a year whereas in feedyards it might be appropriate to review the VDO monthly. Your veterinarian may need to specify brand name as well as the generic name on the VDO because the drug withdrawal time and route of administration may be different for similar medications and vaccines. Never allow anyone to substitute products on the VDO.

Injections

Regardless of animal age, injections (All IM and routine SQ medications and vaccines) should be given in front of the shoulders-- never in the rump or back leg. Ask that all medications be given SQ, IV, IN or orally if possible. It is against BQA guidelines to give SQ injections along the ribs or in the elbow region. Giving injections above the curve of the ribs could cause excessive trim in the area of the "rib-roll" or "prime rib" cut of meat.

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

Bent and Broken Needles

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

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

Broken Needles Guidelines.

1. Restrain animals properly and adhere to injection site management as outlined on page tbd.
2. Do not straighten and reuse bent needles. Replace immediately.
3. Develop a standard operating procedure for dealing with needles broken off in cattle.
 - a) If the needle remains in the animal, mark the location where the needle was inserted.
 - b) If a broken needle cannot be removed at the ranch, contact a veterinarian immediately to have the needle surgically removed.
 - c) If a broken needle cannot be extracted from the tissue, record the animal's ID to ensure that it is never sold or leaves the ranch. At the end of its productive life, the animal should be euthanized and disposed of properly.

Withdrawal Times (withdrawal)

A minimum withdrawal time for newly processed cattle should be established. The minimum time period is the longest withdrawal time required for any product given. Animals recovering from illness may have some organ damage and may not be clearing medications from their system normally. Therefore, a residue screening test such as the LAST test may offer a margin of comfort if these cattle need to be shipped soon after their prescribed withdrawal date.

Unfortunately, there will be animals that do not perform at the highest level possible. Often these animals have not recovered from sickness, have organ damage, or have been injured. These non-performing animals are a HIGH RISK for causing a violative residue problem. These animals should have all of their records reviewed by both the veterinarian and manager before being released for salvage. Establish a residue screening program for non-performing animals (i.e. medicated market cows/bulls, realizer feeder cattle). Also consider that even if you have not treated an animal, it could have been treated before it arrived. This is another reason to establish a minimum withdrawal time and a residue screening program for all non-performing animals.

Extra-Label Drug Usage (ELDU)

Extra-label drug use is using a drug at a dose, by a route, for a condition or indication, or in a species not on the label.

Withdrawal period: the period of time that must pass after the last dose is given until harvest of the animal. The withdrawal period stated on the label allows time for elimination of the drug from the animal, or reduction of drug residues to below tolerance levels before harvest.

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

Prescription drugs can be used only on the order of a veterinarian, within the context of a Veterinarian/Client/Patient Relationship (VCPR). Medications used in this fashion must be labeled with an additional label that contains the contact veterinarian and instructions given, including the withdrawal time. Drug cost is not considered a valid reason for extra label drug use under the Animal Medicinal Drug Use Clarification Act (AMDUCA) or the regulations promulgated to implement the act.

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

FDA-CVM criteria for Extra-Label Drug Usage:

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

Veterinarian/Client/Patient Relationships Exist When:

- A. The veterinarian has assumed the responsibility for making clinical judgments regarding the health of the animal and the need for medical treatment, and the client has agreed to follow the veterinarian's instructions.
- B. The veterinarian has sufficient knowledge of the animal to initiate at least a general or preliminary diagnosis of the medical condition of the animal. This means the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal by virtue of an examination of the animal or the medically appropriate and timely visits to the premises where the animal is kept.
- C. The veterinarian is readily available for follow-up evaluation in the event of adverse reactions or failure of the treatment regimen.

A Beef Producers Guide for Judicious Use of Antimicrobials in Cattle

1. **Prevent Problems:** Emphasize appropriate husbandry and hygiene, routine health examinations, and vaccinations.
2. **Select and Use Antibiotics Carefully:** Consult with the herd 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 to 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. **Combination Antibiotic Therapy Is Discouraged Unless There Is Clear Evidence The Specific Practice Is Beneficial:** select and dose an antibiotic to affect a cure.
6. **Avoid Inappropriate Antibiotic Use:** Confine therapeutic 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:** To minimize the potential for bacteria to become resistant to antimicrobials.

10. **Avoid Environmental Contamination with Antibiotics:** Steps should be taken to minimize antimicrobials reaching the environment through spillage, contaminated ground runoff or aerosolization.
11. **Keep Records of Antibiotic Use:** Accurate records of treatment and outcome should be used to evaluate therapeutic regimens and always follow proper withdrawal times.
12. **Follow Label Directions:** Follow label instructions and never use antibiotics other than as labeled without a valid veterinary prescription.
13. **Extra-label Antibiotic Use Must follow FDA Regulations:** Prescriptions, including extra-label use of medications must meet the Animal Medicinal Drug Use Clarification Act (AMDUCA) amendments to the Food, Drug, and Cosmetic Act and its regulations. This includes having a Veterinary/Client/Patient Relationship.
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.

Guidelines 1-13 adapted from AVMA, AABP and AVC Appropriate Veterinary Antibiotic Use Guidelines.

Antibiotic Use Guidelines.

1. Strictly follow all recommendations and guidelines from herd veterinarian for selection of products.
2. Follow label directions for use of product. Use product at recommended dosage for required time period. Treatment regimens must comply with label directions unless otherwise prescribed by a veterinarian. If drugs are to be used in an extra-label manner, that must be done under the prescription or direct supervision of a licensed veterinarian. (The requirements for a veterinarian/client/patient relationship are covered in the Appendix, page tbd.) All cattle treated in an extra-label manner must comply with prescribed withdrawal times, which have been set by herd veterinarian under the guidelines of a VCPR.

The BQA program does not support/recommend extra-label drug use (ELDU) for injectable aminoglycosides (such as neomycin, gentamicin or kanamycin) because of the potential violative residues related to extremely long withdrawal times. Some studies have shown withdrawal times on these types of products could be as long as 18 months.

3. Accurately calculate dose requirements based on the animal's weight and the specific health problem being treated. Providing the same drug simultaneously by injection, feed or water may result in overdosing and, thereby, create a residue problem.
4. When administering injectable products, follow the Best Management Practices for Injections.
5. Never administer more than 10 cc per IM injection site. Exceeding this amount will increase tissue damage, alter withdrawal time and may require testing before cattle are marketed for consumption.
6. Do not mix products prior to administration. This practice of using "Bloody Mary" mixes is compounding use and will result in undetermined withdrawal periods.
7. All animals treated for problems unique to the individual animal should be recorded by the animal's ID, treatment date, drug and dose administered product serial/lot number, approximate weight of animal, route and location of administration, and the earliest date the animal would clear the prescribed or labeled withdrawal period. (See page tbd for sample treatment records). You can record treatments either by individually identifying each animal in your herd and/or individually identifying each animal when or if they are treated. The ID number should be unique to that animal and tie it to the group from which it came.
8. **A special note for producers who do not individually identify animals:** Identifying each animal individually is not required to participate in this program. Cattle can be identified by group. However,

if treated cattle are not individually identified, then the entire group must be managed together until the appropriate withdrawal times have elapsed for every animal in the group. **The withdrawal time applies to the entire group of animals.**

For example, let's say several calves develop scours and numerous calves are treated within a 10-day period. The entire group of calves would receive a withdrawal date based on the last date of administration of the product (to any individual animal) with the longest withdrawal period. The complete history of product use should be available for transfer when the group of cattle is sold or moved to the next production unit within an operation.

Otherwise, the buyer (or the foreman of the other unit) will not be aware of when those calves can safely enter the marketing chain. For example, when a stocker operator culls his non-performing steers any time during the course of a grazing period, those animals could potentially be sent to a packer. If the stocker operator is unaware that the prior owner treated the animal with an antibiotic whose withdrawal time has not expired, he might have unknowingly contributed to a violative residue problem.

9. All animals treated as part of a group will be identified by group or lot with treatment information recorded. Records should include the animal lot or group identification, processing/treatment date, product serial/lot number, product and dose administered, route and location of administration, name of person who administered it and withdrawal information. Recording animals under this system assumes that every animal in the lot or group received the treatment. (See forms for recording group treatment history on page tbd).
10. All cattle marketed from the operation can potentially go directly to harvest. Therefore, records for any cattle to be marketed should be checked by personnel to ensure that treated animals will meet or exceed label withdrawal times for all products administered. A release slip should be signed and dated by the person who checks records prior to shipping cattle from the operation. The examination should include processing records, feeding records, treatment records and all other records that may apply.
11. Extended withdrawal times should be expected for emaciated or severely debilitated animals. All cattle sold that are not typical of the herd (medicated market cows/bulls and realizer cattle) may be subject to verification of drug withdrawal. (Realizers are animals with a health problem that get culled because they never recover.) Should there be any question about withdrawal period, the veterinarian will evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank and the animal may have to pass a residue screening test, such as the Live Animal Swab Test (LAST), which tests for antibiotic residues. Residue screening will be performed by qualified personnel under the supervision of a veterinarian. The results will determine whether the animals can be released for shipment, but cannot be used to shorten the labeled withdrawal time. Attempting to salvage sick animals by treatment and prompt harvest requires an accurate diagnosis and careful selection of drugs.
12. Make sure that all employees are aware of the proper use and administration of antibiotics and withdrawal times, and they have the ability to check appropriate withdrawal restrictions before moving cattle to market. For example, provide employees with charts or software to help them track withdrawal dates.

You DON'T know where they're going.

Any animal marketed from a cow-calf or stocker operation could potentially go into a meat product. You may sell an animal with no intent of it going for harvest; however, the person you sold the animal to could resell it within a matter of days to someone else who sends it to harvest. This applies to cows, bulls, calves and yearlings. That's why it is so important to observe withdrawal times whenever cattle are sold or transferred.

BEST MANAGEMENT PRACTICES - PREVENTION AND PROCESSING

Only FDA, USDA or EPA-approved products can be used in processing and treatment programs in beef operations. Records must be maintained for any pesticide, medication or biological product administered. The records will include the following: date, group identification number, individual identification if appropriate, name of product, manufacturer of product administered, lot/serial number of product used, dosage administered, route and location of administration, withdrawal period and name of person administering the product.

All products will be used in accordance with label directions unless otherwise specified by a legal prescription. A legal prescription will consist of a Veterinary Drug Order plus a dated and signed Treatment Protocol Book. Extra-label drug use of over the counter medications must be labeled by your supplier with labels outlining procedures as described in your current signed and dated Treatment Protocol Book in accordance with FDA-CVM regulations. Extra-label drug use must be prescribed by a veterinarian according to FDA guidelines.

Management

Correct administration is important for the proper use of animal health products. Recently, packers have noticed an increase in the number of abscesses and lesions in wholesale and retail beef cuts resulting from improper injections. Abscesses and lesions can diminish carcass value. This loss can be passed back to the producer through market discounts and docks. Product discounts as a result of abscesses and lesions can be minimized or avoided by following these simple procedures:

- A. Handle cattle gently to minimize bruises.
- B. Don't use chemical disinfectants while using a modified live virus (MLV) product as efficacy will be decreased or even eliminated.
- C. Use the needle size proper for the situation. Use the smallest needle possible to complete the injection, but large enough to prevent breaking off in the muscle. *More information is available later in this section of the manual.*
- D. Provide proper restraint to avoid breaking needles in animal tissue.
- E. Purchase high quality needles, change needles often and discard damaged needles.
- F. **All injections must be administered in front of the shoulders, no exceptions.** Select the injection site carefully. Packers report a high incidence of fabrication trim in the top butt and round. Changing the injection site to the neck prevents the loss of expensive cuts and reduces the potential for market docks.
- G. Administer less than 10 cc per IM injection site. The volume of solution injected at one site will directly influence tissue damage, scar tissue and potential abscesses.
- H. **Always use SQ or IV routes of administration when permitted by the product's label.** Check product labels closely and administer the product as specified on the label. Select products that have subcutaneous as an approved route of administration when possible. **Ask suppliers to find products that have SQ, IV, IN or oral routes of administration rather than IM.**
- I. Properly place implants to reduce trim loss. Implants placed too close to the ear base or into the base tissue can result in excess trim. Improperly placed implants will place regulatory liability on the feedyard. More information on administration of implants is available later in this section of the manual.

- J. During bad weather take extra care to see that the injection site is free of manure and dirt and that syringes and needles are clean and disinfected. Injecting cattle during wet weather increases the potential for carrying a contaminant into the injection site.
- K. Wetting the area around the chute will reduce the chance of contamination from dust and other foreign material in injection sites and open incisions.
- L. Overall sanitation of equipment, working area and the cleanliness of your employees and co-workers will reduce injection site defects. A sound educational effort directed toward sick pen and processing crews offers great potential for helping eliminate these problems.

Vaccinations

The use of biological products for the prevention of diseases such as IBR, P13, Lepto, BVD, and BRSV will lessen the chance of treatments and residue problems later in the production cycle. However, cattle do not always arrive in healthy condition and immediate treatment may be necessary. Many treatment regimes include vaccines to stimulate immune system response and lessen the chance of re-treatment. Vaccines should be considered as an alternative to antibiotics and other medications that can lead to residue problems, even though vaccines can have extended withdrawal times.

Needle Selection

Visit with the herd veterinarian if you have any questions about the following needle selection information for vaccines, antibiotics and supportive therapies.

Needles contribute to injection site defects. Use needles that are no larger than necessary to adequately complete the injection, but large enough to prevent needle bending or breaking off in muscle tissue. The leading cause of needle bending is improper restraint, but using dull, damaged or poor quality needles may also contribute to the problem. Under no circumstances can animals with broken needles in them be sent to a harvest facility.

Primary considerations in needle selection:

1. Route of administration
2. Size of animal
3. Location or site of injection (BQA requires all injections be given in the neck)

Secondary consideration in needle selection:

Viscosity and volume/amount of fluid injected

These considerations are the basis for the guidelines listed in the following table:

Injectable Viscosity	Route of Administration								
	SQ (1/2 - 3/4 inch needle)			IV (1 1/2 inch needle)			IM (1 - 1 1/2 inch needle)		
	Cattle Weight lbs.			Cattle Weight lbs.			Cattle Weight lbs.		
	<300	300-700	>700	<300	300-700	>700	<300	300-700	
Thin Example: Saline	18 gauge	18-16 gauge	16 gauge	18-16 gauge	16 gauge	16-14 gauge	20-18 gauge	18-16 gauge	
Thick Example: Tetracycline	18-16 gauge	18-16 gauge	16 gauge	16 gauge	16-14 gauge	16-14 gauge	18 gauge	16 gauge	16
SELECT THE NEEDLE TO FIT THE CATTLE SIZE (THE SMALLEST PRACTICAL SIZE WITHOUT BENDING)									

Needle Guidelines.

Needle selection and use in a nut shell:

- Use proper restraint and high quality needles
- Select needle size to fit the size of the cattle
- Diameter (gauge) to fit the viscosity, adjusted to the cattle weight
- Length to fit the route of administration, adjusted to the cattle weight

Change needles

- Immediately if the needle bends (DO NOT USE A BENT NEEDLE)
- If needles become contaminated with feces, dirt, or irritating chemicals
- If the needle point is damaged/burr develops
- Before the needle becomes dull (at least every 10 to 15 injections)
- Between cattle with KNOWN blood borne infectious disease
- Follow the herd veterinarian's instructions

Needle care

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

Needle disposal

- Follow EPA guidelines for disposal of used needles and other Sharps
- Seal Sharps container and dispose of in an approved land fill

Disinfectants

- DO NOT USE DISINFECTANTS ON NEEDLES USED FOR FLUID INJECTABLES
 - Disinfectants kill MLV vaccines
 - Disinfectants can cause severe tissue irritation

Route of administration

- When possible select injectable products that can be given SQ or IV
- If you must use a product IM:
 - o Inject in the neck region
 - o Do not exceed 10 cc per intramuscular site
 - o Properly space injections at least 2 to 4 inches apart

Residue Avoidance

Avoiding tissue residue of antibiotics is simple to manage. Observe and follow label directions and ensure that cattle are not marketed until the appropriate withdrawal time has elapsed. On the next page are basic management practices necessary to assure that no violative antibiotic residues will be present in carcass tissues.

Adulteration of beef products can occur with residues from animal health products, pesticides and chemical contaminants of feed and water. Traces of some drugs and chemicals may be allowed in certain tissues. This is known as the tolerance level.

Tolerance levels are usually discussed in terms of one part of drug or chemical to one million or one billion parts of tissue. For some chemicals, no detectable amount is allowed (zero tolerance). The Food and Drug Administration establishes tolerance levels for residues in food products.

Residues are monitored through sampling of meat products and suspect animals in beef processing facilities. Violations of the legal limits called violative levels can result in regulatory action, including fines, herd quarantine and possibly criminal prosecution.

To date, violations have been minimal. But recent changes in inspection and monitoring may result in a higher incidence of residue detection.

The Food and Drug Administration, the U.S. Department of Agriculture and the Environmental Protection Agency approve and establish guidelines for the use of animal health products and agricultural chemical products used in pasture and range management, crop production, feed processing and storage.

During the approval process, withdrawal times are established for livestock treated with or exposed to regulated compounds and products. These times are explicitly defined on the labels for the products. The first step in avoiding residues is to read and follow label directions for all products used in beef and other agricultural production.

In addition to animal health products and pasture and range pesticides, contamination or residues may result from accidental or negligent exposure to feed, water or soil that has been contaminated with heavy metals, petrochemicals, PCBs, PCPs, insecticides, fungicides, herbicides, mycotoxins or other hazardous materials. Careful management and oversight is necessary to prevent exposure to these compounds.

Traces of some drugs and chemicals may be allowed in certain tissues. This is known as the tolerance level or Maximum Residue Level (MRL).

Residue monitoring

Residues in fresh meat and poultry are monitored by the Food Safety Inspection Service through the National Residue Program (NRP). The NRP helps prevent the entry of animals containing violative residues of pesticides, drugs or potentially hazardous chemicals into the food chain through monitoring and enforcement.

Random samples are tested for monitoring the national residue incidence.

Specific samples are collected for enforcement based on clinical signs and previous herd history.

Traditionally, animals were selected for testing based on pre-harvest evaluation only (down, disabled, recent surgery). Effective Aug. 9, 1999, inspectors were instructed to check for residues after harvest in animals with any of the following 12 conditions:

1. Downers (Non-ambulatory animals)
2. Suspects
3. Mastitis
4. Pneumonia
5. Body-cavity lining inflammation
6. Heart sac lining inflammation
7. Skin inflammation
8. Twisted stomach disease
9. Septicemia (blood poisoning)
10. Pyemia (blood poisoning)
11. Injection sites
12. Uterine infection

Violations of the legal limits, called violative levels, can result in regulator action, including fines, herd quarantine and possible criminal prosecution.

Residues are monitored and can be traced back to the owner through back tags that are applied at the auction market or harvest facility. In 2005 (the most current year reported), the majority of violative residues for antibiotics and sulfonamides occurred in tissue samples from dairy cows. However, beef cows were also a significant source of violative residues.

Based on results from the most recent Market Cow and Bull Beef Quality Audit, each carcass tested for residues costs nearly \$45. That averages out to almost one dollar (\$0.92) for every market cow and market bull marketed that year.

The impact may seem small on a per cow basis, but nationally there are approximately 6 million market cows/bulls harvested every year. Additionally, the cost of inspecting for residues in the end product goes against the principles of HACCP and TQM, which stress prevention rather than inspection.

These problems can and must be solved at the producer level, and progress in reducing residues will only be accomplished if producers pay strict attention to guidelines for proper use of animal health products and other potential contaminants.

Antibiotic Residue Avoidance Strategy

1. Identify all animals treated.
2. Record all treatments: Date, animal ID, serial/lot number, dose given, route of administration, the person who administered the treatment and the withdrawal time.
3. Strictly follow label directions for product use.
4. Use newer technology antibiotics when possible.
 - a. Reduce unwanted depot effect. Select low volume products when available.
 - b. Select generic medications and vaccines with EXTREME CAUTION.
 - c. Avoid inferior products. They may cause performance loss or damage quality.
5. Select with short withdrawal when antibiotic choice is equivalent.
6. Never give more than 10 cc per IM injection site.
7. Avoid Extra-Label Drug Use (ELDU) of antibiotics.
 - a. Use label dose and route of administration.
8. Avoid using multiple antibiotics at the same time.

9. Don't mix antibiotics in the same syringe, especially if given IM or SQ.
10. Check ALL medication/treatment records before marketing:
 - a. Don't market cattle with less than 60 withdrawal days without examining their treatment history.
 - b. Extend the withdrawal time if the route or location of administration is altered.
 - i. Example; the withdrawal for ear route of administration ceftiofur will be over 120 days if given SQ in the neck.
 - ii. Example; tissue irritation will cause the withdrawal for Banamine to be over 30 days if given IM or SQ instead of IV.
 - c. Extend the withdrawal time for multiple medications given by summing their label recommended withdrawal.
 - i. Example; if the 1st medication has a 10 day withdrawal and the 2nd medication has a 28 day withdrawal, assign a 38 day withdrawal.
 - ii. Example; if 1st medication has a 10 day withdrawal and is repeated in three days, assign a 20 day withdrawal.
 - d. Extend the withdrawal for all penicillin given at doses which exceed the label dose
 - i. Example; the withdrawal for Procaine Pen G given at 3 CC per CWT IM or SQ is over 30 days
 - ii. Example; the withdrawal for Procaine Pen G given at 4 CC per CWT IM or SQ is over 30 days
 - iii. Example; the withdrawal for Long Acting Pen G given at 3 CC per CWT IM or SQ is over 120 days
 - iv. Example; the withdrawal for long acting Pen G given at 4 cc per cwt IM or SQ is over 180 days
1. Testing urine may not detect injection site residues that will test positive by the USDA-FSIS.
- e. Never inject gentamicin or neomycin. The estimated withdrawal is more than 24 months
- i. Testing urine may not detect a kidney that will test positive by the USDA-FSIS.
- f. Don't market cattle that have relapsed without examining the treatment history.
- g. Don't market cattle with suspected liver or kidney damage without examining the treatment history.
- h. Don't market cattle with antibiotic injection site knots without examining the treatment history.
- i. Screen the urine for antibiotics of all cattle identified in steps a-d above. It is best to use broad spectrum microbial inhibition test such as the Pre-Harvest Antibiotic Screening Test (PHAST), a microbial growth inhibition test which uses *B. megaterium* as the test organism. Test sensitivity relative to FDA-CVM violative residue tolerances (Maximum Residue Limit).

Overall, the beef industry is doing an excellent job of controlling violative drug residues by placing emphasis on the identification and handling of individually treated cattle. This includes identifying each animal treated, accurately recording the treatment, date and treatment dose, and following prescribed withdrawal times.

It is important that beef producers establish a working relationship with a veterinarian. Find and use a veterinarian who is willing to be involved with your Beef Quality Assurance program. Be cautious about cattle treatment advice from anyone who is not highly acquainted with your operation and the proper use of animal health products.

Parasite control

Both internal and external parasites can have an impact on cattle quality. In part, it will be an impact on nutritional status. But it will also impact condemnation of livers, hide quality and muscle damage through parasite migration.

Internal parasites, such as stomach worms, can cause extensive damage to the digestive tract of cattle. The damage can result in impaired digestive function and suppressed absorption of nutrients, leading to deficiencies in energy and protein. Nutrient deficiencies can lead to suppression of the immune system, resulting in poor animal performance and health.

Liver flukes are another common internal parasite in some parts of the United States. Infection is generally limited to cattle produced in areas that commonly have standing water, such as river bottom pastures and alkaline soils. Additionally, the presence of an aquatic snail is necessary to serve as the

intermediary host for the liver fluke.

Many of the major river/flood areas in the southeastern United States are habitat for such snails, and pastures adjacent to these waters are sources of potential infection. Fluke control for cattle managed in fluke-infected areas should be considered. A liver fluke infection can reduce animal performance and cause liver condemnation in fed cattle, market cows and market bulls.

External parasites, such as the horn fly and heel fly, are pests that can impact performance and hide quality. Horn fly irritation reduces gains in calves and yearlings and body condition in cows. Horn flies are biting insects that not only affect performance, but can also reduce hide quality due to scar tissue on the surface of the skin. This damage devalues the hide, because it can't be used to manufacture high-quality leather products.

Heel flies also cause annoyance during the spring fly season. Heel fly eggs laid on lower legs of cattle migrate to the skin surface and burrow through the skin. Larvae then migrate through the body and ultimately become encapsulated just beneath the hide, along the back.

At this stage the larvae, or "grubs," require oxygen for further development and burrow through the hide, creating a small hole. Eventually, the larvae migrate through the skin and drop to the ground where they pupate and emerge as heel flies in the spring.

The migrating larvae cause tissue damage, resulting in trim loss and reduced carcass value. The holes in the hides eventually heal, but the scar tissue devalues the hide. Treating cattle one to two months after heel fly activity ceases can control larvae from heel flies.

BEST MANAGEMENT PRACTICES - PESTICIDES

Internal and external parasites are a constant economic threat. Parasites directly affect animal performance, transmit disease and affect the wholesomeness of beef produced. Improperly handled pesticides can lead to residue contamination, feed contamination, by-product contamination and environmental damage. Only EPA, FDA and USDA-approved pesticides can be used for cattle treatment. These products must be used in compliance with label directions.

Pesticide Records

A record of pesticide use must be kept and must include product ID, serial/lot number, date used, amount used, person who administered the pesticide, the animal or animals exposed to the pesticide and withdrawal time. If a pesticide, such as a pour on, is used at processing, the record of its use can be included on the processing record for the group of cattle. If a premise pesticide is used, a record of its use can be included on a Premise Pesticide Use Record. Restricted Use Pesticides (RUP) require records be kept for three years.

Pesticide Residue Contamination

Pesticides have proven to be effective when utilized at label dosages and approved routes of administration. Improper dosage levels or routes of administration excessively stress cattle and affect withdrawal periods. This creates an economic hazard as well as a potential for residue contamination at slaughter time. These chemicals can be persistent and remain in the systems of stressed cattle for extended periods of time, making correct withdrawal time's unpredictable.

Pesticide Feed Contamination

The potential for adulteration of beef from contaminated feed is greater than most producers realize. However, contamination is not common at the ranch level. Accidental contamination is much more common than any other type of problem.

EPA and FDA both require all hazardous chemicals be stored away from feed and feed storage areas. Specifically, insecticides must be stored separately from feed additives (Refer to cGMPs, Part 225.35 (b): and Part 225.135). Several incidents of deadly feed contamination have resulted from careless handling and storage of pesticides. These chemicals must be stored in original containers or in properly marked storage bins. Placing a pesticide in an improperly marked or labeled container is very risky to your operation; improper use of the product may result in regulatory action.

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

Animal By-Product Contamination

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

Occupation Safety and Health Administration

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

Worker Protection Standard

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

Avoiding Chemical Residues

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

Chemical Residue Guidelines.

1. Use only agricultural chemicals approved for application to land grazed by livestock or on land where feedstuffs are removed for animal consumption at a later time.
2. Follow label directions and observe grazing restrictions on pastures, rangeland and crops treated with pesticides.
3. Prevent accidental exposure to agricultural chemicals by proper storage and disposal of containers. Do not use the same sprayer to apply agricultural chemicals to pasture or rangeland that you use to apply livestock pesticides directly to cattle.
4. Only use products approved for control of internal and external parasites of cattle. Caution should be exercised when using petrochemicals, such as motor oil or diesel fuel, in backrubbers or other self-treatment devices for control of external parasites. These compounds are routinely screened for at harvest and overexposure can result in a violative residue.
5. Apply topical, oral and/or injectable livestock pesticides at label dose rate. Overdosing constitutes extra-label usage with unknown withdrawal times. Individual animal weights can help determine appropriate calculation of doses.
6. Document usage and observe all appropriate withdrawal times before marketing cattle. Remember that residue problems occur more frequently with market cows/bulls and realizer cattle than for healthy calves or yearlings.

7. Prevent consumption of hazardous chemicals and heavy metals by proper storage and disposal of paint, batteries, chemical containers, used petrochemical products and other materials, and make sure cattle don't have access to petrochemical production sites.
8. Prevent contamination of feedstuffs by chemical compounds through proper storage of chemicals and proper treatment of stored feed products with insecticides and fungicides. These should not be stored in the same location as approved animal-use products.
9. Record dates of application, areas, animals and/or feedstuffs treated, products used, product serial and lot numbers, appropriate withdrawal periods, etc. Producers may request a letter of guarantee from the feed supplier that the feed is below violative levels for residues and mycotoxins. More pesticide information can be found from your local extension educator or university beef specialist.

Why keep records?

Recordkeeping is a key element of Beef Quality Assurance, and it's simply a good business practice. There are many software programs on the market that are designed for both commercial and purebred cattle operations. However, even old-fashioned pen and paper beats no recordkeeping system.

The important thing is to find a method that you are comfortable with, which allows you to maintain accurate, thorough and timely documentation of your herd health program, nutrition program and other important production factors. It's also essential to controlling your costs of production and keeping your eye on other pieces of data that help you make informed management decisions.

For example, animal health records tell the manager and veterinarian what treatments are being used so they can make sure that recommendations are being followed and decide whether treatment protocols need to be adjusted.

As well, to inspire consumer confidence we must be able to document the responsible use of products and demonstrate that we have control over risk factors that have residue potential. Good records are also important if your operation is inspected (for example, if one of your market cows is found to have a violative residue) by any state or federal agency.

Should your operation get cited for a residue violation and you believe it's a case of mistaken identity, good records are your only evidence that the animal in question does not belong to you. Or, if it is your animal, then your records may help prove the animal was never given the particular drug in question.

Effective documentation showing appropriate training, inventory control, product use, animal identification, withdrawal and disposal s the only way to avoid liability from a residue contamination. The only way to accurately determine if you are in compliance with withdrawal times is to know exactly what was given, how much was given, where it was given, how it was given and when it was given to the animal.

Updated records also allow you to make well-informed decisions about marketing cattle without worrying whether enough time has elapsed since the last treatment. Also, as mentioned in the section on feed contamination, you should keep records on your use of pesticides, herbicides and other chemicals. Understand the remarks and safety restrictions with regard to withdrawal times and animal types (pregnant, lactating, etc.) that should not be treated or exposed to treated areas.

Animal Health Product Records

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

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

Several pharmaceutical companies have developed computer programs to control animal health product inventory records. The product is recorded at the chute during administration via a chute-side computer terminal or via a handwritten system consisting of an individual treatment card or a processing work order form.

Animal Treatment Records Guidelines.

1. Keep all records for at least three years from the date of transfer or sale of the cattle. In case a problem arises later, your records will help you track the treatment history of the animal when it was in your possession.
2. The treatment record should contain the following information:
 - a) Treatment date
 - b) Animal or group identification
 - c) Approximate weight of animal or group average
 - d) Product administered
 - e) Product lot/serial number
 - f) Earliest date the animal could clear withdrawal time
 - g) Dose given
 - h) Route of administration (IM, SQ, etc.)
 - i) Location of injections
 - j) Name of person who administered the drug
3. A copy of the appropriate records should be made available to the buyer of your cattle or as they are transferred from one unit of your ranch to another. Records should include all individual and group treatment/processing history and other information as deemed appropriate.

Feed Records Guidelines.

1. Keep all feed records for at least two years (an industry standard) from the date of transfer or sale of the cattle. In case of a problem, you will have documents to prove what you have or have not fed your cattle.
2. It's a best management practice to require that all feed products be accompanied by an invoice that includes the date, amount, lot/batch number and signatures of both the person who delivered the product and the person receiving the product.

Chemical Records Guidelines.

1. If you are a licensed pesticide applicator (required for purchasing restricted-use chemicals), your state Department of Agriculture already requires you to keep records on your use of these chemicals. These records are sufficient. An additional set of records should be maintained for non-restricted pesticides. Records should record the date and time used, product name, name of applicator and EPA product number. Additional information may be required to be recorded. Check with your pesticide supplier and extension educator for additional information.

BEST MANAGEMENT PRACTICES – ACTION IN CASE OF A VIOLATION

If an unacceptable residue is found by FSIS, it is preferable for a joint assessment by the beef operation, the veterinarian, the nutritionist, FSIS, FDA and BQA Program Personnel. Adjustment in the BMP and corrective action taken to prevent reoccurrence of such violation. All violations should be reported to the BQA Technical Advisory Committee for review and potential adjustment or updating of BQA Guidelines.

BEST MANAGEMENT PRACTICES - CARCASS QUALITY

1. The beef operation will strive to prevent bruising during animal handling. When possible, bruising rates will be monitored at the packing plant. Other carcass quality concerns at the packer level include buckshot, injections site damage and bruises.
2. Microbial Contamination: Evaluate way to prevent fecal contamination of cattle feed or oral cavity.
3. Avoid high-risk feed sources and protect feed supplies from fecal contamination.
4. Observe septic leach fields and fix any broken pipes.
5. Educate workers about the importance of personal hygiene near feedstuffs or feed bunks, water tanks or even pens where cattle could come in contact with tapeworm segments or eggs spread by infected humans.

BEST MANAGEMENT PRACTICES - CATTLE HANDLING

Bruising from improper cattle handling costs the industry \$117 million annually in carcass trim at the time of processing. Handling stress lowers conception rates and reduces both immune and rumen functions. Shipping fever and excess shrink caused by mishandling stresses also cost the industry severe economic damage. An understanding of cattle behavior will facilitate handling, reduce stress, reduce bruise defects and improve both handler safety and animal well-being.

Cattle Vision

Cattle have a wide-angle vision field in excess of 300 degrees. Loading ramps and handling chutes should have solid walls to prevent animals from seeing distractions outside the working area. Seeing moving objects and people through the sides of a chute can cause cattle to balk or become frightened. Solid walls are especially important if animals are not completely tame or if they are unaccustomed to the facility.

Cattle have a tendency to move from dark areas to lighter areas, provided the light is not glaring. A spot light directed onto a ramp or other apparatus will often facilitate entry. Handling facilities should be painted one uniform color because cattle are more likely to balk at a sudden change in color.

Hearing

Loud noises should be avoided in cattle handling facilities. However, small amounts of noise can be used to assist in moving livestock. Placing rubber stops on gates and squeeze chutes and positioning the hydraulic pump and motor away from the squeeze chute will help reduce noise. It is also beneficial to pipe exhausts from pneumatic powered equipment away from the handling area.

Flight Zone

An important concept of livestock handling is the animal's flight zone or personal space. When a person enters the flight zone, the animal moves away. Understanding of the flight zone can reduce stress and help prevent accidents. The size of the flight zone varies depending on how accustomed the cattle are to their current surroundings, people, etc.

The edge of the flight zone can be determined by slowly walking up to the animals. If the handler penetrates the flight zone too deeply, the animal will either bolt and run away or turn back and run past the person. The animal will most likely stop moving when the handler retreats from the flight zone. The best place for the person to work is on the edge of the flight zone. Cattle sometimes rear up and become agitated while waiting in a single file chute. A common cause of this problem is a person leaning over the chute.

Properly designed alleys and chutes

Design, construction and maintenance of chutes or working alleys are especially important. A curved working system or a properly designed loading box with double alleys more efficient. Livestock will often balk when they have to move from an outdoor pen into a building. To combat this problem, animals should be lined up in a single file chute/working alley outside. Again, solid sides are recommended on both the handling facilities and the crowding pen that leads to a squeeze chute or loading ramp.

