

were collected via jugular vein on d 12. Pigs fed corn/corn DDGS increased ($P < 0.05$) AID of Ca, P, arabinoxylans and total NSP and ATTD of Ca, P, fat and total NSP digestibility compared with pigs fed wheat/wheat bran. Apparent ileal digestibility (AID, %) of DM (65.8 vs. 62.1), CP (79.4 vs. 75.9), Ca (62.8 vs. 51.7) and P (52.0 vs. 40.3) were greater ($P < 0.05$) in pigs fed their respective diets with xylanase supplementation than their counterparts, respectively, independent of wheat/wheat bran or corn/corn DDGS. Apparent total tract digestibility (ATTD, %) of energy, DM, Ca and P improved ($P < 0.05$) with xylanase supplementation (i.e., 64.8, 65.8, 62.8 and 52.0 vs. 61.4, 62.1, 51.7 and 40.3, respectively). Glucose, plasma urea N content and AID of starch did not differ ($P > 0.10$) among treatments. No interactions were observed ($P > 0.10$) between diet type and xylanase supplementation. The study demonstrated that effectiveness of xylanase in improving nutrients and energy utilization across different feed types. These benefits were related to the breakdown of both soluble and insoluble arabinoxylans fractions from corn and wheat.

Key Words: digestibility, pigs, xylanase

P059 The effect of adding β -mannanase in corn-soybean meal based diets on individually housed nursery pig performance. Z. Rambo¹, J. Ferrel², D. Kelly¹, B. Richert^{1,*}, ¹*Animal Sciences, Purdue University, West Lafayette*, ²*ChemGen Corp, Gaithersburg, MD*.

Individual barrows (BW=6.34±0.43kg; 26d age) were used to evaluate the effect of adding β -mannanase (M) in corn-soybean meal based diets on pig performance during the nursery period. Pigs were allocated in a randomized block design into individual pens, stratified by litter and initial BW to 3 dietary treatments, with 7 (PC) or 8 (NC, T2) pens per treatment. Dietary treatments were: Negative Control (NC; 3309 and 3314 kcal/kg ME phase 2 and 3, respectively); T2, NC+M (0.10 MU/kg); and Positive Control (PC, 3389 and 3394 kcal/kg ME phase 2 and 3, respectively) for 25d. Pigs were fed 3 dietary phases, a common phase 1 (d 0 to 7), phase 2 (d 7 to 17), phase 3 (d 17 to 32). Individual body weight and feed disappearance were recorded on d 7, 17, and 32. Phase 2 ADG was numerically improved for PC and T2 compared to NC (433, 465, 480 g/d, T1-T3, respectively). G:F during Phase 2 was also numerically improved for PC and T2 compared to NC (0.770, 0.812, 0.827, T1-T3, respectively). On d 17 BW was significantly higher ($P < 0.05$) for T2 compared to NC while PC was intermediate (13.89, 14.86, 14.69 kg, T1-T3, respectively). Phase 3 ADG tended ($P < 0.10$) to increase for T2 over PC with NC being intermediate (573, 618, 557 g/d, T1-T3, respectively) while G:F numerically improved for T2 and PC over NC (0.599, 0.619, 0.611, T1-T3, respectively). Overall, T2 ADG and ADFI numerically improved over both NC and PC (517, 557, 526 g/d, T1-T3, respectively), (803, 840, 779 g/d, T1-T3, respectively). Overall G:F for PC was numerically higher than NC with T2 being intermediate (0.646, 0.672, 0.686, T1-T3, respectively). Final BW for experimental treatments were 19.25, 20.25, 19.52 kg, T1-T3, respectively. The supplementation of a corn-soybean meal based diet with the exogenous enzyme β -mannanase can improve overall nursery pig ADG, ADFI, and G:F performance.

Key Words: enzyme, swine, β -mannanase

P060 Effects of added zinc on growth performance and carcass characteristics of finishing pigs fed ractopamine HCl. C. Paulk^{1,*}, M. Tokach¹, J. Nelssen¹, J. Gonzalez¹, J. DeRouchey¹, R. Goodband¹, S. Dritz², ¹*Animal Science and Industry*, ²*Diagnostic Medicine/Pathobiology, Kansas State University, Manhattan*.

