



# BEEF CATTLE RESEARCH UPDATE

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May 2007

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## **Carcass Characteristics and Quality Attributes of Calf- and Yearling-Fed Steers**

Due to increasing grain prices (due to increased corn usage for ethanol production), feedlots are feeding heavier weight cattle (yearlings) that have spent more time on pasture as compared to feeding calves. How will this shift in cattle feeding affect the quality and palatability of the final product marketed to consumers? Recently published research addresses this issue. Research suggests that calves begin to accumulate marbling as soon as they are adapted to a high grain diet, and backgrounding calves on pasture may retard marbling development.<sup>1</sup>

Nebraska researchers conducted a two year experiment to compare carcass characteristics and meat palatability attributes of steers ( $\frac{3}{4}$  British,  $\frac{1}{4}$  Continental) finished postweaning (weaned in October) as calves or yearlings.<sup>2</sup> In this study, calves and yearling of the same contemporary group were designated to a finishing system at weaning. Calves were finished in a feedlot (191 days) on a 90% concentrate diet. Yearlings grazed crop residues (cornstalks) after weaning followed by grazing spring (bromegrass) and summer (bluestem, Indiangrass, and switchgrass) pasture, and concluded with a 91-day finishing period in the feedlot. All steers were fed to a constant fat thickness endpoint (0.39 inches). Calf-finished steers were approximately 13 to 14 months old at slaughter, whereas, yearling-finished steers were approximately 19 to 20 months old at slaughter. Steaks from both production systems were aged for 7, 14, or 21 days for Warner-Bratzler shear force (WBS) determination and for 7 or 14 days for sensory panel evaluation.

Yearlings produced heavier carcasses (827 vs 694 lb) with larger rib-eye areas (12.6 vs 11.3 sq inches) and lower marbling scores and quality grades. The calf-finished steers produced carcasses that graded 66.2% USDA choice or greater, whereas, only 15.7% of the yearling carcasses graded choice or better. Calves produced steaks with lower WBS values and greater sensory rating for flavor than yearlings. Choice steaks from calves were more tender, juicy and palatable than Choice steaks from yearlings. Similarly, Select steaks from calves were rated more tender, juicy and palatable than Select steaks from yearlings. Increasing aging time from 7 to 14 to 21 days produced steaks with lower WBS values, regardless of production system. Aging improved tenderness ratings for Select grade steaks, but had no effect on Choice grade steaks. The steaks were categorized as tough, intermediate or tender based on WBS. Steaks from yearling had a much greater risk of being tough than steaks from calves (21.2 vs 1.2%). Similarly, sensory panel ratings for tenderness, juiciness and flavor showed that steaks from calves were much more likely to be desirable than steaks from yearlings (38 vs 21%).

In summary, these researchers found that growing genetically similar steers for a longer period of time on forage with a short finishing period resulted in heavier carcasses with lower quality grades and tougher, less palatable beef. When fed to a common backfat thickness endpoint, calf-finished steers produced carcasses superior in both quality and palatability. However, increasing postmortem aging time greatly decreased the probability that yearling-finished steers produced tough, unacceptable beef.

Texas researchers compared calf- and yearling-finished Brangus nuclear transfer cloned steers fed either to a constant age (16 months) or a constant body weight (1166 lb).<sup>1,3,4</sup> These researchers reported that calves had heavier carcasses, greater backfat thickness, numerically greater yield grades, and greater quality grades (marbling scores) compared to yearlings fed to a constant-age endpoint. Whereas, calves and yearlings fed to a constant weight yielded carcasses similar in

weight and fat thickness with no differences in quality grade. Neither endpoint affected meat palatability between the calves and yearlings.

