

# Getting the Most From Your Dairy Beef

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Most dairy producers have focused their management expertise on production of milk, not meat, and their food quality and safety efforts on milk products. Dairymen receive 4% (vs. 16% for cow/calf producers) of their gross revenue from sale of salvage cattle and 96% from sale of fluid milk (Roeber *et al.*, 2000a), justifying their emphasis on milk production and their nonchalance about the value of salvage cattle. There are, however, financial incentives for dairymen willing to become well-informed on the use of meat from market cows and bulls and to promote value by managing their herds to minimize quality shortcomings and defects, by monitoring the health and condition of market cows and bulls, and by marketing salvage cattle in a timely manner (National Cattlemen's Beef Association, 2000).

Contrary to the popularly held belief of most producers, not all of the beef from market cows and bulls is used in the production of commodity ground beef. In fact, beef from market cows and bulls is widely used in the retail and food service sectors in a variety of product forms. Roeber *et al.* (2000a) interviewed packers during the 1999 National Market Cow And Bull Beef Quality Audit and reported that 43.6% of cow and bull beef was sold as 100% Visual Lean (for use in restructured beef roasts) or as primals/subprimals (for sale as steaks/roasts in supermarkets and food-service operations), leaving 56.4% for use in ground beef and sausage products.

Since 1994, National Cattlemen's Beef Association's Beef Quality Assurance Advisory Board has commissioned five studies: (a) Two kinds of annual audits to identify incidence of injection-site lesions in muscles of the round of dairy and beef cows and bulls; (b) A study to identify uses of meat from dairy and beef, market cow and bull carcasses; and (c) Two studies to identify quality concerns through conduction of national audits of market cows and bulls, their carcasses and their edible and inedible offal (Smith *et al.*, 1999a). These studies were parts of the activities of the NCBA, BQA Advisory Board and were intended to educate producers regarding means for improving the quality and value of market (sometimes called "non-fed," "cull" or "salvage") cows and bulls generated by beef and dairy cattle operations.

National audits have been conducted annually since 1994 to determine the incidence of injection-site lesions in muscles of the round from market cows and bulls; results of the first five of those national audits (Smith *et al.*, 1999b) are presented in Table 1. Information gathered from these audits was the basis for national and state BQA programs designed to increase producer awareness about injection-site lesion problems. From 1994 through 1996, efforts of national and state BQA programs, to encourage producers and veterinarians to choose subcutaneous (rather than intramuscular) routes of administration and alternate body-location sites for injection (in front of the shoulder rather than in the rump or hindquarter), were succeeding (Smith *et al.*, 1999b). Incidence of injection-site lesions was 28.9% in 1994, 23.0% in 1995 and 19.3% in 1996. But, when the incidence dramatically increased — to 40.9% in 1997 — and then, just as abruptly decreased — to 23.9% in 1998 — in a two-year period of study, members of the NCBA, BQA Advisory Board decided that the methodology, by which the audits of muscles from the rounds of market cows and bulls were being conducted, needed to be improved. As a result, it was decided that, for producer awareness and education purposes, the injection-site lesion incidence should be determined more accurately (by carefully slicing whole muscles from end to end) and more definitively (by cattle types—dairy vs. beef).

Beginning in 1998, a national "slice audit" was performed by identifying dairy and beef cows at packing plants across the United States, following the carcasses through fabricating/boning and carefully checking — from end-to-end, from the topline between the hooks and pins down to the hock, in the outside, and eye of, round muscles (*biceps femoris* and *semitendinosus*) — for injection-site lesions (Smith *et al.*, 1999b). Results of the first slice audit (Table 2) revealed that an astonishing percentage of those muscles had visible tissue damage sufficient to cause loss of weight and value (because such lesions must be dissected out and discarded, to remove damaged and greatly toughened muscle). It was also determined that there were substantive differences between rounds from