Herd Instinct

Cattle are herd animals and they are likely to become highly agitated and stressed when they are separated from their herd mates. Many serious cattle handling accidents have been caused by isolated, frantic cattle. If an isolated animal becomes agitated, other animals should be put in with it as cattle are motivated to maintain visual contact with each other. A gentle calf will keep an excited calf calm. Allow livestock to follow the leader and do not rush them. If animals bunch up, handlers should concentrate on moving the leaders instead of pushing a group of animals from the rear. Proper handling management will reduce stress related to shipping fever and carcass damage resulting from bruising.

Providing environmental protection and adequate water is not just an issue of animal well-being, it is vital for optimizing cattle performance. Environmental protection should include excellent pen maintenance for confined cattle. Mud is a big profit robber in confined cattle, as mud increases maintenance requirements and decreases feed efficiency. Mud also causes considerable loss of hide value and increases the cost of processing at the packing plant. Providing environmental protection, mud control, and an adequate supply of fresh clean water are important parts of quality cattle management.

Cattle Handling Guideliness

1. Using their natural flight zone, cattle can be moved quietly. To move forward, move toward their rear past their point of balance (shoulder). To stop or back up in chute, move forward past their point of balance.
2. Handling facilities should ideally have curved chutes and round crowding pens.
3. Use two or more sorting pens in front of the squeeze chute.
4. Never fill a crowding pen more than three-quarters full; cattle need room to turn around.
5. Cattle should move easily up the chute. If not, hanging chains, shadows, backstops, noises, dogs or people could be preventing movement.
6. Cover the sides of the squeeze chute, especially the back three-quarters, to reduce balking as they enter the chute.
7. Minimize your use of cattle prods (electric and others that bruise). Instead, wave sticks with plastic streamers on the end.
8. Reducing stress on the animal will reduce animal injuries and sickness, employee injury and increase overall efficiency.

Nutritional Management

Nutrition is a broad category involving management of energy, protein, vitamins, minerals and water. Nutritional status of the cow herd has a direct impact on production efficiency, immunity and carcass characteristics of calves.

General health and immune system function

Proper cow nutritional management includes utilizing Body Condition Scores (BCS) to monitor herd nutritional status. Target a BCS 5 or higher at calving for optimum production and for cow and calf health. Cows calving below a BCS 5 produce less volume of colostrum, lower-quality colostrum and decreased milk production.

BCS Diagram

Additionally, calves born to these cows are slower to stand and nurse and are more susceptible to cold stress. This results in decreased colostrum consumption, reduced antibody absorption and reduced passive immunity. For maximum passive transfer, calves should nurse within four hours. Although some absorption can occur during the first 24 hours, efficiency of antibody absorption decreases after the first two hours.

Lower body condition will affect passive transfer, resulting in lower maternal antibody protection and decreased neonatal calf resistance to disease. Calves born to thin cows have increased susceptibility to calf scours and lower stores of brown adipose tissue, resulting in higher morbidity and mortality during the first two weeks of life. Immunocompromised calves have an increased risk of sickness when exposed to stress and pathogens throughout their life.

Nutritional stress can and will mask the expression of immunity in cattle exposed to infectious pathogens. The most critical nutritional consideration is the protein and energy balance. When adequate protein and energy are available, digestion is enhanced and mineral digestion and absorption is adequate in most instances. Adequate levels of most B vitamins are synthesized when microbial activity is high.

In most cow-calf production systems, protein is the first limiting nutrient. Deficiencies in protein intake affect total forage intake, energy digestion, microbial protein synthesis and vitamin synthesis by rumen microflora. It is important to stress that protein and energy requirements must be met before the impact of minerals or vitamins can be determined.

Minerals are necessary for microbial synthesis of protein and energy, maintenance of forage digestibility and electrolyte fluid balance in the animal. Minerals also play an important role in metabolic pathways and immune system function. Imbalances in mineral intake interfere with the development and function of the immune system, even when adequate levels of protein and energy are supplied.

Trace minerals known to be involved in immune system function include copper (Cu), zinc (Zn), selenium (Se), iodine (I), iron (Fe), molybdenum (Mo) and sulfur (S). Other trace minerals may have an indirect affect on immunity because of antagonistic interactions with essential minerals. For example, elevated levels of S, Fe or Mo will interfere with the digestion and absorption of Cu. Copper is critical in the function

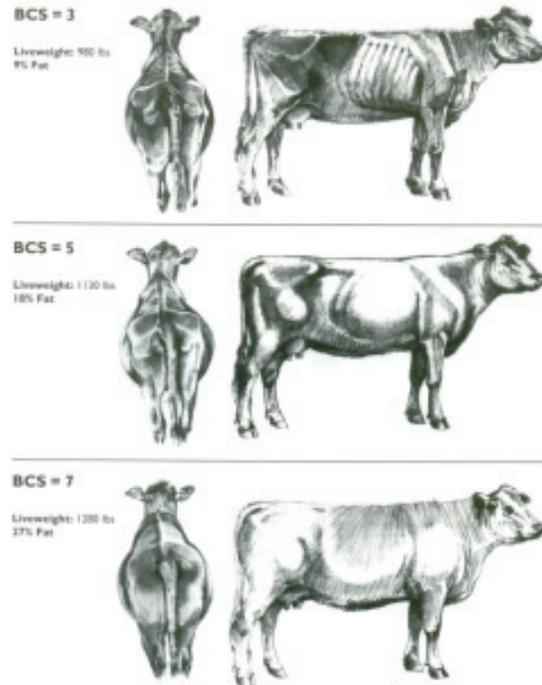


Illustration 2. Drawing of what beef cows look like without hair and are in BCS 3, 5, and 7. Drawings courtesy of Illinois.

of the immune system.

The accompanying graph (Figure 6) illustrates how trace mineral deficiencies impact the immune system before affecting growth or fertility. Immune function, growth and fertility are depressed before clinical symptoms normally associated with mineral deficiencies are evident.

Producers cannot afford to wait until clinical symptoms are expressed before initiating changes in nutritional management.

Cows must have adequate trace mineral intake during the last trimester of pregnancy so the fetus can deposit adequate stores of copper and zinc in the liver prior to birth. Milk is an inadequate source of copper or zinc for the newborn calf. Calves with inadequate liver stores have a compromised immune system at birth, making them more susceptible to neonatal infections like calf scours.

Vitamins that appear to be the most critical in immune system function are vitamin A (betacarotene) and vitamin E. Selenium and vitamin E function as antioxidants and reduce the accumulation of compounds produced as cells in the immune system response to invasive organisms.

Weaning nutritional management

One of the most stressful periods in a calf's life occurs during the weaning process. Stress suppresses the immune system. Commonly, calves are sold or shipped to market within 24 hours of removal from the cow. Removal from the cow, introduction to a new environment and commingling with cattle of different origins are stressful events.

This stress is accompanied by reduced feed and water intake and exposure to pathogens. These stressors result in a high percentage of freshly weaned calves requiring treatment for respiratory disease. These problems can be managed if calves are weaned and held at the ranch for a minimum of 45 days.

It is well documented that health management practices at the ranch are often inadequate to prevent these calves from becoming sick. It's not uncommon for 25 to 50 percent of fresh-weaned calves to require treatment.

The Texas Ranch to Rail and other steer feed-out programs have documented that calves requiring treatment not only have higher medical costs, but also reduced performance, increased death loss and decreased carcass quality.

In an effort to enhance immunity, and thereby performance of stocker and feeder cattle, vaccination and nutritional management programs were designed for weaning programs on the ranch. Preconditioning programs with a 45 day post-weaning period have been accepted by the industry to improve animal performance, health and carcass quality.

It's not uncommon for 25 to 50 percent of fresh-weaned calves to require treatment.

The practice of preconditioning calves has received a lot of attention in the last few years. Preconditioning can mean many different things to different people. It's important that everyone has the same program in mind as this topic is addressed.

Preconditioning is the process by which calves are weaned and "conditioned" before moving them to grass or a backgrounding yard for growing or sending them straight to a feedyard for finishing. Preconditioning can be done at the ranch or at preconditioning facilities that specialize in managing fresh-weaned calves. We will focus on the preconditioning of weaned calves before they leave the ranch of origin.

The preconditioning process improves the likelihood that a calf can deal with future stressors and exposure to pathogens without health complications. Bridging the management gap from suckling calf to weaned calf is not that difficult when it's done at the ranch. It involves enhancing and managing the immune system, controlling stress and preventing overexposure to pathogens during this brief period of time.

Calves that have fewer health problems after they leave the ranch will (1) require less medication, which reduces costs but also lowers the potential for injection site lesions and residues; (2) suffer less death loss; (3) perform more efficiently; and (4) potentially have higher-valued carcasses. So, preconditioning is a value-added management practice. In the past, it's been difficult for a calf producer to realize the added value in preconditioned calves they've sold. However, this appears to be changing, and there are more opportunities through both direct sales and auction markets for calf producers to receive extra value for preconditioned calves. The following are just a few of the things to consider about preconditioning calves.

Plan ahead

Locating markets, allocating pasture, shopping for feed and health products, scheduling other farm and ranch activities, and finally the preconditioning process itself, takes time. So allow adequate time to plan, evaluate and implement your program.

Identify your market

In agriculture, producers are good managers, but they often fall short with their marketing efforts. A key to realizing the added value in preconditioned calves is finding the outlets that have buyers seeking preconditioned calves and pursuing those markets. These may be auction venues or direct sales to buyers. This effort must start well in advance of the time calves are weaned.

What does the market require?

Once market outlets have been identified, determine the buyers' expectations in those outlets. These may include specifications for vaccination and parasite control practices, nutritional management, number of days weaned, weight and cattle type and individual animal identification. Know what is expected and plan to deliver.

Evaluate the economics

Just because it seems easy to do and it's beneficial to the calves and the industry, that doesn't mean preconditioning will automatically be profitable to your ranch. If cattle are being prepared for retained ownership, then preconditioning is a necessary production step.

However, if cattle are being preconditioned for sale, the economics must be carefully considered. The ranch should be ready and willing to retain ownership in the cattle if they cannot receive adequate compensation for their preconditioning efforts. Likewise, suffering a loss at the end of preconditioning might be the best alternative if retained ownership doesn't appear to be profitable.

Identify your costs

It's critical for producers to take time to evaluate the costs of preconditioning. Many producers fail to adequately project the costs of a program and then are disappointed when they don't recoup their costs at marketing. Buyers' requirements dictate a portion of the costs. Feed (purchased feed, raised feed and grazing) and opportunity costs account for the larger part of the preconditioning costs.

Be certain to charge interest against the value of the calves the day they are weaned. If you borrow operating money, this interest is the cost of not paying down the loan when the calves were weaned. If you do not borrow operating money, the interest represents income you could have realized by putting the money in savings.

If you graze your own pasture, charge the preconditioning program a reasonable rate for use of the pasture. Some may question this expense; but this ensures that money is being set aside to pay land rent or payments. If your stocking rate has to be lowered to support preconditioning, it will add expense to the enterprise.

If the land is owned and debt-free, this charge represents income for the ranch enterprise. If the preconditioning program breaks even, the ranch still pocketed some income. Some may prefer to leave this cost in the cow herd expenses. Likewise, account for use of equipment and facilities, fuel, labor, utilities and other costs.

One simple accounting method is to assign a daily yardage charge for each calf in the program. Again, some may question this expense and prefer to allocate the expense to the cow herd. As well, don't forget to add in marketing costs like commissions, freight and other expenses.

What will the preconditioned calves be worth?

In order to evaluate a preconditioning program, it will be necessary to project the weight and sale price of the calves at the end of the preconditioning program. Many producers are concerned with the premiums they will receive for their preconditioned calves. This is a factor to consider, but an equally important consideration is seasonal market fluctuation. Does the market typically go up or down during the period of time the calves are being preconditioned?

Feed and opportunity costs account for the larger part of the preconditioning costs.

The difference between the calf's value the day it's weaned and at the end of the preconditioning period is the money available to pay for the preconditioning program and provide some extra income to the ranch. Projecting this margin allows you to determine if the program is feasible.

Control your costs

Shop for animal health products. Check with the market outlets to see if they have purchase arrangements for the required products. As mentioned, feed is one of the major costs of preconditioning. So, it's important to utilize on-site forage and feed resources as much as possible.

This means utilizing excess forage and feed resources to add value to calves. If pastures can be managed to provide good-quality forage to weaned calves, then preconditioning becomes a viable option. Quality can be supplemented, but quantity of available feed resources is important to the success of your program.

Although it will vary from region to region, the most economical way to manage calves during the preconditioning period will involve forage and supplement. In some areas, raw feed commodities and by-products are relatively inexpensive and fit well in a preconditioning program.

In other areas, manufactured feeds are the only option and a relatively higher cost. If harvest forage has to be purchased for feeding any time other than the first five days post-weaning, carefully evaluate the profit potential. Minimize feed purchases and scrutinize the cost of these purchases closely.

In order to evaluate a preconditioning program, it will be necessary to project the weight and sale price of the calves at the end of the preconditioning program.

The objective of preconditioning is not to get cattle on feed; it's to harden them up and prepare them for the stresses to come. There are some real limitations as to the amount of feed that can be purchased and fed to ranch-weaned calves. Weaning on the ranch is different from preconditioning purchased and stressed calves in a preconditioning yard. Ranch calves will not need mixed feed to maintain a positive plane of nutrition or to maintain their health.

Use Best Management Practices and don't cut corners

Follow Beef Quality Assurance guidelines. Don't cut corners on the nutrition and health programs or the calves may still have problems once they leave the ranch. This will reflect badly on the ranch and the whole concept of preconditioning.

Preconditioning has routinely been done over a period of 14 to 45 days. The standard has been 21 to 30 days. Only recently have the benefits of 45-day programs been documented. There are instances where shorter programs may work effectively; but keeping the calves for 45 days, as opposed to 30 days, offers additional insurance against sickness at relatively little more expense.

Ranch to Rail data documented feedyard performance of steers relative to how many days they were weaned and what vaccination programs were used in the preconditioning process. Calves weaned for 45 days had the lowest medical expense and loss of production, while calves weaned for less than 30 days had the highest treatment rates and the greatest reduction in performance.

Don't expect too much from the calves

Be realistic in estimating the performance of your calves during preconditioning. Rate of gain can vary from less than 0.5 lbs/day to more than 2 lbs/day, depending on feed resources and how the calves respond to weaning. In most preconditioning programs, achieving an average daily gain of 1 to 1.5 pounds per day during the 45 days will be adequate.

Calves weaned for 45 days had the lowest medical expense and loss of production, while calves weaned for less than 30 days had the highest treatment rates and the greatest reduction in performance.

This rate of gain can be achieved economically with a wide range of nutritional programs. Higher rates of gain can be achieved but the cost of gain may not be economical. If calves are contracted, calculate the desired rate of gain to meet the target and always make sure the target is realistic.

From a practical standpoint, cow-calf producers should set a goal to maximize immune system response. This can be done by enhancing the immune response through nutritional management of the cow herd. Managing your cows to be in a Body Condition Score 5 at calving and providing the cow herd with adequate level of minerals, particularly during late gestation and lactation is crucial.

Strengthen passive transfer and antibody response in the calf through supplementation of the cow in late gestation and early lactation. Passive transfer can also be enhanced through proper vaccination programs targeted at the cow in late gestation. Develop your heifers, stockers and/or feeders by maintaining a positive plane of nutrition throughout the weaning and growing phases.

Maximum immune response will be achieved when proper vaccinations are administered in conjunction with proper nutritional management. Nutrition is not what makes the immune system work; but deficiencies can prevent the immune system from working properly.

Calf management practices

Castration and dehorning are recommended management practices for cow-calf producers. On a national basis, castration and dehorning are performed routinely prior to the time calves are marketed. In much of the country that it's estimated that 80% of calves sold as "steers" are intact bulls.

There is no demand for intact males either in feedyards or stocker operations. Intact bull calves are always castrated prior to grazing or feeding. Intact bull calves gain faster than non-implanted steers, but there is no gain advantage when compared to implanted steers. Management of intact bulls is also difficult due to aggressive behavior. Beef from intact bulls has a coarser texture, lower marbling scores and more variable tenderness.

All bulls that are not herd sire prospects should be castrated as early in life as possible. Early castration is less stressful on bull calves. Preferably, castration should occur between birth and four months of age. Castration of older, heavier animals causes greater stress and increases the chances for surgical complications and bacterial infections. The additional stress can also suppress immune function and increase susceptibility to other diseases.

Regardless of coffee-shop perceptions, there are economic incentives to castrating bull calves prior to marketing. Analyses of auction sales show that lightweight bull calves (under 400 pounds) are discounted less than heavier bull calves and yearlings, but they *are* discounted.

Research in Texas and Kansas has demonstrated that castration of a 550-pound bull calf reduces weight and increases morbidity (sickness), mortality (death rate) and treatment costs. Based on research, “cutter bulls” should be discounted \$6 to \$7 per cwt. as compared to the same weight steers due to lost production efficiency. Heavier (600 pound) or older (yearling) cutter bulls generally receive price discounts of \$6 to \$12 per cwt.

Dehorning is as stressful as castration. Horn buds should be removed sometime between birth and 4 months of age. Cattle with horns are the cause of a significant amount of bruising in fed and non-fed cattle. Groups of horned cattle have twice as many bruises as groups of non-horned cattle. Bruises from horns are trimmed out, resulting in lost carcass weight, devalued primal cuts and reduced carcass value.

Obviously, the use of polled genetics is the easiest and least stressful way to dehorn cattle. Does that imply all producers should breed polled cattle? No. It means that if calves are born with horns, electric or surgical dehorning should be used to prevent horn growth (before the calves are 4 months old).

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

Like misconceptions about the reality of discounts for intact bull calves, it’s also commonly believed that horned cattle do not receive a discount when marketed. Actually, auction market results indicate that horned heifers and steers are discounted \$2 to \$3 per cwt. As with bull calves, discounts for horns increase with age and weight.

Not only do horns cause substantial bruise damage (that has to be trimmed from the carcass) to other cattle in the pen, they often cause the head to be condemned during inspection by USDA-FSIS. Head condemnations result in a loss of approximately \$18 per affected animal.

***Early castration is less stressful on bull calves.
Preferably, castration should occur between birth and four months of age.***

Branding

For centuries, fire branding has been utilized as a method of animal identification. It is still a very acceptable means of permanent identification to establish proof of ownership. Placement of your brand is important because it affects the value of the hide. Ideally, brand placement (freeze brand or hot iron) should be located high up on the hip, close to the tailhead.

This allows the brand to be cut away from the hide without a significant loss of the most valuable portions. In many instances, butt-branded hides sell at prices similar to native (non-branded) hides. Rib brands and multiple brands devalue cattle \$5 to \$25 per head.

Freeze branding can also be used to identify cattle. However, *improper* freeze branding can scar, similar to a hot iron, which lowers the value of the hide. Improper branding procedures can also create beef quality problems. Brands that are too hot or held too long can result in scar tissue that toughens the underlying muscle tissue. In extreme cases, the brand is visible on the muscle tissue below the hide.

While branding is not mandatory in all state to establish ownership of cattle, it is mandatory in some locations and you must register your brand with the county clerk in each county where you run cattle. Also, all brands must be re-registered every 10 years (most recently in September 2001 through February 2002).

Processing/Cattle Handling

Processing involves management decisions when working cows or calves, receiving stocker cattle, weaning calves and shipping cattle. Castration and dehorning, immunization, branding, injections and cattle movement are all control points for management.

Not only do these chores need to be done, they must be done correctly. Management practices performed early in life will reduce the chance of stress-related sickness, carcass damage and carcass devaluation.

BEST MANAGEMENT PRACTICES - CULLING MANAGEMENT

Regardless of herd size, all beef cow operations produce some culled animals. Many times, these are older cows past their prime producing years. Other culled animals may result from failure to reproduce in a given breeding season. Market cows and bulls represent 15% to 20% of producer revenue. With proper management and timely marketing, the value of market cows and bulls can be increased.

Culled animals (beef and dairy market cows and market bulls) supply between 15% and 20% (depending on market conditions) of total U.S. beef production. Most producers assume that the major product from market cows is ground beef marketed through fast-food restaurants.

While ground beef is a very important product of market cows/bulls, it's only one of many beef products from culled animals. Market cow/bull packers utilize tenderloins, ribeyes and strip loins, particularly from younger cows. These cuts are merchandised through family steakhouses.

The outside round is often pressed into deli-style meats and inside rounds are routinely used for beef jerky. Many of the individual muscles are utilized for specific manufactured products.

Not all culled animals are suitable for processing into higher-valued products. Some are condemned, resulting in losses to the industry that are ultimately passed back to the producer. Quality defects in mature cows and bulls include things like inadequate muscling, excessive fat trim, lightweight or heavyweight carcasses, lameness, "cancer eye" and non-ambulatory animals.

The 1999 Non-Fed Quality Audit revealed that 96% of market cows and bulls have clear eyes; 96% are without abscesses; 85% are sound or have only minor structural problems; and 97% have a Body Condition Score of 3 or higher. The following table summarizes some of the quality defects and the potential number of cattle that would be affected based on the 1999 slaughter figures.

Quality Defect	Incidence Rate	Head Affected ¹
Cancer eye		
Bone or lymph involved	0.4%	27,760
Prolapsed eye	0.2%	12,380
Horns		
Large, protruding	13%	804,700
Brands		
Shoulder brands	5.6%	346,640
Rib brands	21.1%	1,306,090
Hip brands	36.4%	2,253,160
Multiple brands (2-3)	19.6%	1,213,240
Four or more brands	1.6%	99,040
Lameness		
Beef cows	11.9%	412,502
Beef bulls	18.1%	117,641
Dairy cows	14.5%	251,314
Arthritic joints		
One joint	7.37%	456,203
Two joints	3.97%	245,743
Inadequate muscle		
Beef cows	44.4%	1,539,082
Dairy cows	72.5%	1,256,570
Too thin (BCS=1-2)		
Beef cows	2.3%	79,727
Dairy cows	4.5%	77,994
Too fat (BCS=8-9)		
Beef cows	4.5%	155,988
Dairy cows	1%	17,332
Bruises		
Minor	72.4%	4,481,560
Medium	38%	2,352,200
Major	19.4%	1,200,860
Extreme	2.2%	136,180
Whole carcass condemnation		
Prior to slaughter	0.12%	7,428
After slaughter	1.06%	65,614
Other condemnations		
Liver condemnations	24.1%	1,491,790
Head condemnations	6.7%	414,730
Cow carcasses		
Too light (<500 lbs)	43%	2,235,828

¹Based on a projected slaughter of 6,190,000 head of market cattle in 1999. Estimates corresponding to beef vs. dairy and bulls vs. cows are based on a slaughter mix that is 56% beef cows, 28% dairy cows, 10.5% beef bulls and 2% dairy bulls.

In general, producers do a fair job of managing and marketing surplus animals.

But the 1999 audit also helped to identify specific areas where the quality of market cows and bulls could be improved. Realizing that some of these defects are impossible to avoid completely, producers should pay close attention to marketing in order to return maximum value from their culled livestock.

Cancer eye

Cancer eye can't always be avoided. But proper marketing avoids loss of value. The 1999 audit revealed that 0.4% of market cows/bulls had a tumor that involved the bone or lymph tissue around the eye. These advanced stages of tumor development generally result in the head of the animal being condemned. Head condemnations result in a loss of approximately \$18 per affected animal.

The most severe stages of cancer eye, involving a prolapsed eye, were detected in 0.2% of market cows/bulls. The good news is the incidence of this advanced stage had been significantly reduced from the 1.1% incidence detected in the 1994 audit.

This indicates that producers are marketing cows in a more timely fashion prior to advanced stages, and/or cows with advanced stages are being euthanatized at the ranch. Cows with advanced stages of cancer eye are a primary cause of whole carcass condemnation. As such, packers are unwilling to purchase these cows at times.

When cancer eye is detected, the eye should be removed immediately, or the animal should be marketed as quickly as possible.

Horns

Horns were identified as a quality defect in the 1999 audit for two reasons: horns are a major cause of carcass bruising (which was the No. 1 concern of cow packers), and horns must be removed prior to the removal of the hide. This leaves the sinus cavities exposed to hair or foreign material contamination. If the inspector suspects contamination of the sinus cavities, the head must be condemned, resulting in a loss of value.

Dehorning at a young age is a good animal husbandry practice that should be routine on all operations.

Brands

Brands continue to be a quality concern relating to hide value of market cows/bulls. Branding is the only permanent, easily readable means of identification that is currently available. Placement of the brand is an important decision that affects hide value. Rib brands reduce the value of the hide as much as \$5 to \$15 in market cows/bulls. When considering placement of brands, the optimum place is high up on the hip, close to the tail head.

The 1999 audit revealed that 28.8% of beef cows had a rib brand, 29% had multiple (two to three) brands and 1.6% had four or more brands. These trends are very similar to the 1994 audit.

Lameness

Lame and disabled cattle are a perception problem for the industry. The 1999 audit showed that nearly 12% of beef cows and 18% of beef bulls had arthritis or a stifle injury. Some of these problems are unavoidable, particularly with bulls. However, many problems with lame cattle are easily avoidable if producers will cull animals before they age excessively and develop feet and leg problems.

The packer is required to remove all tissue associated with an arthritic joint. In the 1999 audit, the average trim loss associated with an arthritic joint was nearly 40 pounds. More than 7% of cattle had at least one arthritic joint, and nearly 4% had two bad joints.

Non-ambulatory cattle still represent a significant problem to beef producers with 0.7% of beef cows (nearly 25,000 head) classified as disabled. This group of cattle typically receives special attention from inspectors. Additionally, excessive bruising results in large trim losses. Disabled cattle should either be merchandised directly to the packer or euthanized at the ranch.

Inadequate muscling/excessive fat

Lean beef products are the principal end products of culled cattle. It's important that culled animals have adequate muscling without excessive amounts of fat. The 1999 audit suggested that 44.4% of beef cows had inadequate muscling. Poor muscling is often a result of emaciation. As Body Condition Score drops below 5 (on a scale of 1 to 9), losses are comprised of both lean and fat.

The 1999 audit revealed that more than 40% of beef cows were at or below a BCS 4, suggesting that some of the "inadequate muscling" was actually due to thin condition. Extremely thin cows (BCS 1 to 2) accounted for 2.3% of beef cows surveyed. These cows produce a product that is greater than 90% lean, but their lean yield is extremely low, which limits the salvage potential.

Emaciated cows are also more prone to bruising because they have no fat to serve as padding, and they are more likely to be disabled upon arrival at the packing plant. Thin cows will not make a long trip prior to harvest. Consequently, the number of buyers for emaciated cattle is limited. At the other extreme, excessively fat cows (BCS 8 to 9) are also a problem.

These cows often yield cuts that can be salvaged and merchandised for a higher value (strips, ribs, tenderloins), but there is an excessive amount of waste fat. The 1999 audit revealed that 4.5% of beef cows were excessively fat.

The ideal condition to merchandise market cows is between BCS 4 and 5. And because these cows have optimal red meat yield, they generally bring the highest price per pound at the auction market.

Bruising

The No. 1 concern of packers in the 1999 audit was the high incidence of bruising - 88.2% of cow carcasses had bruises. Minor, medium, major and extreme bruises result in an estimated 0.69, 1.42, 4.78 and 15 pounds of trim loss, respectively.

Using these estimates, more than 14 million pounds of product were lost due to bruising in 1999.

Unfortunately, the bruises do not just occur on the lower-valued portions of the carcass. The 1999 audit revealed that similar trim loss was observed in the top sirloin, loin, rib, round and chuck.

Handling practices at the ranch are very important in minimizing bruises. An estimated one-third of bruises occur on the ranch, and the other two-thirds occur in transport and marketing. Close scrutiny of handling facilities to eliminate sharp, protruding corners and employee training can help reduce bruising. Producers should also merchandise market cows/bulls before they become emaciated and are more susceptible to bruises.

Overall, the 1999 audit suggests that nearly \$70 is lost for every culled cow or bull that is merchandised. Most of this loss comes from merchandising thin, emaciated animals that are more susceptible to bruises, trim loss and have poor yields. A portion of this loss can be captured through better management/marketing of culled animals at the ranch level.

Culling Guidelines.

1. Do not market culled animals that pose a public health threat.
2. Be certain that ALL animals shipped to market have cleared proper withdrawal times.
3. Do not market culled animals that have a terminal condition.
4. Do not send culled animals to market that are disabled.
5. Market culled animals BEFORE they become severely emaciated.
6. Do not market culled animals that have an advanced eye lesion.

Beef quality and consistency begins on the ranch. Everyone involved in the production system - from the producer to the packer - bears a responsibility for ensuring that market cows/bulls are not handled roughly on trucks, at auction markets and in other sales facilities, as well as in harvest plant premises.

Best Management Practices, Foreign Object Avoidance (contamination/adulteration)

There are two major types of foreign objects to be concerned with: (1) buckshot or birdshot and (2) broken needles. On rare occasion, rifle bullet fragments and arrow tips have also been found in carcasses.

While the main sources of chemical residues have been discussed, there are other areas that may become a problem. Buckshot contamination of carcasses, while infrequent, continues to be reported by packers, including occurrence in fed cattle. When buckshot is found the animal is condemned. Do not shoot at any animals and don't allow hunting around your cattle.

Birdshot/buckshot

Lead birdshot/buckshot cannot be detected by metal detection devices used in packing and processing facilities. Furthermore, lead is considered an adulterant by the Food and Drug Administration. If the shot is detected on the slaughter floor, the entire carcass is routinely condemned.

If shot is detected during ground beef production, the entire lot of ground beef must be condemned. In large slaughter and processing plants, this can be several thousand pounds in one batch! In the 1994 audit of non-fed beef cattle (market cows and bulls), one processor commented that his company lost a total of 100,000 pounds in a six-week period due to the presence of lead shot.

The Market Cow and Bull Beef Quality Audit revealed more than 10,000 head of slaughtered markets cows and bulls were condemned due to the presence of lead shot. In fact, the presence of buckshot/ birdshot ranked third on the list of packer concerns; only bruises and antibiotic residues ranked higher.

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

Birdshot/Buckshot Guidelines.

1. Never use a shotgun to gather cattle. Develop alternative methods to control and capture animals. If an unruly animal cannot be trapped or gathered by some other means when it reaches the end of its productive life, the animal should be euthanatized on the premise and disposed of properly (in other words, when you would normally cull the animal).
2. Work with hunters to prevent shooting cattle with any weapon. Educate hunters to the potential safety concerns associated with adulterated carcasses. Remove cattle from hunting areas when possible to avoid accidental shootings.

Microbial Contamination

Diseases such as beef measles (cysticercosis) should not be forgotten. Beef measles result when human tapeworms infect cattle. The problem can be avoided if cattle feeds are never contaminated with human feces. Fecal-oral contamination should be avoided regardless of the source. Fecal contamination of feed or water can lead to digestive tract disease and poor performance. Keep an eye out for sources of contamination such as feed loaders or buckets contaminated with fecal material, dirty vehicles driving into a trench silo and people stepping in feed bunks.

As the beef industry strives to produce a safe and wholesome product, many areas of quality assurance take on new importance. Contamination of beef with various organisms of importance in human health is an increasingly grave concern. Recognized pathogens, such as *E. coli* O157H7, *Listeria* spp. (all species) *Salmonella* spp. and *Campylobacter*, may enter the beef supply in a number of ways.

While we do not have adequate methods today to eliminate microbial contamination in cattle production, attention to basic sanitation practices and proper animal health techniques can decrease the chance of microbial contamination.

Microbial Contamination Guidelines.

1. Evaluate ways to prevent fecal contamination of cattle feed or oral cavity
2. Avoid high-risk feed sources and protect feed supplies from fecal contamination
3. Observe septic leach fields and fix any broken pipes.
4. Educate workers about the importance of personal hygiene near feedstuffs or feed bunks, water tanks or even pens where cattle could come in contact with tapeworm segments or eggs spread by infected humans.

Pest Control

Control of rodents and birds is a continuous battle in most feedyards. These pests transmit disease and cause damage to equipment, including sensitive electrical connections. Control measures should consider any possible residue as well as animal and human safety potential.

Water Contamination

Protection of the water supply from contamination must be a high priority of every beef operation. Everyone in the beef operation must be on constant alert for practices which could cause contamination of the water supply. If anyone suspects they have discovered a water supply contamination source, it must be reported to the manager as soon as possible and action must be taken.

Dealing with Non-performing Cattle

Non-performing cattle are a HIGH RISK for causing a violative residue problem. Non-performing cattle should have records reviewed by both the veterinarian and manager before being released for salvage. Establish a minimum withdrawal time that reflects the longest withdrawal for any of the products administered. Animals recovering from illness may have organ damage that interferes with the normal clearing of medications. A residue screening test such as the Live Animal Swab Test may offer a margin of comfort if these cattle need to be shipped close to their withdrawal time. Establish a residue screening program for non-performing animals before releasing them for salvage.

Market Cows and Market Bulls

An important segment of the industry, which makes up 20 percent of the total beef produced in the United States, is the market cow/bull beef sector. Contrary to popular belief, beef derived from market cows and bulls is not just used solely for the production of hamburger. A vast majority of the “middle meats” from the rib and loin, which would include ribeye rolls, short-loins, strip-loins, and tenderloins, as well as the round are removed and marketed as such. Packers spend considerable time finding cuts of beef from market cow/bull carcasses that can be marketed at a higher price than that of lean trim. It is important to note that the sale of market cows and market bulls typically accounts for 15-20 percent of a beef cattle producer’s annual revenue.

Beef Production – Market Cows and Market Bulls

In 1994, roughly 4.57 billion pounds of U.S. produced beef from market cows and market bulls were consumed by consumers, in the form of ground beef. Ground beef accounts for 43 percent of the total beef consumed in the U.S. It is easy to see that much of the beef that is consumed by Americans comes from dairy and beef cows, as well as bulls. The annual ratio of bulls to cows harvested is 1 to 10. The slaughter of market cows generates approximately 75% of all domestic non-fed beef. Of all market cows harvested approximately one-half are culled dairy cows. Thus, approximately one-third of domestic market cows/bulls beef production is derived from dairy cows.

Marketing of Market Cow/Bull Beef

Many market cows and bulls that are marketed are sold because they may have a problem that is hindering their production. Problems that can occur are: 1) prolapses, 2) disease, 3) lameness, 4) cancer eye, 5) lumpy jaw, 6) abscesses, 7) edema, and 8) sheath damage. It is important to remember that many of these problems do not always improve with time. Thus, timely marketing of animals with these problems is important. The quicker they are marketed the better.

Injection Site Lesions

There is a greater percentage of injection site lesions/scars found in harvested non-fed beef than fed beef. The November 1997 Non-Fed Beef Quality Audit reported that 40.9% of rounds evaluated possessed lesions/scars with 3.9% having fluid-filled abscesses. The FSIS reported that the greatest percentages of residues were found in culled dairy and beef cows. Proper and responsible management practices as well as accurate recordkeeping can easily help to correct these problems. All injections must be kept in front of the shoulder to minimize trim in high priced cut areas. Additionally, producers must honor withdrawal times to help eliminate residue occurrence.

Injection site management

The administration of practically all injectable animal health products can cause tissue irritation and result in an injection site lesion. There are three types of lesions that result from injections: active fluid-filled, woody callous and discoloration.

The first type, an active fluid-filled lesion, is the result of a) an accumulation of white blood cells and fluid (immune response to the product) or, b) an abscess due to improper injection techniques. Public perception often refers to these lesions as “tumors.” The incidence of active, fluid-filled lesions has dropped significantly since it was targeted with a national education and awareness campaign in 1991.

