BEEF CATTLE RESEARCH UPDATE

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Implants for Feedlot Steers: A Meta-Analysis

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.[1] Research reviews published in 2013 reported that implanting in the feedlot on average increases average daily gain (ADG) 18%, dry matter intake (DMI) 6%, feed efficiency 8%, and hot carcass weight (HCW) 5% compared with non-implanted controls.[2,3] These reviews also noted that a combination implant would increase returns by $163/head. A recent Kansas State University study conducted a meta-analysis of studies evaluating feedlot steer implant programs to evaluate the differential effects of implant dosage on feedlot performance and carcass traits.[4] The implant treatments included in this analysis were negative controls (no implant), single estrogen implants (EST), and single implants of a combination of estrogen and trenbolone acetate (TBA). The combination dosages included 24 mg estradiol 17β plus 120 mg TBA (ET120) and 28 mg estradiol benzoate plus 200 mg TBA or 20 mg estradiol-17β plus 200 mg TBA (ET200). Two meta-analyses were conducted in this study. In the first analysis, the three implant treatments were compared to negative control and a second analysis compared ET120 vs. ET200 using only studies that included a direct comparison of these 2 dosages.

In the first comparison analysis, these researchers reported that a single implant increased ADG by 0.59 lb/day, DMI by 1.21 lb/day, and HCW by 47 lb, and decreased feed to gain ratio (F:G) by 0.65 units compared to negative controls (all at $P < 0.05$). They also noted that implanting with ET200 had a 61%, 48%, and 78% greater influence on ADG, F:G, and HCW compared to EST ($P < 0.05$), but ET120 was numerically intermediate and not different from either EST or ET200 for any of these variables. In the second comparison analysis, ET200 tended to have greater ADG (0.07 lb/day, $P = 0.10$) and HCW (3.1 lb, $P = 0.07$) and had lower F:G (0.12 units, $P < 0.01$) compared to ET120. It is interesting to note that the differences reported in Comparison 2 for F:G and the tendency for increased ADG and HCW for ET200 vs. ET120 have not been consistently reported in individual studies. Of the studies that contained 34 direct comparisons between ET200 and ET120, only one had previously reported a significant difference in ADG and only one of 32 individual studies concluded that ET200 reduces F:G compared to ET120. These researchers concluded that these meta-analyses can "enlighten our decision process regarding small but valuable differences in performance using different implant programs".

Incidence of Ruminal Acidosis in Feedlot Steers during Backgrounding, Diet Transition, and Finishing

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 the incidence, prevalence, severity, and risk factors for ruminal acidosis in feedlot steers during backgrounding, diet transition, and finishing.[5] This experiment used 250 British-based crossbred steers (728 lb initial weight) which were grouped together with 28 steers fitted with a ruminal cannula (547 lb initial weight). Steers were randomly allocated to 1 of 8 pens with 3 to 4 cannulated steers per pen with a total of 35 steers per pen. The entire feeding period (143 days) was divided into 4 feeding phases: backgrounding (BKGD; days 1 to 20), diet transition (TRAN; days 21 to 40), and the first half (FIN1; days 41 to 91) and second half (FIN2; days 92 to 143) of the finishing phase. During backgrounding, the steers were fed a forage-based diet which contained 45.7% barley silage, 41.6% rolled barley grain, and 12.7% supplement (canola meal and mineral and vitamins) on a dry mater (DM) basis. Steers were transitioned to a finishing diet containing (% DM) 5% barley silage, 80.9% rolled barley grain, and 13.8% supplement using 4 transition diets. In this study, ruminal pH was recorded in cannulated steers every 10 minutes throughout the study, and feed refusals and body weight were recorded every 2 weeks. Ruminal acidosis was defined to occur in cannulated steers when ruminal pH was below 5.5 for at least 180 minutes per day. The incidence of acidosis was defined as the number of times steers experienced ruminal acidosis during each period and prevalence was defined as the percentage of steers that experienced acidosis during each period.

These researcher's reported that the incidence rate of ruminal acidosis increased as the cattle had been on feed longer ($P < 0.01$; 0.1, 0.3, 6.7, and 14.9 episodes during BKGD, TRAN, FIN1, and FIN2, respectively). The prevalence of ruminal acidosis also increased with time ($P < 0.01$; 0.7, 1.7, 15.4, and 37.8%, respectively during BKGD, TRAN, FIN1, and FIN2). They also reported that for every pound increased in DMI that the prevalence of ruminal acidosis increased by 3.13% ($P < 0.01$) and the length of time that ruminal pH was below 5.5 increased by 12 minutes per day. In this study, daily gain and gain efficiency (gain to feed ratio) were both positively correlated to mean ruminal pH and negatively correlated with prevalence for ruminal acidosis, suggesting that performance may be compromised with low ruminal pH.

These authors concluded that the greatest incidence, prevalence, and severity of ruminal acidosis were observed towards the end of the finishing phase. The major risk factors associated with ruminal acidosis were days on feed and DMI. Due to the association between low ruminal pH and reduced gains and gain efficiency, they suggested that strategies to help regulate ruminal pH may have a positive impact on growth performance.

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[1] USDA-APHIS. 2013. The use of growth-promoting implants in u.S. Feedlots. USDA–APHIS–Veterinary Services, Fort Collins, CO.
[2] 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.
[3] 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.
[4] Reinhardt, C. D. and J. J. Wagner. 2014. High-dose anabolic implants are not all the same for growth and carcass traits of feedlot steers: A meta-analysis. J. Anim. Sci. 92: 4711-4718.
[5] Castillo-Lopez, E.,B. I. Wiese,S. Hendrick,J. J. McKinnon,T. A. McAllister,K. A. Beauchemin, and G. B. Penner. 2014. Incidence, prevalence, severity, and risk factors for ruminal acidosis in feedlot steers during backgrounding, diet transition, and finishing. J. Anim. Sci. 92: 3053-3063.