
A total of 360 early-weaned barrows (3.9 kg and 12 d of age; Newsham Hybrids) was used in a 36 d growth trial to determine the influence of added zinc from zinc oxide on starter pig performance. Pigs were blocked by weight and randomly allotted to each of nine dietary treatments with five pigs per pen and eight replications per treatment. The nine treatments consisted of a control diet containing no added zinc, and eight diets containing increasing levels of zinc from zinc oxide (50, 100, 200, 400, 800, 1,600, 2,400, and 3,200 ppm zinc). Zinc oxide replaced corn starch in the control diet to form the dietary zinc levels. There was no additional zinc in the trace mineral premix. All diets were fed in meal form in four phases: d 0 to 5, 5 to 11, 11 to 21, and 21 to 36. Dietary zinc concentrations were maintained throughout the 36 d trial. From d 0 to 5 and d 5 to 11, no differences (P >.05) were observed, however, pigs fed 100 ppm of zinc had numerically the highest ADG, ADFI, and feed efficiency (G:F). From d 11 to 21, ADG was highest (linear and quadratic, P <.03) for pigs fed 3,200 ppm of zinc, with pigs fed 100 ppm of zinc having the second best performance. Average daily feed intake was highest (linear, P = .0001) for pigs fed 3,200 ppm of zinc. From d 21 to 36 ADG was highest (linear, P = .0004) for pigs fed 3,200 ppm of zinc, while pigs fed 100 ppm of zinc had the best (linear, P = .004) G:F. From d 0 to 36, ADG and ADFI was highest (linear, P = .06 and .0002, respectively) for pigs fed 3,200 ppm of zinc. Gain to feed ratio was best (linear, P = .03) for pigs fed 100 ppm of zinc. These results suggest that 3,200 ppm of zinc from zinc oxide can be added to starter pig diets to achieve maximum growth performance, but only 100 ppm of zinc from zinc oxide is required to meet the basal requirement for zinc.

Key Words: Weaning Pig, Zinc, Growth


Forty-eight barrows (8.88 ± 1.76 kg) were used to evaluate the influence of feeding 750 μm or 550 μm diets, and 100 or 3,000 mg/kg Zn from ZnO or 3,000 mg/kg Zn from ZnSO4 on growth, plasma mineral concentrations, and nutrient availability in young pigs. Upon weaning, pigs were housed in 83.3 m x 71 m stainless steel metabolism cages and were fed 200, 400, 600 and 800 g/d of their respective diet during weeks 1, 2, 3, and 4 of the experiment respectively. Urine and feces were collected from d 15 to 20 of the 28 d experiment. Apparent DM and energy digestibility was lower (P<.0001) for pigs fed diets with 3,000 mg/kg supplemental Zn. Apparent nitrogen digestibility was also lower (P<.05), however, apparent nitrogen retention was similar across treatments. Apparent P retention was reduced (P<.05) for pigs fed diets containing pharmacological levels of Zn. Supplementing the diet with 3,000 mg/kg Zn from ZnSO4 had a greater negative impact on apparent DM and energy digestibility than did a similar level of Zn from ZnO. Additionally, apparent Ca, Zn, and Cu retention were adversely affected by 3,000 mg/kg Zn from ZnSO4 but were unaffected by ZnO supplementation. Plasma Zn concentration at d 14 was higher (P<.05) for pigs fed diets containing 3,000 mg/kg supplemental Zn. On d 28, plasma Zn concentrations remained elevated (P<.05) for pigs fed Zn supplemented diets, with ZnSO4 supplementation elevating plasma Zn compared with ZnO supplementation. Plasma Cu was reduced (P<.05) at d 28 for pigs fed diets containing 3,000 mg/kg supplemental Zn, with the greatest reduction detected when ZnSO4 was the source of supplemental Zn. The 11.6 percent reduction in apparent P retention with Zn supplementation during the collection period from d 15 to 20 was not reflected in an alteration in plasma P concentration. These results suggest a major impact of pharmacological Zn supplementation on total nutrient availability and utilization with ZnSO4 supplementation having a greater effect than supplementing the diet with ZnO.

