

**4 Effects of galactosyl lactose on ileal microflora, entantion acids, performance, and energy and nitrogen zation in the weanling pig.** C. M. Robbins\*, S. E. Chattin, A. G. Mathew, *The University of Tennessee, Knoxville.*

series of trials, cannulated and intact pigs were used to mine the effects of galactosyl lactose (GL) on ileal flora, short chain fatty acid concentrations, performance, and gen and energy utilization. All pigs were weaned at 21 d of and assigned to one of two treatments, including; 1) an 18% e protein corn-soy based control diet, and 2) a similar diet .99 g/kg of galactosyl lactose. In the cannulation studies, ileal les were collected twice weekly from 24 pigs over a three ; period. Digesta were analyzed for total *E. coli*, streptococci, bacilli, lactate, and VFA. No differences ( $P > .10$ ) were rved in microflora or short chain fatty acid concentrations ven treatments. Average ileal *E. coli* concentrations of 7.59 6.99, streptococci concentrations of 8.77 and 8.58, and bacilli concentrations of 7.84 and 8.04  $\log_{10}$  cfu/g were rved for control and GL-fed pigs respectively. Total ileal VFA entrations of 46.1 and 43.0 meq/L and total lactate concentra- s of 44.5 and 36.4 meq/L were observed for control and GL-fed respectively. In performance trials using a total of 90 pigs, a d ( $P < .06$ ) for greater intake was observed in GL-fed pigs pared to controls while gain and feed/gain ratios were similar .10) between treatments. For digestibility trials, 20 pigs were vidually caged and feces and urine collected three consecutive ; per week over a 3-week period. Apparent energy digestibility, arent nitrogen digestibility and metabolizability were not erent ( $P > .10$ ) between treatments. These results indicate e milk derived oligosaccharide, galactosyl lactose, does not ct selected ileal microflora and their metabolites, performance, energy and nitrogen utilization in the weanling pig.

**Words:** Oligosaccharide, Microflora, Short Chain Fatty Acids

**35 Effect of diet composition on the response of vly weaned pigs to zinc oxide or apramycin sulfate.** D. Y. . C. R. Hamilton, G. W. Libal and D. N. Peters, *South Dakota te University, Brookings.*

efficacy of adding pharmacological levels of Zn (as ZnO) or apramycin sulfate (APR) to simple or complex starter diets for 21 : 8 d old weaned pigs was studied. A split-split plot design was d. A total of 258 pigs (7.1 kg) were weaned in two groups with h group assigned to 24 pens at different nursery sites (whole- t). Diets (sub-plots) were simple containing corn, soybean al, and 20% dried-whey or complex containing these ingre- nts plus 10% lactose and 6% spray-dried porcine plasma. All ts were formulated for 1.40% lysine and at least 100 ppm added . Additions to these diets of no additional Zn or APR, 3000 ppm or 75 ppm APR were the sub-sub plots. Plasma urea N (PUN) l plasma Zn concentration (PZC) were determined on d 10 and 0. From d 0 to 14, feeding complex diets increased ADG (269 vs 1 g/d), ADFI (346 vs 254 g/d), and d 10 PZC (107 vs 81 ppm) l reduced d 10 PUN (6.20 vs 11.56 mg/dl) compared with ple diets ( $P < .01$ ). Similar results were noted from d 0 to 28. ded Zn resulted in greater ADG (275, 209 and 195 g/d) and I (340, 278 and 282 g/d) from d 0 to 14 than feeding APR or : basal diets ( $P < .01$ ). Added Zn resulted in greater overall G (413, 373 and 346 g/d) and ADFI (577, 527 and 498 g/d) n feeding APR or the basal diets ( $P < .01$ ). A diet x additive raction occurred ( $P < .01$ ) for ADG. Pigs fed a simple diet with ded Zn or any complex diet had similar ( $P > .10$ ) ADG (d 0 to 14 d d 0 to 28). Pigs fed added Zn had lower PUN (7.54, 10.36 and 3 mg/dl) than pigs fed APR or the basal diets on d 10 ( $P < .07$ ). ded Zn resulted in higher PZC on d 10 (148, 70, and 64 ppm) d d 20 (175, 85, and 68 ppm) than feeding APR or the basal ts ( $P < .01$ ). These results suggest that pharmacological Zn ditions stimulate growth and feed intake in pigs weaned at 21 to d of age. Feeding a simple starter diet with 3000 ppm added Zn ZnO was as efficacious as feeding a complex diet in this study.

