

Beef Cattle Research Update

Michigan State University beef cattle specialists Harlan Ritchie, Steven Rust and Daniel Buskirk offer the following summaries of current industry research.

Effects of limit-feeding barley on heifer growth, reproduction

Grain is often a more economical source of dietary energy than forage. The objective of this University of Idaho study was to evaluate the effects of substituting barley for forage on growth and reproduction of heifer calves.

Forty crossbred heifers, averaging 701 pounds (lb.), were allotted to four dietary treatments:

- 1) conventional forage;
- 2) forage with barley provided in the morning;
- 3) forage with barley provided in the evening; or
- 4) barley fed in the morning as a pressed pellet.

In all treatments, heifers were fed to provide equivalent levels of energy so as to limit average daily gain (ADG) to 1.6 lb. per day. After 105 days, heifers were commingled, fed a common diet, synchronized and bred by artificial insemination (AI) upon detection of estrus.

There were no significant differences among treatments in body condition score (BCS), number of corpora lutea

(CL) at the time of second prostaglandin injection, or serum progesterone.

Furthermore, there were no differences among treatments in pregnancy rate.

The authors concluded these results indicate that substituting barley for forage in limit-feeding systems is a feasible method of meeting dietary energy requirements without jeopardizing reproduction.

[Szasz et al. 200. J. Anim. Sci. 88 (Suppl. 1): Abstract T168]

Effects of limit-feeding grain, added fat on reproduction

University of Georgia researchers conducted two experiments to evaluate the effects of limit-feeding a high-concentrate diet and the addition of fat on reproductive performance and hormone profiles of mature cows.

In Experiment 1, Angus cows (27 days postpartum) were allotted to one of two treatments for the 56 days preceding breeding season:

- 1) *ad libitum* feeding of Bermuda grass hay; or
- 2) limit-feeding a corn-based diet.

After 56 days, cows grazed Bermuda

grass pasture and were exposed to bulls for 75 days.

Initial average BCSs for both groups were 5.5. Likewise, after breeding season, BCSs for both treatments were similar (averaging 5.4). However, body weight loss was significantly greater for cows on the corn-based diet than for cows on hay (116 lb. vs. 18 lb.).

Nevertheless, days to first estrus did not differ between treatments (52.9 for Bermuda grass hay vs. 52.4 for corn diets). Insulin concentrations were greater at 56 days for cows fed the corn-based diet than for cows fed the Bermuda grass hay.

In Experiment 2, Angus cows (12 days postpartum) were allotted to one of four treatments for 56 days prior to breeding season:

- 1) Bermuda grass hay + 4.6 lb. cottonseed meal as a source of fat;
- 2) Bermuda grass hay + 5.5 lb. corn-soybean meal mix (no fat);
- 3) limit-fed corn + 4.6 lb. cottonseed meal; or
- 4) limit-fed corn (no fat).

Final BCSs and days to first estrus were similar among treatments. Like in Experiment 1, insulin concentration was higher at 56 days for cows fed corn than for those fed hay.

These results show that a corn-based diet increases insulin concentrations compared with feeding a hay-based diet. However, overall reproductive performance was not affected by prebreeding energy concentration or by added dietary fat.

[Rossi et al. 2005. J. Anim. Sci. (Suppl. 1) Abstract W163]

Effect of implant on heifer growth, reproduction

Intervet researchers evaluated the effects of the implant Revalor® G on growth and reproduction of grazing heifers. A total of 150 Angus and Angus-cross heifers were allotted to either:

- 1) control group, no implant; or
- 2) treatment group, Revalor G [given 40 milligrams (mg) trenbolone acetate and 8 mg estradiol-17b].

Heifers were approximately 12 months old at implant time (Day 0). After 36 days on pasture, Angus bulls were turned out and then removed 60 days later when heifers were weighed for pasture gain. All heifers were pregnancy-checked on Day 135 and again on Day 148.

ADG was significantly greater for implanted heifers than for controls (1.43 lb. vs. 1.26 lb. per day, respectively).

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There were no differences between treatments for percent pregnant (74% for the control group and 72% for the implanted group). However, days to conception favored the controls compared to the implanted heifers (24 days vs. 30 days, respectively).

The authors concluded that a grazing

heifer's gain was improved by 12% with Revalor G, and that conception rate was not adversely affected. They noted, however, that the use of Revalor G may increase days to conception compared to nonimplanted heifers.

