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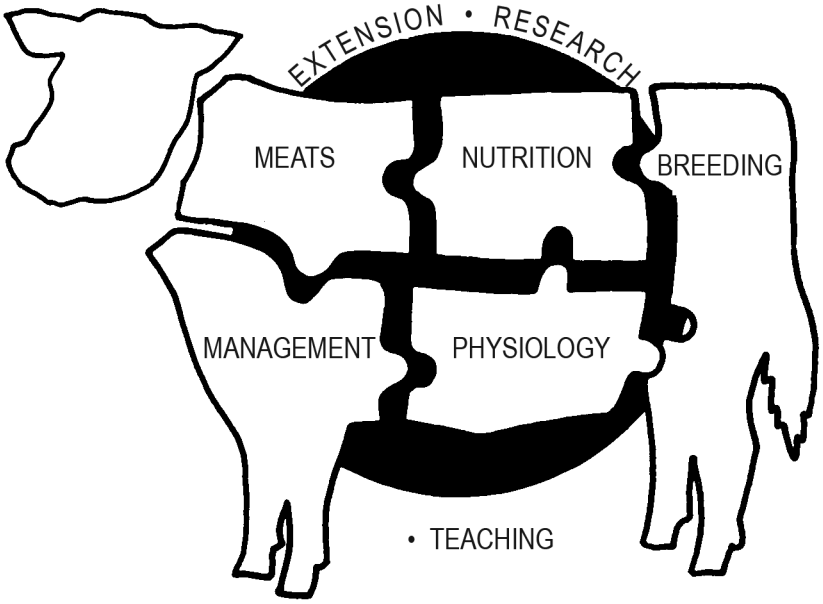

Agricultural Research Division
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2015 Beef Cattle Report

IANR

Effect of 300 or 400 mg Daily of Ractopamine Hydrochloride on Growth Performance and Carcass Characteristics of Finishing Steers During the Last 14, 28, or 42 Days

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Summary

The effects of ractopamine hydrochloride (Optaflexx®) dosage (0, 300, and 400 mg/head/day) and duration (14, 28, or 42 days) on growth performance were evaluated in feedlot finishing diets. Feeding 300 mg of Optaflexx for 28 or 42 days increased live final BW by 13 and 29 lb, while feeding Optaflexx at 400 mg resulted in 27 or 24 lb increases relative to 0 mg steers, respectively. Feeding 300 mg of Optaflexx for 28 or 42 days would suggest 11.1 or 16.6 lb improvements in HCW, while feeding 400 mg of Optaflexx would suggest 19.7 or 20.7 lb heavier carcasses compared to steers fed 0 mg Optaflexx, respectively.

Introduction

ß-adrenergic agonists have been shown to increase protein accretion and decrease fat accretion in animal growth (*Journal of Animal Science,* 1998, 76:160). Ractopamine hydrochloride (trade name Optaflexx; Elanco Animal Health, Greenfield, Ind.) is a ß-1 adrenergic agonists and is approved for feeding the last 28 to 42 days at the label dose of 70-430 mg/head/day to finishing cattle before harvest. When fed to finishing cattle, Optaflexx improves feed efficiency, final BW, and HCW when fed the last 28 to 42 days of the finishing period. However, few data exist evaluating the effects of feeding Optaflexx to yearling steers for less than 28 days due to FDA restrictions. Therefore, the objective of this experiment was to evaluate the effects of Optaflexx dose and duration (14-42 days) on animal growth performance of yearling steers.

Table 1. Basal diet and supplement.

Ingredient	% of diet DM
High-moisture corn	28.0
Dry-rolled corn	18.0
Modified distillers grains plus solubles	25.0
Sweet Bran	20.0
Wheat straw	5.0
Dry supplement[1]	
Fine ground corn	1.5118
Limestone	1.9980
Salt	0.3000
Tallow	0.1000
Beef trace mineral	0.0500
Vitamin A-D-E	0.0150
Rumensin-90	0.0165
Tylan-40	0.0087

[1]Supplement formulated to be fed at 4% of diet DM and formulated for 30 g/ton Rumensin and 90 mg/daily of Tylan.

