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Summary with Implications

A feedlot study evaluated the effects of ractopamine hydrochloride (Optaflexx®) dosage (0 or 300 mg/steer daily) and days on feed (118, 139, 160, 174 DOF) as a 2 × 3 + 1 factorial (steers fed 174 d were not fed Optaflexx) on performance of big yearlings. No interaction was observed between Optaflexx and days on feed. Feeding Optaflexx improved live final BW, carcass-adjusted ADG, carcass-adjusted feed conversion, and calculated yield grade. Increasing days on feed linearly increased live final BW, carcass-adjusted feed conversion, HCW, dressing percent, and marbling score but not ADG. Furthermore, a quadratic increase in LM area, 12th rib fat, and calculated yield grade was observed with days on feed. The response in added carcass weight due to feeding Optaflexx is the same with different lengths of time cattle are fed, and for large yearlings placed on feed.

Introduction

Feeding β–adrenergic agonists has been shown to increase protein accretion and decrease fat deposition in animal growth (*Journal of Animal Science,* 1998, 76:160). Ractopamine hydrochloride (trade name Optaflexx®; Elanco Animal Health) has been widely used in the industry since 2004 to increase final BW, HCW, and improve feed efficiency in finishing cattle. Optaflexx has been approved for feeding the last 28 to 42 days at the label dose of 70–430 mg/head to finishing cattle before harvest. However, limited data exist evaluating the effects of feeding Optaflexx to large yearling steers, and fed to larger finished weights common today with increased days on feed (DOF). Therefore, the objective of this experiment was to evaluate the effects of increasing DOF and feeding Optaflexx on performance of large yearlings.

Procedure

A feedlot study was conducted at the University of Nebraska-Lincoln Eastern Nebraska Research and Extension Center (ENREC) near Mead, NE. Crossbred yearling steers (n = 342; initial BW = 917 ± 74 lb) were utilized in a randomized block design (3 BW blocks) with a 2 × 3 + 1 factorial treatment design. Factors included Optaflexx dosage (0 or 300 mg/steer daily) and days on feed (118, 139, or 160 d) plus cattle fed 2 weeks longer (174 d) without Optaflexx. Prior to initiation of trial, steers were limit fed at 2% of BW for 5 days a diet consisting of 50% Sweet Bran® (Cargill) and 50% alfalfa hay (DM basis) to minimize variation in gastrointestinal fill. Steers on the 118 d treatment were fed to a target endpoint of approximately 1000 lb HCW or 0.5 in. of fat thickness. Steers on the 139 d treatment were fed to a target endpoint of 1050 lb HCW, and 160 d steers were fed to a target of 1100 lb HCW. Lastly, steers on the 174 d treatment were not fed Optaflexx to compare the impact of just feeding cattle longer. Steers were weighed two consecutive days (day 0 and 1) to establish initial BW. Steers were blocked by day 0 BW, stratified by BW within blocks (light, medium, heavy), and assigned randomly to 42 pens. Pens were assigned randomly to one of 7 treatments with 6 pens per treatment (8 steers/pen). Light, medium, and heavy blocks consisted of 2, 3, and 1 replications, respectively. All steers were adapted to a common finishing diet over a 21-day period consisting of four adaptation diets. The amounts of Sweet Bran and supplement included in each adaptation diet were held constant at 40 and 5% (DM basis), respectively. The amount of high moisture corn was gradually introduced in the diet while replacing grass hay and corn silage. The supplement was formulated for 30 g/ton of DM as Rumensin® (Elanco Animal Health) and to provide 90 mg/steer daily of Tylan® (Elanco Animal Health). Steers were fed once daily between 0700 and 0900 hours.

Optaflexx was initiated when steers were 35 days from their projected endpoints. Steers were pen weighed on the day of treatment initiation and every 7 d thereafter. Steers were removed from their pens (approximately 0700 hours) prior to feeding and pen weights were collected using a pen scale. Pen weights (4% pencil shrink applied) were collected every 7 d to evaluate live performance over the Optaflexx treatment phase. All residual feed remaining in the bunk was removed and weighed. Optaflexx was delivered daily during the treatment phase via dry supplement in the total mixed ration at 300 mg/steer daily, with fine ground corn as the carrier. Two dry supplements were used during the treatment phase, one that contained no Optaflexx and one that provided 300 mg of Optaflexx.

