

# Beef Quality Assurance



*Oklahoma Cooperative Extension Service*

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# Beef Quality Assurance

**1<sup>st</sup> Edition**

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## History and Mission of Beef Quality Assurance

The Beef Quality Assurance (BQA) program was first implemented in 1982 by producers, the United States Department of Agriculture, and the Food Safety Inspection Service (USDA-FSIS). The purpose was to avoid violative drug residues in beef. Since that time, the BQA program has been expanded to include other factors that influence overall beef quality (Figure 1). The BQA principles are similar to those developed by Pillsbury for the quality control program for supplying food to the NASA space program. Their program, the Hazard Analysis Critical Control Point Program (HACCP), gained USDA acceptance and is presently the outline for quality assurance programs in packing houses and processing facilities.



**Figure 1 – The BQA Program is intended to maximize consumer confidence concerning beef.**

## Hazard Analysis Critical Control Points

HACCP is a process of determining what could go wrong, planning to avoid it, and documenting production practices, with the additional steps of validation and monitoring success. As of January 1, 2000, all livestock processing packing plants have HACCP programs meeting USDA guidelines. The Oklahoma BQA program is designed to bring best management practices to the farm or ranch that, along with HACCP principles applied at processing facilities, will ensure a safe, wholesome, high quality beef product for consumers.

It includes planning to avoid physical, chemical, and biological problems and documenting corrective actions. HACCP's seven principles are incorporated in this manual. They include:

1. Review of all management programs to identify production practices that affect food safety, quality, and the environment. For example, educating those who might be giving injections about the proper technique and injection location.
2. Identify the critical points where potential problems can occur and steps to prevent or control such problems. For example, storing vaccines at improper temperatures or not exposing them to continual sunlight.
3. Establish critical limits associated with each control point. For example, understanding and following withdrawal times associated with animal health products.
4. Establish control point monitoring requirements to ensure that each control point stays within its limit.
5. Establish corrective actions in the event a problem occurs. For example, training employees to avoid previous problems such as improper injection technique.
6. Establish effective record keeping procedures that document the system is working properly. For example, taking the time to complete the processing map, recording where injections are given, how much is given, who administered products, etc.
7. Establish procedures for verifying that the system is working properly. For example, periodic review of records, production practices, and treatment protocols.

### *Quality Control Points*

Using the HACCP program as a basis – finding improvements in the beef production system requires a look at control points throughout the production process. These control points are common management steps such as calving, purchasing feed-stuffs, weaning calves, and transporting cattle as

**The BQA Mission: To maximize consumer confidence and acceptance of beef by focusing the producers' attention on daily production practices that influence the safety, wholesomeness, and quality of beef and beef products through the use of science, research, and educational initiatives.**

part of an overall management scheme. It is during these control points that BQA practices should be incorporated in order to limit any potential hazards from occurring to food safety and quality.

Table 1 provides some examples of control points impacting the BQA program. For example, prevention and treatment of health disorders may occur at weaning time by administering animal health products. If properly administered during this control point, any potential food safety hazards – such as injection-site lesions or residues should be eliminated.

HACCP emphasizes identifying control points or production activities where food quality can be adversely affected. Through the efforts of the American Association of Bovine Practitioners and national and state cattlemen’s associations, national BQA guidelines have been established (Figure 2). The objective of the Oklahoma BQA program is to educate cattle producers and other industry professionals regarding the BQA guidelines and to encourage the adoption of BQA principles. The overall goal of the Oklahoma BQA program is to improve beef quality characteristics by minimizing the occurrence of violative residues, pathogen contamination, and carcass defects and by improving carcass leanness, cutability, and palatability. The Oklahoma BQA program is a cooperative effort between beef producers, the Oklahoma Beef Council, Oklahoma Cooperative Extension Service, and other

industry groups. The BQA Program acts as a catalyst to encourage use of the latest science and technology, to meet expectations about beef quality and safety.

## Industry Quality Challenges – Quality Audits

The importance of the BQA can be seen when reviewing the top quality defects identified in a series of National Beef Quality Audits. These audits were intended to document carcass characteristics and defects in the cattle harvested and processed for beef in the United States. To date, four audits have been conducted (1991, 1995, 2000, and 2005) surveying cattle that had been fed high grain diets in feed yards prior to harvest. These audits are referred to as fed-cattle or fed-beef audits. Additionally, three Market Cow and Bull Quality Audits have been conducted (1994, 1999, and 2007) to represent average characteristics and defects of non-fed sources of beef.

### Fed-cattle Quality Audits

University researchers collected data in 30 beef packing plants representing over 70% of the federally inspected slaughter in the U.S. The audits were generally conducted May through November.

**Table 1 – Examples of control points impacting the BQA program.**

Process	Control Point	Potential Quality Concerns
Breeding and genetics	Planned breeding system Sire selection Replacement female selection Culling	Carcass characteristics Health Performance Temperament
Herd health and cattle handling	Processing cows and calves: at branding at weaning Receiving breeding cattle Receiving and processing stocker cattle Shipping cattle	Bruises Drug residues Injection site lesions Carcass characteristics Health Temperament Dark cutters
Parasite control	Internal parasite control External parasite control	Injection site lesions Withdrawal times Performance Hide damage
Nutrition and grazing management	Herbicide application Blending feed Purchasing feed	Drug residues Feed additives Ruminant derived protein Thin cows
Culling management	Timely marketing Shipping culls	Carcass characteristics Bruising Condemnation Downer cows Health

## National Beef Quality Assurance Guidelines

### *Feedstuffs and Sources*

- Maintain records of any pesticide/herbicide use on pasture or crops that could potentially lead to violative residues in grazing cattle or feedlot cattle.
- Adequate quality control programs are in place for incoming feedstuffs. Programs should be designed to eliminate contamination from molds, mycotoxins or chemicals of incoming feed ingredients. Supplier assurance of feed ingredient quality is recommended.
- Suspect feedstuffs should be analyzed prior to use.
- Ruminant-derived protein sources cannot be fed per FDA regulations.
- Feeding by-product ingredients should be supported.

### *Feed Additives and Medications*

- Only FDA approved medicated feed additives will be used in rations.
- Medicated feed additives will be used in accordance with the FDA Good Manufacturing Practices (GMP) regulations.
- Follow Judicious Antibiotic Use Guidelines for more information visit <http://www.fda.gov/cvm/>.
- Extra-label use of feed additives is illegal and strictly prohibited.
- To avoid violative residues — withdrawal times must be strictly adhered to.
- Where applicable, complete records must be kept when formulating or feeding medicated feed rations.
- Feed records are to be kept a minimum of three years.
- Operator will assure that all additives are withdrawn at the proper time to avoid violative residues.

### *Processing/Treatment and Records*

- Following all FDA/USDA/EPA guidelines for product(s) utilized.
- All products are to be used per label directions.
- Extra-label drug use shall be kept to a minimum, and used only when prescribed by a veterinarian working under a Valid Veterinary Client Patient Relationship (VCPR).
- Strict adherence to extended withdrawal periods (as determined by the veterinarian within the context of a valid VCPR) shall be employed.
- Individual treatment records will be maintained with the following recorded:
  1. Individual animal or group identification
  2. Date treated
  3. Product administered and manufacture's lot/serial number
  4. Dosage used
  5. Route, location, and person administering the product
  6. Earliest date animal will have cleared withdrawal period

- Extra label drug use of aminoglycosides is strictly prohibited.
- When cattle are processed as a group record the following:
  1. Group or lot identification
  2. Date treated
  3. Product administered and manufacture's lot/serial number
  4. Dosage used
  5. Route, location, and person administering the product
  6. Earliest date animals will have cleared withdrawal period
- All cattle fed and non-fed shipped to slaughter will be checked by appropriate personnel to assure that all treated animals meet or exceed label or prescription withdrawal times for all animal health products administered.
- All processing and treatment records should be transferred with the cattle to next production level. Prospective buyers must be informed or any cattle that have not met withdrawal times.
- Records should be kept a minimum of three years.

### *Injectable Animal Health Products*

- Products labeled for subcutaneous (SQ) administration should be administered SQ in the neck region only (no exceptions, regardless of age).
- All products labeled for intra-muscular (IM) use shall be given in the neck region only (no exceptions, regardless of age).
- All products cause tissue damage when injected IM. Therefore all IM use should be avoided if possible.
- Products cleared for SQ, IV, or oral administration are recommended.
- Products with low dosage rates are recommended. For multiple injection sites, proper spacing should be followed.
- No more than 10 cc of product is administered per IM injection site.
- The dewlap is an acceptable SQ injection site location.

### *Care and Husbandry Practices*

- Follow the 'Quality Assurance Herd Health Plan' that conforms to good veterinary and husbandry practices.
- All cattle will be handled/transported in such a fashion to minimize stress, injury, and/or bruising.
- Facilities (fences, corrals, load-outs, etc.) should be inspected regularly to ensure proper care and ease of handling.
- Strive to keep feed and water handling equipment clean.
- Provide appropriate nutritional and feedstuffs management.
- Strive to maintain an environment appropriate to the production setting.
- Bio-security should be evaluated.
- Records should be kept for a minimum of three years.