Procedure

Crossbred yearling steers (n = 576; BW = 899 ± 64 lb) were utilized in a randomized block design (n = 4 BW blocks) with a 3 x 3 factorial treatment design to study the effects of Optaflexx dosage and duration on growth performance. Factors included Optaflexx feeding duration (14, 28, or 42 days prior to harvest) and Optaflexx dosage (0, 300, and 400 mg/head/day). Steers were received at the University of Nebraska's Agricultural Research and Development Center (ARDC) near Mead, Neb., in the fall of 2012. Prior to initiation of trial, steers were limit-fed at 2% BW for 5 days a diet consisting of 50% Sweet Bran® and 50% alfalfa hay (DM basis) to minimize variation in gastrointestinal fill. Steers were weighed two consecutive days (day 0 and 1) to establish initial BW. Steers were blocked by day 0 BW, stratified by BW, and assigned randomly within strata to pens. Pens were assigned randomly to treatments. The study consisted of eight pens per treatment with eight steers per pen. Cattle were adapted to a common finishing diet (Table 1) over a 19-day period consisting of four adaptation diets. The amount of modified distillers grains plus solubles (MDGS), Sweet Bran, wheat straw, and supplement included in each adaptation diet was held constant at 25, 20, 5, and 4% (DM basis), respectively. The amount of corn was gradually introduced in the diet while replacing alfalfa hay. The supplement was formulated for 30 g/ton Rumensin® and to provide 90 mg/steer daily of Tylan®. Cattle were fed once daily between 0700 and 0900 hours.

Optaflexx was initiated when steers were within 14 to 42 days of their projected endpoints. Two weeks prior to treatment initiation and every seven days thereafter, steers were removed from their pens (approximately 0700 hours) and pen weights were collected using a pen scale. On the morning of treatment initiation, each pen was removed and weighed. All residual feed remaining in the

Table 2. Animal performance of steers fed 0, 300, and 400 mg/head/day of Optaflexx for 14, 28, or 42 days at the end of the finishing period.

Duration:	14 day			28 day			42 day						
Dosage:	0	300	400	0	300	400	0	300	400	SEM	Int.	Dose	Dur
Live Performance													
Initial BW, lb	892	890	889	886	890	891	891	891	888	2	0.54	0.57	0.50
Live final BW, lb[1]	1385^{e}	1390^{e}	1391^{e}	1414^{d}	1427^{cd}	1441^{c}	1473^{b}	1502^{a}	1497^{a}	6	0.03	0.01	<0.01
Over Control, lb	—	5	6	—	13	27	—	29	24				
DMI, lb/day	26.4^{ab}	26.4^{ab}	26.4^{ab}	27.0^{a}	26.1^{b}	26.1^{b}	26.5^{ab}	26.8^{ab}	27.1^{a}	0.4	0.07	0.69	0.59
ADG, lb[2]	4.02^{ab}	4.09^{a}	4.10^{a}	3.88^{c}	3.94^{bc}	4.04^{ab}	3.88^{c}	4.06^{a}	4.06^{a}	0.13	0.15	<0.01	0.08
Feed:Gain[3]	6.54^{abc}	6.45^{ab}	6.41^{ab}	6.94^{d}	6.58^{bc}	6.41^{a}	6.80^{cd}	6.59^{ab}	6.66^{abcd}	0.006	0.04	<0.01	0.24
Carcass-Adjusted Performance													
Final BW, lb[4]	1339^{e}	1346^{e}	1353^{e}	1399^{d}	1417^{c}	1424^{c}	1454^{b}	1480^{a}	1486^{a}	9	0.30	<0.01	<0.01
ADG, lb[5]	3.65^{e}	3.73^{de}	3.77^{cd}	3.78^{cd}	3.85^{bc}	3.89^{abc}	3.73^{de}	3.90^{ab}	3.97^{ab}	0.10	0.51	<0.01	<0.01
Feed:Gain	7.25^{d}	7.09^{cd}	6.99^{bcd}	7.14^{d}	6.76^{ab}	6.67^{a}	7.04^{cd}	6.80^{abc}	6.76^{ab}	0.005	0.63	0.01	0.03

[a-e]Means with different superscripts differ ($P < 0.05$).
[1]Live final BW measured by weighing cattle on pen scale day of shipping and applying a 4% pencil shrink.
[2]Calculated using live final BW.
[3]Analyzed as G:F, the reciprocal of F:G.
[4]Calculated from HCW divided by a common dressing percent (63%).
[5]Calculated using carcass-adjusted final BW.

bunk was removed and weighed. Pen weights (4% pencil shrink applied) were collected every seven days to evaluate animal performance over the Optaflexx treatment phase. Optaflexx was delivered daily during the treatment phase via top-dress at either 300 or 400 mg/head/day, depending on treatment, with fine ground corn used as the carrier. Three top-dress supplements were used during the treatment phase, one that contained no Optaflexx (1 lb/head/day of fine ground corn), one that contained 300 mg of Optaflexx (1 lb/head/day of a 600 g/t Optaflexx medicated supplement), and one that contained 400 mg of Optaflexx (1.11 lb/head/day of a 720 g/t Optaflexx medicated supplement). Steers that were fed 0 mg/head/day of Optaflexx were top-dressed daily with fine ground corn during the treatment phase.

