

two wk. DSM did not alter animal gain, feed intake, or feed conversion ($P>0.05$). Fecal samples were collected from 40 animals (20 with DSM and 20 without DSM) at wk 10 (d 0 on diets), 14, 18, and 22, and were analyzed for *Lactobacillus* sp. (LAB), Enterobacteriaceae (EB), coliforms (CF), generic *Escherichia coli* (EC), and *Salmonella* sp. At week 10, fecal bacterial counts (\log_{10} CFU/g feces) were 9.55, 7.26, 7.01, and 6.93 for LAB, EB, CF, and EC populations, respectively. The EB, CF, and EC populations decreased through wk 14 and 18 ($P<0.05$), but were still higher with the DSM diet ($P<0.05$). The LAB population decreased over time in the absence of DSM in the diet, whereas DSM sustained higher LAB counts ($P<0.05$). At wk 22, populations of EB, CF, and EC were higher ($P<0.05$) than wk 18 for the diet without DSM, but no change was observed with DSM. As a result, no differences between the diets were observed at week 22. *Salmonella* were detected in 70% of the animals at wk 10 and 14, but only 20% at wk 18 and 22. DSM did not affect *Salmonella* shedding, but pooled analysis indicated that fewer recurring incidences of *Salmonella* shedding occurred in animals with higher LAB bacteria. Nonetheless, weight gain for individual animals was not affected by *Salmonella* shedding in this study. It is concluded that 10% DSM affects fecal bacterial populations, but not *Salmonella* shedding in growing-finishing pigs.

Key Words: Gut and Microbes, Dry Skim Milk, Swine

Nonruminant Nutrition: Grow/Finish - Minerals & Additives

T47 Response of pigs to dietary phytase and calcium-to-phosphorus ratio. J. A. Jendza^{*1}, R. N. Dilger¹, M. R. Bedford², and O. Adeola¹, ¹*Animal Sciences, Purdue University, West Lafayette, IN*, ²*Zymetrics, Golden Valley, MN*.

Pigs were fed corn-soybean meal-based basal diets containing 0.71% Ca and 0.40% P to determine response to phytase and Ca-to-total P ratio (Ca:tP) in two 4-wk experiments. Pigs were blocked by weight and gender such that the average weight across treatments was similar with 1 barrow and 1 gilt receiving each treatment within each block, housed in individual pens, and allowed ad libitum access to diets and water. In Exp. 1, 48 10-kg crossbred pigs were used to evaluate the efficacy of an experimental microbial phytase. Diets consisted of the basal, basal plus 3.4 or 6.7 g/kg monosodium phosphate (MSP), basal plus 500 or 1,000 phytase units (FTU)/kg of the experimental or control phytase, and a positive control with adequate Ca and P. Supplemental MSP resulted in linear increases in wk 1 ADFI ($P < 0.05$), ADG in all periods ($P < 0.05$), final weight and ASH ($P < 0.0001$). Experimental phytase increased percent bone ash (ASH), apparent P digestibility ($P < 0.0001$), final weight, overall ADG, wk 4 ADG and wk 4 ADFI ($P < 0.05$). Bone ash (51.1%) in the 1,000 FTU experimental phytase/kg diet was similar to the 6.7 g/kg MSP diet (51.5%). Control phytase improved ASH and apparent P digestibility ($P < 0.01$). In Exp. 2, 48 11-kg crossbred pigs, were randomly assigned to treatments in a 3 x 2 factorial arrangement. The respective factors were Ca:tP (1.8, 1.5, or 1.2) and supplemental experimental phytase (0 or 1,000 FTU/kg). Phytase increased ($P < 0.01$) average BW at 2, 3 and 4 wk; ADG at 2, 3, 4 wk and overall; ADFI at 4 wk and feed efficiency (G:F). Lowered Ca:tP improved ($P < 0.05$) BW and ADG in all periods; ADFI at 3, 4 wk and overall; and G:F at 2, 3, 4 wk and overall. Interaction was significant for ADFI at 3, 4 wk and overall ($P < 0.05$). Results indicate that the experimental phytase is effective at liberating phytate P for uptake and utilization, while decreasing Ca:tP from 1.8 to 1.2 improves ADG, ADFI and G:F.

Key Words: Phosphorus, Phytase, Pig

T48 Growth performance and meat quality changes from trace mineral manipulation of finishing pig diets. B. V. Lawrence^{*}, D. Overend, S. A. Hansen, J. D. Hahn, and J. Hedges, *Hubbard Feeds Inc., Mankato, MN*.

