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.

INFECTIONOUS 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

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 import 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:
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

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<thead>
<tr>
<th>Compound</th>
<th>Chlorine 0.01-5%</th>
<th>Iodine Iodophor 0.5-5%</th>
<th>Chlorhexidine 0.05-0.5%</th>
<th>Alcohol 70-95%</th>
<th>Oxidizing 0.2-3%</th>
<th>Phenol 0.2-3%</th>
<th>Quaternary Ammonium 0.1-2%</th>
<th>Aldehyde 1-2%</th>
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</thead>
<tbody>
<tr>
<td>Examples</td>
<td>Clorox</td>
<td>Tincture / Provodine</td>
<td>Novalsan</td>
<td>VikronS</td>
<td>Lysol</td>
<td>Rocal-D</td>
<td>Wavicide</td>
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<tr>
<td>Bactericidal</td>
<td>Good</td>
<td>Good</td>
<td>Very Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
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<td>Viricidal</td>
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<td>Good</td>
<td>Very Good</td>
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<td>Non-Envelope Viruses</td>
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<td>Poor</td>
<td>Fair</td>
<td>Fair-Good</td>
<td>Poor</td>
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<td>Fungicidal</td>
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<td>Good</td>
<td>Fair to Good</td>
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<tr>
<td>Effective in Organic Matter</td>
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<td>Inactivated by soap</td>
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<td>Effective in Hard water</td>
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<td>Residual activity</td>
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# Cattle Viruses with and without Viral Envelopes

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<th>Virus</th>
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<td>Malignant Catarrhal Fever</td>
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<td>Rotavirus</td>
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<td>Enteric Coronavirus</td>
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<td>Cowpox</td>
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<td>BRSV</td>
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<td>Pseudocowpox</td>
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<td>IBR / IPV</td>
<td>Yes</td>
<td>Lumpy Skin Disease</td>
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*Note:* Foot & Mouth Disease (an Aphthovirus) is a Non-Enveloped RNA virus.
BSE Prion denatured by 5.25% Na Hypochlorite & 275°F (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 herb 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
      euthanatized 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”.

BEEF QUALITY ASSURANCE™ MANUAL
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.


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:

<table>
<thead>
<tr>
<th>Injectable Viscosity</th>
<th>Route of Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SQ (1/2 - 3/4 inch needle)</td>
</tr>
<tr>
<td></td>
<td>IV (1 1/2 inch needle)</td>
</tr>
<tr>
<td></td>
<td>IM (1 - 1 1/2 inch needle)</td>
</tr>
<tr>
<td>Cattle Weight lbs.</td>
<td></td>
</tr>
<tr>
<td>&lt;300</td>
<td>300-700</td>
</tr>
<tr>
<td>Thin Example: Saline</td>
<td>18 gauge</td>
</tr>
<tr>
<td>Thick Example: Tetracycline</td>
<td>18-16 gauge</td>
</tr>
</tbody>
</table>

**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:
  - Inject in the neck region
  - Do not exceed 10 cc per intramuscular site
  - 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) 7. Skin inflammation
2. Suspects 8. Twisted stomach disease
4. Pneumonia 10. Pyemia (blood poisoning)
5. Body-cavity lining inflammation 11. Injection sites
6. Heart sac lining inflammation 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.
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
   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.
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 is 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
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 dehorners 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. Preferences, 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.
<table>
<thead>
<tr>
<th>Quality Defect</th>
<th>Incidence Rate</th>
<th>Head Affected¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer eye</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bone or lymph involved</td>
<td>0.4%</td>
<td>27,760</td>
</tr>
<tr>
<td>Prolapsed eye</td>
<td>0.2%</td>
<td>12,380</td>
</tr>
<tr>
<td>Horns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large, protruding</td>
<td>13%</td>
<td>804,700</td>
</tr>
<tr>
<td>Brains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder brands</td>
<td>5.6%</td>
<td>346,640</td>
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<tr>
<td>Rib brands</td>
<td>21.1%</td>
<td>1,306,090</td>
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<tr>
<td>Hip brands</td>
<td>36.4%</td>
<td>2,253,160</td>
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<tr>
<td>Multiple brands (2-3)</td>
<td>19.6%</td>
<td>1,213,240</td>
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<tr>
<td>Four or more brands</td>
<td>1.6%</td>
<td>99,040</td>
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<tr>
<td>Lameness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beef cows</td>
<td>11.9%</td>
<td>412,502</td>
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<tr>
<td>Beef bulls</td>
<td>18.1%</td>
<td>117,641</td>
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<tr>
<td>Dairy cows</td>
<td>14.5%</td>
<td>251,314</td>
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<tr>
<td>Arthritic joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One joint</td>
<td>7.37%</td>
<td>456,203</td>
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<tr>
<td>Two joints</td>
<td>3.97%</td>
<td>245,743</td>
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<tr>
<td>Inadequate muscle</td>
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<tr>
<td>Beef cows</td>
<td>44.4%</td>
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<tr>
<td>Dairy cows</td>
<td>72.5%</td>
<td>1,256,570</td>
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<tr>
<td>Too thin (BCS=1-2)</td>
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<tr>
<td>Beef cows</td>
<td>2.3%</td>
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<tr>
<td>Dairy cows</td>
<td>4.5%</td>
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<tr>
<td>Too fat (BCS=8-9)</td>
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<tr>
<td>Beef cows</td>
<td>4.5%</td>
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<tr>
<td>Dairy cows</td>
<td>1%</td>
<td>17,332</td>
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<tr>
<td>Bruises</td>
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<tr>
<td>Minor</td>
<td>72.4%</td>
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<tr>
<td>Medium</td>
<td>38%</td>
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<tr>
<td>Major</td>
<td>19.4%</td>
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<tr>
<td>Extreme</td>
<td>2.2%</td>
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<td>Whole carcass condemnation</td>
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<tr>
<td>Prior to slaughter</td>
<td>0.12%</td>
<td>7,428</td>
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<tr>
<td>After slaughter</td>
<td>1.06%</td>
<td>65,614</td>
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<tr>
<td>Other condemnations</td>
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<tr>
<td>Liver condemnations</td>
<td>24.1%</td>
<td>1,491,790</td>
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<td>Head condemnations</td>
<td>6.7%</td>
<td>414,730</td>
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<tr>
<td>Cow carcasses</td>
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<td></td>
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<tr>
<td>Too light (&lt;500 lbs)</td>
<td>43%</td>
<td>2,235,828</td>
</tr>
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</table>

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 0157H7, 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% x 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.
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 guage ½ - ¾ inch needles work well for SQ. 16 guage 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.

![Diagram showing the relative location of implants and vaccine](image)

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


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.