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Influence of implant strategy on growth performance and carcass characteristics of calf-fed Holstein steers

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ABSTRACT

The effect of initial implant type (short or long duration) and reimplant scheme on performance and carcass characteristics of calf-fed Holstein steers was evaluated. A total of 240 steers (113.5 ± 6.2 kg) were used in a 349-d trial. The 2 implant strategies were (1) implant on arrival with 43.9 mg of estradiol and reimplant on d 224 with 120 mg of trenbolone acetate and 24 mg of estradiol (Imp-2) and (2) implant on arrival with 100 mg of progesterone and 10 mg of estradiol benzoate and reimplant on d 112 and 224 with 120 mg of trenbolone acetate and 24 mg of estradiol (Imp-3). During the initial 112 d, performance was not affected by implant strategy. From d 112 to 212, Imp-3 had greater ADG (9.6%, $P < 0.01$), DMI (2.3%, $P = 0.04$), and gain efficiency (7.0%, $P < 0.01$) than Imp-2. During the final 137-d period, Imp-3 had similar ADG ($P = 0.93$) but greater DMI (4.1%, $P < 0.01$) and lower gain efficiency (3.9%, $P < 0.01$) than Imp-2. Overall, DMI (2.3%, $P = 0.02$) and final weight (1.9%, $P = 0.07$) were greater for Imp-3 versus Imp-2. Treatment effects on gain efficiency and energy utilization were not appreciable ($P > 0.75$). Implant strategy had minor effects on carcass characteristics ($P > 0.10$). Although, LM area was greater (4%, $P < 0.01$) for Imp-3 versus Imp-2. Implanting with a longer-duration implant on arrival followed by a combination implant on d 224 (Imp-2) may result in slightly lower ADG than implanting at 3 intervals (Imp-3).

Key words: feedlot, Holstein, implant, performance

INTRODUCTION

Holstein calves enter the feedlot at lighter weights (115 to 180 kg) than conventional beef steers, with growing-finishing periods that are typically in excess of 300 d (Zinn et al., 2005; Duff and McMurphy, 2007). As with conventional beef breeds, hormonal implants promote ADG, gain efficiency, HCW, and LM area of calf-fed Holstein steers (Chester-Jones et al., 1990; Perry et al., 1991; Torrentera et al., 2016). However, Beckett and Algeo (2002) observed that because of the very light initial weights of Holsteins, delaying the first implant application did not affect overall growth performance and carcass characteristics. Likewise, Torrentera et al. (2016) observed that growth performance and carcass characteristics were not affected when Holstein steers received the first implant at weights within the range of 267 to 321 kg. Otherwise, there is limited comparative information regarding implants of different hormonal dosages and purported duration, and their scheduling, on growth performance and carcass characteristics of calf-fed Holstein steers. The aim of the present experiment was to assess the influence of type of initial implant used (short or long duration) and reimplant scheme on growth performance and carcass characteristics of Holstein steers.

MATERIALS AND METHODS

Animals, Management, Housing, and Feeding

Procedures for animal care and management were conducted under protocols approved by the University of California, Animal Use and Care Advisory Committee. A total of 240 calf-fed Holstein steers (113.5 ± 6.2 kg) were fed during a 349-d trial to evaluate the effects of implant strategies on growth performance and carcass traits. Upon arrival at the University of California Desert Research Center, El Centro, steers were vaccinated for infectious bovine rhinotracheitis-parainfluenza 3 (TSV-2, Zoetis, Florham Park, NJ), clostridials—*Haemophilus* (Ultrabac 7, Zoetis), and *Mannheimia haemolytica* (One Shot, Zoetis) and treated for internal and external parasites (Dectomax, Zoetis), injected with 500,000 IU of vitamin A (Vital E-A + D3, Stuart Products, Bedford, TX), branded, and ear tagged. Calves were blocked by weight and randomly assigned within weight groupings to 40 pens

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Table 1. Composition of receiving and finishing diets

Item	Days on feed: 1–112, Receiving diet	Days on feed: 112–349, Finishing diet
Ingredient composition, % DM (unless noted)		
Alfalfa hay	20.00	12.00
Steam-flaked corn	64.94	75.26
Fishmeal[1]	3.00	0
Yellow grease	3.00	3.50
Cane molasses	7.00	6.00
Limestone	0.70	1.19
Urea	0.50	1.00
Trace mineral salt[2]	0.40	0.40
Magnesium oxide	0.20	0.25
Dicalcium phosphate	0.26	0.40
Monensin,[3] mg/kg	25	25
Nutrient composition[4]		
NE, Mcal/kg		
Maintenance	2.14	2.23
Gain	1.47	1.55
CP, %	14.0	12.7
Rumen undegradable CP	38.3	35.1
Rumen degradable CP	61.7	64.9
Ether extract, %	6.67	7.05
Calcium, %	0.90	0.80
Phosphorous, %	0.40	0.35
Potassium, %	1.03	0.80
Magnesium, %	0.28	0.30
Sulfur, %	0.25	0.20

[1]Menhaden.

[2]Trace mineral salt contained $CoSO_4$, 0.068%; $CuSO_4$, 1.04%; $FeSO_4$, 3.57%; ZnO, 0.75%; $MnSO_4$, 1.07%; KI, 0.052%; and NaCl, 93.4%.

[3]Rumensin, Elanco Animal Health (Indianapolis, IN).

[4]Based on tabular values for individual feed ingredients (NRC, 2000) with the exception of supplemental fat, which was assigned NE_m and NE_g values of 6.03 and 4.79 Mcal/kg, respectively (Zinn, 1988).

(6 calves per pen). Pens were 50 m^2 with 27 m^2 overhead shade and equipped with automatic drinkers and 4.3-m fence-line feed bunks. Two implant strategies consisting of type of initial implant used (short or long duration) and reimplant scheme were evaluated: (1) **Imp-2**: implanted on arrival with Encore (43.9 mg of estradiol; marketed as a 400-d controlled release implant, Elanco Animal Health, Greenfield, IN) and reimplanted once on d 224 with Revalor-S (120 mg of trenbolone acetate and 24 mg of estradiol; Merck & Co. Inc., Millsboro, DE); and (2) **Imp-3**: implanted on arrival with Synovex-C (100 mg of progesterone and 10 mg of estradiol benzoate; Zoetis) and reimplanted on d 112 and 224 with Revalor-S. During the initial 112-d period, calves received a 14% CP growing diet supplemented with 3% fishmeal to meet their average metabolizable AA requirements. Thereafter, calves were fed a conventional 13% CP finishing diet with urea as the sole source of supplemental N (Table 1). Calves were provided ad libitum access to feed and water. Fresh feed was added to the feed bunk twice daily. For calculation of growth performance, initial live weight is the off-truck arrival weight. Interim and final live weight were reduced 4% to account for digestive-tract fill. The projected growth performance of steers in the current study was based on the equations developed by Torrentera et al., (2016).

Estimation of Dietary NE

Energy gain (EG, Mcal/d) was derived from measures of live weight (W; kg) and ADG (kg/d) according to the equation: $EG = (0.0557\,W^{0.75})ADG^{1.097}$ (NRC, 1984). Net energy content of the diet for maintenance and gain were calculated assuming constant maintenance energy (EM, Mcal/d) of $0.084\,W^{0.75}$ (NRC, 2000). The NE values of the