The second type, a woody callous lesion, is a connective tissue scar that remains after an active fluid-filled lesion has healed. These scars are visible for several months to years after the injection was given. Although the scar tissue looks like fat and can be removed by trimming, research has documented that tenderness of the surrounding muscle tissue is reduced significantly.

While the actual lesion may be small, tenderness will be affected in a 3-4 inch radius around the lesion. A single injection can negatively affect the tenderness of several retail portions. Injectable antibiotics, vaccines and anthelmintics can produce injection site lesions.

The third type of lesion is actually a discoloration of the muscle tissue. Apparently, components within certain vaccines react with gases in the modified atmosphere package. This blemish is not apparent during the fabrication and packaging of retail beef products. Blemishes materialize during transport to the retail store and preclude the product from being displayed in the retail meat case. The primary retail cuts affected are top blade steaks and the beef clod, indicating that injections are being placed in the front or top of the shoulder rather than in the neck.

This problem isn't limited to calves and fed cattle; it's also a significant problem in market cows and bulls. Annual revaccination of breeding animals exposes them to numerous injections over their productive lives. The good news is that management through employee training can eliminate injection site lesions and related tenderness concerns.

Vaccine handling and administration

Calves moving through the production chain must stay healthy. Period. Sickness requires treatment and increases the probability of death loss, poor performance, injection site lesions and residues. Proper handling/administration of vaccines is critical to this program.

It's not uncommon to hear about ranches having poor results with their vaccination programs. There are numerous explanations for these failures; for example, exposure to high levels of pathogens, stress level, age, nutrition, genetics and vaccine failure. Generally, vaccination failure at the ranch level is the result of improper vaccine handling and administration.

The highest quality vaccine available is useless if it's not handled and administered properly. Even experienced producers overlook many key aspects when preparing and administering vaccines. With the increased use of Modified Live Virus (MLV) and Chemically-Altered (CA) vaccines, you need to re-evaluate how everyone involved with your operation handles products.

Both MLV and CA products must be reconstituted with a sterile diluent prior to being administered. These products are routinely used in the stocker and feeder segments of our industry with excellent response. However, their processing speed is considerably faster than on most cow-calf operations. Their processing facilities are also more likely to be sheltered from exposure to environmental hazards during processing. Most cow-calf operations lack covered or protected working facilities. Therefore, ranchers must exercise more caution when handling and administering MLV or CA products. Many common handling techniques can render MLV products inactive and even greatly reduce the effectiveness of Killed (K) vaccines.

Remember, vaccination alone does not guarantee immunization.

Purchase vaccines from a reputable dealer. A vaccine will be less than 100% effective if it has ever been stored improperly. Improper storage includes freezing and/or exposure to heat or sunlight. Maintaining a high level of efficacy is critical to establishing immunity in a majority of vaccinated cattle.

For example, if the vaccine is only 80% effective, and 80% of the cattle respond to the vaccine, then only 64% ($80\% \times 80\%$) of the vaccinated animals are protected against the targeted pathogen. Management practices can increase the percentage of cattle that respond to vaccine, and greater efficacy of the vaccine greatly enhances immune response. Reducing exposure, stress and improved nutritional management, along with proper timing of vaccination, will increase the response rate to the vaccine.

Keep it cold and in the dark

When purchasing an animal health product, always transport it in a closed, refrigerated container. Refrigerate your vaccine and shield it from ultraviolet light (UV) at all times until it's administered to an animal. Use cold packs during transport and chute-side storage of vaccine. These should be available to you at the point of purchase.

Protect vaccine chute-side

Most ranches fail to handle vaccines correctly at the time of vaccination. Always keep the vaccine cool while you process cattle. Keep the working bottle in a cooler with syringes. A working bottle is the mixed product from which the vaccine is drawn into a syringe. Store all unused and unmixed product in a closed, refrigerated container until it's needed.

Never mix either MLV or CA product before it is needed. Mix only enough to be administered within one hour. Mixed vaccine begins to lose effectiveness in a relatively short period of time. On small operations, it's advisable to purchase vaccines in smaller containers (5-10 dose bottles) and mix as needed. Although larger-dose bottles are generally less expensive per dose, their use often results in leftover product. Partially used bottles should not be saved.

Protect vaccine from heat and light

Avoid exposure of vaccine and syringes to heat. Do not allow vaccine or syringes to sit in direct sunlight, even for a short time. Sunlight and ultraviolet light will destroy vaccines. Always cool syringes before the initial draw of vaccine. Carrying syringes in the cooler while going to the working facilities will allow sufficient time for the syringe to cool.

Do not leave syringes on top of working tables, barrels or tailgates while performing other processing chores at the chute. Figure 2 illustrates one method to keep syringes cool and out of direct sunlight while maintaining easy accessibility to them. A cooler, as shown, keeps syringes from prolonged exposure to UV light throughout processing. If any delay occurs in processing, place syringes back in a cooler immediately.

Don't disinfect with chemical sterilants

Do NOT clean/disinfect syringes or needles with chemical sterilants or disinfectants. Many of these products will kill MLV vaccines and cause damage to Killed vaccines. Do NOT use products like alcohol, soap, Lysol®, Betadine®, Nolvasan® or Chlorox® to clean or disinfect the syringe.

Any sterilant other than boiling water will leave a residue in the syringe, altering the effectiveness of the vaccine it contacts. Although this contamination predominately affects the first draw, it could impact the immunization of several animals. A 50 cc syringe would impact from 10 to 25 animals, depending on whether it was a 5 cc or 2 cc dose rate.

Disinfect syringe components in boiling water. Multiple-dose syringes need to be completely disassembled and cleaned after each working. After sterilizing, reassemble syringes and store in a clean, dry environment until needed. If not, re-sterilize prior to next use. Many continuous-feed syringes cannot be cleaned effectively because they cannot be disassembled and boiled. However, drawing boiling water through the syringes and feeder tubes can clean them.

Syringe selection, utilization and cleaning

Selecting the appropriate syringe is very important to developing a sound vaccination program. Plus, proper syringe handling does not add significantly to processing time. Multiple-dose syringes, such as shown in Figure 3, or sterile, disposable syringes, are appropriate for administering vaccines.

To help prevent contamination of the remaining vaccine in your working bottle, never enter a bottle with a used needle. When using multiple-dose guns, the needles should be changed each time the syringe is refilled. This practice prevents contamination of the bottle and ensures that you're using a sharp needle.

Continuous-feed syringes reduce the chance of contaminating vaccines by accidentally drawing product from the wrong bottle. These syringes are harder to clean and it's very difficult to keep all components of a continuous-feed syringe sheltered from exposure to the elements. If continuous-feed syringes are used, the bottle, hose and syringe must be protected from exposure to UV light.

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

Sterilized disposable syringes ensure a sterile delivery instrument. These plastic syringes are a very accurate single-dose delivery system. It is best to utilize a syringe size that closely matches the dose, and draw a single dose for each individual animal. Disposable syringes are often used for multiple-dose delivery and result in inaccurate dose delivery.

For example, a 10 cc syringe filled with vaccine is not appropriate for administering a 2 cc dose to five head. Administering multiple doses in this manner often leads to over- or under-dosing. The problem is magnified when using larger-dose syringes. When using disposable or single-dose syringes for vaccinations, purchase vaccines in the smallest available bottle size to reduce the risk of contaminating product.

Lubricate with first vaccine draw (No petroleum-based products) Use the first draw of vaccine to lubricate the syringe. Do not lubricate syringes with silicone, mineral oil, Vaseline® or any other lubricant. All of these lubricants may inactivate MLV or CA product. These products may also alter the quality of Killed products. If the plunger and stopper are difficult to move without lubricant, replace the syringe, or at least the stopper.

Inspect and maintain equipment

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

Even slight changes in working components change dose rates. Dosage gauges on some multi-dose syringes can accidentally change volume settings, leading to under- or over-dosing. Adjust the tension on the plunger to prevent leakage. Always keep spare parts available in case something happens to the working syringe. Keep a supply of extra disposable syringes as a backup delivery system.

Mixing and drawing vaccines

When using vaccines that must be mixed prior to use, such as MLV products, mix only as much as can be used in one hour or less. MLV products **MUST** be used when mixed and **CANNOT** be stored for later use. Reconstituted Killed vaccines can be stored for short periods of time after initial use, but they should not be kept if anything other than a sterile needle entered the bottle during use.

Use a sterile transfer needle when reconstituting MLV and CA vaccines. Transfer needles can be sterilized and reused. Transfer needles ensure against product contamination during mixing. If a transfer needle is not available, use a sterile syringe to draw the diluent out of the plastic bottle and then place it in the glass vial.

When using a transfer needle, always place the transfer needle in the stopper of the plastic bottle first, then invert the needle and diluent as the other end of the transfer needle is placed in the stopper of the glass vial containing the freeze-dried fraction. After proper mixing, vaccine can be drawn from the glass vial into the dosing gun.

Never refill a syringe using a needle that has been in an animal. This introduces non-sterile matter into the vaccine and contaminates the remainder of the bottle. Adopt the practice of changing needles before filling a syringe to keep needles sharp and prevent contamination of the vaccine.

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

Never use one syringe to administer antibiotics or dewormers one time, and then MLV, CA or Killed products the next time. Any residue can potentially affect the product.

Read labels

Always read label and dosing instructions prior to processing to make certain you're administering the proper dose of each product. Many products have changed their dosage rate or approved route of administration. Some products are now administered in low-dose (2cc) volume to reduce injection site reactions.

Other products are formulated to be delivered in a 5cc dose. Some products may be 2cc when administered alone, but 5cc when additional antigens are included in the vaccine. One example is found in the CA products CattleMaster®4 and CattleMaster®4-VL5. CattleMaster®4 is a 2cc product, while CattleMaster®4-VL5 is a 5cc product.

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

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

These are the main factors associated with the success or failure of immunization programs. The recommendations outlined above are meaningless unless the nutrition, stress and genetic components of the immune system are in proper balance.

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

Vaccination Guidelines.

1. Determine target pathogens.
2. Select the most effective vaccine.
3. Prevent exposure of vaccine to heat and UV light.
4. Draw from bottle with sterile needle.
5. Use quality syringes.
6. Inspect and maintain all working components.
7. Administer proper dose.
8. Use proper needle size.
9. Administer recommended route (example: IM or SQ).
10. Administer in recommended site (neck region).
11. Change needles often to reduce tissue irritation.
12. Always follow label directions.
13. Booster all vaccines when label requires it.
14. Always read directions before starting.

NEVER

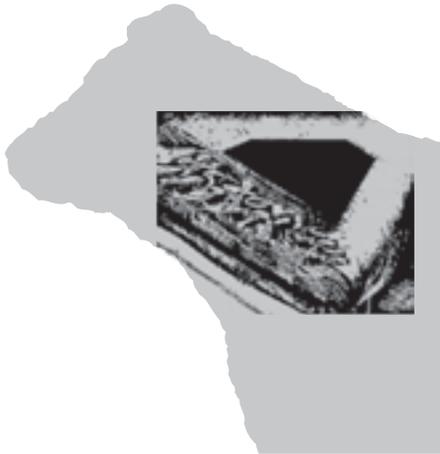
1. Leave vaccines in direct sunlight or UV light.
2. Leave vaccines un-refrigerated.
3. Place a used needle in a bottle of vaccine.
4. Place vaccine in hip or round.
5. Assume anything – always check the directions for use.

Steps to Improve the Quality of Market Cow/Bull Beef

The following is a list of steps to minimize quality shortfalls found in market cow/bull harvested beef:

1. Minimize condemnations by monitoring herd health and marketing market cows/bulls with physical disorders in a timely manner
2. Prevent residues and injection site lesion in market cows/bulls by ensuring responsible administration and withdrawal of all animal health products
3. Improve beef safety by encouraging practices, which reduce bacterial contamination of carcasses
4. Reduce bruises by dehorning, by correcting deficiencies in facilities, transportation equipment, and by improved handling
5. **All injections must be administered in front of the shoulders**

Injection Site Diagrams



**Change needles frequently (10 to 15 injections max)
Change needle if contaminated or damaged Never straighten a needle...
the second time it bends there is a chance it will break.**

16 gauge ½ - ¾ inch needles work well for SQ, 16 gauge 1 t- 1 ½ inch needles work well for IM

NEVER INJECT ANYTHING BEHIND THE SLOPE OF THE SHOULDER !!!
NEVER EXCEED 10 cc per IM SITE !!!

Cattle are never too young or old for us to cause a quality defect.
All injections including SQ and IM injections must be given in the neck region. Never give injections in the rear leg – regardless of age. Limit all IM injections to not more than 10 cc per injection site.

SQ Vaccinations Given In the Ear May Reduce Injection Blemishes

In 1991, a target of reducing injection site damage was set with the focus on immediate practical solutions to reduce lesions found in the top butt as well as research aimed at understanding the relationship of injection site damage to animal health decisions. This effort has been one of the biggest beef quality assurance success stories. In 1991, the injection lesion rate in top butts was approximately 23%, and by late 1997, the lesion rate dropped to less than 6%.

Moving the injection site area to the neck stops damage to expensive steak cuts and it is also easier for packers to identify lesions in the plant. Research uncovered an association between meat tenderness and injection sites, including sites that had no visible lesion. A summary of this research can be found in Section VII. **Findings concluded that all intramuscular injections create permanent damage regardless of the product used or age of the animal at the time the product was given.**

SQ Injections

Subcutaneous injections can cause injection site damage on the surface of muscle tissue. The blemishes typically result from a normal immune response by the animal, but when trimmed by the packer can cause a slight lowering of carcass dressing percent. On occasion the trim associated with a blemish can be severe, especially if the vaccine adjuvant was strong, if poor injection technique was used or the processing environment was less than ideal.

Moving all injections (IM and SQ) to the neck decreases the amount of injectable area available on cattle. Using the ear for injections may not be a new technique, but a technique that may answer loss of injection

target area and decrease damage to edible tissue. One of the first vaccines available for controlling blackleg used dried pellets injected SQ in the calf's neck or ear.

Ear Use Vaccine and Implants

The ear is a valuable site for growth promotant implants. Presently, research has looked at the use of clostridial vaccines in the same ear as an implant. Research results have not shown a loss of vaccine efficacy. Until additional research confirms no loss of implant efficacy, it is recommended that all ear injections be given in an ear not being used for implants. Tissue swelling appears to be no worse than the swelling observed with SQ neck injections. To minimize the swelling effects, causing the ear to drop (a common symptom cowboys look for in sick cattle), the vaccine should be given no higher than the level of the top ear rib.

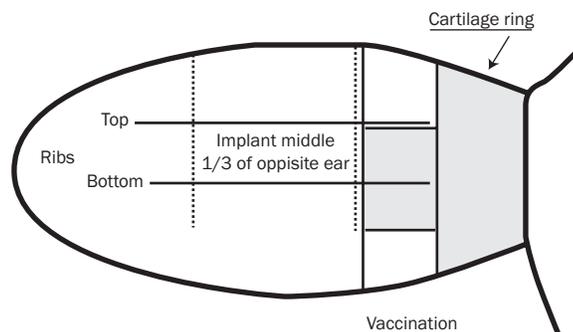
Ear Injection Technique	
Do	Don't
Do: Train people to use the technique properly.	Don't: Place the needle above the level of the top ear rib.
Do: Hold the ear steady, just as you would if you were giving an implant.	Don't: Use the same ear for both implants and vaccine.
Do: Select a 1 inch 16 gage needle for cattle over weaning age	Don't: Inject an ear that is covered with wet feces without first cleaning the ear.
Do: Insert the needle starting at the loose fold of skin over the first 1/3 of the ear.	Don't: Use a contaminated needle without cleaning it in a suitable disinfectant.
Do: Inject at the base of the ear, but back of the auricular cartilage.	Don't: Inject more than one vaccine per ear.
Do: Insert the needle all the way to the hub before injecting the vaccine.	Don't: Disinfect a needle used for giving modified live virus or bacterial vaccines.
Do: Hold the syringe plunger depressed as you remove the needle.	Don't: Use a needle that has had the point damaged. Change it!
Do: Using the thumb of the hand to hold the ear, apply pressure over the hole where the needle was inserted.	Don't: Use the same needle for more than 10-15 injections. Change often.

It is too soon to know if the ear injection technique will become common practice, but it is great to know that people are trying to find answers to BQA concerns. **There are no most-valuable players – if you have an idea pass it on.**

For more information visit with herd veterinarian, read the article in the Bovine Veterinarian: March-April 1998, by Geni Wren

Relative Location of Implants and Vaccine

Note: It is not recommended to give implants and vaccines in the same ear.



Implant utilization and recommendations

When used properly, growth-stimulating implants offer the commercial cow-calf producer a fast, easy-to-use method of increasing weaning weights. Implants have been proven safe and effective through both research and actual use in the beef industry.

As a general recommendation, implant male calves when they are castrated. Do not implant bull calves. Implanting bulls can arrest the development of reproductive organs, causing sterility, and it does not increase efficiency or rate of gain. Always check label directions for age/weight recommendations for the use of specific implants.

Research has shown that there are no benefits to implanting heifers intended to be kept as replacements. However, there are no detrimental effects of implanting replacement heifers with a single implant after 60 days of age and before they are 6 months old.

Implants are placed under the skin on the back of the ear (See Figure 4 for proper implant placement). The potential benefit cannot be realized if the implant is administered improperly. For example, if the implant site becomes infected, an abscess can develop. The implant may become walled off – preventing absorption.

The abscess also has the potential to push the implant pellets out of the implant site. To prevent abscesses, the implant needle should be disinfected between animals. Sanitation is important, not from a potential impact on meat quality, but on product effectiveness.

Potential causes of implant failures:

- Improper site (in the cartilage)
- Abscess due to poor sanitation
- Missing implant (through the ear)
- Partial implant due to technique or implant gun failure
- Bunched or crushed pellets
- Improper implant storage (exposure to moisture, refrigeration)

Implant Guidelines.

1. All implants come with instructions for implanting and proper handling. Review all instructions carefully before implanting. There are no withdrawal periods for the implants currently approved for use in grazing cattle.
2. Properly restrain the animal. If cattle are caught properly, just behind the ears in an unmodified head gate, no further restraint is necessary to properly place implants. If proper restraint is not possible with the head gate, use a halter.
3. Determine which ear you want to implant and adjust the implant instrument so the needle can be positioned next to and parallel to the ear.
4. Select the proper implant site on the back of the ear. Place the implant between the skin and cartilage in the middle third of the ear.
5. Clean the needle with a disinfectant to reduce contamination of the implant site. Use only sharp needles; burrs increase the chance of tissue trauma and infection.
6. Utilize disinfectant to clean the implant site when the site is contaminated with feces, urine or mud. Contamination increases the chance of abscessed implant sites.
7. When possible, implant all calves in the same ear to minimize confusion. Avoid placing implants in the same ear used for ear tags, tattoos or ear notching.

8. Grasp the ear with one hand while the other hand positions the needle parallel to and nearly flush with the ear. Put the point of the needle against the ear with the beveled part facing outward.
9. Use the tip of the needle to prick the skin, lift slightly and completely insert the needle under the skin. Do not allow the needle to gouge or pierce through the cartilage. If you feel resistance as you insert the needle, it is quite probable that the cartilage has been gouged and pellets may be covered with scar tissue and “walled off.”
10. Depress the plunger of the implant gun and withdraw the needle.
11. Palpate the ear to determine if the implant was inserted properly.
12. Never sacrifice careful implantation technique for speed.
13. Proper employee training is essential. Cow-calf and stocker operators should be aware of the training programs offered by pharmaceutical companies.
14. Record the date and type (brand name) of implant administered. Stacking implants can cause problems with prolapse in heifers. When implanting calves, transferring ownership or retaining ownership into the feedyard, it's important to review your records and inform purchasers or managers about past implant management to avoid future problems.

Ear notching can sometimes cause problems for other folks who buy your cattle and want to tag or implant those calves. If a large chunk of one or both ears is missing it is difficult to put tags and implants where they need to be.

SECTION IV

PUTTING BQA TO WORK THROUGH A HAZARD ANALYSIS CRITICAL CONTROL POINT-LIKE (HACCP) SYSTEM

"Build on what you know" is the operative phrase in the BQA program. The Beef Quality Assurance program road map is a Hazard Analysis Critical Control Point-like system. Cattlemen, employees, veterinarians, nutritionists and other specialists must look for what could go wrong, and then figure out ways to avoid having the problem occur. Build practices that allow checking, verifying and documenting that you are accomplishing what you intended to do. Design all of the everyday working techniques to avoid problems, especially those problems that can cause a safety or quality defect. This includes evaluating safety problems that can affect family members and employees.

HACCP: Five Preliminary Steps

1. Assemble your HACCP team: Bring together your HACCP resources.

Ask trusted friends and experts to help identify areas in production where quality problems and defects can occur. Include herd veterinarian, nutritional advisor, extension educator, university specialists, suppliers, neighbors, family and employees to help develop your HACCP-like plan. Each individual must be willing to make a commitment to brainstorm where problems might occur and how to avoid them. They must also be willing to review the final plan to make sure all the pieces fit and nothing has been over looked. There are no Most Valuable Players – everyone's ideas must be heard.

2. Describe what you raise and how you distribute cattle.

Each segment of cattle production will have some differences in their HACCP concerns. There is a built-in margin of safety for withdrawal times in the beef industry. The longest withdrawal time for any FDA/USDA/EPA-approved product is 60 days, which is shorter than we typically own/manage cattle. All beef producers must be aware of high residue risk situations such as marketing culled or nonperforming cattle. Nonperforming cattle (i.e. medicated market cows/bulls, realizer feeder cattle) might have organ damage, which would prevent the normal clearance of a product. So, they may have passed the withdrawal time but still have drug residues present.

3. Identify who buys your cattle and communicate with them.

Cow/calf and stocker producers typically raise cattle that will not leave their operation to immediately enter the food chain. The cattle will either become a production unit or be finished for harvest. This reduces the residue risk unless sold directly or indirectly into the food chain. Typically the most important quality defect these producers must avoid is injection site lesions. Injection lesions may last forever and cattle are never too young or old to have this type of quality defect. A well-designed and administered health management program will prevent injection lesions by minimizing the need for treatment.

Feedyard producers, on the other hand, send their cattle directly to packers. There is no room for error in withdrawal times or physical injury that causes bruising. Nonperforming cattle, while not a large percent of the cattle sold, present serious safety and quality problems for the industry.

4. Develop and verify a process flow diagram.

Outline ALL of the steps of production in your operation. Have others review the list to insure no steps have been forgotten. The members of your planning team will evaluate each step for the potential of quality defects occurring. The defects will include: 1) bacterial contamination which can cause infectious disease in your cattle or employees, 2) chemical usage/contamination which can lead to a violative residue, and 3) physical damage such as injection site damage, bruising or broken needles in animal tissue.

5. Meet the requirements for the BQA Best Management Practices and Standard Operating Procedures (SOP), including sanitation SOP (finding ways to prevent or minimize fecal – oral contamination).

The BQA BMPs have been outlined previously in Section III.

Seven Specific HACCP Steps

1. Identify Potential Problems or Hazards: Biological, Chemical and Physical (B-C-P)

Conduct a production analysis to identify potential problems that could occur in the production process. The use of the production flow diagram/outline/list will provide the best guide to insure no area has been forgotten.

2. Identify Critical Control Points

Critical control points must be identified in the production process where potential problems could occur and be prevented and/or controlled. The use of the production flow diagram/outline/list will provide the best guide for identifying where potential problems might occur and points where training/management activities might avoid having the problems occur.

3. Establish Critical Limits for CCPs

Limits must be established for preventative measures associated with each critical control point. Determine how to identify when a production activity is not being conducted properly. Some limits are easy to establish – some are not. For example, giving all injections in the neck is a CCP. Any injection not given in the neck is outside the CL. Providing clean water for cattle to drink might be a CCP, but within minutes of cleaning a water trough, an animal/bird contaminated the water with feces (outside CL) and you don't know it – the best that can be done is to follow a reasonable cleaning schedule. Proper handling of cattle (another CCP) is important but sometimes hard to establish a rigid CL for, other than setting that CL for training and supervision by a person whose animal handling judgment you trust.

4. Establish CCP Monitor Procedures

Each CCP must be monitored to ensure they stay within the established limits set by management. Supervision on a timely basis is the key. This step outlines a person(s) in a operation who is(are) designated to regularly check to make sure the activity is being carried out in a manner that meets the operation's (management's) objective. Simply stated – is anyone checking to make sure those activities are being done like they were intended to be done or as best it could be done under the circumstances. A scheduled check list is useful (a must for some CCP). The CCP monitoring list will help employees keep from forgetting important items. Just about everyone regularly works from lists. An operation's CCP monitoring list may have items scheduled for checks daily, weekly, monthly, or yearly. See the BQA Checklist examples (Pages tbd) for cow/calf and feedyard operations for both feedstuffs and animal health products.

5. Establish Corrective Actions (CA)

Corrective action must be taken when monitoring determines a critical management point is not within established critical limits. CA should include what will be done in the future to prevent the problem from happening again. "What do you do if --" needs to be discussed/decided before something goes wrong. There are two reasons it is important to establish CA prior to a problem occurring: the problem will be corrected faster and the corrective action needed may change the seriousness with which a problem is viewed. Understanding the seriousness of potential problems may change how prevention of the problem is viewed by employees. The planning team can help develop possible and appropriate corrective actions.

6. Establish Verification Procedures

Testing and other measurements must be used to verify the program is working properly. For example: liver abscess reports from a packer are appropriate for verifying a feedyard's liver abscess control program is working.

7. Establish Recordkeeping Procedures

Keep records that document the management system is being monitored and is working correctly. Any format of records will work so long as they are appropriate to meet the needs of the HACCP-like system developed for the operation.

The concept of BQA is as simple as thoughtfully and sincerely considering what can go wrong in production that could cause a quality defect and figuring out how to prevent it from going wrong. You cannot monitor what you don't measure, so it is very important to document and verify the steps you take to avoid having problems occur.

Example: BQA Cow-Calf Feed Checklist

Beef Operation _____ Date _____ Assessor _____

Pasture Maintenance and Raised Feeds

- Water source protected and checked yearly for contamination.
- Pastures protected from contamination.
- Training for handling pesticides.
- Pesticides stored in protected area away from feed or health products.
- Follow FDA/USDA/EPA guidelines for all product use.
- All pesticide handling equipment checked before each use for delivery accuracy and contamination.
- Cattle or harvest withdrawal time established if needed before allowing cattle to graze.
- Proper disposal of used containers.

Purchased Feeds

- Evaluation, sampling, and sample storage protocol developed/used.
- Receiving/Inventory Log/Record: source (verified), date, description (name, invoice #).
- Training for evaluating received / purchased feeds.
- Feed storage inspected for contamination before receiving new loads of ingredients.
- Feed storage area only used to store feed ingredients (no pesticides, solvents, etc).
- Procedures in place to protect feed handling equipment contamination.
- All feed handling equipment checked before each use for contamination.

Feed Additives

- Receiving Log Record: source (verified), date, description (including serial / lot #).
- Stored separate from other feedstuffs.
- Use Log Record: date, dose per ton, ID of animals.
- Physical Inventory Log (can be column in use log).
- Training for using feed additives.

Feed Formulas

- Record of all feed formulas.
- Medicated feed formulas checked by nutritionist or veterinarian for accurate dosing.
- Directions for use, including withdrawal time.
- Training for mixing and quality control sampling/testing for feed mixing.

Batch/Load/Feed Delivery

- Batch/Delivery Log/Load, (delivery matches feeding plan if needed).
- Minimum/Maximum and exception table or chart for ingredients and mixing.
- Training (see above).

Cattle Release

- Withdrawal checked on all feed records.

Example: BQA Cow-Calf Product Use Checklist

Beef Operation _____ Date _____ Assessor _____

Cattle Handling Facilities

- Inspected for proper function for cattle and human safety before each use.
- Handling facilities and equipment properly designed, maintained, and used.

New Cattle Entering the Operation

- Receiving Log Record: source (verified), date, description.
- Appropriate Health/Import/Transfer/Movement Records.
- Cattle Handling Training.
- Basic Quality Control:
 1. Holding pens and handling alleys properly designed and maintained.
 2. Clean feed and water as needed available to cattle on arrival.
 3. Visual inspection of cattle on arrival.

Health Management, Mass Medication, and Pesticide Products (Receiving, Storage and Use)

- Receiving/Inventory Log/Record: source (verified), date, description (name, serial / lot #).
- Stored in protected area: refrigerated as needed, sun light controlled, locked if required.
- Use (Health Management/Treatment) Records for all cattle: Date, animal(s) ID, diagnosis/reason, product, dose, withdrawal and release date.
- Cattle Product Use Maps used for health management (includes product and serial / lot #).
- Minimum/Maximum and exception table or chart for product use.
- Product Handling and Use Training (including MSDS/Product Inserts/etc.).
- All injections should be given in the neck region, injectables given Sub Q if possible.
- Supplier Agreements and Veterinary Drug Order (as appropriate).
- Signed Use Protocols (Health Maintenance, Treatment, Premise Pesticides).
- Follow FDA/USDA/EPA guidelines for all product use.
- Equipment for delivery properly designed, maintained and used.
 - Cattle: chutes, snakes, holding pens, syringes, needles.
 - Feed and Pesticides: scales, mixers, delivery system.
- Proper disposal of used containers.
- Withdrawal time established and estimated date for release, (injectables see above).
- Residue screening of non-performers (exceptions: reproduction and lameness if no Rx).
- Training for processing, health management, mass medication, and pesticide products.

Feed Management

- Withdrawal time established, release date estimated.
- Feed management, mixing and delivery training.
- Follow FDA/USDA/EPA guidelines for all product use.
- Training for feed management.

Cattle Release

- Withdrawal checked on all products used (Health Management, and Treatment) records.
- All withdrawal times met and LAST test all non-performers (except no Rx: repro and lame).
- Release/Transfer form signed.

Example: BQA Feedyard Feed Checklist

Beef Operation _____ Date _____ Assessor _____

Feeding Facilities

- Feed storage inspected for contamination before receiving new loads of ingredients.
- Feed storage area only used to store feed ingredients (no pesticides, solvents, etc).
- Water source protected and checked yearly for contamination.
- Procedures in place to protect feed handling equipment contamination.
- All feed handling equipment checked before each use for contamination.

Receiving Feedstuffs

- Receiving Log Record: source (verified), date, description.
- Training.
- Basic Quality Control:
 1. As needed for economic evaluation of feedstuff (ex: moisture, protein, etc.).
 2. Visual inspection for contaminants (ex: pink seed corn).
 3. Source verify high oil feeds (ex: fat from packing plants vs. blended fats).
 4. Inspect trucks for contaminants (ex: any signs of hauling dangerous materials before feed).
 5. Samples of "high risk" feeds stored as per nutritionist recommendations.

Feed Additives

- Receiving Log Record: source (verified), date, and description (including serial/lot #).
- Stored separate from other feedstuffs.
- Use Log Record: date, dose per ton, ID of animals.
- Physical Inventory Log (can be column in use log).
- Training for using feed additives.

Feed Formulas

- Record of all feed formulas.
- Medicated feed formulas checked by nutritionist or veterinarian for accurate dosing.
- Directions for use, including withdrawal.
- Training.

Batch/Load

- Batch Log.
- Minimum/Maximum and exception table or chart for ingredients and mixing.
- Training.

Feed Delivery

- Delivery Log/Load Tickets.
- Delivery matches Call.
- Training.

Cattle Release

- Withdrawal checked on all feed records.

Example: BQA Feedyard Product Use Checklist

Beef Operation _____ Date _____ Assessor _____

Cattle Handling Facilities

- Inspected for proper function for cattle and human safety before each use.
- Handling facilities and equipment properly designed, maintained, and used.

Receiving Cattle

- Receiving Log Record: source (verified), date, description.
- Appropriate Health/Import/Transfer/Movement Records.
- Cattle Handling Training.
- Basic Quality Control:
 1. Holding pens and handling alleys properly designed and maintained.
 2. Clean feed and water as needed available to cattle on arrival.
 3. Visual inspection cattle (injection blemishes recorded for release LAST screening).

Processing, Health Management, Mass Medication, and Pesticide Products (Receiving, Storage and Use)

- Receiving/Inventory Log/Record: source (verified), date, description (name, serial/lot #).
- Stored in protected area: refrigerated as needed, sun light controlled, locked if required.
- Use (Processing/Treatment) Records for all cattle:
 - Date, animal(s) ID, diagnosis/reason, product, dose, withdrawal and release date.
- Processing Maps used for processing cattle (includes product and serial/lot #).
- Minimum/Maximum and exception table or chart for product use.
- Product Handling and Use Training (including MSDS/Product Inserts/etc.).
- All injections should be given in the neck region, injectables given SQ if possible.
- Supplier Agreements and Veterinary Drug Order (as appropriate).
- Signed Use Protocols (Processing, Treatment, Premise Pesticides).
- Follow FDA/USDA/EPA guidelines for all product use.
- Equipment for delivery properly designed, maintained and used.
 - Cattle: chutes, snakes, holding pens, syringes, needles.
 - Feed and Pesticides: scales, mixers, delivery system.
- Proper disposal of used containers.
- Withdrawal time established and estimated date for release, (injectables see above).
- Residue screening of non-performers.
- Training for processing, health management, mass medication, and pesticide products.

Feed Management

- Withdrawal time established, release date estimated.
- Feed management, mixing and delivery training.
- Follow FDA/USDA/EPA guidelines for all product use.
- Training for feed management.

Cattle Release

- Withdrawal checked on product used (Processing, Mass Med, and Treatment) records.
- All withdrawal times met and LAST test all non-performers.
- Release/Transfer form signed by each department.



Hazard Analysis Critical Control Points EXAMPLE Check List Manual

This **EXAMPLE** manual covers the Beef Hazard Analysis Critical Control Point-like System basics. The entire purpose is to figure out what-where-how quality defects can occur, and how to prevent them. Then document what was done. The HACCP team should review your HACCP system as often as needed but at least yearly.

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*Production Flow Diagram: (Possible Biological (B), Chemical (C) and/or Physical (P) Hazards Are Noted. Process "Steps" are the order to consider, not steps in production. Check As Apply or List Corrections, Adjustments and Additions	9
*Hazard Analysis Critical Control Point-like system Check List Check items which apply and which control standard operating procedures are in place.	10
*SOP Check list Evaluation or Validation List the name of the evaluator or validator and the date evaluated or validated.	11-14
Hazards Not Controlled By Operator and Appendix Evaluate to insure list is correct.	15
Beef Quality Assurance, Critical Management Point (CMP) Outline for Feedstuffs and Product Use: Review and identify areas which are appropriate to operation.	16-17

Beef Quality Assurance Resource Team

Planning Team	Name of Operation: _____ Owner/Manager: _____ Feed Employee: _____ Cattle Employee: _____ Maintenance Employee: _____ Office Employee: _____ Veterinarian: _____ Extension Educator: _____ Nutritional Advisor: _____ Transfer Advisor: _____ Univ. Specialist1: _____ Univ. Specialist2: _____ Dpt Ag Specialist1: _____ Dpt Ag Specialist2: _____
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Product Description:	Beef Cattle List Corrections, Adjustments and Additions: For _____ (beef operation)	Check As Apply or List Corrections, Adjustments and Additions
Important Product	<p>Cattle born on farms/ranches within shipping distance to a finish fed feedyard.</p> <p>Nursed by its mother and grazed on native or planted forage until weaned.</p> <p>At weaning between 4 to 8 months the cattle will be transferred to grazing pastures for 2 to 6 month before transferring to feedyards. The cattle can be transferred directly from weaning to feedyards. Most cattle will be 7 to 24 months of age when entering feedyards.</p> <p>Cattle will be shipped to packers after feeding 3 to 10 months</p> <p>Health status: Healthy, normal performance, Healthy, non-performers, and Injury (acute or chronic) all of which are evaluated by an accredited veterinarian before transferring between production locations as required by state/federal regulations and again by a USDA-FSIS inspector at a packing plant</p>	
Unrestricted inputs	<p>Healthy Cattle (Inspection by a veterinarian dependent on state/federal law)</p> <p>Growth promotion implants, Vitamins, Grain, Forage, Protein Supplements, Minerals (except Se), Water.</p>	
Restricted inputs	<p>Biologics (21 day withdrawal, 60 day withdrawal if oil adjuvant), Antibiotic (variable withdrawal), Minerals (Se restricted), Ionophores</p>	
End use	<p>Supply product to packing plants (meat, hide and offal)</p>	
Transportation controls	<p>Animal handling and well-being, production hygiene and truck sanitation</p>	
Notes, comments, and explanations.		

