# BEEF CATTLE RESEARCH UPDATE

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**Benefits of Natural Branded vs. Conventionally-Fed, Commodity Beef**

Research on natural-branded beef is limited, yet consumers perceive that natural and organic beef provide certain health benefits. These perceived benefits include lower amounts of saturated fatty acids (SFA) and higher amounts of polyunsaturated fatty acids (PUFA). Recent University of Arkansas research compared the quality characteristics of fresh and cooked steaks from natural-branded beef with that of commodity beef.[1] In this study, beef ribeye rolls were purchased from five natural-branded programs and two commodity beef programs to evaluate quality attributes. The natural-fed beef requirements were all vegetarian diet, no hormone implants, and no dietary antibiotics.

These researchers reported that muscle pH, moisture content, intramuscular fat content, instrumental color, and fatty acid composition (SFA and PUFA) did not differ between steaks from commodity beef and steaks from natural beef programs. If anything, natural-branded beef tended to be higher in in SFA and lower in PUFA than commodity beef. Steaks from the commodity programs had greater cooking losses and received higher juiciness ratings than natural steaks, but there were no differences in Warner-Bratzler shear force (measure of tenderness), or consumer ratings for tenderness, texture, flavor intensity, beef flavor and overall impression between the two beef programs. This research also noted that consumers could not distinguish natural beef from commodity beef based solely on palatability. These researchers concluded that this study indicated that, with the exception of price, there are little to no differences between commodity beef and natural beef programs.

**Sustainability Implications of Feedlot Management Practices**

In recent years, the term sustainability has become a desirable selling point. The perception is that "natural" beef products" are more sustainable than conventional raised beef. No formal standards exist for "natural" beef. However, the USDA Agricultural Marketing Service (AMS) has developed a set of requirements for a marketing claim for a product called "Never Ever 3" (NE3). To be marketed as NE3 beef, cattle from birth to slaughter may not receive antibiotics, growth promotants, or animal byproducts (AMS, 2009).[2] Recent University of California research compared animal feedlot performance, carcass attributes, costs of production, and greenhouse gas emissions implications associated with two feedlot management regimes (Conventional and NE3).[3] In this study, the conventional cattle were implanted with Synovex® Choice on days 1 and 70 of the feeding period, were fed Rumensin® and Tylan® over the entire study, and were fed Optaflexx™ for 29 days prior to shipping. In contrast, the NE3 cattle received no growth promotants or feed additives. The cattle were shipped on a constant end weight basis when the average pen weight (four pens per treatment) reached a target of 1300 lb (actual 1314 lb weight). For the last seven days on feed, each pen was moved to a facility where greenhouse gas emissions (methane, $CH_4$ and nitrous oxide, $N_2O$) were continuously recorded for five days in each pen.

The results of this study are shown in Table 1. The conventional cattle had 34% greater daily gains (3.99 vs. 2.98 lb/day) and were on feed 42 fewer days than NE3 cattle (146 vs. 188 days). Due to the fact that the conventional cattle were fed fewer days, their total feed intake was reduced by 24% (2452 vs. 3224 lb). However, the average dry matter intake (DMI) per day did not differ between treatments. The conventional cattle were 33% more efficient than NE3 cattle (0.24 vs. 0.18 Gain/Feed ratio). The cost of gain was 16% lower for conventional cattle than NE3 cattle (51 vs. 61¢/lb gain). The conventional cattle produced carcasses with larger ribeyes, less backfat, lower yield grades, and lower marbling scores. Steaks from the NE3 cattle had lower Warner-Bratzler

shear force values (WBSF) than steaks from conventional cattle indicating greater tenderness (7.03 vs. 7.63 lb). However, the mean WBSF values for both treatments were below the threshold value of 9.9 lb, above which consumers generally consider steaks to be tough.[4]

It was reported that treatment did not affect daily $CH_4$ or $N_2O$ emissions during the days in which emissions were recorded ($CH_4$: 295 vs. 282 grams/steer and $N_2O$: 5.73 vs. 4.79 grams/steer for conventional and NE3, respectively). Assuming that emissions were constant on a DMI basis throughout the course of the feedlot trial, conventional feedlot management resulted in a 31% decrease in emissions per finished steer compared with NE3 management. Expressing $CH_4$ on a carbon dioxide equivalent ($CO_2$-eq) basis shows that conventional cattle produced 22% less $CO_2$-eq per lb of liveweight gain in the feedlot than NE3 cattle (3.92 vs. 5.02).

These researchers concluded that the use of implants and feed additives reduced the feed inputs and production resources required to produce a fixed amount of output, with resultant environmental and economic sustainability advantages.

Table 1. Effect of treatment on feedlot performance, carcass data, and greenhouse gas emissions.

| Item | Conventional | NE3 | p-value |
|---|---|---|---|
| Performance Data | | | |
| Initial weight, lb | 743 | 743 | 0.77 |
| Final weight, lb | 1323 | 1303 | 0.09 |
| Average daily gain, lb | 3.99 | 2.98 | <0.0001 |
| Days on feed | 146 | 188 | 0.01 |
| Total lb of feed DM/steer | 2452 | 3224 | 0.041 |
| DMI/steer/day, lb | 16.76 | 17.20 | 0.22 |
| Gain/Feed | 0.24 | 0.18 | 0.0019 |
| Cost of feed + technology, $/lb gain | 0.51 | 0.61 | 0.011 |
| Carcass Data | | | |
| Carcass weight, lb | 811 | 798 | 0.072 |
| Dressing percent | 61.3 | 61.3 | 0.62 |
| Ribeye area, $in^2$ | 13.5 | 12.4 | <0.0001 |
| USDA Yield Grade | 3.38 | 3.95 | <0.0001 |
| Fat thickness, in. | 0.65 | 0.72 | 0.0061 |
| Marbling score* | 5.4 | 6.2 | <0.0001 |
| WBSF, lb | 7.63 | 7.03 | 0.004 |
| Greenhouse Gas Emissions | | | |
| $CH_4$/hd/day during emission recording, grams | 295 | 282 | 0.62 |
| $N_2O$/hd/day during emission recording, grams | 5.73 | 4.79 | 0.70 |
| lb $CO_2$-eq/lb gain | 3.92 | 5.02 | |

*5 = $Small^{00}$, 6 = $Modest^{00}$, and 7 = $Moderate^{00}$.
Adapted from Cooprider et al., 2011

[1] Keys, C. A., J. K. Apple, J. W. S. Yancey, R. J. Stackhouse, and L. N. Mehall. 2010. Benefits of natural branded vs. Conventionally-fed, commodity beef. Arkansas Animal Science Department Report Research Series 584:57-59. Available: http://arkansasagnews.uark.edu/584-14.pdf.

[2] AMS. 2009. Never Ever 3 (NE3). Available: http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5066028.

[3] Cooprider, K. L., F. M. Mitloehner, T. R. Famula, E. Kebreab, Y. Zhao, and A. L. V. Eenennaam. 2011. Feedlot efficiency implications on greenhouse gas emissions and sustainability. J. Anim. Sci. 89:2643-2656.

[4] Shackelford, S. D., J. B. Morgan, J. W. Morgan, J. W. Savell, and H. R. Cross. 1991. Identification of threshold levels for warner-bratzler shear force in top loin steaks. J. Muscle Foods 2:289-296.