Two experiments were conducted to determine the effects of added Zn on growth performance and carcass characteristics of finishing pigs fed ractopamine HCl (RAC; Elanco Animal Health, Greenfield, IN). In Exp. 1, 1,234 pigs (PIC 337 × 1050, 102 kg BW) were used in a 28-d study with 26 pigs per pen and 24 pens per treatment. Pens randomly assigned to 1 of 2 diets with and without 50 ppm added Zn from ZnO. All diets (0.92% SID Lys) contained 5 ppm RAC and 80 ppm Zn supplied from the premix. Addition of 50 ppm Zn did not influence ($P > 0.20$) growth performance or carcass characteristics. In Exp. 2, 312 pigs (PIC 327 × 1050, 94 kg BW) were used in a 27-d study. Pens were randomly allotted to diets with 2 pigs per pen and 26 pens per treatment. Treatments were a corn-soybean meal diet (0.66% SID Lys), a diet (0.92% SID Lys) with 10 ppm RAC, the RAC diet plus 50, 100, and 150 ppm added Zn from ZnO, or 50 ppm added Zn from Availa-Zn (Zinpro, Eden Prairie, MN). The premix used in all diets provided 83 ppm Zn from ZnSO₄. Pigs fed the RAC diet had increased ($P < 0.05$) ADG, G:F, HCW, yield, loin weight compared with pigs fed the control diet. Increasing Zn from ZnO in diets containing RAC tended to increase G:F (linear, $P < 0.09$) and loin weights (quadratic, $P < 0.06$). Pigs fed diets with 50 ppm added Zn from Availa-Zn tended to have increased ($P < 0.06$) ADG compared with pigs fed the RAC diet. No differences between sources of 50 ppm added Zn were observed. The trends for improved performance with the addition of Zn indicate that further research is needed with Zn in pigs fed RAC.

Key Words: Availa-Zn, ractopamine HCl, zinc oxide

P061 The effects of microsource S and diet-type on pig performance, fecal consistency, pen cleaning time and microbial load of growing-finishing pigs. S. Nitikanchana^{1,*}, S. Dritz¹, M. Tokach¹, R. Goodband¹, J. DeRouchey¹, J. Nelssen¹, J. Bergstrom², ¹*Kansas State University, Manhattan*, ²*DSM, Nutritional Products, Parsippany, NJ*.

A total of 1,245 pigs (PIC 1050×337, initially 48 kg) were used in a 90-d study to determine the effects of MicroSource S (DSM Nutritional Products Inc., Parsippany, NJ) and diet type on growth performance, carcass traits, fecal consistency, pen cleaning time, and post-cleaning microbial load as measured by ATP concentration in growing-finishing pigs raised under commercial conditions. Pens were allotted in a completely randomized design with 25 to 26 pigs per pen and 8 replications per treatment. Treatments were arranged as a 3×2 factorial with main effects of MicroSource S (0, 1×, or 1.3×) and diet type (corn-soybean meal- or a by-product-based diet with 30% dried distillers grains with solubles and 15% bakery by-product). The MicroSource S dose in the diet was 73.5 million cfu/kg feed for the 1× level and 95.5 million cfu/kg feed for the 1.3× level. Overall (d 0 to 90), increasing MicroSource S had no effect ($P > 0.12$) on growth performance, carcass characteristics, ATP concentration, manure score, or wash time. Pigs fed the by-product diet had greater ($P < 0.01$) ADFI and poorer ($P < 0.01$) G:F compared with those fed the corn-soybean meal diet with no difference in ADG. Pens of pigs fed the by-product diets required more ($P < 0.01$) time to wash, which appeared to be the result of an increase ($P < 0.01$) in manure buildup.

P061 Table

	Exp. 1			Exp. 2							
	Control	Added Zn	SEM	Control	RAC	Availa-Zn, ZnO, ppm Zn			50	SEM	
						50	100	150			
ADG, kg	1072	1079	9	ADG, g	1036	1204	1237	1228	1236	1265	22
G:F	0.350	0.355	0.3	G:F	0.314	0.383	0.389	0.391	0.397	0.395	0.005
HCW, kg	96.3	96.8	0.6	HCW, kg	89.5	93.8	94.9	94.0	94.2	95.3	0.70
Carcass yield, %	75.6	75.6	0.2	Carcass yield, %	73.9	74.4	74.8	74.5	74.4	74.7	0.2
Backfat depth, mm ¹	15.8	15.7	0.2	Backfat depth, mm ¹	24.7	23.6	23.7	23.1	22.3	22.8	0.9
Loin depth, mm ¹	70.3	70.9	0.4	Loin wt, kg ¹	3.86	4.05	3.97	4.05	4.13	4.00	0.06
Lean, % ¹	51.3	51.4	0.1	Lean, % ¹	51.7	52.2	52.1	52.3	52.6	52.5	0.4

¹Adjusted to a common HCW.

In summary, the 1× or 1.3× level of MicroSource S did not improve growth performance or alter fecal consistency, post-cleaning microbial load, or barn wash time. (See table above.)

Key Words: by-products, MicroSource S, pig

P062 Evaluating indicators of bone metabolism and turnover in geriatric, ovariectomized rats fed varied sources of conjugated linoleic acid. K. Kanosky*, E. Benavides, D. Keisler, B. Wiegand, *Division of Animal Sciences, University of Missouri, Columbia.*