A total of 257 terminal Duroc cross gilts (Compart Boar Store Line 442 X D100; 32.5 ± 1.9 kg) were compared between 2 treatments: a corn-soybean meal control diet (CTRL), or the CTRL diet for 63-d followed by the CTRL diet supplemented with Yield Pak (a blend of vitamins and trace minerals, YPC) from day 63 - 91. Pens ($n = 6$) were weighed on d-0, 63 and 91. Gain and gain:feed during the 91-d was not different between treatments despite the YPC pigs having higher ($P<0.05$)

T46 Metabolizable energy value of meat and bone meal for pigs. S. A. Adedokun^{*} and O. Adeola, *Purdue University, West Lafayette, IN*.

The metabolizable energy (ME) values of six samples of meat and bone meal (MBM) were determined in barrows. Twenty four pigs with an average weight of 34 kg were used for each of the MBM samples. The gross energy (GE), crude protein (CP), fat, and ash contents of the MBM samples ranged between 3.49 to 4.75 kcal/g, 44.81 to 61.38%, 8.44 to 13.27%, and 18.87 to 35.37%, respectively. The CP and GE of diets ranged from 17.6 to 19.2% and 4.26 to 4.44 kcal/g, respectively. Each diet was randomly assigned to each block of three crates giving a total of eight blocks for each sample of MBM. Diets were formulated by replacing the same ratio of corn and soybean meal in the basal diet with MBM at 0, 5, or 10%. The digestibility assay employed a 5-d acclimation followed by a 5-d period of total but separate collection of feces and urine. The ME of each of the MBM sample was calculated by regressing the MBM contribution to ME intake against amount MBM intake. The slope of the regression gave the ME content of the MBM sample. The ME of the MBM ranged from between 2.43 and 3.28 kcal/g. Meat and bone meal ME increased as both the GE and fat contents of the different MBM samples increased while MBM ME decreased with an increase in MBM ash content.

Key Words: Metabolizable Energy, Meat and Bone Meal, Pigs

intakes from day 63 - 91. At day 91, 80 gilts per treatment (116.2 ± 6.6 kg) were scanned using real-time ultrasound for 10th rib backfat and loin eye area as well as last rib fat. There was no effect ($P>0.10$) of YPC inclusion on carcass composition. A total of 40 gilts per treatment were individually tagged, tattooed, and weighed prior to shipment (123.0 ± 4.5 kg). After 8-h of transit to a commercial abattoir, live weights (119.7 ± 4.1 kg) and hot carcass weights (HCW) were obtained (91.9 ± 3.2 kg). Weight prior to shipment, abattoir live weight, and HCW were not different ($P>0.10$) between treatments. Fat and muscle depth and lean percentage were similar between treatments ($P>0.10$). Loin pH was measured at 1 and 22-h post-mortem and was not different at 1-h post-harvest, however, 22-h pH (5.62 vs. 5.70) was higher ($P<0.05$), and 22-h pH drop loss (0.49 vs. 0.60 units) lower ($P<0.05$) for the YPC pigs. At 22-h a 40 - 50 g loin core was taken between the 7th and 8th ribs and held for 7-d for determination of drip loss. The reduction in 22-h pH drop was associated with a tendency ($P<0.15$) toward a reduction in 7-d drip loss (3.93 vs. 4.86%). NPPC measures of loin color, firmness, and marbling, as well as ColorTec L*, A*, and B* values were not different ($P>0.10$) between the CTRL and the YPC pigs. The results of this experiment suggest that short term supplementation of the diet with an appropriate blend of vitamins and trace minerals may improve pig growth via stimulation of feed intake and may reduce drip loss via a reduction in the rate of post-mortem pH decline.

Key Words: Minerals, Pigs, Meat Quality

T49 Performance of pigs fed grain sorghum-based diets supplemented with phytase. J. Yáñez¹, M. Cervantes^{*1}, M. A. Barrera¹, W. Sauer², and N. Torrentera¹, ¹*Universidad Autónoma de Baja California, Mexicali, Mexico*, ²*University of Alberta, Edmonton, AB, Canada*.

An experiment was conducted to evaluate the effect of phytase supplementation to sorghum-soybean meal diets on the performance of growing pigs. Twenty-eight pigs (average initial BW 22.9 kg) were randomly distributed in 4 dietary treatments (7 replicates/treatment), according to a RB design. Treatments were: T1) sorghum-soybean meal, basal diet, 0.67% apparent ileal digestible lysine; T2) basal diet plus 350 units of phytase activity (FTU)/kg diet; T3) basal plus 700 FTU/kg diet; T4) basal diet plus 1 050 FTU/kg diet. All were formulated to contain 90% (0.77%) of the requirement of apparent ileal digestible lysine, and 100% the requirement of available phosphorus for pigs ranging in BW from 20 to 50 kg. All diets were supplemented with vitamins and minerals to meet or exceed the requirements for the 20 to 50 kg pigs. Daily weight gain (ADG), feed intake, lysine intake, threonine intake, and feed conversion for treatments 1 to 4 were: 0.67, 0.60, 0.61, 0.66 kg/d; 1.39, 1.29, 1.33, 1.47 kg/d; 12.4, 11.5, 11.9, 13.1 g/d; 9.3, 8.6, 8.9, 9.8 g/d; 2.09, 2.18, 2.17, 2.17. There was no effect of phytase supplementation on the