[Nichols et al. 2005. *J. Anim. Sci.* 83 (Suppl. 1): Abstract W31]

Effects of early weaning on forage disappearance, calf performance

Researchers at North Dakota State University (NDSU), South Dakota State University (SDSU), and the University of Wyoming collaborated in a three-year study to evaluate the effects of weaning calves 75 days earlier than normal on subsequent performance. Early-weaned (EW) calves were weaned in mid-August,

and normal-weaned (NW) calves were weaned in early November. Following is a brief summary of results of the first year of the study.

- Native range disappearance tended to be reduced when calves were weaned early.
- EW calves gained faster and more efficiently during a seven- to eight-week backgrounding phase. Nevertheless, NW calves were still heavier at the end of the backgrounding phase.
- Early weaning resulted in improvements in cow body weight and condition.
- NW calves were 170 lb. heavier at arrival to the finishing yard than EW calves; however, the average final harvest weight did not differ.
- NW calves required 61 fewer days on feed.

The authors concluded that early weaning can result in sparing a significant amount of forage and that it is advantageous to cow BCS. They also noted EW calves performed adequately during the postweaning period.

(Landblom et al. 2005. *South Dakota Beef Report*)

Factors affecting profitability of cow-calf enterprises in Northern Plains

SDSU scientists surveyed 148 cow-calf enterprises in eight Northern Plains states to analyze factors that influenced profitability. The data set was segregated into three profit groups based on return on assets (ROA): high (18.16% ROA), medium (2.88%) and low (-15.55%).

Results of the analysis revealed that high levels of profit are a function of lower-than-average investment and total expenses, and above-average reproductive performance and market prices for calves. Neither high nor low levels of other biological production traits, geographical region, size of operation or year were factors that explained differences in profitability.

The authors noted that profitability in the high-profit group is very competitive with other sectors of the economy. They went on to say, however, that the profit levels in the medium- and low-profit groups were not competitive with other opportunities for investment in the economy. They concluded that the long-term viability of the operations in these two groups would be difficult without other sources of income or investment.

(Dunn et al. 2005. *South Dakota Beef Report*)

Seven different genes may be related to feed efficiency

Numerous studies have shown that feed cost accounts for the greatest single cost in most beef production systems. Therefore, identification of genes that control feed efficiency could help reduce costs of production.

In this collaborative study, University of Alberta, Lacombe Research Centre and Lethbridge Research Centre scientists used the university's beef cattle population to conduct a genome

scan to map chromosomal regions that may be related to net feed efficiency. Net feed efficiency was determined by measuring residual feed intake (RFI; actual feed intake minus expected feed intake) of individual animals.

The mapping analysis detected seven statistically significant chromosomal regions for net feed efficiency. The authors concluded that the chromosomal regions identified in this study provide a valuable reference for further fine mapping and identification of candidate genes for net feed efficiency.

[Nkrumah et al. 2005. J. Anim. Sci. 88 (Supp. 1): Abstract M31]

Calf growth traits not antagonistic with calving traits

University of Manitoba and Agriculture Canada scientists used 6,442 calving records from three Angus herds for years 1984 through 2001 to determine, using two different analyses, genetic parameters for growth and calving traits in Canadian Angus cattle. Calf growth traits were birth weight (BW), weaning weight (WW) and yearling weight (YW). Calving traits were first calving date (CD1), calving date (CD) and calving interval (CI).

Averages of the two analyses for direct heritability estimates of BW, WW and YW were high (0.48, 0.70 and 0.65, respectively). The corresponding maternal heritability estimates were low to moderate (0.14, 0.22 and 0.09, respectively).

Estimates of direct heritabilities for CD1, CD and CI were low to moderate (0.18, 0.25 and 0.10, respectively). Direct growth traits tended to be strongly genetically correlated with one another (0.31 to 0.89), as were maternal growth traits (0.20 to 0.98).

Direct genetic correlations of growth traits with calving traits were generally negative (favorable). The same was true with maternal genetic correlations of growth traits with calving traits. These results indicate that selection for growth traits would not be antagonistic to calving traits and vice versa.

The authors also conducted an analysis of genetic trends for growth traits. This analysis revealed that BW, WW and YW in Canadian Angus cattle are increasing at rates of 0.37 lb., 4.01 lb. and 9.69 lb. per year, respectively, indicating that strong selection pressure was placed on growth traits during the study period, and further showing that these traits are highly heritable.

