



NAVIGATING PATHWAYS to SUCCESS



Market Cow and Bull
Executive Summary



Fellow Cattle Industry Members,

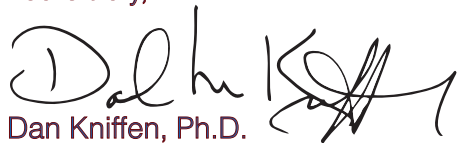
Cows and bulls are the foundation of our cattle herds. They also, however, are sources of beef that are significant and, therefore, worth understanding. Well-being is of critical importance to the animals and to us as beef producers who are stewards of their care.

Through the Beef Checkoff Program, industry experts have regularly researched the quality status of this segment of the beef chain over the past two decades. The National Beef Quality Audit that focuses on market cow and bull beef offers a robust look at ways we produce beef and bring it to market. Its far-reaching data collection provides us with sound, valuable guidance as we determine the best ways of improving the beef production capabilities of cows and bulls, as well as assuring the lives of these animals reflect the highest industry standards for beef stewardship and production.

Before 2016, the most recent Cow and Bull Audit had been conducted in 2007. We believe the research conducted in this most recent study shows we're making progress in areas highlighted as key priorities in past audits.

Our work through the Beef Quality Assurance (BQA) program, the National Dairy Farmers Assuring Responsible Management (FARM) program and other initiatives are also having an impact on industry practices. As cattle and beef producers we should be proud, yet our work is not done. As we navigate the journey of continuous improvement, we will work to adapt and strengthen our efforts to make our industry's cow and bull market the best it can be.

Yours truly,



Dan Kniffen, Ph.D.
Chairman, Beef Quality Assurance Advisory Board



Karen Jordan, DVM
Chairwoman, National Milk Producers Federation FARM
Technical Writing Group

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BACKGROUND

In the U.S. beef industry, sales of cull breeding animals now contribute up to 20 percent of operational gross revenue for both beef and dairy operations. The reasons for marketing these dairy and beef animals are varied. It is imperative that the industry understand the factors that lead to improved quality and minimized economic losses in this important component of the market.

The beef industry first conducted a market cow and bull audit in 1994 to complement the National Beef Quality Audit program for fed steers and heifers. Among the findings of the 1994 report, conducted by Colorado State University, were:

- ▶ Harvest cows and bulls were often not being marketed in a timely manner. Instead, producers showed a tendency to wait until the physical condition of cattle had deteriorated. This contributed to numerous problems down the production line;
- ▶ Beef and dairy cows frequently had inadequate muscling at harvest;
- ▶ Too many market cows were disabled prior to harvest;
- ▶ Too many market cattle and carcasses were condemned; and
- ▶ Too many carcasses had excessive bruises.

The audit concluded closer monitoring, as well as managing and marketing of herds to promote value and improve quality, could have helped producers reclaim losses. A second audit in 1999 found that the industry had made significant strides in multiple areas, including reducing condemnations, the frequency of disabled cattle, bruising, damage caused by branding, injection-site lesions and overall condition of cattle. However, more work was needed to improve beef from cows and bulls to ensure beef producers remained competitive.

“

We've come a long way since we first conducted a cow and bull audit in 1994. While our biggest successes have been the 'low hanging fruit,' our strides in more challenging areas are equally impressive." - *Strategy Session participant*

By the time another Cow and Bull Audit had been conducted in 2007, the industry had made significant improvements in five areas:

- ▶ Herd management techniques
- ▶ Animal welfare and handling
- ▶ Hide damage
- ▶ Injection-site location
- ▶ Bruises

However, the following four directives were identified for industry improvement:

- ▶ Recognize and optimize the value of market cows and bulls;
- ▶ Be proactive to ensure the safety and integrity of the product;
- ▶ Use appropriate management and handling practices to prevent quality defects; and
- ▶ Closely monitor herd health and market cattle appropriately and in a timely fashion.

The 2016 National Beef Quality Audit Market Cow and Bull research assesses the industry's progress in managing these issues and reaching its goals of increasing the value and marketability of cows and bulls.

THE RESEARCH PROCESS

As part of the 2016 National Beef Quality Audit, face-to-face interviews with 194 representatives of the different market sectors were conducted. Among topics addressed were the following:

- Definition of product attributes by each sector of the industry;
- Relative importance of various product attributes;
- Economic determination of what is important, what is not important and how much beef buyers are willing to pay for those attributes;
- Image of the industry; and
- Strengths and weaknesses of, and the threats to, the cow and bull market.

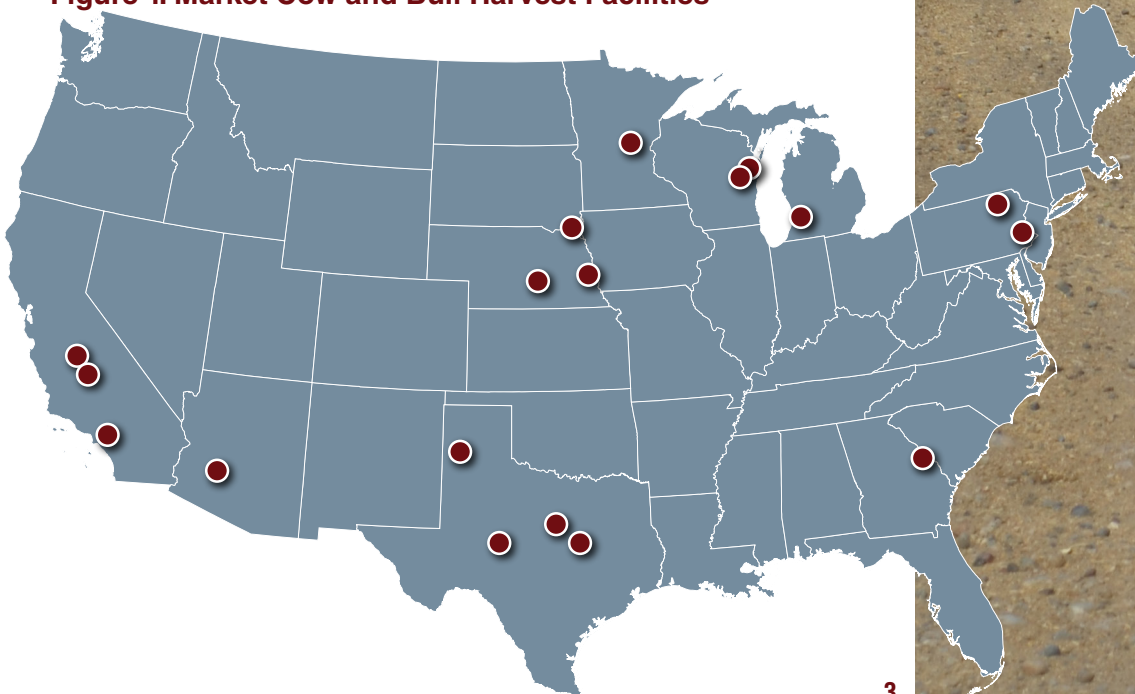
Eighteen commercial cow and bull harvest facilities located across ten states were involved in the collection of in-plant live animal, carcass and offal data from March to December of 2016 (Figure 1). This allowed the formation of an updated status report of the market cow and bull sector as it pertains to cattle transportation, mobility, and live cattle and carcass characteristics, as well as beef by-products.

