Microbial load in the gastrointestinal tract (GIT) can be related to contamination of skin/hide and carcass surfaces in ruminants. Thirty-six Boer × Spanish goats (BW = 17.7 kg) were used to determine the effects of dietary treatment on volatile fatty acid concentrations (VFA) in rumen and microbial loads of GIT contents. Animals were randomly allotted to nine pens, and each pen (4 goats/pen) was assigned to one of three dietary treatments for 90 d (3 pens/treatment): (1) a hay diet, consisting of alfalfa (Medicago sativa) hay alone (H); (2) a 18% CP concentrate diet, consisting predominantly alfalfa meal and yellow corn (C); or (3) a combined diet, consisting of the hay diet for the first 45 d, followed by the concentrate diet (HC). At the end of the feeding trial, goats were slaughtered using standard procedures. Immediately after evisceration, rumen fluid and rectal samples were aseptically collected from each animal to determine the microbial loads. Rumen fluid was also collected and prepared for determination of VFA. No significant differences were found in rumen fluid VFA among treatments, although the acetic acid concentration was high in the H group (66.27 mM), low in HC group (34.61 mM), and intermediate in C group (44.18 mM; $P < 0.05$). The total plate counts were not different ($P > 0.05$) among treatments for rumen fluid and fecal (rectal) samples. The E. coli counts in the rectal samples were lower in the H group (6.43 $\log_{10}$ CFU/g), compared with C (8.21 $\log_{10}$ CFU/g) or HC (8.40 $\log_{10}$ CFU/g) groups. However, no significant differences were found in the E. coli counts of rumen fluid samples among the dietary treatments. The mean (± SEM) rumen E. coli counts were 1.38, 1.65, and 2.51 ± 0.560 $\log_{10}$ CFU/g in H, C, and HC groups, respectively. The results indicated that either concentrate diet or a diet change from hay to concentrate may increase fecal shedding of E. coli in meat goats.

Key Words: Diet, *E. coli*, Goats

W136 Impact of types of pelleted feed and two pellet to hay ratios on the development of urolithogenic compounds in meat goats. K. Sullivan[1], S. Freeman*[1], M. Poore[1], E. van Heugten[1], K. Ange-van Heugten[1], and B. Wolfe[2], [1]*North Carolina State University*, *Raleigh*, [2]*The Wilds*, *Cumberland, OH*.

Goats and giraffes both have documented problems with urolith formation. Since research in giraffes poses logistical challenges, 18 buck goats were used as a model. Our objective was to determine the impact of two commercial pellets used as feed for giraffes (ADF-16, A; and Wild Herbivore, W) and two hay to pellet ratios (80:20, 80H; and 20:80, 20H) in a 2 × 2 factorial design. Total feces and urine were collected over 2 5-d periods separated by 9d for N and mineral balance determination. Fresh urine samples were collected twice during each collection period and evaluated microscopically for urolithic crystal content. Ruminal fluid was collected by rumenocentesis 2 hr post-feeding once at the end of the trial. Analysis of feedstuffs showed % CP, % NDF, % Ca, and % P to be 20.2, 43.9, 1.5, and 0.2 for the alfalfa hay; 19.4, 30.0, 0.8, and 0.7 for A; and 14.2, 54.4, 1.0, and 0.4 for W, respectively. DM and water intake were higher for the 20H than 80H bucks ($P \leq 0.05$ and 0.10, respectively); however, there were no treatment differences in DM digestibility. Retention of N was higher in bucks fed 20H diets ($P \leq 0.05$). Crystals observed were predominantly calcium phosphate. Crystal counts were not influenced by diet; however, crystal scores were higher in animals receiving 20H diets ($P \leq 0.10$). Ruminal NH_3 was higher in A bucks than W while urine pH was higher in W bucks than A. Urine pH was also higher for 80H than 20H ($P \leq 0.05$). Our data suggest that the proportion of hay offered to the goats was a greater influence on urinary calcium phosphate crystals than was pellet type.

Table 1. Impact of hay level and pellet type on meat goats

DM Basis	80HA	80HW	20HA	20HW	
% CP	20.1	19.0	19.5	15.4	
%NDF	41.1	46.0	32.8	52.3	
% Ca	1.3	1.4	1.0	1.1	
% P	0.3	0.3	0.6	0.4	
DMI (g/d)	1042	990	1198	1378	H[1]
H_2O intake (L/d)	2.8	2.9	3.2	3.4	H[2]
% DM dig	67.5	67.7	69.2	66.6	NS
N retention (g/d)	6.9	7.3	10.5	10.8	H[1]
Urine pH	8.6	8.9	8.4	8.7	H[1], P[1]
Crystal score	1.8	2.0	2.8	2.8	H[2]
Crystal count	48.8	136.5	205.6	149.8	NS
Ruminal NH_3 (mg/dl)	24.5	14.0	30.0	11.8	P[1]
Ruminal pH	6.25	6.60	6.31	6.34	NS

[1] $P \leq 0.05$ for H, P [2] $P \leq 0.10$ for H, P

Key Words: Hay to Concentrate Ratio, Meat Goats, Uroliths

Nonruminant Nutrition: Feeder Pig and Sow Nutrition II

W137 Comparison and accounting for differences of three phytase activity assay methods. J. D. Weaver* and X. G. Lei, *Cornell University*, *Ithaca, NY*.

Phytases are now widely used throughout the world as feed additives for simple-stomached animals to increase phosphorus bioavailability and reduce phosphorus content in the excreta. Phytase activity is measured colorimetrically by the complexing of molybdenum with liberated phytate-phosphate. There are three different methods of assaying phytase activity: the molybdenum blue method with reduction of the phosphomolybdate complex by ascorbic acid (method 1), the molybdovanadate method (method 2), and the acetone phosphomolybdate method (method 3). Since different conditions may affect enzyme activity, we compared these three methods in order to characterize the relative impact of each assay condition on the activity outcome. Two commercialzed phytase enzymes, *Aspergillus niger* PhyA and *Escherichia coli* AppA2, were used for the assay comparison. When PhyA samples were analyzed, method 2 gave different ($P < 0.05$) activity values from that of method 1 or 3. In the case of AppA2 enzyme, all three methods gave different ($P < 0.05$) activity values. The greatest disparity was between methods 1 and 2 for AppA2 (2.8-fold, $P < 0.05$), and this difference was attributed to buffer, 39%; pH, 30%; and Triton X-100 and bovine serum albumen, 32%. The lower substrate concentration of method 3 versus method 1 reduced the activity of PhyA by 22%, without affecting the activity of AppA2. The presence of Trtion X-100 and bovine serum albumen in the exraction buffer for AppA2 tended to increase the phytase activity value ($P = 0.06$-0.08). These results help clarify discrepancies between various research groups and assist consumers in choosing a phytase additive.

Key Words: Phytase, Assay, Conditions

W138 Effects of dietary supplementation of an enzyme blend on digestibility of nutrients in the hindgut of growing pigs. F. Ji*[1], D. Casper[2], D. Spangler[2], K. Haydon[3], and J. E. Pettigrew[1], [1]*University of Illinois*, *Urbana*, [2]*Agri-King, Inc.*, *Fulton, IL*, [3]*Prince Agri Products*, *Quincy, IL*.

To measure the impact of a beta glucanase/protease enzyme blend product (EBP) on the digestibility of nutrients in the hindgut of pigs, 12 cannulated barrows (38.2 ± 0.5 kg) were blocked on previous feed intake (FI) and randomly assigned to 1 of 4 treatments using a 4 x 4 latin square design replicated 3 times. Treatments were hydrolyzed casein for measurement of endogenous N flow reported elsewhere, Basal diet (B), B + 0.05% EBP (EBP1), B + 0.10% EBP (EBP2). The B consisted of corn and soybean meal (SBM) having 3.36 Mcal ME/kg and 1.2% total lysine. The periods consisted of 4 d of adaptation, 5 d of fecal collection, 3 d of transition, and 2 d of ileal collection. Pigs were fed and feces were collected twice daily at 12-h intervals. Ileal effluent was collected continuously for 12 h each d. The FI of each square during period 1 was 85% of the minimum FI of 4 pigs during the preliminary period, equalized within square, and increased by 100g/d in each subsequent period. The difference between fecal and ileal digestibility (DFID) and digestibility based on the nutrients entering the hindgut (DNH) were calculated. The DFID of hemicellulose was higher ($P < 0.05$) in B than in EBP1 and EBP2 (Table 1). The DNH of EBP1 and EBP2 was higher ($P < 0.05$) in CP and tended to be higher ($P = 0.06$) in DM than that of B. In conclusion, this study showed that EBP increased the hindgut digestibility of CP but reduced that of fiber in growing pigs fed a corn-SBM diet because of greater intestinal NDF digestibility occurring with EBP.

