159 Incorporation of short-chain fructooligosaccharides and Tylan® into diets of early weaned pigs. M.D. Howard*, H. Liu, J.D. Spencer, M.S. Kerley, and G.L. Allee, *University of Missouri, Columbia, MO.*

Two experiments (263 pigs, average initial BW 6.0 kg, 16 to 23 days of age) were conducted to determine the effect of supplementing three-phase diets with short-chain fructooligosaccharides (SCFOS) and Tylan®. The objective was to determine if the effects of feeding SCFOS and Tylan® on pig performance were additive, synergistic, or antagonistic. The feeding program used three-phase complex diets, with Phase 1 diets containing 3.5% plasma protein and 1.75% red blood cells. The experiments used a 4 x 2 factorial arrangement: SCFOS was added at 0, .45 kg (.1%), 1.13 kg (.25%), or 2.27 kg (.5%)/454 kg, and Tylan® was added at either 0 or 100g/908 kg. Experiment 1 lasted 42 d. During Phase 1 (2 wk), Tylan® addition increased ADG (P = .02) and ADFI (P = .02) by 27 g/d. Addition of SCFOS, linearly increased feed efficiency in both Phase 1 (P = .04) and Phase 2 (P = .08). For the entire 42 d, feed efficiency showed a SCFOS x Tylan® interaction (P = .09): feed efficiency was linearly increased (P = .005) as SCFOS increased in the presence of Tylan®. Experiment 2 lasted 38 d. For Phase 1 (18 d) SCFOS addition quadratically affected (P = .04) ADG and feed efficiency. During Phase 2, Tylan® addition increased (P = .04) ADG by 36 g/d. SCFOS quadratically affected ADG (P = .01) and ADFI (P = .03). For the entire 38 d, SCFOS addition quadratically affected ADG (P = .004), ADFI (P = .02), and feed efficiency (P = .06). The quadratic response was typified by highest performance for .1% and .5% SCFOS diets, indicating a positive response could be elicited with as little as .1% SCFOS. The effects of Tylan® and SCFOS seldom showed an interaction suggesting that their mode of action are different: Tylan® is likely inhibiting pathogenic bacteria, while SCFOS may be stimulating beneficial bacteria, providing short-chain fatty acids for energy metabolism in the large intestine, and altering intestinal morphology.

Key Words: Fructooligosaccharides, nursery diets, weaned pigs

160 Evaluation of spirulina plantensis in diets for weanling pigs. G.S. Grinstead*, M.D. Tokach, R.D. Goodband, J.L. Nelssen, J.T. Sawyer, C.J. Maxwell, and R.D. Stott, *Kansas State University, Manhattan..*

Three experiments were conducted to evaluate the effect of an algae derived feed additive, spirulina platensis (SP), on weanling pig performance. In all experiments, pigs were blocked by BW and allotted to treatments at weaning. Standard KSU diets and feeding regimens were used. In Exp.1, a control diet or diets containing .2, .5, or 2% SP were fed in a pellet form from d 0 to 14 after weaning then in meal form from d 14 to 28. In Exp.2, treatments included a control diet (no SP, fed for 6 wk), .1% SP (fed for 6 wk) or .2% SP (fed for 1, 2, 4 or 6 wk) with pigs switched to a control diet at the end of the 1, 2, or 4 wk period. In Exp.3, control or .2% SP diets were fed in either pellet or meal form. In all experiments, SP replaced soybean meal on a lysine basis. From d 0 to 14 in Exp. 1, no difference in ADG or gain/feed (G:F) were observed. For d 0 to 28, a cubic (P < .05) response was observed for ADG and ADFI with increasing SP with the optimal response at .2% SP. From d 0 to 14 in Exp.2, no differences in ADG or ADFI were observed between treatment groups. However, pigs fed .2% SP for 2 wk had numerically higher ADG than pigs fed the control diet or pigs fed .1% SP. From d 14 to 28 or d 0 to 28, pigs fed .2% SP for only 2 wk had the highest ADFI (P < .01) and numerically higher ADG than any other treatment. Pigs fed diets containing .1% or .2% SP for the entire 28 days had improved G:F (P < .02) compared with other treatments. From d 0 to 42, no differences in ADG or ADFI were observed. From d 0 to 14 in Exp. 3, adding SP to pelleted diets tended to decrease ADG (SP x Pellet, P < .10) while adding SP to meal diets tended to improve ADG. From d 14 to 28 or d 0 to 28, no differences in growth were observed. However, pigs fed SP had numerically higher ADG compared to pigs fed the control diets with the greatest gain when adding SP to the meal diet. These experiments suggest that adding low inclusions of SP to meal diets can enhance performance, although the response was not consistent.