Figure 2 – National Beef Quality Assurance Guidelines.

Frequencies of specific quality defects and carcass traits are shown in Table 2. Approximately 40,000 cattle are represented within each year of this data set.

Several of the quality indicators have changed over time. For example, the percentage of fed-cattle with horns has declined substantially since 1995. Perhaps the majority of this improvement is due to trends in breed selection among producers (more polled cattle), although it is also possible that more producers are dehorning cattle compared to previous years.

The frequency of branding and bruising defects has not changed significantly, while the frequency of liver, lung, head, and tongue condemnations increased substantially from 1991 to 2005. Producers may be improving management of cattle to avoid dark cutting beef because the audit data indicates a gradual decline in this defect. While percentage of cattle falling within each quality and yield category varied some from year to year, a substantial trend is not evident within this data set.

According to results from the most recent audit (2005), the sum of quality grade, yield grade, weight, and condemnations average nearly \$56 per head, or a total of over \$1 billion annually. Excessive fat and inadequate marbling were identified as the two major value loss items. Together, these two defects account for about 86% of total value losses.

**Table 2 – Frequency of carcass, hide, and offal defects and carcass traits.**

	1991	1995	2000	2005
<b>Frequency of carcass, hide, and offal defects, %</b>				
Moderate to severe mud and/or manure	-	-	26.2	16.0
Horns	31.1	32.2	22.7	22.3
One or more brands	44.5	52.3	50.7	38.0
One or more bruises	39.2	48.4	46.7	35.2
Dark cutters	5.0	2.7	2.3	1.9
Liver condemnations	19.2	22.2	30.3	24.7
Lung condemnations	5.1	5.0	13.8	11.5
Tripe condemnations	3.5	11.0	11.6	11.6
Head condemnations	1.1	0.9	6.2	6.0
Tongue condemnations	2.7	3.8	7.0	9.7
Carcass condemnations	-	0.1	0.1	0.0
<b>Carcass weight, lb</b>	<b>759.9</b>	<b>747.9</b>	<b>787.0</b>	<b>795.8</b>
<b>USDA Quality Grade, %</b>				
Prime	2.2	1.3	2.0	3.0
Choice	52.7	46.7	49.1	54.3
Select	36.9	46.7	42.3	37.3
Standard	7.6	4.6	5.6	4.1
<b>USDA Yield Grade, %</b>				
1	10.0	12.6	12.2	16.5
2	33.9	45.3	37.4	36.3
3	39.6	34.2	38.6	33.1
4	13.6	7.1	10.4	11.8
5	2.9	0.8	1.3	2.3

Source: National Beef Quality Audit.

***Inadequate marbling costs the industry \$26.81 per head of fed-cattle marketed and excessive fat and/or inadequate muscling costs the industry \$20.92 per head.***

### Market Cow and Bull Quality Audits

In 2007, audits were conducted at 23 packing plants, representing approximately 50% to 60% of the federally inspected slaughter of market cows and bulls. In this work, holding-pen audits were conducted at the packing facilities as well as slaughter-floor and cooler audits. Table 3 shows the frequencies of defects identified in the holding-pen audits.

Of particular interest is the high incidence of hide damage from brands, scratching, and scarring. In fact, 4% of beef cows had multiple brands and 7% of beef cows had at least one rib brand, which causes the greatest devaluation to the hide.

Researchers classified over 51% of the beef cows as thin to extremely thin. A high percentage of cows in thin condition are also reflected in the fact that 61% of the live animals (beef cows) were classified as having inadequate muscling. The degree of muscling in cattle can be attributed to genetics, previous plane of nutrition, and/or animal health. As cows decline in body condition, they lose muscling as well as fat. A much lower percentage of cows were classified as being obese or extremely fat.

Nearly one out of every four cows and bulls had horns. Perhaps this relatively high percentage contributes to the extremely high incidence of bruising in cow carcasses as shown in Table 4. Fifty-

**Table 3 – Frequency (%) of defects identified in holding-pen audits of non-fed cattle.**

	Percent of Cows	
	1999	2007
Eye lesions	4.3	3
Lumpy Jaw	1	0.4
Small horns and scurs	10	8.4
Large horns	13	10.8
Brands, beef cows only	60.0	31.3
Hide scratching or scarring	61.0	
Hide damage from insects	2.4	3.0
Lameness caused by arthritis or stifle joint injury	13.0	16
Inadequate muscling, beef cows only	44.4	61
Body condition score of 1 or 2 (extremely thin, beef cows only)	2.3	10.0
Body condition score of 3 or 4 (thin, beef cows only)	38.3	41.1
Body condition score of 8 or 9 (extremely fat, beef cows only)	4.5	4.2

Source: National Market Cow and Bull Quality Audit.

**Table 4 – Incidence of bruises and severity of trim loss in market cows and bulls.**

Severity of Bruises	Percent of Cows	
	1999	2007
Extreme	2.4	5.4
Major	21.6	12.4
Medium	41.7	30.9
Minor	77.2	36.7
No bruises	11.8	36.6

Source: National Market Cow and Bull Quality Audit.

three percent of bulls and 63% of cows had at least one bruise, with about 21% of bulls and 18% of cows having major and extreme bruises. Certainly, bruising can be caused by many things besides horns, such as poorly designed and maintained cattle working facilities, overzealous and impatient human handlers, and overcrowding in working facilities and trucks.

Actual carcass traits are shown in Table 5. Average carcass weight in cows was only 635 lbs, with 29% of cow carcasses weighing less than 500 lbs. Light carcasses in cows can be largely attributed to high incidence of light muscled cows in thin body condition, resulting in low dressing percent.

**Table 5 – Overall means of carcass traits in market cows and bulls.**

Carcass Trait	Cows	Bulls
Carcass weight, lbs	635	873
Muscling <sup>a</sup>	2.2	3.5
Fat thickness, inches	.25	.12
Fat color <sup>b</sup>	3.1	2.1
Dark cutters, %	1.7	2.6
Blood splash, %	2.5	-

a Muscling score is a subjective measurement (1 =1 lightly muscled, 5 = heavily muscled).

b Fat color score is a subjective measurement (1 = white fat, 6 = yellow, oily fat).

Source: National Market Cow and Bull Quality Audit.

## Meeting the Challenges – BQA Guidelines

### Management to Improve Carcass Composition and Quality

#### Fed-cattle

Improving quality and consistency of fed-beef carcasses begins first with understanding the industry targets for carcass traits and selecting carcass targets that are appropriate for the specific operation's type of cattle and production environment and/or production system. Targets for carcass defects (injection-site blemishes/lesions, bruises, dark cutters, liver condemnation, etc.) are zero. Industry targets for carcass weight, yield grade, quality grade, ribeye area, and other characteristics vary depending

on the marketing program for which the cattle are being targeted. For example, USDA currently has registered over 50 Certified Beef Programs, all of which have varying carcass targets. Specifications for each of these Certified Beef Programs can be viewed at the following Web site: <http://www.ams.usda.gov/lsg/certprog/industry.htm>.

Based on the National Beef Quality Audit data, carcass composition remains the area where the greatest amount of fed-beef value can be recaptured. Inadequate marbling costs the industry \$26.81 per head of fed cattle marketed (2005 NBQA), while inappropriate yield grades, as a result of excess fat and/or inadequate muscling, costs the industry \$20.92 per head. In order to achieve improvements in these areas, general fed-beef carcass targets are suggested in Table 6.

**Table 6 – Targets to improve fed-beef carcass characteristics.**

Trait	Target
Yield Grade	< 3.5
Quality Grade	Select and higher, A Maturity
Carcass Weight	> 600 lbs; < 950 lbs
Ribeye Area	> 11.0; < 15.5

Producers need to establish and follow a methodical plan to make significant progress in improving feed yard performance and carcass composition of their cattle. The first step in this plan should be to determine the relative performance and carcass characteristics of their cattle at present and to identify a marketing program that best fits their cattle management. For producers who typically sell calves at weaning or do not care to retain ownership on large numbers of calves, the Oklahoma Steer Feedout is available as a low-risk opportunity to gather this type of information. Information regarding the Oklahoma Steer Feedout can be found at <http://www.ansi.okstate.edu/exten/oksteer>. Producers in the trade area of the Noble Foundation may also want to consider participating in their Retained Ownership Program. Information is available at <http://www.noble.org/ag/livestock/ownership/ownership.htm>. The information gathered through this process is essential in identifying potential marketing programs that fit their cattle and production system best. Until carcass targets that are associated with various marketing programs are identified, the producer cannot establish clear goals for improvement.

Once carcass targets and current performance have been established, the second step is to use the information gathered to set clear goals for improving feed yard and carcass performance. For example, reducing average yield grade of steer progeny by .25 units within three years or increasing percentage of cattle grading average choice and above by five percentage units within

three years may be appropriate goals. The third step is to develop and initiate an action plan that will facilitate goal achievement, and the final step is to monitor progress.

