Effects of Supplemental Availa®Zn on Growth and Carcass Characteristics of Finishing Cattle Fed Diets With or Without Optaflexx

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Summary and Implications

Supplementation of 60 ppm Zn from Availa®Zn improved performance during the initial 86 days of the 115 d finishing period. However, during the final 29 d, when Optaflexx (**OPT**) was included in the diet, increasing concentrations of Availa®Zn linearly increased growth of OPT-fed steers. During this period supplementing 90 ppm of Zn had the greatest additive effect on the response to OPT, suggesting that the addition of Zn to OPT diets may improve performance.

Introduction

Zinc (Zn) is essential for growth in both humans and animals. Research data have demonstrated that dietary concentrations of Zn well above the documented requirements can increase the growth performance and efficiency of swine and gain in beef cattle. Previous research in pigs has shown the addition of 40-50 ppm of Zn above the requirement to diets containing Paylean improves ADG and decreases F:G when compared to Paylean alone. Additionally, data from large pen feedlot studies have indicated that feeding Zn beyond the NRC requirement of finishing steers may provide additional hot carcass weight when cattle are fed a beta agonist such as Optaflexx. The objective of this experiment was to determine the optimum concentrations of dietary Zn from Availa®Zn to optimize the growth performance of Optaflexx-fed finishing cattle.

Materials and Methods

Pre-Optaflexx period. Forty-one steers (mean BW = 838 lbs) were stratified by weight and assigned randomly to one of four treatments for 86 d: **Con**: no supplemental Availa®Zn (n = 6), **Zn30**: 30 pm Zn from Availa®Zn (n = 12), **Zn60**: 60 ppm Zn from Availa®Zn (n = 12), and **Zn90**: 90 ppm Zn from Availa-Zn (n = 11). All steers were fed the same dry-rolled corn based finishing-type diet that was supplemented with 60 mg/kg DM of Zn from $ZnSO_4$. Steers were fitted with electronic identification tags and daily individual intake was measured using the Feed Intake Management System at Iowa State University's Beef Nutrition farm. Two-day consecutive weights were taken on d 0 and 1 at the beginning of the experiment, and steers were weighed every 28 d throughout the Pre-OPT period.

Optaflexx period. On d 90 one of the two pens of steers on treatments that included supplemental Availa®Zn was randomly selected to be supplemented or not supplemented with Optaflexx at 300 mg/steer/d for the final 29 days of the experiment, creating 7 final treatments: **Con**) 0 ppm of Zn from Availa®Zn, not supplemented with OPT (n=6); **Zn30**) 30 ppm of Zn from Availa®Zn + not supplemented with OPT (n = 6); **Zn30-O**) 30 ppm of Zn from Availa®Zn + OPT (n = 6); **Zn60**) 60 ppm of Zn from Availa®Zn, not supplemented with OPT (n = 6); **Zn60-O**) 60 ppm of Zn from Availa®Zn + OPT (n = 6); **Zn90**) 90 ppm of Zn from Availa®Zn, not supplemented with OPT (n = 5); and **Zn90-O**) 90 ppm of Zn from Availa®Zn + OPT (n = 6). At the end of the 29 d OPT feeding period double weights were taken on d 114 and 115 and steers were shipped to a commercial abattoir and harvested. After a 24 h chill, carcass data were collected by personnel from Tri County Steer Carcass Futurity (Lewis, IA)

ADG was calculated from weights at the beginning and end of each period. Steer intake was adjusted for weekly dry matter content to determine DMI. Feed efficiency (F:G) was calculated approximately every 28 d from the total gain and total DMI from that period. Steer was considered the experimental unit for both the pre-OPT and OPT periods. Performance and carcass data were analyzed using the MIXED procedure of SAS including the random effect of steer and the fixed effect of dietary treatment for both the Pre-OPT and OPT periods (SAS Institute Inc., Cary, NC). Day 0 and day 86 values were used as covariates in analysis for the pre-OPT and OPT periods, respectively. Body weights, ADG, DMI, and F:G were analyzed as repeated measures for the pre-OPT period, also using the MIXED procedure of SAS. For the pre-OPT period, three *a priori* individual degree of freedom contrasts were developed, Con vs. Zn: which compared the Con treatment to Zn30, Zn60 and Zn90, the linear effect of Zn, and the quadratic effect of Zn. For the OPT period, six *a priori* individual degree of freedom contrasts were developed to evaluate the Zn response during the OPT period. Within the OPT supplemented treatments: Con vs. Zn, which compared the Con treatment to Zn30, Zn60 and Zn90, the linear effect of Zn, and the quadratic effect of Zn. Within the OPT supplemented animals, the linear effect of Zn within OPT, and the quadratic effect of Zn within OPT were evaluated, and the No OPT vs. OPT (Zn30, Zn60 and Zn90 vs. Zn30-O, Zn60-O and Zn90-O).