Table 1. Digestibility (%) of nutrients in the hindgut.

Nutrient	B	EBP1	EBP2	SD[1]
n	11[2]	12	12	
DFID				
DM	17.25	19.68	18.32	3.79
Energy	16.00	18.19	16.96	3.86
CP	9.13	12.86	11.15	4.01
NDF	55.93	45.36	45.93	12.95
Hemicellulose	50.94[b]	37.87[a]	34.19[a]	14.41
DNH				
DM	57.78	62.70	61.14	4.56
Energy	54.41	58.53	56.83	6.42
CP	39.20[a]	50.71[b]	46.67[b]	7.68
NDF	54.38	49.78	50.76	6.47
Hemicellulose	47.00	42.92	39.47	8.22

[1] Pooled SD. [2] One outlier was removed. [a,b]Means with unlike superscripts differ, $P < 0.05$.

Key Words: Enzyme, Digestibility in the Hindgut, Growing Pigs

W139 Effect of sex and feeding level on meat quality and fatty acid profile of backfat of Iberian pigs reared under intensive production systems. M. P. Serrano[1], D. G. Valencia[1], R. Lázaro[1], A. Fuentetaja[2], and G. G. Mateos*[1], [1]*Universidad Politécnica de Madrid*, *Spain*, [2]*Copese*, *Segovia, Spain*.

Iberian (IB) pigs are the ancestral dark-haired pigs of Spain, originally reared under free range conditions and sacrificed at 160 to 180 kg BW. Usually both sexes were castrated. Currently, many IB pigs are reared indoors and fed on concentrates to meet the increasing demand for IB products. We studied in 160 crossbred (Duroc sire x IB dam) pigs the effects of sex (EF, entire females; CF, castrated females; CM, castrated males) and feeding level (*ad libitum* vs. 23% restriction of *ad libitum* feed intake from 42 to 112 kg BW) on meat quality and fatty acid (FA) profile of backfat (BF). From 112 kg BW to slaughter at 152 kg BW, all pigs were fed *ad libitum*. Each treatment was replicated four times (seven pigs). Samples of *Longissimus muscle* (LM) were taken at the last rib level and of BF at tail insertion. No differences were detected between EF and CF for any trait studied ($P > 0.10$). The LM of CM and CF had more fat (8.3 vs. 5.8%; $P < 0.01$) and less crude protein (21.1 vs. 21.7%; $P < 0.05$) and moisture (70.4 vs. 72.3%; $P < 0.01$) than the LM from EF. In all cases the intramuscular fat content of EF was sufficient to generate cured products of high quality. Meat color was not affected by sex ($P > 0.10$). Feeding level did not affect chemical composition or color of LM ($P > 0.10$). Subcutaneous fat was more unsaturated (60.9 vs. 59.9%; $P < 0.01$) in EF than in CM or CF mostly because of the higher linoleic acid content (9.2 vs. 8.6%; $P < 0.01$). *Ad libitum* fed pigs had higher percentage of oleic acid and monounsaturated FA ($P < 0.001$) and lower of stearic acid and saturated FA ($P < 0.001$) than restricted fed pigs. We conclude that entire females are an alternative to castrated males and castrated females to produce Iberian cured products of high quality. Also, a 23% feed restriction from 42 to 112 kg body weight modified slightly the fatty acid profile of backfat but not meat quality.

Key Words: Iberian Pig, Duroc Pig, Pork Quality

W140 Effects of conjugated linoleic acid (CLA) on sow reproductive performance. R. Patterson*, M. L. Connor, and C. M. Nyachoti, *University of Manitoba*, *Winnipeg, Manitoba, Canada*.

The ability of CLA to improve reproductive performance was evaluated using 14 mixed parity Cotswold sows in a completely randomized repeated measured design. Treatments were arranged as a 2x2 factorial with diet (0% or 2% CLA) and parity (I = Immature or M = Mature) as follows: 1) 0%-I n = 3; 2) 0%-M n = 3; 3) 2%-I n = 4; 4) 2%-M n = 4. Diets were fed as gestation rations from d 85 to 112 of pregnancy and for 4 d post-weaning, and as lactation rations from d 112 of gestation until weaning at 17±1 d of age. Blood was collected from sows on gestation d 85, 105, 112 and lactation d 1, 3, 17 and 4 d post-weaning and from piglets on d 3 and 17. Sow BW, back fat depth and feed intake and piglet BW were determined on the same d as blood sampling. Blood samples were analyzed for PUN, IgA and IgG concentrations. BW and back fat depth were used to estimate whole body nutrient status. Dietary CLA had no effect ($P > 0.10$) on sow ADFI and BW during gestation and lactation periods although sows fed CLA-supplemented diets had less back fat than control sows during gestation ($P = 0.05$) but not lactation ($P = 0.15$). Immature sows fed CLA-supplemented diets tended ($P = 0.09$) to lose less back fat than control sows during lactation. Dietary CLA increased sow whole body protein percentage during gestation but not during lactation ($P = 0.05$) but had no effect on whole body lipid content ($P > 0.10$). Piglets nursing sows consuming CLA-supplemented diets were lighter than piglets nursing control sows ($P = 0.06$). However, dietary CLA did not affect total litter weight ($P > 0.10$). Although dietary CLA had no effect on the concentrations of IgA and IgG of sows and piglets ($P > 0.10$), piglets nursing CLA-supplemented sows had greater PUN concentrations compared to piglets nursing control sows at d 3 and 17 of age ($P < 0.01$). While supplementation of sow diets with CLA did not

improve litter performance or immune status pre-weaning, when provided to immature sows, dietary CLA has the potential to diminish deleterious body condition loses associated with lactation.

Key Words: CLA, Sows, Piglets

W141 Apparent and standardized ileal amino acid digestibilities in pea and pea protein isolate fed to growing pigs. F. O. Opapeju, G. Borgesa*, R. Patterson, and C. M. Nyachoti, *University of Manitoba*, *Winnipeg, Manitoba, Canada*.

Four Cotswold barrows (50.41 ± 5.05 kg BW), each fitted with a T-cannula at the distal ileum, were used to determine apparent (AID) and standardized (SID) ileal digestibility of amino acids (AA) in whole pea and pea protein isolate (PPI) from the same batch of whole pea. Pigs were allotted to diets containing either pea or PPI as the sole source of protein and formulated to contain 15.5% crude protein (CP) in a simple crossover design. Pigs were fed twice daily (0830 and 1530) at 2.6 times maintenance energy requirement. The experiment consisted of two 6-d experimental periods. During each period, pigs were adapted to experimental diets for 4 d followed by 12 h of continuous ileal digesta collection on d 5 and 6 to determine AID. The SID of CP and AA were determined by correcting AID values for basal endogenous AA losses using published values. Chromic oxide (0.3%) was included in the diets as an indigestible marker. The AID (%) of CP (88 vs. 80), Ile (91 vs. 79), Leu (92 vs. 81), Lys (93 vs. 84), Phe (92 vs. 84) and Val (89 vs. 76) for indispensable AA and Asp (91 vs. 81), Glu (94 vs. 87) and Ser (89 vs. 78) for dispensable AA were higher ($P < 0.05$) in PPI than in pea. Similar to AID results, PPI contained higher ($P < 0.05$) SID (%) values than pea for Ile (96 vs. 84), Leu (96 vs. 85), Lys (99 vs. 88) Phe (95 vs. 87), and Val (95 vs. 82) for indispensable AA and Asp (95 vs. 85), Cys (85 vs. 77), Glu (108 vs. 100), and Ser (97 vs. 86) for dispensable AA. The results indicate that PPI has higher AID and SID values for most indispensable AA compared with whole pea.

Key Words: Amino Acid Digestibility, Pea Protein Isolate, Pigs

W142 Growth performance and carcass characteristics of growing pigs fed crude glycerol. P. J. Lammers*[1], M. S. Honeyman[1], B. J. Kerr[2], T. E. Weber[2], and K. Bregendahl[1], [1]*Iowa State University*, *Ames*, [2]*USDA-ARS, Swine Odor and Manure Management Research Unit*, *Ames, IA*.

