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Effects of using increasingly aggressive implant protocols on feedlot performance and carcass characteristics of calf-fed steers

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ABSTRACT

Three experiments evaluated aggressive implant strategies to better understand implant duration and allow for maximum return on implant investment in feedlot steers. Crossbred steers (n = 1,350; 282 kg initial BW, SD = 8) were fed for an average of 215 d (Exp. 1). Treatments were Revalor-IS (80 mg of trenbolone acetate and 16 mg of estradiol) or Revalor-XS (200 mg of trenbolone acetate and 40 mg of estradiol) initially followed by 1 or 2 consecutive Revalor-200 (200 mg of trenbolone acetate and 20 mg of estradiol) implants (6 replications). Crossbred steers (n = 1,513; 265 kg initial BW, SD = 18) were fed for an average of 208 d (Exp. 2). Treatments were (1) Revalor-G (40 mg of trenbolone acetate and 8 mg of estradiol) on d 0, Revalor-IS on d 50, and Revalor-200 on d 140; (2) Ralgro (36 mg of zeranol) on d 0 and Revalor-XS on d 50; and (3) Revalor-XS on d 0 and Revalor-200 on d 140 (5 replications). Holstein steers (n = 1,832; 144 kg initial BW, SD = 11) were fed for an average of 360 d (Exp. 3). Treatments were (1) Ralgro on d 0, Revalor-IS on d 120, and Revalor-S on d 240; (2) Ralgro on d 0 and Revalor-XS on d 120; (3) Ralgro on d 0, Revalor-IS on d 60, and Revalor-XS on d 160; and (4) Revalor-XS on d 0 and Revalor-XS on d 160 (6 replications). In all 3 experiments, final BW, ADG, and HCW were not affected by treatment ($P \geq 0.12$). Increasingly aggressive implant protocols have limited effects on feedlot and carcass performance of beef and Holstein steers.

Key words: carcass characteristics, cattle, feedlot, implant, performance

INTRODUCTION

Implants are used to improve growth rate and feed efficiency of beef cattle (Meyer, 2001). Johnson et al. (2013) reported that 90% of all feedlot cattle in the United States receive some type of growth-promoting implant. Most beef cattle are fed for more than 160 d, and Holsteins are fed for almost a year. Many implants only last 60 to 120 d, depending on the dose, before the hormones contained in the implant are depleted. Therefore, reimplanting is an important management tool used to further improve animal performance (Preston, 1999). Understanding the duration of implant effectiveness and knowing how long cattle will be on feed are important for cattle feeders. Understanding this allows feeders to match the proper implants and implant strategies to their cattle and allows for maximum return on investment (Brandt, 1997). When compared with nonimplanted cattle, Duckett and Pratt (2014) observed a 20% increase in ADG and a 13.5% improvement in gain efficiency in cattle that were reimplanted.

With an increased demand for efficiency, the use of more aggressive implant protocols has become increasingly common. However, when considering more aggressive implants and more aggressive implant protocols [increasing quantity of trenbolone acetate (**TBA**) and estradiol benzoate (**E**) dose], data are limited on the use of these implant combinations in cattle fed for greater than 170 d. Previous studies have compared nonimplanted Holstein cattle with single, double, and triple implant programs (Apple et al., 1991; Scheffler et al., 2003), but there is little information available that compares different combinations of multiple aggressive implants on long-fed Holstein steers to maximize production efficiency. Hilscher et al. (2016) conducted 3 experiments evaluating initial implant strategies for crossbred finishing cattle using more aggressive implants. They concluded that implant protocols using a more aggressive initial implant followed by a more aggressive terminal implant did not differ from implant protocols that used a less aggressive initial implant followed by a more aggressive terminal implant. Therefore, the objectives of these experiments were to compare feedlot and carcass performance of long-fed crossbred and Holstein

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steers receiving different aggressive initial implant strategies in commercial feed yard pens.

MATERIALS AND METHODS

The following experiments were conducted in collaboration with Merck Animal Health (De Soto, KS), Cattlemen's Nutrition Service LLC (Lincoln, NE), Larson Nutrition Services (Fowler, CO), Simplot Land and Livestock (Grand View, ID), and the University of Nebraska–Lincoln. Research was conducted at commercial facilities and followed the guidelines stated in the *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching* (FASS, 2010). Treatment design, treatment application, and data collection were overseen by university personnel, including graduate students; daily care and feeding were implemented by personnel at each individual commercial feedlot. Each of the commercial feedlots had previous experience conducting research trials.

