2016

Effects of Supplementing OmniGen- AF® with or without Ractopamine Hydrochloride on Performance and Carcass Characteristics of Feedlot Steers

Kelby M. Sudbeck
University of Nebraska-Lincoln

Robert G. Bondurant
University of Nebraska-Lincoln, robby.bondurant@unl.edu

Troy J. Wistuba Wistuba
University of Nebraska-Lincoln

Kevin C. DeHaan
University of Nebraska-Lincoln

James C. MacDonald
University of Nebraska-Lincoln, jmacdonald2@unl.edu

See next page for additional authors

Effects of Supplementing OmniGen-AF® with or without Ractopamine Hydrochloride on Performance and Carcass Characteristics of Feedlot Steers

Kelby M. Sudbeck, Robby G. Bondurant, Troy J. Wistuba, Kevin C. DeHaan, Jim C. MacDonald, Galen E. Erickson, and Matt K. Luebbe

Summary

An experiment was used to evaluate feeding OmniGen-AF during the last 28 or 56 days of the finishing phase in diets with or without Optaflexx. There were no differences in steer performance or carcass characteristics when OmniGen-AF was fed alone or in combination with Optaflexx. Feeding Optaflexx increased ADG, HCW, and improved F:G. Supplementation of Optaflexx also increased the rate of accretion in LM area, but decreased the accretion of intramuscular fat percentage. These data illustrate the repartitioning of nutrients between lean and fat tissues when Optaflexx is fed.

Introduction

OmniGen-AF is patented proprietary product shown to augment the immune system in ruminants. In several studies where feedlot cattle were exposed to an endotoxin challenge (lipopolysaccharide, LPS), researchers reported an ability of OmniGen-AF to prime the immune system before the LPS challenge allowing the cattle to a display stronger acute phase response to the LPS challenge while preserving energy stores in the body [Burdick Sanchez et al., 2014 J. Anim. Sci. 92(E-Suppl 2):37].

Supplementing cattle with ractopamine hydrochloride (RAC) reduces the rate at which body fat is deposited, allowing for continued increase in the proportion of muscle growth by increasing muscle fiber hypertrophy. Supplementing cattle with RAC increases ADG, HCW, and final BW as well as improves F:G, while having little to no impact on DMI, 12th rib fat thickness or marbling characteristics. Anecdotal evidence suggests feeding beta agonists may impair the immune response late in the finishing period.

There are currently no data on the combination of supplementing OmniGen-AF during the final phase of feedlot production along with the use of RAC. Thus, the objectives of this study were to evaluate the effects of feeding OmniGen-AF during the final 0, 28, or 56 days of the feedlot finishing phase with or without supplemented RAC on feedlot steer performance and carcass characteristics. In addition, change in body composition over the final 56 days was evaluated via ultrasound imaging.

Procedure

Crossbred steers (n = 336; initial BW = 658 ± 67 lb) were utilized in a feedlot finishing trial at the University of Nebraska Panhandle Research Feedlot (PREC) near Scottsbluff, Nebraska in a 3 × 2 factorial randomized block design. The first factor was the duration of OmniGen-AF (OG; Phibro Animal Health; Quincy, IL) feeding (4 g/ 100 lb BW) during the last 0, 28, or 56 days of the finishing period. The second factor was supplementation of ractopamine hydrochloride (RAC; Elanco Animal Health; Greenfield, IN) at 300 mg/ steer daily for the last 28 days of finishing or no beta agonist supplementation. Steers were limit fed a diet consisting of 45% ground alfalfa hay, 35% wet beet pulp, and 20% of wet distillers grains plus solubles (WDGS; DM basis) for a minimum of 5 d prior to the start of the experiment. Three BW measurements were recorded on d-1, 0 and 1 of the experiment, were averaged, and used as the initial BW for the experiment. Steers were blocked by initial BW into heavy, medium, and light BW blocks, stratified by BW and assigned randomly within block to pen for a total of 42 pens (8 steers/pen). Pen was assigned randomly to one of the six treatments. Steers were implanted with Revalor®-XS (Merck Animal Health) on day-1. Steers were adapted to a finishing diet using four grain adaptation diets that replaced alfalfa hay with dry-rolled corn (DRC). Adaptation diets were fed 3, 4, 7, and 7 days; respectively, and by d 22 steers were fed the common finishing diet (Table 1).

