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The Effect of Delaying Initial Feedlot Implant on Body Weight, Average Daily Gain, and Carcass Characteristics of Calf-Fed Steers[1]

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ABSTRACT

Two experiments were conducted to determine the effect of delaying initial feedlot implant on BW, ADG, and carcass characteristics. At receiving, steers were assigned to 1 of 2 treatments: 1) implant at feedlot entry (NORM) or 2) implant 30 d after feedlot entry (DELAY). In Exp. 1, steers (n = 200) were not implanted until feedlot entry; however, in Exp. 2 steers (n = 209) were implanted at approximately 50 d of age. In Exp. 1, there was a tendency (P = 0.11) for BW at d 30 to be heavier (10 kg) for NORM compared with DELAY; however, all other BW measures were similar (P = 0.29). In Exp. 2, BW measures were also similar (P = 0.82) for NORM and DELAY. In both experiments, carcass weight, fat thickness, LM area, and YG were similar (P = 0.51). Additionally, in both experiments marbling scores (P = 0.58) and the percentage of carcasses grading USDA Choice and greater were similar (P = 0.54) when comparing NORM and DELAY. In these studies, delaying initial feedlot implant had no effect on BW, ADG, or carcass measures including YG and QG.

Key words: calf-fed, delayed implant, feedlot

INTRODUCTION

Growth-promoting implants are routinely used in beef cattle production to increase growth efficiency and decrease the costs of production (Montgomery et al., 2001). However, there is concern that the use of implants may have negative impacts on carcass quality and beef tenderness (Smith et al., 1992). A common perception in beef cattle production is that cattle must be fed a certain number of days before they will grade USDA Choice, suggesting marbling develops later in the life of cattle. However, hypertrophy of adipocytes begins at 100 to 200 d of age (Vernon, 1980). Additionally, in early-implanted calves, fractional intramuscular fat accretion rates can be inhibited by implanting calves at feedlot entry (Bruns et al., 2005). These studies suggest that management practices such as the implanting schedule can alter marbling in the life of calves.

Implanting with low-dose initial implants or delaying implanting has affected QG in steer calves (Samber et al., 1996). Delaying the initial feedlot implant has been shown to have no effect on QG when compared with receiving no implant during the finishing period. However, implanting cattle at the beginning of the finishing period reduced marbling scores (**MS**) when compared with cattle receiving no implant (Bruns et al., 2005). Most previous studies on the effect of anabolic implants on beef quality compared implant programs in which cattle were administered a single implant or 2 successive implants during finishing periods of 100 to 160 d. Additionally, delayed implant studies involving cattle fed in excess of 160 d have used naïve cattle not exposed to implants before feedlot entry. Therefore, the objective of this study was to determine whether delaying the initial feedlot implant would affect BW, ADG, and carcass characteristics of steer calves implanted or not im-

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planted at branding and fed in excess of 200 d.

MATERIALS AND METHODS

Experiment 1

One hundred crossbred (five-eighths Red Angus, three-eighths Continental) steer calves (215 ± 20 kg) were received in the fall of each year for 2 consecutive years. Calves were weaned a minimum of 10 d before being transported approximately 200 km to the feedlot. On arrival, cattle were dewormed (Dectomax Pour On, Pfizer, New York, NY) and vaccinated with a killed vaccine for clostridial diseases (Vision 7/Somnus with Spur, Intervet, Millsboro, DE) and *Hemophilus sominus* (Vision 7/Somnus with Spur, Intervet). Additionally, cattle were vaccinated with a modified live vaccine for respiratory viruses (BoviShield Gold 4, Pfizer). At receiving, cattle were individually weighed and randomly assigned to 1 of 2 treatments: an initial implant received at feedlot entry (d 0), or at 32 and 31 d after feedlot entry in yr 1 and yr 2, respectively. In this experiment, steer calves received no implant at branding; therefore, the initial feedlot implant was the first implant the cattle received. The initial feedlot implant in both treatments was Synovex-S (Fort Dodge Animal Health, Overland Park, KS). Steers from both treatments were reimplanted with Synovex Choice (Fort Dodge Animal Health) on d 112 (yr 1) or d 117 (yr 2). In yr 1, steers were individually weighed on d 0, 32 (delayed implant), and 112 (reimplant). In yr 2, steers were individually weighed on d 0, 31 (delayed implant), and 117 (reimplant). Final BW was calculated by adjusting carcass weight (**HCW**) to a common dressing percentage (63%). In both years of Exp. 1, initial BW was the average of 2 consecutive weights. Other reported weights, excluding final BW, are weights on a single day.