Results and Discussion

Pre-Optaflexx period. At the end of the 86 d pre-OPT period, there was tendency for a quadratic effect of Zn on growth ($P < 0.10$; Table 1) where the Zn60 steers had the greatest final BW and the greatest ADG. The Zn60 steers also tended to have the lowest G:F ($P < 0.10$). There was a linear effect of Zn on DMI, where increasing dietary Zn concentration decreased DMI ($P = 0.07$). The supplementation of either 30 or 90 ppm of Zn from Availa®Zn did not provide a benefit when compared with the performance of steers that were not supplemented with Availa®Zn during the pre-OPT period. This suggests that Zn60 may be the optimum concentration to include in the diet, when OPT is not supplemented.

Optaflexx period. The addition of OPT to the diets for the last 29 d of finishing increased final BW (Figure 1) and ADG (Figure 2; $P = 0.001$), as well as decreased F:G ($P = 0.002$; Figure 3). When OPT was supplemented, increasing amounts of dietary Availa®Zn improved ADG and final BW linearly ($P = 0.02$). In contrast to the pre-OPT period when supplementing 90 ppm Zn from Availa®Zn diet DM provided no benefit over the Con treatment, Zn90R steers performed the best in the OPT period, suggesting that when OPT is supplemented, Zn90 may be the optimum inclusion rate. However, as Zn90 was the highest Zn inclusion in this study, it is unknown whether a plateau in performance has been reached. It is unclear from our results whether there would be an additional benefit in supplementing OPT-fed cattle with greater than 90 ppm Zn; however, further investigation seems warranted. Steers consuming the Zn60 diet may have been further along in their growth curve at the beginning of the OPT period, as evidenced by their greater BW on d 86. Differences in growth potential may explain why the Zn60 steers not placed on OPT did not continue to perform better than Zn30 and Zn90, as they did during the pre-RAC period.

Carcass Characteristics. The inclusion of OPT increased HCW ($P = 0.03$; Table 2). Hot carcass weight also tended to increase linearly with increasing dietary Zn, when OPT was included in the diet ($P = 0.09$), following a similar trend as growth performance. There were no differences in dressing percentage, rib eye area or marbling scores ($P \geq 0.11$). However, CON steers had the greatest back fat and yield grade ($P < 0.05$) when compared with Availa®Zn supplemented steers, and this effect tended to increase as dietary Zn concentrations increased ($P < 0.07$) suggesting that the inclusion of Availa®Zn may reduce external fat accumulation, regardless of OPT inclusion.

In conclusion, prior to adding OPT to the finishing diets, steers supplemented with an additional 60 ppm of Zn from Availa®Zn had the greatest growth performance. When OPT was included in the diet there was a linear increase in growth performance, efficiency, and HCW as Availa®Zn inclusion increased. There was no additional benefit to supplementing Availa®Zn alone during the final 29 d of the finishing period.

Acknowledgements

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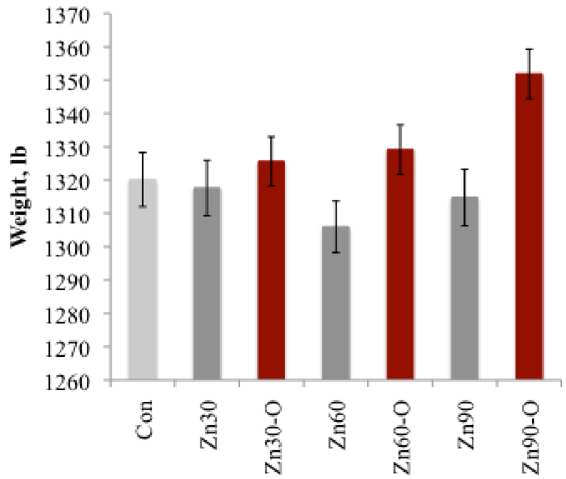
Table 1. Effect of Availa-Zn supplementation on growth performance in finishing steers.