One hundred days prior to the target marketing date for steers on the 28 day treatment, all steers were implanted with Component TE-S with Tylan®. The terminal implant window ranged from 86 to 114 days, depending on treatment duration. On day of shipping, cattle were fed 50% of the previous days feed call and then in the afternoon all cattle to be shipped were removed from their pens, pen weighed, and loaded onto the truck. All steers were harvested at Greater Omaha Packing Co. (Omaha, Neb.) the following morning. Hot carcass weight was obtained on day of harvest. After a 48 hour chill, USDA marbling score, 12th rib fat depth, and LM area were recorded. Yield grade was calculated from the following formula: 2.50 + (2.50*fat thickness, in) + (0.2* 2.5 [KPH]) + (0.0038*HCW, lb) – (0.32*LM area, in^2). Final live BW were pencil shrunk 4% to calculate dressing percent and live animal performance. A common dressing percentage of 63% was used to calculate carcass-adjusted performance to determine final BW, ADG, and F:G.

Animal performance and carcass characteristics were analyzed as a 3 x 3 factorial using the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.), with pen being the experimental unit and animals that were removed during the experiment not included in the analysis. The model included the effects of dose, duration, and dose x duration interaction. Block was treated as a fixed effect. Due to a significant difference in BW among steers when Optaflexx was initiated, Optaflexx initial BW was used as a covariate in the model. The significance of the linear and quadratic coefficients were tested for Optaflexx dose when looking at final live BW and HCW change over Optaflexx feeding duration using the MIXED procedure of SAS. Treatment differences were declared significant at $P \leq 0.05$.

Results

The interaction of dose x duration was observed for final live BW and F:G ($P < 0.05$; Table 2); therefore, simple effects will be presented. Intake was 0.9 lb/day greater ($P = 0.02$) for steers fed 0 mg Optaflexx compared to 300 and 400 for 28 days. Live final BW was not different ($P > 0.35$) for steers fed 0, 300, or 400 mg Optaflexx for 14 days. At 28 days, live final BW was 27 lb heavier ($P < 0.01$) for steers fed Optaflexx at 400 mg than steers receiving 0 mg Optaflexx. At 28 days, steers fed Optaflexx at 300 mg tended ($P =0.07$) to be 13 lb heavier than steers receiving 0 mg. Feeding 400 mg Optaflexx for 28 days increased ($P = 0.05$) live final BW 14 lb compared to 300 mg. Live final BW was 29 and 24 lb greater ($P <0.01$) for steers fed Optaflexx for 42 days at 300 and 400 mg compared to 0 mg. Live final BW were not different ($P = 0.51$) between steers receiving Optaflexx at 300 and 400 mg for 42 days. Weekly live BW response over 0 mg fed steers is presented in Figure 1. Feeding 300 mg of Optaflexx would provide 23.4, 26.7, and 28.9 lb of added live BW,

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Table 3. Carcass characteristics of steers fed 0, 300, and 400 mg/head/day of Optaflexx for 14, 28, or 42 days at the end of the finishing period.

Duration:	14 day			28 day			42 day			SEM	Int.	Dose	Dur
Dosage:	0	300	400	0	300	400	0	300	400				
Carcass Characteristics													
HCW, lb	843.4^{e}	848.1^{e}	852.3^{e}	881.7^{d}	892.8^{c}	901.4^{c}	915.7^{b}	932.3^{a}	936.4^{a}	5	0.30	<0.01	<0.01
Over Control, lb	—	4.7	8.9	—	11.1	19.7	—	16.6	20.7				
Dressing, %[1]	60.9^{b}	61.0^{b}	61.2^{b}	62.4^{a}	62.6^{a}	62.4^{a}	62.3^{a}	62.2^{a}	62.7^{a}	0.4	0.73	0.53	0.01
Marbling[2]	440^{cd}	430^{d}	432^{d}	465^{abc}	452^{bcd}	467^{abc}	484^{a}	485^{a}	475^{ab}	11	0.86	0.71	<0.01
LM area, in	13.3^{cd}	13.1^{d}	13.1^{d}	13.4^{bcd}	13.8^{abc}	13.6^{abc}	13.8^{abc}	13.9^{ab}	14.0^{a}	0.2	0.18	0.83	0.83
12th rib fat, in	0.48^{c}	0.50^{bc}	0.50^{bc}	0.59^{a}	0.55^{ab}	0.57^{a}	0.58^{a}	0.59^{a}	0.59^{a}	0.02	0.72	0.93	<0.01
Calculated YG	3.1^{cd}	3.3^{bc}	3.3^{abc}	3.5^{ab}	3.3^{abc}	3.4^{ab}	3.5^{a}	3.5^{a}	3.5^{a}	0.1	0.46	0.86	0.04

