

mentation to sows impacts the immune components of colostrum and milk, which may explain the subsequent improved nursery performance in offspring from sows fed MOS.

Key Words: Mannan oligosaccharide, Sow, Leukocyte

109 Dietary supplementation with zinc oxide increases IGF-I and IGF-I receptor gene expression in the small intestine of weanling piglets. X. Li, J. Yin, D. Li*, X. Chen, J. Zang, and X. Zhou, *National Key Laboratory of Animal Nutrition, Beijing, China.*

The study was conducted to investigate the mechanism for the effect of elevated levels of zinc oxide (ZnO) in enhancing the intestinal growth of weanling piglets. Thirty-six 4-wk-old crossbred barrows were allotted to one of two dietary groups in a randomized complete-block design based on body weight and litter, with 6 pens per group and 3 pigs per pen. One group was fed the basal diet, which contained 100 mg/kg zinc. The other group was fed the basal diet supplemented with ZnO to provide 3000 mg/kg zinc. At the end of the 14-d trial, Pigs were weighed, feed consumption was measured, and blood samples were collected for assays of insulin-like growth factor-I (IGF-I). One pig from each pen was randomly selected to obtain samples of the small intestinal mucosa for the analysis of IGF-I and IGF-I receptor (IGF-IR) gene expression. Small intestinal morphology was also determined. Dietary supplementation with ZnO increased ($P < 0.05$) the average daily body-weight gain, average daily feed intake, and villus height of the small intestinal mucosa (341 μm vs 387 μm ; for 100 and 3000 mg/kg zinc, respectively). The mRNA (0.63 vs 1.02; 0.73 vs 1.33 level relative to that for beta-actin reference gene; for 100 and 3000 mg/kg zinc, respectively) and protein levels for IGF-I and IGF-IR in the small intestine (0.53 vs 1.19; 0.73 vs 1.17 level relative to that for GAPDH reference protein; for 100 and 3000 mg/kg zinc, respectively) were markedly enhanced ($P < 0.05$) by feeding elevated levels of Zn. Serum IGF-I levels did not differ between the control and Zn-supplemental groups. These results suggest that dietary Zn supplementation exerts its beneficial effects on intestinal growth of weanling piglets through increasing expression of the genes for IGF-I and IGF-IR in the small intestinal mucosa.

Key Words: Zinc oxide, Small intestine, Piglets

110 Comparison of water-based and in-feed antimicrobials for growth performance enhancement of weanling pigs. R. O. Gottlob*, M. D. Tokach, S. S. Dritz, R. D. Goodband, J. M. DeRouchey, J. L. Nelssen, C. W. Hastad, C. N. Groesbeck, and C. R. Neill, *Kansas State University, Manhattan.*

Two experiments were conducted to evaluate the effects of water-based antimicrobials on growth performance of weanling pigs. In Exp. 1, 350 pigs (initially 5.9 kg and 21 d of age) were allotted to one of five treatments 3 d after weaning: 1) negative control (no antimicrobial in the feed or water); 2) positive control diet containing neomycin sulfate and oxytetracycline (154 ppm neomycin sulfate, 154 ppm oxytetracycline HCl; NEO/OXY); 3) neomycin sulfate in the water (25 mg neomycin sulfate per L); 4) oxytetracycline in the water (25 mg oxytetracycline HCl per L); and 5) combination of treatments 3 and 4. Overall (d 0 to 28), pigs provided water medication had greater ($P < 0.02$) ADG and

ADFI compared to negative control pigs. Pigs fed diets containing NEO/OXY had greater ($P < 0.01$) ADG and ADFI than pigs provided water medication. There were no differences in performance among water medication treatments. In Exp. 2, 360 pigs (initially 6.4 kg and 21 d of age) were allotted to one of eight treatments 3 d after weaning: 1) negative control (no antibiotic in the feed or water); 2) positive control with NEO/OXY in the feed; 3, 4, and 5) neomycin sulfate in the water (38.0, 75.5, and 113.5 mg neomycin sulfate per L, respectively); 6 and 7) neomycin sulfate in the feed (157 and 314 ppm, respectively); and 8) combination of treatments 2 and 4. Overall (d 0 to 24), pigs fed the positive control diet and pigs provided neomycin sulfate in the water or feed had greater ($P < 0.05$) ADG and ADFI compared to negative control pigs. Pigs provided the combination of the positive control diet and medicated water (Treatment 8) had greater ADFI ($P < 0.04$) than pigs provided treatment 2 or 4. Increasing neomycin sulfate in the water or feed linearly increased ($P < 0.04$) ADG and ADFI. There were no differences in growth performance among pigs provided neomycin sulfate in the water or feed. Growth performance was similarly improved by adding neomycin sulfate to either the feed or water.

Key Words: Nursery pig, Antibiotic, Water

111 Effect of intermittent usage of water-based neomycin sulfate on the growth performance of weanling pigs. R. O. Gottlob*, M. D. Tokach, S. S. Dritz, R. D. Goodband, J. M. DeRouchey, J. L. Nelssen, C. R. Neill, C. N. Groesbeck, K. R. Brown, and N. Z. Frantz, *Kansas State University, Manhattan.*

A total of 360 weanling pigs (initially 5.2 kg and 18 ± 3 d of age) were used to determine the effects of intermittent use of water-based medication on nursery pig growth performance. Pigs were blocked by initial weight and randomly allotted 3 d after weaning to one of eight treatments: 1) negative control (no antibiotics in the feed or water); 2) positive control diet containing 154 ppm neomycin sulfate and 154 ppm oxytetracycline HCl; 3) and 4) continuous use of 38.0 and 75.5 mg neomycin sulfate per L of water, respectively; 5) and 6) use of 38.0 and 75.5 mg neomycin sulfate per L of water, respectively, during wk 1 and 3 after placement; and 7) and 8) use of 38.0 and 75.5 mg neomycin sulfate per L of water, respectively, during wk 2 and 4 after placement. Overall (d 0 to 28), pigs provided neomycin sulfate in the water continuously (Treatments 3 and 4), and pigs fed the positive control diet had greater ($P < 0.05$) ADG and ADFI compared to pigs provided non-medicated water and feed. There was no difference however, in growth performance and G:F between pigs fed the positive control diet and those provided continuous water-based neomycin sulfate. Numerical increases in ADG and ADFI were observed when pigs were provided water-based neomycin sulfate after drinking non-medicated water as a part of weekly intermittent dosage. However, growth performance returned to the control level immediately after the supply of neomycin sulfate was removed. Pigs provided continuous water medication had greater ADG ($P < 0.02$) and ADFI ($P < 0.04$) than pigs provided an intermittent supply of water-based neomycin sulfate. These data demonstrate that providing neomycin sulfate in the feed or water results in a growth response; however, there is no carryover effect to support intermittent usage of this type of antimicrobial.

Key Words: Nursery pig, Antibiotic, Water