Eight universities collaborated on the study. Each of the facilities surveyed were audited through an entire single production day. If the facility operated two shifts per day, cattle and carcasses in both shifts were evaluated.

“ Safety and integrity, as well as timeliness of marketing at both the ranch and dairy, are all key issues. We need to improve consumer confidence in our products.”

-Dairy Producer

Figure 1. Market Cow and Bull Harvest Facilities



FACE-TO-FACE INTERVIEWS

Though not addressed in the same way, interviews with end-users in 2007 determined that the top five cow and bull quality challenges were product uniformity, product quality, buck shot, cattle availability and injection-site lesions.

Over time, food safety, as a quality attribute, has become the most important factor to those that purchase beef (Table 1). In contrast to the fed cattle beef supply, the composition of carcasses is the second most important attribute to most buyers in the beef chain. However, it became apparent in 2016 that fewer beef buyers actually understand the types of cattle from which their products are being sourced. The beef industry needs to do a better job of helping beef buyers understand the products they're purchasing.

“ People don't know that cows and bulls supply beef to the industry.” - *Foodservice Operator*

The image of the industry among each sector varies significantly, with an equal number of packers seeing it as negative as seeing it as positive. Half of retailers and more than half of the government and trade organization (GTO) representatives saw the image of the industry as positive.

Economics, quality and value were considered strengths of the cow and bull industry, while weaknesses focused more on animal welfare aspects, with timeliness of marketing identified as a key production shortcoming by beef packers. Foodservice, GTO personnel, as well as further processors cited animal welfare as a primary weakness of the market cow and bull sector.

Table 1. Relative importance of quality attributes for cows and bulls

Trait	Packer	Retailer	Foodservice	Further Processor	GTO ¹
Food Safety	56.3%	52.3%	66.4%	62.7%	39.0%
Lean, Fat and Bone	13.4%	21.2%	11.1%	11.7%	14.0%
Eating Satisfaction	8.4%	15.9%	8.4%	8.2%	13.0%
Visual Characteristics	7.8%	6.1%	4.9%	5.3%	10.6%
Weight and Size	5.4%	1.8%	4.2%	4.9%	9.2%
How and Where Cattle were Raised	4.5%	1.5%	2.9%	4.4%	7.2%
Cattle Genetics	4.1%	1.1%	2.1%	2.7%	7.1%

¹Government and Trade Organizations



DOING DOUBLE DUTY

By Gary Smith, Ph.D.

When we started this journey of beef quality discovery for market cows and bulls in 1994, there was no set of instructions and few research guidelines. The focus on cows and bulls had historically been on production of milk and baby animals, not beef production.

Certainly, there were valid reasons for this attitude. Meat is, after all, the second contribution from the cow and bull segment of the industry after the production of milk and the replenishment of the cow herd. But that second contribution has become progressively more significant through the years, and represents an increasingly substantial segment of the beef production industry. How that beef is raised, transported and marketed continues to be an important consideration for producers today.

The industry unquestionably wants to maximize the profitability of these animals. But make no mistake: it's about more than the profits we leave on the table when we don't pay enough attention to these sources of beef. It's the humane treatment of these animals that serve other purposes; it's the respect we show for them when their lives as milk and calf producers have come to an end.

The research results in this report demonstrate that the cow and bull segment of the beef market is on the road to continuous improvement. It is a pathway, however, not a destination. We can always be better.

Ronald Reagan coined the phrase "trust but verify." It's something that's appropriate when talking about improvement. We must be proactive and work behind the scenes – through vo-ag teachers, county agents, professors, veterinarians, cattle associations, allied industry, extension and others – to assure that we are verifying our actions on cattle well-being, care and handling. Our efforts should be validated and documented by those with knowledge of the business and trust of the consumers.

Beef in the United States has a tremendous story to tell, and the work you are doing is part of that story. Being part of the Beef Quality Assurance and Dairy FARM programs and documenting your efforts through the 2016 NBQA are vital steps along the pathway to greater beef industry success.

Dr. Gary Smith, who has been involved with Quality Assurance Audits throughout their history, is a respected authority on meat, food and animal science. His advice and counsel on meat sciences and food safety are relied upon by government agencies, industry associations, private industry and international organizations throughout the world. He has served on the faculties of Washington State University, Colorado State University and Texas A&M University. He is currently a visiting professor at Texas A&M, and provided input into the 2016 NBQA Strategy Session.



TRANSPORTATION AND CATTLE MOBILITY

Methods/Procedures

Ten percent of all trucks coming to each processing facility were evaluated for type, dimension, use of compartments and use of center gate. Other information on the cattle and their transportation was gathered at that time. After unloading, more than 4,000 cattle were assessed for mobility using the North American Meat Institute's 4-point scale.

Notable Conclusions

Averaged across all loads surveyed, cattle were in transit for a duration of 6.7 hours and traveled 283.2 miles (Table 2). Generally, sufficient space as outlined by the Animal Handling Guidelines was provided. Across all load types an average of 25.3 ft² was offered for animals during transit. This matches results from 2007. The majority of cows and bulls brought to harvest in trailers are being provided sufficient trailer space, which helps to assure animal safety and welfare, while maintaining carcass value.