All steers were fed a supplement via micromachine to provide 360 mg/hd daily of Rumensin and 90 mg/steer daily Tylan (Elanco Animal Health). OmniGen-AF feeding (OG; 4 g/100 lb BW) was administered by topdressing beginning 56 or 28

Table 1. Diet Composition—DM basis

Ingredient	d 1–3	d 4–7	d 8–14	d 15–21	d 22+
	Step 1	Step 2	Step 3	Step 4	Finisher
Alfalfa Hay	27.5	20.0	12.5	5.0	0.0
Corn Silage	30.0	25.0	20.0	15.0	15.0
WDGS[a]	25.0	25.0	25.0	25.0	25.0
DRC[b]	11.5	24.0	36.5	49.0	54.0
Supplement[c,d]	6.0	6.0	6.0	6.0	6.0

[a]Wet distillers grains plus solubles
[b]Dry-rolled corn
[c]Liquid supplement formulated to provide a dietary DM inclusion of 10% Ca, 0.3% salt, 60 mg/kg of Fe, 40 mg/kg of Mg, 25 mg/kg of Mn, 10 mg/kg of Cu, 1 mg/kg of I, 0.15 mg/kg of Se, 1.5 IU/g of vitamin A, 0.15 IU of vitamin D, 8.81 IU/kg of vitamin E.
[d]Feed additives were provided via micromachine (Model 271 Weigh and Gain Generation 7; Animal Health International, Greely, CO) to provide 360 mg / hd / daily Rumensin® (Elanco Animal Health; DM basis) and 90 mg/ steer daily of Tylan (Elanco Animal Health). OmniGen-AF supplementation (4 g / 45.5 kg BW) was administered through topdressing the delivered finishing diet beginning 56 or 28 d prior to the targeted marketing date during the remainder of the finishing period. The topdress consisted of 50 g OmniGen-AF and 100g fine ground corn carrier (DM basis) fed to achieve 4 g OmniGen-AF / 45.5 kg steer BW.

Table 2. Effects of supplementing OmniGen-AF last 0, 28, or 56 days with or without supplementation of ractopamine hydrochloride the last 28 days of feedlot finishing period in crossbred beef steers on performance and carcass characteristics

Item	Ractopamine[a]		OG[b]			SEM	*P*-value[c]		
	NORAC	RAC	0	28	56		RAC	OG	OG × RAC
Performance									
Initial BW, lb	686	684	686	684	686	21	0.89	0.90	0.53
Interim BW, lb	1199	1185	1187	1201	1187	15	0.04	0.18	0.42
Final BW, lb[d]	1355	1378	1366	1364	1370	6	< 0.01	0.82	0.97
ADG, lb	3.87	3.98	3.92	3.91	3.94	0.06	0.02	0.89	0.99
DMI, lb/d	23.0	22.9	22.9	22.8	23.0	0.2	0.69	0.80	0.67
F:G, lb/lb	5.95	5.74	5.84	5.83	5.85	—	0.05	0.62	0.72
Carcass Characteristics									
HCW	854	868	861	859	863	7	< 0.01	0.83	0.97
LM area, in[b]	12.32	12.76	12.49	12.45	12.69	0.32	0.01	0.35	0.52
12th rib fat, in	0.52	0.58	0.53	0.56	0.54	0.03	0.42	0.10	0.55
Yield grade[e]	3.65	3.62	3.57	3.73	3.61	0.14	0.69	0.19	0.46
Marbling score[f]	454	455	449	458	457	13	0.90	0.76	0.44
Abscessed livers, %	5	8.7	7.5	5.5	7.5	0.31	0.18	0.80	0.62

[a]Steers either did not receive a beta-agonist (NORAC) or were supplemented with ractopamine hydrochloride at 300 mg/ hd / day (RAC).
[b]Steers received OmniGen-AF® supplementation for the last 0, 28, or 56 days of the finishing period.
[c]OG = main effect due to OmniGen-AF supplementation the last 0, 28, or 56 days of the finishing period; RAC = main effect due to ractopamine hydrochloride supplementation the last 0 or 28 days of the finishing period; OMNI × RAC = the interaction between OmniGen-AF supplementation and ractopamine hydrochloride supplementation.
[d]Carcass adjusted final BW, used in calculation of ADG and F:G, was calculated from HCW using a common dressing percentage of 63% to minimize errors associated with gastrointestinal tract fill.
[e]Yield grade = 2.50 + (2.5 × fat thickness, in) − (0.32 × LM area, in^2) + (0.2 × KPH, %) + (0.0038 × HCW, lb).
[f]Marbling score of 400 = small[00].

d prior to the targeted marketing date of each BW block. The topdress consisted of 50 g OG and 100g fine ground corn carrier (DM basis) fed to achieve 4 g OG/100 lb steer BW. Pens designated to receive no OG supplementation also received a topdress of fine ground corn as a control. Pens designated to treatments that received a beta agonist were supplemented RAC (300 mg/ steer daily) via micromachine beginning 28 d prior to the targeted market date of each BW block.