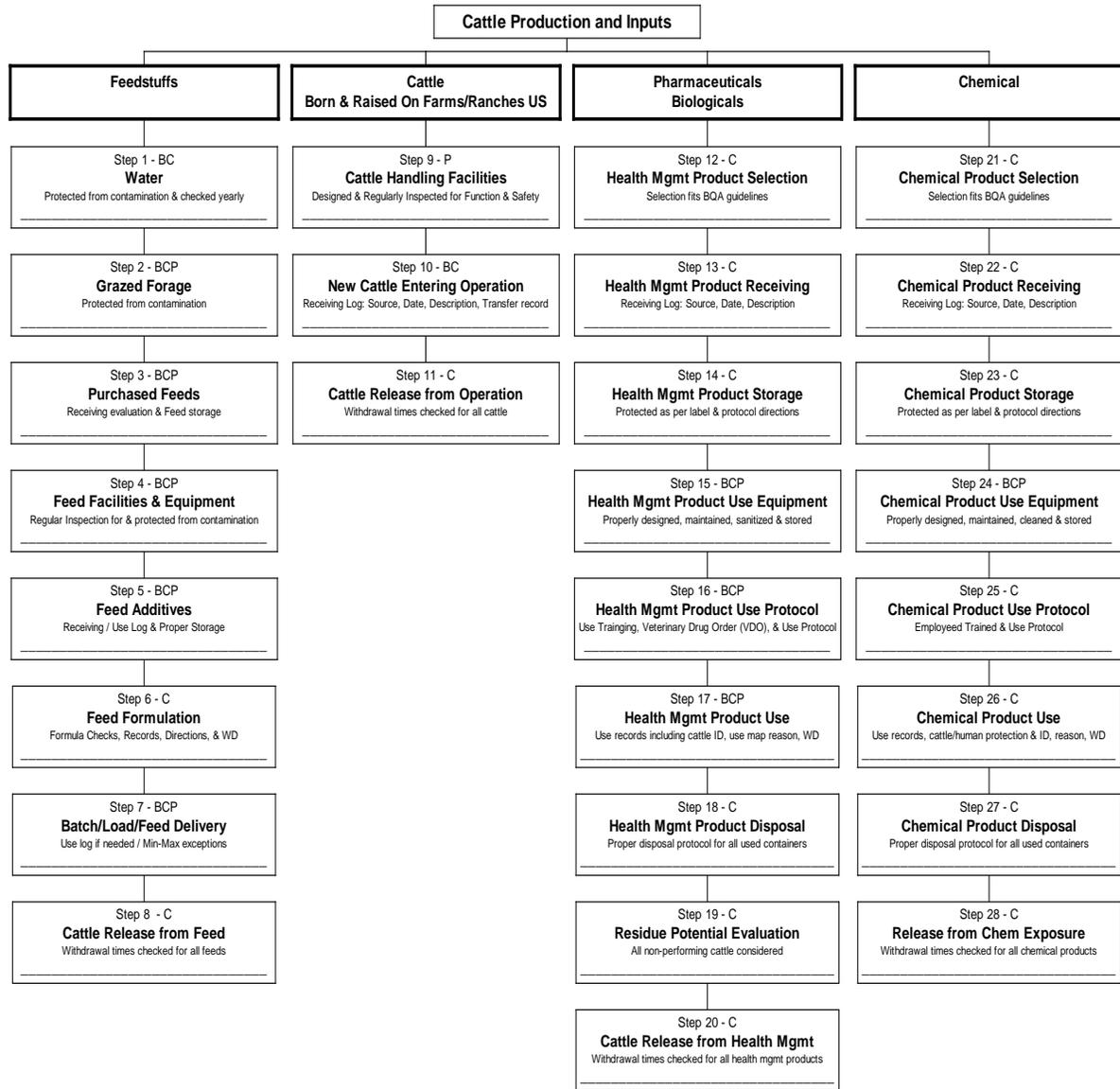
Inputs Description For Cattle Production Hazards: Biological (B), Chemical (C), Physical (P)	Check As Apply or List Corrections, Adjustments and Additions
Cattle = BC	
Cattle born and raised on farms/ranches across the US and Transported from across the US on approved USDA-APHIS permits (accredited vets – State Veterinarian) Cattle may enter from Canada and Mexico by USDA-APHIS permit and quarantine.	
Feedstuffs = BC	
<p>Grazed forage is subject to treatment with FDA/USDA/EPA approved products. All grazing withdrawal times.</p> <p>Transported from across the world. All imported feedstuffs are subject to USDA approval process.</p> <p>Most feedstuffs from local source. All supplements will comply with USDA and FDA regulations including not contain ruminant derived protein.</p>	
Pharmaceutical and Biologic = CP	
Feed Medications: Ionophores, antibiotics, supportives.	
Group Medications – individual: implants, anti-parasitics, antibiotics, supportives.	
Group Vaccines – individual: Modified Live /Killed Bacteria and Virus.	
Individual Treatment Antibiotics, supportives.	
Medical Device Supplies = BCP	
Automatic Dose Devices: Internal-External parasite, Syringes and needles	
Individual Syringes and needles; Surgical devices and supplies	
Chemical Selection Storage, Use and Disposal = C	
Pesticides , Location pesticides, Animal pesticides, Equipment chemicals, and Miscellaneous chemicals	
Water and Water Handling = BC	
Source, Storage, Handling, Delivery, Testing, Hygiene and sanitation	

Production Flow Diagram

(Possible Biological (B), Chemical (C) and/or Physical (P) Hazards Are Noted.
Process "Steps" are the order to consider, not steps in production.

Check As Apply or List Corrections, Adjustments and Additions

For _____ (beef operation)



Notes, comments, and explanations. _____

HACCP-like Standard Operating Procedures Check List (page 1 of 2)

Yes / No	SOP HACCP-like ITEMS CONSIDERED
	Pasture Maintenance and Raised Feeds
	Water source protected and checked yearly for contamination.
	Pastures protected from contamination.
	Training for handling pesticides and herbicides.
	Pesticides and Herbicides stored in protected area away from feed or health products.
	Follow FDA/USDA/EPA guidelines for all product use.
	All pesticide/herbicide equipment checked before use (delivery, accuracy and contamination).
	Cattle or harvest withdrawal time established if needed before allowing cattle to graze.
	Proper disposal of used containers.
	Feeding Facilities
	Feed storage inspected for contamination before receiving new loads of ingredients.
	Feed storage area only used to store feed ingredients (no pesticides, solvents, etc).
	Water source protected and checked yearly for contamination.
	Procedures in place to protect feed handling equipment contamination.
	All feed handling equipment checked before each use for contamination.
	Receiving Feedstuffs
	Receiving Log Record: Source (verified) Date, Description, and Training.
	Basic Quality Control:
	As needed for economic evaluation of feedstuff, (ex: moisture, protein, etc.).
	Visual inspection for contaminants (ex: pink seed corn)
	Source verify high oil feeds (ex: fat from packing plants vs. blended fats)
	Inspect trucks for contaminates (ex: any signs of hauling dangerous materials before feed).
	Samples of "high risk" feeds stored as per nutritionist recommendations.
	Purchased Feeds
	Evaluation, sampling, and sample storage protocol developed / used.
	Receiving/Inventory Log/Record: Source (verified), Date, Description (name, invoice #).
	Training for evaluating received / purchased feeds.
	Feed storage inspected for contamination before receiving new loads of ingredients.
	Feed storage area only used to store feed ingredients (no pesticides, solvents, etc).
	Procedures in place to protect feed handling equipment contamination.
	All feed handling equipment checked before each use for contamination.
	Feed Additives
	Receiving Log Record: Source (verified) Date, and Description (including serial / lot #).
	Stored separate from other feedstuffs.
	Use Log Record: Date, dose per ton, ID of animals.
	Physical Inventory Log (can be column in use log).
	Training for using feed additives
	Feed Formulas
	Record of all feed formulas.
	Medicated feed formulas checked by nutritionist or veterinarian for accurate dosing.
	Directions for use, including Withdrawal
	Training for mixing and quality control sampling/testing for feed mixing.
	Batch/Load/Feed Delivery
	Batch / Delivery Log/Load, (delivery matches feeding plan if needed).
	Minimum/Maximum and exception table or chart for ingredients and mixing.
	Training (see above).
	Cattle Release: Withdrawal checked on all feed records.

HACCP Standard Operating Procedures Check List (page 2 of 2)

Yes / No	SOP HACCP-like ITEMS CONSIDERED
	Cattle Handling Facilities
	Inspected for proper function for cattle and human safety before each use.
	Handling facilities and equipment properly designed, maintained, and used.
	New Cattle Entering The Operation
	Receiving Log Record: Source (verified) Date, and Description.
	Appropriate Health / Import / Transfer / Movement Records.
	Cattle Handling Training.
	Basic Quality Control:
	Holding pens and handling alleys properly designed and maintained.
	Clean feed and water as needed available to cattle on arrival.
	Visual inspection of cattle on arrival.
	Health Mgmt, Mass Medication, and Pesticides (Receiving, Storage and Use)
	Receiving/Inventory Log/Record: Source (verified), Date, Description (name, serial / lot #).
	Stored in protected area: Refrigerated as needed, sun light controlled, locked if required
	Use (Health Management/Treatment) Records for all cattle:
	Date, Animal(s) ID, diagnosis/reason, product, dose, withdrawal and release date.
	Cattle Product Use Maps used for health management (includes product and serial / lot #).
	Minimum/Maximum and exception table or chart for product use.
	Product Handling and Use Training (including MSDS/Product Inserts/etc.).
	No injectables given in the rear leg (rump or round), injectables given Sub Q if possible.
	Supplier Agreements and Veterinary Drug Order (as appropriate).
	Signed Use Protocols (Health Maintenance, Treatment, Premise Pesticides).
	Follow FDA/USDA/EPA guidelines for all product use.
	Equipment for delivery properly designed, maintained and used.
	Cattle: Chutes, snakes, holding pens, syringes, needles
	Feed and Pesticides: Scales, Mixers, Delivery System.
	Proper disposal of used containers.
	Withdrawal time established and estimated date for release, (injectables see above)
	Residue screening of non-performers (exceptions: reproduction and lameness if no Rx).
	Training for processing, health management, mass medication, and pesticide products.
	Medicated Feed Management
	Withdrawal time established, release date estimated.
	Feed management, mixing and delivery training.
	Follow FDA/USDA/EPA guidelines for all product use.
	Cattle Release
	Withdrawal checked on all products used (Health Management, and Treatment) records.
	All withdrawal times met and LAST test all non-performers (except no Rx: repro and lame).
	Release / Transfer form signed.

Check List Should Be Reevaluated Yearly

Evaluated or Validated by:	Name:	Date:
Owner / Manager Evaluation		
Veterinarian Evaluation		
Nutritional Adviser Validation		
Ext Ed/University Validation		

Cattle HACCP-like Hazard Identification

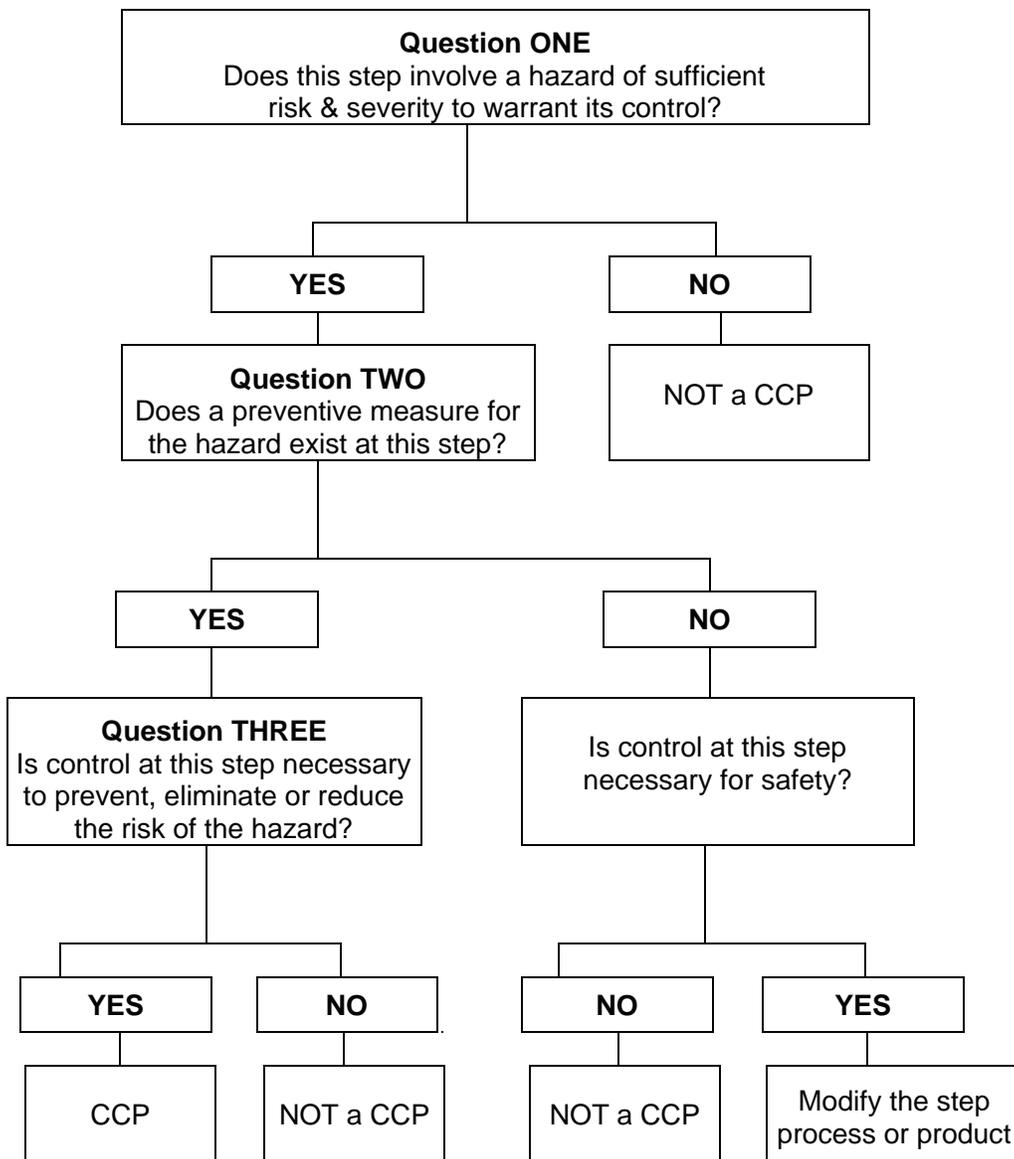
Biological (B), Chemical (C), Physical (P)

Biological hazards Identification	Control Possible (Yes at __) (No)	Chemical hazards Identification	Control Possible (Yes at __) (No)	Physical hazards Identification	Control Possible (Yes at __) (No)
Cattle selected virus, bacteria and parasites pathogens; Pasteurella spp., H. somnus, Clostridia. E. coli O157:H7, Salmonella spp. Cryptosporidia, Cryptosporidia, Cysticercus		Cattle isolate for time significant to allow all FDA/ USDA/EPA products to clear before transfer		Cattle protected from injury	
Feedstuffs (Grains, forage, supplements): bacteria and parasites pathogens; (fecal contamination) Molds and parasites		Feedstuffs (Grains, forage, supplements): protection from contamination		Cattle protection from contaminated with physical contaminates	
Water: bacteria (fecal contamination)		Water protected from contamination			

Cattle HACCP-like Hazard Evaluation: Biological (B), Chemical (C), Physical (P)

Biological Evaluation (Steps Listed)	Possible (Yes/No)	Chemical Evaluation (Step Listed)	Possible (Yes/No)	Physical Evaluation (Step Listed)	Possible (Yes/No)
1: Protected and yearly evaluation		1: Protected and yearly evaluation		2: Protect from contamination	
2: Protect from contamination		2: Protect from contamination		2: Protect from contamination	
3: Receiving protocol		3: Receiving protocol		3: Receiving protocol	
4: Protection from contamination		4: Protection from contamination		4: Protection from contamination	
5: Delivery Cross contamination and delivery accuracy		5: Delivery Cross contamination and delivery accuracy		5: Delivery Cross contamination and delivery accuracy	
7: Protection from cross-contamination		6: Check feed formulations		7: Contamination protection	
10: Contamination through feed / water		7: Contamination		9: Evaluate cattle	
15: Equipment Contamination		8: Check records		15-24: Equipment check	
16: Equipment Contamination		10: Check records		16: Protocol	
17: Equipment Contamination		11: Check records		17: Records	
		12-21: Selection			
		13-22: Records			
		14-23: Storage			
		15-24: Equipment			
		16-25: Protocol			
		17-26: Use records			
		18-27: Disposal plan			
		19-28: Evaluate cattle			
		20: Check records			

CCP Decision Tree



Critical Control Point Determination

Process Step Incoming Ingredients	Category and ID Hazard Determine if fully controlled by SOP If YES, ID SOP Proceed to next hazard If NO, Proceed to Q1	Q1: Could a control be used by operator at any process step? If NO, not CCP + ID control of hazard + proceed to the next hazard If YES move to next question	Q2: Is it likely the contamination with the identified hazard could occur in excess of the acceptable limits or could increase to an unacceptable level? If NO, not CCP Proceed to the next hazard If YES, is CCP	Q3: Is this process step specifically designed to eliminate or reduce the likely occurrence of the identified hazard to an acceptable level? If NO, next question. If YES, is CCP go to last column.	Q4: Will is subsequent step eliminate the identified hazard	CCP Number Proceed to next hazard
Incoming materials						
Cattle	B: bacterial NO	No, see Appendix 1				
	B: parasites NO	No, see Appendix 1				
	C: residues NO	No, see Appendix 1				
Grain	B: bacterial NO	No, see Appendix 1				
	B: molds NO	No, see Appendix 1				
	C: residues NO	No, see Appendix 1				
Forage	B: bacterial NO	No, see Appendix 1				
	B: molds NO	No, see Appendix 1				
	C: residues NO	No, see Appendix 1				
Supplements	B: bacterial YES SOP					
	C: residues NO	No, see Appendix 1				
Water	B: bacterial YES SOP					
	C: residues YES SOP					

Process Step Incoming Ingredients	Category and ID Hazard Determine if fully controlled by SOP If YES, ID SOP Proceed to next hazard If NO, Proceed to Q1	Q1: Could a control be used by operator at any process step? If NO, not CCP + ID control of hazard + proceed to the next hazard If YES move to next question	Q2: Is it likely the contamination with the identified hazard could occur in excess of the acceptable limits or could increase to an unacceptable level? If NO, not CCP Proceed to the next hazard If YES, is CCP	Q3: Is this process step specifically designed to eliminate or reduce the likely occurrence of the identified hazard to an acceptable level? If NO, next question. If YES, is CCP go to last column.	Q4: Will is subsequent step eliminate the identified hazard	CCP Number Proceed to next hazard
Process STEP						
Feed Receiving	B: bacterial YES					
	C: contamination YES SOP					
Feed Storage	B: bacterial YES					
	C: contamination YES SOP					
Feed Processing	B: bacterial YES					
	C: contamination YES SOP					
Feed Formulation	C: contamination YES SOP					
	C: contamination YES SOP					
Feed Mixing	B: bacterial YES					
	C: contamination YES SOP					
Feed Delivery	B: bacterial YES					
	C: contamination YES SOP					

Process Step Incoming Ingredients	Category and ID Hazard Determine if fully controlled by SOP If YES, ID SOP Proceed to next hazard If NO, Proceed to Q1	Q1: Could a control be used by operator at any process step? If NO, not CCP + ID control of hazard + proceed to the next hazard If YES move to next question	Q2: Is it likely the contamination with the identified hazard could occur in excess of the acceptable limits or could increase to an unacceptable level? If NO, not CCP Proceed to the next hazard If YES, is CCP	Q3: Is this process step specifically designed to eliminate or reduce the likely occurrence of the identified hazard to an acceptable level? If NO, next question. If YES, is CCP go to last column.	Q4: Will is subsequent step eliminate the identified hazard	CCP Number Proceed to next hazard
Process STEP						
Cattle Transport	B: bacterial YES					
	C: contamination YES SOP					
	P: injuries YES SOP					
Cattle Receiving	B: bacterial YES					
	C: contamination YES SOP					
	P: injuries YES SOP					
Cattle Sort/Mix	B: bacterial YES					
	P: injuries YES SOP					
Cattle Processing	C: contamination YES SOP					
	P: injuries YES SOP					
Cattle Feeding	B: bacterial YES					
	C: contamination YES SOP					
Cattle Shipping	B: bacterial YES					
	P: injuries YES SOP					

Process Step Incoming Ingredients	Category and ID Hazard Determine if fully controlled by SOP If YES, ID SOP Proceed to next hazard If NO, Proceed to Q1	Q1: Could a control be used by operator at any process step? If NO, not CCP + ID control of hazard + proceed to the next hazard If YES move to next question	Q2: Is it likely the contamination with the identified hazard could occur in excess of the acceptable limits or could increase to an unacceptable level? If NO, not CCP Proceed to the next hazard If YES, is CCP	Q3: Is this process step specifically designed to eliminate or reduce the likely occurrence of the identified hazard to an acceptable level? If NO, next question. If YES, is CCP go to last column.	Q4: Will is subsequent step eliminate the identified hazard	CCP Number Proceed to next hazard
Process STEP						
Pharm/Bios Use	C: contamination YES SOP					
	P: injuries YES SOP					
Pharm/Bios Disposal	C: envi-contam YES SOP					
Chemical Selection	C: safety YES SOP					
Chemical Storage	C: contamination YES SOP					
Chemical Use	C: contamination YES SOP					
Chemical Disposal	C: envi-contam YES SOP					

HACCP-like Hazards Not Controlled By Operator

List of any biological, chemical and physical hazards not controlled by the operator	
Hazards	Indicate the way the hazard could be addressed
Incoming materials:	
Cattle virus, bacteria and parasites; Pasteurella spp., H. somnus, Clostridia spp. E. coli O157:H7, Salmonella spp.	Purchase agreements Education/training
Grains: Salmonella, Cysticercus, Molds and parasites, Chemical residues	Purchase agreements Education/training
Forages: Molds and parasites, Chemical residues	Purchase agreements
Water: Salmonella spp. and parasites, Chemical residues	Education/training

Appendix

Hazards with insufficient data for control	Action to be initiated
Incoming materials:	
Cattle selected virus, bacteria and parasites pathogens; Pasteurella spp., H. somnus, Clostridia spp. E. coli O157:H7, Salmonella spp. Cryptosporidia,	Prevalence and management risk factors associated with farm prevalence is unknown. Research is pending.
Feedstuffs (Grains, forage, supplements): bacteria and parasites pathogens; (coliform contamination) Molds and parasites	Prevalence and management risk factors associated with prevalence is vague. Research is pending.
Processing steps:	
1: Visual observation and QC samples? And verify management history and withdrawal times	Management risk and control factors are unknown. Research is pending.
5, 7, 10: Population prevalence and cross-contamination during handling and processing	Management risk and control factors are unknown. Research is pending.

HACCP-like (CCP) Outline for Feed

The following table was review with _____ (owner/manager)

To identify those areas appropriate to _____ (beef operation)

Min: Potential site of Minor Problem (s =safety, p =production, q =quality).

Maj Potential site of Major Problem (s =safety, p =production, q =quality).

CCP: Problem will exist if not controlled at this point (s =safety, p =production, q =quality).

BQA Hazard	CCP	Preventive Measures	Monitoring Procedures	Corrective Action	Records	Verification
Pasture maintenance pesticide use	Min	Follow label directions	Observe Record Inspect	Keep cattle off until withdrawal met	Pesticide use Records	Evaluate Records
Raised feed	Min	Employee Training Approved products Withdrawal if require, Disposal of product containers	Sample and test Visual inspection	Quarantine Store until cleaned EPA approved disposal	Production log and test sheets	Evaluate Records
Purchased feed	Min	Employee Training	Sample and test Storage, Visual inspection	Reject load Quarantine Store	Receiving log, test sheets and Invoices	Check records Invoices
Receiving Feedstuffs	CCP-1	Source verified Invoice date, description Employee Training Only approved products	Sample every load, test and/or store, Visual inspection Product and truck	Reject load Quarantine, Store until cleaned EPA approved disposal	Receiving log, test sheet, and Invoices	Check records
Feed Facilities	Min	Regular examination	Visual Inspection	Clean and Inspect	Inspection Record	Records Mill and Main office
Feed Additives	CCP-2	Invoice date, description and numbers Employee Training approved products	Additives inventory Against Inventory balance	Notify -nutritionist Quarantine Withdrawal adjusted for group if need	Receiving log Invoices Use log	Check records and Invoices (receiving log-use log, withdrawal report before releasing
Feed Formulas	CCP-3	All formulas managed by Nutritionist	Checked by Nutritionist Estimated DOF against withdrawal, Batch checked	Withdrawal errors Max level chart	Formulation sheets, batch sheets Feeders log	Check records (for-batch-log) as used and before releasing
Batch/Load	Maj	Establish rout and Sequence, Balance min Establish Min/Max and exception chart, Employee Training	Batch check list Accumulation and total Batch/load sheets, Regular audits	Withdrawal errors Max level chart	Batch logs Truck log Feeders log	Balance logs
Feed delivery	Min	Employee training Establish rout Loads match call	Balance load total against feeders log	Assign delivery balance load against delivery	Load records: Group feed log	Check records (delivery-call) Re-checked before releasing
Cattle release	CCP-4	All withdrawal times met	Records of transferred cattle reviewed and balanced	LAST - RELEASE	Release form signed	All forms examined before release

HACCP-like (CCP) Outline for Product Use

The following table was review with _____ (owner/manager)

To identify those areas appropriate to _____ (beef operation)

Min: Potential site of Minor Problem (s =safety, p =production, q =quality).

Maj Potential site of Major Problem (s =safety, p =production, q =quality).

CCP: Problem will exist if not controlled at this point (s =safety, p =production, q =quality).

BQA Hazard	CCP	Preventive Measures	Monitoring Procedures	Corrective Action	Records	Verification
Cow/Bull Health	CCP-5	Health/ Nutrition appropriate to operation	Vet Diagnosis of problem Palpation/BCS/ Others	Adjust as Vet and examine inject-SQ neck	Production Records	Records checked by operator and vet
Calf Health (Birth)	Min	Cow in optimum condition at calving, Environment appropriate to optimum calf Assist as needed Colostrum mgmt. Employee Training approved product	Calving management	Adjust as Vet and examine injections SQ neck	Calf health records	Check records To see all treatments and procedures recorded.
Calf Health Early Management	Maj	Individual ID Health appropriate to operation Withdrawal established Employee Training approved products	Vet Diagnosis of problem Date, Product, ID, withdrawal	Set withdrawal, SQ neck	Processing records	Check protocol against invoices of products and processing records
Pre-wean Health	Maj	Individual ID Health appropriate to operation Withdrawal established Employee Training approved products	Vet Diagnosis of problem Date, Product, ID, withdrawal	Set withdrawal SQ neck	Receiving/ Pen/Yard sheet	Check protocol against invoices of products and processing records
Cattle Receiving	CCP-6	Assume Contaminated	Observe/record variation	Sort and examine	Receiving Record	Records foreman Office
Processing products	Min	Group ID Name/serial #'s Withdrawal time Employee Training approved products	Set clear dates Inventory	Establish min sale date for group	Receiving/ Pen/Yard sheet	Check records (receiving-feed-hospital-main) before releasing
Pesticides management	Min	Employee Training Pesticide use plan approved products	Inventory	Lock and separate	Use records: 1) Individual 2) Premise	Check records before releasing
Mass Med	Maj	Group ID Withdrawal time approved products	Projected sell date against withdrawal, Inventory	LAST test non-performers	Receiving/ Pen/Yard sheet	Check records (receiving-feed-hospital) before releasing
Sickness	CCP-7	ID, Date, Product Protocol and established withdrawal Employee Training approved products	Vet Protocol, Date, Product, ID, withdrawal, est. sell date	Monitor and set withdrawal SQ neck, LAST non-performers	Health records	Check protocol against health records
Transfer, Culling or Feedyard release	Min CCP-8	Check Withdrawal	Check withdrawal Records available	Withdrawal check Last test non-performers	Release form signed	Check records before releasing

SECTION V

THE CATTLE INDUSTRY'S GUIDELINES FOR THE CARE AND HANDLING OF CATTLE

Introduction

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 herd productivity. 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. Personal experience, training and professional judgment can serve as a valuable resource for providing proper animal care.

Producer Code of Cattle Care

Beef cattle producers take pride in their responsibility to provide proper care to cattle. The Code of Cattle Care below lists general recommendations for care and handling of cattle:

- Provide necessary food, water and care to protect the health and well-being of animals.
- Provide disease prevention practices to protect herd health, including access to veterinary care.
- Provide facilities that allow safe, humane, and efficient movement and/or restraint of cattle.
- Use appropriate methods to humanly euthanize terminally sick or injured livestock and dispose of them properly.
- Provide personnel with training/experience to properly handle and care for cattle.
- Make timely observations of cattle to ensure basic needs are being met.
- Minimize stress when transporting cattle.
- Keep updated on advancements and changes in the industry to make decisions based upon sound production practices and consideration for animal well-being.
- Persons who willfully mistreat animals will not be tolerated.

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 feed 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 well-being, 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 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 owner's control until drought relief is achieved.
- During periods of decreasing temperature, feeding plans should reflect increased energy needs.

Feeding Guidelines for Stocker Cattle

Stocker cattle 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 by-products) 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 (acidosis 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-being 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 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.

Identification

- If cattle are branded, it should be accomplished quickly, expertly and with the proper equipment.
- Feeder cattle should not be re-branded when entering a feedlot unless required by law.
- Brands should be of appropriate size to achieve clear identification.
- Jaw brands should not be used.
- Ear notching may be used to identify cattle.
- Wattling, ear splitting and other surgical alterations for identification are strongly discouraged.

Shelter and Housing

- Cattle in backgrounding facilities or feedyards must be offered adequate space for comfort, socialization and environmental management.
- Pen maintenance, including manure harvesting, will help improve pen conditions.
- Mud is more of a problem in the winter with low evaporation rate or improper drainage conditions. Accumulation of mud on cattle should be monitored as a measure of pen condition and cattle care in relation to recent weather conditions.
- Feedyards should use dust reduction measures to improve animal performance.
- Floors in housing facilities should be properly drained and barns and handling alleys should provide traction to prevent injuries to animals and handlers.
- Handling alleys and housing pens must be free of sharp edges and protrusions to prevent injury to animals and handlers.
- Design and operate alleys and gates to avoid impeding cattle movement. When operating gates and catches, reduce excessive noise, which may cause distress to the animals.
- Adjust hydraulic or manual restraining chutes to the appropriate size of cattle to be handled. Regular cleaning and maintenance of working parts is imperative to ensure the system functions properly and is safe for the cattle and handlers.
- Mechanical and electrical devices used in housing facilities must be safe.

Cattle Handling

- Abuse of cattle is not acceptable under any circumstances.
- Avoid slippery surfaces, especially where cattle enter a single file alley leading to a chute or where they exit the chute. Grooved concrete, metal grating (not sharp), rubber mats or deep sand can be used to minimize slipping and falling. Quiet handling is essential to minimize slipping. Under most conditions, no more than 2% of the animals should fall outside the chute. A level of more than 2% indicates a review of the process may be of value, including asking questions such as: is this a cattle temperament issue, has something in the handling area changed that is effecting cattle behavior, etc.
- Take advantage of cattle's flight zone and point of balance to move them. For safety and welfare-being 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, handlers should investigate and correct the reason for the balking rather than resort to overuse of electric prods.
- Under desirable conditions, ninety percent 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, nose, 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% of cattle vocalize (after being squeezed but prior to procedures being performed) it may be an indication that chute operation should be evaluated.
- If more than 25% of cattle jump or run out of the chute (do not consider loping as running) there should be a review of the situation and questions asked such as: is this a result of cattle temperament or prior handling issues, was the chute operating properly etc. Evaluate procedures to determine if cattle handling practices need to be improved.
- Properly trained dogs can be effective and humane tools for cattle handling. Insure that rough handling, barking and impeding of cattle flow is minimized.

Marketing Cattle

The overwhelming majority of cattle are marketed in good health and physical condition. Some compromised cattle should not enter intermediate marketing channels because of animal well-being concerns. Instead, these cattle should be sold directly to a processing plant or euthanized (see Euthanasia section), depending upon the severity of the condition, processing plant policy, and state or USDA regulations.

Transportation

- Cattle sorting and holding pens should allow handling without undue stress, be located near the loading/unloading facility and be suitable for herd size.
- Provide properly designed and maintained loading facilities for easy and safe animal movement. Proper design of loading chutes as well as personnel that are knowledgeable of their proper use can assure the safety of both cattle and cattle handlers. Ramps and chutes should be strong and solid, provide non-slip footing, and have sides high enough to keep cattle from falling or jumping off. A ramp angle of 25 degrees or less will improve cattle movement.
- All vehicles used to transport cattle should provide for the safety of personnel and cattle during loading, transporting and unloading.
- Strictly adhere to safe load levels with regard to animal weight and space allocation.
- Producers hauling cattle in farm and ranch trailers must ensure that adequate space is provided so that cattle have sufficient room to stand with little risk of being forced down because of overcrowding.
- Cattle that are unable to withstand the rigors of transportation should not be shipped.
- When the vehicle is not full, safely partition cattle into smaller areas to provide stability for the cattle and the vehicle.
- Knowingly inflicting physical injury or unnecessary pain on cattle when loading, unloading or transporting animals is not acceptable.
- No gap which would allow injury to an animal should exist between the ramp, its sides, and the vehicle.
- Vehicle doors and internal gates should be sufficiently wide to permit cattle to pass through easily without bruising or injury.

- Cattle should be loaded, unloaded, and moved through facilities with patience and as quietly as possible to reduce stress and injury.