ADG ($P = 0.93$), feed intake ($P = 0.37$), lysine intake ($P = 0.37$), threonine intake ($P = 0.37$), or feed conversion ($P = 0.54$). However, pigs fed the diet supplemented with 350 FTU/kg tended to have a lower ($P = 0.10$) ADG as compared with the basal diet. The results from these experiments indicate that phytase supplementation does not affect the performance of pigs fed sorghum-soybean meal diets.

Key Words: Pigs, Sorghum, Phytase

T50 Paylean® did not compromise bone traits of finishing pigs fed diets formulated with phytase. C. E. Pardo*, J. N. Trower, D. K. Schneider, and T. D. Crenshaw, *University of Wisconsin, Madison.*

Improved performance of pigs fed ractopamine (Paylean®, Elanco Animal Health) is well established, but concerns have arisen over the combined use of Paylean and phytase in diets with no supplemental inorganic P (iP). The combination of Paylean and phytase (Natuphos®, 9400 G-concentrate, BASF) was evaluated in finishing pigs to determine if additional iP was required. One hundred twenty crossbred (D x LW x LR) pigs were initially (50.5 ± 0.4 kg) fed diets with phytase (0 or 500 FTU/kg) for 4 wk, then (82.0 ± 1.0 kg) fed one of five diets for an additional 4 wk. Diets provided Paylean (0 vs. 10 mg/kg, diets 1,2 vs. 3,4,5), phytase (0 vs. 500 FTU/kg, diets 1,3,5 vs. 2,4) and iP (0.45 vs. 0.65% total P, diets 1,3 vs. 5). Total lysine was increased from 0.70 to 0.90% in Paylean diets. As expected, ADG, feed efficiency, and carcass traits improved ($P < 0.05$) with inclusion of Paylean, but no benefits from iP were observed (data not shown). Metacarpal bone ash, percentage ash and mechanical properties (Force and Stress) were suppressed ($P < 0.06$) in pigs fed diets with phytase regardless of Paylean additions. Bone traits from pigs fed Paylean + phytase diets were compromised to the same extent as traits from pigs fed phytase without Paylean. The responses are consistent with a limitation due to phytase, but not Paylean. In pigs fed Paylean, additional iP improved bone traits ($P < 0.02$) over pigs fed diets with minimal P or phytase. In conclusion, growth, feed efficiency, carcass traits and bone traits of finishing pigs fed Paylean can be maintained with minimal supplemental P levels from either iP or phytase sources.

Dietary Treatments

Item	1	2	3	4	5	SEM
Paylean, mg/kg	0	0	10	10	10	
Phytase, FTU/kg	0	500	0	500	0	
P equivalents, %	0.45	0.45	0.45	0.45	0.65	
Ash, g ^{ab}	7.24	6.99	7.23	7.07	7.55	0.14
Ash, % ^{bcd}	59.6	58.5	59.5	59.0	60.7	0.2
Force, kg-cm ^{bcd}	78.6	68.1	79.0	77.6	84.5	3.2
Stress, kg/cm ^{2 cd}	2.62	2.28	2.57	2.53	2.91	0.12

^aBlk, $P < 0.05$; ^b3,4 vs. 5, $P < 0.02$;

^c1,2 vs. 3,4,5, $P < 0.06$; ^d1 vs. 2, $P < 0.06$;

^e3 vs. 4, $P < 0.05$.

Key Words: Bone, Ractopamine, Phosphorus

T51 Utilization of phytase in diets of growing pigs - ileal AA digestibility, performance and mineral excretion. H. O. Silva, E. T. Fialho*, J. A. F. Lima, L. D. S. Murgas, and R. T. F. de Freitas, *University Federal of Lavras - UFLA, Brazil.*

Exp. 1 evaluated the effect of level of phytase on the apparent ileal digestibility of protein and AA (AIDCP and AIDAA). The treatments were: T1- corn + soybean meal + defatted rice bran (DRB); T2 - corn + soybean meal; T3 - soybean meal + DRB; and T4 - soybean meal. All diets were supplemented with four levels of phytase (0, 400, 800 and 1200 FTU/kg diet from Natuphos 5000). Eight pigs with a simple T-cannula were used. The pigs were allocated to a 4 x 4 Latin Square design. Supplementation with phytase yielded a higher AIDCP and AIDAA of the diets, the level of 483 FTU/kg ($Y = 83.81 + 0.0029X - 0.000003X^2$,