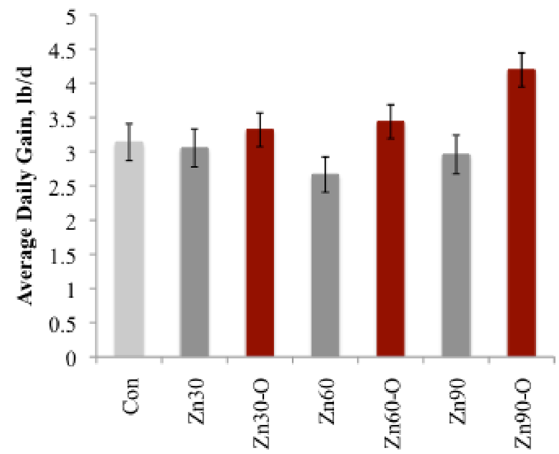
	Treatments					Contrast *P*-values		
	Con	**Zn30**	**Zn60**	**Zn90**	**SEM**	**Con vs. Zn**	**Linear Zn**	**Quad Zn**
Initial BW, lb	841.0	846.8	827.0	836.5	11.52	0.79	0.56	0.88
Final BW, lb	1221.7	1206.7	1259.1	1196.2	13.61	0.96	0.72	0.09
Repeated Measures								
DMI, lb	25.0	25.0	24.2	24.2	0.36	0.30	0.07	0.92
ADG, lb/d	4.52	4.38	4.85	4.18	0.154	0.80	0.49	0.10
F:G	6.17	6.08	5.40	6.13	0.250	0.38	0.51	0.10

Figure 1. Effect of Availa-Zn supplementation with or without Optaflexx on final body weights of finishing steers.



Contrast	*P*-value	Contrast	*P*-value
Con vs. Zn	0.65	Linear Zn	0.46
Linear Zn w/in OPT	0.02	Quad Zn	0.51
Quad Zn w/in OPT	0.30	Non-OPT vs. OPT	0.001

Figure 2. Effect of Availa-Zn supplementation with or without Optaflexx on average daily gain of finishing steers.



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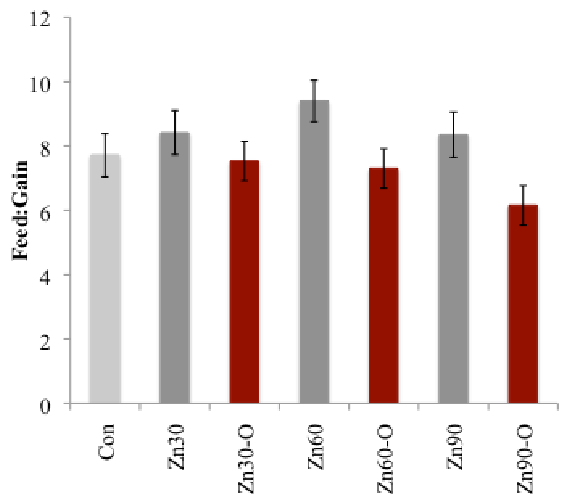
Con vs. Zn	0.65	Linear Zn	0.46
Linear Zn w/in OPT	0.02	Quad Zn	0.51
Quad Zn w/in OPT	0.30	Non-OPT vs. OPT	0.001

Figure 3. Effect of Availa-Zn supplementation with or without Optaflexx on Feed:Gain of finishing steers.



Contrast	*P*-value	Contrast	*P*-value
Con vs. Zn	0.85	Linear Zn	0.35
Linear Zn w/in OPT	0.12	Quad Zn	0.23
Quad Zn w/in OPT	0.55	Non-OPT vs. OPT	0.002

Table 2. Effect of Availa-Zn supplementation with or without Optaflexx on carcass characteristics of finishing steers.

	Treatments								
	Con	Zn30	Zn30-O	Zn60	Zn60-O	Zn90	Zn90-O	SEM	Contrast
HCW, lb	857	864	862	853	876	858	880	7.4	1, 2
DP, %	62.3	62.9	62.4	62.8	63.3	62.7	62.5	0.59	
Back fat, in	0.65	0.57	0.54	0.56	0.47	0.50	0.53	0.050	3, 4
REA, in^2	12.5	13.6	12.8	13.0	13.3	13.1	13.2	0.40	
Yield grade	3.88	3.38	3.53	3.48	3.16	3.30	3.41	0.188	3, 4
Marbling	470	476	520	468	427	471	462	34.2	
KPH, %	2.50	2.57	2.59	2.55	2.18	2.34	2.26	0.135	

1 = No OPT vs. OPT; $P = 0.03$
2 = Linear Zn within OPT; $P = 0.09$
3 = Con vs. Zn; $P \leq 0.04$
4 = Linear Zn; $P \leq 0.07$