Many factors are involved in determining final carcass composition (fat versus lean) and marbling. Some of the major factors known to influence carcass composition are genetics for muscularity (cutability) and marbling, time on feed, age placed on feed, nutritional history prior to being placed on feed, implant regime, season of the year, and incidence and severity of sickness. Several of these factors interact with one another to further complicate the issue.

Genetic tools, such as breed selection; within herd selection, for example culling and replacement heifer retention; sire selection; and mating systems are likely the most powerful tools available to producers in influencing feed yard performance and carcass composition. While feed yard performance and carcass composition become more important over time, care must be taken to avoid overemphasizing selection for these traits at the risk of ignoring or even damaging other important genetic traits. Cow herd reproductive performance, milk production, and mature size are examples of traits that must be balanced or improved over time while improvements in carcass composition are achieved.

Breed or breed type has a major influence on carcass characteristics. Researchers at the USDA Meat Animal Research Center chose the seven beef breeds having the greatest number of registrations in the U.S. to conduct an extensive study documenting average differences among these breeds in many traits, including carcass characteristics. Figures 3 and 4 show average percent choice and yield grade, respectively, for F1 steer progeny sired by the breed indicated. Calves sired by Angus and Red Angus had higher percentages grading choice compared to calves sired by Charolais, Gelbvieh, Limousin, Simmental and Hereford. Conversely, calves sired by exotic breeds of cattle (Charolais, Limousin, Gelbvieh, Simmental) produced carcasses with lower yield grades (higher cutability) compared to

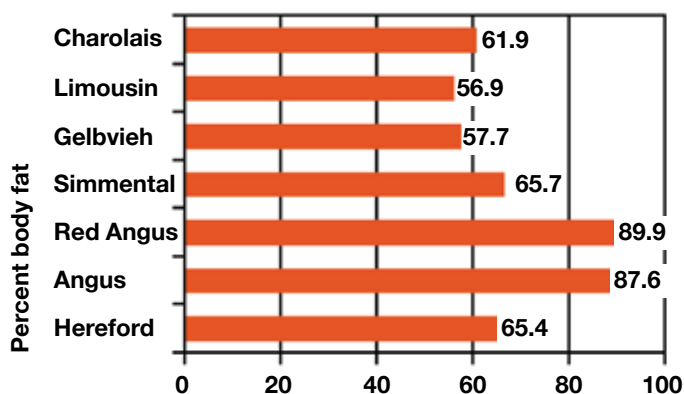


Figure 3 – Breed of sire influences on percent choice of F1 steers. Source: Cundiff et al.

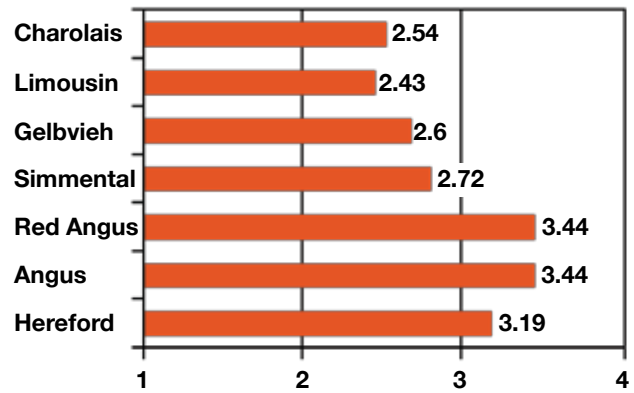


Figure 4 – Breed of sire influence on yield grade of F1 steers. Source: Cundiff et al.

calves sired by English breeds of cattle (Angus, Red Angus, Hereford).

It should be recognized that sires are available within each breed that excel in producing carcasses with higher than breed average quality grades and lower than breed average yield grades. By selecting a breed or breed combination of cattle, and by applying selection principles and mating systems appropriate for the production system and marketing program, producers can make substantial improvement in feed yard performances and carcass characteristics over time.

Age placed on feed is often thought to play a major role in feed yard performance and carcass characteristics. This variable is frequently closely related to and confounded with days on feed. It is not uncommon for cattle to be placed on feed anywhere from 2 to 18 months of age in the U.S. However, two very common production systems in Oklahoma are to place calves on feed at weaning at about 6 to 8 months of age (calf-fed) or to place them on feed as yearlings, when they are anywhere from 11- to 16-months-old. Obviously, time on feed varies dramatically depending on the rate of gain during the stocker phase, frame size of cattle, fleshiness of the cattle at different times, and market conditions. Several experiments have been conducted to document differences in carcass characteristics and feed yard performance among calf-fed versus yearling-fed production systems. In general, when cattle from both production systems are fed to a constant back fat endpoint, yearling-fed cattle, compared to calf-fed cattle, have:

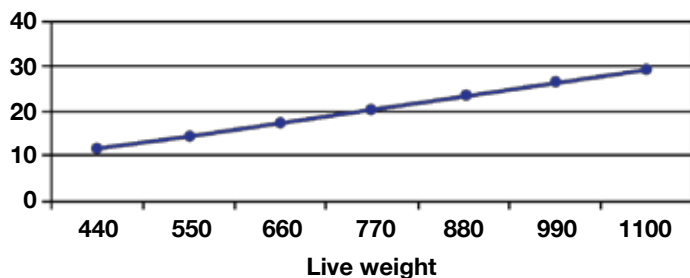
- Heavier placement weights
- Higher feed intake
- Faster rates of gain
- Poorer feed conversion
- Fewer days on feed
- Larger live carcass weight

Surprisingly, the research indicates that average quality grade and yield grade is not substantially different, again, assuming that the cattle are harvested at a constant back fat thickness. Therefore, according to this research, the choice of production

system primarily influences live carcass weight. Thus, carcass weight parameters defined in the targeted marketing program and the type of cattle (large versus medium frame) should be considered in this decision. Many other factors will be involved in this decision as well, such as market conditions and available ranch resources.

Days on feed is highly and positively correlated with live body weight, body fat (Figure 5), carcass weight, yield grade, and to a lesser extent, percent grading choice or higher. Therefore, producers can use days on feed as a powerful tool to manipulate back fat thickness and yield grade. Once again, previous history of the ranch's cattle is necessary to use as a benchmark and to determine if days on feed should be increased or decreased.

It is well documented that sickness reduces feed yard performance, carcass weight, and percentage of cattle grading choice and higher (Lalman and Smith, 2000). Therefore, any management steps taken to minimize the risk of sickness and the severity of sickness will ensure optimum feed yard and carcass performance.



**Figure 5 – Influences of weight (time on feed) on body fat composition.**

#### *Cows and Bulls*

Improving characteristics of non-fed beef carcasses is primarily an issue of market timing and culling management. Recent research (Apple, 1999) concluded that cows in a body condition score of 6 at harvest optimized returns to producers and processors, based on quality grade and lean meat yield. Therefore, cattle with physical disorders, such as arthritis and stifle joint infections should be marketed before they become excessively thin (less than body condition score 4).

Each year, producers should examine teeth or mouth cows that are 8 years of age and older. Any cow developing a broken mouth or having lost several teeth should be either marketed before she loses substantial weight and condition or put on a culling list so that she can be identified and culled at the earliest opportunity.

Managing cows to gain weight before marketing may be a profitable alternative if the animals are healthy and if high quality forages or moderate to low cost concentrate feeds are available. When healthy, thin cows are not lactating and are grazing high quality forage, such as spring and early summer grass or

**Disabled or downer cattle are no longer allowed in the food chain and should be humanely euthanized on the farm under the direction of a veterinarian.**

wheat pasture, they can gain one full body condition score in about 30 days. High concentrate feeding programs also can be used to rapidly improve body condition of thin, healthy cows. However, producers should recognize that feed conversion in mature cows is not very efficient compared to growing cattle. In fact, most studies suggest that feed conversion in thin cows receiving a high concentrate ration (85% to 95% concentrate) is in the neighborhood of 9 to 10 lbs of feed per pound of weight gain. This compares to a conversion of between 5.5 to 7 lbs of feed per pound of weight gain in calves and yearlings. Cows that do not raise a calf should be marketed before they become excessively fat.

Disabled or downer cattle are no longer allowed in the food chain and should be humanely euthanized on the farm under the direction of a veterinarian.

#### *Minimizing Dark Cutters*

Dark cutters result from preharvest stress, which depletes muscle glycogen stores. Without sufficient glycogen in the carcass, lactic acid cannot be produced to reduce the pH of the meat. The result is dark, firm, and dry lean. Inclement weather, growth promotants, genetics, disposition, and handling practices before harvest all play a role in causing dark cutters. The following list includes management strategies to minimize the occurrence of this carcass defect.

**Feedyard** - Mean percentages of dark cutters per pen differ between individual feedyards. This suggests different management, animal handling, and/or differing structural or environmental attributes of the feedyards.

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

**Environment** - The occurrence of dark cutting beef is highest during very cold weather combined with precipitation. This increases the rate of body-heat loss and elicits shivering. The incidence of dark cutters is also high in hot weather or when large fluctuations in temperature occur over short periods of time.