$R^2 = 0.946$) was computed to yield the higher ileal digestibility values. These data show that phytase supplementation in the range of 440-900 FTU/kg diet is adequate in growing pig diets. Exp. 2 was designed to verify the effect of phytase on performance, bone mineralization and plasma urea content in growing pigs. A total of 80 crossbred (LD x LW; 30 ± 3.1 kg BW) barrows and gilts were allotted to four treatments and five replications. The treatments consisted of diets based on corn, soybean meal and DRB supplemented with four levels of phytase (0, 400, 800 and 1200 FTU/Kg). Over the 42 d experimental period, every eight days, blood of two animals per pen was collected. At the end of the experimental period, two animals were slaughtered for the collection of the metacarpal bone. Supplementation with the enzyme phytase up to the level of 1200 FTU/kg diet yielded a linear improved feed conversion and the content of Ca and P in the bone ($P < 0.05$). Phytase supplementation resulted in a quadratic effect on plasma urea and Mn ($P < 0.05$). It was concluded that supplementation with the enzyme phytase in growing pig diets should be beneficial as demonstrated by improved pig performance as well as increased bone mineralization of Ca, P and Mn. This would also contribute to the reduction of the environmental impact caused by pig excrement.

Key Words: Bone Mineralization, Phytase, Amino Acid Digestibility

T52 Use of betaine and conjugated linoleic acid as growth promotants in growing Iberian pigs. I. Fernandez-Figares*, I. M. Lachica¹, R. Nieto¹, E. Gonzalez Sanchez², and J. F. Aguilera¹, ¹Consejo Superior de Investigaciones Cientificas, ²Universidad de Extremadura, Spain.

Dietary betaine (BET) and conjugated linoleic acid (CLA) are associated with decreased lipid deposition and may improve feed efficiency in swine. We hypothesized that BET and/or CLA could have an impact as growth promotants on genetically unimproved purebred Iberian pigs. Gilts ($n=20$) were fed control, 1% CLA (CLA-60), 0.5% BET or 1% CLA+0.5% BET isoenergetic diets from 20 to 50 kg BW. Animals were fed diets containing 120 g crude ideal protein, and 15.4 MJ ME /kg DM at 80% of ad libitum intake. Dietary treatments and individual pen locations were assigned at random to experimental gilts. Pigs were weighed and feed intake was adjusted weekly according to BW. At 50 kg, pigs were electro-stunned, exsanguinated and organs were removed and weighed. Carcasses were chilled for 24 h to obtain carcass measurements. Fat depths along the midline and at P1, P2, P3 sites at 10th rib were determined. Compared to controls, pigs fed on BET+CLA had greater ($P < 0.05$) daily weight gain (602 vs. 540 g/day) although BET or CLA treatments were not different from control. Feed/Gain ratio was not influenced by the diets tested. Drip loss was increased when pigs were fed on the CLA+BET diet compared to control ($P < 0.05$; 2.39 vs 1.72%). There was a trend towards higher Loin Eye Area/EBW ratio when BET fed pigs were compared to controls ($P = 0.075$; 9.97 vs 8.83 cm²/kg). BET and BET+CLA fed pigs had 20% lower P1 than controls ($P < 0.05$). A nonsignificant 12% decrease in P2, P3, first rib, last rib, 10th rib back fat was observed in BET+CLA fed pigs compared to controls ($P > 0.10$). Livers from animals fed on BET+CLA were 17% heavier than controls ($P < 0.05$) while other organs were not affected by dietary treatments ($P > 0.10$). These preliminary data suggest that use of BET+CLA mixture is more effective than BET or CLA individually as growth promotants in growing Iberian gilts.

Key Words: Betaine, Conjugated Linoleic Acid, Iberian Pig

T53 Effects of dietary levels of tylosin on digestive and post-absorptive utilization of dietary nutrients in growing pigs. K. Bregendahl*, X. Yang¹, Y. Shen¹, G. Vessie², R. Bagg², T. C. Rideout¹, T. Archbold¹, P. Dick², and M. Z. Fan¹, ¹University of Guelph, Guelph, ON, Canada, ²Elanco Animal Health, Guelph, ON, Canada.