Key Words: Zinc, Pigs, Particle Size


Fasting and finely ground diets are implicated in ulcer development of older pigs. Zinc is known to be a gastroprotective agent in humans. The influence of these factors has not been documented in young pigs. A total of 72 barrows (8.34 ± 1.7 kg) were used to evaluate the influence of a 24-h fast following weaning, feeding 750 μm or 550 μm diets, and feeding 3,000 mg/kg Zn from either ZnO or ZnSO4 on weaning fasting-induced ulcer formation in the pars esophageal tissue of the pig stomach. A total of 12 pigs were euthanized immediately after weaning. An additional 12 pigs were euthanized following weaning and a 24-h fast. Eight additional barrows were assigned to each of six diet particle size and Zn treatments consisting of 750 μm or 550 μm diets formulated with 100 mg/kg or 3,000 mg/kg supplemental Zn from ZnO or 3,000 mg/kg supplemental Zn from ZnSO4. Pigs were fed 200, 400, 600, and 800 g/d of their respective diet in two equal meals during weeks 1, 2, 3, and 4 of the experiment respectively. Growth rate tended (P<.10) to be greater for pigs fed diets containing 3,000 mg/kg supplemental Zn and for pigs fed 550 μm diets. Stomach morphology of the newly weaned pig appeared normal. Fasting induced keratinization resulting in a higher (P<.05) ulcer index score. Feeding a 750 μm μm diet resulted in a lower (P<.05) ulcer index score than was observed for pigs fed the 550 μm diets. Pharmacological levels of Zn in the diet from ZnO or ZnSO4 did not promote healing of the pars esophageal tissue in pigs fed 550 μm diets. This experiment indicates newly weaned pigs are susceptible to the same initiators of ulceration as older pigs, that feeding a 750 μm diet may allow the pars esophageal tissue to undergo repair while feeding a 550 μm diet maintains fasting-induced tissue damage. Additionally, pharmacological levels of Zn in the diet of the young pig did not appear to promote pars esophageal tissue repair.

Key Words: Zinc, Ulcers, Pigs

611 Influence of timing and dosage of intraperitoneal zinc sulphate injection on plasma mineral concentrations and development of fasting-induced ulceration in young pigs. B. V. Lawrence, T. R. Cline, and O. Adeola.

Intraperitoneal (i.p.) injection of ZnSO4 has been shown to effectively inhibit gastric ulceration in adult swine. Sixty-eight barrows were used in two experiments to evaluate the influence of i.p. Zn injection on plasma mineral concentrations and inhibition of fasting-induced ulceration in pigs. In Exp. 1, twelve newly weaned barrows were injected with 0, 22, or 88 mg ZnSO4/kg BW and individually housed in .86 m x .38 m pens. Injection volume was 1 ml. Plasma samples were obtained via jugular vein puncture at 0, 3, 6, 12, 24, and 48 h post-injection for subsequent mineral analyses. Pigs were offered a corn-soy diet which contained 100 ppm of Zn. Plasma Zn concentration of pigs injected with 22 mg/kg ZnSO4 was similar to those of pigs injected with 0 mg/kg in 9% saline (P> .10). However, pigs injected with 88 mg/kg ZnSO4 had higher plasma Zn concentrations at most sampling periods (P<.05). In Exp. 2, a total of 48 suckling barrows were randomly selected and injected i.p. with 22 or 88 mg/kg ZnSO4 either 12, 24, or 48 h prior to weaning. A total of 8 barrows were euthanized immediately following weaning. Upon weaning, the 48 barrows which had been injected with ZnSO4 were placed 2/pen in .86 m x .38 m pens and fasted for 24 h. Following the 24-h fast, all pigs were euthanized. Plasma samples for mineral analyses were collected at weaning and following the 24-h fast. A reduction in the ulcer index score from .80 to .40 was observed for pigs injected with 88 mg/kg ZnSO4 12 h prior to weaning. The reduction in ulcer index score was associated with a higher weaning plasma Zn concentration (1.72 vs. .50 vs. .52) than observed for pigs injected with 22 mg ZnSO4 12 h prior to weaning compared with suckling pigs respectively. These studies suggest that injection of 88 mg/kg ZnSO4 prior to weaning may partially alleviate weaning/fasting-induced ulceration in newly weaned pigs.

Key Words: Zinc, Pigs, Ulcer