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beef vs. dairy cattle in the incidence and location of the injection-site lesions. In round muscles from beef cows, the incidence of injection-site lesions was 28.7% and most of the lesions were found in the uppermost quadrants of the muscle (38.0% of all lesions were found at the top of the muscle, Quadrant 4 (Q4) — near the backbone — with 36.1%, 19.4% and 6.5% located in quadrants 3, 2 and 1 (Q3, Q2 and Q1), respectively, where Q1 is the Quadrant at the bottom of the muscle — near the hock). In rounds from dairy cows, the incidence of injection-site lesions was twice as high — at 57.5% — and the lesions occurred in Q4, Q3, Q2 and Q1 quadrants of the muscle at incidences of 18.3%, 36.2%, 29.5% and 16.1%, respectively, suggesting that sites preferred by producers and/or veterinarians for administering injections to dairy cows are much lower on the leg (on the standing animal) than are those for beef cows (Smith *et al.*, 1999b).

National “slice audits” performed in 1998, 1999 and 2000 (Table 2) reveal meaningful decreases in total incidences of injection-site lesions, over that time period, in round muscles from both beef cows (28.7%, 25.7% and 20.0%, respectively) and dairy cows (57.5%, 51.0% and 34.5%, respectively) suggesting that education efforts of BQA programs are succeeding (Smith *et al.*, 1999b; Roeber *et al.*, 2000b). Interestingly, proportions of injection-site lesions occurring in the upper-half (Quadrants 3 plus 4) of the round muscles decreased, between 1998 and 2000, from 74.1%, to 52.2% (beef cattle) and from 54.5%, to 33.1% in dairy cattle suggesting that the lower-half (Quadrants 1 plus 2) of the round muscles is becoming a more popular site (25.9%, to 47.8% in beef cattle; 45.6%, to 66.9% in dairy cattle) for administering intramuscular injections (Table 2).

The primary function of activities of the NCBA, BQA Advisory Board is to develop information for use in educational programs of national and state BQA programs. One educational opportunity involves helping cattle producers become more knowledgeable about the uses — as foods — of the muscles from market cows and bulls, and especially about changes in management practices that might improve the quality and value of those muscles (Smith *et al.*, 1999a). Unfortunately, far too many producers think of market cows and bulls as “junk,” to be discarded at whatever price is offered, because they believe, incorrectly, that the only use for their meat is as a source of raw materials for sausage or inexpensive hamburger meat. Because ground beef sold in supermarkets is so much leaner (85% to 96% lean is now common) now than it was a decade ago (70% to 80% lean was then the norm) a

much greater proportion of today’s highest quality (and highest priced) retail ground beef is comprised of cow/bull meat. In addition, many subprimal cuts from market cows and bulls are now sold in the same manner (to be merchandized as steaks and roasts) as are subprimal cuts from grain-finished steers and heifers (Smith *et al.*, 1999a).

Industry nomenclature for kinds/qualities of market cows and bulls and their carcasses is not used consistently and is not based on any standardized criteria; new, effective official USDA grades are badly needed for price determination and market reporting for these cattle and carcasses (Roeber *et al.*, 2000a). Smith *et al.* (1999a) reported results of an interview of management personnel of one of the nation’s largest harvesters/fabricators of market cows and bulls, in which that company’s grading system was characterized. The classes used by that packer to describe market cow and bull carcasses are:

1. “White Cows” or “High Quality Cows” — these carcasses have a significant covering of white fat (many of these are from fleshy Holstein cows and some are from beef cows that have been grouped and fed high-concentrate diets for about 20 to 60 days prior to harvest), good body conformation and high muscle quality (color and marbling).
2. “Boners and Breakers” — these are relatively lean carcasses with some marbling and good body conformation.
3. “Cutters and Canners” — these are lean carcasses with little or no marbling and with poor to very poor body conformation.
4. “Bulls” — these are bull carcasses that usually have little fat cover but good body conformation.
5. “Bologna Bulls” — these are bull carcasses that have basically no fat cover (the entire boneless carcass will yield meat that is approximately 92% lean) and for which conformation is not an issue (Smith *et al.*, 1999a).