This study was conducted to examine effects of various dietary levels of tylosin on digestive and post-absorptive utilization of dietary crude protein (CP), calcium (Ca), and phosphorus (P) in growing pigs. Thirty-five Yorkshire barrows, with initial and final BW of 35 and 50 kg, were surgically fitted with a T-cannula, and fed five diets for five periods according to a completely randomized block design. The five diets were corn and soybean meal-based, and formulated to contain five levels of tylosin at 0, 11, 22, 44, and 110 ppm, respectively. Each experimental period lasted 25 d with 6-d adaptation and surgery, 6-d recovery, 10-d adaptation to diets, and 4-d collection of total urine excretion, and

digesta and fecal samples. Partitioned as the percentage of the total nutrient intake, post-absorptive metabolic urinary loss (19.1-25.1%) was the major route of N excretion followed by indigestible fecal loss, and the endogenous fecal loss (9.9-18.8%). Fecal loss (23.5-69.5%), and the post-absorptive metabolic urinary loss (0.4-1.1%) were the major routes of Ca losses. Fecal loss (37.7-67.7%), and the post-absorptive metabolic urinary loss (3.6-5.5%) were the routes of P losses. Orthogonal polynomial contrasts suggested that dietary levels of tylosin affected ($P < 0.05$) the nutrient retention through changing the nutrient losses at the ileal and the fecal levels but not ($P > 0.05$) at the post-absorptive urinary level. Dietary inclusion of tylosin at 11 ppm was optimal and improved ($P < 0.05$) the efficiency of digestive utilization of the nutrients and reduced ($P < 0.05$) the fecal excretion of these nutrients by about 10 percentage units. In conclusion, dietary supplementation of tylosin at 11 ppm resulted in the best efficiency of digestive utilization of the nutrients under the research environment. This optimal level of tylosin supplementation is likely to be affected by sanitary conditions.

Key Words: Growing Pigs, Nutrient Utilization, Tylosin

T54 Effects of dietary antibiotics on growth performance in pigs. J. W. Hong^{*1}, O. S. Kwon¹, B. J. Min¹, W. B. Lee¹, K. S. Son¹, J. H. Kim², B. C. Park³, and I. H. Kim¹, ¹Dankook University, Cheonan, Korea, ²Agribands Purina Korea, Inc., Seoul Korea, ³CTC Bio Inc., Seoul, Korea.

For Exp. 1, a total of 80 pigs (20.94 ± 0.85 kg average initial BW) were used in a 42-d growth assay to determine the effects of dietary chlortetracycline and sulfathiazole complex, oxytetracycline, and tylosin on growth performance in growing pigs. Dietary treatments included 1) CON (Basal diet : without antibiotic), 2) CTC (CON diet + 100 ppm chlortetracycline and sulfathiazole complex), 3) OTC (CON diet + 100 ppm oxytetracycline), 4) CTC+OTC (CON diet + 100 ppm chlortetracycline and sulfathiazole complex + 100 ppm oxytetracycline) and 5) TYL (CON diet + 44 ppm tylosin). For d 0-21, pigs fed TYL (471 g) diets had greater ADG than pigs fed CTC (366 g), OTC (416 g) and CTC+OTC (425 g) diets ($P < 0.04$). However, for the overall period, ADG, ADFI and Gain/feed were not significantly differences among the treatments. For the Exp. 2, a total of 80 pigs (52.04 ± 1.02 kg average initial BW) were used in a 42-d growth assay to determine the effects of dietary chlortetracycline and sulfathiazole complex, oxytetracycline and tylosin on growth performance in finishing pigs. Dietary treatments included 1) CON (Basal diet : without antibiotic), 2) CTC (CON diet + 100 ppm chlortetracycline and sulfathiazole complex), 3) OTC55 (CON diet + 55 ppm oxytetracycline), 4) OTC110 (CON diet + 110 ppm oxytetracycline) and 5) TYL (CON diet + 22 ppm tylosin). For the overall period, ADG of pigs fed CTC, OTC55, OTC110 and TYL diets were greater by 11% than pigs fed CON diet ($P < 0.03$). However, ADFI and Gain/feed were not significantly different among the treatments. In conclusion, the results obtained from these feeding trials suggest that dietary oxytetracycline and tylosin are an effective means of improving growth performance in growing and finishing pigs.

Key Words: Antibiotic, Growth, Pigs

T55 Effect of dietary natural herb extract (Biomate[®]) supplementation on growth performance, IGF-1 and carcass characteristics in growing-finishing pigs. O. S. Kwon^{*1}, B. J. Min¹, W. B. Lee¹, K. S. Son¹, J. H. Cho¹, J. H. Kim², I. H. Kim¹, and J. C. Ra³, ¹Dankook University, Cheonan, Korea, ²Agribands Purina Korea, Inc., Seoul, Korea, ³RNL Life Science Ltd., Korea.