The authors concluded that the genetic parameter estimates in this study indicate the potential merit for developing breeding strategies that permit genetic improvement of both growth and dams' calving efficiency in Canadian Angus cattle.

[Rasali et al. 2005. Can. J. Anim. Sci. 85 (3): 309]

Backgrounding energy source may affect feedlot performance

The purpose of this University of Guelph experiment was to compare the

use of corn or soybean hulls in a haylage-based backgrounding diet on calf performance and subsequent feedlot performance. Crossbred steers weighing 667 lb. were individually fed one of three diets:

- 1) full-fed haylage [17.4% crude protein (CP)];
- 2) haylage + 20% cracked corn (CC); or

3) haylage + 20% soybean hulls (SBH).

The backgrounding phase lasted for 112 days. After backgrounding, all steers were fed a high-moisture corn-based diet and were harvested when estimated backfat reached 0.28 inches (in.).

As expected, during the backgrounding phase, steers fed either CC or SBH outperformed those fed straight haylage.

ADG, dry-matter intake (DMI) and feed conversion did not differ between the CC- and SBH-fed steers. However, during the finishing phase, steers fed SBH had lower ADG (3.50 lb. vs. 3.88 lb., respectively) and final body weight (1,362 lb. vs. 1,430 lb., respectively) than those fed CC. DMI and feed conversion did not differ between the two groups.

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The authors concluded that either CC or SBH could be included at 20% of the diet in haylage-based backgrounding diets to improve growth and efficiency. However, when finished on a comparable high-concentrate diet, steers previously fed CC gained faster, suggesting that source of energy during backgrounding

may influence subsequent feedlot performance.

[Ko et al. 2005. J. Anim. Sci. 88 (Suppl. 1): Abstract M161]

Compare receiving diets on health, performance, carcass traits

The objective of this collaborative

study between Illinois State University, the University of Kentucky and the University of Illinois was to evaluate the effect of four different receiving diets on prefinishing performance and subsequent finishing performance.

A total of 176 crossbred steers weighing 582 lb. were fed a receiving diet of grass hay fed *ad libitum* plus one of the following supplements fed at 1%

of body weight:

- 1) wheat midds and soy hulls;
- 2) corn gluten feed and ground shelled corn;
- 3) corn gluten feed and soy hulls; or
- 4) corn gluten feed.

The receiving period was 53 days. Steers were harvested after a finishing period of either 195 or 204 days.

There were no significant differences between treatments during the prefinishing period in number of steers pulled for treatment, ADG, DMI or feed efficiency. Furthermore, there were no significant differences between treatments in finishing performance or carcass traits. These results suggest that various combinations of these four feedstuffs can be fed as a supplement to grass hay with similar results.

[Walker et al. 2005. J. Anim. Sci. 88 (Suppl. 1): Abstract M173]

Effects of DDGS on performance, odor emissions

Distillers' grains have become more plentiful as a feedstuff, with distillers' dried grains plus solubles (DDGS) being the predominant form. SDSU researchers conducted a trial to determine if increasing dietary concentrations of DDGS would affect feedlot performance and/or odor emissions.

A total of 199 steers weighing 851 lb. were allotted to one of four dietary groups:

- control — 82% cracked corn, 0.8% urea;
- treatment 1 — all urea and portion of corn replaced with 15% DDGS;
- treatment 2 — all urea and portion of corn replaced with 25% DDGS; or
- treatment 3 — all urea and portion of corn replaced with 35% DDGS.

DMI was significantly greater for the 25% DDGS steers than for all other treatments (24.8 lb. per day vs. 23.9 lb. per day, respectively). There were no differences in final weight. However, the 35% DDGS steers had a higher dressing percentage, which resulted in significantly greater carcass weights than the other three treatments (827 lb. vs. 795 lb.). There were no differences between treatments for marbling, backfat, ribeye area or yield grade.

Air samples were collected via wind tunnel over a three-day period. No differences in odor characteristics between treatments were detected.

These results indicate that feeding a diet with 35% DDGS can result in an increase in dressing percentage and carcass weight without an increase in odor emissions.