Of the total daily U.S. cattle slaughter, 15 to 25% (depending on season) of beef production will be from market cow and bull carcasses (Smith *et al.*, 1999a). Of the national market cow and bull slaughter, about 0.5% are “Bologna Bulls,” approximately 9% are “Bulls” and about 1% are “White Cows” while the remaining 88 to 89% of market cows and bulls are classified by packers using names like “Commercial,” “Breaker” (or “Breaking Utility”), “Boner” (or “Boning Utility”), “Cutter” (or “Top Cutter,” “Cutter” and “Low Cutter”) and “Canner” (or “Canner,” “Low Canner” and “Shelly Canner”) or using names and numbers (e.g., “Boning Utility 2,” “Canner 3,” etc.).

Some carcasses (usually those of highest quality) from market cows are fabricated into primal and subprimal cuts in the same way as are carcasses from grain-finished

steers and heifers (Smith *et al.*, 1999a; Roeber *et al.*, 2000a). After fabrication, the primals are usually boned; some of the subprimal cuts are trimmed, vacuum packaged and boxed, while others are placed in combo-bins for use as raw materials for sausage, restructured beef, or ground beef production. Trimmings from market cow and bull carcasses are often labeled by primal cut of origin for the production of primal-specific products, such as ground sirloin, ground round or ground chuck, which are sold throughout the U.S. in restaurants and supermarkets. In addition to boxed subprimal cuts and beef trimmings, a third type of product that is widely manufactured from market cow and bull carcasses is "100% Visual Lean." 100% Visual Lean can be derived from any whole-muscle subprimal that can be trimmed such that no fat or connective tissue seams remain anywhere on or in the cut.

Boxed subprimal cuts from high-quality market cow and bull carcasses are sold to certain supermarket and food-service operators. The middle meats (tenderloins, striploins/shortloins, ribeyes, top sirloins, etc.) are sometimes sold to retail meat markets, but are most commonly sold to steak-cutting companies that sell them as steaks to family restaurants, airlines, commissaries, or other food-service operators (Smith *et al.*, 1999a; Roeber *et al.*, 2000a). Other cuts, such as tri-tips, skirt steaks, briskets, etc., may be sold to further-processors who produce pre-cooked entrées, marinated fajita meat, or corned beef, as well as other products. Almost all of the 100% Visual Lean is sold to further-processors who produce restructured beef products that are sold in roast beef sandwiches.

All primals and subprimals from Bologna Bulls are fabricated into beef trimmings with the exception of the whole tenderloin (sold as a boxed subprimal) and the round cuts and necks which are sold as 100% Visual Lean. Subprimal cuts from White Cows are generally too fat for production of 100% Visual Lean and therefore are either marketed as boxed subprimals or converted to beef trimmings. From White Cows, almost all major cuts are sold as boxed subprimals and the minor cuts such as shanks and short plates (navels) are converted to beef trimmings. Depending on market conditions, the chucks and sirloins (including knuckles) from White Cows may also be sold as beef trimmings.

The following two tables (Table 3 and Table 4) contain information (Smith *et al.*, 1999a) demonstrating how primals and subprimals from carcasses of the three most common classes of market cows and bulls (Bologna Bulls and White Cows are not included) are fabricated and marketed. The proportion of the subprimal cuts from market cow and bull carcasses that is sold as boxed beef is quite substantial. As was reported also by Roeber *et al.*

(2000a), slightly more than half of the meat from market cows and bulls is marketed as ground beef (commodity, very-high lean content or primal-cut origin specific) and the remainder (about 44%) is sold as boxed subprimals or restructured beef.

The National Non-Fed Beef Quality Audit — 1994 and the National Market Cow And Bull Beef Quality Audit — 1999 each consisted of three Phases: Phase I was Face-To-Face Interviews with industry leaders to identify and quantify "quality defects"; Phase II consisted of a national audit, in packing plants, to quantify "quality defects" in the holding pens, on the slaughter floor and in the cooler, and; Phase III was a workshop at which researchers, industry leaders, packers, processors, restaurateurs and cattle producers identified strategies to reduce the incidence of product-quality shortcomings, correct non-conformities and improve the quality, consistency and competitiveness of beef from market cows and bulls (National Cattlemen's Beef Association, 1994, 2000).

