



# BEEF CATTLE RESEARCH UPDATE

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## **Effect of a Low Vitamin A Diet on Marbling and Carcass Characteristics of Angus Cross and Simmental Steers**

Research reviews evaluating the potential effects of vitamin A on marbling deposition in beef cattle have suggested that feeding no supplemental vitamin A to feedlot cattle might increase marbling deposition while not affecting cattle performance.<sup>1,2,3</sup> The 2016 Beef NRC recommends a dietary vitamin A concentration of 1,000 IU/lb of dry matter (DM) for feedlot cattle.<sup>4</sup> A 2015 survey of feedlot consulting nutritionists showed the average vitamin A concentration recommended by consultants was 2,138 IU/lb in finishing diets (most frequent recommendation was 907 IU/lb).<sup>5</sup> These vitamin A research studies did not compare the effects of vitamin A restriction on cattle with high or low propensities to marble. North Dakota State University researchers hypothesized that propensity to marble may be an important aspect to consider when determining vitamin A supplementation.<sup>6</sup>

In this North Dakota study, commercial Angus steers consisting of a minimum of 75% Angus genetics (Angus x Simmental) and purebred Simmental steers were used to evaluate the effect of a low vitamin A diet on growth and meat quality characteristics. These steers had previously been grazing on summer pasture and therefore likely had high liver vitamin A stores. To begin to deplete liver vitamin A stores, the steers were then backgrounded on a low vitamin A diet (461 IU/lb of DM) for 3 months. The steers were then allocated to one of two dietary treatments for finishing. The basal diet was low in vitamin A (328 IU/lb). One treatment consisted of the basal diet with no supplemental vitamin A while the other treatment was supplemented with vitamin A at the NRC recommended level of 1,000 IU/lb of DM. The steers were slaughtered in two groups after 150 and 180 days of finishing, when they weighed approximately 1345 lb at a commercial slaughter facility where two strip loin steaks were collected from each steer to analyze meat quality characteristics.

These researchers reported that average daily gain of steers in the low vitamin A treatment was 5.3% greater (3.35 vs. 3.18 lb/day,  $P = 0.03$ ) than the supplemented treatment. However, vitamin A treatment did not effect any other production measurement. This result contrasts with previous vitamin A research which has reported no difference or a reduction in growth with vitamin A restriction.

There was an interaction of breed and treatment on marbling score ( $P = 0.008$ ). Within the Angus-cross steers, the low vitamin A treatment had 16% greater marbling scores than steers supplemented vitamin A. Whereas, there was no difference in marbling scores between treatments in the Simmental steers. This difference in marbling score was associated with Quality Grade differences. A greater proportion (86.7 vs. 62.1%,  $P = 0.02$ ) of Angus cross cattle graded choice than Simmental steers. Within the Angus cross cattle, the low vitamin A treatment resulted in 26.6% of cattle grading higher (choice improving to prime) than their non-supplemented A counterparts. When examining prime carcasses, there was a significant interaction of breed and treatment, with more low vitamin Angus cross cattle grading prime than any other group ( $P = 0.02$ ).

These authors concluded that these results suggest that “feeding a low vitamin A diet to cattle that have a genetic high propensity for marbling (Angus cross) would function to increase the profits of cattle producers and packers without increasing cost of production”. They also noted that no adverse effects on production characteristics or carcass characteristics were apparent when vitamin A was not supplemented in the diet of either breed of cattle. Thus, it may be beneficial to reduce or remove vitamin A supplementation from all cattle finishing diets, though care must be taken to avoid vitamin A deficiency.

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- <sup>1</sup> Pyatt, N. A. and L. L. Berger. 2005. Review: Potential effects of vitamins A and D on marbling deposition in beef cattle. *Prof. Anim. Sci.* 21:174-181.
  - <sup>2</sup> Hicks, B. 2007. Effect of supplemental vitamin A concentrations on marbling in feedlot cattle. Oklahoma Panhandle Research and Extension Center Beef Cattle Research Updates (September, 2007). Goodwell, OK. Available: <http://oprec.okstate.edu/animal-science/research-newsletters/by-date/2007%20Beef%20Reports/bcr-updt-sept-2007.pdf>.
  - <sup>3</sup> Hicks, B. 2008. Effect of supplemental vitamin A concentrations on marbling in feedlot cattle. Oklahoma Panhandle Research and Extension Center Beef Cattle Research Updates Beef Cattle Research Update (June, 2008). Goodwell, OK. Available: <http://oprec.okstate.edu/animal-science/research-newsletters/by-date/2008%20Beef%20Reports/bcr-updt-june-2008.pdf>.
  - <sup>4</sup> National Academies of Sciences, Engineering, and Medicine. 2016. *Nutrient Requirements of Beef Cattle, Eighth Revised Edition*. Washington, DC: The National Academies Press.
  - <sup>5</sup> Samuelson, K. L., M. E. Hubbert, M. L. Galyean, and C. A. Löest. 2016. Nutritional recommendations of feedlot consulting nutritionists: The 2015 New Mexico State and Texas Tech University survey. *Journal of Animal Science* 94: 2648-2663.
  - <sup>6</sup> Knutson, E. E., X. Sun, A. B. P. Fontoura, J. Gaspers, J. H. Liu, K. R. Carlin, M. L. Bauer, K. C. Swanson, and A. K. Ward. 2017. Effect of a low vitamin A diet on marbling and carcass characteristics of Angus cross and Simmental steers. *Proc. West. Sec. Am. Soc. Anim. Soc.* 68: 96-100.

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