Growth performance and carcass characteristics of growing pigs fed crude glycerol were determined in a 138-d feeding trial conducted at Iowa State University, Ames, IA. Crude glycerol was obtained from AG Processing Inc., Sergeant Bluff, IA and contained 84.51% glycerol, 12.24% water, 2.93% sodium chloride, and 0.32% methanol. Pigs were weaned at 21d of age and fed a commercial starter-pellet for 1 wk. Eight days post-weaning, 96 pigs (48 gilts, 48 barrows) with an average BW of 8.0 ± 0.2 kg were allotted to 24 pens (4 pigs/pen). Gender distribution and pen weight was balanced at the start of the experiment. Dietary regimes were randomly assigned to each pen, with dietary treatments being 0, 5, and 10% crude glycerol inclusion in corn-soybean meal based diets. Within each phase, diets were offered ad libitum in meal form and formulated to be equal in ME, NaCl, and Lys with other AA balanced on an ideal AA basis. There were 5 dietary phase changes over the 138-d trial. Pigs were weighed once every 2 wk with the change in the dietary phase occurring on a day that all pigs were weighed. Feed disappearance was recorded at the time of pig weighing, and G:F calculated. On d 138, all pigs were weighed (mean BW 133 ± 2.3 kg) and scanned using real-time ultrasound. Least-squares means of growth performance and carcass characteristics were compared using PROC MIXED of SAS. There was no difference in ADG ($P = 0.93$), ADFI ($P = 0.65$), or G:F ($P = 0.13$) among the 3 dietary treatments over the 138 d trial. Dietary treatment did not affect backfat depth ($P = 0.14$), loin muscle area ($P = 0.12$), or percentage fat free lean on a live basis ($P = 0.13$). Pig gender affected backfat depth ($P < 0.001$) and percentage fat free lean on a live basis ($P < 0.001$), but there was no diet by gender interaction for any parameter measured. Growing pigs can be supplemented with up to 10% crude glycerol without affecting growth, efficiency of gain, or carcass composition.

Key Words: Crude Glycerol, Pigs

W143 True phosphorus digestibility of feedstuffs determined with growing and finishing pigs. S. Bunzen, H. S. Rostagno*, L. T. Albino, L. R. Apôlonio, and C. G. Borsatto, *Federal University of Viçosa*, *Viçosa, MG, Brazil*.

The objective of this study was to determine the true phosphorus digestibility coefficients (TPDC) of 18 feedstuffs commonly used in swine diets, including: plant sources, animal by-products and inorganic sources of phosphorus. A complete randomized experimental design was applied in a trial with individual metabolic cages with three replicates per treatment and one pig (barrow) per experimental unit, in a 2 x 2 x 20 factorial arrangement of two methodologies applied simultaneously (Cr2O3 as fecal marker and total fecal collection), two growth phases (Growing with 37.5Kg and finishing with 72.5 Kg) and 18 feedstuffs. Two additional diets were included in the factorial experiment; a reference diet (0.17% P) where the evaluated feed ingredients were included to furnish either 0.15 or 0.20% P, and a low P diet (0,03% P) to estimate fecal P endogenous losses. There was no difference ($P>0.05$) between the two methodologies evaluated (marker 64.5% TPDC vs. total collection 65.8% TPDC). The TPDC of plant feedstuffs was lower ($P<0.05$) when determined with growing pigs as compared to the values obtained with finishing pigs. The TPDC of plant sources for the growing and finishing phases were, respectively: Corn, 54.8 and 81.9%; sorghum, 51.5 and 82.5%; corn gluten feed (22% CP), 33,3 and 49,4%; corn gluten meal (60% CP), 48.6 and 57.8%; cottonseed meal (30% CP), 34.8 and 46.4%; wheat bran & middling, 52.2 and 59.3%; soybean meal, 51,0 and 53,4%; soybean full fat extruded, 44.7 and 66.9% and yeast from alcohol distillery, 62.2 and 70.9%. The TPDC of animal by-products and inorganic sources of phosphorus showed no effect of growing phase ($P>0.05$), with the following average values: meat and bone meal (41% CP), 62.9%; feather and poultry by-products meal, 52.5%; feather meal, 90.8%; fish meal, 88.5%; dried whey, 92.0%; dicalcium phosphate, 66.4%; monocalcium phosphate, 76.1; monodicalcium phosphate, 80.6% and steamed bone meal, 61.8%.

Key Words: Digestible Phosphorus, Feedstuffs, Swine

W144 Effect of phytase on phosphorus and calcium digestibility in lactating sows. J. Tossenberger[1], L. Babinszky*[1], and I. Kühn[2], [1]*University of Kaposvár*, *Kaposvár, Hungary*, [2]*AB Enzymes GmbH*, *Darmstadt, Germany*.

The objective was to determine the effect of dietary phytase supplementation on Ca and P digestibility in lactating sows. The trial used hybrid sows [(Large White x Landrace; average parity: 3.8; 8 sows per treatment (Trt)]. Diets were wheat-barley-soybean meal based and followed NRC energy and amino acid recommendations (1998). Diet in Trt1 had no inorganic P (P_t:3,6 g/kg, Ca:4,3 g/kg) and no phytase supplementation. Dietary P content in Trts2, 3 and 4 was the same as in Trt1, but all were supplemented with phytase (type: 6-phytase produced by *trichoderma reesei*) at a rate of 125 PPU/kg (Trt2), 250 PPU/kg (Trt3) and 500 PPU/kg (Trt4), respectively. Faeces were collected between days 18 and 22 of lactation. Data were analyzed with ANOVA (SAS, 2004). It was concluded based on the results that the feed intake of negative control sows was significantly below ($P \leq 0.05$) the feed intake of animals fed the phytase supplemented diets. Apparent P digestibility was found to be unusually low in contrast to the relatively high values generally described for wheat-barley based diets. This is probably attributable to the low P intake due to low dietary P levels, and to the high endogenous P-portion of the total faecal P excretion. Each of the tested phytase dosages (125 PPU/kg; 250 PPU/kg; 500 PPU/kg) resulted in a further significant ($P \leq 0.05$) increase of P digestibility (Trt1: 22.3%, Trt2: 29.9%, Trt3: 33.5%, Trt4: 36.1%). The expected maximum of P digestibility can not be estimated on the basis of phytase dosages tested. As a result of the lowest phytase dosage (125 PPU/kg) Ca digestibility increased significantly ($P \leq 0.05$). Further increase of the phytase dosages (250 and 500 PPU/kg Phytase) were not accompanied by a further increase of dietary Ca digestibility ($P \geq 0.05$). Supplementation of the wheat-barley-soybean meal based diet of lactating sows (without P_i supplementation) with 100 PPU/kg of this 6-phytase, is expected to increase the P digestibility by 2.6% (R^2: 0.84).

Key Words: Lactating Sow, Phosphorus Digestibility, Phytase

W145 Effect of dietary fat and restriction on productivity and fatty acid composition of Iberian pigs. J. Viguera*[1], M. Señorón[2], M. Cortés[3], J. Peinado[1], J. Ruiz[3], and P. Medel[1], [1]*Imasde Agropecuaria, S.L.*, *Pozuelo de Alarcón, Spain*, [2]*SAT Villa Vieja*, *Olivenza, Spain*, [3]*Universidad de Extremadura*, *Cáceres, Spain*.