Non-Ambulatory (Downer) Cattle

- A prompt diagnosis should be made to determine whether the animal should be humanely euthanized or receive additional care.
- Provide feed and water to non-ambulatory cattle at least once daily.
- Move non-ambulatory animals very carefully to avoid compromising animal well-being. Dragging non-ambulatory animals is unacceptable. Likewise, animals should not be lifted with chains onto transportation conveyances. Acceptable methods of transporting non-ambulatory animals includes 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.
- When treatment is attempted, cattle unable to sit up unaided (i.e. lie flat on their side) and refuse to eat or drink should be humanely euthanized within 24-36 hours of initial onset.
- **Cattle that are non-ambulatory must not be sent to a livestock market or to a processing facility.**
- Marketing cattle promptly, before this issue occurs, will promote better quality of life for the animal and economic benefit for the operation.

Euthanasia

Euthanasia is humane death occurring without pain and suffering. The decision to euthanize an animal should consider the animal’s well-being. The producer will most likely perform on-farm euthanasia because a veterinarian may not be immediately available to perform the service. When euthanasia is necessary, an excellent reference is the Practical Euthanasia of Cattle guidelines developed and published by the American Association of Bovine Practitioners.

Reasons for euthanasia include:

- Severe emaciation, weak cattle that are non-ambulatory or at risk of becoming downers
- Non-ambulatory cattle that will not sit up, refuse to eat or drink, have not responded to therapy
- 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

Heat Stress Procedures

- During periods of high heat and humidity and little wind, actions should be taken to minimize the effects of heat stress as cattle are processed
- Provide adequate water
- 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 98o 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 NebGuide G00-1409-A (www.gpvec.unl.edu)
- 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

Pasture Cattle Heat Stress Procedures

- During the summer the THI in the southeastern United States can be high
- Breeding programs in the southeast should consider cattle's heat tolerance and ability to adapt to their regional environment
- Trees are abundant on most farms and ranches in the southeast, providing natural shade and relief from heat. Cattle instinctively use shade and ponds for cooling when the THI is high
- When heat stress is extreme:
 1. Ensure adequate drinking water is available
 2. Move or process cattle during the cooler part of the day
- Heat management tools, such as shades and sprinklers, should be considered if sufficient natural shade is not available

Training and Education for Maintaining and Improving Cattle Care and Handling Implementation and Review Programs

Management practices should be informally assessed every day to ensure that animal well-being is not compromised. Regardless, producers are encouraged to implement a system to verify efforts directed towards animal care and handling. This can be accomplished by:

- o Establishing a network of resources on cattle care
- o Following the Cattle Care and Handling Guidelines
- o Keeping track of training and education activities
- o Conducting self-audits of animal care and handling procedures

Informal self-reviews should be periodically conducted by those involved with cattle feeding and care.

Training of those who handle cattle should include:

- An understanding of the animal's point of balance and flight-zone
- Avoiding sudden movement, loud noises or other actions that may frighten cattle
- Proper handling of aggressive/easily excited cattle to ensure the well-being of the cattle and people
- Proper use of handling and restraining devices
- Recognizing early signs of distress and disease
- How to properly diagnose common illnesses and provide proper care
- Administration of animal health products and how to perform routine animal health procedures
- Recognizing signs associated with extreme weather stress and how to respond with appropriate actions
- Basic feeding/nutritional management of beef cattle

Summary

Cattlemen have long recognized the need to properly care for their livestock. Research provides the basis for many day-to-day decisions about animal husbandry. Management programs should be science-based and common sense. As such, the cattle industry continues their commitment to proper care and handling of their livestock.

Training Materials

- National Institute for Animal Agriculture (NIAA):
 - Cattle Handling and Transportation (video)
 - Livestock Handling Guide (pamphlet)
 - Livestock Trucking Guide (pamphlet)
 - Proper Handling Techniques for Non-Ambulatory Animals (pamphlet)
- Flight Zone and Point of Balance
 - www.grandin.com/behavior/principles/flight.zone.html

Transporting Cattle

- Cattle and Swine Trucking Guide for Exporters, USDA Agricultural Marketing Service publication, published May 1997

Euthanasia

- Practical Euthanasia of Cattle, American Association of Bovine Practitioners

Heat Stress

- NebGuide G00-1409-A, www.gpvec.unl.edu

Additional References

- FASS 1999
- Midwest Planning Service (MWPS) Manuals

SECTION VI

ENVIRONMENTAL QUALITY CONTROL POINTS

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.

Process	Control Point	Potential Environmental Concern
Forage Management	Stocking Rate	Deteriorating range/pasture Riparian areas Air and/or Water Quality Soil Erosion
Soil Fertility	Fertilizer application Animal waste application	Water Quality Transfer of Disease
Pasture Chemical use	Herbicide & pesticide use Container disposal	Water Quality Soil contamination
Disposal of dead stock	Composting, burial, burning	Air and/or Water Quality Transfer of Disease
Confined cattle	Water runoff control	Air / Water contamination Transfer of Disease

Management Approaches for Environmental Control Points

Environmental concerns fall under these five areas:

1. *Forage management*
 - a. Stocking rate
 - i. Forage conservation
 - ii. Water quality and conservation
 - iii. Soil conservation/erosion
 - b. Grazing management
2. *Soil fertility*
3. *Pesticides*
 - a. Safe application of pesticides
 - b. Safe storage of pesticides
 - c. Safe disposal of pesticides and containers
4. *Water Quality*
5. *Mortality disposal*

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.

Stocking Rate: 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.

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.

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.

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.

Every grazing land situation is unique, so every grazing management plan should be site-specific.

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. 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.)
3. Record all applications (rate and nutrient composition) of fertilizer, regardless of source, and the area to which it was applied.

Pesticide Use

An Integrated Pest Management (IPM) approach seeks to use routine management practices to minimize the use of pesticides on a regular basis. These routine strategies include:

- The use of an appropriate stocking rate for the grazing management unit. This minimizes the number of unwanted weed species in the pasture environment and, thus, the routine application of herbicides.
- The use of relevant grazing systems that allow for biological control of unwanted, but palatable and nutritious, weed species. This again minimizes the routine application of herbicides.
- The use of appropriate fertility programs on introduced forage pastures. This encourages the growth and vigor of desirable forage species that can challenge less desirable weed species.
- The use of prescribed burning programs. Prescribed fire can safely and efficiently reduce competition from many weed species, especially those that are woody in nature.
- Close adherence to label directions. When pesticides are required, Best Management Practices include following label directions carefully to optimize target species control and eliminate negative effects to the environment.

***To use pesticides in a manner not consistent with label directions
.is a violation of state and federal laws.***

Pesticide Storage and Disposal Guidelines.

1. Don't stockpile.
2. Always store pesticides in their original containers.
3. Store pesticides out of reach of children and pets.
4. When disposing of pesticides, check with your local landfill, solid waste management authority, local health department or your state Department of Agriculture to find out whether your community has a hazardous waste collection program for getting rid of unwanted pesticides.
5. If you have any doubt about proper pesticide use and disposal, contact your state Department of Agriculture.
6. Water that is used to rinse pesticide containers should never be dumped on the ground or down a drain. It must be added to the sprayer tank and used on the site in a manner for which the pesticide is labeled.
7. Do not pour leftover pesticides down the sink, into the toilet, or down a sewer or street drain. Pesticides may interfere with the operation of wastewater treatment systems or pollute waterways. Many municipal systems are not equipped to remove all pesticide residues. If pesticides reach waterways, they can harm fish, plants and other living things.

Steps for triple-rinsing pesticide containers:

1. Remove the cap or lid from the pesticide container, measure the pesticide as you empty the container into the sprayer tank and let the container drain into the sprayer tank for 30 seconds.
2. Fill the container 10-20% full of water.
3. Secure the cap or lid on the container and shake to rinse the inside.
4. Remove the cap or lid and add the rinse water from the container to the sprayer tank. Let the container drain into the sprayer tank for 30 seconds or more.
5. Repeat steps 2-4 two more times.
6. Put the cap or lid back on the pesticide container and dispose of the container according to label directions.
7. Do not use empty containers to store any other liquids.

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.

Mortality Disposal

The disappearance of rendering plants in rural areas is a concern and has become a national trend in recent years. It is estimated that fees for livestock mortality removal range from \$20 to \$150 dollars per animal. High disposal prices, combined with the disappearance of rendering plants, have resulted in some producers improperly burying or simply dumping the carcass into wooded areas, creeks or other inconspicuous areas.

These practices have created concerns about:

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

For livestock, several options for carcass disposal are available, including burial, incineration, and composting. Incineration of large animals requires special facilities, which may be impractical for cow-calf and stocker producers.

Researchers are studying the feasibility of on-site composting of carcasses as a means of environmentally sound disposal. Composting is routinely done in the poultry and swine industries and is being adopted by feedyard/backgrounding operations to economically dispose of mortalities.

Guidelines are available to aid producers in developing composting facilities. Other options, such as cooking carcasses for animal feed (done in swine and poultry industry), are not an option with cattle

because of the ban on feeding ruminant-derived proteins back to ruminants (See Ruminant Ban Fact Sheet in the Appendix, page tbd).

Disposal of mortalities is not a major concern for cow-calf producers, who usually deal with minimal numbers of dead livestock. However, for larger backgrounding and stocker operations, timely disposal of mortalities becomes an environmental concern.

On-site burial of carcasses may be the best disposal option for cow-calf producers currently available. However, regardless of the size of your operation, no dead animal is to be buried on-site unless you have checked with applicable local and state authorities and have received approval to do so.

Some municipal solid waste landfills will accept dead animals provided that they can be covered immediately with 3 feet of other solid waste or at least 2 feet of soil. Producers should contact the local waste disposal facility to determine if carcasses are accepted.

Mortality Disposal Guidelines.

1. Under no circumstances should mortalities be disposed of by dumping in a creek, on a county road, abandoned hand-dug wells or other areas where water and air quality might be jeopardized.

SECTION VII

PRODUCT USE APPENDIX: The table below contains commonly used antibiotics, supportives, vitamins, antiparasitics, and vaccines. Only products that have SQ, Topical or IV route of administration are listed. The hundreds of product labeled for use in cattle that are not listed in the table. It is extremely important to read and follow label directions including the proper dose, route of administration and withdrawal time. Changing the route of administration WILL change the withdrawal time. For example, Banamine has a 4 day withdrawal if given as directed (IV). If used IM or SQ the Food Animal Residue Avoidance Databank experts suggest adding not less that 7 additional days to the withdrawal. This table may not be current as labels continuously change. Consult the product label for the correct usage and withdrawal information.

Cattle Subcutaneous (SQ) or Intravenous (IV) or Topical (T) Products

Type product: A =antibiotic, AS =supportive, N =vitamin, P =parasite, V =vaccine.

Product	Type	Company	Route	Withdrawal
Adspec	A	Pfizer	SQ	11
Albon 40	A	Pfizer	IV	5
Amoxi-Inject	A	Pfizer	SQ	25
Baytril 100	A	Bayer	SQ	28
Biomycin 200	A	Boehringer Ingelheim	SQ	36
Duramycin	A	Durvet	IV	19
Dura-Pen	A	Durvet	SQ	30
Excenel	A	Pfizer	SQ	3 (11 Site)
Flo-Cillin	A	Fort Dodge	SQ	30
LA Pen	A	Premier Farmtech	SQ	30
Liqumycin LA 200	A	Pfizer	SQ,IV	28
Micotil 300	A	Elanco	SQ	28
Nuflor	A	Schering-Plough	SQ	38
Oxybiotic 200	A	Butler	IV	28
Pen BP-48	A	Pfizer	SQ	30
ProCure 200	A	Bayer	IV	28
Sodium Iodide	A	(all)	IV	60?
Sulfadimethoxine	A	(all)	IV	5
Twin-Pen	A	AgriLabs	SQ	30
Vetisulid	A	Solvey	IV	5
Banamine	AS	Schering-Plough	IV	4
Triple Histamine	AS	RXV, WVS	IV	4
Bo-Se	N	Schering-Plough	SQ	30
Mu-Se	N	Schering-Plough	SQ	30
Velenium S-E	N	Fort Dodge	SQ	30
Vita-B Complex	N	AL,B, D,P,V,	SQ	?
Dectomax	P	Pfizer	SQ	35
Ivomec	P	Merial	SQ	35
Ivomec Plus/PourOn	P	Merial	SQ/T	49/48
Levamisole	P	AL, A, Mall	SQ	7
Tramisol	P	RXV, Fort Dodge	SQ	7

Product	Type	Company	Route	Withdrawal
20/20 Vision	V	Intervet	SQ	21
Alpha 7, CD	V	Boehringer Ingelheim	SQ	60
Bar-Vac	V	Anchor	SQ	21
BovaMune	V	AgriLabs	SQ	21
Cattlemaster Gold	V	Pfizer	SQ	21
Clostri Shield	V	Norvartis	SQ	21
Clostridial (all)	V	AgriLabs	SQ	21
Fortress 7,8, CD	V	Pfizer	SQ	21
K99 Shield	V	Norvartis	SQ	60
Leukotox M	V	AAH	SQ	60
Master Guard 10	V	AgriLabs	SQ	21
Ocu-guard MB	V	Boehringer Ingelheim	SQ	21
OneShot	V	Pfizer	SQ	21
Piliguard Pinkeye + 7	V	Schering-Plough	SQ	21
Plazvax	V	Schering-Plough	SQ	60
Pre-Vent 6	V	AgriLabs	SQ	21
Pyramid	V	Fort Dodge	SQ	21
Quatracon-2X	V	Boehringer Ingelheim	SQ	21
Resist 7	V	AgriPharm	SQ	21
Respiragen Antiserum	V	Colo Serum	SQ	21
ResProMune	V	AgriLabs	SQ	21
Somnu Shield	V	Norvartis	SQ	21
Somubac	V	Pfizer	SQ	21
Sprirovac	V	Pfizer	SQ	21
Tetguard	V	Boehringer Ingelheim	SQ	21
Triangle (most)	V	Fort Dodge	SQ	21
TrichGuard	V	Fort Dodge	SQ	60
Ultrabac (all)	V	Pfizer	SQ	21
Vib Shield, L5	V	Norvartis	SQ	21
Vibrin	V	Pfizer	SQ	60
Vision 7,8,CD and Volar	V	Intervet	SQ	21
Vista	V	Intervet	SQ	21
Volar	V	Intervet	SQ	21
Wart Vac	V	AgriLabs, Colo Serum	SQ	21

Note: Cattle vaccines are controlled by the USDA and generally have one of two different withdrawal times, either 21 days or 60 days for vaccines that contain an oil adjuvant.

Pesticide Information can be found at:

<http://www.ianr.unl.edu/ianr/pat/ephome.htm>

Note: Days to graze are not necessarily equal to the slaughter withdrawal time. Read the label for specific slaughter withdrawal times.

Pasture and Range Herbicides

This is a guide to many of the products that are available.

This list could change as new products are developed and withdrawal time re-evaluated.

ALWAYS READ THE LABEL for proper withdrawal times.

Trade Name	Days From Last Application To	
	Harvest	Graze
Alley	0	0
Amber	0	0
Banvel 4S	0	0
Crossbow 3S	365	35
Curtail	30	0
Escort	0	0
Gramoxone Ex	30	30
Grazon P+D	0	0
Roundup Ultra	56	56
Spike 20P	365	6
Stinger 3E	0	0
Tordon 22K	14	0
2,4-D	30	7

Corn Herbicides

This is a guide to many of the products that are available. This list could change as new products are developed and withdrawal time re-evaluated.

ALWAYS READ THE LABEL for proper withdrawal times.

Trade Name	Generic Name	Days From Last Application To	
		Harvest	Graze
Atrazine	Atrazine	21	21
Banvel	Dicamba	30	30
Bladex	Cyanazine	21	21
Brominal	Bromoxynil	60	60
Buctril	Bromoxynil	60	60
Evik	Ametryne	30	30
Lorox	Linuron	60	60
Prowl	Pendimethalin	21	21
Round Up	Glyphosphate	40	40
Treflan	Trifluralin	0	0

Corn Pesticides

This is a guide to many of the products that are available. This list could change as new products are developed and withdrawal time re-evaluated.

ALWAYS READ THE LABEL for proper withdrawal times.

Trade Name	Generic Name	Days From Last Application To	
		Harvest	Graze
Alfa-Tox	Methoxychlor * Diazinon	7	0
AmBush 2E	Permethrin	NA	NA
AmBush 25W	Permethrin	NA	NA
AG 500	Diazinon	0	0
Comite	Propargite	30	30
Cygon	Dimethoate	14	14
Diazinon 14.3G	Diazinon	0	10
Disyston 8 lb.	Disulfoton	28	28
Disyston 15% G	Disulfoton	40	40
Dyfonate	Fonofos	30	30
Dylox	Trichlorfon	1	0
Ethion		50	*
Furadan	Carbofuran	3	30
Lannate	Methomyl	0	3
Lorsban 4E	Chlorpyrifos	5	14
Malathion	Malathion	5	5
Methyl Parathion	Methyl Parathion	12	12
Nudrin	Methomyl	0	3
Pay-Off	Flucythrinate	60	60
Penncapp-M	Methyl Parathion	12	12
Parathion	Parathion	12	12
Pydrin 2.4	Fenvalerate	21	21
Pounce	Permethrin	NA	NA
Rampart	Phorate	30	30
Sevimol	Carbaryl	0	0
Sevin	Carbaryl	0	0
Sulfur	Sulfur	0	0
Thimet	Phorate	30	30

(*Do Not Feed Treated Forage)

(NA - Information is not available)

Small Grain Pesticides (Wheat, Oats, Barley, Rye)

This is a guide to many of the products that are available. This list could change as new products are developed and withdrawal time re-evaluated.

ALWAYS READ THE LABEL for proper withdrawal times.

Trade Name	Generic Name	Days From Last Application To	
		Harvest	Graze
Cygon*	Dimethoate	60	14
Dimetholate*		60	14
Di-Syston**	Disulfoton	30	****
Dilox	Trichlorfon	21	0
Ethyl Parathion***	Ethyl Parathion	15	15
Lannate	Methomyl	7	10
Malathion	Malathion	7	7
Methyl Parathion	Methyl Parathion	15	15
Nudrin	Methomyl	7	10
Rampart*	Phorate	45	45
Sevin 80S, XLR	Carbaryl	21	0
Thimet	Phorate	70	28

*Wheat Only **Barley and Wheat Only ***Not Cleared for Rye ****Not Cleared For Grazing

Small Grain Herbicides (Wheat, Oats, Barley, Rye)

This is a guide to many of the products that are available. This list could change as new products are developed and withdrawal time re-evaluated.

ALWAYS READ THE LABEL for proper withdrawal times.

Trade Name	Generic Name	Days From Last Application To	
		Harvest	Graze
Banvel	Dicamba	NA	30
Baytleton		NA	21
Brominal	Bromoxynil	NA	30
Buctril	Bromoxynil	NA	30
2,4-D	2,4-D	NA	7
Glean	Chlorosulfuon	NA	0
Hoelon	Dichlofop-Metay	NA	*
Lexone	Metribuzin	NA	14
Misc. Trade Names	MCPA	NA	7
Sencor	Metribuzin	NA	14
Tilt		NA	*

*Do Not Graze

(NA - Information is Not Available)

Alfalfa Herbicides

This is a guide to many of the products that are available. This list could change as new products are developed and withdrawal time re-evaluated.

ALWAYS READ THE LABEL for proper withdrawal times.

Trade Name	Generic Name	Days From Last Application To	
		Harvest	Graze
Balan	Benefin	0	NA
Butryal	2, 4-D	60	NA
Furloc	Chloroprotham	40	NA
Gramoxone Super	Paraquat	60	NA
Kerb	Pronamide	25	NA
Lexone	Metribuzin	28	NA
Poast	Sethoxydim	20	NA
Sencor	Metribuzin	28	NA
Veipar	Hexazinone	30	NA

*Do Not Graze (NA - Information is Not Available)

Alfalfa and Clover Pesticides

This is a guide to many of the products that are available. This list could change as new products are developed and withdrawal time re-evaluated.

ALWAYS READ THE LABEL for proper withdrawal times.

Trade Name	Generic Name	Days From Last Application To	
		Harvest	Graze
Alfa-Tox	Diazinon and Methoxychlor	7	7
Bactur	Bacillus Thuringiensis	0	0
Cygon	Dimethoate	10	10
Cythion	Malathion	0	0
De-Fend	Dimethoate	10	10
Diazinon	Diazinon	7	7
Dipel	Bacillus Thuringiensis	0	0
Di-Syston*	Disulfoton	0	0
Di-Syston**	Disulfofon	7	7
Dylox	Trichlorfon	0	0
Furadan	Carbofuran	28	28
Guthion*	Azinphosmethyl	16	16
Imidan	Phosmet	7	7
Lannate	Methomyl	NA	7
Malathion	Malathion	0	0
Methyl Parathion	Methyl Parathion	15	15
Nudrin	Methomyl	NA	7
Parathion	Parathion	15	15
Sevimol	Carbaryl	0	0
Sevin	Carbaryl	0	0
Supracide	Methidathion	10	10
Systox	Demeton	15	***
Thiocide	Bacillus Thuringiensis	0	0

*Alfalfa ** Clover ***Do Not Graze (NA - Information Not Available)

Feed Additives and Medications

1. Drug Categories: All drugs are divided into one of two categories:

CATEGORY 1 - Drugs that have no required withdrawal time when used at lowest usage level.

CATEGORY 2 - Drugs that either (1) have withdrawal times at lowest usage level or (2) are regulated because of a "no residue" tolerance level.

2. Medicated Feed Type

All medicated feeds are divided into one of three types:

TYPE A - Medicated feed articles that usually consist of highly concentrated forms of the drug in the form of mill premixes, super-concentrates, and fortifiers that have a higher potency than permitted in Type B or Type C feeds. Type "A" feeds are used to produce Type B and Type C feeds. See Table F-8 below.

TYPE B - Medicated feeds that usually consist of dilute drug premixes, some feed concentrates, supplements, and other mixtures that require further mixing with one or more feed ingredients to achieve final dilution before being fed. See Table F-8 below.

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

3. Registration with the Food and Drug Administration

a) Who must register with the FDA?

Any establishment that uses one or more Type "A" sources of a Category 2 drug to manufacture or produce medicated feed articles. Registration requires completion of either Form FD-2656 (for first time registrants) or 2656e (for annual re-registration), together with a separate Form FDA-1900 for each of the Type A, Category 2 drugs being used. The forms are described in paragraph 4 below.

b) What about feed mixed on the farm?

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

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

4. Forms used by the FDA

FD-2656. Registration of Drug Establishment. This form is required for initial registration with the FDA and must be submitted within five working days after commencement of operation of the facility.

FD-2656e. Annual Registration of Drug Establishment. This form is used for annual registration of facilities. The FDA will send this form to your facility on an annual basis.

FDA-1900. Medicated Feed Application. This form is used to obtain FDA approval to manufacture or use any Type “A” Category 2 feed article at your facility. Purchase of a medicated premix or complete feed does not require a FDA-1900 as the facility that blends and manufactures the feed will have one on file. However, each user is responsible for the correct level of drug contained in the total feed. If your facility does not have a FDA-1900 on file for the proper drugs, your facility must first pass a cGMP inspection conducted by the FDA; then FDA will approve your Medicated Feed Application '1900'. See Table F-8.

These forms can be obtained by writing to:

Department of Health, Education and Welfare
 Food and Drug Administration, Bureau of Drugs
 Drug Listing Staff (HFD-315)
 5600 Fishers Lane
 Rockville, MD 20857

Recordkeeping requirements for non-registered facilities are summarized below.

NON-REGISTERED FACILITIES SHALL:

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

Regulatory Scheme

	Category 1 Drugs	Category 2 Drugs
Manufacture of Type A	Premixes containing drugs at levels greater than permitted in Type B feed FD-356 approved required	Premixes containing drugs at levels greater than permitted in Type B feed FD-356 approval required
Use of Type A	No FDA-1900 required No FDA-2656 or 2656e required No mandatory inspection by FDA Relaxed CGMP No assays	FDA-1900 required FDA-2656 or 2656e required Mandatory inspection over CGMP Full CGMP 3 assays per year
Use of Type B or Type C	No FDA-1900 No FDA-2656 or 2656e No FDA inspection Relaxed CGMP No assays	No FDA-1900 No FDA-2656 or 2656e No FDA inspection Relaxed CGMP No assays

Feed Additives and Medications Use

The feed additives and medications listed in the following Approved Feed Additives and Medications for Beef Cattle Table lists approved feed additives and additive combinations. *All medicated additive combinations not listed in the table are not approved by FDA and therefore are illegal.* Other medicated feed additives (not listed) are illegal unless the label clearly states it may be used in beef cattle.

Furthermore, it is illegal for a veterinarian to prescribe any level of a feed additive or medication of any type to be added into a feed mixture. This has been a misconception in the past.

Table F-8 also contains information as to whether you are required to hold a FDA-1900 Medicated Feed Application (MFA) for various drugs. Anyone using a Type “A” Category 2 medicated feed article with a drug concentration higher than the percentage indicated in Table F-8 is required to secure a FDA-1900. If you hold a FDA-1900 MFA for any of the following ingredients: Aureo S-700, Neo Terra, MGA, Rumatel,

Beef Cattle Feed Additives (Usage Withdrawal & Approved Combinations) ^p						
Ref. Source: Feed Additive Information is found in the Federal Code of Regulation Title 21 Part 558 (21CFR558) http://www.gpoaccess.gov/cfr/index.html Allowable Analytical Variation is found in 21CFR558.4						
Trade Name	Generic Name	Classification	21 CFR 558	Use	Dose ^o	WD ^a
Albac (BZ)	Bacitracin	Antibiotic	558.78	FE ^b , WG ^c	30-75 mg/day	0
Aureomycin/CTC (A)	Chlortetracycline	Antibiotic	558.128	FE ^b , WG ^c , DC ^h	RCFR ^m	RCFR ^m
Bovatec (B)	Lasalocid	Ionophore	558.311	FE ^b WG ^c , CC ^d	100-360 mg/day	0
Cattlyst (C)	Laidlomycin	Ionophore	558.305	FE ^b , WG ^c	30-150 mg/day	0
Deccox (D)	Decoquinat	Coccidiostat	558.195	CC ^d	22.7mg/CWT	0
GainPro (G)	Bambermycins	Antibiotic	558.95	WG ^c	10-40 mg/day	0
MGA/HeifermaX (M)	Melengestrol	Hormone	558.342	EC ^f	50 mg/day	0
Morantel Tartrate	Morantel Tartrate	Dewormer	558.360	DW ^e	440mg/CWT	14
Optaflexx (O) ^j	Ractopamine	Beta-Agonist	558.500	FE ^b , WG ^c	8.2 - 24.6 gm/ton ^o	0
Rabon (RB)	Tetrachlorvinphos	Insecticide	40CFR186.950	FC ^g	RCFR ^m	0
Rumensin(R) Beef*	Monensin	Ionophore	558.355	FE ^b , WG ^c , CC ^d	50-480 mg/day	0
Rumensin(R) Dairy**	Monensin	Ionophore	558.355	Milk Production	115-660 mg/day	0
Terramycin (OTC)	Oxytetracycline	Antibiotic	558.450	FE ^b , WG ^c , DC ^h	RCFR ^m	RCFR ^m
Tylan (T)	Tylosin	Antibiotic	558.625	LA ⁱ	60-90 mg/day	0
V-Max (V)	Virginiamycin	Antibiotic	558.635	WG ^c	100-340 mg/day	0
Tramisol (L)	Levamisole	Dewormer	558.315	DW ^e	360mg/CWT	3
Safe-Guard (SG)	Fenbendazole	Dewormer	558.258	DW ^e	230mg/CWT	13
Zilmax (Z) ^k	Zilpaterol	Beta-Agonist	558.665	FE ^b , WG ^c	60-90 mg/day ^z	3
Below find the trade named products FDA has approved to be used in various combinations See the individual medication listing (SIM ^l) for information concerning each drug in the combination approval (The generic names ⁱ , classification ⁱ , CFR listing ^j , Use ⁱ , Dose ⁱ and Withdrawal ^l can be found in 21 CFR 558)						
Albac (BZ) + Bovatec (B) Albac (BZ) + Deccox (D) Albac (BZ) + Rumensin (R)	Aureomycin(A) + Bovatec (B) Aureomycin(A) + Cattlyst (C) Aureomycin(A) + Deccox (D)	Bovatec (B) + MGA (M) Bovatec (B) + MGA (M) + Tylan(T) Bovatec (B) + Terramycin (OTC)		MGA (M) + Tylan (T)		
Rumensin (R) + Deccox (D) Rumensin (R) + Optaflexx (O) Rumensin (R) + Tylan (T) Rumensin (R) + Tylan (T) + Deccox (D) Rumensin (R) + Tylan (T) + MGA/HeifermaX (M)	Rumensin (R) + Tylan (T) + Optaflexx (O) Rumensin (R) + Tylan (T) + MGA/HeifermaX (M) + Optaflexx (O) Rumensin (R) + Tylan (T) + Zilmax (Z) Rumensin (R) + Tylan (T) + MGA/HeifermaX (M) ⁿ + Zilmax (Z) Rumensin (R) + Zilmax (Z)					
a: WD (Withdrawal Days) b:FE (Feed Efficiency) c: WG (Weight Gain) d: Coccidia Control e: DW (Deworm) f: EC (Estrus Control) g: FC (Fly Control) h: DC (Disease Control)	i: LA (Liver Abscess Control) j: final 28 to 42 days on feed k: final 20- to 40 days on feed l: SIM (See Individual Meds) m: RCFR (Refer to the Code of Federal Regulations) n: HeifermaX not approved in this combination	o: additionally, feed grams/ton specifications must be met. Some are calculated on a 90% DMB (dry matter basis) while others are on a 100% DMB. Refer to product label for usage directions. p: Excludes lactating dairy cows producing milk for humans z: Zilmax 60-90 mg dose is based on 7.6 gm/ton DMB inclusion *: Beef doses target growing, including dairy heifers & finishing cattle. ** Dairy usage refers to mature milk cows. Lactating usage rates are 185-660mg/day. Dry cow usage rates are 115-410mg/day.				

Tramisol 50% tyou are required to sample and test (assay) the feed or supplement that contains a Category 2 drug three (3) times per year. Generally, the pharmaceutical representative will assist with the annual tests. It is not necessary to have a commercial lab run these assays as drug companies will do this as a service for you. In addition, the table sets forth the withdrawal time of each drug. A complete description of the approved feed additives is available in: The Feed Additive Compendium, Miller Publishing Company, 12400 Whitewater Drive, Minnetonka, MN 55343

The table is current as of February, 1991. The table should be used as a reference only; refer to label directions for complete information and consult your nutritionists or veterinarian for further assistance.

Feed Additives: Levels, Withdrawals and Legal Combinations

ID #	NAME	LEVEL (all air dry or 90%DMB)	Withdraw Days	Legal Combinations * (Match the numbers)
1	Rumensin	10-30 g/ton	0	1 (2, 3, 15)
2	Tylan	8-10 g/ton	0	2 (1,3)
3	MGA	0.25 - 0.50 mg/hd/day	0	3 (1,2,4)
4	Bovatec	20-30 g/ton	0	4 (2,5,8)
5	GainPro	1-4 g/ton	0	
6	Cattyst	5-10 g/ton	0	
7	V-Max	11-22.5 g/ton	0	
8	Aureomycin	1 to 10 mg/lb/hd/day	0-10	8 (1,4,6)
9	Sulfamethazine	350 mg/hd/day	7	9 (5)
10	Terramycin	1 to 10 mg/lb/hd/day	0-10	10 (4)
11	Amprolium	2.27 mg/lb/day (21days) 4.54 mg/lb/day (5 days)	1	
12	Deccox	0.227 mg/lb/day	0	
13	Safe-Guard	2.27 mg/lb	13	
14	Poloxalene	10-20 mg/lb	0	
15	Optaflexx	8.2 to 24.6 g/ton	0	15 (1, 2, 3)

Ruminant Ban Fact Sheet

Purpose and Scope of Regulation: The Food and Drug Administration (FDA) adopted the “Animal Proteins Prohibited from Ruminant Feed” regulation to prevent the establishment of Bovine Spongiform Encephalopathy (BSE) in the United States through feed, and thereby minimize any risk to animals and humans.

The regulation prohibits the use of protein derived from mammals in ruminant animal feed. There are, however, certain exceptions to the rule including:

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

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

The final rule went into effect on August 4, 1997. In regards to printed packaging, labels, labeling, and finished products manufactured before August 4, 1997, such material and product needed to be exhausted by October 3, 1997.

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

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

1. Maintain copies of all purchase invoices for all feeds received that contain animal protein.

If a feed intended for ruminants contains animal protein, the protein can consist only of non-prohibited material. The regulation requires maintenance of invoices for all feeds containing animal protein, so that the FDA can verify if necessary that the animal protein contained in the ruminant feed is from non-prohibited sources.

2. Maintain copies of labeling for feeds containing animal protein products that are received.

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 from each shipment that represents a different product is necessary. Finally, 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.

3. Make copies of the invoices and labeling available for inspection and copying by the FDA.
4. Maintain the records for a minimum of one year.

The records should be kept so that they are legible and readily retrievable. The one-year requirement means one year from the date of the receipt of the product.

Requirements for protein blenders, feed manufacturers and distributors that separate prohibited material and non-prohibited material.

Distributor is defined as any firm or individual that distributes or transports feeds or feed ingredients intended for animals. Haulers are included in this definition. Haulers who haul both prohibited material and non-prohibited material, including blended animal protein products, are subject to the separation or clean-out procedures described below. Haulers of complete and intermediate feeds are “distributors”.

The FDA suggests that for all equipment, including that used for storage, processing, mixing, conveying, and distribution that comes in contact with feeds containing prohibited material and non-prohibited protein, reasonable and effective procedures to prevent contamination of manufactured feed be followed. The steps used to prevent contamination of feeds often include one or more of the following, or other equally effective procedures: 1) Physical means (vacuuming, sweeping, or flushing and/or sequential production of feeds); 2) if flushing is utilized, the FDA recommends that the flush material be properly identified, stored, and used in a manner to prevent contamination of other feeds. The volume of flushed material should be sufficient to equal the operating volume of the shared equipment; 3) if sequential production is utilized, the FDA recommends that it be on a predetermined basis designed to prevent unsafe contamination of ruminant feeds. An example of appropriate sequencing would be swine feed containing prohibited material, followed by a swine or poultry feed not using prohibited material, followed by a ruminant feed containing non-prohibited material.

If you have any questions regarding the ruminant ban or concerns thereof, please contact the National BQA Program at 303-694-0305

A Study of Injection-Site Lesions

The data presented in the following tables were abstracted by Dee Griffin from figures in the "Report to the National Cattlemen's Beef Association." The numbers in two of the tables were estimates from charts and may not accurately represent the raw data.

Incidence, Severity, Amount of Tissue Affected and Effects on Histology, Chemistry and Tenderness of Injection-Site Lesions in Beef Calves Administered a Control Compound or One of Seven Chemical Compounds.

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Department of Animal Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80523-1171.