These researchers also measured fatty acid synthesis and adipocyte diameter and volume in the adipose tissue of the three feeding groups. Volume distributions for both i.m. and s.c. adipocytes indicated that yearling-feds had smaller adipocytes than calf-feds when they were sampled at the same age (Figure 1). This occurred due to the shorter time on the corn finishing diet for the yearling steers since research suggest that corn (starch) promotes marbling.<sup>1</sup> However, feeding yearlings to the same body weight as calves resulted in adipocyte volumes that were similar between the two feeding groups.<sup>3</sup> These researchers concluded that although backgrounding yearling-fed steers on pasture initially depresses fat deposition, there is a complete recovery of carcass fat when the yearlings are grown to the same body weight as calf-feds.<sup>1</sup>

Different results between the Nebraska and Texas studies could possibly be attributed to greater genetic variation in the Nebraska experiment. Since clones were used in the Texas study, most or all of the genetic variability would have been eliminated.

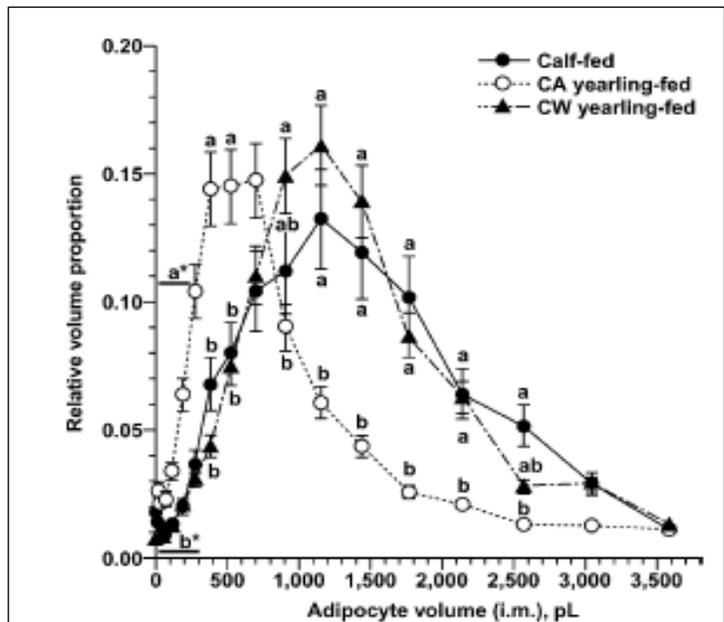


Figure 1. Volume distributions of i.m. adipocytes from calf-fed and yearling-fed Brangus steers raised to a constant age (16 mo; CA yearling-fed) or a constant BW (530 kg; CW yearling-fed). <sup>a,b</sup>Relative volume proportions of i.m. adipocytes without common superscripts are different ( $P < 0.05$ ). <sup>a\*,b\*</sup>Relative volume proportions  $< 300$  pL are all greater in i.m. adipose tissue of CA yearling-fed steers than in calf-fed or CW yearling-fed steers. Source: Smith et al., 2007

- <sup>1</sup> Smith, S. B. and D. K. Lunt. 2007. Marbling: Management of cattle to maximize the deposition of intramuscular adipose tissue. Plains Nutrition Council Spring Conference Publ. No. AREC 07-20:26-40.
- <sup>2</sup> Brewer, P. S., J. M. James, C. R. Calkins, R. M. Rasby, T. J. Klopfenstein, and R. V. Anderson. 2007. Carcass traits and m. Longissimus lumborum palatability attributes of calf- and yearling-finished steers J. Anim. Sci. 85:1239-1246.
- <sup>3</sup> Harris, J. J., D. K. Lunt, S. B. Smith, W. L. Mies, D. S. Hale, M. Koohmaraie, and J. W. Savell. 1997. Live animal performance, carcass traits, and meat palatability of calf- and yearling-fed cloned steers J. Anim. Sci. 75:986-992.
- <sup>4</sup> Smith, S. B., A. A. Chapman, D. K. Lunt, J. J. Harris, and J. W. Savell. 2007. Adiposity of calf- and yearling-fed Brangus steers raised to constant-age and constant-body weight endpoints J. Anim. Sci. 85:1136-1143.

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