[Benson et al. 2005. J. Anim. Sci. (Suppl. 1): Abstract 421]

Accounting for variation in feedlot profitability

Using closeouts on 1,836 pens of cattle from producers in the Iowa Feedlot Monitoring program, Iowa State University scientists analyzed factors

affecting performance and profitability.

As initial body weight increased, DMI and ADG increased, but feed efficiency declined. Cattle started on feed in the winter had significantly improved feed efficiency compared to those started in the summer or fall.

Cattle fed lower levels of concentrate (less than 75%) were the most profitable; those fed intermediate levels (75%-85%) were least profitable; and those fed higher levels (greater than 85%) were intermediate in profitability.

Fewer cattle per pen (less than 100 vs. greater than 100 head) led to greater profit per head. Steers gained faster and more efficiently than heifers, but there was no difference in profitability.

The percentage of profit variability attributable to various factors broke down as follows: fed price, 26%; feeder price, 25%; feed efficiency, 13%; corn price, 2%; and ADG, 1%.

The authors concluded that because more than 50% of the variation in profit is due to fed and feeder-cattle prices, these results show the importance of marketing on profitability.

(Koknaruglu et al. 2005. Prof. Anim. Sci. 21:286)

Molasses blocks had no effect on calf performance or health

NDSU scientists used a total of 144 crossbred steers to assess the effects of supplemental cooked molasses blocks with or without flax on newly received calf health and subsequent performance over a period of six weeks. There were three groups:

- 1) control (no block);
- 2) block without flax (WOF); and
- 3) block with ground flax added (WFA).

Calves were fed a basal diet of 48% corn and 52% roughage.

There were no differences among treatments for body weights taken at days 14-15, 26-27, or at the conclusion of the trial; nor was ADG (3.2 lb.) different between treatments. Furthermore, DMI and feed efficiency did not differ among treatments. Block intake (0.35 lb. per day) did not differ between WOF and WFA. Number of calves treated for sickness did not differ between treatments.

The authors concluded that providing a supplement in the form of a molasses block, with or without flax, did not improve calf performance or health.

[Larson et al. 2005. J. Anim. Sci. (Suppl. 1) Abstract 609]

Effects of phase-feeding of crude protein on feedlot performance

Decreasing dietary CP, especially during the latter part of the finishing period, could significantly decrease feed costs and reduce nitrogen (N) losses to the environment.

In a collaborative study, New Mexico State University, Texas Tech University and University of Arizona researchers used 360 crossbred steers weighing 695 lb. to evaluate the effects of phase-feeding CP on performance of

feedlot cattle fed a 90%-concentrate diet. Cattle were on feed for an average of 182 days. There were six treatment groups:

- 1) fed 11.5% CP throughout;
- 2) fed 13% CP throughout;
- 3) switched from 11.5% to 10.0% CP 56 days prior to harvest;
- 4) switched from 13% to 11.5% CP 56 days prior to harvest;

5) switched from 13% to 10% CP 56 days prior to harvest; and

6) switched from 13% to 11.5% CP 28 days prior to harvest.

Cattle were harvested when 60% of the cattle within a block were estimated to grade USDA Choice.

Steers switched from 13% to 10% CP had significantly lower ADG (2.51 lb. vs.

3.35 lb.) and feed efficiency than steers fed 13% CP throughout.

Steers on phase-feeding programs had numerically lower ADG and DMI during the last 41 days on feed than those fed 11.5% or 13% CP throughout.

Performance of steers fed constant 11.5% CP was similar to steers fed constant 13% CP, although steers fed the

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lower CP diet had numerically lower ADG (3.26 lb. vs. 3.35 lb., respectively) and DMI (16.84 lb. vs. 17.55 lb., respectively).

These results indicate that a modest decrease in dietary CP (for example, 13% to 11.5%) has only modest effects on performance, but decreasing CP to 10%

would negatively affect the performance of finishing cattle.

[Gleghorn et al. 2005. J. Anim. Sci. (Suppl. 1): Abstract 611]

Feedlot cattle getting fatter in wrong places

Cattle-Fax analysts recently reported

that the percent of Yield Grade (YG) 4 cattle has been increasing at a rate of about one percentage point per year since 2001. In 2005, YG 4s averaged about 7%, compared to only 2% in 2001. If this rate continues, the percent of YG 4 cattle could reach 12% by 2010.

Equally alarming is the fact that the percent of Choice grade cattle has remained relatively flat during the same

time period. In other words, carcasses are getting fatter on the outside, but marbling is not keeping pace with external fat. Heavier carcass weights are also contributing to the increase in YG 4s.