Exp. 1

Animals and Treatments. Crossbred steer calves (n = 1,350; 282 kg initial BW) sourced from ranches and sale barns located in Nebraska, Iowa, Utah, South Dakota, Idaho, and California were fed at a commercial feed yard in central Nebraska. Days on feed (**DOF**) across all blocks averaged 215 d (204 to 232 d). Treatments were (1) Revalor-IS (80 mg of TBA + 16 mg of E; Merck Animal Health) at initial processing with a terminal Revalor-200 (200 mg of TBA + 20 mg of E; Merck Animal Health) on d 133 (120 to 140 d); (2) Revalor-IS at initial processing followed 67 d (60 to 70 d) later by Revalor-200 with a terminal Revalor-200 on d 133; and (3) Revalor-XS (200 mg of TBA + 40 mg of E; Merck Animal Health) at initial processing with a terminal Revalor-200 on d 133.

All steers had ad libitum access to a forage-based receiving diet between arrival at the feedlot and trial initiation. Cattle were held at the feedlot for a minimum of 3 d before starting on trial. On the day of trial initiation steers were brought to the handling facility in the morning before feeding to limit gut fill, and weights were not shrunk. One group of 52 steers was started on trial the same day as arrival at the feedlot; they were hauled approximately 2 h from sale barn to feedlot.

Steers were allotted randomly to pen within arrival block (6 blocks). Block represented a common arrival time at the feedlot and a common time on feed such that the block experienced common environmental conditions and slaughter day. For blocks that included more than one sale barn source, sources were kept in separate pens until trial initiation when each source was randomized independently into treatment pens to ensure that source was equally represented within each pen. Cattle in block 1 (229 steers) and 2 (245 steers) were from 1 sale barn in Nebraska. Block 3 consisted of 167 steers from an Iowa sale barn and 78 steers from a Utah sale barn. Block 4 consisted of 190 steers from 2 sale barns in Nebraska. Cattle in block 5 were sourced from South Dakota (92 steers), Idaho (80 steers), and Nebraska (52 steers). Block 6 consisted of 217 steers sourced from a California ranch.

Steers were sorted by gate sorting every 2 steers into 1 of 3 pens before processing. Implant treatments were assigned randomly to pen within a block (18 pens total). After steers were sorted into their respective pens, each pen was group weighed on a platform scale before processing to establish pen initial BW. At initial processing, steers were individually weighed, were given an individual feedlot identification tag, received an infectious bovine rhinotracheitis virus and bovine virus diarrhea (types 1 and 2) combination vaccine (Vista 3, Merck Animal Health), were treated for internal parasites with an oral dose of fenbendazole (Safe-Guard, Merck Animal Health) and a s.c. injection of moxidectin (Cydectin, Boehringer Ingelheim, St. Joseph, MO), and were implanted as specified by treatment assignment. At reimplant (averaged 67 d), all pens within a block were brought to the processing facility and pen weighed, and cattle on the combination Revalor-IS and Revalor-200 treatment were reimplanted with Revalor-200. On d 133, all cattle again were pen weighed and reimplanted with a terminal Revalor-200.

Cattle were housed in 18 open lots (6 pens per treatment) with earthen mounds and had ad libitum access to clean water and diets. Space within pens was 26.9 m^2/animal. A step-up period consisting of 3 adaption diets was used to adapt cattle to the finishing diet by increasing the amount of steam-flaked corn and reducing the amount of alfalfa hay in each period. The step-up period lasted 18 to 20 d, with all treatments within a block having the same step-up period. The finishing diet was identical across treatments and averaged 58.2% steam-flaked corn, 17.5% wet distillers grains (range 9 to 25%), 5.1% mixed hay (range 4 to 7%), 4.7% corn silage (range 3 to 7%), 4.9% liquid supplement (range 4.1 to 5.2%), 0.04% micro ingredients, and 1.86% fat (range 0 to 2.7%), all on a DM basis. All diet changes that occurred during the feeding period were the same for all cattle on trial. Diets were analyzed monthly for DM and nutrient content. Steers were fed twice daily at approximately 0700 and 1300 h in concrete fence-line feed bunks (30.7 cm of bunk space per animal), with feed bunks visually evaluated each morning and managed to allow trace amounts of feed to remain in the bunk before feed delivery.

Carcass Evaluation. Final live BW was determined at shipping by weighing steers on a platform scale (pen weights) and applying a 4% shrink to adjust for gut fill. Cattle were weighed at approximately 0600 h before feeding and then immediately loaded on trucks and transported 201 km to a commercial processing facility (JBS, Grand Island, NE). Carcass data were collected by personnel from the Beef Carcass Data Center at West Texas A&M University (Canyon, TX). Individual HCW, LM area, USDA QG, and USDA YG were collected. Both USDA QG and YG were called by federal graders. Dressing percent was calculated by dividing the HCW by final