Steers were adapted to the final finishing diet in 57 d using 3 step-up diets containing 37, 27, and 14% roughage, fed for 10, 7, and 40 d, respectively. The final finishing diet contained 40% wet corn gluten feed (Sweet Bran, Cargill Inc., Blair, NE), 48% dry-rolled corn, 7% alfalfa hay, 5% supplement, and a minimum of 12% CP, 0.7% Ca, 0.35% P, and 0.6% K. Steers were fed for 203 and 221 d in yr 1 and yr 2, respectively. In yr 1, one-half of the steers were assigned to treatments in which the effect of different ionophores and antibiotics was tested. Steers were supplemented with either 28 g/ton Rumensin (Elanco Animal Health, Indianapolis, IN) and 10 g/ton Tylan (Elanco Animal Health) or 28 g/ton Bovatec (Alpharma, Fort Lee, NJ) and 7.5 g/ton Terramycin (Phibro Animal Health, Ridgefield Park, NJ). No difference in animal BW or ADG was attributable to ionophore and antibiotic supplementation ($P > 0.10$); therefore, results of the ionophore and antibiotic effects are not presented. In yr 2, steers were supplemented with 28 g/ton Rumensin and 10 g/ton Tylan.

Experiment 2

Crossbred (five-eighths Red Angus, three-eighths Continental) steer calves (239 ± 24 kg) were received in the fall of each year, 127 in yr 1 and 84 in yr 2. Calves were weaned a minimum of 10 d before being transported approximately 200 km to the feedlot. Calves were treated as described above for Exp. 1. At receiving, cattle were individually weighed and randomly assigned to 1 of 2 treatments: an initial implant received at feedlot entry (d 0), or at 31 and 29 d after feedlot entry in yr 1 and yr 2, respectively. In this experiment, steer calves were implanted at branding with Synovex-C (Fort Dodge Animal Health); therefore, the initial feedlot implant was the second implant these cattle received. The initial feedlot implant in both treatments was Synovex-S (Fort Dodge Animal Health). Steers from both treatments were reimplanted with Synovex Choice (Fort Dodge Animal Health) on d 125 (yr 1) and d 112 (yr 2). In both years of the experiment, steers from both treatments were reimplanted on the same date with Synovex Choice. In yr 1, steers were individually weighed on d 0, 31 (delayed implant), and 125 (reimplant). In yr 2, steers were individually weighed on d 0, 29 (delayed implant), and 112 (reimplant). Final BW was calculated by adjusting HCW to a common dressing percentage (63%). In both years of Exp. 2, initial BW was the average of 2 consecutive weights. Other reported weights, excluding final BW, were weights on a single day. Steers were adapted to the final finishing diet as described above, with the same finishing diet that contained 28 g/ton Rumensin (Elanco Animal Health), and 10 g/ton Tylan (Elanco Animal Heatlh). Steers were fed for 221 and 213 d in yr 1 and yr 2, respectively.

In both experiments, steers were slaughtered at a commercial packing plant. On the day of slaughter, HCW was collected. After a 24-h chill, USDA MS, KPH, 12th-rib fat thickness (**FT**), and LM area were measured. Yield grade was calculated as 2.5 + 6.35 × FT (cm) + 0.0017 × HCW (kg) + 0.2 × KPH (%) − 2.06 × LM area (cm^2; Boggs and Merkel, 1993).

In both experiments, steers from both treatments were fed in the same pens; therefore, DMI or G:F was not measured for these animals. From previous delayed implant studies, there does not seem to be an effect on DMI or G:F of delaying the initial feedlot implant when evaluating the entire finishing period (Samber et al., 1996; Milton et al., 2000; Scaglia et al., 2004; Bruns et al., 2005).

Statistical Analysis

All nonproportional data were analyzed using the MIXED procedure (SAS Inst. Inc., Cary, NC) as a completely randomized design. The model statement included treatment as a fixed effect. Year and the year × treatment interaction were included in the model as random effects. Percentage USDA Choice data were analyzed using the GLIMMIX procedure of SAS, with treatment as a fixed effect and year and the year × treatment

Table 1. Effects of delaying initial feedlot implant on BW and ADG (Exp. 1)

Item	Normal[1]	Delay[1]	SEM	*P*-value
Initial BW, kg	216	215	1	0.64
Delay BW,[2] kg	275	265	5	0.11
RI BW,[3] kg	422	416	2	0.29
Final BW, kg	580	576	3	0.55
Initial to delay ADG,[4] kg/d	1.83	1.53	0.10	0.17
Initial to RI ADG,[5] kg/d	1.79	1.74	0.04	0.45
Delay to RI ADG,[6] kg/d	1.75	1.80	0.02	0.28
Delay to final ADG,[7] kg/d	1.68	1.72	0.07	0.36
Overall ADG, kg/d	1.72	1.70	0.07	0.71

[1]Normal = implant at feedlot entry; Delay = implant 30 d after feedlot entry.