Quality losses for each market cow or bull equivalent were determined in both the National Non-Fed Beef Quality Audit — 1994 and the National Market Cow And Bull Beef Quality Audit — 1999; results are presented in Table 5. Ranked in order of monetary loss, the five most important quality defects in 1994 were excess external fat, inadequate muscling, condemnations (cattle, carcasses, carcasses passed for cooking), hide value loss (brands) and condemnations (edible offal items) while those in 1999 were inadequate muscling, excess external fat, trim loss (arthritic joints), yellow external fat and condemnations (edible offal items). Two new quality defects (trim loss from birdshot/buckshot and handling/testing for antibiotic residues) appeared in the 1999 Audit. Comparison of results of the 1994 and 1999 Audits suggests that producers made progress in reducing incidence or severity of seven quality defects; those were condemnations (cattle, carcasses, carcasses passed for cooking), disabled cattle (additional handling), hide value loss (brands), trim loss (bruises), trim loss (compliance with "Zero Tolerance"), excess external fat and light-weight carcasses. Producers lost ground on condemnations (edible offal items), hide value loss (scratches, cuts, insect damage), trim loss (arthritic joints), trim loss (injection-site lesions), yellow external fat, dark-cutting muscle, and inadequate muscling (National Cattlemen's Beef Association, 1994, 2000).

The total cost of value losses from data of the National Market Cow And Bull Beef Quality Audit — 1999 was \$68.82 (\$1.08 less than for 1994), not just for those with one or more quality defects but for every market cow or bull harvested in that year. Of the \$68.82 lost, cattle

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producers could recover: (a) \$13.82 by *managing*, to minimize defects and quality deficiencies, (b) \$27.50 by *monitoring* health and condition, and (c) \$27.50 by *marketing* in a timely manner (National Cattlemen's Beef Association, 2000).

Strategies for improving quality, competitiveness and value of market cows and bulls, their carcasses, their cuts and their byproducts, identified in the National Non-Fed Beef Quality Audit — 1994 Strategy Workshop were:

1. Minimize condemnations by monitoring herd health and marketing non-fed cattle with physical disorders in a timely manner.
2. Effect end-product improvements by monitoring and managing non-fed cattle and by marketing them before they become too fat or too lean, too light or too heavy, thinly muscled or emaciated.
3. Decrease hide damage by coordinating management and parasite-control practices and by developing new methods for permanent ownership identification of non-fed cattle.
4. Reduce bruises by dehorning, by correcting deficiencies in facilities, transportation and equipment, and by improving handling.
5. Encourage competitiveness by implementing non-fed cattle marketing practices that assure producer accountability.
6. Assure equity in salvage-value by requesting improved consistency of interpretation and application of federal meat inspection criteria among non-fed cattle slaughter establishments.
7. Improve beef safety by encouraging practices which reduce bacterial contamination of carcasses.
8. Prevent residues and injection-site lesions in non-fed cattle by ensuring responsible administration and withdrawal of all animal-health products.
9. Enhance price discovery by encouraging development of effective live and carcass grade standards for non-fed cattle.
10. Encourage on-farm euthanasia of disabled cattle and those with advanced bovine ocular neoplasia (National Cattlemen's Beef Association, 1994).