**Mixing Different Groups of Cattle** - Pens of cattle should not be mixed prior to harvest. Fighting to establish a new social order 24 to 48 hours prior to harvest can increase the incidence of dark cutters.

Mixing bulls can cause dark cutters within 90 minutes.

**Crowding** - Overcrowding causes physical and mental stress in livestock and results in higher incidence of dark cutters. Avoid overcrowding cattle in working and loading facilities as well as trucks and trailers.

**Genetics** - Animals vary considerably in terms of their ability to handle stress. This trait seems to be highly heritable. Cattle that are wild or easily excited and scared have a much higher incidence of dark cutters compared to more docile, calm, quiet cattle. Producers are encouraged to cull animals that do not exhibit a calm disposition.

**Castration** - Demand is limited for intact males in both feedyard and stocker settings. Beef from intact bulls has a coarser texture, lower marbling score, and more variable tenderness. Early castration will reduce the stress impact on the animal. Castration is recommended to occur between birth and four months of age.

#### *Minimizing Carcass Bruising*

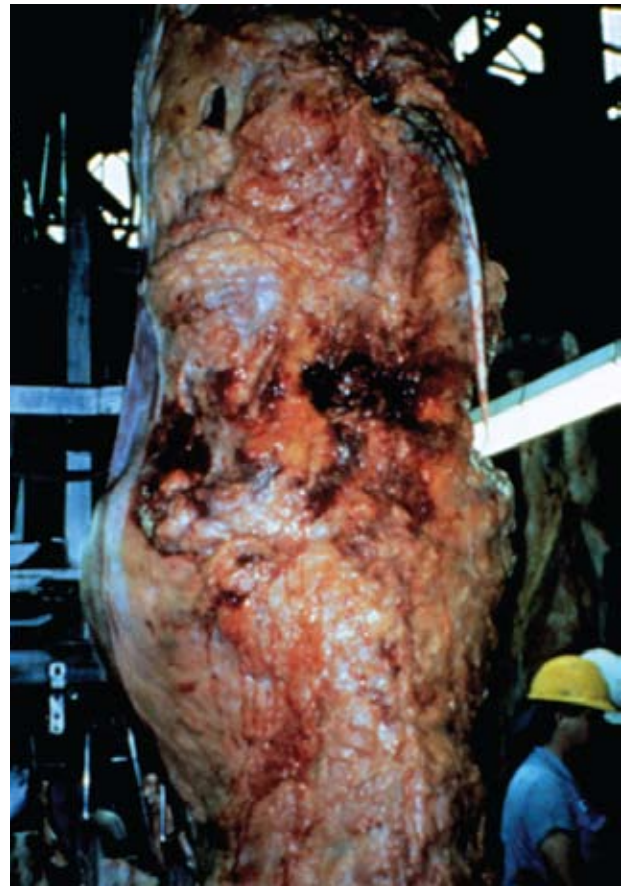
Over 47% of fed-beef and 83% of market cow and bull carcasses exhibited bruising (Figure 6). Producers can have a tremendous impact on reducing the incidence of this value-degrading defect. Bruising from improper cattle handling costs the industry \$22 million annually in carcass trim at the time of processing. Shipping fever and excess shrink caused by stress resulting from mishandling also lead to severe economic loss in the industry. An understanding of cattle behavior will facilitate handling, reduce stress, reduce bruise defects, and improve both handler safety and animal welfare.

The following suggestions should help:

**Horns** - Groups of horned cattle have more bruises than polled cattle. Tipping will not reduce bruising. Dehorning of cattle, manual or genetic, is recommended. Over-crowding horned cattle on a truck will increase bruising.

**Gates** - A common cause of loin bruises is throwing a gate into the side of an animal. A bruise will result if the animal becomes wedged between the end of the gate and the fence.

**Protruding Objects** - Broken boards, nails, and exposed bolts should be eliminated from working facilities. Check facilities by looking for shiny, rubbed spots, or tufts of hair. Sliding gates (vertical or horizontal) should be padded with large-diameter hose. Corners can be padded by cutting strips from old tires or conveyor belts.



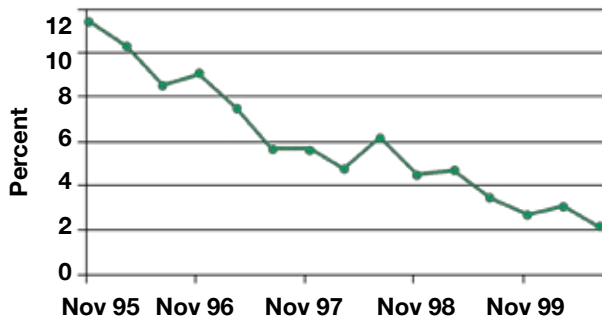
**Figure 6 – Bruises cost the cattle industry \$22 million annually.**

**Fencing** - Planks, sheet metal, or other fencing materials should be installed on the side of posts toward the cattle. If animals are being handled on both sides of the fence, install a belly rail to prevent them from catching hips on the posts. The area from 28 inches to 52 inches from the floor is the hazard zone.

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

#### *Processing, Treatment, and Use of Animal Health Products*

A series of audits designed specifically to monitor the incidence of injection-site lesions in top sirloin butts of fed-beef began in November 1995 and continued in March, July, and November of each year following. As an example of how improvement can be made with improved awareness resulting in an industry-wide management change, injection-site blemishes declined from a high of 11.4% in 1995 to a low of 2.06% in July of 2000 (Figure 7). Much of this dramatic improvement can be attributed to beef producers in each segment moving injection sites from the hip to the neck region.



**Figure 7 – Incidence of injection-site lesions in fed-beef sirloin top butts.**

However, the results of the first Market Cow and Bull Quality Audit in 1994 showed that the percent of injection-site lesions in non-fed cattle was found to be 28.9%. In the 1999 audit, which included cull dairy cows, this number increased to 40.9%; however, in the most recent 2007 audit, this number decreased to 33%. Contrary to popular belief, not all beef from market cows is marketed as ground beef. For example, ribeye rolls and rounds from market cows and bulls are used in products such as Philly Steak and roast beef sandwiches.

Moving the injection-site area to the neck stops damage to expensive steak cuts and allows easier identification of these lesions in the plant. There is a negative relationship between meat tenderness and injection sites, including injection sites that had no visible lesion. In fact, all intramuscular (IM) injections, including sterile water, create permanent damage regardless of the age of the animal at the time the product was administered. At the very least, tenderness is reduced in a three-inch area surrounding the injection site (Figure 8).

Correct administration of any injection is a critical control point in beef production and animal health. Producers can help to avoid product discounts as a result of abscesses and lesions, and maximize the effectiveness of the animal health product being used by following these simple procedures:



**Figure 8 – Fluid-filled injection-site lesion. Source: Boyles.**

***Always use SQ or IV routes of administration when permitted by the product's label.***

- Use well designed cattle restraining facilities to make the job of giving injections in the proper location safer and easier. Improper animal restraint is the cause of most bent needle problems. By providing proper restraint, the appearance of broken needles in beef products can be avoided. In the event that a needle is broken off in the neck muscle, a veterinarian should be immediately contacted and the broken needle surgically removed. 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 should animals with broken needles be sold or sent to a packer.
- Use the needle size proper for the situation (Table 7). Use the smallest needle possible to complete the injection, but large enough to prevent the needle from breaking off in the muscle. Primary considerations in needle selection include route of administration, size of animal, and location or site. Secondary consideration in needle selection includes viscosity of the fluid (how thick and tenacious the fluid is) and volume/amount of fluid injected.
- Purchase high quality needles, change needles often, and discard damaged or contaminated needles. Needles should be changed every 10 to 15 head to prevent using a dull needle and developing a burr on the end of the needle. Change needles immediately if the needle bends. Do not straighten it and use it again. Obtain a new needle if the needle in use becomes contaminated with feces or an irritating chemical. Use only a sterile needle to pull vaccine or medicine from a bottle. This keeps the contents in the bottle sterile.
- Properly dispose of used or damaged needles. Place the needles in a hard plastic or rigid cardboard container with a secure lid. Label the container Sharp Objects for Disposal.
- Give injections according to label instructions. Route descriptions follow: Subcutaneous (SQ) means under the skin, intramuscular (IM) means in the muscle, intravenous (IV) means into the blood, orally (PO and/or O) means in the mouth or in water, and (MF) indicates medicated feeds.
- 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 (SQ) as an

**Table 7 – Guidelines for needle selection for cattle.**

Injectable Viscosity	Route of Administration								
	SQ (1/2 to 3/4 inch needle)			IV (1 1/2 inch needle)			IM (1 to 1 1/2 inch needle)		
	Cattle Weight			Cattle Weight			Cattle Weight		
	<300	300-700	>700	<300	300-700	>700	<300	300-700	>700
Thin example: virus vaccine	18 gauge	18-16 gauge	16 gauge	18-16 gauge	16 gauge	16-14 gauge	20-18 gauge	18-16 gauge	18-16 gauge
Thick example: oxytetracycline	18-16 gauge	18-16 gauge	16 gauge	16 gauge	16-14 gauge	16-14 gauge	18 gauge	16 gauge	16 gauge

Select the needle to fit the cattle size (the smallest practical size without bending).

approved route of administration. Remember to tent the skin for SQ injections unless advised otherwise by the manufacturer. Ask suppliers to find products that have SQ, IV, or oral routes of administration rather than intramuscular (IM).