[a-e]Means with different superscripts differ ($P < 0.05$).
[1]DP = Dressing Percent; calculated from HCW divided by live final BW, with a 4% pencil shrink applied.
[2]Marbling Score: 300 = Slight, 400 = Small, 500 = Modest, etc.

while feeding 400 mg would provide 22.7, 24.0, and 23.6 lb of added live BW over 0 mg fed steers for a 28, 35, and 42 feeding duration, respectively.

Carcass-adjusted ADG was not different ($P = 0.19$; 3.65 vs. 3.73 lb) between steers fed Optaflexx at 0 mg and 300 mg for 14 days. Carcass-adjusted ADG was greater ($P = 0.05$) for steers fed Optaflexx at 400 mg (3.77 lb) compared to 0 mg (3.65); however, carcass-adjusted ADG was not different ($P = 0.47$) between steers receiving 300 and 400 mg of Optaflexx for 14 days. At 28 days, carcass-adjusted ADG was not different ($P > 0.20$) among cattle fed Optaflexx at 0 or 300 mg and 300 or 400 mg. Feeding 400 mg of Optaflexx tended to increase ($P = 0.06$; 3.89 vs. 3.78 lb) carcass-adjusted ADG compared to 0 mg for 28 days. Carcass-adjusted ADG was greater ($P < 0.01$) for steers fed Optaflexx for 42 days at 300 (3.90 lb) and 400 mg (3.97 lb) compared to 0 mg (3.73 lb). There was a tendency ($P = 0.10$) for an improvement in carcass-adjusted feed conversion (F:G) when steers were fed Optaflexx at 400 compared to 0 mg for 14 days. Carcass-adjusted feed conversion was not different ($P = 0.35$) between steers fed 0 and 300 mg of Optaflexx for 14 days. No difference ($P = 0.48$) in carcass-adjusted F:G was observed when feeding Optaflexx for 14 days at 300 or 400 mg. Compared to 0 mg of Optaflexx, carcass-adjusted F:G was improved ($P < 0.01$) by 5.3 and 7.0% when steers were fed 300 or 400 mg of Optaflexx for 28 days, but were not different

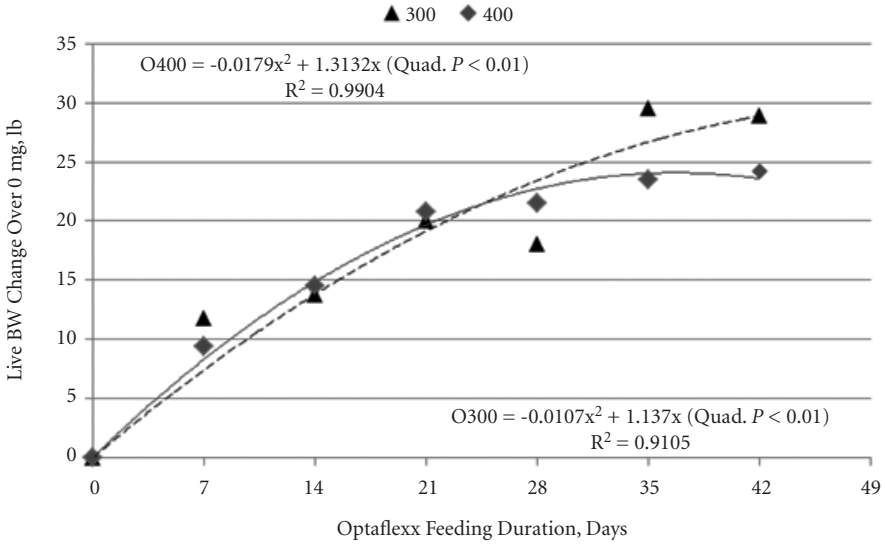

Figure 1. Live BW change when feeding 300 and 400 mg Optaflexx over 0 mg of Optaflexx[ab].

[a]Growth performance is calculated on a shrunk basis (4%).
[b]Day 7-14 has 24 Optaflexx 300 mg pens averaged together and 24 Optaflexx 400 mg pens averaged together, days 21-28 has 16 pens for 300 mg and 16 for 400 mg, and days 35-42 has 8 pens for 300 mg and 8 for 400 mg.