Table 2. Mean values for time and distance traveled, number of cattle in the loads, trailer area, and the subsequent area allotted per animal for all trailer types surveyed¹

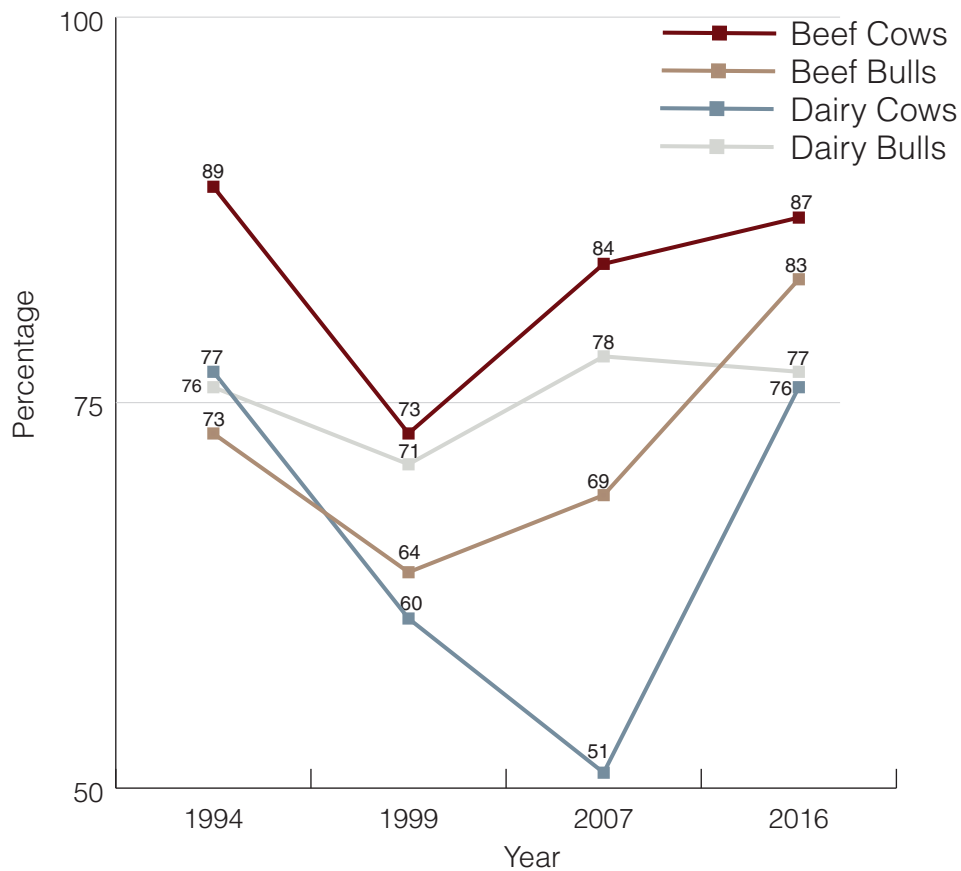
	<i>n</i>	Mean	Std. Dev.	Min	Max
Time traveled (h)	151	6.7	6.4	0.2	39.5
Distance traveled (miles)	145	283.2	273.9	2.0	1412.9
Number of cattle in load	154	26	13.4	1	47
Number of compartments used	152	4	1.7	1	7
Trailer area (ft ²)	151	360.6	110.2	96	467.5
Area allotted per animal (ft ²)	151	25.3	35.5	6.4	217.6

¹Approximately 10% of cattle trucks were sampled within a day's production at each plant.

Pot belly trailers were the primary type used to transport cows and bulls to market, followed by gooseneck trailers. Since 2007, fewer transporters are using the doghouse, a small compartment meant for hauling smaller framed cattle that is located at the back of a pot belly trailer. Use of trailer compartmental divisions suggests transporters are utilizing the features available to them to separate cattle by size to minimize carcass bruising and ensure animal welfare.

The study found that 64.4 percent of loads containing both cows and bulls did not separate the two sex groups, a slight (2.1 percent) decrease from 2007. Other studies have suggested mingling the sexes during transit could be a cause of carcass bruising.

Figure 2. Frequency distribution of cattle that were not lame



In all cattle types surveyed, the majority of cattle walked normally with no apparent lameness. This compared favorably with results from previous cow and bull audits (Figure 2).

Since 2007, there has been a 3.3 percentage point increase in sound beef cows, a 24.6 percentage point increase in sound dairy cows, and a 14.2 percentage point increase in sound beef bulls. Despite the positive soundness findings for cows, it's important for producers to be mindful of the advantage to culling cows before lameness is observed whenever possible.

“Information sharing in the industry is key. We should all be operating from the same page.” - *Cow-Calf Producer*

LIVE ANIMAL EVALUATIONS

Methods/Procedures

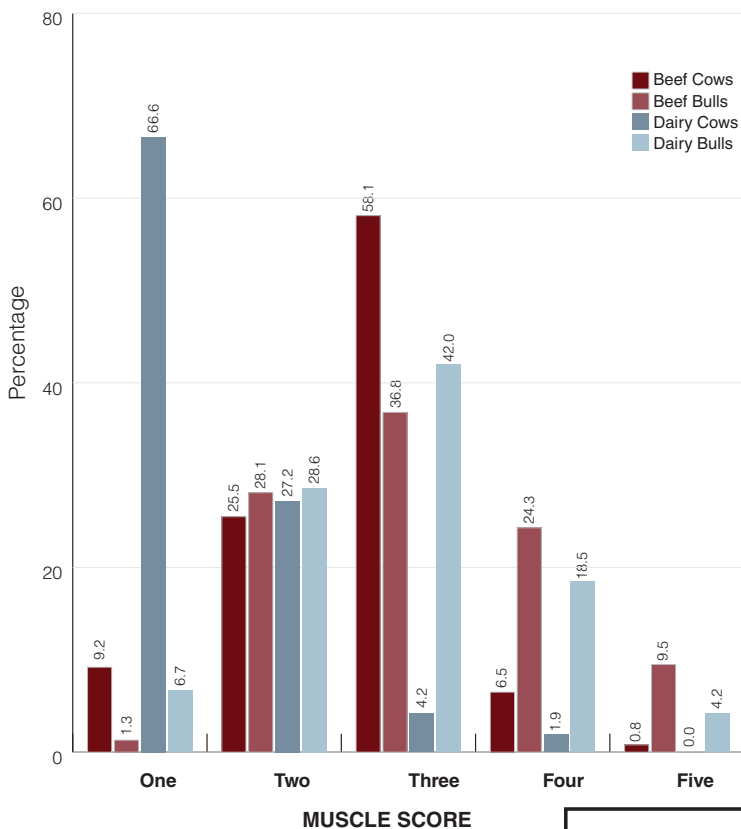
One-third of cattle processed during a production day were surveyed for live animal characteristics that may have given producers reason to market those cattle. The 5,470 cows and bulls were assigned a muscle score and a body condition score, and defects were identified and quantified to help determine the factors that lead producers to market those animals.