Effects of preweaning management on calves during receiving period

The objective of this University of Florida/U.S. Department of Agriculture (USDA) study was to examine the effects of preweaning management strategies on the 30-day performance of weaned calves after being transported for 24 hours. Sixty-four Brahman x British steers were allotted to one of four treatments:

- 1) control — weaned directly onto truck;
- 2) creep-fed — fed free-choice creep feed for 45 days before weaning;
- 3) preweaned — weaned 45 days prior to transport; or
- 4) early-weaned — weaned at 80 days of age.

Calves were weaned on Day 0 and trucked for 24 hours to the feedyard. Calves were then fed free-choice hay and a commercial grain starter during the 30-day receiving period.

Average body weight gain was greater for early-weaned calves than for control calves. Average body weight gain did not differ between preweaned and creep-fed calves, but both tended to be greater than controls.

DMI was greater for early-weaned than for control calves. DMI did not differ between creep-fed and preweaned calves, but both were greater than controls.

Feed efficiency (feed-to-gain) was better for early-weaned calves than for control calves, but did not differ among creep-fed, preweaned and control groups.

The authors concluded that adoption of the three preweaning management strategies described in this study may optimize calf performance following transport and entry into the feedyard.

[Cooke et al. 2005. J. Anim. Sci. (Suppl. 1): Abstract T164]

Pasture-finished beef fatty acids profiles

The fatty acids linolenic acid (an omega-3 fatty acid) and conjugated linoleic acid (CLA) are known to be beneficial to human health. Virginia Tech researchers conducted a 140-day trial to evaluate the effect of two different diets on the concentration of these fatty acids in the adipose tissue of finishing steers.

Twelve steers were finished on a high-concentrate, corn-based diet, and 12 were finished on pasture. Subcutaneous adipose tissue biopsy samples were taken initially and at days 28, 84 and 140.

The CLA and linolenic acid contents of adipose tissue increased significantly in pasture-finished steers and decreased significantly in steers

fed high-concentrate. By Day 140, the concentrations of adipose CLA were 10.1 mg per gram (g) vs. 2.12 mg per g tissue, respectively, for the two diets. The concentrations of adipose linolenic acid were 5.81 mg per g vs. 2.57 mg per g tissue, respectively.

These results indicate that pasture finishing increased CLA and omega-3 fatty acids in beef products.

[Guay et al. J. Anim. Sci. (Suppl. 1): Abstract 620]

Vaccination effective in reducing *E. coli* O157:H7 colonization

University of Nebraska researchers conducted a trial to evaluate the effects of vaccination on the probability of feedlot steers to shed *E. coli* O157:H7 in the feces and for the organism to colonize in the terminal rectum.

A total of 288 steers were allotted to one of two treatments — vaccination or no vaccination. Fecal samples were collected from the rectum of each steer on days 1, 14, 28 and 56. At harvest (Day 57), mucosal samples were collected from each steer by scraping the mucosal lining of the rectum.

The probability to shed *E. coli* O157:H7 in the feces did not differ significantly between vaccinated and nonvaccinated steers. However, the probability of colonization by *E. coli* O157:H7 in the terminal rectum was dramatically reduced by vaccination (0.7% vs. 27.0% for vaccinated and nonvaccinated, respectively).

These results suggest that vaccination may be a promising preharvest intervention for the control of *E. coli* O157:H7 in feedlot cattle.

[Peterson et. al. J. Anim. Sci. (Suppl. 1): Abstract 379]

Diverse biotypes of steers respond similarly to ractopamine supplementation

Colorado State University and Elanco scientists conducted a study to determine if three different biological types of cattle would respond differently to supplemental ractopamine (RAC).

A total of 420 British, Continental-cross, and Brahman-cross steer calves were allotted to one of two treatments:

- 1) control, no RAC; or
- 2) fed 200 mg RAC per head per day during the last 28 days of the finishing period.

Feeding RAC significantly improved ADG (3.81 lb. vs. 3.31 lb., respectively) and feed conversion (5.99 lb. vs. 7.04 lb., respectively). RAC supplementation did not affect dressing percentage, fat thickness, kidney and pelvic heart (KPH) fat percentage, or yield grade. Steers fed RAC had significantly heavier carcass weights (805 lb. vs. 792 lb., respectively) and larger ribeye areas [13.0 square in. (sq. in.) vs. 12.7 sq. in., respectively] than control steers.