Initially, all steers were implanted with Component® TE-IS (Elanco Animal Health). Given variable harvest dates, multiple terminal implanting dates were established to standardize the terminal implant window to 90 days. All steers were re-implanted with the terminal implant Component® TE-200 (Elanco Animal Health). On day of shipping, steers to be shipped were pulled out of pens, weighed to determine final live BW, then placed back in pens and were fed 50% of the previous days feed called. In the afternoon all steers to be shipped were pulled from pens and loaded onto the truck. All steers were harvested at a commercial abattoir (Greater Omaha) after 118, 139, 160, or 174 days on feed, depending on treatment. Hot carcass weight and liver scores were recorded on day of harvest. After a 48-hour chill, LM area, USDA marbling score, and 12th rib fat thickness were recorded. Yield grade

Table 1. Performance of yearling steers fed 0 or 300 mg/steer daily of Optaflexx for the last 35 days and fed overall for 118, 139, 160 or 174 d.

Days on Feed:	118 d		139 d		160 d		174 d		*P*-value			
Optaflexx Dosage:	0	300	0	300	0	300	0	SEM	Int.	Dose	Days on Feed	
Live Performance:											Linear	Quad.
Initial BW, lb	917	917	917	918	916	916	919	1.7	0.98	0.90	0.89	0.57
Final BW, lb [1]	1407	1433	1457	1501	1539	1553	1587	14.5	0.51	0.01	<0.01	0.39
DMI, lb/d	29.9	30.3	29.4	30.0	28.4	28.4	28.6	0.4	0.56	0.25	<0.01	0.75
ADG, lb [2]	4.16	4.38	3.91	4.23	3.92	4.00	3.87	0.10	0.43	<0.01	<0.01	0.25
F:G [3]	7.23	6.98	7.59	7.13	7.29	7.11	7.42	—	0.57	<0.01	0.33	0.28
Carcass-Adjusted Performance:												
Final BW, lb [4]	1394	1418	1449	1481	1567	1581	1611	15.5	0.82	0.05	<0.01	0.22
ADG, lb [5]	4.04	4.25	3.83	4.05	4.07	4.15	3.98	0.11	0.76	0.04	0.78	0.15
F:G [3]	7.58	7.23	7.87	7.48	7.07	6.97	7.24	—	0.92	0.05	0.02	0.16
Live Treatment Phase Performance [6]:												
Initial BW, lb	1327	1336	1382	1404	1446	1434	1473	13.3	0.40	0.51	<0.01	0.59
DMI, lb/d	28.4	29.9	26.0	27.7	23.5	24.1	23.8	0.5	0.45	< 0.01	<0.01	0.05
ADG, lb [2]	2.29	2.77	2.18	2.85	2.75	3.47	3.37	0.19	0.78	< 0.01	<0.01	<0.01
F:G [3]	12.6	11.1	12.1	9.97	8.82	7.07	7.20	—	0.43	< 0.01	<0.01	<0.01

[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.
[6]Performance the last 35 days based on live performance when Optaflexx was fed.

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 2 × 3 + 1 factorial using the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.), with pen as the experimental unit. Steers that were removed during experiment were not included in the analysis. The model included Optaflexx dose treatment, days on feed, and dose × days on feed interaction. Block was treated as a fixed effect. Treatment differences were declared significant at $P \leq 0.05$.

Results

Cattle performance was negatively influenced by wet, cold, muddy conditions in December and January, which lowered ADG and HCW compared to targeted finish weights/HCW for the study. Cattle ADG was dramatically lowered during the time periods of d 90–97 and 111–118. Days 90–97 (1/6/16–1/13/16) of the trial, cattle on both treatments had a negative ADG response (control =-0.12 and Optaflexx =-0.09) as well as a loss of 1 lb in live interim BW. During days 111 to 118 (1/27/16–2/3/2016), cattle performance suffered a reduction in live interim BW for steers fed 118 d for both Optaflexx and control treatments (2 and 10 lb, respectively). Furthermore, cattle fed 139 d only had a slight increase in live interim BW for both control and Optaflexx treatments, 2 and 3 lb respectively. The reduction in live interim BW could be the result of negative ADG for 118 d fed cattle and low positive ADG for 139 d cattle. During these time points, weather was adverse with low comprehensive climate index (CCI) numbers resulted in lack of change in BW or low ADG. The negative impact of weather on ADG impacted cattle performance measured on cattle fed for 118 or 139 d more so than cattle fed longer as cattle fed longer than 139 d had time to recover in performance.