Notable Conclusion

Beef cows, beef bulls and dairy bulls had the highest frequency of muscle score 3, indicating average muscling (Figure 3). Nearly 67 percent of dairy cows were given the lowest muscle score – almost 32 percentage points higher than was reported in 2007. A low score is to be expected among dairy cows because they are typically lighter muscled than beef cows. Furthermore, cows are lighter muscled than bulls.

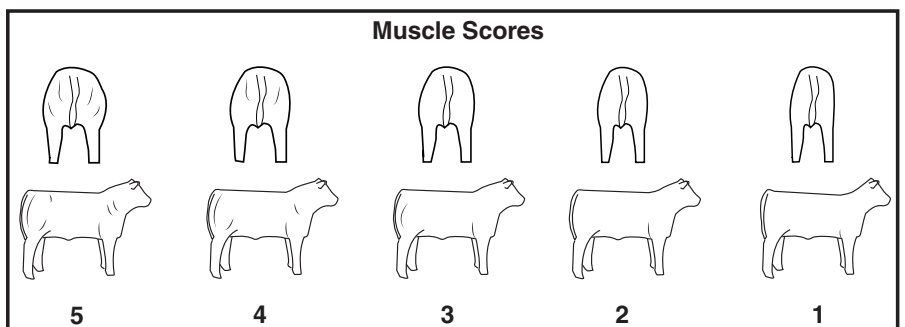
There has been a trend toward increased body condition scores in beef and dairy cows since 2007, while condition has stayed relatively constant for the bull population. In fact, body condition scores for dairy cows (scale of 1-5) improved substantially, from 36 percent with body condition score of 3 or above in 2007 to 45 percent in 2016. Although dairy cattle classified in the upper range of the dairy condition scale are being marketed, this does not suggest these animals are overly fat for some beef fabrication and retail marketing purposes. In contrast, beef cows and bulls with body condition scores (scale of 1-9) in excess of seven contribute to excessive packer trim rates.

Figure 3. Frequency of muscle scores observed in surveyed cattle



“Beef from the dairy segment of the industry is increasing. As beef producers, we play a key role in the success of the products reaching consumers.”
-Dairy Producer

Physical defects that impair reproductive efficiency, prevent an animal from maintaining herd function or result in economic losses are considerations for producers in determining market readiness of cattle. In the 2016 NBQA, the greatest majority of cattle



surveyed had no defects present when evaluated, indicating animals were culled for less visible reasons, possibly including behavior, reproductive inability or replacement of the genetic pool. In further assuring cattle well-being and product integrity, it is important for producers to market animals before health or welfare conditions deteriorate. Fortunately, data indicate producers may have been more likely to cull cattle after observing a single defect rather than holding an animal until other conditions occurred (Figure 4).

“ Foreign material, such as broken needles, can still be an issue, as can buckshot and birdshot. We should provide economic pushback down the chain to solve these issues.” -Packer

Of the cattle surveyed, 97.9 percent had no visible knots, swellings resulting from an injection of animal health products. Furthermore, of the knots visible, 44.9 percent were observed in the neck, the region in which injections should be administered in accordance with Beef Quality Assurance (BQA) guidelines. The 2016 Audit revealed that only 0.9 percent, 0.3 percent, 0.3 percent and 0.1 percent of all cattle had a knot in the neck, shoulder, top butt and round, respectively, all lesser frequencies than reported in previous audits. These results further suggest efforts have successfully reduced injection-site lesions through BQA training and producer education.

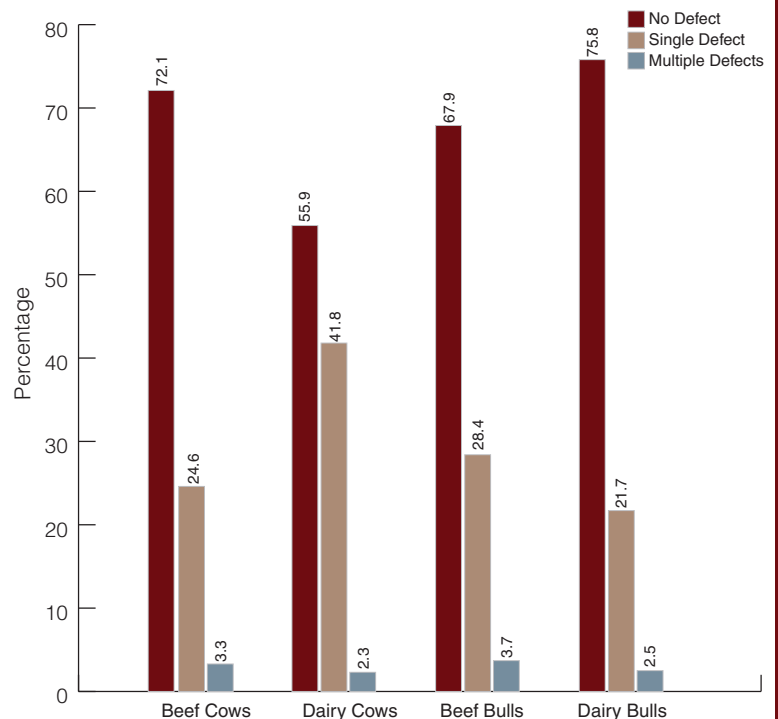
Table 3 indicates the frequency of cattle not identified or identified with either single or multiple forms of identification. The majority of cattle in the study were tagged with an individual ID ear tag. There was a higher frequency of dairy cows identified with an electronic tag than beef cows (22.1 percent versus 4.0 percent, respectively).