A total of 160 Iberian x Duroc pigs (50% male, 50% female, all castrated) of 40.3±2.7kg of initial BW was used to study the influence of dietary fat source and feed restriction on productivity and subcutaneous fatty acid composition. There were 3 experimental periods; i) grower: 40–80kg BW, 98d of trial, common diets *ad lib*; ii) fattening: 80–114kg BW, four treatments arranged as a 2x2 factorial design: *ad lib* (31d) *vs* restricted (51d), diets containing Iberian lard –IL– *vs* oleic acid enriched sunflower oil –OESO– and iii) finisher: 114kg–slaughter, 77d, diets based on IL or OESO *ad lib*. Final BW and experiment duration were 167.4 *vs* 171.5 kg, and 206 *vs* 226 d, for pigs fed *ad lib* and restricted, respectively. The oleic levels were 1.72, 2.65, 2.55 and 3.75% for IL and OESO diets in the fattening and finisher periods, respectively. Each treatment was replicated four times (ten pigs housed together). Productivity was measured per pen every 28d, and biopsies were taken at 98, 129, 149, 207 and 225d for fatty acid analysis. In the grower period, restricted pigs showed lower feed intake, and poorer growth and feed conversion (4,777 *vs* 2,784 g/d, 1,130 *vs* 582 g/d and 4.23 *vs* 4.80 feed/gain, respectively, $P<0.05$). However, in the finisher period, pigs restricted in the grower period had better growth and feed conversion (652 *vs* 778 g/d and 5.94 *vs* 5.23 feed/gain, $P<0.05$) and tended to eat more (3,868 *vs* 4,054 g/d, $P=0.09$) than pigs fed *ad lib*. For the whole period, restricted pigs in the grower period ate and grew less but showed better feed conversion than pigs fed *ad lib* (614 *vs* 581 g/d, 2,994 *vs* 2,759 g/d and 4.88 *vs* 4.75 feed/gain, respectively; $P<0.05$). In addition, feed restriction slightly decreased oleic acid and increased linoleic acid at 129 and 149d. Fat sources did not modify any performance parameter. However, IL consumption slightly increased palmitic acid at 207d, and decreased linoleic acid at 225d and oleic acid at 149, 207 and 225d. It is concluded that the restriction level tested increased the growth period, but improved feed conversion by 2.7%. Fat sources tested caused slight variations in the fatty acid composition.

Key Words: Iberian Pig, Fat Sources, Restriction

W146 Effect of dietary fat on productivity, fatty acid composition and lipid oxidation in Iberian pigs. J. Viguera*[1], M. Señorón[2], M. Cortés[3], J. Peinado[1], and J. Ruiz[3], [1]*Imasde Agropecuaria, S.L.*, *Pozuelo de Alarcón, Spain*, [2]*SAT Villa Vieja*, *Olivenza, Spain*, [3]*Universidad de Extremadura*, *Cáceres, Spain*.

A total of 160 Iberian x Duroc pigs (50% males and 50% females, all castrated) of 35.8±1.3 kg of initial BW was used to study the influence of dietary fat source on productivity, fatty acid composition of intramuscular (IM) fat, and lipid oxidation of pork. A common diet was used from 35 to 110 kg BW. There were four treatments depending on the source of supplemental fat (5 %) from 110 to 170 kg BW: 1) Iberian lard –LARD–, 2) oleic acid enriched sunflower oil –OESO–, 3) olive fatty acid distillers –OFAD– and, 4) olive oleins –OLEI–. The oleic acid levels of the diets were 2.56, 3.77, 3.60, 3.81% for treatments 1 to 4, respectively. Each treatment was replicated four times (ten pigs housed together). After slaughter, samples of the *longissimus* muscle of the last rib of two pigs selected at random per replicate were obtained to quantify the fatty acid composition of the neutral (NL) and polar (PL) lipid fractions of IM fat, and 2–thiobarbituric acid reactive substances (TBARS) at 0, 50, 100 and 200 min of induced lipid oxidation. Pigs fed OFAD showed higher final BW and better feed conversion ratio than pigs fed OESO (172.6 *vs* 163.7 kg and 5.51 *vs* 6.14 g feed/g gain respectively; $P<0.05$). In the PL fraction of IM fat, pigs eating OFAD showed higher linoleic acid values than pigs eating diets with OLEI, LARD and OESO (0.77 *vs* 0.61, 0.56 and 0.48 %; $P<0.01$); pigs fed OESO had more oleic acid than those fed LARD (18.7 *vs* 15.8 %; $P<0.05$); and pigs supplemented with OESO and OLEI showed the highest percentage of polyunsaturated fatty acids ($P<0.05$). At 100 and 200 min, meat from pigs fed LARD showed significantly higher levels of TBARS than those fed the others fat sources. It is concluded that fat sources tested in this study did not modify substantially the fatty acid composition of intramuscular fat. However, diets supplemented with vegetable fats reduced the lipid oxidation of pork loin, probably due to the presence of compounds with antioxidant activity.

Key Words: Intramuscular Fatty Acids, Iberian Pig, Fat Sources

W147 Effect of lignocellulose intake on the ileal endogenous amino acid losses in growing pigs. L. Babinszky*, J. Tossenberger, and J. Tenke, *University of Kaposvár*, *Kaposvár, Hungary*.

Lignocellulose based fiber (LCF) ingredients are increasingly used in pig diets. We studied the changes of ileal endogenous nitrogen (EN) and amino acid (EAA) excretion in response to the LCF supplementation of N-free diets. A total of 12 hybrid barrows were used in the trial (4 treatments, 3 per treatment, 2 replicates, live weight 30±3 kg). Prior to the trials pigs were fitted with a PVTC cannula. The rate of ileal EN and EAA excretion was measured in a total of 4 treatments where N-free diets contained 20-, 36-, 52 and 68 g/kg LCF. Daily rations of the N-free diet contained 2 times the maintenance energy requirement (920 KJ ME/kg$^{0.75}$/d). Diet specification and the DM, CP and AA content of the digesta were determined in accordance with AOAC (1996). Water holding capacity (WHC) of the diets was determined according to Robertson and Eastwood (1981). Trial data were analyzed with ANOVA and regression analysis (SAS, 2004). Our data show a difference of only 18.3 % between the EN excretion of pigs consuming the lowest (20g/kg) and the highest (68g/kg) level of LCF in their diet. The decrease was found to be the largest with MET (21 vs. 11 mg/100 g DMI), THR (81 vs. 52 mg/100 g DMI), TRP (14 vs. 9 mg/100 g DMI). The decrease of LYS excretion was 27.5 % (58 vs. 42 mg/100 g DMI). The probable cause of decrease is the higher WHC due to the increasing dietary LCF level (data not shown). A close linear relationship ($R^2 = 0.99$) was found between the dosages of LCF and the EN excretion of growing pigs. Similarly to the findings for N-excretion a close linear relationship ($R^2 = 0.9 – 0.99$) was found between the dietary LCF content and the rate of ileal EAA excretion. Our data underline that in the calculation of true amino acid digestibility of pig diets no uniform adjustment should be applied to the rate of ileal EN and EAA excretion, and in addition to the crude fiber and NDF content of the diets also the fiber source and its WHC should be taken into account.

Key Words: Lignocellulose, Endogenous Amino Acids, Pigs

W148 The effect of wheat dried distillers grains plus solubles in diets for fattening pigs with or without xylanase. K. Sigfridson and A.-K. Haraldsson*, *Lantmännen*, *Lidköping, Sweden*.

The ethanol production from wheat is growing in Sweden and the volumes of DDGS will increase. Two feeding experiments were performed in order to evaluate wheat DDGS for pigs and the effect of xylanase on a DDGS based diet. Exp 1 comprised of 3 diets, formulated with 0% (control), 10 % and 20% DDGS. Each diet was fed to18 pens (2 pigs/pen). In exp 2 diets with 0% (control), 20% DDGS and 20% DDGS + 200 FXU endo-1,4-beta-xylanase (Ronozyme WX) were fed to 12 pens/treatment (4 pigs/pen). The control diets were based on wheat, barley, RSM, SBM and peas. All diets had a calculated energy value of 12.4 MJ ME/kg and 15% CP. The standardized ileal digestible lysine was 7,7 g (8,5-8,9 g total) and 7,1 g (8,0-8,2 total) per kg for exp 1 and 2, respectively. The pigs were fed each diet from 22 to 110 kg LW, close to ad libitum before 60 kg and restricted after 60 kg LW (34 MJ/d). Data was analysed as least square means (PROC GLM, SAS). At 20% DDGS inclusion level the diets were to 90-95% based on wheat products and barley. To compensate for the decrease in protein quality, the use of pure lysine, threonine and methionine were increased by over 100% in the experimental diets compared to the control. In exp 1, pigs fed the control diet had a DWG of 897g/d, a FCR of 33,6 MJ/kg and 58,2% lean meat content (carcass quality). The DDGS diets did not significantly influence any of these parameters. In exp 2, the performance of the control diet was similar to exp 1, but the DWG and FCR were significantly ($p<0,05$) lower for the diets with 20% DDGS (-4%). Since wheat DDGS is rich in low digestible carbohydrates, the addition of xylanse was thought to improve the DDGS based diet, but no such effect could be proven. It can be concluded that wheat DDGS can be used to fattening pigs, but the inconsistent results from these experiments indicate that variation in the nutritional value of the product can have a significant negative effect on pig performance. Thus, it is of great importance that producers of DDGS provide a consistent product and that the knowledge of energy content and protein digestibility is improved.