Dietary fat alters characteristics of bone metabolism in rats. CLA has been shown to decrease arachidonic acid and PGE₂, thus improving bone density. We sought to determine if varied sources of 0.6% CLA altered rat tissue fatty acid compositions, femur and spine bone mineral content (BMC), femur and spine BMD, and osteoclast activity in aged ovariectomized female rats. Retired breeder (365 ± 28 d of age and 4.5 ± 0.5 parity), Sprague Dawley, female rats (n=86) were randomly assigned to ovariectomy (OVX) or sham (SHAM) surgeries. Rats were fed 4% soy oil (CON) for 14 d. For an additional 70 d, within surgery groups, rats were randomly allotted to dietary treatments: CON, 0.6% CLA + 3% soy oil (CLA), 0.6% CLA from cheddar cheese powder + 3% soy oil (CC), or 0.3% CLA + 0.3% CLA from cheddar cheese powder + 3% soy oil (CCCLA). Total fatty acids from liver, peritoneal fat, thigh muscle, and femoral bone marrow were extracted and detected by gas chromatography. Dual-energy X-ray absorptiometry (DEXA) scans measured BMC and BMD of femora and spines (L1-L4). Activity of rat serum band 5 tartrate-resistant acid phosphatase (TRAcP5b) was detected by ELISA. Additionally, serum estradiol concentrations were measured by RIA. The fatty acid composition of liver was not altered by the dietary treatments. When given CLA, the percentage of 20:4n6 ($P<0.01$) and total n3 ($P<0.01$) decreased in peritoneal fat. In thigh muscle, a reduction in total PUFA ($P<0.01$), PUFA:SFA ($P<0.01$), total n6 ($P=0.01$), total n3 ($P<0.01$), and 20:4n6 ($P<0.01$) was observed. Rats that were given CLA had lower amounts of 18:2n6c ($P<0.05$), total PUFA ($P<0.01$), PUFA:SFA ($P<0.01$), total n3 ($P<0.01$), and total n6 ($P<0.05$) in rat femoral bone marrow. No differences were detected for treatment or surgery effects on femur BMC, spine BMC, or spine BMD. Rats fed CC and CCCLA tended to have less dense femurs ($P=0.08$) when compared to CON- and CLA-fed rats. TRAcP5b and estradiol were not affected by treatment or surgery. In conclusion, rats fed CLA had lower amounts of PUFA, therefore indicating a possible reduction in PGE₂ by affecting bone remodeling.

Key Words: bone, linoleic acid, rat

P063 The effect of Tempeh supplementation on growth performance, nutrient digestibility, blood profiles, fecal microflora, and fecal score in weanling pigs. J. H. Cho, D. Jung, I. H. Kim*, *Department of Animal Resource & Science, Dankook University, Cheonan, Republic of Korea.*

Tempeh is fermented soybean food in Indonesia, and contains high protein, saponin, essential amino acids, vitamins and fiber. A total of 125 weanling pigs [(Landrace × Yorkshire) × Duroc, BW = 7.51 ± 0.73 kg] were used for a 35-d trial to evaluate the effect of Tempeh supplementation on growth performance, nutrient digestibility, blood profiles, fecal microflora, and fecal score. Pigs were allocated to 1 of 5 treatments by BW and sex (2 gilts and 3 barrows/pen; 5 pens/treatment). Treatments included: CON, control diet; KT1, CON + 0.15% Tempeh from Korea (produced by Sunbio); KT2, CON + 0.30% Tempeh from Korea (produced by Sunbio); IT1, CON + 0.15% Tempeh from Indonesia; IT2, CON + 0.30% Tempeh from Indonesia. All diets were formulated to meet or exceed the NRC (2012) nutrient requirements of weanling pigs. In this study, pigs fed IT1 diet had the higher (409 vs. 361 g; $P<0.05$) ADFI than pigs fed ST2 diet during d 1 to d 14. Pigs fed the KT1 diet had higher ($P<0.05$) ADG than those fed the CON and IT2 diets during d 15 to d 35 (655 vs. 619 or 596 g) and during d 1 to d 35 (526 vs. 495 or 479 g). The ADG in IT1 was higher ($P<0.05$) than that in IT2 during d 15 to d 35 (637 vs. 596 g) and during d 1 to d 35 (510 vs. 479 g). Dietary treatments had no effect ($P>0.05$) on G/F ratio throughout the experimental periods. Apparent total tract digestibility (ATTD) of N was increased ($P<0.05$) in KT1, KT2 and IT1 compared with CON ($P<0.05$) on d 14 (86.94 or 85.93 or 85.83 vs. 82.17%) and d 35 (85.29 or 84.98 or 84.40 vs. 80.80%). The ATTD of energy was higher ($P<0.05$) in pigs fed KT1 and KT2 diets than those fed CON and IT2 diets (82.72 or 82.11 vs. 78.86 or 79.29%) on d 35. The blood IgG concentration was increased ($P<0.05$) in pigs fed the KT1 diet compared with pigs fed the CON diet (325.8 vs. 301.0 mg/dL) on d 35. No effect ($P>0.05$) was observed on the RBC, WBC concentration and lymphocyte percentage, fecal *lactobacillus* and *E. coli* counts among treatments at the end of the experiment. No effect ($P>0.05$) was observed on the fecal score among treatments. In conclusion, dietary supplementation with 0.15% Korea Tempeh improved the growth performance, nutrient digestibility, and IgG concentration in weanling pigs.

Key Words: growth performance, Tempeh, weanling pig