Table 3. Percentage¹ of identification types in surveyed cattle shown to have no ID, a single ID or multiple IDs

	All Cows & Bulls	Beef Cows	Dairy Cows	Beef Bulls	Dairy Bulls
IDENTIFICATION					
No ID	8.3	11.9	3.2	20.2	17.9
Single ID	38.6	48.3	29.0	50.1	56.0
Multiple ID	53.0	39.8	67.9	29.7	26.2

¹Percentages exceed 100% due to animals having multiple forms of identification.

Figure 4. Distribution of the number of defects observed on cattle surveyed



Terms of Note:

- **HCW:** Hot carcass weight, the un-chilled weight of the carcass after slaughter and the removal of the head, hide, intestinal tract, and internal organs. It is used to determine yield grade and dressing percentage.
- **LM AREA:** Also, referred to as ribeye area, the *longissimus* muscle is exposed when a beef carcass is ribbed between the 12th and 13th rib.
- **FT:** Refers to the thickness of subcutaneous fat at the 12th rib. The FT is used to determine yield grade.
- **ADJUSTED FT:** Measurement of subcutaneous fat taken at the 12th and 13th rib adjusted to reflect overall fat cover of the entire carcass.
- **KPH:** The internal fat surrounding the heart and kidneys and in the pelvic area; used to determine yield grade.
- **YG:** Yield grade estimates the amount of boneless, closely trimmed retail cuts from the high-value parts of the carcass – the round, loin, rib, and chuck. Rated numerically from 1-5, Yield Grade 1 denotes the highest yielding carcass and Yield Grade 5 the lowest.
- **MS:** Marbling (intramuscular fat) score is the intermingling or dispersion of fat within the lean. Degree of marbling is the primary determination of quality grade.
- **DARK CUTTER:** A carcass subjected to undue stress before slaughter. The beef appears darker and less fresh, making it undesirable to consumers.

HARVEST FLOOR ASSESSMENTS HIDE-ON EVALUATIONS



Method/Procedures

Carcasses with hides still on were selected throughout the production day to represent one-third of total production. Observations about hide color, mud, brands, and horns were recorded for 5,278 animals.

Notable Conclusions

Holstein was the overwhelmingly predominant hide color and pattern for dairy cows and bulls. Black, followed by red, was the predominant hide color for beef animals. The 2016 Audit showed an increase from 2007 in black-hided beef animals.

The percentage of cattle without mud in 2016 (56 percent - Table 4) was noticeably higher than cattle with no mud in 2007 (42.7 percent), suggesting

industry improvements in removing mud from hides prior to dressing. Packing facilities have comprehensive and costly interventions for removing mud from animals. In the end, however, presence of mud at any level could pose potential contamination, and should be minimized.

Table 4. Frequency (%) of mud amount observed in cattle surveyed¹

	All Cattle	Beef Cows	Dairy Cows	Beef Bulls	Dairy Bulls
None	56.0	54.9	57.8	52.8	48.8
Small	34.1	35.0	32.0	39.0	42.7
Moderate	8.1	8.1	8.5	6.8	6.1
Large	1.1	0.8	1.4	0.8	1.2
Extreme	0.7	1.2	0.2	0.8	1.2

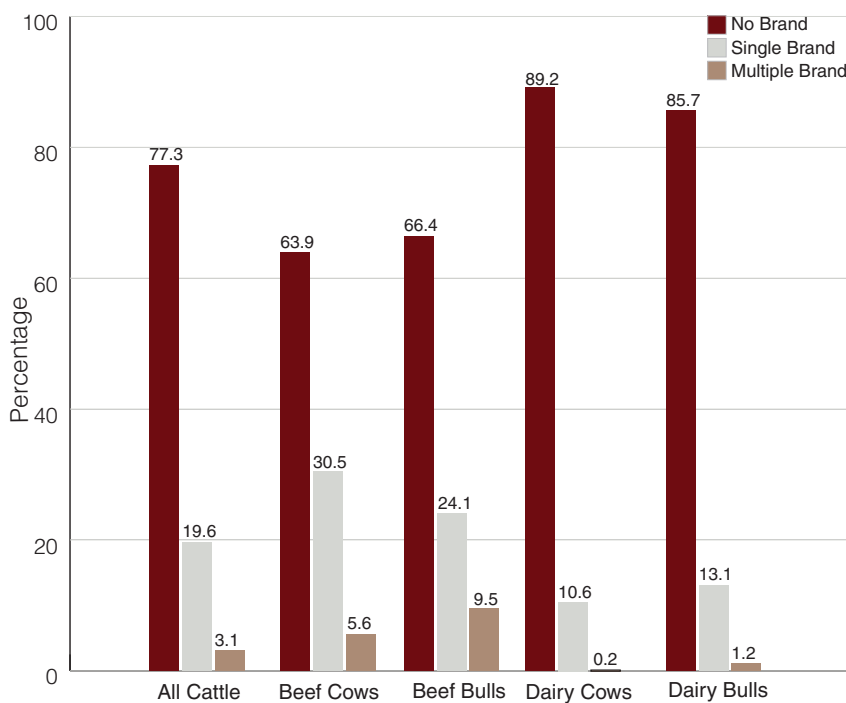
¹Mud reference scoring system: <http://meat.tamu.edu/files/2017/03/NBQA-Mud-Reference-Scoring-System.pdf>



Animal well-being is paramount in the cow and bull market. In raising, transporting and processing, the care provided to these animals should be our primary focus."

-Strategy Session participant

Figure 5. Percentage of cattle with no brands, single brands and multiple brands



While the majority of cattle had unbranded hides, 22.7 percent had at least one brand visible which is only a slight improvement (0.9 percentage point decrease) over 2007. Brands were more prevalent among beef cattle (35.7 percent) than dairy cattle (10.7 percent) (Figure 5) as expected because branding is a management practice that is not utilized heavily in the dairy industry. Producers can minimize the value loss due to branding by placing brands on the butt or shoulder rather than the side.

