BEEF CATTLE RESEARCH UPDATE

Britt Hicks, Ph.D., PAS
Area Extension Livestock Specialist
Oklahoma Panhandle Research & Extension Center

February 2014

Effect of Duration of Time that Feedlot Cattle are Fed a High-Grain Diet on Recovery from a Bout of Ruminal Acidosis

Finishing feedlot cattle are fed high-grain diets to meet the energy requirement for rapid growth, but this feeding practice predisposes cattle to ruminal acidosis which is the most prevalent digestive disorder in feedlot cattle. Recent Canadian research determined if the duration of time that cattle are fed a high-grain diet influences their susceptibility to and recovery from a bout of ruminal acidosis.[1] In this study, 16 ruminally cannulated Angus heifers were transitioned from a backgrounding diet (60% barley silage, 30% barley grain, and 10% supplement on a dry matter basis, DM) to a finishing diet (9% barley silage, 81% barley grain, and 10% supplement, DM basis) over a 20 day period using 5 intermediate diets each fed for 4 days. The heifers were fed the fed the high-grain diet for either 34 days (long adapted) or 8 days (short adapted) before inducing ruminal acidosis. On the day before the acidosis challenge, feed intake for both treatment groups was restricted to 50% of DM intake as a proportion of body weight (BW). On the day of the challenge, heifers received an intraruminal infusion of ground barley at 10% of DM intake as a proportion of BW. Heifers were then given their regular diet allocation 1 hour after the intraruminal infusion. Data was collected during four distinct periods in this study including an 8-day baseline period, on the day of the acidosis challenge, and during two consecutive 8-day recovery periods.

These researchers reported that treatment had no effect on DM intake or ruminal pH variables (minimum, mean, and maximum pH) during any of the collection periods (baseline, challenge, and recovery). However, during the baseline period and challenge periods, heifers that had spent more time on the final diet exhibited decreased between-day variation in ruminal pH as compared to heifers that had been on the final diet for only 8 days. Even though, the ruminal pH variation was greater for short adapted than long adapted heifers, the severity of the induced acidosis and the risk of acidosis did not differ by treatment. Data collected during the recovery periods indicated that long adapted heifers required less time to recover from a bout of acute ruminal acidosis. These authors concluded that more time on high-grain feed stabilizes ruminal pH both before and following a bout of ruminal acidosis but does not affect susceptibility of cattle to ruminal acidosis.

Implants and Meat Quality

Implants are routinely used in the finishing phase of beef production to improve animal performance and feed efficiency. Data collected during the USDA's National Animal Health Monitoring System's Feedlot 2011 study showed that about 94% of heifers and steers were implanted at least once in the feedyard.[2] Nearly four of five implanted steers (79.8%) weighing less than 700 lb when placed on feed received two or more implants and nearly all implanted heifers (98.6%) weighing less than 700 lb when placed on feed received two or more implants. For steers or heifers weighing 700 lb or more at placement, 77.8% of the steers and 48.8% of the heifers were implanted only once.

Papers presented at a 2013 American Society of Animal Science symposium on "Implants, Muscle Development, and Meat Quality" reviewed the impact of implants on beef quality and palatability.[3,4] These reviews noted that implanting in the feedlot on average increases daily gains 18%, feed intake 6%, feed efficiency 8%, carcass weight 5%, and ribeye area 4% compared with non-implanted controls. In a 1996 review of 37 implant trials, the use of a combination implant (estrogenic and trenbolone acetate) increased returns by $77/head compared with non-implanted steers. If calculated using today's prices, a combination implant would increase returns by $163/head. However, implants can have adverse effects on carcass quality and eating quality depending on the dose and frequency (aggressiveness) of the implant regimen administered. A

review of implant studies reported that the use of single estrogenic implant or a single combination implant reduced marbling scores by 3.75% and 4.6%, respectively, compared with non-implanted controls. Reimplant programs resulted in greater reductions in marbling scores as compared to non-implanted controls: estrogenic implant with estrogenic reimplant = -7.4%, combination implant and reimplant = -9.3%, or estrogenic implant with a combination reimplant = -11.5%. These reviews also noted that implanting cattle does not have a consistent effect on marbling score or Warner-Bratzler shear force. While most studies show that multiple implants and/or aggressive implanting regimens increase shear force, trained sensory panels frequently cannot detect differences in tenderness, juiciness, or flavor, especially when tenderness is maintained through proper postmortem aging at the packing plant. These reviews concluded that with the current high feed costs and cattle prices that implants are one of the most cost-effective technologies that can be used in beef production systems.

---

[1] Schwaiger, T., K. A. Beauchemin, and G. B. Penner. 2013. The duration of time that beef cattle are fed a high-grain diet affects the recovery from a bout of ruminal acidosis: Dry matter intake and ruminal fermentation. J. Anim. Sci. 91:5729-5742.

[2] USDA-APHIS. 2013. The use of growth-promoting implants in u.S. Feedlots. USDA–APHIS–Veterinary Services, Fort Collins, CO.

[3] Duckett, S. K. and S. L. Pratt. 2014. Meat science and muscle biology symposium—anabolic implants and meat quality. J. Anim. Sci. 92:3-9.

[4] Garmyn, A. J. and M. F. Miller. 2014. Meat science and muscle biology symposium—implant and beta agonist impacts on beef palatability. J. Anim. Sci. 92:10-20.