Abstract

Heifer calves (n=20) were used to investigate the incidence, severity, histological ramifications and tenderness effects of injections-site lesions produced by the intramuscular (IM) administration of a control compound (sterile saline) or one of seven biological and pharmaceutical compounds. The compounds examined were representatives of: (1) a saline preparation, (2) a modified-live virus vaccine, (3) a combination virus vaccine, (4) a clostridial bacterin, (5) a vitamin ADE mixture, (6) an aqueous antibiotic, (7) a macrolide antibiotic, and (8) a long-acting oxytetracycline antibiotic. Each weaning-age calf randomly received IM injections of two of the eight compounds, one in the left top sirloin butt (biceps femoris and gluteus medius) and one in the left outside round (biceps femoris). Most compounds administered caused, 178 days later, an unacceptably high lesion incidence in the top sirloin butt and outside round. Subprimals containing visible lesions had higher ($P<.001$) mean shear force values and greater tenderness variation than contralateral non-injected control subprimals. However, even when injected subprimals showed no visible lesion they had higher ($P<.001$) mean shear force values and greater ($P<.01$) tenderness variation than their contralateral control subprimals. The volume of toughened ($P<.05$) tissue (both grossly lesioned and non-grossly lesioned) as compared to "no" toughened tissue in their contralateral control subprimals, when sterile saline, a modified-live virus vaccine, a combination virus vaccine, a clostridial bacterin, a vitamin ADE mixture, an aqueous antibiotic, a macrolide antibiotic, and a long-acting oxytetracycline antibiotic, individually, was administered into outside round was 44.8, 51.8, 42.4, 54.2, 37.7, 44.8, 49.5, and 63.6 cubic inches, respectively, and 18.9, 18.8, 28.3, 42.4, 37.7, 35.4, 35.4, and 49.5 cubic inches, when these same compounds, respectively, were administered into the top sirloin butt. The IM administration of all compounds (including sterile saline) caused unacceptable tissue consequences. IM injections must be eliminated.

Number and Incidence of Injection-site Lesions Associated with Injecting Identified Products IM into the Top Butt and Outside Round of Calves at Weaning.

Product	TOP SIRLOIN BUTT		OUTSIDE ROUND		
	Number ^a	Incidence(%)	Number ^a	Incidence (%)	Average
Saline	2/14	14.3 ^{e*}	4/13	30.8 ^{e*}	22.2 ^e
Bovishield4	1/13	7.7 ^{e*}	3/13	23.1 ^{e*}	15.4 ^{ef}
Vira Shield5	9/12	75.0 ^{d*}	6/12	50.0 ^{d*}	62.5 ^d
Clost. 7-way	12/13	92.3 ^{c*}	11/11	100.0 ^{b*}	95.8 ^d
Vital E-A+D	8/13	61.5 ^d	9/13	69.2 ^c	65.4 ^d
Naxcel	1/14	7.1 ^e	1/14	7.1 ^f	7.1 ^f
Tylosin Inj	11/11	100.0 ^{b*}	10/14	71.4 ^{c*}	84.0 ^c
LA-200	14/14	100.0 ^{b*}	11/11	100.0 ^b	100.0 ^b
Total	58/104	55.8	55/101	54.5	55.1

^a Number of grossly visible lesions identified vs the total number of injections administered of a particular product in those subprimal cuts.

* Means within a row differ ($P<.01$)

^{bcd} Means within a column with different superscript letter differ ($P<.01$)

Number of Lesions in each Lesion-classification Category Stratified by Subprimal Injected and Product Administered.

Product	Lesion Classification									
	Woody Callous ^a		Clear Scar ^b		Mineralized Scar ^c		Scar with Nodules ^d		Scar with Fluid ^e	
	Butt	Round	Butt	Round	Butt	Round	Butt	Round	Butt	Round
Saline	1	1	1	2	--	--	--	1	--	--
Bovishield4	1	1	--	2	--	--	--	--	--	--
Vira Shield5	1	1	7	4	--	--	1	1	--	--
Clost. 7-way	7	5	5	3	--	--	--	2	--	1
Vital E-A+D	6	6	2	1	--	--	--	2	--	--
Naxcel	--	--	1	1	--	--	--	--	--	--
Tylosin Inj	8	6	3	2	--	--	--	2	--	--
LA-200	6	9	7	2	--	--	1	--	--	--
Total	30	29	26	17	--	--	2	8	--	1

- ^a Older lesions which are characterized by the injection-site lesion being replaced by organized connective tissue and fat.
- ^b Older lesion, predominantly white fibrous scar tissue.
- ^c Scar containing mineralized remnants of muscle cells.
- ^d Lesions containing a central area of necrosis, surrounded by granulomatous inflammation.
- ^e Lesion containing fluid material.

Shear Force: Top Butt & Outside Round (Non-Injected & Injected)

Non Injected	Top Butt		Product	Outside Round		Non Injected
	Injected	Tenderness Loss		Tenderness Loss	Injected	
7.88	8.53	0.65	Saline	2.25	9.53	7.28
7.66	8.73	1.07	Bovishield4	1.50	8.98	7.48
7.24	8.40	1.16	Vira Shield5	1.60	9.94	8.34
7.33	9.15	1.82	Clost. 7-way	3.39	10.41	7.02
7.72	8.64	0.92	Vital E-A+D	2.02	9.79	7.77
7.06	8.38	1.32	Naxcel	2.46	10.34	7.88
7.50	8.10	0.60	Tylosin Inj	2.05	9.71	7.66
6.97	8.91	1.94	LA-200	2.44	10.32	7.88
7.42	8.60	1.18	Average	2.21	9.88	7.72

The shear force (lbs) was not different between visible & non-visible lesions.

Changes In Shear Force (lbs) Measured Inches From Injection Site Top Butt and Outside Round (Non-Injected and Injected) *

Top Butt				Product	Outside Round			
Three inches from injection	Two inches from injection	One Inch from injection	At injection site		At injection site	One Inch from injection	Two inches from injection	Three inches from injection
8.3	8.6	8.9	9.3	Saline	11.2	10.0	9.5	8.8
8.1	8.5	9.2	9.5	Bovishield4	10.4	9.5	8.6	8.0
8.4	8.6	8.8	9.5	Vira Shield5	11.2	10.5	9.9	9.2
9.4	8.5	9.3	10.0	Clost. 7-way	12.1	10.7	10.0	9.1
8.6	8.4	8.5	9.5	Vital E-A+D	11.2	10.7	10.1	9.2
8.4	8.2	8.4	8.4	Naxcel	10.1	9.9	9.8	9.4
7.5	7.9	8.3	8.7	Tylosin Inj	11.4	10.1	9.5	8.9
8.5	8.8	9.3	9.7	LA-200	13.2	11.5	10.2	8.8
8.39	8.44	8.84	9.33	Average	11.35	10.36	9.70	8.93
7.4	7.4	7.4	7.4	Control	7.3	7.3	7.3	7.3

*Estimated from figure 5, p23 and figure 10, page 29 of the report to NCBA. Shear force values over 9.5 lbs are considered tough.

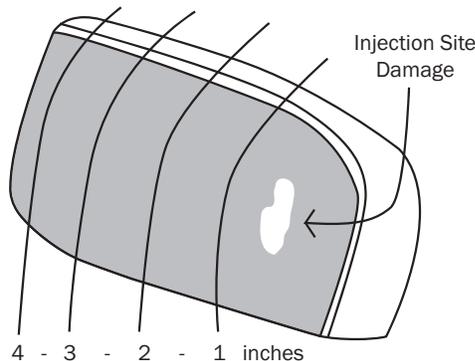
Average Volume of Tissue Toughened By IM Injections In The Top Butt and Outside Round

Top Butt	Product	Outside Round
18.9	Saline	44.8
18.9	Bovishield4	51.8
28.3	Vira Shield5	42.4
42.4	Clost. 7-way	54.2
37.7	Vital E-A+D	37.7
35.4	Naxcel	44.8
35.4	Tylosin Inj	49.5
49.5	LA-200	63.6
33.3	Average	48.6
Cubic Inches		Cubic Inches

There is approximately 40 cubic inches in a softball.

The shear force was not different between visible and non-visible lesions.

Injection Site Damage Effects On Tenderness



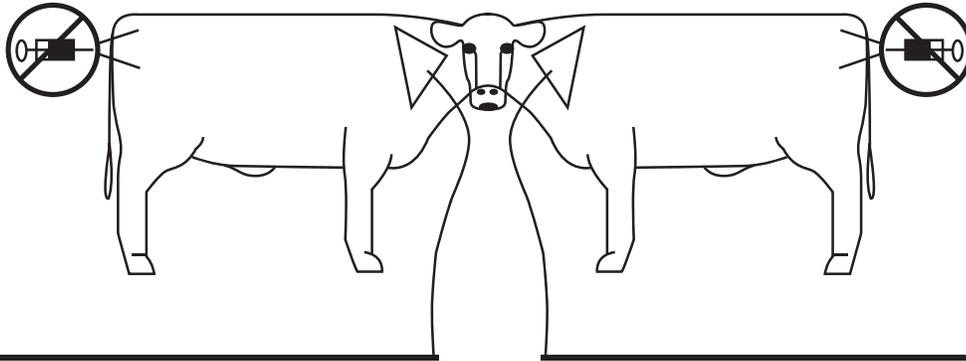
(Damage is in all directions from the site.)

Cattle Health Record

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, | H.somnus, | Brucella, |
| Internal Parasites, | Coccidiostat, | External Parasites, | Implants, | Antibiotics, |
| Creep/Bunk Broke, | Micro-Nutrients, | 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.

Procedure / Procedure #	Lot or Serial #	Company	Date Given	Date Withdrawal	Route Admin	Dose	Booster N/Y-when	Crew Initials
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								

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: _____

Processing Map

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

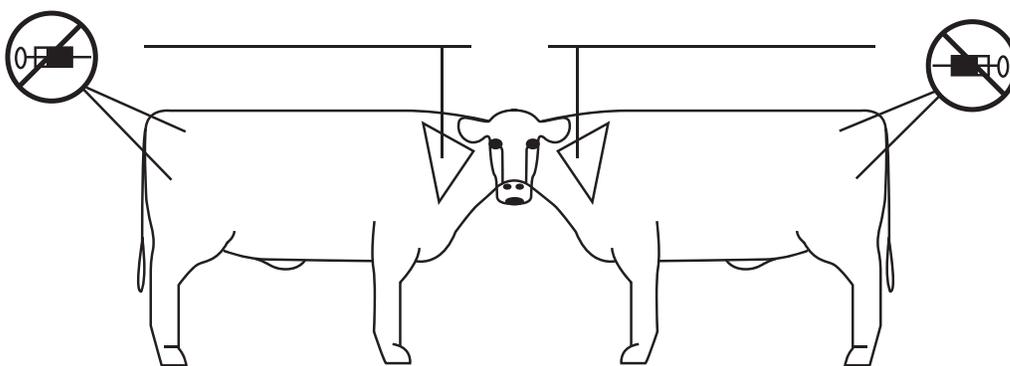
Date: _____ **Time:** _____ **Air Temperature:** _____

In Weight (Average/Variation): _____ / _____ **Breed:** _____

Frame: S, M, ML, L Muscle: 1, 2, 3 Sex: S, H, B

ID: Right Ear or Left Ear/Group color and number: _____ / Individual: _____

List "Treatment" Number on line connecting Injection Triangle & indicate ear implanted.



Identify Brand and Indicate Location

Implant: R/L _____ Serial #: _____ Crew: _____

External Parasite control _____ Dose: ____ Serial #: _____ Crew: _____ withdrawal: _____

Internal Parasite control _____ Dose: ____ Serial #: _____ Crew: _____ withdrawal: _____

R1: _____ Dose: ____ Serial #: _____ Crew: _____ withdrawal: _____

L1: _____ Dose: ____ Serial #: _____ Crew: _____ withdrawal: _____

R2: _____ Dose: ____ Serial #: _____ Crew: _____ withdrawal: _____

L2: _____ Dose: ____ Serial #: _____ Crew: _____ withdrawal: _____

Comments: _____

Signature: _____



BQA Shipping / Transfer Release Record

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.

Head	Group / Pens / Lot	Individual animal numbers
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Date: _____ Signature: _____

Manager and/or Owner _____

Name of Operation _____

Phone (Day and Evening) _____

Address _____

City/State/Zip _____

BQA Supplier Agreement:

Supplier: _____

Address: _____

City/State/Zip: _____

Phone: _____

As a professional supplier of products and services to the beef industry I will personally or through my agents assist the beef producer, their veterinarian, their nutritionist, and their other consulting professionals maintain quality control over the products and services we provide. This will include assisting the beef producer select products that fit the BQA guidelines, record all serial / lot numbers for the products delivered, and assist in the development of a MSDS / product insert file. Services will also include advice on the proper inventory control, storage, special handling, precautions, use, and disposal of used containers and supplies.

Signed: _____ Date _____

SECTION IX

SUMMARY AND REVIEW

BQA Guidelines

Hazard Analysis Critical Control Point-like System

Feedstuffs and Sources

- Record chemical use
- QC feed ingredients

Feed Additives and Medications

- NO Extra-Label Drug Use – Administer FDA medicated feed additives according to label and withdrawal directions
- Record medicated rations, three years
- Feed no ruminant derived protein sources

Individual Treatments

- FDA/USDA/EPA guidelines for product selection and use
- Subcutaneous if possible
- Administer all products in front of the shoulders
- Avoid tissue damaging products, 10 cc or less per intramuscular injection site

Treatment and Product Use Records

- Treatment regimes: label directions unless prescribed by a veterinarian
- Follow Extra-Label Drug Use withdrawal as set by veterinarian (valid Veterinarian/Client/Patient relationship)
- Group or Mass Treatments – Record date, person administering, animal identification, medication, dosage, location/method of administration and withdrawal
- Individual Treatments – Record date, person administering, animal identification, medication, dosage, location/method of administration and withdrawal
- Check withdrawal of all cattle shipped and sign release
- Closely check non-performing cattle (i.e. medicated market cows/bulls, etc.) prior to shipment

Recordkeeping

- All BQA records are subject to inspection by BQA program staff and/or USDA/FSIS upon request
- A signed copy of the BQA records are forwarded
- Backward information flow available

Cattle Care and Husbandry

- Keep equipment clean
- Strive to maintain the environment
- Evaluate biosecurity

Summary of BQA

Purpose:

Protect Consumer Confidence in Beef Quality and Safety

History:

The BQA program is designed for our industry, and all cattlemen ... the cattlemen are in charge! The BQA program began in 1980 and has grown to include 47 states. The development and coordination of the revitalization program has been through the Beef Council, the BQA Advisory Committee, the various veterinary medical associations and Cooperative Extension. Other states have started revitalization programs similar to the BQA program.

BQA:

The BQA program follows the guidelines set forth by the National BQA program. Two additional requirements are added to the BQA program: No extra label use of aminoglycosides or related compounds can be used as injectable medications regardless of animal's age. The BQA program stipulates **NO INJECTIONS BEHIND THE SLOPE OF THE SHOULDER REGARDLESS OF ANIMALS AGE AND NEVER GIVE MORE THAN 10 CC PER INTRAMUSCULAR (IM) SITE.** These guidelines are specific to the BQA program.

Program Objective:

Provide education, training, verification and documentation for all beef producers. The program is needed to follow FDA, EPA and USDA-FSIS standards (FOLLOW THE RULES), as well as BQA requirements. BQA incorporates into management objectives and into a producer's job, allowing a quality and responsible attitude to grow. Preventing small mistakes improves production efficiency.

What BQA is NOT:

Presently, it is not possible for BQA to be a food borne pathogen reduction program.

The BQA utilizes Hazard Analysis Critical Control Point System. The program will allow our industry to work with HACCP-like procedures until it can be applied at the production level. Texas Cattle Feeders Association started a HACCP-like feedyard program in October 1997. They identified broken needles (physical hazards) and residues (chemical hazards) as the two controllable hazards in cattle. They were unable to identify methods of controlling bacterial hazards in cattle pre-harvest.

"Build on what you know" ... has been and continues to be the operative phrase:

While BQA is not a HACCP program, the HACCP system is a good resource/reference for the BQA program. Cattlemen, Employees, Veterinarians, Nutritionists, other Specialists must look for what could go wrong, then figure out ways to avoid having things go wrong --- Build practices that allow checking and verifying, document you are accomplishing what you intended to do. *Design all everyday working techniques to avoid having anything go wrong.*

HACCP-like Programs: Five Preliminary Steps

- Assemble the HACCP-like planning team – bring together your HACCP resources
- Describe what you raise and how you distributed it
- Identify who gets your cattle and how they use them
- Develop and verify a process flow diagram
- Meet the requirements for BMP and SOP, including sanitation SOP

Seven Specific HACCP-like Program Steps

- Identify potential hazards: Biological, Chemical, and Physical (B-C-P)
- Identify critical control points (CCPs)
- Establish Critical Limits for each CCP
- Establish CCP monitor procedure
- Establish Corrective Actions
- Establish verification procedures
- Establish recordkeeping procedures

=====

Who says we can't ... WE HAVE. When BQA started in the early 80's, chemical residues were approximately 1% – they dropped to ZERO in fed cattle for over a decade ⇒ Top Butt Injection Site Lesions were identified in 1991 as a target and in just 6 years, 22% ⇒ 6%. Other targeted defects and production losses as a result of the defects include Hide= \$25, Bruises= \$4, Dark Cutters= \$6, Injection Site Damage= \$7. All are manageable defects!

Remember the BQA Basics

- Recruit your BQA team: Employees, Family, Affiliate, Specialists, Experts
- Take a look at what could go wrong.
- What will be done when something goes wrong.
- How are problems avoided.
- Validate your plan.
- Train and Educate ← Re-train and Re-educate.
- Develop a timed checklist – then use it.
- Document and double check.

IT IS SIMPLE ECONOMICS ... WE SELL PERFORMANCE ... Animal performance can be optimized only if the people managing the animal respect the ANIMAL, THEMSELVES, and the PEOPLE THEY WORK WITH. Following Best Management Practices (BMPs) improves efficiency.

Consumers buy what they trust: Confidence comes from trust ... a trust we have earned. There are few of us left and consumers don't know us as they once did. Changes in demographics, government, media, etc. are making it even tougher and the standards required of us may seem impossible. But this is the life, the job we were entrusted with.

Beef Quality Assurance: It is up to you . . . It will and it has to fit management objectives. Cattle are never to YOUNG or OLD to have a quality defect.

There are NO Most Valuable Players ⇒ BQA is Everyone's Job.

Where do we go from here? Get involved! Get everyone involved.

BQA ⇒ Our Business ⇒ Our Future

Glossary

(Revised 9/08)

abomasum Fourth stomach compartment of cattle that corresponds to the true stomach of monogastric animals.

abortion Delivery of fetus between time of conception and normal parturition.

abscess Localized collection of pus in a cavity formed by disintegration of tissues.

accrual method of accounting Accounting method whereby revenue and expenses are recorded when they are earned or incurred regardless of when the cash is received or paid.

accuracy or ACC (of selection) Confidence that can be placed in the EPD (expected progeny difference); for example, high (0.70 and above), medium (0.40-0.69), and low (below 0.40).

acetonemia See ketosis.

acidosis A high-acid condition in the rumen (pH 5.3-5.7) caused by rapid consumption or overconsumption of readily fermentable feed; may cause digestive disturbance and/or death.

ADG See average daily gain.

adjusted weaning weight Weaning weight of a calf is adjusted to a standard age (205 days) and age of dam (5-9 years of age).

adjusted yearling weight Yearling weight of a calf is adjusted to a standard age (365 days) by adding (160 times average daily post-weaning gain) to the adjusted 205-day weight (see also adjusted weaning weight).

ad lib See *ad libitum*.

ad libitum (ad lib) Free choice; allowing cattle access to all they want. Typically refers to feed and water. (e.g. fed ad lib)

afterbirth Fetal membranes that are expelled after parturition. See also placenta.

AHIR See Angus herd improvement records

AI See artificial insemination.

AI certificate A certificate issued by some breed associations that must be submitted before AI calves can be registered.

alliance An organization in the beef industry (horizontal or vertical) designed to improve profitability by improving coordination of beef production, processing, and/or merchandising.

American Meat Institute (AMI) Association of meat-packing and processing companies.

American National Cattlewomen (ANCW) Organization of women involved in the promotion of beef through education and consumer relations programs.

AMI See American Meat Institute.

amnion Fluid-filled membrane located next to the fetus.

ANCW See American National Cattlewomen.

anestrous Period of time when the female is not in estrus; the nonbreeding season.

Angus Herd Improvement Records (AHIR) Performance records program administered by the American Angus Association.

animal unit (AU) A generalized unit for describing stocking density, stocking rate and carry capacity. Usually accepted to be a 1,000-lb cow with calf or 1.4 yearling cattle.

annual cow cost Cost (dollars) to keep a cow for a year. Includes the value of: the amount of harvested forage fed, the number of pasture days, operating costs, fixed costs, hours of labor, herd size, percent calf crop, and weaning weight.

animal unit month (AUM) Amount of feed or forage required to maintain one animal unit (see also animal unit) for one month.

ante mortem Before death.

anthelmintic or antihelminthic Drug or chemical agent used to kill or remove internal parasitic worms (helminths).

antibiotic Product produced by living organisms such as yeast that destroys or inhibits the growth of other organisms, especially bacteria.

antibody Specific protein molecule that is produced in response to a foreign protein (antigen) that has been introduced into the body.

antigen Foreign substance that, when introduced into the blood or tissues, causes the formation of antibodies. Antigens may be a toxin or other foreign substance or may be produced within the organism such as a native protein.

appreciation Increase in the value of a capital asset (e.g., land) due to external influences such as inflation.

arteriosclerosis Disease resulting in the thickening and hardening of the artery walls.

artificial insemination (AI) Placing semen into the female reproductive tract (usually the cervix or uterus) by means other than natural service.

artificial vagina Device used to collect semen from a male while he mounts in a normal manner to copulate. The bull ejaculates into this device, which simulates the vagina of the female in pressure, temperature, and sensation to the penis.

as fed Feeding of feeds that contain their normal amount of moisture.

assets Items of value owned by a beef business or producer.

atherosclerosis Form of arteriosclerosis involving fatty deposits in the inner walls of the arteries. See also arteriosclerosis.

atrophy Shrinking or wasting away of tissue.

auction Market for cattle through which an auctioneer sells cattle to the highest bidder.

AUM See animal unit month.

autopsy Post-mortem examination in which the body is dissected to determine cause of death. See also necropsy.

average daily gain Pounds of liveweight gained per day averaged over a period of time. e.g. Total pounds gained in gain period ÷ days in gain period = average daily gain.

backcross Mating of a two-breed crossbred offspring back to one of its parental breeds.

backfat Amount (thickness) of fat over the animal's back, usually measured at the twelfth to thirteenth rib.

backgrounding Growing program, typically grazing or feeding harvested feed, for feeder cattle from time calves are weaned until they are on a finishing ration in the feedlot.

balance sheet Financial statement that summarizes assets, liabilities, and net worth at a specific point in time. See also net worth statement.

balling gun Instrument inserted into the animal's throat to discharge pills.

Bang's disease See *brucellosis*.

barren Incapable of producing offspring.

basis Difference between the cash market price and the futures market price.

BCS See body condition score.

BCTRC Boneless, closely trimmed retail cuts from round, loin, rib, and chuck.

beef Meat from cattle (bovine species) other than calves. Meat from a calf is called veal.

beefalo Hybrid animal (potentially fertile) resulting from a cross between domestic cattle and bison resulting in 5/8 *Bos taurus* and 3/8 *Bison bison* genetics. See also cattalo.

beef belt Area of the United States where commercial beef production, harvesting (slaughtering), and processing are concentrated.

Beef Breeds Council National organization of beef breed associations.

Beef Checkoff program Beef Promotion and Research Act established in October 1986. Each time cattle are marketed, \$1 per head is paid by the seller to the Beef Industry Council (BIC). Money is used in promotion, research, and education. Generates approximately \$70 million per year.

Beef Improvement Federation (BIF) A federation of organizations, businesses, and individuals interested or involved in performance evaluation of beef cattle.

Beef promotion and research program See Beef Checkoff program.

Beef Quality Assurance (BQA) Program(s) designed to help beef producers implement good management and production methods which help prevent defects in beef products.

BIF See Beef Improvement Federation.

bioeconomic trait Any biological trait of economic importance.

biological efficiency Ratio of physical input to physical output (e.g., pounds of feed per 100 lb. of gain).

biological type Usually refers to size of cattle (large, medium, or small), growth rate, milk production (high, medium, or low), and age at puberty.

biotechnology Use of microorganisms, plant cells, and animal cells or parts of cells (such as enzymes) to produce industrially-important products or processes.

birth weight (BW or B.Wt.) Weight of a calf taken within 24 hours after birth.

birth weight EPD The expected average change (increase or decrease) in birth weight (lb) of a bull's calves when compared to other bulls in the same sire summary. A plus figure indicates an increase in birth weight, while a negative value is a decrease. The value is a measure of calving ease. See also expected progeny difference (EPD).

birth weight ratio Compares the individual birth weight of a calf to the herd average. Usually calculated within gender.

loat Abnormal condition characterized by a distention of the rumen, usually seen on the left side, due to an accumulation of gases.

bloom Haircoat usually has a luster (shine) that gives the appearance of a healthy animal.

BLUP Best linear unbiased prediction method for estimating the breeding values of breeding animals.

body condition score (BCS) A visual score (usually 1 = thin; 9 = very fat) for body fatness. BCS is typically related to postpartum interval in beef females and other factors such as feeding regime.

bolus (1) Regurgitated food. (2) Large pill for treating cattle.

Bos indicus Zebu (humped) cattle, including the Brahman breed in the United States.

Bos taurus Includes most cattle found in the United States and their European ancestors.

bovine Refers to a general family grouping of cattle.

bovine spongiform encephalopathy (BSE) A degenerative disease that affects the central nervous system of cattle.

bovine viral diarrhea (BVD) Viral disease in cattle that can cause diarrhea, lesions of the digestive tract, and repeated breeding, abortion, mummification, and congenital defects.

boxed beef Cuts of beef put in boxes for shipping from packing plant to retailers. These primal (rounds, loins, ribs, and chucks) and subprimal cuts are intermediate cuts between the carcass and retail cuts.

BQA See Beef Quality Assurance.

brand (1) Permanent identification of cattle, usually made on the hide with hot-iron or freeze branding. (2) Process of branding.

branded beef product A specifically labeled product that is differentiated from commodity items by its brand name. e.g. Certified Angus Beef, Laura's Lean, or Cattleman's Collection.

breakeven price Volume of output or price received/unit that is required for revenue to equal the total of fixed and variable expenses.

breaking Cutting carcasses into primal and subprimal cuts.

bred Female has been mated to a bull, usually assumed to be pregnant.

breech A breech presentation at birth occurs when the rear portion of the fetus is presented first, either feet or buttocks first.

breed Cattle of common origin and having characteristics that distinguish them from other groups within the same species.

breed complementarity Combining breeds to take advantage of breed superiority for specific traits.

breeder In most beef breed associations, the owner of the dam of a calf at the time the dam was mated or bred to produce that calf.

breeding soundness examination (BSE) Evaluation of the reproductive potential of the bull giving the reproductive trait; a physical examination, measuring involves scrotal circumference, and evaluating a semen sample for motility and morphology.

breeding value Value of an animal as a parent. The working definition is twice the difference in performance between a very large number of progeny and the population average when individuals are mated at random within the population and all progeny are managed alike. The difference is doubled because only a sample half (one gene of each pair) is transmitted from a parent to each progeny.

brisket disease Noninfectious disease of cattle characterized by congestive right heart failure. It affects animals residing at high altitudes (usually above 7,000 ft). Sometimes referred to as “high mountain disease” or “high altitude disease.”

British breeds Cattle breeds originating in Great Britain. e.g. Angus, Hereford, and Shorthorn.

brockle-faced White-faced with other colors splotched on the face and head.

broken mouth Some teeth are missing or broken.

broker Individual or firm that buys and sells options, futures contracts, and stocks and bonds for a commission fee.

browse (1) Woody or brushy plants (e.g., sagebrush, shadscale, and other shrubs and bushes). (2) Cattle feeding on the tender shoots or twigs of woody or brushy plants.

brucellosis Contagious bacterial disease that results in abortions. See also Bang’s disease.

BSE See breeding soundness examination or bovine spongiform encephalopathy.

budget (1) Financial form prepared in advance and used as a guide to help manage financial aspects of a beef operation. (2) Financial form used to examine alternative plans for a beef operation and to estimate the profitability of each alternative.

bull Bovine male. The term usually denotes animals of breeding age.

buller-steer syndrome Behavior problem in which a steer is sexually attracted to other steers in the pen. The buller steer is ridden by other steers, resulting in poor performance and potential for injury.

bulling Term describing a cow or heifer in estrus being mounted by her peers.

bullock Young bull, typically less than 20 months of age.

butt-branded Hides from cattle that are hot-iron branded on the hip.

buttons (1) Cartilage on dorsal processes of the thoracic vertebrae. See also cotyledon. (2) Horn buttons (or buds) are the origination of a calf’s horns.

BVD See bovine viral diarrhea.

bypass protein Feed protein that escapes microbial degradation in the rumen (bypasses the rumen) and is digested in the small intestine.

by-product or co-product Product of less value than the major product. For example, the hide and offal are by-products while beef is the major product.

C-section See caesarean section.

Caesarean section Delivery of fetus through the opening created by incisions through the abdominal and uterine walls.

calf Young male or female bovine animal under 1 year of age.

calf crop See percent calf crop.

calorie Amount of heat required to raise the temperature of 1 g of water 1°C at Standard Temperature and Pressure.

calve Giving birth to a calf. See also parturition.

calving difficulty Abnormal or difficult labor, causing difficulty in delivering the calf. See also dystocia.

calving interval Time (days or months) between the birth of a calf and the birth of a subsequent calf, both from the same cow.

calving season Season(s) of the year when calves are born.

cancer eye Cancerous growth on the eyeball or eyelid.

carcass evaluation Techniques for measuring components of meat quality and quantity in carcasses.

carcass merit Value of a carcass for consumption.

carotene Orange pigment found in leafy plants (e.g., alfalfa), yellow corn, and other feeds that can be broken down to form two molecules of vitamin A.

carrier Heterozygous individual having one recessive gene and one dominant gene for a given pair of genes (alleles).

carrying capacity (1) The maximum stocking rate that will achieve a target level of animal performance on a particular grazing unit under a specified grazing method. (2) The potential number of animals or liveweight that may be supported on a unit area for a grazing season based on forage potential.

case-ready Beef cuts received by the retailer that do not require further processing before they are put in the retail case for sale.

cash flow Cash receipts and cash expenses.

cash-flow budget Detailed estimate of the projected cash receipts and expenses over a future period of time used to evaluate the financial feasibility of a plan.

cash-flow statement Financial statement summarizing all cash receipts and disbursements over a period of time (usually monthly for a year).

cash market price Price that results when cattle are marketed.

cash method of accounting An accounting method by which revenue and expenses are recorded when the cash is received or paid out.

castrate (1) To remove the testicles. (2) An animal that has had its testicles removed.

cattalo Animal resulting from a cross between domestic cattle and bison, male offspring are typically sterile. e.g. *Bos taurus* x *Bison bison*. See also beefalo.

Cattle-Fax Not-for-profit marketing organization governed by cattle producers. Market analysis and information is provided to members by a staff of market analysts.

Cattlemen's Beef Board (CBB) Responsible for the management of the Beef Checkoff program, oversees the collection of \$1 per head on sales of domestic cattle as well as the equivalent on imported cattle, beef, and beef products.

CBB See Cattlemen's Beef Board.

central test Location where animals are assembled from several herds to evaluate differences in certain performance traits under uniform management conditions. Usually involves breeding bulls, though some slaughter steer and heifer tests exist.

Certified Angus Beef Branded-beef product supplied by Angus or Angus-crossbred cattle that meets certain carcass specifications.

cervix Portion of the female reproductive tract between the vagina and the uterus. It is usually sealed by thick mucus except when the female is in estrus or delivering offspring.

checkoff See Beef Checkoff program.

chorion Outermost layer of fetal membranes.

chromosome Rodlike or stringlike body found in the nucleus of the cell that is darkly stained by chrome dyes. The chromosome contains the genes.

chronic Regular appearance of a symptom or situation.

chuck Wholesale cut (shoulder) of the beef carcass.

class Group of cattle determined primarily by sex and age (e.g., market class or show-ring class).

clitoris A highly-sensitive organ, part of the female genitalia, located inside the ventral part of the vulva. It is homologous to the male penis.

clone Genetically-identical organisms produced by nucleus substitution or embryo division.

closed herd Herd in which no outside breeding stock (cattle) are introduced.

cod Scrotal area of steer remaining after castration.

cold shortening Sarcomeres as part of the muscle fiber, shorten too rapidly during the chilling of the carcass, thus decreasing meat tenderness.

collagen Primary protein in connective tissue. Collagen envelops individual muscle fibers and attaches muscles to bones.

collateral relatives Relatives of an individual that are not its ancestors or descendants. Brothers and sisters are examples of collateral relatives.

colon Large intestine from the end of the ileum (lowest portion of small intestine) beginning with the cecum all the way to the anus.

Colorado-branded Hides from cattle hot-iron branded on the ribs.

colostrum First milk produced by a female following delivery of a calf. It is rich in antibodies that helps protect the newborn calf from disease-causing microorganisms.

compensatory gain Faster-than-normal rate of gain following a period of restricted gain.

compensatory growth See compensatory gain.

complementarity Using breed differences to achieve a more optimum additive and non-additive breed composition for production and carcass traits of economic value.

composite breed Breed that has been formed by crossing two or more breeds.

composition Usually refers to the carcass composition of fat, lean, and bone.

Compudose® Growth implant containing estradiol and progesterone.

computer Electronic machine which by means of stored instructions and information performs rapid, often complex, calculations or compiles, correlates, and selects data.

concentrate Feed that is high in energy content low in fiber content, and highly digestible.

conception Fertilization of the ovum (egg).

conditioning Treatment of cattle by vaccination and other means prior to putting them in the feedlot.

conformation Physical form of an animal; its shape and arrangement of parts.

congenital Acquired during prenatal life. Condition exists at birth. Often used in the context of congenital (birth) defects.

contemporaries Group of animals of the same sex and breed (or similar breeding) that have been raised under similar environmental conditions (same management group).

continental breed See European breed.

continuous grazing A method of grazing where animals have unrestricted access to an entire grazing unit throughout a large portion or all of a grazing season.

controlled grazing Grazing management designed to improve utilization of forage either by 1) allocating pasture in subunits with grazing periods typically less than 5 days or 2) varying stocking rate to match forage growth rate and availability (put-and-take stocking).

cooler A room in harvest (packing) plant where carcasses are chilled after harvest (slaughter) and prior to processing.

co-product or by-product Product of less value than the major product. For example, the hide and offal are co-products while beef is the major product.

corpus luteum Yellowish body in the ovary. The cells that were follicular cells develop into the corpus luteum, which secretes progesterone. It becomes yellow in color from the yellow lipids that are in the cells.

correlation coefficient Measure of how two traits vary together. A correlation of +1.00 means that two traits will move in the same direction (either increase or decrease). A correlation of -1.00 means that as one trait increases the other decreases—a perfect negative, or inverse, relationship. A correlation of 0.00 means that as one trait increases, the other may increase or decrease—no consistent relationship. Correlation coefficients may vary between +1.00 and -1.00.

cost of gain Total of all costs divided by the total pounds gained; usually expressed on a per-pound basis.

cotyledon Area where the placenta and the uterine lining are in close association such that nutrients can pass to and wastes can pass from the circulation of the developing young. See also button.

cow Sexually mature female bovine animal that has birthed at least one calf.

cow-calf operation Management unit that maintains a breeding herd and produces weaned calves.

cow hocked Condition in which the hocks are close together but the feet stand apart.

creep Enclosure where calves can enter to obtain feed but cows cannot enter. This process is called creep feeding.

creep feeding See creep.

creep grazing The practice of allowing calves to graze areas that cows cannot access.

crest Bulging, top part of the neck on a bull.

crossbred Animal produced by crossing two or more breeds.

crossbreeding Mating animals from different breeds. Utilized to take advantage of hybrid vigor (heterosis) and breed complementarity.

cryptorchidism Retention of one or both testicles in the abdominal cavity.

cud Bolus of feed that cattle regurgitate for further chewing.

cull (1) To eliminate one or more animals from the breeding herd. (2) An animal eliminated, either voluntarily or involuntarily, from the breeding herd.

currentness Marketing term indicating how feedlots market fed cattle. If current, then feedlots market cattle on schedule. If feedlots are not current, then a backlog of cattle usually results—these cattle typically have higher slaughter weights, poorer yield grades, and usually lower prices.

custom feeding Cattle feeders who provide facilities, labor, feed, and care as a service but they do not own the cattle.

cutability Fat, lean, and bone composition of the beef carcass. Used interchangeably with yield grade. See also yield grades.

cutting chute Narrow chute, where cattle go through in single file, with gates such that selected animals can be diverted into pens alongside the chute; also referred to as a sorting chute.

cwt Abbreviation for hundredweight (100 lb).

cycling Infers that nonpregnant females are having an estrous cycle or “cycling”.

dam Female parent.

dark cutter Color of the lean (muscle) in the carcass has a dark appearance, usually caused by stress (excitement) to the animal prior to harvest (slaughter).

deflation General decrease in prices that increases the purchasing power of a dollar.

dehorn To remove the horns (or horn bud/buttons) of an animal.

deoxyribonucleic acid (DNA) Molecule that comprises the genetic material of animals. Genes are units of DNA. See also gene.

depreciation Decrease in the value of an asset due to age, use, and obsolescence; the prorated expense of owning an asset.

dewclaws Hard, horny structures above the hoof on the rear surface of the legs of cattle.

dewlap Loose skin under the chin and neck of cattle.

digestibility Quality of being digestible. If a high percentage of a given feed taken into the digestive tract is absorbed into the body, that feed is said to have high digestibility.

direct selling Selling cattle from one ranch to another, from ranch to feedlot, or from feedlot to packer without an intermediate party.

disease Any deviation from the normal state of health.