[2]Delay BW = BW at the time delayed implant was administered.

[3]RI BW = BW at the time of reimplant.

[4]Initial to delay ADG = ADG from d 0 to administration of delayed implant.

[5]Initial to RI ADG = ADG from d 0 to reimplant.

[6]Delay to RI ADG = ADG from administration of delayed implant to reimplant.

[7]Delay to final ADG = ADG from administration of delayed implant to day of slaughter.

interaction as random effects. In all analyses, pen was the experimental unit. There were 2 replications per treatment in each year of each experiment. Significance was determined when $P \leq 0.05$.

RESULTS AND DISCUSSION

Feedlot Gain

Body weight and gain data from Exp. 1 are presented in Table 1. When evaluating implant treatments, initial BW ($P = 0.64$), BW at reimplant ($P = 0.29$), and adjusted final BW ($P = 0.55$) were not different. However, comparing ADG from d 0 to delayed implant, steers implanted on d 0 tended ($P = 0.17$) to gain more (0.30 kg/d) than cattle receiving the delayed initial feedlot implant and were numerically 10 kg heavier ($P = 0.11$). There were no differences in ADG from d 0 to reimplant ($P = 0.45$), delayed implant to reimplant ($P = 0.28$), delayed implant to slaughter ($P = 0.36$), and overall feedlot ADG ($P = 0.71$).

Body weight and gain data for Exp. 2 are presented in Table 2. Initial feedlot BW ($P = 0.89$), BW at delayed implant ($P = 0.94$), BW at reimplant ($P = 0.86$), and adjusted final BW ($P = 0.82$) were not different between treatments. Additionally, ADG from d 0 to delayed administration of the implant ($P = 0.48$), d 0 to reimplant ($P = 0.51$), delayed administration of the implant to reimplant ($P = 0.83$), delayed administration of the implant to slaughter ($P = 0.73$), and overall ADG ($P = 0.63$) were not different.

When comparing BW and ADG results from Exp. 1 and 2, steers implanted on d 0 had numerically greater BW compared with steers in the delayed implant treatment in Exp. 1 at the time of the initial implant for the delayed implant treatment. However, in Exp. 2, there were no differences in BW measures throughout the finishing period. In Exp. 1, steers received their first implant in the feedlot, whereas in Exp. 2, steers were implanted at branding, before feedlot entry. Steers were of similar genetic type; therefore, the difference in BW at delayed administration of the implant was likely not due to genetic differences in Exp. 1 and 2. Differences between experiments may be due to the implant at branding, because previous research has demonstrated that backgrounding implant sequence and dose may affect feedlot cattle BW and ADG (Mader, 1998).

Differences in ADG have been shown in previous research when the initial implant for yearling steers was delayed 70 d or longer; however, no differences were exhibited in daily

Table 2. Effects of delaying initial feedlot implant on BW and ADG (Exp. 2)

Item	Normal[1]	Delay[1]	SEM	*P*-value
Initial BW, kg	237	215	7	0.89
Delay BW,[2] kg	286	265	6	0.94
RI BW,[3] kg	445	416	5	0.86
Final BW, kg	587	576	9	0.82
Initial to delay ADG,[4] kg/d	1.56	1.51	0.05	0.48
Initial to RI ADG,[5] kg/d	1.74	1.71	0.05	0.51
Delay to RI ADG,[6] kg/d	1.78	1.76	0.06	0.83
Delay to final ADG,[7] kg/d	1.61	1.60	0.03	0.73
Overall ADG, kg/d	1.61	1.59	0.02	0.63

[1]Normal = implant at feedlot entry; Delay = implant 30 d after feedlot entry.

[2]Delay BW = BW at the time delayed implant was administered.

[3]RI BW = BW at the time of reimplant.

[4]Initial to delay ADG = ADG from d 0 to administration of delayed implant.

[5]Initial to RI ADG = ADG from d 0 to reimplant.

[6]Delay to RI ADG = ADG from administration of delayed implant to reimplant.

[7]Delay to final ADG = ADG from administration of delayed implant to day of slaughter.

Table 3. Effects of delaying initial feedlot implant on carcass characteristics (Exp. 1)

Item	Normal[1]	Delay[1]	SEM	*P*-value
Carcass wt, kg	365	363	2	0.54
Marbling score[2]	543	553	16	0.73
Fat thickness, cm	1.32	1.35	0.10	0.70
LM area, cm^2	82.52	82.77	0.52	0.82
KPH, %	2.44	2.43	0.41	0.93
YG	3.24	3.25	0.05	0.94
USDA Choice, %	77.3	80.5	10.6	0.87
Md[3] or greater, %	18.0	20.4	4.1	0.74

[1]Normal = implant at feedlot entry; Delay = implant 30 d after feedlot entry.

