Characteristics of Dark Cutting Steer Carcasses

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Story in Brief

To determine how carcasses with various degrees of lean darkness differ, standard carcass measurements were obtained from 1,129 steers. Of these carcasses, 2.8% had some degree of dark cutting lean with 0.7% being classified as full dark cutters. Though hot carcass weight did not differ with lean color, the greater the degree of darkness of lean, the greater ribeye area and less the fat thickness over the rib and the lower the yield grades. These differences suggest that greater leanness was associated with darker colored lean. USDA quality grade tended to be lower with darker lean, especially for full dark cutting carcasses for which carcass grades are discounted because of the dark colored lean. Comparing fully dark cutting carcasses with carcasses with bright cherry red color, dark cutters had lower ribeye area, less rib fat thickness, lower (leaner) yield grades and a higher percentage of carcasses in the lowest (standard) quality grade. Because of lower yield grades and thereby higher cutability and maturity discounts imposed for carcasses with fully dark lean, price discounts for dark cutting carcasses may be too severe considering that processed and cooked meats from dark cutting carcasses supposedly are fully acceptable in terms of tenderness, juiciness, and flavor by consumers.

(Key Words: Carcass Measurements, Dark Cutting Beef.)

Introduction

Specific management or harvest techniques that increase energy expenditures and decrease glycogen content of muscle have been associated with an increased incidence of carcasses with lean that is dark rather than bright cherry red in color. Withholding feed and other factors such as warm days and cool nights, specific implants, gender, longer transport time, crowded transport conditions, longer holding prior to harvest, and wild temperament have been implicated as increasing dark cutting incidence (Scanga and Belk, 1998). In Europe, the incidence of dark cutting carcasses often exceeds 30% compared means in the US of about 5 and 2% in 1992 and 1995 based on Beef Quality Audits (NCBA, 1992; 1995) or only 0.24% based on a survey of nine commercial feedyards (Scanga and Belk, 1998). A seasonal effect, with a higher incidence noted in spring and especially in late fall, may explain the divergence among these means. The higher incidence in Europe has been attributed to longer transport and lairage times and greater physical activity and fighting between bulls that have been raised in small pens than among steers raised in larger groups in the United States. Depending on the degree of darkness of the color of lean tissue, carcasses are classified as 1/3, 2/3 or fully dark cutting. Carcasses classified as fully dark cutting are discounted in quality grade, and, because the dark color is less appealing in the supermarket display case, price typically is discounted by about 30%. To determine how those carcasses with dark cutting lean differed from carcasses with bright cherry red lean, we contrasted carcass measurements of market steers with cohort animals of similar background and fed in the same feedlot pen.

Materials and Methods

Finished steers (n = 1,136; mean weight = 1,212 lb) were marketed on six different dates. Each pen of steers (about 190 per pen) had been fed together for at least 200 d prior to harvest. On alternate weeks, feed was either withdrawn for 24 h or not withdrawn prior to transporting the steers to the packing plant. Live weights were measured at the time cattle were loaded on trucks and of the trucks at arrival at the packing plant approximately 200 miles away. Weight loss (shrink) during transport, hot carcass weights, marbling scores, and dark cutting incidence was determined. Carcass measurements from steers with various degrees of dark cutting lean tissue were contrasted statistically.

Results and Discussion

Measurements for carcasses classified as 1/3, 2/3 and fully dark cutting are contrasted with carcasses from cattle in the same pen that were bright cherry red in color are presented in Table 1. This comparison is more direct than simply calculating means of all dark cutting carcasses in a packing plant because certain pens of cattle may have a higher incidence of dark cutters. The total number of dark cutting carcasses is not large, although 2.8% of cattle in this sample had some degree of dark cutting with 0.7% being classified as full dark cutters.

No differences in mean carcass weight were detected. This is surprising based on the suggestion that two factors that have been associated with dark cutters, nervousness and extensive muscling, would be expected to cause carcass weights to be less or greater, respectively, than other cattle fed in the same pen. Of carcasses classified as full dark cutters, one had a weight of 633 lb, more than one standard deviation lower than control cattle (741 $\pm$ 70 lb) but the other seven had carcass weights (range = 705 to 763 lb) that fell within the expected weight range. One dark cutting carcass had a calculated yield grade of 0.75 but yield grades of others ranged from 1.3 to 2.2. Consequently, carcass characteristics of dark cutting cattle did not reflect certain conditions that have been associated previously with an elevated incidence of dark cutting cattle within a specific group or pen. Considering the numerous factors that have been associated with dark cutting carcasses, perhaps two subgroups of cattle may be involved. A small percentage of animals may have physiological abnormalities that cause this condition while additional animals may become dark cutters when subjected to unusual or abnormal conditions. This would suggest that stress avoidance and increasing energy reserves prior to harvest may reduce but not fully eliminate the condition.