DM See dry matter.

DNA See deoxyribonucleic acid.

DNA markers Areas of the genome at which differences in the DNA sequence can be visually detected. A marker locus by itself may not have a direct effect on a phenotypic trait, but it may be located close to a gene that does directly affect a trait. Markers can serve as location reference points for gene mapping and marker-assisted selection.

DNA probe A method to determine an animal's genotype for a particular gene or marker.

dominance One (dominant) allele masks the effect of another (recessive) allele.

double-entry accounting System of bookkeeping in which every transaction is recorded as a debit in one or more accounts and as a credit in one or more accounts such that the total of the debit entries equals the total of the credit entries.

double-muscling A simple recessive trait evidenced by an enlargement of the muscles with large grooves between the muscle systems, especially noticeable in the hind leg.

drench To give fluid by mouth.

dressed beef Carcasses from cattle.

dressing percentage Percentage of the live animal weight that becomes the carcass weight at harvest (slaughter). It is determined by dividing the carcass weight by the liveweight and multiplying by 100. Also referred to as yield.

drop Body parts removed at harvest (slaughter), primarily the hide, head, shanks, and offal.

drop credit Value of the drop.

dropped Being born (e.g., “the calf is dropped”).

dry (cow) Refers to a non-lactating female.

dry matter Feed after water (moisture) has been removed (100% dry).

dystocia Difficult birth; see calving difficulty.

ear mark Method of permanent identification by which slits or notches are placed in the ear.

ear tag Method of identification by which a numbered, lettered, and/or colored tag is placed in the ear.

early maturity Early puberty as the animal begins to fatten early, sometimes before desired harvest (slaughter) weight is attained.

EBV See breeding value; expected progeny difference (EPD).

economic efficiency Ratio of output value to cost of input.

economic value The net return within a herd for making a pound or percentage change of the trait in question.

edema Abnormal fluid accumulation in the intercellular tissue spaces of the body.

efficiency Ratio of output to input. See also biological efficiency; economic efficiency.

80%-20% rule Basic rule of management. Too often managers expend 80% of their efforts on “the trivial many” problems that produce only 20% of the results. Effective managers recognize that spending time (20%) on problems or situations that count most, will produce 80% of the desired results.

ejaculation Discharge of semen from the male.

emaciation Thinness; loss of flesh such that bony structures (hips, ribs, and vertebrae) become prominent.

embryo Fertilized egg in its early stages of development (undifferentiated); after body parts can be distinguished it is known as a fetus.

embryo splitting Dividing an embryo into two or more similar parts to produce several calves from a single embryo.

embryo transfer (ET) Transfer of fertilized egg(s) from a donor female to one or more recipient females.

Endangered Species Act (ESA) A regulatory statute intended to protect threatened and endangered species by preserving the ecosystems on which they depend.

endocrine gland Ductless gland that secretes a hormone into the bloodstream.

energy Force, or power, that is used to drive a wide variety of systems. It can be used as power of mobility in animals, but most of it is used as chemical energy to drive reactions necessary to convert feed into animal products and to keep animals warm and functioning.

enterprise Segment of the cattle business or an associated business that is isolated by accounting procedures so that its revenue and expenses can be identified.

enterprise budget Detailed list of all estimated revenue and expenses associated with a specific enterprise.

environment Total of all external (nongenetic) conditions that affect the well-being and performance of an animal.

Environmental Protection Agency (EPA) Independent agency of the federal government established to protect the nation’s environment from pollution and other hazards.

enzyme Complex protein produced by living cells that causes changes in other substances in cells without being changed itself and without becoming a part of the product.

EPA See Environmental Protection Agency.

EPD See expected progeny difference.

epididymis Long, coiled tubule leading from the testis to the vas deferens.

epididymitis Inflammation of the epididymis.

epistatis Situation in which a gene or gene pair masks (or controls) the expression of another non-allelic pair of genes.

equity See net worth.

eruction or eructation Elimination of gas by belching.

esophageal groove Groove in the reticulum between the esophagus and omasum. Directs milk consumed by a nursing calf directly from the esophagus to the omasum.

estrogen Any hormone (including estradiol, estriol, and estrone) that causes the female to express esturs (heat) and to be receptive to the male. Estrogens are produced by the follicle of the ovary and by the placenta and have additional body functions.

estrous Adjective that modifies such words as *cycle*. The estrous cycle is the heat cycle, or the time from one period of heat to the next. Estrus is the period of heat (sexual receptivity) within the estrous cycle.

estrous synchronization Controlling the estrous cycle so that a high percentage of the females in the herd express estrus at approximately the same time.

estrus Period of mating activity (sexual recptiveness) in the heifer or cow. Same as heat.

ET See embryo transfer.

ethology Study of animal behavior.

EU See European Union.

European breed Breed originating in European countries other than England (these are called British breeds); a larger dual-purpose breed such as Charolais, Simmental, and Limousin; also called a continental or exotic breed in the United States.

European Union Group of European countries (25 in 2008) whose major objective is to coordinate the development of economic activities. Previously called The European Economic community, European community, and Common Market.

eviserate Removal of the internal organs during the harvesting (slaughtering) process.

exotic breed See European breed.

expected progeny difference (EPD) One-half of the breeding value of a sire or dam; the difference in expected performance of future progeny of a sire, when compared with that expected from future progeny of bulls in the same sire summary.

F₁ Offspring resulting from the mating of a purebred (straightbred) bull to a purebred (straightbred) female of another breed.

fabrication Breaking the carcass into primal, subprimal, or retail cuts. These cuts may be boned and trimmed of excess fat.

FAD See foreign animal disease

fat thickness Usually refers to the amount of fat (thickness) that covers muscles; typically measured at the twelfth and thirteenth rib as inches of fat over the *longissimus dorsi* muscle (rib eye).

FDA See Food and Drug Administration (FDA).

feces Bodily wastes; excretion product from the intestinal tract.

fed cattle Steers and heifers that have been fed concentrates, usually for 90-120 days in a feedlot or until they reach a desired slaughter weight.

feed additive Ingredient such as an antibiotic or hormone like substance that is added to a diet to perform a specific role.

feed bunk Trough or container used to place feed for cattle.

feed conversion See feed efficiency.

feed efficiency (1) Amount of feed required to produce a unit of weight gain or milk. (2) Amount of gain or mik made per unit of feed.

feed markup Per-ton feed cost charged to the customer by a feedyard for the cattle-feeding services it provides.

feeder (1) Cattle that need further feeding prior to harvest (slaughter). (2) Producer who feeds cattle.

feeder grades Grouping of feeder cattle to predict the harvest (slaughter) weight endpoint to a desirable fat-to-lean composition. Frame size and thickness are the two criteria used to determine feeder grade.

feedlot Enterprise in which cattle are fed grain and other concentrates, usually for 90-120 days. Feedlots range in size from less than 100-head capacity to many thousands. Also known as a feedyard.

feedyard See feedlot.

femininity Well-developed secondary female sex characteristics, udder development, and refinement in head and neck.

fertility Capacity to initiate, sustain, and support reproduction.

fertilization Process by which a sperm unites with an egg to produce a zygote.

fetus Later stages of individual development within the uterus. Generally, the new individual is regarded as an embryo during the first half of pregnancy and as a fetus during the last half.

fill Contents of the digestive tract.

financing Acquiring control of assets by borrowing money.

finish (1) Degree of fatness of an animal. (2) Completion of the last feeding phase of slaughter cattle.

finished cattle Fed cattle whose time in the feedlot is completed, and have attained the desired goals such as weight, and are now ready for harvest (slaughter).

finishing ration Feedlot ration, usually high in energy, that is fed during the latter part of the feeding period.

fitting Proper feeding, grooming, and handling of an animal, usually to prepare it for the show ring.

fixed cost Costs incurred whether or not production occurs (e.g., interest, taxes).

flehmen Pattern of behavior expressed by the bull during sexual activity. The upper lip curls up and the bull initiates the smelling process in the vicinity of the vulva or urine.

flushing Placing females on a high level of nutrition before breeding to decrease post-partum interval and possibly stimulate an increased conception rate.

FMD See foot and mouth disease.

FMI See Food Marketing Institute.

FOB (or fob) Free on board; buyer pays freight after loading.

follicle Blisterlike, fluid-filled structure in the ovary that contains the egg.

follicle-stimulating hormone (FSH) Hormone produced and released by the anterior pituitary that stimulates the development of the follicle in the ovary.

Food and Drug Administration (FDA) U.S. government agency responsible for protecting the public against impure and unsafe foods, drugs, veterinary products, biologics, and other products.

Food Marketing Institute (FMI) National association of food retailers and wholesalers located in Washington, DC, that conducts programs of research, education, and public affairs for its members.

foot and mouth disease (FMD) Highly-contagious disease affecting many species of livestock including cattle. This disease is of particular concern in that it can lead to loss of export markets. FMD is a foreign animal disease (FAD).

footrot Disease of the foot in cattle.

forage Grazed or harvested herbaceous plants that are utilized by cattle.

forage production The total amount of dry matter produced per unit of area on an annual basis (e.g., lb/acre/year).

forb Weedy or broad-leaf plants (unlike grasses) that serve as pasture for animals (e.g., clover, alfalfa).

Foreign animal disease (FAD) A disease that is not present within the U.S.

forward contracting Future delivery of a specified type and amount of product at a specified price.

founder Nutritional ailment resulting from overeating. Lameness in front feet with excessive hoof growth usually occurs.

frame score Score based on visual evaluation of skeletal size or by measuring hip height (from ground to top of hips). This score is related to the slaughter weights at which cattle grade Choice or have comparable amounts of fat cover over the loin eye at the twelfth to thirteenth rib.

frame size Usually measured by frame score or estimated visually.

freemartin Female born twin to a bull (approximately 90% of such heifers are sterile).

FSH See follicle-stimulating hormone (FSH).

full sibs Animals having the same sire and dam.

futures market Electronic market through which buyers and sellers trade contracts on commodities or raw materials. Futures contracts are available for a variety of delivery months. However, delivery of actual products seldom occurs. Futures markets are used as a risk management tool or as a speculative venture.

GATT (General Agreement on Tariffs and Trade) An agreement originally negotiated in Geneva, Switzerland in 1947 among 23 countries, including the U.S., to increase international trade by reducing tariffs and other trade barriers. The agreement provides a code of conduct for international commerce and a framework for periodic multilateral negotiations on trade liberalization and expansion.

gene Segment of DNA in the chromosome that codes for a trait and determines how a trait will develop.

gene map A blueprint of the chromosomes of a species, indicating the relative order of location of genes and DNA markers.

generation interval Average age of the parents when the offspring are born.

generation turnover Length of time from one generation of animals to the next generation.

genetic correlation Correlation between two traits that arises because some of the same genes affect both traits. See correlation coefficient.

genetic engineering Changing the characteristics of an animal by altering or rearranging its DNA. It is an all-embracing term for several techniques: (1) manipulations at a cellular level (cloning); (2) manipulation of the DNA itself (gene manipulation); (3) changing the DNA sequence through the selection and mating of cattle.

genome Total number of genes in a species.

genotype Genetic constitution or makeup of an individual. For any pair of alleles, three genotypes (e.g., AA, Aa, and aa) are possible.

genotype–environmental interaction Variation in the relative performance of different genotypes from one environment to another. For example, the superior cattle (genotypes) for one environment may not be superior for another environment.

gestation Time elapsing from conception until the female gives birth, an average of 285 days in cattle.

goal Target or desired condition that motivates the decision maker.

gonad Testis of the male; ovary of the female.

gonadotrophin Hormone that stimulates the gonads.

grade augmentation Supplementation of traditional USDA visual carcass grading using objective instrumentation.

grade and yield Marketing transaction whereby payment is made on the basis of carcass weight and quality grade.

grading up Continued use of purebred sires of the same breed in a grade herd.

grass tetany Disease of cattle marked by staggering, convulsions, coma, and frequently death that is caused by a mineral imbalance (magnesium). Typically occurs while grazing lush pasture.

grazier A person who manages grazing livestock.

grazing cell A parcel of land subdivided into paddocks and rotationally grazed.

grazing cycle The length or passage of time between two grazing periods in a particular paddock of a grazing unit. One grazing cycle includes one grazing period and one rest period.

gross margin Difference between the revenue and variable production cost for one unit (one acre or one animal) of an enterprise.

growing ration Usually a high-roughage ration whereby gains of 0.25-2.0 lb per day are anticipated.

growth Increase in mass (particularly protein) over loss in the animal body. Growth occurs by increases in cell numbers, cell size, or both.

grubs Larvae of the heel fly found under the hide on the backs of cattle.

half-sibs Animals having one common parent.

hand mating or hand breeding Bringing a female to a male for breeding, after which she is removed from the area where the male is located.

hanging tender Part of the diaphragm muscle, not to be confused with the tenderloin of the carcass.

hard keeper Term used when an animal does not perform well; it may have hardware, parasites, or show the effects of other disease.

hardware disease Ingested sharp objects perforate the reticulum and cause infection of the heart sac, lungs, and/or abdominal cavity.

Hazard Analysis Critical Control Point (HACCP) A process used to identify those steps in production where mistakes may critically damage the final performance of the product and to establish a system of monitoring and intervention to avoid these mistakes.

heart girth Circumference of the animal's body, measured just behind the shoulders.

heat See estrus.

heat increment Increase in heat production following consumption of feed when an animal is in a thermoneutral environment. It includes additional heat generated during fermentation, digestion, and nutrient metabolism.

hedge Risk management strategy that allows a producer to lock in a price for a given commodity at a specified time.

heifer Young female bovine cow prior to the time that she has produced her first calf.

heiferette Heifer that has calved once and is then fed for harvest (slaughter); the calf has usually died or been weaned at an early age.

herd Group of cattle (usually cows) that are in a similar management program.

heredity Transmission of genetic or physical traits of parents to their offspring.

heritability Proportion of the phenotypic differences between animals that is due to heredity.

hernia Protrusion of an intestine through an opening in the body wall (also commonly called rupture) but remain contained within the body by the animal's

skin. Two types of hernias—umbilical and scrotal—occur in cattle.

heterosis Performance of offspring that is greater than the average of the parents. Usually referred to as the amount of superiority of the crossbred over the average of the parental breeds. Also called hybrid vigor.

heterozygous Designates an individual possessing unlike genes for a particular trait.

hides Skins from cattle.

high mountain disease See brisket disease.

hiplock Condition at calving in which the hips of the calf cannot pass through the pelvis of the cow.

homozygous Designates an individual whose genes for a particular trait are alike.

hormone Chemical substance secreted by a ductless gland. Usually carried by the bloodstream to other places in the body, where it has its specific effect on another organ.

hot carcass weight Weight of carcass just prior to chilling.

“hot fat trimming” Removal of excess surface fat while the carcass is still “hot,” prior to chilling the carcass.

HRI (hotel, restaurant, and institutional) used in the context that some beef is supplied to the HRI trade.

hybrid vigor See heterosis.

hydrocephalus Condition characterized by an abnormal increase in the amount of cerebral fluid, accompanied by dilation of the cerebral ventricles.

hypothalamus Portion of the brain found in the floor of the third ventricle that regulates reproduction, hunger, and body temperature and performs other functions.

immunity Ability of an animal to avoid, resist, tolerate, or overcome infection.

implant To graft or insert material to intact tissues.

inbreeding Mating of individuals more closely related than the average individuals in a population. Inbreeding increases homozygosity in the cattle population but does not change gene frequency.

income Difference between revenue and expenses that is referred to as net income; gross income refers to total income.

income statement Financial statement that summarizes all revenues and expenses and used to determine the net income or net loss for a given period of time, usually a year.

independent culling level Selection method whereby minimum acceptable phenotypic levels are assigned to several traits.

index Overall merit rating of an animal.

inflation General increase in prices that decreases the purchasing power of a dollar.

insemination Deposition of semen in the female reproductive tract.

intake The amount of feed consumed by an animal per day. Intake is usually expressed as a percent of bodyweight or in pounds per day.

integrated resource management (IRM) Multidisciplinary approach to managing cattle more efficiently and profitably; management decisions are based on how all resources are affected.

integration Bringing together of two or more segments of beef production and processing under one centrally organized unit.

intensive grazing management (IGM) Grazing management where a grazing unit is subdivided into subunits (paddocks) with grazing periods typically less than 5 days.

intensive rotational grazing Synonymous with “intensive grazing management.”

interest rate Charge or fee associated with borrowed money.

intermuscular fat Fat located between muscle systems. See also seam fat.

intramuscular fat Fat within the muscle, see also marbling.

inter se mating Mating of animals within a defined population. Literally to mate among themselves.

intravenous Within the vein. An intravenous injection is made into a vein.

in vitro Outside the living body; in a test tube or artificial environment.

in vivo Within the living body.

involution Return of an organ to its normal size or condition after being enlarged (e.g., the uterus after parturition). A decline in size or activity of other tissues; the mammary gland tissues normally involute with advancing lactation.

ionophore Ionophores (such as monensin, lasalocid, laidlomycin, salinomycin and narasin) are antimicrobial compounds that are commonly fed to ruminant animals to improve feed efficiency. These antimicrobials specifically target the ruminal bacterial population and alter the microbial ecology, resulting in increased carbon and nitrogen retention by the animal, increasing production efficiency.

IRM See integrated resource management.

joint venture Any business arrangement whereby two or more parties contribute resources to and engage in a specific business undertaking.

kidney knob The kidney and the fat that surrounds it.

kidney, pelvic and heart fat (KPH) The internal carcass fat associated with the kidney, pelvic cavity and heart expressed as a percentage of chilled carcass weight. The kidney is included in the estimate of kidney fat. Used in the calculation of yield grade.

ketosis Condition characterized by a high concentration of ketone bodies in the body tissues and fluids. Also called acetonemia.

kosher meat Meat from ruminant animals (with split hooves) that have been harvested (slaughtered) according to Jewish law.

labor (1) Parturition or the birth process, (2) Resource that produces goods or provides services.

lactation Production and secretion of milk.

LEA See loin-eye area (LEA); rib-eye area (REA).

lethal gene A gene that causes the death of an individual at some stage of life, pre- or post-parturition.

legume Any plant type within the family *Leguminosae*, such as pea, bean, alfalfa, and clover.

leucocytes White blood cells.

LH See luteinizing hormone (LH).

liabilities Obligations or debts owed by a business or person to others.

libido Sex drive or the male's desire to mate.

lice Small, flat, wingless insects with sucking mouth parts that are parasitic on the skin of animals.

limited partnership Partnership consisting of at least one general partner, who is responsible for the management and liabilities of the business, and at least one limited partner, whose liability is limited to his or her investment.

linear programming Mathematical technique used to find profit-maximizing combinations of production activities or cost-minimizing combinations of ingredients subject to a number of linear relationships that constrain the activities or ingredients.

linebreeding Form of inbreeding whereby a bull's genes are concentrated in a herd. The average relationship of the individuals in the herd to this ancestor (outstanding individual or individuals) is increased by linebreeding.

linecrossing Crossing of inbred lines.

liquidate To convert to cash; to sell.

liver flukes Parasitic flatworm found in the liver.

load Pounds (number) of cattle that can be hauled on a large cattle truck. For example, pot load is 42,000-52,000 lb (~40-42 head of slaughter steers, 72 yearlings, or 100 calves).

locus Place on a chromosome where a gene is located.

loin-eye area (LEA) Area of the *longissimus dorsi* muscle, measured in square inches between the twelfth and thirteenth ribs. Usually referred to as rib-eye area (REA).

long yearling Animal between 18 months and 2 years of age.

longevity Life span of an animal; usually refers to the number of years a cow remains productive.

longissimus dorsi See rib-eye area.

lousy Infested with lice.

luteinizing hormone (LH) Protein hormone produced and released by the anterior pituitary that stimulates the formation and retention of the corpus luteum. It also initiates ovulation.

maintenance Condition in which the body is maintained without an increase or decrease in body weight and with no production or work being done.

mammary gland Gland that secretes milk.

management Act, art, or manner of managing, handling, controlling, or directing a resource or integrating several resources.

management systems Methods of systematically organizing information from several resources to make effective management decisions. See also integrated resource management.

marbling Flecks of intramuscular fat distributed in muscle tissue. Marbling is usually evaluated in the rib-eye between the twelfth and thirteenth ribs and is a key determinant in evaluating Quality Grade.

MARC See Meat Animal Research Center.

margin (1) "Earnest money" that serves as default protection in a futures transaction. (2) Difference between prices at different levels of the marketing system. (3) Difference between cost and sale price.

marker-assisted selection A method of genetic evaluation which takes into consideration the DNA marker genotype along with conventional selection procedures.

market class Cattle grouped according to their use, such as slaughter, feeder, or stocker.

market grade Cattle grouped within a market class according to their value.

market niche Segment of consumer demand targeted by a specialized production and marketing plant. Examples include the "white tablecloth" restaurant trade, health foods, and convenience foods.

masculinity Well-developed secondary sex characteristics in the neck, chest, and shoulders of the bull.

masticate To chew feed.

mastitis Inflammation of the mammary gland.

maternal Pertaining to the female (cow or heifer).

maternal first-calf calving ease Ease with which a sire's daughters calve as first-calf heifers (under 33 months of age). Reported as a ratio or an EPD.

maternal heterosis Heterosis for those traits influenced by the cow genotype. e.g. maternal heterosis of weaning weight refers to the increase in weaning weight from being raised on a crossbred cow rather than a straightbred cow.

maternal traits All of the traits expressed by the cow. A limited definition implies milk and weaning weight production of the cow.

maternal weaning weight Weaning weight of a bull's daughter's calves. The EPD value predicts the difference in average 205-day weight of a bull's daughter's calves compared to daughters of all other bulls evaluated. It can be calculated by adding one-half of the bull's EPD for weaning weight to his milk EPD.

maturity An estimation of the chronological age of the animal or carcass.

maverick Unbranded animal, usually on the range.

M/B or M:B ratio See muscle-to-bone ratio.

mean (1) Statistical term for average. (2) Term used to describe cattle having bad behavior.

meat Tissues of the animal body that are used for food.

Meat Animal Research Center (MARC) U.S. government research center located in Clay Center, NE, that conducts numerous beef cattle research projects.

Meat Export Federation (MEF) See U.S. Meat Export Federation.

MEF See U.S. Meat Export Federation.

melengestrol acetate (MGA) Feed additive that suppresses estrus in heifers; used in estrus synchronization and feedyard heifers.

MERCOSUR (Common Market of the South) A customs union implemented in January 1995, and including Argentina, Brazil, Paraguay, and Uruguay. MERCOSUR represents the culmination of bilateral negotiations started by Argentina and Brazil in 1986.

metabolic body size Weight of the animal raised to the 3/4-power ($W^{0.75}$); a figure indicative of metabolic needs and of the feed required to maintain a certain body weight.

metabolism (1) Sum total of chemical changes in the body, including the "building up" and "breaking down" processes. (2) Transformation by which energy is made available for body uses.

metabolizable energy Gross energy in the feed minus the sum of energy in the feces, gaseous products of digestion, and energy in the urine. Energy that is made available for body uses.

metritis Inflammation of the uterus. Infection of uterus.

MGA See melengestrol acetate (MGA).

middle meats Rib and loin of a beef carcass. These primals generally yield the highest-priced beef cuts.

milk EPD Estimate of the milking ability of a bull's daughters compared to the average of the daughters of other bulls. Reported in pounds of weaning weight; positive values indicate above-average performance and negative numbers indicate below-average maternal ability. See also expected progeny difference.

mill feed Any feed that is subjected to the milling process.

minimum culling level Selection method in which an animal must meet minimum standards for each trait desired in order to qualify for being retained for breeding purposes.

mites Very small arachnids that can be parasites of cattle.

morbidity Measurement of illness; morbidity rate is the number of individuals in a group that become ill during a specified time period.

mortality rate Number of individuals that die from a disease during a specified time period, usually 1 year.

most probable producing ability (MPPA) Estimate of a cow's future productivity for a trait (such as progeny weaning weight ratio) based on her past productivity. For example, a cow's MPPA for weaning ratio is calculated from the cow's average progeny weight ratio, the number of her progeny weaning records, and the repeatability of weaning weight.

mouthed Examination of an animal's teeth.

MPPA See most probable producing ability (MPPA).

muley Term used to describe the polled (hornless) condition.

muscle-to-bone (M/B) ratio Pounds of muscle divided by pounds of bone. For example, 4:1 ratio means that there is 4 lb of muscle to 1 lb of bone (usually on a carcass basis).

muscling Amount of lean meat in a slaughter animal or carcass. Estimated on the live animal by thickness of forearm muscle or stifle thickness. Ultimately it is the ratio of muscle to bone or lean yield of the carcass after fat and bone are removed.

muzzle Nose of cattle.

myofibrils Primary component part of muscle fibers.

NAFTA (North American Free Trade Agreement) A trade agreement involving Canada, Mexico, and the U.S., implemented on January 1, 1994, with a 15-year transition period.

National Cattlemen's Beef Association (NCBA) National organization for cattle breeders, producers, feeders, and affiliated organizations with offices in Centennial, CO, Chicago, IL, and Washington, DC. Previously known as the National Cattlemen's Association or NCA.

National Live Stock and Meat Board (NLSMB) Organization located in Chicago that provides nutrition, research, education, and promotional information on beef, pork, and lamb. See also Beef Industry Council.

national sire evaluation Programs of sire evaluation conducted by breed associations to compare sires on a progeny-test basis. Carefully conducted national reference sire evaluation programs give unbiased estimates of expected progeny differences. Sire evaluations based on field data rely on large number of progeny per sire to compensate for possible favoritism or bias for sires within herds.

native hides Hides from cattle that have not been hot-iron branded.

natural beef Refers to beef from cattle that have not been provided growth stimulants or antibiotics.

natural fleshing Lean meat or muscle.

navel Area where the umbilical cord was formerly attached to the body of the animal.

NCBA See National Cattlemen's Beef Association.

necropsy To perform a post-mortem examination. See also autopsy.

NEg Net energy for gain.

NEI Net energy for lactation.

NEm Net energy for maintenance.

net energy Metabolizable energy minus heat increment, or the energy available to the animal for maintenance and production.

net income Total revenue earned minus expenses incurred for a given period of time.

net worth (equity) Represents the owner's claim on the assets of a business: net worth = assets - liabilities.

net worth statement See balance sheet.

nicking Way in which certain lines, strains, or breeds perform when mated together. When outstanding offspring result, the parents are said to have nicked well.

nipple See teat.

NPN (nonprotein nitrogen) Nitrogen in feeds from substances such as urea and amino acids, but not from preformed proteins.

nutrient (1) Substance that nourishes the metabolic processes of the body. (2) End product of digestion.

nutrient density Amount of essential nutrients relative to the number of calories in a given amount of food.

obesity Excessive accumulation of body fat.

offal All organs and tissues removed from inside the animal during the harvesting (slaughtering) process.

off feed Animal refuses to eat or consumes only small amounts of feed.

omasum The third of four stomach compartments of cattle, the omasum contains many folds.

on full feed Refers to cattle that are receiving all the feed they will consume. See also *ad libitum*.

open Refers to nonpregnant females.

operating expenses Expenses incurred in the usual production cycle, such as seed, fuel, feed, and hired labor costs.

opportunity cost Cost of using a resource based on what it could have earned using it in the next best alternative use.

optimize To make as effective as possible.

optimum Amount or degree of something that is most favorable to some end (e.g., the best combination of resources associated with cattle production yields the highest sustainable net return).

optimum level of performance Performance level of a trait or traits that maximizes net profit. Resources are managed (including a balance of traits) that sustain high levels of profitability.

outbreeding Process of continuously mating females of the herd to unrelated males of the same breed.

outcrossing Mating of an individual to another in the same breed that is not related to it. Outcrossing is a type of outbreeding.

ova Plural of *ovum*, meaning eggs. See also ovum.

ovary Female reproductive organ in which the eggs are formed and progesterone and estrogenic hormones are produced.

overhead Expenses incurred in the operation of the business that cannot conveniently be attributed to the production of specific commodities or services.

ovulation Shedding or release of the egg from the follicle of the ovary.

ovum Egg produced by a female.

packing plant Facility in which cattle are harvested (slaughtered) and processed to some degree.

paddock A pasture subdivision within a grazing unit.

palatability Degree to which food (e.g., beef) is acceptable to the taste or sufficiently agreeable in flavor, juiciness and tenderness to be eaten.

palpation Feeling or examining by hand (e.g., the reproductive tract is palpated for reproductive soundness or pregnancy diagnosis).

parasite Organism that lives a part of its life cycle in or on, and at the expense of, another organism. Parasites of farm animals live at the expense of the animals.

parity Number of different times a female has had offspring.

parrot mouth Upper jaw is longer than the lower jaw.

partial budget Budget that includes only those revenue and expense items that would change as a result of a proposed change in the business.

parturition Process of giving birth.

pasture rotation Rotation of animals from one pasture to another so that some pasture areas have no livestock grazing on them during certain periods of time.

patchy Uneven fat accumulations, usually lumps of exterior fat around the tailhead and pin bones.

paternal Refers to the sire or bull.

pathogen Biologic agent (e.g., bacteria, virus, protozoa, nematode) that may produce disease or illness.

paunch See rumen.

paunchy Heavy middled.

pay weight Actual weight for which payment is made. In many cases, it is the shrunk weight (actual weight - pencil shrink).

pedigree Records of the ancestry of an animal.

pelvic area Size of pelvic opening determined by measuring pelvic width and length and used to predict calving difficulty.

pen rider Person who rides through feedyard pens and checks cattle.

pencil shrink Deduction from an animal's weight, often expressed as a percentage of liveweight, to account for fill (usually 3% for off-pasture weights and 4% for fed-cattle weights).

pendulous Hanging loosely.

percent calf crop The percentage of calves produced within a herd in a given year relative to the number of cows and heifers exposed to breeding.

per capita Per person.

performance data Records on individual animal's reproduction, production, and possibly carcass merit. Traits included are birth, weaning, and yearling weights; calving ease; calving interval; milk production; and others.

performance pedigree Includes the performance records of ancestors, half- and full sibs, and progeny in addition to the usual ancestral pedigree information. The performance information is systematically combined to list estimated breeding values on the pedigrees by some breed associations.

performance test Evaluation of an animal according to its performance.

pharmaceutical Medicinal drug.

phenotype Characteristics of an animal that can be seen and (or) measured (e.g., color, weight, or presence or absence of horns).

phenotypic correlations Correlations between two traits caused by both genetic and environmental influences. See correlation coefficient.

pheromones Chemical substances that attract the opposite sex.

photoperiod Time period when light is present.

pituitary Small endocrine gland located at the base of the brain.

placenta Membranes that form around the embryo and attach to the uterus. See also afterbirth.

Plains states Includes Texas, Oklahoma, Kansas, Nebraska, South Dakota, and North Dakota and the eastern parts of New Mexico, Colorado, Wyoming, and Montana; often referred to as the "Beef Belt."

pluck Organs of the thoracic cavity (e.g., heart and lungs).

pneumonia Inflammation or infection of alveoli of the lungs caused by either bacteria or viruses.

polled Naturally or genetically hornless.

pons Accumulation of fat over pin bones.

portion-controlled beef products Retail cuts of beef that meet size and form specifications.

postnatal See postpartum.

postpartum After birth.

postpartum interval Days from calving until the cow returns to estrus, or days from calving until cow is pregnant again.

pounds of retail cuts per day of age A measure of cutability and growth combined; it is calculated as follows: cutability times carcass weight divided by age in days.

pounds of calf weaned per cow exposed Calculated by multiplying percent calf crop by the average weaning weight of calves.

preconditioning Preparation of feeder calves for marketing and shipment; may include vaccinations, castration, and training calves to eat and drink in pens.

prenatal Prior to being born; before birth.

prepotent Ability of a parent to transmit its characteristics to its offspring so that they resemble that parent, or each other, more than usual. Homozygous dominant individuals are prepotent. Also, inbred cattle tend to be more prepotent than outbred cattle.

price cycle Traditional or historic changes in prices (usually by months, seasons, or years).

price discovery Process that shows how the specific price for a given quantity and quality of beef is determined.

primal cuts Wholesale cuts—round, loin, flank, rib, chuck, brisket, plate, and shank.

production testing Evaluation of an animal based on its production record.

progeny Offspring of the parents.

progeny testing Evaluation of an animal based on the performance of its offspring.

progesterone Hormone produced by the corpus luteum that stimulates progesterational proliferation in the uterus of the female.

prolapse Abnormal protrusion of part of an organ, such as the uterus or rectum.

prostaglandins Chemical mediators that control many physiological and biochemical functions in the body. One prostaglandin, $\text{PGF}_2\alpha$, can be used to synchronize estrus.

prostate Gland of the male reproductive tract located just behind the bladder that secretes a fluid that becomes a part of semen at ejaculation.

protein Substance made up of amino acids that contains approximately 16% nitrogen (based on molecular weight).

protein supplement Any dietary component containing a high concentration (at least 25%) of protein.

puberty Age at which the reproductive organs become functionally operative.

purebred Animal eligible for registry with a recognized breed association.

purveyor Firm that purchases beef (usually from a packer), then performs some fabrication before selling the beef to another firm.

qualitative traits Those in which there is a sharp distinction between phenotypes (e.g., red or black color). Usually, only one or two gene pairs are involved.

quality (1) Something special about an object that makes it what it is; a characteristic, attribute, excellence. (2) The composite or attribute of an animal or product that has economic or aesthetic value to the user; meeting or exceeding each customer's expectations at a cost that represents value to the customer every time.

quality grades Grades such as Prime, Choice, and Select that group slaughter cattle and carcasses into value- and palatability-based categories. Grades are determined primarily by marbling and age of animal.

quantitative traits Those in which there is no sharp distinction between phenotypes, with a gradual variation from one phenotype to another (such as weaning weight). Usually, many gene pairs are involved, as well as environmental influences.