Key Words: Wheat DDGS, Fattening Pigs, Xylanase

W149 Isolation and characterization of Bacillus sp. PPS-52 producing thermophilic protease. S. J. Lim and D.-K. Kang*, *Dankook University*, *Cheonan, Choongnam-do, Rep. of Korea*.

Protease enzyme enhances the nutritional value of animal feeds. A thermophilic bacterium PPS-52 showing proteolytic activity against both skim milk powder and defatted soybean was isolated from pig feces. The isolate was found to be the Gram-positive, non-motile, catalase-positive, and spore forming strain. Under an electron microscope, the cells were observed to be rod-shaped. The 16S rDNA sequences of the isolate PPS-52 showed high homology (99%) with that of Bacillus amyloliquefaciens, examined by similarity search using the GenBank database, thus named Bacillus amyloliquefaciens PPS-52. The purification and characterization of the thermophilic protease are under way.

Key Words: Thermophilic Protease, Bacillus

W150 Comparison of the digestible energy content of corn and triticale when fed to finishing pigs. C. Feoli*, J. D. Hancock, C. R. Monge, and T. L. Gugle, *Kansas State University*, *Manhattan*.

A total of 96 finishing pigs (average initial BW of 91 kg) was used in a 5-d experiment to determine the DE content of corn and triticale. The diets were either corn- or triticale-based with added vitamins, minerals, and amino acids. The result was diets with 97.5% corn and 97.8% triticale. Pigs used in the experiment were sorted by sex and ancestry, blocked by BW, and assigned with 12 pigs/pen and four pens/treatment. Feed (meal form) and water were consumed on an ad libitum basis. The pigs were allowed to adjust to the experimental diets for 4 d. Feces were collected from no less than six pigs per pen (via rectal massage) on the afternoon of the fourth day and morning of the fifth day. The fecal samples were dried, ground, and analyzed for concentrations of DM, N, and GE with Cr2O3 used as an indigestible marker. Digestibility of DM was greater ($P < 0.03$) for pigs fed corn vs. triticale (82.8 vs. 81.2%, respectively). However, the opposite was true for digestibility of N ($P < 0.002$) with values of 67.8% for corn and 74.7% for triticale. Digestibility of GE was not different ($P > 0.26$) among the treatments (81.1 and 80.5% for the corn and triticale, respectively). However, because of the greater GE in the triticale, it still had a higher DE content ($P < 0.02$) in triticale with DE value of

3,376 than that of 3,261 kcal/kg in corn. In conclusion, our results indicated that triticale was utilized well by finishing pigs supporting greater digestibility of N and having greater DE than corn.

Key Words: Triticale, DE, Pigs

W151 DXA scans of pig feet accurately predict bone ash content. L. E. Hoffman*, T. Burgers, D. K. Schneider, and T. D. Crenshaw, *University of Wisconsin*, *Madison*.

Dual-energy X-ray absorptiometry (DXA) offers a rapid method to predict bone ash content of humans, animals, and tissues. Earlier work in our laboratory demonstrated that the GE Lunar Prodigy instrument (software version 10.10.038), in selected scan modes, accurately predicted the bone ash content of pigs from 1 to 60 kg. The current experiment was designed to assess the accuracy of DXA scans of pig feet as a rapid screening method to evaluate qualitative responses by pigs to nutrient treatments affecting mineral status. The front foot was selected as an easily accessible sample to collect from carcasses in a slaughter plant. The front foot included all bones distal of the carpal bones. Ten pig feet were aligned parallel to the DXA bed and placed in various orientations to determine which position allowed the most accurate prediction of bone ash content. Orientations included 1) direction of hoof, hoof either scanned first or carpal bones first, 2) dewclaw orientation, dewclaws facing up or down. Another variable included variation in background material, either 2.5 cm or 5 cm thick rice bags, and the position of rice bags, either both beneath the foot or one below and one above the foot. Following scans all bones within each foot were dissected, dried at 100°C for 24 h, and ashed at 750°C for 12 h. Total bone ash content from each foot was compared by regression analysis with bone mineral content (BMC) from DXA scans within each orientation and type of background material. Selection of the regression models to most accurately predict bone ash content from DXA scans were based on the model with a coefficient closest to 1.0. The model selected (ash = -0.403 + 0.988*BMC, R^2=0.979) was based on scans with the hoof scanned first, dewclaws down, and two rice bags beneath the foot. The model with the lowest coefficient (ash = 11.6 +0.717*BMC, R^2=0.836) was based on scans with hoofs scanned last, dewclaws up and one rice bag. In conclusion, DXA scans of pig feet can accurately predict bone ash content of the foot, but foot orientation and background material are important variables.

Key Words: Bone Ash, DXA, Pig Feet

W152 Short-term excesses of potassium bicarbonate for prevention of fatigue in market pigs. J. R. Danielson*, J. L. Reichert, J. A. Kane, and T. D. Crenshaw, *University of Wisconsin*, *Madison*.

The objective of this study was to determine the efficacy of excess cations for prevention of acidosis in market pigs following a brief period of aggressive handling. Thirty two pigs (~115 kg) were used in two replicate trials (16/trial). Pigs were allowed access to either alkaline (ALK, 30.2 g $KHCO_3$/liter) or water (W) treatments via a nipple waterer. Following a 24-h water restriction, pigs were allowed access to ALK or W treatments for 18 h. Pigs were housed 4/pen and allowed ad libitum access to a standard diet. Handling protocols, gentle (GE) or aggressive (AG) were applied to randomly selected pigs within each pen. Total distance for each handling protocol was ~ 960 ft. For AG pigs, handling involved movement through a restricted chute (5 times) with intentional crowding and application of shocks with an electrical prod. The GE pigs were walked the same distance and passed through a restricted chute (5 times) with only a hurdle board used to guide the pigs. In the first trial, 2 pigs from each pen were assigned to GE and AG treatments. In the second trial, 1 pig from each pen was GE and 3 were AG handled (in order to obtain more AG observations). Immediately after completion of handling treatments, venous blood was collected in 10 mL heaprinized vacutainer tubes for blood gas, NH_4 and lactate assays. Blood gas values (SBE, standard base excess, pH, HCO_3) were reduced ($P<0.05$) in AG vs GE pigs, but NH_4 and lactate concentrations were increased ($P<0.05$), consistent with acidosis following AG handling. Differences in blood gas values were not detected ($P>0.10$) between ALK and W treatments within handling protocols. However, in AG pigs given ALK, plasma NH_4 concentrations were greater ($P<0.05$) than pigs given W. Likewise, plasma lactate in ALK pigs tended ($P<0.10$) to be higher than W pigs after AG handling. Conclusions from these data are compromised by measurements obtained from a single time point following AG handling. More frequent sampling intervals are needed to assess the changes in acidosis with ALK treatments after AG handling.

Key Words: Fatigue, Acidosis, Potassium

W153 Effects of dietary supplemental Megazone® on growth performance, nutrients digestibility, blood characteristics, meat quality and carcass traits in weaning-to-finishing pigs. Y. H. Kim*[1], Y. Wang[2], J. C. Park[1], H. J. Jung[1], J. H. Cho[2], Y. J. Chen[2], J. S Yoo[2], I. C. Kim[1], S. J. Lee[1], H. K. Moon[1], and I. H. Kim[2], [1]*National Livestock Research Institute*, *Cheonan, Chungnam, Republic of Korea*, [2]*Dankook University*, *Cheonan, Chungnam, Republic of Korea*.

This study was conducted to investigate the effects of Megazone® (an alumninosilicate mineral mix, which include 30% quartz, 30% feldspar, 30% ceramic and 10% biotite) supplementation on growth performance, nutrients digestibility, blood characteristics, meat quality and carcass traits in weaning-to-finishing pigs. A total of 48 crossbred ([Landrace×Yorkshire]×Duroc) pigs with initial BW of 4.46 ± 0.18 kg were used in a 21 wks trial. Pigs were randomized allocated to two dietary treatments. There were 6 pens per treatment and 4 pigs per pen. Dietary treatments included: 1) CON (basal diet) and 2) MT (basal diet + 0.8% Megazone®). Through the entire experimental period, there were no effects of dietary Megazone® supplementation on growth performance, nutrients digestibility, blood characteristics and meat quality ($P>0.05$). Also, market weight and backfat thickness had no differences between the two treatments ($P>0.05$). However, carcass weight and carcass ratio in MT treatment were improved compared with CON treatment ($P<0.05$). In conclusion, supplmentation of Megazone® can increase carcass weight and carcass ratio in weaning-to-finishing pigs, however, it has no effects on growth performance, nutrients digestibility, blood characteristics and meat quality traits.