Carcasses of cattle classified as dark cutting tended to be leaner (larger ribeye areas, less external fat which resulted in lower numerical yield grades) than carcasses with brighter lean color. The increased incidence of dark cutting carcasses in recent years may be due to a higher incidence among cattle selected for greater leanness at a specified weight. Implants that increase lean mass may increase dark cutting incidence for a similar reason. Altering type of muscle fiber could increase rate of glycogen depletion during fasting, exercise, or excitement. USDA yield grades tended to underestimate true yield grade of dark cutting carcasses. Marbling scores tended to be lower for dark cutting carcasses. No difference in carcass bone maturity was detected. The percentage of carcasses in the lower USDA quality grades (select and standard) was greater for dark cutting carcasses due to lower marbling scores of 1/3 and 2/3 dark carcasses; this was particularly apparent for fully dark carcasses due to the mandated USDA grade discount. This additional mandated grade discount may represent overkill with regard to tenderness and eating quality of lean beef from dark cutting carcasses. Although meat characteristics were not measured in this trial, fabrication is thought to yield products fully as acceptable to consumers as fresh beef that has a bright red color.

Carcasses of steers that had very dark colored lean were more muscular but had less external fat and marbling and lower yield grades than those with bright cherry red lean. No differences in carcass weights were detected that would support the contention that specific factors known to elevate the incidence of dark cutters above a normal rate, e.g., nervousness or large framed or continental breeds, were responsible for the dark cutting when its incidence is rather low. Results support the concept that multiple factors probably are responsible for dark cutters, and that improved cattle management may reduce but not completely eliminate dark cutters.

Literature Cited

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Table 1. Least squares means of carcass measurements of dark cutting steers as compared with carcass measurements of other steers fed in the same pen.

	Dark cutting score				Probabilities, P <		
Measurement	0	1/3	2/3	Full	Effects	All vs 0	Full vs 0
Cattle, number	1106	20	3	8			
Hot carcass weight, lb	741	722	743	724		.48	.49
Rib eye area							
Square in	14.2[a]	14.5[ab]	15.0[ab]	15.4[b]	LC	.06	.02
Square in/cwt	1.92[a]	2.00[ab]	1.92[ab]	2.13[b]	LC	.08	.01
Marbling score	420[d]	399[de]	409[de]	356[e]		.17	.06
KPH, %	1.89	1.79	1.82	1.70		.15	.12
Blood splash, %	1.98	.34	.30	-.27[e]		.57	.64
Rib fat, in	.52[a]	.43[b]	.46[ab]	.33[b]	LC	.01	.01
Yield grades							
Preliminary	3.20[a]	3.01[b]	3.02[ab]	2.71[b]	LC	.01	.01
Adjusted	3.29[a]	3.08[b]	3.14[ab]	2.81[b]	LC	.01	.01
Actual	2.45[a]	2.02[b]	2.18[ab]	1.49[b]	LC	.01	.01
USDA	2.49	2.34	2.24	2.57		.64	.81
USDA YG > 3, %	4.81	.02	.69	.29		.37	.54
Quality grades							
USDA	3.48[a]	3.11[b]	3.03[ab]	3.91[ab]		.67	.43
Prime, %	1.3	.2	0	0		.64	.73
High choice, %	16.3	11.5	3.5	-2.1[e]		.17	.16
Low choice, %	33.5	26.9	37.8	10.3		.45	.17
Select, %	46.8	51.3	60.2	78.3		.16	.07
Standard, %	2.0[b]	10.2[a]	-1.4[ab]	13.5[ab]		.12	.03
Bone maturity							
A class, %	97.7	100.1	99.2	100.1		.55	.65
B class, %	2.3	-.2[e]	.8	-.1[e]		.55	.65

a,b Means not sharing a superscript differ (P<.05).

c,d Means not sharing a superscript differ (P<.10).

Letters imply responses to dark cutting score (l = linear effect at P<.05; L = linear effect at P<.01; c = cubic effect at P<.05; C = cubic effect at P<.01.

[e]Negative least squares means are not significantly different from zero.

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