Participants in the Strategy Workshop for the National Market Cow And Bull Beef Quality Audit—1999 developed four "Directives" for improving the quality and value of market cows and bulls; those were:

- A) *Recognize And Maximize The Value Of Your Market Cows And Bulls,*
- B) *Be Pro-Active To Ensure The Safety And Integrity Of Your Product,*

- C) *Use Appropriate Management And Handling Practices To Prevent Quality Defects, and*
- D) *Closely Monitor Herd Health And Market Cull Cattle Timely And Appropriately.* In addition to identifying the four Directives, participants in the Strategy Workshop developed a Quality Assurance Marketing Code of Ethics for use by cattlemen, dairymen and packers when they market and harvest cows and bulls (National Cattlemen's Beef Association, 2000):

*I will only participate in marketing cattle that:*

- Do not pose a known public health threat
- Have cleared proper withdrawal times
- Do not have a terminal condition (advanced lymphosarcoma, septicemia, etc.)
- Are not disabled
- Are not severely emaciated
- Do not have uterine/vaginal prolapses with visible fetal membrane
- Do not have advanced eye lesions
- Do not have advanced lumpy jaw

*Furthermore, I will:*

Do everything possible to humanely gather, handle and transport cattle in accordance with accepted animal husbandry practices.

*Finally, I will:*

Humanely euthanize cattle when necessary to prevent suffering and to protect public health (National Cattlemen's Beef Association, 2000).

Improving the quality and value of market cows and bulls is an attainable goal. Based on results of the National Market Cow And Bull Beef Quality Audit — 1999: 99.8% of market cows and bulls show no evidence of prolapse, 99.7% are free of birdshot/buckshot, 99% show no evidence of lumpy jaw, 97% have a body condition score of 3 or higher, 96% have clear eyes, 96% are without abscesses, 90% are free of excessive hide contamination, and 85% are sound or have only minor structural problems. To improve further the quality/value of market cows and bulls, success will come not by doing 1 thing 100% better; it will come by doing 100 things 1% better (Roeber *et al.*, 2000a).

Schnell *et al.* (1997) fed cull cows, of Dairy, Brahman-crossbred, British and Continental European breeding, a high-concentrate diet for 0, 14, 28, 42 or 56 days; cows were then harvested and carcass traits and steak palatability characteristics were determined. Live and carcass weights, average daily gain and dressing percentage increased through 28 days of feeding; fat color became whiter but marbling was not affected by feeding. Steak tenderness was higher for cows fed 56 days than for cows fed 0 or 14 days; Continental European cow carcasses yielded more fat-free lean and less fat while Dairy cow

carcasses generally provided the most tender beef, across all slaughter periods. In general, sensory tenderness and yields of cow carcass components were increased, without requiring excessive trimming of fat, by feeding cull beef and dairy cows for periods up to 56 days.

The economics of feeding cull cows was also considered in the Schnell *et al.* (1997) study. Feeding cows for 56 days cost \$93.80 per head (feed only) and increased live weight enough to improve value by \$142.38; value of the ribeye subprimal cuts increased \$2.06 per carcass due to higher weight and \$6.20 per carcass because fat on those cuts was then white rather than yellow. Value for feeding a cull cow for 56 days was \$52.58 (net, after feed cost) for weight gain plus \$8.26 for improved quality and weight of ribeye subprimal cuts; so, the net improvement in value for feeding cull cows was \$60.84 per head.

## Summary and Conclusions

Contrary to the popularly held belief by most producers, not all of the meat from market dairy cows and bulls winds up as commodity ground beef. Instead, beef from market dairy cows and bulls appears in the consumer marketplace in many forms: (a) as entrée items (e.g., some loins and ribs are sold as steaks or roasts in family restaurants); (b) as high-value entrée items (e.g., some tenderloin steaks are presented in first class service meals on airline flights); (c) as the primary alternative to ground beef in fast-food operations (e.g., as sliced beef in sandwiches at quick-service restaurants); (d) as a snack food (e.g., as beef jerky); (e) as a quick-to-fix form of supermarket beef (e.g., as fajitas); (f) as extra-lean ground beef (e.g., 90%-, 93%-, 95%- or 96%-lean ground beef); (g) as ground sirloin, ground loin, ground chuck or ground round in modified atmosphere packages at major supermarkets, or; (h) as main menu items in buffet meals at gambling establishments in Nevada and New Jersey (e.g., as roast beef, shish kabobs or grilled steaks).