**Words:** Pigs, Diets, Zinc Oxide

**136 The effect of supplemental mineral regimen on weanling pig growth performance.** J. W. Smith, II\*, J. D. Arthington, M. D. Tokach, R. D. Goodband, J. L. Nelssen, B. T. Richert, K. Q. Owen, J. R. Bergstrom, and W. B. Nesssmith, Jr., *Kansas State University, Manhattan.*

A 34 d growth assay utilized 266 pigs (initially 5.65 kg and 21 d of age) to compare the effects of Zn (zinc oxide) and Cu (copper sulfate) supplement- ation regimens on the growth performance of starter pigs. There were six replicate pens per treatment with 6 or 7 pigs per pen. Pigs were blocked by BW and assigned to one of seven dietary treatments as indicated in the table headings below. Diets were fed in three phases: phase I (d 0 to 7), phase II (d 7 to 22), and phase III (d 22 to 34). Added Zn levels were 3,000 ppm from d 0 to 7 and 2,000 from d 7 to 34; Cu supplemented diets contained 250 ppm Cu. During phase I, no differences were detected for ADG, ADFI, or G:F. From d 7 to 22, pigs fed the diets containing Zn (regimens 3, 4, and 5) had increased ADG and were more efficient than pigs fed the control diets (regimens 1, 2, and 6;  $P < .05$ ). Pigs fed the diets containing zinc also grew faster and more efficiently than pigs fed the diet containing copper ( $P < .10$ ). During the first week of phase III (d 22 to 28), pigs fed regimen 3 had better G:F than pigs fed regimen 5. From d 28 to 34, no differences were detected, but pigs fed regimen 3 had the numerically lowest ADG and ADFI. For the entire phase III period, no differences were detected for ADG, ADFI, or G:F. For the entire trial, pigs fed regimens 3 and 4 were heavier ( $P < .10$ ) than pigs fed regimen 1 and 6. In conclusion, based on these results, adding zinc oxide (2,000 ppm) to the starter diet improved growth performance from 8 to 17 kg BW.

	Mineral Regimens							CV
	0 to 7	0	Zn	Zn	Zn	Zn	Cu	
d 0 to 7	0	0	Zn	Zn	Zn	0	Cu	
d 7 to 22	0	0	Zn	Zn	Zn	0	Cu	
d 22 to 34	0	Cu	Zn	0	Cu	0	Cu	
Regimen #	1	2	3	4	5	6	7	
Pig BW, kg								
d 7	7.85	7.79	7.83	7.77	7.82	7.64	7.66	3.9
d 14	9.41	9.42	9.85	9.87	9.53	9.33	9.26	4.0
d 22	13.49	13.40	14.22	14.22	13.83	13.29	13.27	4.6
d 28	16.33	16.66	17.45	17.10	16.52	16.63	16.52	4.4
d 34	20.52	20.91	21.46	21.55	21.15	20.72	20.94	3.7

**Key Words:** Zinc, Copper, Pigs

**137 The effect of supplemental mineral regimen on weanling pig blood and immune parameters, and liver and plasma mineral concentrations.** J. W. Smith, II\*, J. D. Arthington, M.D. Tokach, F. Blecha, R. D. Goodband, J. L. Nelssen, B. T. Richert, K. Q. Owen, J. R. Bergstrom, and W. B. Nesssmith, Jr., *Kansas State University, Manhattan.*

A 34 d growth assay utilized 266 pigs (initially 5.65 kg and 21 d of age) to compare the effects of Zn (zinc oxide) and Cu (copper sulfate) supplement- ation regimens on plasma and liver mineral concentration, and immune criteria of weanling pigs. There were six replicate pens per treatment with 6 or 7 pigs per pen. Pigs were blocked by BW and assigned to one of seven dietary treatments as indicated in the table below. Diets were fed in three phases: phase I (d 0 to 7), phase II (d 7 to 22), and phase III (d 22 to 34). When supplemented, Zn levels were 3,000 ppm from d 0 to 7 and 2,000 from d 7 to 34; Cu supplemented diets contained 250 ppm Cu. Pigs were bled every seven days to determine white blood cell count (WBC), red blood cell count (RBC), platelet count (PC), hemoglobin (HGB), hematocrit (HCT), and plasma mineral concentrations. On days 0, 22, and 34 blood samples were collected and lymphocyte blastogenesis assays were performed. Plasma ceruloplasmin levels were determined on d 0, 7, 22, and 34. On d 7, WBC for pigs fed the control diets (regimen 1 and 2) was higher than pigs fed the diet containing copper ( $P < .10$ ) and pigs fed the copper diet had lower HGB than pigs fed the other diets ( $P < .05$ ). On d 22, pigs fed regimen 6, had higher RBC than pigs fed the other diets ( $P < .05$ ), while pigs fed the diet containing zinc had higher HGB than pigs fed the control diet ( $P < .01$ ) and copper diet ( $P < .05$ ). At the end of the experiment, pigs fed regimen 4 had higher RBC than pigs fed the other treatments ( $P < .10$ ) and pigs fed regimen 5 had lower HGB than pigs fed the other diets except regimen 2 ( $P < .10$ ). Lymphocyte blastogenic responses and ceruloplasmin concentrations were not affected by dietary mineral regimen. In conclusion, the data from this trial indicate that the improvement in growth responses from added Zn do not appear to be mediated through changes in blood cell counts or cell-mediated immunity.

	Supplemental Mineral Regimen						
	1	2	3	4	5	6	7
d 0 to 7	0	0	Zn	Zn	Zn	Zn	Cu
d 7 to 22	0	0	Zn	Zn	Zn	0	Cu
d 22 to 34	0	Cu	Zn	0	Cu	0	Cu

**Key Words:** Zinc, Copper, Pigs, Immunity