A total of 86 pigs (LYD, 20.92 kg average initial BW) were used in a 112-d growth assay to determine the effects of dietary natural herb extract (Biomate[®]: extracts of growth promoter in *Artemisia capillaris*) on growth performance, IGF-1 of serum and carcass characteristics in finishing pigs. Dietary treatments included: 1) CON (basal diet; Control), 2) BM1 (basal diet with 0.02% of Biomate[®]), 3) BM2 (basal diet with 0.04% of Biomate[®]) and 4) BM3 (basal diet with 0.06% of Biomate[®]). Through the entire experimental period, as Biomate[®] increased, there was a decrease (linear, $P < 0.08$) in average daily feed intake and an increase (linear, $P < 0.02$; quadratic, $P < 0.08$) in gain/feed. Backfat thickness tended to decrease in pigs fed BM diets compared to pigs fed the CON diet (linear, $P < 0.09$; quadratic, $P < 0.01$). Increasing Biomate[®] tended to increase in IGF-1 content in serum (linear, $P < 0.09$). Hunter

a*(redness) (linear, $P < 0.01$) and b*(yellowness) (linear, $P < 0.02$) values of longissimus muscle were affected by the dietary Biomate[®] treatments. Color of longissimus muscle was higher in the dietary Biomate[®] treatments than pigs fed control diet (linear, $P < 0.03$). In conclusion, the results obtained from this feeding trial suggest that the Biomate[®] supplementation of diets for growing-finishing pigs can be improved growth performance, IGF-1 and meat quality.

Key Words: Pig, Herb Extract, Meat Quality

T56 Different isoflavone contents in soy-based diets are without influence on growth performance and carcass quality in pigs. G. Kuhn¹, K. Ender^{*1}, U. Hennig¹, C. Kalbe¹, S. Moors², G. H. Degen², and C. Rehfeldt¹, ¹Research Institute for the Biology of Farm Animals, Dummerstorf, Germany, ²University of Dortmund, Germany.

A weaner-grower-finisher performance trial with thirty-eight pigs was designed to compare the growth performance and carcass quality of pigs fed diets containing either soybean meal or soy protein concentrate in a pair-feeding design. Soybean meal (SM) and soy protein concentrate (SPC) differed in isoflavone (daidzein plus genistein) content (782 µg/g in SM and 125 µg/g in SPC, respectively). During the experiment, all pigs were fed four-phases-diets characterized by decreasing protein concentrations with increasing age (weaner I, weaner II, grower, finisher diets). Rations of control and experimental groups were isoenergetic, isonitrogenous, and isoaminogen. The weaning pigs with an initial live weight of 8.4 ± 1.1 kg were allotted to flat deck boxes. During the growing/finishing period (days 70 - 170 of age), the pigs were housed in single boxes. Both, the weaning and the grower/finishing performances (daily body weight gain, feed intake, feed conversion ratio) were similar in both groups. No differences were found between the groups in carcass composition (percentages of cuts, tissues, and protein/fat), and meat quality of pigs ($P > 0.05$). Moreover, the IGF-1R mRNA expression in longissimus muscle was not influenced by the kind of soy product ($P > 0.05$). However, circulating levels of isoflavones between pigs fed SM (genistein 239 ± 44; daidzein 162 ± 22; equol 12 ± 4 ng/mL plasma) and animals fed SPC (genistein 22 ± 9 and daidzein 8 ± 3, and equol 10 ± 3 ng/mL plasma) were clearly different (genistein: $P < 0.001$; daidzein: $P < 0.001$; equol: $P > 0.05$). The results confirm the expected differences in the bioavailability of soy isoflavones. Yet, there were no significant differences in performance of pigs fed either soybean meal or soy protein concentrate.

Key Words: Soybean Isoflavone, Pigs, Carcass Quality

T57 Effect of supplementation with natural tranquillizers in the diet of the pigs on the behavior of the animals and the technological quality of loin meat. M. Font i Furnols^{*}, N. Panella, E. Fàbrega, A. Velarde, M.A. Oliver, J. Soler, and M. Gil, *Institute for Food and Agricultural Research and Technology, Monells, Spain.*