Knowing that the beef from market cows is more than just raw material for commodity ground beef (containing 20 to 30% fat), it is imperative that dairy producers manage and handle such livestock with care and caution. As a case in point, dairy producers presently damage more than one-third of all outside round muscles by creating injection-site lesions that cause extensive trimming and processing losses as well as quality and toughness defects at the fabrication level. In addition, poor handling and stressful movement to harvest can cause problems with muscle appearance (especially color), bruising and microbial contamination problems with the carcass and beef from market cows and bulls. Results of the National Non-Fed Beef Quality Audit — 1994 and of the National Market

Cow And Bull Beef Quality Audit — 1999 provide a roadmap for identifying a course of action to be followed by dairy producers who care about the quality of the beef they generate. Included in the Final Report of the National Market Cow And Bull Beef Quality Audit — 1999 are Directives, A Quality Assurance Marketing Code of Ethics and the Audit's Message — to promote value in market cows and bulls, producers should *manage* their cow herds to minimize quality shortcomings and defects, *monitor* the health and condition of market cows and bulls, and *market* cows and bulls, in a timely manner.

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Table 1. Incidence of injection-site lesions in muscles of the round from market cow and bull carcasses (1994 through 1998).

Audit	Incidence of Lesions	Average Trim per Lesion	Active Fluid-Filled Lesions (of Total Lesions)
1994	28.9%	9.2 oz	7.5%
1995	23.0%	11.9 oz	11.5%
1996	19.3%	11.3 oz	8.3%
1997	40.9%	6.2 oz	3.9%
1998	23.9%	4.9 oz	0.7%

SOURCE: Smith *et al.* (1999b)

Table 2. Incidence of injection-site lesions in muscles of the round from market dairy and beef cows (slice audits, 1998, 1999 and 2000).

	Beef Cows			Dairy Cows		
	1998	1999	2000	1998	1999	2000
<b>Total Incidence</b>	28.7%	25.7%	20.0%	57.5%	51.0%	34.5%
<b>Proportionate Incidence In:</b>						
Quadrant 4	38.0%	53.3%	38.4%	18.3%	8.4%	8.8%
Quadrant 3	36.1%	30.7%	13.8%	36.2%	24.2%	24.3%
Quadrant 2	19.4%	13.8%	32.0%	29.5%	40.1%	47.3%
Quadrant 1	6.5%	2.3%	15.8%	16.1%	27.3%	19.6%
<b>Incidence In Back Of Leg:</b>	26.9%	15.3%	26.6%	36.8%	49.5%	33.6%
	(mostly Q3)	(mostly Q3)	(mostly Q2)	(mostly Q2 and Q3)	(mostly Q2)	(mostly Q2)

SOURCE: Smith *et al.* (1999b) and Roeber *et al.* (2000b)

Table 3. Form in which major subprimal cuts (from chuck, rib, loin and round) are marketed from three classes of market cow and bull carcasses.

Subprimal Cut	Carcass Class	Form In Which Fabricated Cuts Are Sold (% Sold As)		
		Boxed Subprimals <sup>a</sup>	100% Visual Lean	Beef Trimmings
Boneless Inside Round	Boner-Breaker Cutter-Canner Bull	50%	50% 100% 100%	
Boneless Gooseneck Round	Boner-Breaker Cutter-Canner Bull		100% 100% 100%	
Boneless Eye of Round	Boner-Breaker Cutter-Canner Bull		100% 100% 100%	
Boneless Knuckle	Boner-Breaker Cutter-Canner Bull			100% <sup>b</sup> 100% <sup>b</sup> 100% <sup>b</sup>
Boneless Striploin or Bone-in Shortloin	Boner-Breaker Cutter-Canner Bull	100% <sup>c</sup>	100% 100%	
Boneless Tenderloin	Boner-Breaker Cutter-Canner Bull	100% 100% 100%		
Boneless Top Sirloin Butt	Boner-Breaker Cutter-Canner Bull	67%		33% <sup>b</sup> 100% <sup>b</sup> 100% <sup>b</sup>
Boneless Tri-Tip (Bottom Sirloin)	Boner-Breaker Cutter-Canner Bull	100%		100% <sup>b</sup> 100% <sup>b</sup>
Sirloin Flap Meat	Boner-Breaker Cutter-Canner Bull	100% 100%		100% <sup>b</sup>
Boneless Ribeye Roll	Boner-Breaker Cutter-Canner Bull	100% 33% 50%	67% 50%	
Boneless Chuck 2pc, Blade and Clod	Boner-Breaker Cutter-Canner Bull	10%		90% 100% 100%
Boneless Chuck Flap	Boner-Breaker Cutter-Canner Bull	100% 100%	100%	
Boneless Chuck Tender	Boner-Breaker Cutter-Canner Bull		100% 100% 100%	