Ralgro® Growth implant containing zeranol (a fermentation product exhibiting estrogenic activity).

random mating System of mating whereby every female (cow and/or heifer) has an equal or random chance of being assigned to any bull used for breeding in a particular breeding season. Random mating is required for accurate progeny tests.

ration Feed fed to an animal during a 24-hour period.

REA See rib-eye area.

reach See selection differential.

realizer Feedyard animal that is removed before the end of the feeding program. Only part of the animal's potential value is realized because of disease, injury, or other issue contributing to the animal's removal.

recessive gene A gene that has its phenotypic expression masked by its dominant allele when the two genes are present together in an individual.

rectal prolapse Protrusion of part of the large intestine through the anus.

red meat Meat from cattle, sheep, swine, and goats. See also white meat.

reference sire Bull designated to be used as a benchmark in progeny testing other bulls (young sires). Progeny by reference sires in several herds enables comparisons to be made between bulls not producing progeny in the same herd(s).

registered Recorded in the herdbook of a breed.

regurgitate To cast up undigested food to the mouth as is done by ruminants.

replacement heifers Heifers, usually between 6 months and 16 months of age, that have been selected to replace cows in the breeding herd.

replacements Cattle that are going into feedyards or breeding herds to replace those being sold or that have died. See also replacement heifers.

reproductive tract score Numerical score based on palpation of the heifer's reproductive tract (1 = not cycling; 5 = heifer cycling).

resource Input or factor used in production, such as cattle, labor, or land.

retail cuts Cuts of beef in sizes that are purchased by the consumer.

retained ownership Usually refers to cow-calf producers maintaining ownership of their cattle through the feedlot.

retained placenta Fetal membranes (afterbirth) are not expelled through the reproductive tract within the normal length of time following calving.

reticulum One of the stomach components of cattle that is lined with small compartments giving a honeycomb appearance.

Revalor® Growth implant containing estradiol and trenbolone acetate used in calves (Revalor-G®), feeder steers (Revalor-IS®), (Revalor-S®), and (Revalor-200®), and feeder heifers (Revalor-IH®), (Revalor-H®), and (Revalor-200®).

rib-eye area (REA) Area of the *longissimus dorsi* muscle, measured in square inches, between the twelfth and thirteenth ribs. Also referred to as the loin-eye area.

rib-eye area per cwt carcass wt Rib-eye area divided by carcass weight.

risk Possibility of suffering economic loss. Sources of risk include climate, disease, and changes in the marketplace.

risk management Managing risks in ways that allow a desired outcome to be achieved.

rotational crossbreeding Systems of crossing two or more breeds whereby the crossbred females are bred to bulls of the breed contributing the least genes to the females' genotype.

roughage Feed that is high in fiber, low in digestible nutrients, and low in energy (e.g., hay, straw, silage, and pasture).

rugged Big and strong in appearance; usually heavy boned.

rumen The first of four compartments of the ruminant stomach. The rumen is similar to a large fermentation pouch where bacteria and protozoa break down fibrous plant material swallowed by the animal. Sometimes referred to as the paunch.

ruminant Mammal whose stomach has four parts—rumen, reticulum, omasum, and abomasum. Cattle, sheep, goats, deer, and elk are ruminants.

rumination Regurgitation of undigested food that is chewed and then swallowed again.

scale (1) Size of cattle. (2) Equipment on which an animal is weighed.

scours Diarrhea; profuse watery discharge from the intestines.

scrotal circumference Measure of testes size obtained by measuring the distance around the testicles in the scrotum with a circular tape. Related to the bull's semen-producing capacity and age at puberty of his daughters.

scrotum Pouch that contains the testicles. Also a thermoregulatory organ that contracts when cold and relaxes when warm, thus tending to keep the testes at a lower temperature than that of the body.

scurs Small growths of hornlike tissue attached to the skin of polled or dehorned animals.

seam fat See intermuscular fat.

seedstock Breeding animals. Sometimes used interchangeably with *purebred*.

seedstock breeders Producers of breeding stock for purebred and commercial breeders.

Select USDA carcass quality grade between Choice and Standard. It replaced the Good grade in 1988.

selection Differential reproduction (e.g., a bull or cow may leave several, one, or no offspring in a herd).

selection differential (reach) Difference between the average for a trait in selected animals and the average of the group from which they come. Also called reach.

selection index Formula that combines performance records from several traits or different measurements of the same trait into a single value for each animal. A selection index combines traits after balancing their relative net economic importance, their heritabilities, and the genetic association among the traits.

self-management Managing oneself as part of human resource management (e.g., time management, information management, self-motivation, honesty).

semen Fluid containing sperm that is ejaculated by the male. Secretions from the seminal vesicles, prostate gland, bulbourethral glands, and urethral glands provide most of the fluid.

seminal vesicles Accessory sex glands of the male that provide a portion of the fluid of semen.

served Female is bred but not guaranteed pregnant.

service To breed or mate.

settle To become pregnant.

shipping fever Respiratory disease of cattle, often of bacterial origin and occurring following shipping.

short yearling Animal is over 1 year of age but under 18 months of age.

show list or show pens Slaughter cattle that are ready for the cattle feeder to “show” the packer buyers.

shrink Loss of weight; commonly used in the loss of liveweight when animals are marketed.

sib Brother or sister.

sick pen Isolated pen in a feedyard where cattle are treated after they have been removed from a feedyard pen. Sometimes referred to as a hospital pen or treatment and recovery pen.

sickle hocked Hocks that have too much set, causing the hind feet to be too far forward and too far under the animal.

silage Forage, corn fodder, or sorghum preserved by fermentation that produces acids similar to the acids used to make pickled foods for people.

sire Male parent.

sire summary Published results of national sire evaluation programs that give EPDs and accuracies for several economically important traits. Several major breed associations publish their own sire summaries.

size Usually refers to weight, sometimes to height.

skins See hides.

skirt Diaphragm muscle in the beef carcass.

software Program instructions to make computer hardware function.

sonoray See ultrasound.

soundness Degree of freedom from injury or defect.

SPA See Standard Performance Analysis.

spay To remove the ovaries. Ovariectomizing, female castration.

sperm A mature male germ cell.

specifications A detailed description, with numerical designations, of animal performance or product quantity.

spermatogenesis Process of spermatozoa formation.

splay footed See toeing out.

stag Castrated male that has reached sexual maturity prior to castration.

standard deviation For traits having a normal distribution characterized by a bell shaped curve, 68% of the population = mean (average) \pm 1 standard deviation, 95% = mean \pm 2 standard deviations, and 99% = mean \pm 3 standard deviations.

Standard Performance Analysis (SPA) Program to determine the unit cost of production for the cow-calf enterprise.

steer Bovine male castrated prior to puberty.

sterility Inability to produce offspring.

stifle Joint of the hind leg between the femur and tibia.

stifled Injury of the stifle joint.

stillborn Offspring born dead without having taken a breath.

stocker Weaned cattle that are fed high-roughage diets (including grazing) before going into the feedyard.

stocking rate The number of animals, animal units or total animal liveweight assigned to a grazing unit for an extended period of time. Stocking rates are usually expressed on a per-acre basis.

stocking density The number of animals, animal units or total animal liveweight present at a particular point in time on a defined area (paddock). Stocking density is usually defined on a per-acre basis.

stockpiling The practice of allowing forage to accumulate for grazing at a later date. Most commonly done with late summer and fall forage growth for fall and/or winter grazing.

strip grazing The practice of dividing a larger pasture into strips with movable fences to control grazing access.

straightbred Animal whose parentage has been from one breed.

stress Unusual or abnormal influence causing a change in an animal's function, structure, or behavior.

subcutaneous Situated beneath, or occurring beneath, the skin. A subcutaneous injection is an injection made under the skin.

subprimal cuts Smaller-than-primal cuts, such as when the primal round is split into top round, bottom round, eye round, and sirloin tip. Subprimal cuts are used in boxed beef programs.

success Progressive realization of predetermined, worthwhile goals that are based on true principles.

suckling gain Gain that a young animal makes from birth until it is weaned.

superovulation Hormonally-induced ovulation in which a greater-than-normal number of eggs are typically produced.

sweetbread Edible by-product also known as the thymus gland.

switch Tuft of long hair at the end of the tail.

syndactyly Union of two or more digits; for example, in cattle the two toes would be a solid hoof.

Synovex® Growth implant containing estradiol and progesterone used in calves (Synovex-C®), feeder steers (Synovex-S®), and estradiol and testosterone propionate used in feeder heifers (Synovex-H®).

synthetic breeds See composite breed.

systems analysis See management systems.

tariff A tax imposed by a government on commodity imports. A tariff may be either a fixed charge per unit of product imported (specific tariff) or a fixed percentage of value (ad valorem tariff).

tagging Usually refers to putting ear tags in the ear.

tandem selection Selection for one trait for a given period of time followed by selection for a second trait and continuing in this way until all important traits are selected.

TDN See total digestible nutrients.

teat Protuberance of the udder through which milk flows.

terminal crossbreeding See terminal sires.

terminal market Large livestock collection center where an independent organization serves as a selling agent for the livestock owner.

terminal sires Sires used in a crossbreeding system in which all their progeny, both male and female, are marketed. For example, crossbred dams could be bred to sires of a third breed and all calves marketed. Although this system allows maximum heterosis and complementary of breeds, replacement females must come from other herds.

testicle Male sex gland that produces sperm and testosterone.

testosterone Male sex hormone that stimulates the accessory sex glands, causes the male sex drive, and results in the development of masculine characteristics.

tie Depression or dimple in the back of cattle caused by an adhesion of the hide to the backbone.

time management Manner in which time is utilized to achieve specific goals.

toeing in Toes of front feet turn in. Also called pigeon toed.

toeing out Toes of front feet turn out. Also called splay footed.

total digestive nutrients (TDN) Sum of digestible protein, nitrogen-free extract, fiber, and fat (multiplied by 2.25).

trait ratio Expression of an animal's performance for a particular trait relative to the herd or contemporary group average. It is usually calculated for most traits as:

$$\frac{\text{Individual record}}{\text{Average of animal in group}} \times 100$$

transgenic An organism or animal whose genome includes "foreign" genetic material. Foreign genetic material would be a DNA sequence or gene that does not normally occur in the species of the host organism or animal.

tray-ready beef Retail cuts that are cut and packaged at the packing plant for retail sales; also referred to as case-ready.

tripe Edible product from the walls of the ruminant stomach.

twist Vertical measurement from the top of the rump to the point where the hind legs separate.

type (1) Physical conformation of an animal. (2) All physical attributes that contribute to the value of an animal for a specific purpose.

udder Encased group of mammary glands of the female.

ultrasound Using high-frequency sound waves to show visual outlines of internal body structures (e.g., fat thickness, rib-eye area, and pregnancy can be predicted). The machine sends sound waves into the animal and records these waves as they bounce off the tissues. Different wavelengths are recorded for fat and lean.

umbilical cord Cord through which arteries and veins travel from the fetus to and from the placenta, respectively. This cord is broken when the young are born.

uncoupling Term used to consider separating quality grading and yield grading.

unsoundness Any defect or injury that interferes with the usefulness of an animal.

urinary calculi Disease that causes mineral deposits to crystallize in the urinary tract. Also known as “water belly”.

USDA See U.S. Department of Agriculture.

U.S. Department of Agriculture (USDA) An executive department of the U.S. government that helps farmers supply farm products for U.S. consumers and overseas markets.

U.S. Meat Export Federation (USMEF) Organization that works to increase consumer demand for red meats and by-products in overseas markets. Members include NCA, state cattle associations, beef councils, farm and commodity groups, packers, agribusiness companies. Funds come from its members and the USDA.

uterus That portion of the female reproductive tract where the young develop during pregnancy.

vaccination. The act of administering a vaccine or antigens.

vaccine Suspension of attenuated or killed microbes or toxins administered to induce active immunity.

vagina Copulatory portion of the female’s reproductive tract. The vestibule portion of the vagina also serves for passage of urine during urination. The vagina also serves as a canal through which young pass when born.

value-based marketing Marketing system based on paying for individual animal differences rather than using average prices.

variable costs Costs that change with the amount produced. If the manager decides to cease production, these costs are avoidable.

variance Variance is a statistic that describes the variation seen in a trait.

variety meats Edible organ co-products (e.g., liver, heart, tongue, tripe).

vas deferens Ducts that carry sperm from the epididymis to the urethra.

veal Meat from very young cattle (under 3 months of age). Veal typically comes from dairy bull calves.

video image analysis (VIA) A video image is analyzed via sophisticated computer techniques to estimate factors associated with carcass value.

virus Ultra-microscopic bundle of genetic material capable of multiplying only in living cells. Viruses can cause a wide range of diseases in plants, animals, and humans, such as rabies and measles.

viscera Internal organs and glands contained in the thoracic and abdominal cavities.

vitamin Organic catalyst, or component thereof, that facilitates specific and necessary functions.

volatile fatty acids (VFA) Group of fatty acids produced from microbial action in the rumen; examples are acetic, propionic, and butyric acids.

vulva External genitalia of a female mammal.

wasty Excessive accumulation of fat.

wattle Method of cattle identification in which 3-6-inch strips of skin are cut on the nose, jaw, throat, or brisket.

weaner Calf that has been weaned or is near weaning age.

weaning or wean Separating young animals from their dams so that the offspring can no longer suckle.

weaning weight Weight of the calf at approximately 5-10 months of age when the calf is removed from the cow.

weaning weight EPD Estimate of the weaning weight (lb) potential of a sire's progeny. Positive numbers indicate above-average performance while negative values indicate below-average weights when compared to other bulls in the same sire summary. This estimate is for direct growth, as maternal effects are removed in the calculations. See also expected progeny difference (EPD).

weaning weight ratio The weaning weight of a calf divided by the herd average. Usually done within gender.

weight per day of age (WDA) Weight of an individual animal divided by days of age.

white meat Meat from poultry. See also red meat.

white muscle disease Muscular disease caused by a deficiency of selenium or vitamin E.

wholesalers Beef operations that buy and sell beef to other firms; considered the middlemen between the packer and consumer segments.

window of acceptability Identifies the acceptable minimum and maximum amounts of fat in meat on the basis of meat palatability and human health.

with calf Heifer or cow is pregnant.

withdrawal time Amount of time before slaughter during which a drug cannot be given to an animal.

woody Opposite of "bloom" - the animal's hair coat appears dull, not shiny. Associated with unthrifty calves. See also bloom.

World Trade Organization (WTO) Established on January 1, 1995 as a result of the Uruguay Round, the WTO replaces GATT as the legal and institutional foundation of the multilateral trading system of member countries.

yardage Per-head daily fee charged by the feedyard to the customer owning the cattle. This fee is usually in addition to the cost of medicine and the feed markup.

yearling Animals that are approximately 1 year old (usually 12-24 months of age).

yearling weight Weight when approximately 365 days old.

yearling weight EPD Estimate of the yearling weight (lb) potential of a bull's progeny compared to progeny from other bulls in the same sire summary. Positive numbers indicate above-average performance while negative values indicate below-average performance. See also expected progeny difference.

yearling weight ratio Yearling weight of a calf divided by the herd average. Usually calculated within sex.

yield See dressing percentage.

yield grades USDA grades identifying differences in cutability—the boneless, fat trimmed retail cuts from the round, loin, rib, and chuck.

Acronym/Abbreviation Appendix

BMP	Best Management Practice
AABP	American Association of Bovine Practitioners
AC	Alternating Current
AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
A-RITS	Assessment, Resistance, Isolation, Traffic Control, Sanitation
AVC	Academy of Veterinary Consultants
AVMA	American Veterinary Medical Association
BCP	Biological, Chemical, or Physical (Hazard)
BCS	Body Condition Score
BH	Biological Hazard
BMPs	Best Management Practices
BQA	Beef Quality Assurance
BRSV	Bovine Respiratory Syncytial Virus
BSE	Bovine Spongiform Encephalopathy
BVD-PI	Bovine Viral Diarrhea - Persistently Infected
BVD	Bovine Viral Diarrhea
CA	Corrective Action
CA	Chemically-Altered
cc	Cubic Centimeter
CCP	Critical Control Point
cGMP	current Good Manufacturing Practice
CH	Chemical Hazard
CHC	Chlorinated Hydrocarbon
CL	Critical Limit
CTC	Chlorotetracycline
CVM	Center for Veterinary Medicine
CWT	Hundredweight
ELDU	Extra-Label Drug Use
ELISA	Enzyme-Linked ImmunoSorbent Assay
EPA	Environmental Protection Agency
FARAD	Food Animal Residue Avoidance Databank
FASS	Federation of Animal Science Societies
FDA	Food and Drug Administration
FDA-CVM	Food and Drug Administration - Center for Veterinary Medicine
FMD	Foot and Mouth Disease
FSIS	Food Safety and Inspection Service
g	gram
HACCP	Hazard Analysis Critical Control Point
hd	Head
IBR	Infectious Bovine Rhinotracheitis
ID	Identification
IM	Intramuscular
IN	Intranasal
IPM	Integrated Pest Management
IPV	Infectious Pustular Vulvovaginitis
IV	Intraveneous

K	Killed
LAST	Live Animal Swab Test
lb	pound
MFA	Medicated Feed Application
mg	milligram
MLV	Modified Live Virus
MRL	Maximum Residue Level
MSDS	Material Safety Data Sheet
MWPS	Midwest Plan Services
NADA	New Animal Drug Application
NASA	National Aeronautic and Space Administration
NBQA	National Beef Quality Audit
NIAA	National Institute for Animal Agriculture
NRC	National Research Council
NRP	National Residue Program
OSHA	Occupational Safety and Health Administration
OTC	Over-the-Counter
PI3	Parainfluenza-3
PCB	Polychlorinated Biphenyl
PCPs	Pentachlorophenols/Pentachlorophenates
PH	Physical Hazard
PHAST	Pre-Harvest Antibiotic Screening Test
PI	Persistently Infected
PRCE	Prevent, Reduce, Control or Eliminate
QC	Quality Control
RITS	Resistance, Isolation, Traffic Control, Sanitation
RNA	Ribonucleic Acid
RUP	Restricted Use Pesticide
Rx	Prescription
SOP	Standard Operating Procedure
SQ	Subcutaneous
SSOPs	Sanitation Standard Operating Procedures
T	Topical
TDS	Total Dissolved Solids
THI	Temperature Humidity Index
TQA	Total Quality Management
USDA	United States Department of Agriculture
USDA-APHIS	United States Department of Agriculture - Animal and Plant Health Inspection Service
USDA-FSIS	United States Department of Agriculture - Food Safety and Inspection Service
UV	Ultraviolet
VCPR	Veterinarian/Client/Patient Relationship
VDA	Veterinary Drug Authorization
VDO	Veterinary Drug Order
VFD	Veterinary Feed Directive
WPS	Worker Protection Standard

BQA Training Program Checklist and Personal Contract.

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

1. **(YES or NO)** 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.
2. **(YES or NO)** 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.
3. **(YES or NO)** 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.
4. **(YES or NO)** All individual treatments will be given in the neck region regardless of being administered subcutaneously or intramuscularly.
5. **(YES or NO)** All individual treatments will strictly follow only FDA/USDA/EPA guidelines and products which cause tissue damage will be avoided.
6. **(YES or NO)** Products will be administered at the lowest dosage recommended and will be administered in such a manner where there will not be more than 10 cc per IM site administered.
7. **(YES or NO)** Treatment procedures will comply with either label directions or as prescribed by a veterinarian with a Veterinarian/Client/Patient relationship.
8. **(YES or NO)** All treatments administered extra label will be kept to a minimum and when given extra label treatments are given they will comply with the prescribed extended withdrawal time.
9. **(YES or NO)** 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.
10. **(YES or NO)** 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.
11. **(YES or NO)** 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.
12. **(YES or NO)** 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 BQA program staff or other named individuals in order to determine compliance.
13. **(YES or NO)** The operation will strive to prevent bruising during animal handling.
14. **(YES or NO)** Should a previous owner request performance information of cattle, all information available will be relayed back to them.

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

Print Name _____ Date _____

Signature _____ Operation _____

BQA Trainer _____



Best Management Practices (BMPs)



Funded by
The Beef Checkoff

**A SAFE, WHOLESOME AND
HEALTHY BEEF SUPPLY**



Beef Quality Assurance™
Best Management Practices

Beef Quality Assurance: Best Management Practices (BQA:BMPs)

1.) Feedstuffs and Sources

- Ruminant By-products: Do not use ruminant-derived protein sources in manufacturing ruminant feeds.
- Feed Toxins: Store feedstuffs in a manner to prevent mold formation and avoid feeding moldy feed.
- Maintain a quality control program for incoming feed ingredients in an attempt to eliminate contamination. It is important to keep in mind that mycotoxins can be present in feeds without visible mold growth; conversely, visibly moldy feed may not always contain detectable mycotoxins.
- Feed Contaminants: Maintain a quality control program for incoming feed ingredients in an attempt to eliminate contamination resulting from molds, mycotoxins, chemicals and other contaminants.
- Store feed in a manner that prevents development of molds and mycotoxins and exposure to chemicals and other potential contaminants.
- Prior to usage, submit any feed ingredient suspected of contamination for analysis by a qualified laboratory.
- To avoid accidental livestock exposure, treat all chemicals as potential hazards. Never store chemical products where leakage or breakage can contaminate feed products or where cattle can directly consume a contaminant. For example, don't store batteries, fuel containers or paint in the same location as feedstuffs.
- Regularly check all feed-handling equipment for fluid leaks.
- Spills should be cleaned up to prevent potential contaminants from causing residues or death in cattle.
- If a feed-related poisoning is suspected, it is critical for the producer or veterinarian to contact a diagnostic laboratory for assistance in confirming the suspicion.
- If purchasing fats and oils, monitor for potential contamination. Letters of guarantee from companies supplying these materials may be requested that state these materials have been tested.

2.) Feed Additives and Medications

- Medicated Feeds: Only FDA-approved medicated feed additives can be used in rations.
- Feed only at recommended rates. Exercise caution when calculating rates for medicated feeds.
- All medicated feed additives will be used in accordance with the FDA-approved label. Extra-label use of feed additives is strictly prohibited by federal law. No one has the authority to adjust the dose as labeled, including veterinarians. All directions for the use of a medicated feed additive will be on the label attached to the bag or will be supplied with a bulk order. Water medications are not considered feed medications; therefore, they can be used under the extra-label drug use guidelines provided by the Center for Veterinary Medicine.
- Ensure that all additives are withdrawn at the proper time to avoid violative residues.
- For operations formulating and mixing rations on site, such as stocker operators, medicated feed additives will be used in accordance with the FDA current Good Manufacturing Practices (cGMPs). These include a formula record of all medicated feed rations produced and production records of all batches of feed produced that contain medicated feed additives. Production records must include additive used, date run, ration name or number, the name of the person adding the additive or responsible for mixing the feed and amount produced. Use separate mixers for mixing medicated feeds and non-medicated feeds, or clean mixers between batches of each.
- Pre-mixed or formulated supplements typically used by many smaller beef operations and most cow-calf operations do not require FDA registration of any type. Larger beef operations that use certain highly concentrated medications may be required to register with the FDA via a FD-1900 permit.
- Identify treated individuals or groups as described in the antibiotic use section.

3.) Animal Treatments and Health Maintenance

- Broken Needles: Restrain animals properly and adhere to injection site management.
- Do not straighten a bent needle and use it again. Replace immediately and dispose of properly.
- Develop a standard operating procedure for dealing with needles broken off in cattle.
 - If the needle remains in the animal, mark the location where the needle was inserted.
 - If a broken needle cannot be removed at the ranch, contact a veterinarian immediately to have the needle surgically removed.
 - If a broken needle cannot be extracted from the tissue, record the animal's ID to ensure that it is never sold or leaves the ranch. At the end of its productive life, the animal should be euthanized and disposed of properly.
- Antibiotic Use: Strictly follow all recommendations and guidelines from your veterinarian for selection of products.
- Follow label directions for use of product. Use product at recommended dosage for required time period. Treatment regimens must comply with label directions unless otherwise prescribed by a veterinarian. If drugs are to be used in an extra-label manner, that must be done under the prescription or direct supervision of a licensed veterinarian. (The requirements for a veterinarian-client-patient relationship (VCPR) are covered in the Appendix, page xyz [page tbd].) All cattle treated in an extra-label manner must comply with prescribed withdrawal times, which have been set by your veterinarian under the guidelines of a VCPR. The BQA program does not support/recommend extra-label drug use (ELDU) for injectable aminoglycosides (such as neomycin, gentamicin or kanamycin) because of the potential violative residues related to extremely long withdrawal times. Some studies have shown withdrawal times on these types of products could be as long as 18 months.
- Accurately calculate dose requirements based on the animal's weight and the specific health problem being treated. Providing the same drug simultaneously by injection, feed or water may result in overdosing and, thereby, create a residue problem.
- Never administer more than 10 cc per injection site. Exceeding this amount will increase tissue damage, alter withdrawal time and may require testing before cattle are marketed for consumption.
- Do not mix products prior to administration. This practice of using "Bloody Mary" mixes is compounding use and will result in undetermined withdrawal periods.
- All animals treated for problems unique to the individual animal should be recorded by the animal's ID, treatment date, drug and dose administered product serial/lot number, approximate weight of animal, route and location of administration, and the earliest date the animal would clear the prescribed or labeled withdrawal period. (See page xyz [page tbd] for sample treatment records). You can record treatments either by individually identifying each animal in your herd and/or individually identifying each animal when or if they are treated. The ID number should be unique to that animal and tie it to the group from which it came.
- All animals treated as part of a group will be identified by group or lot with treatment information recorded. Records should include the animal lot or group identification, processing/treatment date, product serial/lot number, product and dose administered, route and location of administration and withdrawal information. Recording animals under this system assumes that every animal in the lot or group received the treatment.
- All cattle marketed from the ranch can potentially go directly to slaughter. Therefore, records for any cattle to be marketed should be checked by ranch personnel to ensure that treated animals will meet or exceed label withdrawal times for all products administered. A release slip should be signed and dated by the person who checks records prior to shipping cattle from the operation. The examination should include processing records, feeding records, treatment records and all other records that may apply.

- Extended withdrawal times should be expected for emaciated or severely debilitated animals. All cattle sold that are not typical of the herd (medicated cull cows and realizer cattle) may be subject to verification of drug withdrawal. (Realizers are animals with a health problem that are culled because they never recover.) Should there be any question about withdrawal period, the veterinarian will evaluate the treatment history against information provided by the Food Animal Residue Avoidance Databank (FARAD), and the animal may have to pass a residue screening test, such as the Live Animal Swab Test (LAST), which tests for antibiotic residues. Residue screening will be performed by qualified personnel under the supervision of a veterinarian. The results will determine whether the animals can be released for shipment, but cannot be used to shorten the labeled withdrawal time. Attempting to salvage sick animals by treatment and prompt slaughter requires an accurate diagnosis and careful selection of drugs.
- Make sure that all employees are aware of the proper use and administration of antibiotics and withdrawal times, and they have the ability to check appropriate withdrawal restrictions before moving cattle to market. For example, you can provide your employees with charts or software to help them track withdrawal dates.

4.) Prevention and Processing

- Management: Handle cattle gently to minimize bruises.
- Don't use chemical disinfectants while using a modified live virus product as efficacy will be decreased or even eliminated.
- Use the needle size proper for the situation. Use the smallest needle possible to complete the injection, but large enough to prevent breaking off in the muscle. More information is available later in this section of the manual.
- Provide proper restraint to avoid breaking needles in animal tissue.
- Purchase high quality needles, change needles often and discard damaged needles.
- All injections must be administered in front of the shoulders, no exceptions. Select the injection site carefully. Packers report a high incidence of fabrication trim in the top butt and round. Changing the injection site to the neck prevents the loss of expensive cuts and reduces the potential for market docks.
- Administer less than 10 cc per intramuscular (IM) injection site. The volume of medication injected at one site will directly influence tissue damage, scar tissue and potential abscesses.
- Always use subcutaneous (SQ) or intravenous (IV) routes of administration when permitted by the product's label. Check product labels closely and administer the product as specified on the label. Select products that have SQ as an approved route of administration. Ask suppliers to find products that have SQ, IV or oral routes of administration rather than IM.
- Properly place implants to reduce trim loss. Implants placed too close to the ear base or into the base tissue can result in excess trim. Improperly placed implants will place regulatory liability on the feedyard. More information on administration of implants is available later in this section of the manual.
- During bad weather take extra care to see that the injection site is free of manure and dirt and that syringes and needles are clean and disinfected. Injecting cattle during wet weather increases the potential for carrying a contaminant into the injection site.
- Wetting the area around the chute will reduce the chance of contamination from dust and other foreign material in injection sites and open incisions.
- Overall sanitation of equipment, working area and the cleanliness of your employees and co-workers will reduce injection site defects. A sound educational effort directed toward sick pen and processing crews offers great potential for helping eliminate these problems.

5.) Pesticides

- Chemical Residues: Use only agricultural chemicals approved for application to land grazed by livestock or on land where feedstuffs are removed for animal consumption at a later time.
- Follow label directions and observe grazing restrictions on pastures, rangeland and crops treated with pesticides.
- Prevent accidental exposure to agricultural chemicals by proper storage and disposal of containers. Do not use the same sprayer to apply agricultural chemicals to pasture or rangeland that you use to apply livestock pesticides directly to cattle.

- Only use products approved for control of internal and external parasites of cattle. Caution should be exercised when using petrochemicals, such as motor oil or diesel fuel, in backrubbers or other self-treatment devices for control of external parasites. These compounds are routinely screened at harvest and overexposure can result in a violative residue.
- Apply topical, oral and/or injectable livestock pesticides at label dose rate. Overdosing constitutes extra-label usage with unknown withdrawal times. Individual animal weights can help determine appropriate calculation of doses.
- Document usage and observe all appropriate withdrawal times before marketing cattle. Remember that residue problems occur more frequently with cull cows/bulls and realizer cattle than for healthy calves or yearlings.
- Prevent consumption of hazardous chemicals and heavy metals by proper storage and disposal of paint, batteries, chemical containers, used petrochemical products and other materials, and make sure cattle don't have access to petrochemical production sites.
- Prevent contamination of feedstuffs by chemical compounds through proper storage of chemicals and proper treatment of stored feed products with insecticides and fungicides. These should not be stored in the same location as approved animal-use products.
- Record dates of application, areas, animals and/or feedstuffs treated, products used, product serial and lot numbers, appropriate withdrawal periods, etc. Producers may request a letter of guarantee from the feed supplier that the feed is below violative levels for residues and mycotoxins.

6.) Recordkeeping and Inventory control

- Animal Treatment Records: Keep all records for at least three years from the date of transfer or sale of the cattle. In case a problem arises later, your records will help you track the treatment history of an animal when it was in your possession.
 - The treatment record should contain the following information:
 - Treatment date
 - Animal or group identification
 - Approximate weight of animal or group average
 - Product administered
 - Product lot/serial number
 - Earliest date the animal could clear withdrawal time
 - Dose given
 - Route of administration (IM, SQ, etc.)
 - Location of injection(s)
 - Name of person who administered the drug
 - A copy of the appropriate records should be made available to the buyer of your cattle or as they are transferred from one unit of your ranch to another. Records should include all individual and group treatment/processing history and other information as deemed appropriate.
- Feed Records: Keep all feed records for at least two years (an industry standard) from the date of transfer or sale of the cattle. In case of a problem, you will have documents to prove what you have or have not fed your cattle.
 - It's a best management practice to require that all feed products be accompanied by an invoice that includes the date, amount, lot/batch number and signatures of both the person who delivered the product and the person receiving the product.
- Chemical Records: If you are a licensed pesticide applicator (required for purchasing restricted-use chemicals), your state Department of Agriculture already requires you to keep records on your use of these chemicals. These records are sufficient. An additional set of records should be maintained for non-restricted pesticides. Records should record the date and time used, product name, name of applicator and EPA product number. Additional information may be required to be recorded.

7.) Action in Case of a Violation

- If an unacceptable residue is found by FSIS, it is preferable for a joint assessment by the beef operation, the veterinarian, the nutritionist, FSIS, FDA and BQA Program personnel. Adjustment in the BMP and corrective action taken to prevent reoccurrence of such violation. All violations should be reported to the BQA Technical Advisory Committee for review and potential adjustment or updating of BQA Guidelines.

8.) Cattle Handling

- Using their natural flight zone, cattle can be moved quietly. To move forward, move toward their rear past their point of balance (shoulder). To stop or back up in chute, move forward past their point of balance.
- Handling facilities should ideally have curved chutes and round crowding pens.
- Use two or more sorting pens in front of the squeeze chute.
- Never fill a crowding pen more than three-quarters full; cattle need room to turn around.
- Cattle should move easily up the chute. If not, hanging chains, shadows, backstops, noises, dogs or people could be preventing movement.
- Cover the sides of the squeeze chute, especially the back three-quarters, to reduce balking as they enter the chute.
- Minimize your use of cattle prods (electric and others that bruise). Instead, wave sticks with plastic streamers on the end.
- Reducing stress on the animal will reduce animal injuries and sickness, employee injury and increase overall efficiency.

9.) Culling Management

- Do not market cull animals that pose a public health threat.
- Be certain that ALL animals shipped to market have cleared proper withdrawal times.
- Do not market cull animals that have a terminal condition.
- Do not send cull animals to market that are disabled.
- Market cull animals BEFORE they become severely emaciated.
- Do not market cull animals with advanced eye lesions.

10.) Carcass Quality

- The beef operation will strive to prevent bruising during animal handling.
- When possible, bruising rates will be monitored at the packing/harvest plant.
- Other carcass quality concerns at the packer level include buckshot and injection site damage.

11. Care, Husbandry and Other Considerations

- Vaccinations: Determine target pathogens.
- Select the most effective vaccine.
- Prevent exposure of vaccine to heat and UV light.
- Draw from bottle with sterile needle.
- Use quality syringes/needles.
- Inspect and maintain all working components.
- Administer proper dose.
- Use proper needle size.
- Administer recommended route (IM or SQ).
- Administer in recommended site (neck region).
- Change needles often to reduce tissue irritation.
- Always follow label directions.
- Booster all vaccines when label requires it.
- Always read directions before starting.

12. Contamination/Adulteration

- Microbial contamination - Evaluate ways to prevent fecal contamination of cattle feed or oral cavity.
- Avoid high-risk feed sources and protect feed supplies from fecal contamination.
- Observe septic leach fields and fix any broken pipes.
- Educate workers about the importance of personal hygiene near feedstuffs or feed bunks, water tanks or even pens where cattle could come in contact with tapeworm segments or eggs spread by infected humans.
- Birdshot/Buckshot: Never use a shotgun to gather cattle. Develop alternative methods to control and capture animals. If an unruly animal cannot be trapped or gathered by some other means when it reaches the end of its productive life, the animal should be euthanatized on the premise and disposed of properly (in other words, when you would normally cull the animal).
- Work with hunters to prevent shooting cattle with any weapon. Educate hunters to the potential safety concerns associated with adulterated carcasses. Remove cattle from hunting areas when possible to avoid accidental shootings.