Pork quality is greatly affected by the stress which pigs experience *ante mortem* (a.m.). This depends on the handling and behavior of the animal a.m., as well as on the genotype, especially the presence of the halothane gene (Hal). The aim of the project was to test, in nonstressful conditions, whether the diet supplemented with natural tranquillizers [magnesium (Mg) or tryptophan (Trp)] affected the technological quality of pork meat in two different genotypes [homozygous positive (nn) and negative (NN) for the Hal gene]. Thirty-six nn animals and 36 NN animals were reared with the same diet. However, 5 days before the harvest 12 pigs of each genotype were fed a diet supplemented with Mg (3.2 g elemental Mg per day), 12 pigs of each genotype a diet with Trp (12.5 g L-Trp per day) and the rest had no supplement in the diet (control pigs). Hot carcass weight was 78.1 ± 9.2 kg. Meat quality measurements and behavior observations of aversiveness to CO₂ stunning were taken. Diet and genotype effects were analyzed, the interaction being not significant ($P > 0.05$). The diet had no influence ($P > 0.05$) on any of the parameters of meat quality determined. However the pH measured at 45 minutes *post mortem* in the *longissimus* (LT) muscle was lower in nn than in NN animals ($P < 0.05$; 5.70 vs 6.45, respectively) and the electrical conductivity higher ($P < 0.05$; 7.34 vs 4.37 µS). There were no differences in the ultimate pH. The drip losses measured in LT were higher in nn than NN ($P < 0.05$; 10.13 vs 5.89). Both parameters showed that nn animals produced more exudative meat with implications of economical losses. There were no differences between genotypes and diets in the behavior

of the animals during the inhalation of CO₂. It can be concluded that, in a nonstressful a.m. treatment, the supplementation with elemental

Mg or Trp did not affect the meat quality parameters, the genetic of the animals being the most influential factor.

Key Words: Magnesium, Tryptophan, Pork quality

Swine Species

T58 Additional heat behind farrowing sows to reduce the number of stillborn piglets. Y. Gao, H. Y. Zhang, B. Szkotnicki, and R. R. Hacker*, *University of Guelph, Guelph, ON, Canada.*

Additional heat behind a sow at farrowing might help rendering a more relaxed labor in the sow and reduce the number of stillborn pigs at parturition. To examine the hypothesized heat effect, two trials were conducted. Parturient sows were moved to farrowing crates by day 109 of gestation, and fed a 14 (in trial I) or a 16% (in trial II) CP corn-soybean meal diet (3.2-5.5 kg) twice daily. The farrowing room was maintained at 21°C or above and the creep zone was maintained above 35°C with a 175W IR heat lamp. In total, 294 sows (86 Yorkshire in trial I and 208 Hay Bay F1 York/Landrace in trial II) were randomly assigned into either a Heat (an additional 100W IR heat lamp hovered behind the sow at farrowing) or a Non-Heat group. To distinguish stillborn pigs from other pigs that were born alive and died after birth, a lung flotation test was performed on all dead piglets after completion of farrowing. In addition, 20 sows (10 from each group) from trial I were observed for the farrowing behavior. The length of time sows spent sitting, standing and lying down, average delivery interval and position change frequency were recorded. Results showed that additional heat behind a sow at farrowing did not significantly reduce the number of stillborn pigs. On average, there was one stillborn piglet per litter for either the Heat or the Non-Heat group. However, Heat did appear to make live born piglets move readily to the sows udder. Furthermore, there was no difference between the Heat and the No-Heat group for the time farrowing sows spent lying down (85.8 vs. 85.8 min), sitting (9.5 vs. 10.1 min) or standing (4.6 vs. 4.2 min). Additional heat did not significantly decrease the average piglet delivery interval (16.9 min for the Heat group and 17.2 min for the Non-Heat group), however, it significantly decreased ($P < 0.05$) position change frequency (24 vs. 30 times). Less sow movement reduces the risk of the neonatal pigs being crushed by the sow.

Key Words: Additional Heat, Stillborn, Sow Farrowing Behavior

T59 Addition of heat at birth and supplementation of energy and IgG products on improving survivability in neonatal pigs. Y. Gao, H. Y. Zhang, B. Szkotnicki, and R. R. Hacker*, *University of Guelph, Guelph, ON, Canada.*

The objective of this study was to reduce piglet mortality during the first 7d of life by providing additional heat at birth and orally administering cream (C), (10% Half-and-Half cream, Parmalat Canada), and IgG, as Porcine plasma IgG concentrate (P), (American Protein Corp. Inc., IA, USA), to provide supplemental heat, energy and immunoglobulin to neonatal pigs. The farrowing room was maintained at 21°C or above and the creep zone was maintained above 35°C with a 175W IR heat lamp. In two trials, 294 litters (86 litters from Yorkshire sows in trial I and 208 litters from Hay Bay F1 York/Landrace sows in trial II) were randomly assigned into either a Heat (an additional 100W IR