A majority of beef cows (90.3%), dairy cows (87.9%), beef bulls (82.7%), and dairy bulls (69.0%) were not horned. This is a positive increase in percentage points from that reported in 2007 for beef cows and bulls and dairy bulls, suggesting producers understand the effect of horns on carcass bruising.

HARVEST FLOOR ASSESSMENTS HIDE-OFF EVALUATIONS

Method/Procedures

Over 5,500 carcasses were selected and evaluated for the incidence, location, and severity of bruising. Recorders stationed near the USDA-FSIS personnel evaluated livers, viscera, kidneys, lungs, and hearts for condemnation. If surveyed offal items were condemned, the reason was noted. Heads were evaluated for condemnation by USDA-FSIS or trimming by plant personnel with reason for condemnation or trimming recorded. Surveyed cows were assessed for fetal presence and approximate fetal age/size.

Notable Conclusions

Although more than half of the cow carcasses surveyed in the audit were bruised, the largest majority possessed a bruise of minimal severity, meaning less than 1 pound of surface trim would be removed due to the bruise damage (Table 5). The significant industry improvements made in bruise reduction – particularly from 1999 to 2007 – could be attributed to the identification of bruising in the 1999 National Market Cow and Bull Beef Quality Audit as an important quality limitation for the industry. Based on the results of the 2016 audit, there is still opportunity for improvement to decrease the prevalence of carcass bruising.

Of bruises reported in cows, the greatest percentage were located on the round or sirloin. Bulls tended to have a higher frequency of bruises on the brisket, plate, and flank regions. Bruise location is often a result of handling practices and facility design that cattle experience 24 hours prior to harvest. Continued emphasis on proper cattle handling to reduce both the severity and frequency of bruising could increase the value of beef carcasses.

Table 5. Frequency¹ of carcass bruise severity over the past twenty-two years in cows and bulls

	1994	1999	2007	2016
COWS	n= N/A	n= 4,848	n= 5,092	n= 4,262
No bruise	20.3	11.8	36.6	35.9
Minimal	51.5	77.2	36.7	67.3
Major	53.9	41.7	30.9	45.1
Critical	30.7	21.6	12.4	4.9
Extreme	-	2.4	5.4	1.4
BULLS	n= N/A	n= 831	n= 477	n= 389
No bruise	63.8	47.1	46.8	57.1
Minimal	25.3%	44.4	31.5	42.4
Major	19.5	16.7	20.1	21.9
Critical	7.4	6.9	11.5	1.5
Extreme	-	1.0	7.6	0.3

¹Percentages do not add to 100% because some animals possessed multiple bruises, some of varying severity.

Bruise size key

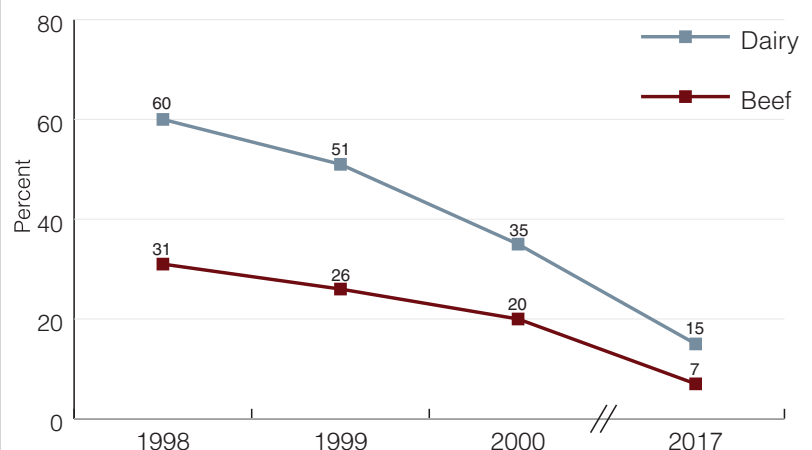
Minimal	< 1 lb surface trim loss
Major	1-10 lb trim loss
Critical	> 10 lb trim loss
Extreme	Entire Primal

Additional research was conducted in 2017 at seven of the NBQA Market Cow and Bull packing plants to determine the presence of injection-site lesions using the slice audit procedure used during the 1998 – 2000 injection-site lesions audits (Roeber et al., 2002)¹. In each facility, nearly 200 outside rounds identified as being from beef or dairy carcasses were selected, sliced into approximately 1-inch slices and examined for the presence of injection-site lesions.

The frequency of injection-site lesions has decreased 13 percentage points in beef-type carcasses (677 evaluated) and 20 percentage points in dairy-type carcasses (623 evaluated) since the 2000 injection-site audit.



Figure 6. Incidence of injection-site lesions in the round



¹ Roeber, D. L., R.C. Cannell, W.R. Wailes, K.E. Belk, J.A. Scanga, J.N. Sofos, G.L. Cowman, and G.C. Smith. 2002. Frequencies of injection-site lesions in muscles from rounds of dairy and beef cow carcasses. J. Dairy Sci. 85:532-536.