- All injections must be administered in front of the point of the shoulder approximately 4+ cm only, no exceptions. (Figure 9).



**Figure 9 – Correct injection site. Source: Boyles.**

- Administer less than 10 cc per IM injection site unless a larger volume is recommended on an approved label. If 24 cc is the calculated dose, use three, 8 cc injections instead of two, 12 cc injections. Properly space injections with a minimum of three inches separating injection sites from front to back not top to bottom.
- 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.
- Overall sanitation of equipment and the working area, as well as the cleanliness of your employees and coworkers will reduce injection-site defects. A sound educational effort directed toward the people handling the cattle offers great potential for helping eliminate or minimize these problems.

- Properly clean syringes and needles. The use of disposable equipment is recommended and preferred. However, if used, reusable syringes and needles and other injection equipment should be heat sterilized by boiling. Any disinfectants used, including alcohol, must be thoroughly rinsed from equipment for they will neutralize vaccine and chemically react with some antibiotics. If a disinfectant is used, syringes should be thoroughly rinsed with sterile water before use. Sterile water can be purchased. Distilled water is not sterile water. Consult your veterinarian before sterilizing equipment to make sure you are using proper techniques. Improper sterilization can reduce the effectiveness of future injections and result in infection at the injection site. Do not contaminate modified live virus products with disinfectants as efficacy will be decreased or even eliminated.

#### *Responsible Drug/Vaccine Use*

The United States Food and Drug Administration (FDA) is responsible for determining the market status of animal drugs based in part upon whether or not it is possible to prepare adequate directions for use under which a layperson can use the drugs safely and effectively. The two basic classes of drugs available to livestock producers are over-the-counter (OTC) and prescription (Rx) drugs. A drug that has significant potential for toxicity in humans or animals (or other harmful effects), which may have a unique method of use, or which requires other special considerations for its use is usually labeled as a prescription drug. Such products can be used or dispensed only by or on the order of a licensed veterinarian, and the label must bear the legend: Caution: Federal law restricts this drug for use by or on the order of a licensed veterinarian.

#### *Extra-label Drug Use*

Over the counter (OTC) drugs can be purchased from multiple sources and must be used as directed on the label. For example, most procaine penicillin

***Injections should be administered in front of the point of the shoulder.***

**Extra-label use of drugs may only take place within the scope of a valid veterinarian-client-patient relationship.**

G products are labeled for use at 1 cc/cwt and are given intramuscularly (IM). So, a 600-pound calf would get 6 cc IM. Producers are not allowed to change the dose or give it by any other route, such as subcutaneously (SQ). OTC products must be used exactly as labeled.

Extra-label use is defined as the actual or intended use of a drug in a manner that is not in accordance with the label. Under the provisions of the Animal Medicinal Drug Use Clarification Act of 1994, the FDA recognized the professional judgment of veterinarians, and allows the extra-label use of drugs (either OTC or Rx) by veterinarians under certain conditions. Extra-label use is limited to situations when the health of an animal is threatened or suffering and death may result from failure to treat, and only by or under the supervision of a veterinarian. Veterinarians may only consider using drugs (OTC or Rx) in an extra-label manner when the following conditions apply:

1. There is no approved drug that is labeled for such use and that contains the same active ingredient in the required dosage form and concentration, or a currently approved and labeled drug is clinically ineffective for its intended use (for example, drug resistant bacterial infections).
2. Prior to using or dispensing a drug in an extra-label manner, the veterinarian must:
  - Make a careful diagnosis and evaluation of the conditions for which the drug is to be used.
  - Establish a substantially extended withdrawal period prior to marketing of milk, meat, eggs, or other edible products.
  - Institute procedures to assure that the identity of the treated animal(s) is carefully maintained.

- Take appropriate measures to assure that the assigned withdrawal times are met and that no illegal drug residues occur in any food-producing animal subjected to extra-label treatment.
3. Drugs prescribed or dispensed to producers for extra-label use must have additional labeling, including at least (Figure 10):
    - The name and address of the prescribing veterinarian.
    - The name of the active ingredient(s).
    - Directions for use including identity of the animal being treated, dosage, frequency and duration of treatment, and route of administration.
    - Any cautionary statements specified by the veterinarian.
    - The veterinarian's specified withdrawal time.
  4. Extra-label use of drugs may only take place within the scope of a valid veterinarian-client-patient relationship (VCPR). A valid VCPR exists when:
    - The veterinarian has assumed the responsibility for making clinical judgments regarding the health of the animal(s) and the need for medical treatment, and the client has agreed to follow the veterinarian's instructions.
    - The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s). This means that the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s), or by medically appropriate and timely visits to the premises where the animal(s) are kept.
    - The veterinarian is readily available, or has arranged for emergency coverage, for follow-up evaluation in the event of adverse reactions or failure of the treatment regimen.

Veterinarian _____		Phone _____
Address _____	Date _____	Expires _____
Owner/Farm _____	Animal ID _____	Species _____
Active Ingredients/Concentration _____		
Quantity _____	Drug Trade Name _____	
Indications _____		
Directions - Give _____ cc/bolus/oz _____ times each day for _____ days		
Drug Withdrawal Time for Slaughter _____ days		
Test for Residues - Urine _____ Blood _____		

**Figure 10 – Example of a label that your veterinarian may give you for extra-label drug use.**

## Extra-label drug use is not permitted in animal feeds.

The privilege of extra-label use of drugs is not permitted in animal feeds. A veterinarian cannot use or prescribe drugs for use in feed in any manner except for the approved use and at the approved dosage. Extra-label use of drugs in treating food-producing animals for improving rate of weight gain, feed efficiency, or other production purposes is also prohibited. Some specific drugs are completely prohibited for extra-label use in food-producing animals including chloramphenicol, clenbuterol, diethylstilbestrol, dimetridazole, ipronidazole, other nitroimidazoles, furazolidone, nitrofurazone, fluoroquinolones, and glycopeptides.

### *Withdrawal Times*

A withdrawal time may be indicated on the label of certain medications. This is the period of time that must pass between the last treatment and the time the animal will be slaughtered or milk used for human consumption. For example, if a medication with a 14-day withdrawal period was last given on August 1, the withdrawal would be completed on August 15 and that would be the earliest the animal could be harvested for human consumption. All federally approved drugs will include the required withdrawal time for that drug on the product label or package insert. These withdrawal times can range from zero to as many as 60 days or more. It is the producer's responsibility to be aware of withdrawal times of any drugs used in their operation.

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

1. Do not market animals for food until the withdrawal time listed on the label or as prescribed by the veterinarian has elapsed.
2. Use only medications approved for cattle and exactly as the label directs or as prescribed by your veterinarian.
3. If ever in doubt, rely on the veterinarian-client-patient relationship you have established with your veterinarian. Consult your veterinarian with all questions and concerns.

### *Drug Storage*

Drugs, vaccines, implants, and other animal health products usually have specific storage requirements. Some, but not all, require refrigeration, and all should be stored in a clean place where they cannot

become dirty or contaminated. Observe and obey the manufacturer's recommended storage instructions for each product you use. Where refrigeration is needed, be sure the refrigerator is kept clean and is located in a safe, clean place that is not likely to be overheated or contaminated by dirt or manure and the temperature should be monitored with a thermometer. Animal health products should be stored away from the feed ingredient or mixing area unless they are regularly mixed feed additives. Storage of bottles of partially used medication or vaccine is discouraged because they may have become contaminated and could cause infections or tissue reactions if reused. Purchase of animal health supplies in containers holding the number of doses typically used in a day of processing animals is encouraged.

### *Syringe Care*

Inadequate vaccine syringe cleaning is frequently responsible for localized infections associated with vaccination. If the infection is severe, it may become generalized and the animal may die.

Injection-site swelling is common, especially when vaccines such as clostridial bacterins are given SQ. If the swelling is hard, it could be due to getting the subcutaneous injection too deep and penetrating part of the first layer of muscles. If this is the cause, consider using a "B-Bevel" 5/8 inch needle or a short (1/2- or 3/4- inch) regular bevel needle. The injection point on the B-Bevel needle is shorter than a regular injection needle.

Sterile disposable syringes will virtually eliminate injection-site infections. If you require multiple dose syringes, several brands of disposable sterile automatic vaccine syringes are available.

### *Syringe Cleaning Steps*

1. Clean only the **external** syringe surface with soap, water, and a brush.
2. Rinse the inside components of the vaccine syringe, including tubes and connectors with distilled or deionized water that is near the boiling point (greater than 180°F).
  - This is accomplished by drawing water that is greater than 180°F into the syringe and squirting it out. Three to five rinses should be adequate.
  - Remove as much water from the inside of the syringe as can be squirted out and let the syringe cool before using. Heat kills modified live vaccine (MLV) products.
  - DO NOT use soap or disinfectant on internal components as residues may kill MLV vaccines.
3. Store the vaccine syringe in a dust free, dry (low humidity) environment.
  - It is best if the newly cleaned vaccine syringe is stored in a new zip lock bag and placed in the freezer.