British steers had the highest marbling scores. Continental-cross steers had the heaviest live weights, highest dressing percentages, heaviest

carcass weights and largest ribeye areas. Brahman-cross steers had the lowest DMIs, lightest carcass weights and lowest marbling scores. However, there were no significant differences among biological types in the magnitude of their response to RAC.

The authors concluded that, despite inherent differences in performance and carcass characteristics of diverse

biological types, these biotypes would be expected to respond similarly to RAC supplementation.

[Gruber et al. 2005. J. Anim. Sci. (Suppl. 1): Abstract 425]

50%- to 75%-concentrate appears optimum for newly received cattle

Because the receiving period is critical to the ultimate profitability of feedlot

cattle, the opposing strategies of starting cattle on higher-roughage vs. lower-roughage diets continue to be debated in the feeding sector.

In this Texas Tech University study, data from the Clayton, N.M., Livestock Research Center were analyzed to determine relationships between dietary roughage concentration and receiving

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period morbidity, DMI and ADG. Table 1 compares the results of feeding a 40%-roughage vs. a 100%-roughage receiving diet for four weeks.

Morbidity and mortality decreased slightly as dietary roughage increased. As expected, ADG and DMI declined with increasing dietary roughage. An

economic analysis revealed that the decreased morbidity associated with a 100%-roughage vs. a 40%-roughage diet would not affect the loss in profit resulting from reduced performance when the 100%-roughage diet was fed.

The authors concluded that the optimum dietary strategy for starting

lightweight (350-550 lb.), highly stressed, newly received cattle on feed would likely be to feed a 50%- to 75%-concentrate diet, which seems to allow cattle to perform well without economically important negative effects on receiving period health.

(Rivera et al. 2005. Prof. Anim. Sci. 21:345)

Table 1: Performance and health of steers fed a 40% vs. a 100%-roughage receiving diet for four weeks

Item	Dietary roughage, % of DM	
	40%	100%
ADG, lb.	1.30	0.13
DMI, lb. per day	10.6	8.8
Morbidity, %	40.0	36.0
Mortality, %	1.0	0.75
Feed cost of gain, \$ per cwt.	60.97	253.20
Profit, \$ per head	-5.11	-29.44

Retail consumers' ribeye preferences

The National Beef Quality Audit (NBQA) revealed there is an extreme range among U.S. beef carcasses in size of the loin. Ribeye area ranged from 7.75 sq. in. to 23.2 sq. in. Previous research has shown that optimum ribeye size for foodservice is 12-15 sq. in. Optimum size for the retail/consumer sector has not been determined and was the objective of this two-phase SDSU study.

In Phase I, 50 USDA Choice ribeye rolls were assigned to five size categories based on ribeye area: 9.5-10.5 sq. in.; 10.8-12.1; 12.4-14.0; 14.3-16.0; or 16.3-18.4.

Fourteen 1-in.-thick steaks were cut from each ribeye roll, transported to a retail grocery store and marked for sale at \$8.99 per lb. Steaks were tallied every four hours to determine the amount of time that each steak remained in the case. Steaks that did not sell within an allotted time were removed from the case and termed "pulled."

Results showed that time in case and percentage of steaks pulled from the case did not differ among the five size categories. However, large steaks (14.7-17.5 sq. in.) sold significantly faster than average-sized and small ribeye steaks.

In Phase II, a willingness-to-pay study was designed to determine whether consumers would discount large steaks (16.3-18.4 sq. in.) compared with average-size steaks (12.4-14.0 sq. in.) and to determine whether cutting steaks in half was a viable marketing option for the large ribeye steaks. A total of 75 consumers were recruited to participate.

Participants were willing to pay a premium of \$0.68 per lb. for large steaks vs. average steaks. They discounted the large steaks that were cut in half by \$0.46 per lb. from the average steaks.

The authors concluded that no optimum loin muscle existed for beef retail consumers; however, a trend existed toward greater demand for larger loin muscle sizes vs. smaller ones. They added that this study suggests the beef industry should not limit loin muscle size. In addition, the authors concluded that cutting large ribeye steaks in half is not a viable marketing option.

(Sweeter et al. 2005. J. Anim. Sci. 83: 2598)