Key Words: Megazone®, Alumninosilicate, Digestibility

W154 Pharmacological addition of zinc to diets inhibits phytase activity but does not compromise inorganic phosphorus (iP) retention in young growing pigs. K. M. Retallick*, M. T. Repinski, J. L. Reichert, J. R. Danielson, D. K. Schneider, and T. D. Crenshaw, *University of Wisconsin*, *Madison*.

Pharmacological Zn addition interferes with apparent P retention in pigs fed diets formulated with phytase. Whether Zn directly inhibits phytase or simply inhibits availability of P is not clear. Hypothetically, bone mineral accumulation is compromised in growing pigs by adding Zn to diets with phytase. Forty eight crossbred (PIC Cambrough X Line 19) pigs (initial BW = 9.1+0.10 kg) were randomly allotted within gender and weight blocks to one of eight diets. Pigs were individually fed assigned diets for 56 d. Pig weights and feed consumptions were recorded weekly. Pigs were scanned by dual-energy X-ray absorptiometry (DXA) using a GE Lunar Prodigy (software version 10.10.038). Total bone mineral (BMC, g) and Ca and P retentions were based on differences between individual pig scans at 56 d and predicted BMC on d 0. BMC on d 0 was predicted from earlier trials as BMC = 24.1+14.1*BW, R^2=0.92. Experimental design of dietary treatments involved a slope ratio comparison of iP (0, 0.12 and 0.24% added iP) and phytase (Natuphos to provide 200, 400, and 600 FTU/kg diet) additions to a basal diet. Two diets included ZnO (2000 mg/kg) additions to mid-point levels of each group, 0.12% iP and 400 FTU. Dose response relationships in BMC gain (g/d) were detected (P<0.05) in pigs fed iP or phytase diets. Added Zn reduced (P<0.01) BMC gain in pigs fed diets with phytase, but not iP. Ca and P retention was calculated from BMC gain, assuming a constant Ca (38%) and P (18%) content in bone ash and a constant distribution of total body Ca (96%) and P (80%) within skeletal tissue. Pigs fed diets with iP retained (P<0.05) more P than pigs fed equivalent diets with phytase, even though BW gain was not different (P>0.20). Thus, assumed P equivalency values for phytase did not meet expectations. P retention in pigs fed added Zn was reduced if fed 400 FTU/kg diets, but not if fed diets with 0.12% iP. Added Zn reduced (P<0.05) efficiency of P retention in pigs fed phytase (24% vs 33%), but not iP (34% vs 33%). In summary, Zn interferes with phytase activity, but not iP bioavailability.

Key Words: Efficiency, Mineral Accretion, Phosphate

W155 Effects of dietary supplementation of ginseng by-product on growth performance and pork quality parameters in finishing pigs. J. C. Park*, Y. H. Kim, H. J. Jung, S. D. Lee, H. D. Jang, I. C. Kim, S. J. Lee, and H. K. Moon, *National Livestock Research Institute*, *Cheonan, Chungnam, Republic of Korea*.

The objective of the present study was to investigate the effects of dietary supplementation of ginseng by-product on growth performance and meat quality in finishing pigs. The animals used in the experiment were a total of 24 Landrace × Yorkshire and the average weight was 65.81±2.02 kg. The experimental diets were basal diet (CON) and supplemented diet with 2.5% ginseng by-product (GBP) which replaced lupin in the basal diet. The diets were fed for 60 days. The pigs were divided into three replicates of four pigs in each treatment according to completely randomized design. In growth performance, average daily feed intake was lower (P<0.01) in GBP than in CON. In biochemical composition of plasma, total protein (P<0.05), blood urea nitrogen (P<0.05), glucose (P<0.05), albumin (P<0.05), calcium (P<0.05) and inorganic phosphate (P<0.05) were increased in GBP when compared to CON. Carcass and meat quality were not different between treatments. Total ginsenoside content of meat was higher (P<0.01) in GBP than in CON. TBARs was significantly lower in GBP than in CON for 6 d (P<0.05). The results indicate that dietary supplementation of ginseng by-product affected positively biochemical composition of plasma, total ginsenoside content and TBARs of pork. This study, therefore, suggests that ginseng by-product could be used in the finishing diet of pigs.

Key Words: Ginseng By-Product, Finishing Pigs, Biochemical Composition

W156 Comparative determination of true digestibility and the fecal endogenous calcium losses associated with soybean meal for growing barrows and gilts by the regression analysis technique. Y. Zhang*[1], J. Wang[2], S. Yan[1], Y. L. Yin[3], and M. Z. Fan[4], [1]*Inner Mongolian Agricultural University*, *Huhhot, China*, [2]*The Chinese Academy of Agricultural Sciences*, *Beijing, China*, [3]*Institute of Subtropical Agriculture, the Chinese Academy of Sciences*, *Changsha, China*, [4]*University of Guelph*, *Guelph, Canada*.

Two digestibility experiments were conducted to comparatively determine true digestibility and the fecal gastrointestinal endogenous calcium (Ca) losses associated with conventional solvent-extracted soybean meal (SBM) for growing barrows and gilts. Experiment 1 was conducted with six Yorkshire x Landrace cross-bred barrows with an average initial BW of 28.6±1.8 kg. Experiment 2 was conducted with six Yorkshire x Landrace cross-bred gilts with an average initial BW of 27.6±3.0 kg. Pigs in both experiments were fed six cornstarch-based semi-purified diets containing six levels of total Ca (0.79, 1.19, 1.55, 2.07, 2.38 and 2.81 g/kg DMI) from SBM according to a 6x6 Latin square design for six periods. Chromic oxide (3.5 g/kg diet, on as-fed basis) was included as a digestibility marker. Each experimental period consisted of 8 d with a 6-d adaptation and a 2-d collection of representative fecal samples. There were linear relationships (P<0.05) between the apparent fecal digestible and the total Ca intake in both the barrow and the gilt experiments, indicating true Ca digestibility and the endogenous fecal Ca losses associated with SBM could be measured by the simple linear regression analysis technique. True fecal Ca digestibility (44.3 ± 8.4 vs. 23.4±1.8%, n = 36) and the fecal endogenous Ca loss (1.08 ± 0.01 vs. fecal, 0.43 ± 0.001 g/kg DMI, n = 36) associated with SBM were higher (P<0.01) in the growing barrow than in the gilt. Our results suggest that there are likely differences in true Ca digestibility measured in feed ingredients between barrows and gilts. Barrows may have a high digestive capacity in processing dietary Ca, however, they may have a higher level of Ca requirement for the maintenance due to the larger fecal endogenous Ca loss compared with the gilt.

Key Words: Calcium, Fecal Endogenous Loss, True Digestibility in Pigs

W157 Evaluation of corn grain with the genetically modified event DAS-59122-7 fed to growing-finishing pigs. H. H. Stein*[1], D. W. Rice[2], B. L. Smith[2], M. A. Hinds[2], T. E. Sauber[2], C. Pedersen[3], D. M. Wulf[4], and D. N. Peters[4], [1]*University of Illinois*, *Urbana*, [2]*Pioneer Hi-Bred International Inc.*, *Johnston, IA*, [3]*Danisco Animal Health*, *Marlborough, UK*, [4]*South Dakota State University*, *Brookings*.

An experiment was conducted to assess the nutritional equivalency of corn grain with the genetically modified input trait Cry34/45Ab1 containing the DAS 59122-7 event. This modified transgenic grain is resistant to western corn rootworm and is also tolerant to the herbicide glufosinate-ammonium. The modified grain, a non-transgenic near-isoline control grain, and a commercial hybrid were grown in 2005 in isolated plots (201m apart) at the same location. A total of 108 pigs were allotted to corn-soybean meal diets containing each of the 3 grains as the sole source of corn. Pigs were fed grower diets from 37 to 60 kg, early finisher diets from 60 to 90 kg, and late finisher diets from 90 to 127 kg. Within each phase, data for ADG, ADFI, and G:F were calculated. At the conclusion of the experiment, pigs were harvested at a meat science laboratory and data for carcass quality were collected. Estimate statements were used to compare values from pigs fed diets containing the control corn and pigs fed diets containing the modified corn. Pigs fed diets produced with conventional corn were used as an additional comparator to evaluate the biological significance of any statistical differences. For the entire experimental period, pigs fed the control and the modified corn had similar final BW (128.9 vs. 127.1 kg), ADG (1.02 vs. 1.00 kg per day), ADFI (2.88 vs. 2.80 kg per day), and G:F (0.356 vs. 0.345 kg per kg). Likewise, no differences in dressing percentage (76.48 vs. 76.30%), loin eye area (49.8 vs. 50.4 cm^2), 10^{th} rib back fat (2.20 vs. 2.12 cm) and lean meat (52.9 vs. 53.4%) were observed between pigs fed the control and the modified corn grain. It is concluded that the nutritional value of the modified transgenic corn grain containing event DAS-59122-7 is similar to that of its non-transgenic counterpart.