Key Words: starter pig, algae, performance

161 Efficacy of mannan oligosaccharide (Bio-Mos®) addition at two levels of supplemental copper on performance and immunocompetence of early weaned pigs. M. E. Davis*[1], C. V. Maxwell[1], E. B. Kegley[1], B. Z. de Rodas[1], K. G. Friesen[1], D. H. Hellwig[1], and R. A. Dvorak[2], [1]*University of Arkansas, Fayetteville,* [2]*Alltech, Inc., Nicholasville, KY.*

An experiment involving 216 weanling barrows (1/2 Large white x Duroc x Landrace from a commercial operation; 6 kg BW and 21*pm*2 d of age) was conducted to determine the efficacy of dietary Bio-Mos® addition at two levels of supplemental Cu on performance and immune response. Pigs were blocked based on initial weight and penned in groups of six (9 pens/treatment) in an off-site nursery. Dietary treatments were arranged as a 2x2 factorial consisting of two levels of Cu (10 or 185 ppm from CuSO4), with and without addition of Bio-Mos® (0 or .2%). Experimental diets were fed throughout the entire study (d 0 to 38 postweaning) and contained 1.50% lysine during phase 1 (d 0 to 10), 1.35% lysine during phase 2 (d 10 to 24), and 1.20% lysine during phase 3 (d 24 to 38). Two pigs from each pen were bled between d 28 and 34 postweaning to measure in vitro cellular immune response using a lymphocyte blastogenesis assay. During phase 1, ADG, ADFI and G/F increased with the addition of Bio-Mos® at 10 ppm Cu, but decreased with the addition of Bio-Mos® at 185 ppm Cu (interaction, P<.01; P<.1, and P<.02, respectively). Pigs fed diets supplemented with 185 ppm Cu during phases 2 and 3 had greater (P<.04) ADG and ADFI than those fed diets with 10 ppm Cu. Similarly, pigs fed diets supplemented with Bio-Mos® had greater ADG (P<.05) and G/F (P<.1) than those fed diets without Bio-Mos®. Overall (d 0 to 38), pigs fed diets containing 185 ppm Cu had greater (P<.02) ADG, ADFI, and G/F than those fed diets containing 10 ppm Cu. Pigs fed diets containing Bio-Mos® had greater (P<.04) ADG and G/F than those fed diets with no Bio-Mos®. Dietary treatments did not affect lymphocyte proliferation from mitogen stimulation. This study indicates that the performance response to Bio-Mos® in phase 1 varied with level of dietary Cu. However, in phases 2 and 3, diets containing either Bio-Mos® or 185 ppm Cu resulted in improved performance.

Key Words: Swine, Oligosaccharide, Copper

162 Evaluation of the optimal growth promoting level of dietary Zn from a Zn amino acid complex for weanling pigs. J.M. McCalla[1], D.D. Gallaher[1], L.J. Johnston[2], M.H. Whitney[1], and G.C. Shurson*[1], [1]*University of Minnesota, St. Paul, MN,* [2]*University of Minnesota, Morris, MN.*

A total of 324 pigs weaned at 18 ± 2 d of age were used to determine the optimal growth promoting dietary level of Zn from a Zn amino acid complex (ZnAA). Forty-eight pens (6 or 7 pigs/pen) of pigs were blocked by initial weight, sex and litter and assigned to one of six dietary treatments. Pigs were provided *ad libitum* access to diets for five weeks. Treatments consisted of: 100 ppm Zn from $ZnSO_4$ (NC), 2000 ppm Zn from ZnO (PC), and 100, 200, 300, and 400 ppm Zn from ZnAA, respectively. A three-phase feeding program was used, and all diets within each phase contained the same nutrient levels except Zn. Blood samples from half of the pigs were obtained by venipuncture at the beginning and end of the 5 wk feeding period. Red blood cells were analyzed for superoxide dismutase (SOD) activity. Initial and final plasma Zn, Cu, and Fe levels were determined. Linear and quadratic contrasts were used to compare growth performance, change in SOD activity, change in plasma Zn, Cu, and Fe, and wk 1 fecal scores among ZnAA treatments. Pigs fed PC had greater overall ADG (418 vs. 376 g/d, P < .05) and overall ADFI (670 vs. 587 g/d, P < .01) than pigs fed NC. Pigs fed PC had higher overall ADFI (P < .05) than pigs fed ZnAA diets. Within the ZnAA treatments, no linear or quadratic trends were observed for ADG, ADFI, and G/F (P > .10). Dietary treatments had no effect on change in SOD activity during the 5 wk feeding period (P > .10). Pigs fed PC had a greater increase in plasma Zn levels than pigs fed ZnAA diets (P < .07). Pigs fed NC had a greater increase in plasma Fe (P < .06) than pigs fed ZnAA diets. Fecal scores during wk 1 tended to increase quadratically (P < .10) as dietary ZnAA level increased. These results suggest that feeding between 100 and 400 ppm Zn from a Zn amino acid complex for a 5 wk feeding period does not elicit a level of growth promotion equivalent to that obtained by feeding 2000 ppm Zn from ZnO.

Key Words: Zinc Amino Acid Complex, Pig Growth, SOD activity