INFLUENCE OF HIGH LEVELS OF ZINC OXIDE IN STARTER DIETS ON PIG PERFORMANCE[1]

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Summary

Two trials were conducted to determine the influence of high levels of zinc oxide on starter pig performance. Two dietary treatments (110 or 3,110 ppm zinc) were used in each trial. In trial 1, 180 pigs (17 d of age and 10.9 lb) were blocked by weight and allotted to 20 pens for a total of eight or nine pigs/pen and 10 pens/treatment. In trial 2, 168 pigs (21 d of age and 12.8 lb) were blocked by weight and sex and allotted to six pens for a total of 28 pigs/pen and three pens/treatment. Experimental diets were fed for d 0 to 14 after weaning (Phase I). All pigs were fed a common diet containing 110 ppm zinc during phase II (d 14 to 25 in trial 1 and d 14 to 29 in trial 2). Adding 3,000 ppm zinc as zinc oxide to the starter diet did not influence starter pig performance in either trial.

(Key Words: Zinc, Starter, Performance.)

Introduction

Postweaning colibacillosis is a problem in many swine herds in the United States. Several veterinarians have reported that adding high levels of zinc oxide (3,000 ppm zinc) to the starter diet will decrease the incidence of postweaning scours and, thus, increase daily gain. A proposed mode of action is that zinc oxide binds excess iron in the intestine. Because iron enhances *E. coli* growth, the reduction in iron would decrease this growth. However, a possible concern is that zinc oxide may improve fecal quality by simply depressing feed intake. Therefore, two growth trials were conducted to determine the influence of high levels of zinc in the starter diet on pig performance.

Procedures

Two trials were conducted on commercial swine farms in Northeast Kansas. Two dietary treatments (110 or 3,110 ppm zinc) were used in each trial. The control diet in each trial contained the normal zinc level (110 ppm) recommended by KSU. Zinc oxide was considered to contain 78% zinc in dietary formulations and, thus, .385% zinc oxide (7.7 lb/ton) was added to the diet to obtain the high zinc treatment (3,110 ppm). Experimental diets were only fed from d 0 to 14 postweaning (Phase I). In each trial, all pigs were fed a common diet containing 110 ppm zinc during phase II (d 14 to 25 in trial 1 and d 14 to 29 in trial 2). Complexity of the experimental diets was different for the two trials as depicted in Table 1.

In trial 1, 180 pigs (17 $\pm$ 3 d of age and 10.9 lb) were blocked by weight and allotted to 20 pens for a total of 8 or 9 pigs/pen and 10 pens/treatment. Adjacent pens shared a common feeder. Therefore, there were 10 replications for ADG and five replications for ADFI and F/G.

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In trial 2, 168 pigs (21 $\pm$ 2 d of age and 12.8 lb) were blocked by weight and sex and allotted to six pens for a total of 28 pigs/pen and three pens/treatment.

In both trials, pigs were housed in environmentally controlled nurseries with metal flooring and allowed ad libitum access to feed and water. Pigs and feeders were weighed at the end of phase I and II to determine ADG, ADFI, and F/G.

Results and Discussion

Adding 3,000 ppm zinc as zinc oxide to the starter diet did not influence starter pig performance in either trial (Table 2). Although fecal scores were not given, adding zinc oxide to the starter diet visually changed the color of the feces from dark black to a light brown (tan) color. However, this change in stool color and consistency did not influence pig performance.

High levels of zinc oxide did not improve pig performance in these trials. However, the prevalence of scours in these herds may have been too low to detect a response. Because high levels of zinc oxide did not improve pig performance, herds without postweaning colibacillosis do not need high levels of zinc in starter diets. An alternative view is that zinc oxide did not decrease feed intake or growth performance indicating that the only cost of adding zinc to the diet is the actual cost of zinc oxide (approximately $10 for the 7.7 lb per ton addition). Thus, zinc oxide may be an attractive treatment option for herds with a history of postweaning colibacillosis.

Further research with zinc oxide is needed in herds with histories of postweaning colibacillosis. Trials are needed in these on-farm situations to ensure that the reported changes in stool consistency and color associated with the addition of zinc oxide to the diet translate into improved pig performance.

Table 1. Composition of Diets[a]

	Trial 1		Trial 2	
Ingredient, %	Phase I	Phase II	Phase I	Phase II
Corn[b]	39.17	58.17	57.13	66.23
Soybean meal (48% CP)	14.07	21.86	23.50	27.12
Dried whey	25.00	10.00	10.00	
Porcine plasma	10.00			
Spray-dried blood meal		2.50		
Menhaden fish meal			3.75	
Lactose	2.50			
Soybean oil	5.00	3.00	2.00	2.00
Dicalcium phosphate (18.5% P)	2.21			
Monocalcium phosphate (21% P)		1.96	1.45	2.09
Limestone	.33	.83	.54	.94
Antibiotic[c]	1.00	1.00	1.00	1.00
Copper sulfate	.08	.08	.08	.08
L-lysine	.15	.15	.15	.15
DL-methionine	.10	.05		
Vitamin premix	.25	.25	.25	.25
Trace mineral premix	.15	.15	.15	.15
Total	100.00	100.00	100.00	100.00
Calculated Analysis, %				
Crude protein	21.2	18.9	19.5	18.4
Lysine	1.50	1.25	1.25	1.10

[a]Pigs were fed the phase I diets from d 0 to 14 postweaning. Phase II diets were fed from d 14 to 25 and d 14 to 29 in trials 1 and 2, respectively.
[b]Zinc oxide (.385%) was added at the expense of corn during phase I to form the experimental diets.
[c]Antibiotics were apralan and mecadox during phase I and II of trial 1, respectively, and neoterramycin in trial 2.

Table 2. Influence of Zinc Oxide on Starter Pig Performance

	Trial 1[a]			Trial 2[b]		
Item	Control	Zinc oxide	CV	Control	Zinc oxide	CV
Phase I[c]						
ADG, lb	.54	.54	9.5	.71	.70	7.9
ADFI, lb	.65	.66	9.3	1.09	1.12	3.8
F/G	1.19	1.23	5.9	1.53	1.62	10.6
Phase II[d]						
ADG, lb	.91	.86	10.4	.92	.92	13.7
ADFI, lb	1.43	1.31	4.1	1.84	1.86	3.3
F/G	1.58	1.52	4.4	2.01	2.06	9.3
Overall						
ADG, lb	.69	.67	7.5	.82	.81	5.2
ADFI, lb	.96	.92	6.1	1.48	1.50	3.1
F/G	1.39	1.38	1.3	1.81	1.85	1.9

[a]Each value for ADG is the mean of 10 pens containing 8 or 9 pigs per pen. Each value for ADFI and F/G is the mean of 5 feeders servicing 2 pens each. Pigs were weaned at an average initial wt and age of 10.9 lb and 17 d, respectively.
[b]Each value is the mean of 3 pens containing 28 pigs per pen. Pigs were weaned at an average initial wt and age of 12.8 lb and 21 d, respectively.
[c]Phase I was d 0 to 14 postweaning.
[d]Phase II was d 14 to 25 postweaning in trial 1 and d 14 to 29 postweaning in trial 2.