Initial ultrasound data were collected 56 days prior to the targeted marketing date of each BW block. Ultrasound data measurements of rump fat thickness (RUMP), 12th rib fat thickness (RIB), LM area, and intramuscular fat (IMF) were collected on each steer 56 d prior (Initial) to the targeted marketing date of each BW block and then again 1 d prior (Final) to steers being harvested. Individual steer BW was also collected at each ultrasound time point. The differences between final and initial ultrasound data were calculated to determine body composition change due to dietary treatments imposed.

Steers in the heavy and medium BW blocks were harvested on d 167 and the light BW block was harvested on d 194. Hot carcass weight, and liver scores were recorded the day of harvest. After a 48-hour chill, 12th rib fat depth, LM area, and marbling score were recorded. Carcass adjusted final BW, used in calculation of ADG and F:G, was calculated from HCW using a common dressing percentage of 63% to minimize errors associated with gastrointestinal tract fill. Yield grade was calculated as 2.50 + (2.50*fat thickness, in) + (0.2*2.5 [KPH]) + (0.0038 * HCW, lb) − (0.32 * LM area, in^2)

Data were analyzed using the Glimmix Procedure of SAS (SAS 9.3; SAS Institute, Inc., Cary, N.C.) as a randomized block design. Pen was the experimental unit and block was treated as a random effect. Model included main effects of OG and RAC, and the interaction of OG and RAC. A difference in interim body weights collected 58 days prior to harvest for steers was detected ($P = 0.04$; Table 2). Therefore, 58-day interim BW was considered a covariate according to the 3-step covariate analysis process. Main effects of OG and RAC were tested as well as the interaction of OG and RAC.

Results

There were no OG by RAC interactions observed in this study for animal performance, carcass characteristic, or ultrasound variables ($P \geq 0.22$; Table 2). Furthermore, there were no differences in any of the feedlot performance measures due to feeding OG ($P \geq 0.18$). Supplementation of RAC at 300 mg/steer daily for 28 d increased final BW by 23 lb, ADG by 0.11 lb/d, and improved F:G ($P < 0.05$). There were no differences in DMI for between treatments ($P > 0.67$), and an increase in ADG, supplementing RAC improved F:G ($P = 0.05$).

There was no effect of feeding OG on

Table 3. Effects of supplementing OmniGen-AF last 0, 28, or 56 days with or without supplemented ractopamine hydrochloride the last 28 days of feedlot finishing period in crossbred beef steers on change in body composition the last 56 days of feedlot finishing

Item	Ractopamine[a]		OG[b]			SEM	*P*-value[c]		
	NORAC	RAC	0	28	56		RAC	OG	OG X RAC
Initial ultrasound									
Rump fat, in	0.40	0.43	0.44	0.42	0.43	0.02	0.47	0.12	0.44
Rib fat, in	0.44	0.47	0.46	0.45	0.46	0.03	0.38	0.12	0.78
LM area, in	12.7	12.9	12.8	13.0	12.6	0.4	0.62	0.46	0.70
Intramuscular fat, %[d]	3.94	4.06	3.98	3.97	4.01	0.15	0.64	0.65	0.52
Final ultrasound									
Rump fat, in	0.51	0.55	0.55	0.53	0.54	0.02	0.61	0.12	0.62
Rib fat, in	0.57	0.61	0.59	0.58	0.60	0.03	0.06	0.06	0.88
LM area, in	13.6	13.8	13.8	13.9	13.6	0.3	0.08	0.48	0.94
Intramuscular fat, %[d]	4.29	4.38	4.35	4.42	4.25	0.15	0.10	0.73	0.50
Ultrasound differences[e]									
Rump fat, in	0.11	0.12	0.11	0.12	0.11	0.01	0.87	0.38	0.95
Rib fat, in	0.13	0.14	0.13	0.13	0.14	0.01	0.09	0.57	0.22
LM area, in	0.9	0.9	1.0	0.9	1.0	0.2	< 0.01	0.07	0.43
Intramuscular fat, %[d]	0.37	0.34	0.39	0.47	0.26	0.16	0.02	0.92	1.00