## Care and Husbandry Practices

Sound animal husbandry practices – based on research and decades of practical experience – are known to impact the well-being of cattle, individual animal health, herd productivity, and carcass quality. Because cattle are produced using a variety of management systems, in very diverse environmental and geographical locations in the United States, there is not one specific set of production practices that can be recommended for all cattle producers to implement. Personal experience, training, and professional judgment are key factors in providing proper animal care. Below are areas to consider as you put a Beef Quality Assurance system into place within your beef production enterprise.

### Biosecurity

Biosecurity is a practice designed to prevent the spread of disease by minimizing the movement of biologic organisms (viruses, bacteria, rodents, etc.) onto and within your operation. Preventing or at least minimizing cross contamination must be a primary focus of all activities on a livestock operation.

Biosecurity can be very difficult to maintain because of the very complex interrelationships between management, biologic organisms, and biosecurity. Biocontainment may be the only practical control for many diseases. While developing and maintaining biosecurity is difficult, it is the cheapest, most effective means of disease control available and no disease prevention program will work without it.

#### Assessment of Biosecurity –

#### Resist – Isolate – Traffic – Sanitation (RITS)

Resist, isolate, traffic, and sanitation (RITS) are multiple disease protection hurdles. Of all the possible breakdowns in biosecurity, the introduction of new cattle and traffic (onto and within) pose the greatest risk to cattle health. Properly managing these two factors should be a top priority on your operation. Biosecurity plans should be developed to meet the specific needs of each operation.

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

Take a close look at what can go wrong. Assess the risk – the relative significance and potential for causing a biosecurity issue – of each potential biosecurity problem.

**Do not allow foreign visitors on the farm until they have been in the country for 5 days.**

**Purchase animals from reputable seedstock producers.**

### Biosecurity and Infectious Diseases

The principle threats that could be present in beef herds include: BVD-PI, Johne's Disease, bovine leucosis, anaplasmosis, salmonellosis, leptospirosis, calf scour pathogens, tuberculosis, bangs, mastitis, trichomoniasis, vibriosis, cryptosporidiosis, neospora, noxious weeds, and bioterrorism issues. The spread of infectious disease can occur via:

- The introduction of diseased cattle or healthy cattle incubating disease.
- Introduction of healthy cattle who have recovered from disease but are now carriers.
- Vehicles, equipment, clothing, and shoes of visitors or employees who move between herds.
- Contact with inanimate objects that are contaminated with disease organisms.
- Carcasses of dead livestock that have not been disposed of properly.
- Feedstuffs, especially high risk feedstuffs, that could be contaminated with feces.
- Contaminated water (surface drainage water, etc.).
- Manure handling and aerosolized manure and dust.
- Non-livestock (horses, dogs, cats, coyotes, raccoons, other wildlife, rodents, birds, and insects).

**Maintain a closed herd if possible.**

### Implementing a Biosecurity Program

1. Controlling disease within the herd
  - Vaccinate the herd against all endemic diseases (BVD, clostridial disease, etc.).
  - Use low stress management for movement and processing. Provide ample feed, water, and shade.
  - Isolate all sick animals.
  - Maintain a closed herd, if possible.
  - Purchase feed from reputable sources.
  - Minimize fence line contact with neighboring animals.
  - Do not place cattle of different ages in the same pen.
  - Keep records of all disease occurrences.
2. Purchasing replacement animals
  - Quarantine all new animals for 30 to 60 days.
  - Test new animals for disease (BVD, Johne's Disease, salmonella, etc.).

## Test new animals for diseases.

- Purchase animals from healthy and reputable herds.
3. Environmental and pest control
    - Provide human foot baths at entrances and exits of confinement facilities.
    - Provide timely manure and dead animal removal.
    - Keep grounds and feed bunks as dry as possible.
    - Have an insect control program in practice (insects can be vectors for diseases such as anaplasmosis and bluetongue).
    - Have a rodent control program in practice.
  4. Disinfection
    - Clean and remove as much organic material as possible before disinfecting.
    - Choose a disinfectant that will work against the pathogen you want to control.
    - Be aware of any toxic, harmful, or corrosive effects of the disinfectant.
    - Follow the label on the disinfectant package.
  5. Visitors
    - Minimize the number of visitors to the facility and their contact with animals.
    - Be sure all visitors have clean clothing/coveralls, boots, and hands.
    - Be sure all vehicles or equipment brought onto the farm are disinfected.
    - Do not allow foreign visitors on the farm until they have been in the country for five days. Do not allow foreign visitors to bring clothing, foods, or accessories they have had in another country onto the farm.
  6. Employees
    - Be sure all employees understand and follow the biosecurity protocol.
    - Realize that employee owned animals (horses, dogs, etc.) can be a possible source of contamination to your facility.

### *Oklahoma Voluntary Premise Registration*

#### What is a premise?

A premise is any location where animals are managed, held, or boarded. Examples of premises include farms, ranches, feedyards, livestock markets, veterinary clinics, and livestock exhibitions sites. The objective of registering Oklahoma Premises is to protect Oklahoma agriculture by enhancing our emergency response capabilities. The ability

to quickly address animal health concerns aid in maintaining the United States participation in the global livestock markets, increases consumer confidence in our beef supply, and consequently helps safeguard the cattle producers' way of life.

#### How do I register my premise?

Applying for a premise registration is simply providing the Oklahoma Department of Agriculture, Food, and Forestry–Veterinary Services (ODAFF-VS) your basic contact information along with what species of animals you own or work with. The basic information includes your name, address, and phone numbers you would like to be contacted at; physical location of where the animals are maintained; and the species of animals you own or have present on your property. If all of your properties are continuous or within a small area, you probably only require a single premise registration. If you have properties that are physically separated by a large distance or are managed separately, you may benefit by having a premise registration for each location or operation. To register the premise, you must be or have the permission of an owner of the property. Additional premise registration information and a premise registration form can be found at [www.OKAnimalID.com](http://www.OKAnimalID.com) or contacting your local county Extension office. The information you provide is protected by Oklahoma law (Title 2, Section 4-20), which indicates that only state animal health officials may access the data and only in the event of animal theft, animal disease outbreak, or animal health emergency.

#### What is the benefit of registering my premise?

The biggest benefit to cattle owners is controlling the spread of diseases and minimizing losses. The ability to prevent or at least minimize contamination is the key to efficient, accurate, and cost-effective disease detection and control efforts. In the event of an animal disease outbreak, the ODAFF-VS will be able to contact you. This will allow them to provide you with information about the presence of a risk to your operation and how to properly protect your animals.

#### *Livestock Facilities*

Facilities (fences, chutes, shelters, etc.) should be maintained in good working condition to provide efficient movement and reduce stress when working cattle. Sharp objects and protrusions can result in bruising and should be avoided whenever possible. Equipment to restrain cattle should allow for quick and secure restraint in order to minimize stress or injury to the animal or the operator. Experienced and trained personnel should operate restraining equipment.

Consider these points when evaluating facilities:

- Keep facilities and equipment in good condition.

- Corrals, pens, and chutes should be the proper size for the number of animals and the type of processing being done.
- Corrals, pens, and barns need to be clean and well ventilated.
- Be sure there is good drainage to avoid standing water and excess manure accumulation.
- Keep equipment clean and in good repair.

Beef cattle are produced in a variety of production settings, from pasture and range, to dry lot and confinement facilities. When behavioral and physiological characteristics of cattle are matched to local conditions, beef cattle thrive in virtually any environment without artificial shelter. However, during extreme weather conditions, cattle should have access to well-drained resting areas and/or to natural or constructed shelter.

### *Cattle Handling*

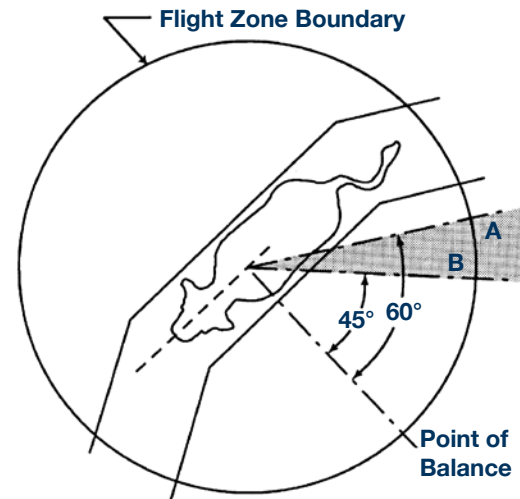
Cattle handling is of utmost importance to reduce the risk of injury and/or carcass defects in cattle. The following areas should be considered relative to animal handling:

**Animal Handling - Processing** should never be treated as a race. Working cattle too quickly can lead to bruises, injection-site damage, vaccine and drug failure, human injuries, and incorrect records. Stress induced by improper, rough handling also lowers conception rates and reduces both immune and rumen functions.