heat lamp hovered behind a sow at farrowing, maintaining the farrowing zone temperature above 30°C) or a Non-Heat group. Within 12h after farrowing, the four smallest (minimum birth body weight of 0.6 kg) newborn piglets were selected from each litter and randomly assigned to one of the following four treatments: Control, C (6ml), CP-1 (7ml, 120mg/ml IgG) and CP-2 (8ml, 210mg/ml IgG) in trial I; Control, C (6ml), CP-3 (6ml, 60mg/ml IgG) and CP-4 (6ml, 120mg/ml IgG) in trial II. Results showed that the addition of heat at birth did not show any significant effect on piglet mortality at birth. There was not a significant effect on 3d or 7d piglet mortality associated with supplementation of energy or IgG to newborn pigs in this study. In addition, there was no difference for piglet weight gain from birth to 7d of life. Further investigations need to be conducted on the transfer and absorption of the supplemented IgG in neonatal pigs.

Key Words: Energy and Immunoglobulin Supplementation, Additional Heat, Piglet Mortality

T60 Effects of stocking rate and feeder space on pig performance in a wean-to-finish system. J. M. DeDecker*¹, M. Ellis¹, B. F. Wolter², and B. A. Peterson¹, ¹*University of Illinois, Urbana,* ²*The Maschhoffs, Inc., Carlyle, IL.*

The objective of this study was to determine the effects of feeder space and stocking rate during the first 8 wk post-weaning on pig performance from weaning (4.8 ± 0.03 kg BW; 15 ± 1d of age) to 23 wk post-weaning. Twenty pens of crossbred pigs (n = 960) were used in a randomized complete block design with a 2 × 2 factorial arrangement of treatments: 1) stocking rate (Single [32 pigs/pen] vs Double [64 pigs/pen]) and 2) feeder space (two spaces [81.3 cm/pen] vs three spaces [121.9 cm/pen]). The stocking rate treatment was imposed for 8 wk post-weaning, thereafter pigs on all treatments had the same group size of 32 pigs/pen. Floor spaces/pig during the treatment period were 0.66 m² and 0.33 m² for the single- and double-stocked treatments, respectively. There were no ($P > 0.05$) stocking rate by feeder space interactions. During the 8 wk double-stocking period, daily weight gain was higher ($P < 0.001$; 494 and 467 ± 4g/d) for the single-stocked pigs resulting in heavier ($P < 0.001$; 32.3 and 30.8 ± 0.23kg) BW at the end of wk 8. Providing three feeding spaces compared to two tended ($P = 0.08$) to improve daily weight gains (485 and 476 ± 4g/d) resulting in a trend ($P = 0.09$) for heavier BW (31.9 and 31.2 ± 0.23kg) at the end of wk 8. From the end of the double-stocking period to slaughter, there was a trend ($P = 0.06$) for average daily gain (839 and 862 ± 7g/d) to be higher for the double-compared to the single-stocked pigs resulting in similar ($P = 0.77$) BW at slaughter. There was no effect of feeder space during this period and BW were similar ($P = 0.71$) at slaughter. In summary, these results suggest double-stocking pigs for 8 wk post weaning reduces growth performance and BW at 8 wk, but that difference is not maintained to slaughter. Adding an additional feeder space did not significantly improve performance of double-stocked pigs in this study.

Key Words: Pigs, Stocking Rate, Feeder Space

Animal Health

T61 Dose-dependent cytokine expression in lipopolysaccharide activated bovine alveolar macrophages. J. A. Mills*, J. E. Campanicki, and R. M. Dyer, *Dept. of Animal and Food Sciences, University of Delaware, Newark.*

Pro- and anti-inflammatory cytokine gene expression in bovine alveolar macrophages could be reflected by level of lipopolysaccharide (LPS) challenge. Lavage procured alveolar macrophages (n=4) were exposed to 0, 1, 10, 100 and 1000 ng/ml of LPS (*E. coli*; O111:B4) for 6 hours. Levels of mRNA expression for IL-1 α , IL-1 β , TNF α , IL-10, IL-12, IL-18, TGF β and iNOS were determined by real time QPCR.

Expression of IL-1 α , IL-1 β and iNOS and peaked at 2.5, 11.3 and 13.0 fold higher ($P < 0.05$) than levels in unexposed cells, respectively at 100 ng/ml of LPS. TNF α expression changed within LPS stimulated alveolar macrophages, but differences between LPS treatments were only significant between 1 ng/ml and 100 ng/ml ($P < 0.05$), and tended to differ between 1 ng/ml and 1000 ng/ml ($P < 0.10$). In contrast, expression of IL-10, IL-12, IL-18 and TGF β decreased ($P < 0.05$) at all levels of LPS exposure with the greatest decrease appearing at 100 and 1000 ng/ml of LPS. These findings suggest the balance of inflammatory and anti-inflammatory cytokine expression is dependent upon levels of LPS