<sup>a</sup> When less than 100% of a subprimal within a class is marketed as boxed subprimals, it is typically the best pieces (best in conformation, marbling, color, etc.) that are boxed, and the remaining pieces are marketed as 100% Visual Lean or as beef trimmings.

<sup>b</sup> Knuckles, top sirloin butts, flap meat and tri-tips that are sold as beef trimmings are labeled as "sirloin trimmings" for the production of ground sirloin.

<sup>c</sup> Unless the fat is extremely yellow, in which case it would be sold as 100% Visual Lean.

Source: Smith *et al.*, 1999a

Table 4. Form in which minor subprimal cuts (from thin cuts) are marketed from three classes of market cow and bull carcasses.

Subprimal Cut	Carcass Class	Form In Which Fabricated Cuts Are Sold (% Sold As)		
		Boxed Subprimals <sup>a</sup>	100% Visual Lean	Beef Trimmings
Boneless Brisket	Boner-Breaker Cutter-Canner Bull	80%	20% 100% 100%	
Boneless Front and Hind Shanks	Boner-Breaker Cutter-Canner Bull			100% 100% 100%
Flank Steak	Boner-Breaker Cutter-Canner Bull	100% 100% 100%		
Inside and Outside Skirts	Boner-Breaker Cutter-Canner Bull	100% 100% 100%		
Boneless Navel	Boner-Breaker Cutter-Canner Bull			100% 100% 100%
Boneless Neck Meat	Boner-Breaker Cutter-Canner Bull		100% 100% 100%	
Bone-in Backribs	Boner-Breaker Cutter-Canner Bull	100% 100%		100% <sup>a</sup>
Bone-in Shortribs	Boner-Breaker Cutter-Canner Bull	100% 100%		100% <sup>a</sup>

<sup>a</sup> Backribs and shortribs from bull carcasses are boned and sold as beef trimmings.

Source: Smith *et al.*, 1990a



Table 5. Quality losses for each market cow or bull harvested in the U.S.A. in 1994 and 1999 using data and estimates from the national non-fed beef quality audit — 1994 (NNFBQA — 1994) and the national market cow and bull beef quality audit (NMCBBQA — 1999).

	NNFBQA — 1994	NMCBBQA — 1999
Condemnations (cattle, carcasses, carcasses passed for cooking)	\$12.02	\$4.14
Condemnations (edible offal items)	3.99	4.49
Disabled cattle (additional handling)	0.78	0.56
Hide value loss (brands)	4.56	3.10
Hide value loss (scratches, cuts, insect damage)	2.36	3.17
Trim loss (arthritic joints)	2.13	9.72
Trim loss (bruises)	3.91	2.24
Trim loss (compliance with “Zero Tolerance”)	1.87	0.46
Trim loss (birdshot/buckshot)	—	0.52
Trim loss (injection-site lesions)	0.66	1.46
Yellow external fat	2.27	6.48
Dark-cutting muscle	0.06	1.41
Inadequate muscling	14.43	18.70
Excess external fat	17.74	10.17
Light-weight carcasses	3.12	1.28
Antibiotic residue (handling/testing)	—	0.92
<b>Total</b>	<b>\$69.90</b>	<b>\$68.82</b>

Source: National Cattlemen’s Beef Association (1994, 2000).