**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. Handling facilities should also be designed to eliminate shadows that may prevent cattle from entering the chutes or working alleys. Cattle have a tendency to move from dark areas to lighter areas, provided the light is not glaring. A spotlight directed onto a ramp or other apparatus will often facilitate entry. Handling facilities should be painted a uniform color because cattle are more likely to balk at a sudden change in color.

**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 (Figure 12).



**Figure 12 – Cattle flight zone. Note: Animal movement stops if handler is in position A. Handler moves to position B to start movement.**

**Hearing** - Loud noises should be avoided when cattle are being handled and particularly, recurring loud noises should be avoided in working 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.

**Curved Chutes and Solid Fences** - Curved single file chutes or working alleys are especially recommended for moving cattle into a truck or squeeze chute. A curved working system is more efficient for two reasons. First, it prevents the animal from seeing to the end of the chute until it is almost there. Second, it takes advantage of the natural tendency to circle around a handler moving along the inner radius. A curved chute provides the greatest benefit when animals have to wait in line for vaccination or other procedures. A curved chute with an inside radius of 13 to 16 ft will work well for handling cattle. 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.

**Cattle should be separated by size or gender prior to shipping and loaded into separate compartments of the trailer.**

**Handling Sick, Disabled, or Deceased Livestock** - It is the responsibility of cattlemen to humanely care for their animals and make every effort to obtain veterinary care for animals that are sick or injured. Livestock that are sick or injured and nonresponsive to medical treatment for a reasonable period of convalescence should be humanely euthanized on the farm or ranch. Moreover, cattle exhibiting symptoms of advanced disease or cattle that are non-ambulatory (downers) should not be transported to market facilities.

Euthanasia is defined as humane death occurring without pain and suffering. Techniques for euthanasia should follow guidelines established by the American Veterinary Medical Association and the American Association of Bovine Practitioners. Producers should use proper methods of disposing of deceased livestock in accordance with federal, state, and local regulations. If utilizing a rendering service, keep deceased livestock in a screened area away from public view.

#### **Cattle Handling Key Points**

1. Be aware of the flight zone for cattle. To move cattle forward, move toward their rear past their point of balance (shoulder). To stop or back up cattle in a chute, move forward past their point of balance.
2. Never fill a crowding pen more than three-quarters full; cattle need room to turn around.
3. Cattle should move easily up the chute. Avoid hanging chains, shadows, backstops, noises, dogs, or people that might prevent movement.
4. Loading ramps and handling chutes should have solid walls to prevent animals from seeing distractions outside the working area.

**Livestock that are sick or injured and nonresponsive to medical treatment for a reasonable period should be humanely euthanized on the farm or ranch under the direction of a veterinarian.**

5. Minimize the use of cattle prods.
6. Reducing stress on the animal will reduce animal injuries and sickness, reduce employee injury, and increase overall efficiency.
7. Take responsibility for handling sick, diseased, and deceased livestock properly and never send disabled livestock on a truck to a market facility.

#### *Transportation*

During the movement of cattle to and from farms, ranches, feedlots and marketing facilities, proper handling and transportation are important for the safety and welfare of the animals. When loading and unloading cattle, personnel should move cattle as quietly and patiently as possible to prevent stress or injury. Cattle should be separated by size or gender prior to shipping, and if possible, different groups loaded into separate compartments of the truck or trailer (Figure 13). To prevent livestock from falling while in transit, drivers should avoid sudden starts/stops and sharp turns. Moreover, the floors of trucks and trailers should be clean and slip resistant. While in transit, occasional stops should be made to ensure that cattle are well dispersed and still standing. Severe weather conditions must be considered when transporting livestock. As appropriate, adequate ventilation and protection should be provided during transit.



**Figure 13 – Overcrowding during transport should be avoided.**

#### *Nutrition and Feedstuffs*

##### *Nutrition*

Cattle should have access to an adequate quantity and quality of nutrients for body maintenance and growth (Figure 14). For grazing cattle, the primary



**Figure 14 – Providing a balanced diet is a critical component of BQA.**

nutrient source is forage. There are times, however, when supplementation or complete feeding is required, such as during winter when adequate forage is not available or when forage quality is low. In these cases, producers are challenged with designing a feeding or a supplementation program designed to match the forage supply. This can be difficult as nutrient requirements of cattle vary according to age, sex, weight, body condition, stage of production, and environmental temperature. Specific guidance for formulating effective supplementation programs and rations for cattle are provided through local Cooperative Extension Service offices and at the Beef Extension Web site: [www.beefextension.com](http://www.beefextension.com). Tabular values of nutrient requirements for various classes of cattle are available and tables showing typical nutrient values of common feeds are provided. Additionally, easy to use computer software is available for producers to download and use.

Cattle should have access to an adequate supply of clean water at all times. Although water requirements vary greatly, as a rule of thumb, water consumption will range from 1 gallon per 100 lbs. of body weight during cold weather, to nearly 2 gallons per 100 lbs. of body weight during hot weather.

An excellent tool to evaluate the effectiveness of an animal's current nutritional status is the body condition scoring (BCS) system (Figures 15 and 16). Scores range from 1 (very emaciated) to 9 (obese or excessively fat). The optimum range for cows at calving time is BCS 5. Cows calving below a BCS 5 produce less colostrum, lower quality colostrum, and have decreased milk production. Nutritional stress can impact the animal's health and immune system, thereby emphasizing the need for the proper balance of protein and energy to the nutritional needs of cattle.

#### *Feedstuffs*

Since most beef cattle operations purchase feeds from outside sources, quality control of the supply is a critical control point in beef quality assurance (Figure



**Figure 15 – Cow with BCS of 4.**



**Figure 16 – Cow with BCS of 7.**

17). Maintaining feed records and closely adhering to feed additive label directions and withdrawal times should also be considered critical control points. Feeding by-product ingredients should be supported with sound science. Ruminant-derived animal protein feeds are not allowed to be used under current federal law. High risk by-product ingredients include fats, rendered by-products, and other plant-based by-products such as glycerol from corn-based ethanol production. These may be single loads or batches that will be fed to cattle over a prolonged period of time. If purchasing fats and oils, monitor for potential



**Figure 17 – Quality control of the feed supply is a critical control point of BQA.**

## Follow pesticide label directions and observe grazing restrictions on pastures, rangeland, and crops.

contaminants. Letters of guarantee from companies supplying these materials may be requested that state these materials have been tested.

### Contamination from Pesticides

Pesticides are an important tool in livestock production to control insects and weeds. However, inappropriate use of these products can lead to chemical residues in beef, unsafe human exposure to chemicals, and groundwater contamination. Consequently, 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 should be used. Be sure to follow label directions and observe grazing restrictions on pastures, rangeland, and crops treated with pesticides. Store all chemicals (pesticides, lubricants, solvents) away from feed supplies (Figure 18). The final step in ensuring the safe use of pesticides is to document usage and observe appropriate withdrawal times before marketing cattle. Pesticide use records should be maintained for a minimum of three years.

Oklahoma Pesticide Law requires the registration of all pesticides distributed, sold, or offered for sale within the state. Each pesticide product must be registered annually with the Plant Industry and Consumer Services Division of the Oklahoma Department of Agriculture, Food, and Forestry. This law also provides for the sampling and chemical analysis of pesticides distributed, sold, or offered for sale in the state. Under the Pesticide Law, it is unlawful to distribute, sell, or use any registered pesticide in a manner inconsistent with its labeling.



**Figure 18 - Check the product label for grazing restrictions following application of pesticides on grazing lands.**

The Environmental Protection Agency is directed by federal law to classify all pesticides for either general use or restricted use. Pesticides classified for general use may be purchased by the general public and applied according to the label directions. Pesticides classified for restricted use may be purchased and applied only by certified applicators or individuals working under the direct supervision of a certified applicator.

A certified applicator is any individual who is certified to use or supervise the use of any pesticide which is classified for restricted use. Applicator certification is available in several classes, including: Private Applicator, Commercial Applicator, Noncommercial Applicator, and Service Technicians. Information on the appropriate certification class and certification procedures can be obtained through the local Cooperative Extension Office or through the Oklahoma Department of Food and Forestry's Plant Industry and Consumer Services Division (405-522-5984 or <http://www.oda.state.ok.us/cps-overviewhome.htm>).

### Mycotoxins

Mycotoxins are naturally occurring chemicals produced by fungi. They can be found in grains and forages, and if present in sufficient concentrations can cause reduced feed consumption, weight loss, abortions, and residues in meat and milk products. Mycotoxins can be produced in feedstuffs prior to harvesting or during storage. Mycotoxins may include: vomitoxin, aflatoxin, fumonisin, and zearalenone. The following guidelines were established by the Food and Drug Administration and the Oklahoma Animal Disease Diagnostic Laboratory for allowable concentration of aflatoxin (one of the most common mycotoxins in Oklahoma) contamination in feedstuffs for cattle:

Lactating dairy cattle	20 ppb <sup>1</sup>
Immature livestock	20 ppb
Breeding cattle	100 ppb
Finishing cattle	300 ppb

<sup>1</sup> Parts per billion.