($P = 0.43$) between 300 and 400 mg for 28 days. There was a tendency ($P = 0.10$) for 3.4% improvement in carcass-adjusted F:G when steers were fed 300 mg of Optaflexx compared to 0 mg for 42 days. Feeding 400 mg of Optaflexx for 42 days resulted in a 4.0% improvement ($P = 0.03$) in carcass-adjusted F:G compared to 0 mg; however, carcass-adjusted F:G was not different ($P = 0.64$) between steers receiving 300 and 400 mg of Optaflexx.

There were no significant ($P > 0.17$; Table 3) dose x duration interaction for carcass data; however, the simple effects will be presented. Hot carcass weight was not different ($P = 0.33$; 843.4 vs. 848.1 lb) between yearlings fed Optaflexx at 0 and 300 mg for 14 days, but tended ($P = 0.07$) to be 8.9 lb heavier for steers fed 400 mg of Optaflexx compared to 0 mg. Hot carcass weight was 11.1 and 19.7 lb greater ($P < 0.02$) for steers fed 300 and 400 mg of Optaflexx for 28 days compared to 0 mg (881.7 lb). Carcasses from yearlings fed Optaflexx for 42 days at 300 and 400 mg were 16.6 and 20.7 lb heavier ($P < 0.01$) than 0 mg (915.7 lb) fed steers. Hot carcass weight change over 0 mg fed steers is presented in Figure 2. Feeding 300 mg of Optaflexx would provide 11.0, 13.7, and 16.4 lb of added HCW, while feeding 400 mg would provide 15.8, 19.7, and 23.6 lb

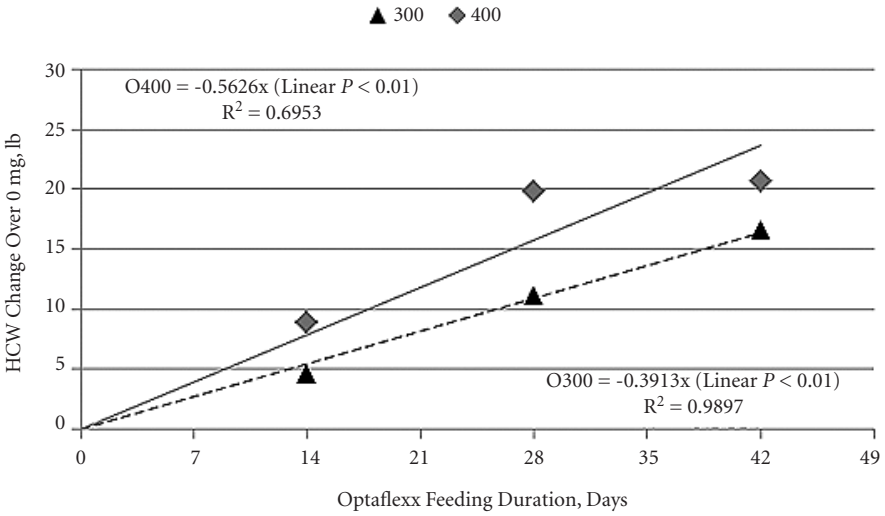

Figure 2. Hot carcass weight change when feeding 300 and 400 mg Optaflexx over 0 mg of Optaflexx[ab].

[a]Day 7-14 has 24 Optaflexx 300 mg pens averaged together and 24 Optaflexx 400 mg pens averaged together, days 21-28 has 16 pens for 300 mg and 16 for 400 mg, and days 35-42 has 8 pens for 300 mg and 8 for 400 mg.

of added HCW over 0 mg fed steers for a 28, 35, and 42 feeding duration, respectively. No other treatment differences ($P > 0.05$) were observed for LM area, dressing percent, marbling score, fat thickness, or calculated yield grade.

In this study, yearling steers were fed Optaflexx for 14 days in order to develop the response curves for both live BW and HCW change. A feeding duration of 14 days is not approved for Optaflexx; therefore, conclusions are based on 28 and 42 days of feeding Optaflexx. Feeding 300 mg of Optaflexx to yearling steers for 28 or 42 days increased live final BW (13 and 29 lb) and HCW (11.1 and 16.6 lb) compared to cattle fed 0 mg of Optaflexx. Feeding 400 mg of Optaflexx the last 28 or 42 days to yearling steers improved live final BW (27 and 24 lb) and HCW (19.7 and 20.7 lb) relative to 0 mg fed cattle. In yearling steers, Optaflexx improves F:G, final live BW, and HCW when fed at 300 or 400 mg for the last 28 or 42 days of the finishing period.

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