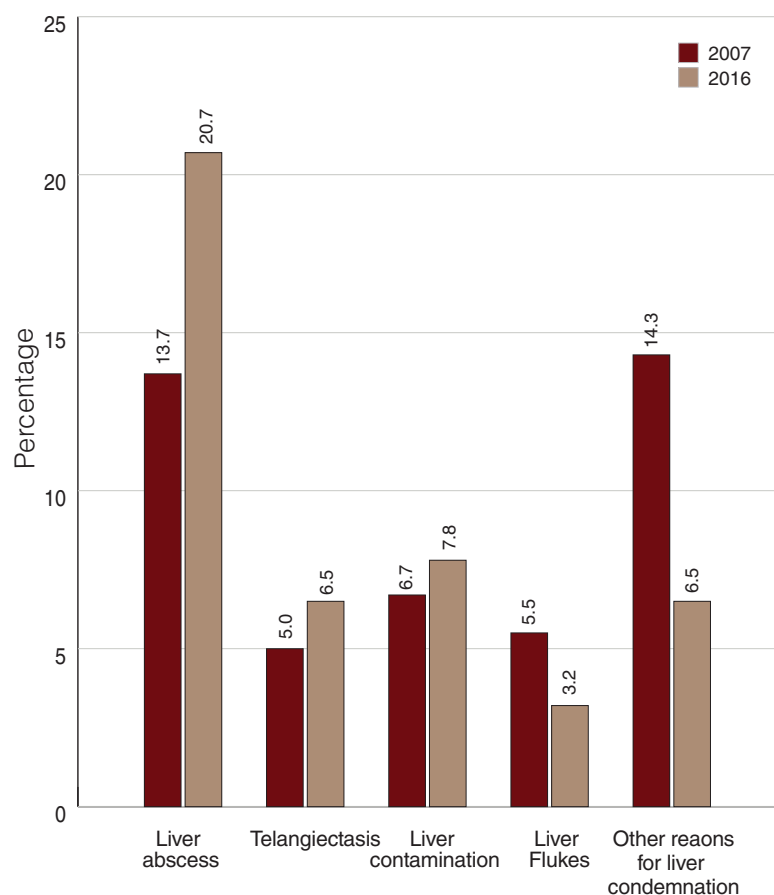
HIDE-OFF EVALUATIONS *Cont'd*

The liver condemnation rate in the present study was similar to the 2007 audit, with both condemnation frequencies being higher than the 1994 and 1999 studies. Liver abscesses were the leading cause of liver condemnations in 2016 (Figure 7).

Lungs were condemned from nearly one-quarter of the carcasses surveyed, most often for contamination. Hearts (15.5%) and viscera (10.1%) were also most often condemned for contamination. The rate of both head and tongue condemnations declined since 2007. The fact that tongue condemnations decreased by 4.1 percentage points while tongue trimming increased by 8.5 percentage points may reflect changes in USDA-FSIS inspection protocol.

To help document the incidence of bred cows being harvested, the audit detailed the presence of fetuses in surveyed cows, finding that 17.4 percent were pregnant at the time of harvest. In 2007, 10.7 percent of cows were pregnant at the time of harvest. While valid reasons for marketing these pregnant animals may exist, there may also be opportunities to capitalize on increased calf crops by checking further for pregnancy in the cow herd.

Figure 7. Frequency distributions for specific liver condemnations from all carcasses sampled in NBQA Market Cow and Bull 2007 and 2016



COOLER ASSESSMENTS

Methods/Procedures

Hot carcass weight (HCW), longissimus muscle (LM) area, lean and skeletal maturity, degree of marbling, preliminary yield grade, kidney, pelvic and heart fat (KPH), and quality defects were recorded in 4,285 selected carcasses. Carcass muscle score and fat color score were assigned, and the number of arthritic joints on each surveyed carcass was assessed in the cooler.

Notable Conclusions

Overall mean carcass trait values for dairy cows and bulls and beef cows and bulls for both 2007 and 2016 can be found in Table 6. There was an increase in the average fat thickness in beef cow, beef bull, and dairy bull carcasses, yet a decrease in the average fat thickness in dairy cow carcasses since 2007. From the time of the last audit, the average beef cow and dairy cow carcass weight increased, while the average dairy bull carcass weight decreased. In addition, average LM area increased slightly in beef and dairy cow and dairy bull carcasses.

The largest portion of beef and dairy cow carcasses manifested Slight amounts of marbling within the ribeye, with fewer beef cow carcasses achieving lower marbling scores (Traces and Practically Devoid) than what was reported in 2007. Even though beef and dairy bulls had a mean marbling score that was lower than their cow carcass counterparts, there was an increase in the percentage of both beef and dairy bull carcasses that achieved Slight marbling since the last audit was conducted. These changes indicate there was an improvement in beef quality within the market cow and bull beef sector.

The average carcass muscle score for beef cow (2.4), dairy cow (1.8), beef bull (3.0), and dairy bull (2.7) carcasses indicate carcasses are more often light muscled (score 1) than they are heavy muscled (score 5). Even so, beef and dairy cow carcass muscle distributions have shifted upwards toward average muscling (score 3) since 2007. The majority of carcasses surveyed garnered a fat color score of 2 (6-point scale; 1 = white fat, 6 = yellow fat). Finally, there was very little incidence of arthritic joints; 98.7 percent of carcasses were free of arthritic joints. This is a 4.9 percent increase since 2007.

Table 6. Means for USDA carcass grade traits from the two most recent National Market Cow and Bull Beef Quality Audits

Trait	2007 ^a	2016 ^b
Beef Cows		
USDA yield grade	2.6	3.1
Adjusted fat thickness, in	0.25	0.29
HCW, lbs	634.9	684.3
LM area, in ²	9.5	10.0
KPH, %	0.3	1.5
Marbling Score	SL ¹⁴	SL ⁴⁶
Overall Maturity	D ⁸²	D ⁴³
Dairy Cows		
USDA yield grade	2.8	2.8
Adjusted fat thickness, in	0.22	0.17
HCW, lbs	648.8	667.5
LM area, in ²	9.7	10.0
KPH, %	1.1	1.8
Marbling Score	SL ⁸⁸	SL ⁶⁷
Overall Maturity	D ²⁵	C ⁸⁷
Beef Bulls		
USDA yield grade	1.6	2.4
Adjusted fat thickness, in	0.12	0.14
HCW, lbs	873	876.4
LM area, in ²	14.1	12.2
KPH, %	0.2	1.1
Marbling Score	TR ²⁸	TR ⁵⁸
Overall Maturity	C ⁹⁴	C ⁹⁹
Dairy Bulls		
USDA yield grade	1.9	2.0
Adjusted fat thickness, in	0.07	0.10
HCW, lbs	927.9	820.6
LM area, in ²	11.7	12.0
KPH, %	0.6	1.2
Marbling Score	TR ⁹⁰	TR ⁷³
Overall Maturity	C ⁶⁷	C ⁶⁰

^a Total number of observations were: beef cows (n=1,315), dairy cows (n=1,320), beef bulls (n=245), dairy bulls (n=95).

^b Total number of observations were: beef cows (n=1,735), dairy cows (n=1,714), beef bulls (n=213), dairy bulls (n=59).