Mycotoxin production in the field is very difficult to control (Figure 19). Drought conditions and hail frequently predispose grain to infection by toxic fungi. Consequently, incoming feed ingredients, including freshly harvested feed grains and forage, should be monitored for possible mycotoxin contamination. Storing feed and grain at low moisture content and temperatures will help prevent fungus growth. Apply chemical preservatives according to label directions to ensure complete coverage of the feed or grain. Monitor and aerate treated feed or grain as you would dry grain.

Cleanliness in feed storage facilities, transportation equipment and feeding areas should be promoted as a method to reduce possible



**Figure 19 - Mycotoxin contaminated corn prior to harvest.**

mycotoxin contamination of feeds. Remove caked and molded grain from transport trucks, storage bins, conveyors, and feeding troughs. If there is question as to the presence of mycotoxins, a feed sample should be submitted to a qualified laboratory for quantitative analysis.

#### *No Ruminant Derived Protein*

No ruminant derived protein sources can be fed. As of 1998, federal regulations prohibit the feeding of certain mammalian protein sources. The regulations primarily impact the feeding of meat meal and bone meal derived from ruminants. This restriction is a key critical control point to prevent the establishment or amplification of BSE in the U.S. through the consumption of specified risk material. Tallow, blood by-products, gelatin products, and milk products are excluded by the regulation and are acceptable for use in ration formulations.

#### *Feed Additives and Medications*

The use of medicated feeds for livestock is regulated by the FDA. Feed mills that mix certain premixes are required to register with the FDA and are subject to routine inspections. Other feed mixing facilities including on-farm mixing facilities are not required to register with the FDA, but are required to follow Current Good Management Practices (CGMPs). CGMPs include the following:

1. Facilities and equipment should be constructed and maintained to minimize vermin and pest infestation; allow proper maintenance and cleaning; accurately produce feed of intended use; and prevent accidental contamination from fertilizer, pesticides, or other contaminants.
2. Quality assurance of feed products through identification, storage, inventory control,

documented corrective actions, and adherence to label instructions.

3. Proper equipment cleanout procedures to prevent carryover.
4. Proper labeling and complete records of feed formulations.

A more complete document outlining CGMPs for nonregistered feed mills is available from the FDA at <http://www.fda.gov/cvm/default.html>.

Only FDA approved medicated feed additives should be used in rations. Extra-label use of feed additives is illegal and strictly prohibited. To avoid violative residues, withdrawal times must be strictly followed. Complete records must be kept when formulating or feeding medicated feed rations. Records are to be kept a minimum of three years.

## *Records*

### *Importance of Records*

Record keeping, either computer or hand generated, is a critical management tool. Inventory and usage records can point out inefficiencies, theft, and negligence. With today's narrow profit margins, correct inventory management is essential.

To ensure consumer confidence and maintain market share, producers must be able to document the use and safety of beef products. The industry must be able to prove that it has tight control over risk factors that have a residue potential through effective documentation. As a result, consumer confidence will be strengthened and regulatory pressures will be reduced.

Animal health products are costly items. Accurate records can highlight inefficiencies on an animal-by-animal basis and prevent ineffective administration of treatments. Furthermore, this information tells the veterinarian the treatments administered so he or she can validate treatment recommendations and adjust treatment regimes as animals and environmental conditions change.

Records are very important to business success. Regulatory inspections by FDA, USDA, EPA, or OSHA will prove the necessity of good records. Effective documentation that shows appropriate compliance with training, inventory control, use orders, animal identification, withdrawal, and disposal will help avoid liability from a residue contamination.

Computer record systems make extensive evaluation easy and efficient; however, hand-kept record systems are still very effective. Each system has its own merits and you should select the system

**Federal regulations prohibit the feeding of ruminant-derived protein.**

that is the most feasible for your beef production unit.

#### *Veterinary Drug Order*

A Veterinary Drug Order (VDO) is a veterinarian approved list of medications used in your operation that fit BQA guidelines (Figure 20 page 23).

The VDO should include all products that have a withdrawal time, including vaccines, antiparasitic drugs, and all injectables (including vitamins). When all medications, vaccines, etc. are managed as if they are prescription items an additional measure of quality assurance and safety is obtained.

All cattle medications and vaccines should be included on the VDO and should be updated at the same time the Treatment Protocol Plan is updated.

#### *Treatment Protocol Plan*

Ask your veterinarian to develop a Treatment Protocol Plan specific to your operation (Figure 21 page 24). Keep the Treatment Protocol Plan on file at the treatment facility.

This concept of a treatment protocol plan may be more familiar to feedyards and larger stocker operations. However, it is a valuable management practice for cow-calf producers as well. It is simply writing down a plan for what treatment(s) are to be used when cattle get sick for various reasons.

Also, write down your plan for follow up and/or alternative treatments if the initial treatment does not produce the desired result.

The plan should be reviewed regularly and updated at least every 90 days or as often as is appropriate. As you update the protocol plan, previous versions should also be kept on file for a year or more, so that you can refer back to treatments that have worked in previous situations. When the plan is updated, it must have your veterinarian's signature and date recorded.

#### *Why Are Treatment Records Important?*

1. Cattle not responding to therapy may require a delayed drug clearance. Good records would indicate if this was the case.
2. Extra-label drug usage is only permitted under FDA guidelines involving a veterinarian-client-patient relationship. Individual animal identification and record keeping are important.
3. Should a feedyard be cited for a residue violation and that feedyard believes a mistake in identity has been made, good records may be the only proof of compliance.
4. Records will indicate the complete listing of pharmaceutical products used at the feedyard. Accusations that certain drugs have been used can be avoided when the feedyard can prove it does not use that specific compound.

**All cattle medications and vaccines should be recorded on the Veterinary Drug Order and should be updated at the same time the Treatment Protocol Plan is updated.**

Accurate records also allow you to know exactly what is going into each animal (Figure 22 page 25) or group of animals (Figure 23 page 26). This information prevents the readministration of treatments that have previously failed to work. Furthermore, the information tells the consultant/veterinarian what treatments you are applying so they can:

- Make sure treatment recommendations are being followed.
- Judge whether treatment regimens need to be adjusted for changing animals and conditions.

Treatment records should include and be kept in the following manner:

1. Treatment records should be maintained with the following recorded:
  - Individual animal/group/lot identification
  - Date treated
  - Product administered and manufacturer's lot/serial number
  - Dosage used
  - Route and location of administration
  - Earliest date animal will have cleared withdrawal period
  - Name of person administering product
2. All cattle, including dairy beef shipped for harvest, should be checked by appropriate personnel to assure that all prescription withdrawal times for animal health products administered have been met or exceeded for animals that have been treated.
3. A copy of all processing and treatment records should be transferred with cattle to the next production level. Prospective buyers must be informed of any cattle that have not met withdrawal times.

## **Conclusion**

Producers can have a positive impact on the quality and consistency of beef products by implementing BQA guidelines. The goal of the BQA program is to assure the consumer that all cattle shipped from a beef operation are healthy, wholesome, and safe, and their management has met all government and industry standards.

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# Treatment Protocol Plan

Disorder: \_\_\_\_\_

Indications for Treatment (symptoms of affected animals): \_\_\_\_\_

## Primary Treatment

Product/Active Ingredient: \_\_\_\_\_

Dose: \_\_\_\_\_

Route of Administration: \_\_\_\_\_

Duration/Frequency of Treatment: \_\_\_\_\_

Withdrawal Period: \_\_\_\_\_

Other Comments: \_\_\_\_\_

## Secondary Treatment

Product/Active Ingredient: \_\_\_\_\_

Dose: \_\_\_\_\_

Route of Administration: \_\_\_\_\_

Duration/Frequency of Treatment: \_\_\_\_\_

Withdrawal Period: \_\_\_\_\_

Other Comments: \_\_\_\_\_

## Prevention

Product: \_\_\_\_\_

Dose: \_\_\_\_\_

Route of Administration: \_\_\_\_\_

Withdrawal: \_\_\_\_\_

Special Instructions: \_\_\_\_\_

Figure 21. Example of a treatment protocol plan. Can be copied.





# Contact Information for the Beef Quality Assurance Team

**Name**

**Phone**

**Name of Operation:** \_\_\_\_\_

\_\_\_\_\_

**Owner/Manager:** \_\_\_\_\_

\_\_\_\_\_

**Feed Employee or Company:** \_\_\_\_\_

\_\_\_\_\_

**Cattle Employee:** \_\_\_\_\_

\_\_\_\_\_

**Maintenance Employee:** \_\_\_\_\_

\_\_\_\_\_

**Office Employee:** \_\_\_\_\_

\_\_\_\_\_

**Veterinarian:** \_\_\_\_\_

\_\_\_\_\_

**Extension Educator:** \_\_\_\_\_

\_\_\_\_\_

**Nutritional Advisor:** \_\_\_\_\_

\_\_\_\_\_

**University Specialist:** \_\_\_\_\_

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**Local NRCS:** \_\_\_\_\_

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