Key Words: DAS-59122-7, Pigs, Transgenic Corn

W158 Reactive lysine in distillers dried grains and distillers dried grains with solubles measured with the homoarginine or the furosine procedure. A. A. Pahm*[1], C. Pedersen[2], D. Simon[3], and H. H. Stein[1], [1]*University of Illinois*, *Urbana*, [2]*Danisco Animal Nutrition*, *Marlborough, UK*, [3]*South Dakota State University*, *Brookings*.

The objective of this study was to measure the concentration of reactive Lys in 36 samples of distillers dried grains with solubles (DDGS) and in 1 sample of distillers dried grain (DDG) using the homoarginine procedure and the furosine procedure. The standardized ileal digestibility (SID) of Lys in these samples had previously been measured using growing pigs. The homoarginine procedure allows for a direct measurement of reactive Lys by converting all reactive Lys in the sample to homoarginine via guanidination with O-methylisourea. The homoarginine concentration in each sample can then be directly measured. The furosine procedure on the other hand measures the concentration of furosine in each sample, which allows for the calculation of the un-reactive (blocked) Lys in the samples. By subtracting the amount of un-reactive Lys from the total Lys in the sample, the concentration of reactive Lys is calculated. Results of the experiment showed that the concentration of reactive Lys was 74.5% of the total Lys in the samples if the homoarginine procedure was used and 82.5% if the furosine procedure was used. Therefore, the amount of un-reactive Lys in the samples was calculated as 25.5 and 17.5%, respectively, by the homoarginine and the furosine procedures. This indicates that a relatively large proportion of the Lys in DDGS and DDG has been heat-damaged during drying of the samples. The values for reactive Lys were correlated with the concentrations of SID Lys in the samples. The results of these analyses indicated that reactive Lys measured by the homoarginine procedure or the furosine procedure was correlated with SID Lys with reasonable accuracy (r^2 = 0.69 and 0.65, respectively; $P \leq 0.01$). It is concluded that some of the Lys in DDGS and DDG is un-reactive and that the concentrations of un-reactive and reactive Lys in the samples may be measured using either the homoarginine or the furosine procedure.

Key Words: Furosine, Homoarginine, Reactive Lys

W159 Ensilage of the high moisture sorghum related to the endosperm structure and starch granules. A. B. R. C. Lopes*[1], D. A. Berto[1], M. Cereda[2], M. Leonel[2], and C. Costa[1], [1]*FMVZ/UNESP*, *Botucatu, SP, Brazil*, [2]*Cerat/FCA/UNESP*, *Botucatu, SP, Brazil*, [3]*FAPESP*, *São Paulo, SP, Brazil*.

The high moisture sorghum grains, naturally moist or reconstituted grains, offers advantages if compared to dry grains, as it deactivates the tannin and improves the protein digestibility. Thus, positive results were obtained in studies that employed the sorghum silage for poultry and piglets. The storage of grains picked with high moisture under anaerobiosis conditions can be a more practical solution, if compared to the dry grains. The silage offers reduced production costs and presents agronomical advantages, such as early harvest (about three to four weeks in advance), enabling a more effective utilization of the harvesting machines, thus leaving the area free for other cultivations, reduced contamination and losses in the field (stratification, insects and fungi) and in the harvest process, reduced qualitative and quantitative losses of grains attacked by worms and moths in the storage area, better digestibility and animal performance. The purpose of this study was to evaluate the ensilage effects of high moisture sorghum grains on the silo temperature, quality parameters and the changes in the endosperm and starch granules. The treatments were studied: dry grinded sorghum (low tannin); dry grinded sorghum (high tannin); high moisture grinded and ensilaged sorghum (low tannin); high moisture grinded and ensilaged sorghum (high tannin). The values of pH silages varied between 3.80 to 4.0. The high moisture grain ensilage and chemical preservation determined a reduction of the starch contents, if compared to the dry sorghum. During the ensilage process, there was a rupture of the proteic matrix (that involves the starch granules), and structural alterations, such as the increase of the pore diameters, similar to that occurring in the enzymatic digestion.

Key Words: Starch, Temperature Monitoring, Silage of High Moisture Grains

W160 Effect of weaning age on nursery pig growth performance. B. E. Bass*, C. L. Bradley, Z. B. Johnson, J. W. Frank, and C. V. Maxwell, *University of Arkansas*, *Fayetteville*.

Two studies were performed to determine the effect of weaning age on pig performance in the nursery. Feed intake and BW were recorded at the end of each phase. Initial BW was used as a covariate in the data analysis. In experiment 1, 270 pigs [GPK348 × EB and (GPK348 × GPK4) × EB] were weaned at an average of 18.2 d of age (BW = 6.42 kg) or 20.8 d of age (BW = 6.48 kg) and housed 9 pigs/pen in a wean-to-finish facility. Pigs were fed common Phase 1 (d 0 to 13) and Phase 2 (d 13 to 34) diets. There were no differences in BW, ADG, ADFI, or G:F with weaning age in the wean-to-finish facility.

In experiment 2, 252 pigs (GPK35 × EBX) were weaned at an average of 19.0 d of age (BW = 5.91 kg) or 21.8 d of age (BW = 6.55 kg) and housed 6 pigs/pen in an offsite nursery. Pigs were fed common Phase 1 (d 0 to 13), Phase 2 (d 13 to 28), and Phase 3 (d 28 to 41) diets. Pigs weaned at 21.8 d of age were heavier than pigs weaned at 19.0 d of age at the end of Phase 1 (10.15 vs. 9.83 kg), Phase 2 (19.23 vs. 18.52 kg), and Phase 3 (28.95 vs. 27.77 kg) ($P < 0.05$). Additionally, ADG was greater for pigs weaned at 21.8 d during Phase 1 (302 vs. 277 g/d), Phase 2 (606 vs. 578 g/d), Phase 3 (748 vs. 710 g/d), and over the entire nursery period (554 vs. 525 g/d) ($P < 0.05$). Pigs weaned at 21.8 d of age also had greater ADFI than those weaned at 19.0 d of age during Phase 1 (379 vs. 351 g/d), Phase 2 (996 vs. 927 g/d), Phase 3 (1422 vs. 1315 g/d), and over the entire nursery period (936 vs. 867 g/d) ($P < 0.05$). There were no differences in G:F between the two weaning groups. Results of this study indicate that differences exist in performance due to weaning age when pigs are weaned into an offsite nursery, with pigs weaned at 21.8 d of age having improved overall growth performance compared to 19.0 d of age. It appears that the increased performance throughout the nursery period in the group weaned at 21.8 d of age can be attributed to increased feed intake, and not improved feed efficiency.

Key Words: Pigs, Weaning Age, Growth

W161 The endosperm structure and starch granules to ensilage of high moisture corn grains. A. B. R.C. Lopes*[1], D. A. Berto[1], M. Cereda[2], M. Leonel[1], and C. Costa[1], [1]*Faculdade de Medicina Veterinária e Zootecnia/UNESP*, *Botucatu, SP, Brazil*, [2]*Cerat/FCA/UNESP*, *Botucatu, SP, Brazil*.