STRATEGY SESSION

More than 70 individuals representing every sector of the beef industry met in Denver, Colo., December 13-15, 2016, to review results of both the 2016 National Beef Quality Audit for Steers and Heifers and the 2016 National Beef Quality Audit for Cows and Bulls. Implications for the U.S. beef industry of this research was discussed. Outcomes from that meeting provide quality guidance to the industry for the next five years.

During the event, a break-out session for the cow and bull sector was conducted, at which factors affecting the cow and bull beef market were discussed. Among aspects addressed were the need for:

- ▶ More timeliness in the marketing of animals at both ranch and dairy based on defects and other factors identified in the research of the 2016 Audit;
- ▶ Appropriate changes to placement and size of brands on the ranch – recognizing legal requirement limitations in many states;
- ▶ Addressing the appropriate site for injections with the veterinarian community, particularly veterinary students and beginning veterinarians;
- ▶ Greater coordination among veterinarians and commercial producers of injection ingredients and materials to ensure promotion of BQA principles and consideration of meat quality;
- ▶ More effective communication with those that transport or purchase animals about their right to refuse to transport or purchase animals they do not deem fit for transport; and
- ▶ Remaining diligent in educating on the principles of Beef Quality Assurance.

“ We have a great story to tell in Beef Quality Assurance, but we need to be telling that story more aggressively to consumers.” *Seedstock Producer*

“ Every operation should have a BQA implementation plan. There is no good reason for ignoring this important program.” *-Cow-Calf Producer*

Significant improvements have been made in cow and bull quality – especially on the dairy side. The National Dairy Farmers Assuring Responsible Management (FARM) program, developed in 2009 by the National Milk Producers Federation with support from Dairy Management, Inc., has raised the quality bar for the entire dairy industry, creating a culture of continuous improvement. Efforts to extend FARM and BQA training have benefited cattle welfare, meat quality and industry profitability and should be continued if not expanded.

LOST OPPORTUNITIES

Lost opportunities for the National Beef Quality Audits are calculated for each audit to give perspective to the value of the quality defects identified during the in-plant assessments. The prevalence of various defects that impact the value of cows and bulls is used, along with average prices from 2016 to calculate the lost opportunities. Challenges arise in each audit during this exercise as prices sometimes aren't reported or changes in data collection occur over time. There is a large increase in lost opportunities from 1999 to 2016. The biggest driver in this change is the increase in value for virtually all of the products, including by-products, associated with cows and bulls.

Table 7. Lost opportunities in quality issues for Market Cow and Bull NBQA-1994, 1999, and 2016 (using 2016 prices)

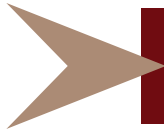
	2016	1999	1994
Whole Cattle/Carcass Condemnations	\$-6.82	\$-4.11	\$-11.99
Head, Tongue, Heart and Liver Condemnations	\$-2.56	\$-1.90	\$-1.75
Hide Defects (Brands and Latent Defects)	\$-7.47	\$-6.27	\$-6.92
Arthritic Joints	\$-1.89	\$-9.72	---
Bruises	\$-3.41	\$-2.24	\$-3.91
Injection-Site Lesions (rounds only in 2016)	\$-0.10	\$-1.46	\$-0.66
Yellow Colored External Fat	\$-12.47	\$-6.48	\$-2.27
Dark Cutters	\$-1.35	\$-1.41	\$-0.06
Inadequate Muscling	\$-31.59	\$-18.70	\$-14.43
Excess External Fat	\$-55.11	\$-10.17	\$-17.74
Total	\$-122.77	\$-62.46	\$-59.73

FINAL CONCLUSIONS

Overall, the National Beef Quality Audit Market Cow and Bull demonstrated there have been improvements in the market cow and bull beef sector since 2007. Additional progress can still be made by focusing on:

- ▶ Food safety, as it has become the most important factor to those who purchase beef;
- ▶ Appropriate management of cull cows and bulls to increase muscle condition before harvest;
- ▶ Culling animals before physical defects are too severe and cause animal welfare concerns or carcass condemnations;
- ▶ Seeking to better understand causes of liver abscesses, the leading reason for liver condemnation;
- ▶ Implementing measures to eliminate carcass bruising on the farm, in transport and at the harvest facility; and
- ▶ Reducing defects as quantified in “lost opportunities” to allow the cow and bull industry to capture additional value.

Additional emphasis on education contained in the Dairy FARM and Beef Quality Assurance programs can further propel the momentum of the cow and bull industry.



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COLORADO STATE UNIVERSITY

Principal Investigators

Keith E. Belk
Dale R. Woerner
Robert J. Delmore, Jr.
Jennifer Martin

Graduate Students

Josh D. Hasty

OKLAHOMA STATE UNIVERSITY

Principal Investigators

Deb L. VanOverbeke
Gretchen G. Mafi

Graduate Students

Morgan M. Pfeiffer

TEXAS A&M UNIVERSITY

Principal Investigators

Jeffrey W. Savell
Dan S. Hale
Davey B. Griffin
Christopher R. Kerth
Ashley Arnold

Graduate Students

Clay Eastwood
Courtney Boykin
McKensie Harris

NORTH DAKOTA STATE UNIVERSITY

Principal Investigators

Rob Maddock

UNIVERSITY OF FLORIDA

Principal Investigators

D. Dwain Johnson
Chad C. Carr
Jason M. Scheffler

UNIVERSITY OF GEORGIA

Principal Investigators

T. Dean Pringle
Alex Stelzleni

UNIVERSITY OF NEBRASKA

Principal Investigators

Ty Schmidt

WEST TEXAS A&M UNIVERSITY

Principal Investigators

Ty Lawrence
Trent McEvers

COLLABORATORS

AGRICULTURAL MARKETING SERVICE - UNITED STATES DEPARTMENT OF AGRICULTURE

Joel Gottlieb

NCBA STAFF COORDINATORS

Josh White
Jesse Fulton
Chase DeCoite
Walt Barnhart
Betty Anne Redson
Grace Webb
Kirby Brincefield





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FOR MORE INFORMATION CONTACT:

National Cattlemen's Beef Association
Contractor to the Beef Checkoff Program
9110 East Nichols Ave.
Centennial, CO 80112

303.694.0305
www.ncba.org

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