[1]Steers either did not receive a beta-agonist (NORAC) or were supplemented with ractopamine hydrochloride at 300 mg/ hd / day (RAC).
[2]Steers received OmniGen-AF® supplementation for the last 0, 28, or 56 days of the finishing period.
[3]OG = main effect due to OmniGen-AF supplementation the last 0, 28, or 56 days of the finishing period; RAC = main effect due to ractopamine hydrochloride supplementation the last 0 or 28 days of the finishing period; OMNI x RAC = the interaction between OmniGen-AF supplementation and ractopamine hydrochloride supplementation.
[4]Percentage of intramuscular fat (IMF) were 2.3–3.9 = Select, 4.0–5.7 = Choice–, 5.8–7.6 = Choice°, 7.7–9.7 = Choice+, and 9.9–12.3 = Prime.
[5]Ultrasound difference calculated by subtracting final ultrasound measurements from initial ultrasound measurements.

HCW, LM area, calculated yield grade, marbling score, or the percentage of abscessed livers in the present study ($P > 0.18$). However a tendency ($P = 0.10$) for OG ration addition to increase 12th rib fat thickness was observed. Carcasses from steers that received RAC were 12 lb heavier than carcasses from steers that received NORAC ($P < 0.01$). Furthermore, carcasses of steers supplemented RAC also had increased LM area compared to carcasses from steers that received NORAC ($P = 0.01$). There were no effects of RAC supplementation on 12th rib fat thickness, calculated yield grade, marbling score, or the percentage of abscessed livers ($P \geq 0.42$).

There was no effect of OG, RAC, or their interaction at the initial ultrasound period 56 days prior to harvest for RUMP, RIB, LM area, or IMF ($P > 0.11$; Table 3). Analysis of the final ultrasound time point also indicates no effect of OG or RAC on RUMP ($P = 0.12$ and 0.61, respectively). There was no effect of OG supplementation on LM area or IMF during the final ultrasound time point ($P = 0.48$ and 0.73, respectively; Table 3). Steers supplemented RAC tended to have increased RIB fat during the final ultrasound measurement compared to steers that were not supplemented RAC ($P = 0.06$). A similar tendency ($P = 0.06$) of an increase in RIB was also observed in cattle supplemented with OG during the final ultrasound period. There also tended to be an effect of RAC supplementation on LM area and IMF during the final ultrasound ($P = 0.08$ and 0.10, respectively).

Finally, when looking at the differences in the variables (RUMP, RIB, LM area, and IMF) collected via ultrasound between the two ultrasound points, no differences were observed for RUMP, RIB, and IMF in the current study due to OG supplementation ($P = 0.38$, 0.57, and 0.92, respectively). There was a tendency ($P = 0.07$) for supplementation of OG to increase the rate of LM area growth of steers. When analyzing the effects of RAC supplementation, there were effects on LM area and IMF change ($P < 0.01$ and 0.02, respectively), but no effects on RUMP ($P = 0.87$), and only a tendency for an effect on RIB to increase ($P = 0.09$) due to RAC supplementation. Steers supplemented with RAC experienced an increase in LM area ($P < 0.01$) between the two ultrasound time points compared to those not supplemented with RAC. However, the supplementation of RAC caused a decrease in IMF accumulation (increased at at slower rate) as compared steers not supplemented RAC. There was also a tendency ($P = 0.09$) for supplementation of RAC to increase the change in RIB fat in comparison to not supplementing RAC.

Feeding RAC increased steer ADG, resulting in an increased final BW, HCW, and improved F:G along with increasing LM area of carcasses. Supplementation of RAC increased the rate of accretion in steer LM area, but decreased the accretion of intramuscular fat percentage. These data would suggest that there is no interaction between OmniGen and ractopamine on steer feedlot performance or carcass characteristics.

Kelby M. Sudbeck, graduate student

Robby G. Bondurant, research technician
University of Nebraska, Department of Animal Science, Lincoln NE

Troy J. Wistuba and Kevin C. DeHaan, Phibro Animal Health, Quincy, Illinois

Jim C. MacDonald, associate professor, University of Nebraska–Lincoln (UNL) Department of Animal Science, Lincoln, Neb.

Galen E. Erickson, professor

Matt K. Luebbe, assistant professor, UNL Panhandle Research and Extension Center, Scottsbluff, Neb.