Despite weather challenges, there were no significant dose × days on feed interactions ($P > 0.40$) observed for growth performance; therefore, main effects will be discussed. Live final BW was 28 lb heavier ($P = 0.01$) for steers fed 300 mg of Optaflexx as compared to steers fed 0 mg. Steers fed 300 mg of Optaflexx had greater ($P = 0.04$) carcass-adjusted ADG (4.15 lb) compared to steers fed 0 mg (4.00 lb). Feeding 300 mg of Optaflexx resulted in an improvement ($P = 0.05$) in carcass-adjusted F:G. Carcass-adjusted DMI was not different ($P = 0.24$)

Table 2. Carcass characteristics of yearling steers fed 0 or 300 mg/steer daily of Optaflexx for the last 35 days and fed overall for 118, 139, 160 or 174 d.

Days on Feed:	118 d		139 d		160 d		174 d		*P*-Value			
Optaflexx Dosage:	0	300	0	300	0	300	0	SEM	Int.	Dose	Days on Feed	
Carcass Characteristics:											Linear	Quad.
HCW, lb	878	894	913	933	987	996	1015	9.8	0.82	0.06	<0.01	0.22
Dressing, %[1]	62.4	62.3	62.7	62.1	64.2	64.1	63.9	0.3	0.56	0.34	<0.01	0.48
Marbling[2]	505	492	558	537	578	577	612	14.8	0.76	0.31	<0.01	0.57
LM area, in^2	13.1	13.8	12.9	13.4	13.5	14.0	13.7	0.2	0.85	<0.01	<0.01	0.01
12th rib fat, in	0.48	0.46	0.63	0.60	0.64	0.61	0.64	0.02	0.92	0.08	<0.01	<0.01
Calculated Yield Grade	3.4	3.2	4.0	3.8	4.1	3.8	4.1	0.09	0.99	<0.01	<0.01	<0.01

[1]DP = Dressing Percent; calculated from HCW divided by live BW, with a 4% pencil shrink applied.
[2]Marbling Score: 300 = Slight, 400 = Small, 500 = Modest, etc.

between Optaflexx doses. Carcass-adjusted final BW was 23 lb greater ($P = 0.05$) for steers fed 300 mg of Optaflexx compared to 0 mg (Table 1).

There were no significant dose × days on feed interactions for carcass data; therefore main effects will be discussed. Hot carcass weight tended to be 15.3 lb greater ($P = 0.06$) for steers fed 300 mg of Optaflexx as compared to 0 mg. Calculated yield grade was improved ($P < 0.01$) for steers fed 300 mg of Optaflexx (3.7) as compared to 0 mg (3.9). Fat thickness tended to be lower for steers fed Optaflexx compared to steers not fed Optaflexx. Dressing percentage and marbling score were not impacted ($P > 0.31$) by Optaflexx treatment (Table 2).

As days on feed increased, live final BW and carcass-adjusted final BW increased linearly ($P < 0.01$). Intake and live ADG decreased linearly ($P < 0.01$) as days on feed increased, which lead to no change ($P > 0.28$) in F:G (on a live basis) with increased days on feed. Because of increased dressing percent, carcass-adjusted ADG was constant ($P > 0.15$) which lead to a small linear improvement ($P = 0.02$) in F:G, due to the reduction in DMI. Hot carcass weight, dressing percent, and marbling score were increased ($P < 0.01$) linearly as days on feed increased. LM area, 12th rib fat, and CYG increased ($P < 0.01$) quadratically as days on feed increased.

Steers fed 174 d had a greater ($P < 0.01$) live ADG during the treatment phase (last 35 d) as compared to the 118, 139 and 160 d fed steers. Steers fed 118 d had the highest ($P < 0.01$) DMI (29.1 lb) during the treatment phase, with 160 d steers having the lowest. Steers fed 174 d had the lowest ($P < 0.01$) F: G as compared to steers fed 118, 139, and 160 d.

Numerically, steers fed 174 d that received 0 mg of Optaflexx were 34.8 lb heavier ($P = 0.07$) compared to steers that were fed 160 d and received 300 mg of Optaflexx. There were no differences ($P = 0.23$) in carcass-adjusted ADG between steers fed 174 d receiving 0 mg of Optaflexx compared to 160 d steers fed 300 mg of Optaflexx. Additionally, 174 d steers tended to have an improved ($P = 0.09$) F:G as compared to steers fed 160 d fed 300 mg of Optaflexx. These changes can be confounded with changes in weather observed during the study, as cattle were not fed during the same conditions when fed longer.

Conclusions

Feeding Optaflexx improved live final BW, carcass-adjusted ADG, carcass-adjusted F:G, and calculated yield grade similar to other studies suggesting a similar response in big yearlings. Feeding steers longer increased fatness and weights. While feeding longer decreased ADG calculated on live BW, carcass-adjusted ADG remained constant as days fed increased.

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