[2]Marbling score = Slight^{00} = 400, Small^{00} = 500, etc.

[3]Md = modest QG, USDA average Choice.

gain when the initial implant for steers was delayed until d 35 (Milton et al., 2000). Additionally, Samber et al. (1996) found no difference in final BW or ADG over the entire finishing period when comparing cattle receiving the delayed implant with cattle implanted at feedlot entry. Bruns et al. (2005) did report an 11-kg increase in calves implanted on d 0 compared with calves receiving a delayed implant, which is similar to the 10-kg response exhibited in Exp. 1. However, Bruns et al. (2005) delayed the initial feedlot implant by 57 d compared with the delay of 30 d in this study. In a similar study, Trenkle (1992) demonstrated that steers receiving a delayed implant had 6.9% faster gain than steers implanted at feedlot entry. In the current study, overall ADG was not affected by implant treatment. Trenkle (1992) related this difference to the time of implant administration and the energy content of the diet. If cattle are implanted at receiving, the implant releases a larger dose of hormone when cattle are being immunized and are on lower energy diets. Delaying the initial feedlot implant until cattle are on full feed may allow the cattle to respond more favorably to the initial hormone release by the implant (Trenkle, 1992).

Carcass Characteristics

In Exp. 1, there was no difference in HCW ($P = 0.54$), FT ($P = 0.70$), LM area ($P = 0.82$), KPH fat ($P = 0.93$), MS ($P = 0.73$), percentage of steers grading USDA Choice or greater ($P = 0.87$), or YG ($P = 0.94$) when steers implanted on d 0 were compared with steers with a delayed initial feedlot implant (Table 3). Carcass characteristics from Exp. 2 are presented in Table 4. The implant treatment had no effect on HCW ($P = 0.82$), MS ($P = 0.58$), FT ($P = 0.56$), LM area ($P = 0.51$), KPH fat ($P = 0.74$), YG ($P = 0.63$), or percentage of carcasses grading USDA Choice or greater ($P = 0.72$).

Previous work has shown that implants increase HCW compared with nonimplanted cattle; however, when different implant treatments are compared, little difference exists between HCW (Samber et al., 1996; Scaglia et al., 2004; Bruns et al., 2005), as was the case in the current study. Several studies have shown little effect of implant on external FT (Perry et al., 1991; Pritchard, 1994; Samber et al., 1996; Scaglia et al., 2004; Bruns et al., 2005), LM area (Samber et al., 1996; Scaglia et al., 2004; Bruns et al., 2005), and KPH fat (Foutz et al., 1990; Samber et al., 1996; Bruns et al., 2005), which is in agreement with the present study. The major focus of this study was to determine the impact of delaying the initial feedlot implant on QG in calf-fed steers. When evaluating previous research, studies have shown that the use of implants has little or no effect on MS or QG (Bartle et al., 1992; Gerken et al., 1995), whereas other studies have shown a substantial reduction in MS and QG (Foutz et al., 1990; Senn and Wagner, 1994). In previous work using delayed implant programs in calves fed for 212 d, Samber et al. (1996) demonstrated no difference in MS or QG from 2 delayed implant programs compared with control nonimplanted cattle; however, MS and QG were both decreased in calves implanted with 3 successive implants. They also demonstrated that ADG and feed efficiency were not different with the 3- vs. 2-implant strategy, indicating that steers received little benefit from implant at feedlot entry,

Table 4. Effects of delaying initial feedlot implant on carcass characteristics (Exp. 2)

Item	Normal[1]	Delay[1]	SEM	*P*-value
Carcass wt, kg	370	368	5	0.82
Marbling score[2]	559	551	24	0.58
Fat thickness, cm	1.30	1.35	0.03	0.56
LM area, cm^2	89.94	88.77	2.84	0.51
KPH, %	1.85	1.88	0.05	0.74
YG	2.79	2.86	0.15	0.63
USDA Choice, %	72.8	74.4	12.9	0.72
Md[3] or greater, %	22.0	13.5	9.4	0.54

[1]Normal = implant at feedlot entry; Delay = implant 30 d after feedlot entry.

[2]Marbling score = Slight^{00} = 400, Small^{00} = 500, etc.

[3]Md = modest QG, USDA average Choice.

which would agree with data from Exp. 1. Bruns et al. (2005) also demonstrated an increase in MS in calves with the initial implant delayed by 56 d compared with calves implanted at feedlot entry. However, delaying the initial implant did not influence MS in yearling steers (Scaglia et al., 2004).

IMPLICATIONS

In the current study, delaying the initial feedlot implant did not influence ADG, BW, or carcass measures in beef calves that had no previous implant or that were implanted at branding. Additional research is needed on the effect of implant strategy on higher risk cattle that may have been recently weaned and transported greater distances.

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