In order to evaluate the effects of high moisture corn grains silage related to the product's final quality and the modifications in the endosperm and starch grains, the following treatments were studied: The following types of treatment were studied (T): T1- Dry whole corn; T2- Dry grinded corn; T3- High moisture grinded and ensiled corn. The high moisture corn grains were grinded at a mill using a 6-mm sieve, while the dry corn was triturated using a 2mm sieve. The silages were stored in 100-liter plastic silos. The temperature monitoring inside four silos of each type of treatment was performed using copper-constantan thermocouples (T type) of PVC insulation and 2X24 AWG, coupled to a data acquisition system equipped with own software, programmed to perform readings at regular intervals of 10 seconds. The temperatures were stored, and the system produced an average value each two hours, also recording the ambient temperature of the places where the silos where located. The samples of dry grains and high moisture ensiled grains were collected and immediately submitted to the pH, granulometry and moisture analyses. The determination of the total starch content followed the methodology of the International Norm ISO 6647. Analyses in scanning microscope were conducted to evaluate the endosperm and the starch granule structures, at the laboratory of the Electronic Microscopy Center of UNESP Biosciences Institute, in Botucatu. The high moisture grain ensilage determines a reduction of the starch contents, if compared to the dry corn. There were some changes during the ensilage process: the rupture of the proteoleic matrix (that involves the starch granules), and structural alterations, such as the increase of the pore diameters and the central concavity, similar to that occurring in the enzymatic digestion.

Key Words: Starch, Temperature Monitoring, High Moisture Grains

W162 Effects of feeding alfalfa on nursery pig growth performance. C. L. Martin*[1], J. W. Frank[1], Z. B. Johnson[1], G. M. Weiss[2], and C. V. Maxwell[1], [1]*University of Arkansas*, *Fayetteville*, [2]*Progress Plus LCC*, *Lancaster, WI*.

Two experiments were conducted to determine the effects of feeding high quality, low fiber alfalfa on growth performance during the nursery period. Typical nursery diets were fed in three phases. Diets in each phase consisted of 0, 5, or 10% alfalfa. A late fall cutting of alfalfa leaves and stems were used in experiment 1 and alfalfa leaves were used in experiment 2. Diets were fed from d 0 to 42 after weaning [Phase 1 (d 0-14), Phase 2 (d 15-28), and Phase 3 (d 29-42)]. In experiment 1, 270 pigs (initial BW = 6.65 ± 0.01 kg) were blocked by BW and randomly allotted to one of the three treatments and reared in a wean-to-finish facility (9 pigs/pen). In Phase 1 and 2, ADG decreased quadratically with increasing alfalfa level ($P = 0.03$). There were no significant differences in growth performance during Phase 3. Overall, ADG (0.493, 0.506, 0.474 kg/d; respectively, $P = 0.02$) and final BW (26.92, 27.38, 26.09 kg/d; respectively, $P < 0.02$) increased quadratically with increasing level of alfalfa. In experiment 2, 234 pigs (initial BW = 6.23 ± 0.01 kg) were blocked by BW and randomly allotted to one of three treatments and reared in a conventional nursery (6 pigs/pen). In Phase 1, ADG, ADFI, G:F and BW decreased linearly with increasing level of alfalfa ($P < 0.03$). During Phase 2, ADG, ADFI, and BW decreased quadratically with increasing level of alfalfa ($P < 0.03$). There were no significant differences in growth performance during Phase 3. Overall, ADG (0.437, 0.425, 0.391 kg/d; respectively) ADFI (0.647, 0.642, 0.601 kg/d; respectively) and BW (24.29, 23.96, 22.59 kg; respectively) decreased linearly with increasing level of alfalfa ($P < 0.01$). In summary, feeding greater than 5% alfalfa during Phase 1 and 2 to pigs during the nursery period may decrease average daily gain and body weight. However, Phase 3 nursery diets containing 10% alfalfa had no effect on growth performance.

Key Words: Pigs, Alfalfa, Growth

W163 Effect of *Ascophyllum nodosum* extract on growth performance, nutrient digestibility, carcass characteristics and selected intestinal microflora populations of grower-finisher pigs. G. E. Gardiner[1,2], A. J. Campbell[1,3], J. V. O'Doherty[3], E. Pierce[3], P. B. Lynch[1], F. C. Leonard[3], C. Stanton[1,2], R. P. Ross[1,2], and P. G. Lawlor*[1], [1]*Teagasc, Moorepark Research Centre*, *Fermoy, Co. Cork, Ireland*, [2]*Alimentary Pharmabiotic Centre*, *Cork, Ireland*, [3]*University College Dublin*, *Belfield, Dublin, Ireland*.

Two experiments were conducted to assess the effect of dietary supplementation with increasing levels of *Ascophyllum nodosum* extract (ANE) on growth performance, carcass characteristics, diet digestibility and gastrointestinal microflora of grow-finisher pigs. In experiment 1, 360 pigs were allocated, based on live-weight and sex, to one of four treatments as follows; control diet (no ANE), control diet plus 3 g/kg ANE, control diet plus 6 g/kg ANE and control diet plus 9 g/kg ANE. These diets were fed *ad-libitum* up to slaughter. At slaughter, ileal, caecal, colonic and rectal digesta as well as ileum and colon tissue were sampled from eight animals per group for microbiological analysis. In experiment 2, eight male pigs were allocated to a control diet (no ANE) or the control diet plus 2.5 g/kg ANE to determine effects of ANE on coefficient of total tract apparent digestibility (CTTAD) of nutrients and nitrogen (N) balance. Supplementation with increasing levels of ANE resulted in reduced

daily gain, carcass weight and kill-out yield during the combined grower-finisher period (P<0.05); however, there were no effects of treatment on feed intake, feed conversion ratio or carcass characteristics. Increasing levels of dietary ANE resulted in decreased ileal coliform counts (P<0.05). Increasing dietary ANE levels tended to increase adherent lactobacilli in the colon (P=0.08) but caecal bifidobacteria declined (P<0.05) and there were trends towards a linear reduction in colonic bifidobacteria (P=0.08) and towards a quadratic effect on rectal lactobacilli (P=0.08). Intestinal pH was unaffected by ANE supplementation (P>0.05). In experiment 2, the CTTAD of nutrients was unaffected by the inclusion of ANE (P>0.05). Overall, the intestinal coliform reductions obtained suggest that ANE may provide a dietary means to improve gut health in finishing pigs. However, the negative effects on growth performance observed in healthy animals will most likely limit the commercial use of dietary ANE as a feed additive.

Key Words: *Ascophyllum nodosum*, Intestinal Microflora, Pig

W164 Effects of energy and lysine intake during late gestation and lactation on the lactational performance in multiparous sows. S. Heo, Y. X. Yang, Z. Jin, J. H. Yun, J. Y. Choi, B. K. Yang, and B. J. Chae*, *Kangwon National University*, *Chuncheon, Kangwon-Do, Republic of Korea*.

A 3 × 2 factorial experiment was conducted to evaluate different dietary levels of energy and lysine during late gestation and lactaion period on reproductive performance in multiparous sows. A total of 36 sows (Yorkshire × Landrace, 3-4 parity) were divided into 6 treatments and each treatment had 6 replicates comprising 1 sow/pen. Treatments consisted of three energy levels (3,265, 3,330, 3,400 ME/kg) and two lysine levels (0.6, 0.8%) during late gestation (from 80th day) and three energy levels (3,265, 3,330, 3,400 ME/kg) and two lysine levels (1.0, 1.3%) during lactation, respectively. The experiment started at 80th day of gestation and the lactational period lasted for 25 days. The higher lysine group significantly affected body weight change (p<0.05) and backfat thickness change (p<0.001) of multiparous sows during both late gestation and lactation. Average daily feed intake was not affected (p>0.05) by either energy or lysine in the diets. During lactation, live birth weight/litter (p<0.01), weanling weight/litter (p<0.01) and growth rate of piglets (p<0.05) were increased as lysine intake was increased. No difference was found piglet's growth performance by dietary energy levels. Wean-to-estrus interval was reduced (p<0.001) in the high lysine group. In conclusion, higher lysine levels than those suggested by NRC (1998) improved body condition and reproductive performance during late gestation and lactation in multiparous sows.

Key Words: Multiparous Sows, Energy, Lysine

W165 Effects of dietary energy and lysine levels during late gestation and lactation on the lactational performance in primiparous sows. S. Heo, Y. X. Yang, Z. Jin, J. H. Yun, J. Y. Choi, B. K. Yang, and B. J. Chae*, *Kangwon National University*, *Chuncheon, Kangwon-Do, Republic of Korea*.

The effects of energy and lysine intake during late gestation and lactation on reproductive performance of primiparous sows were evaluated using 36 gilts (Yorkshire × Landrace). The sows were allocated to six dietary treatments according to a 3 × 2 factorial arrangement and each treatment had 6 replicates comprising 1 sow/pen. Treatments consisted of three energy levels (3,265, 3,330, 3,400 ME/kg) and two lysine levels (0.6, 0.8%) during late gestation (from 80th day) and three energy levels (3,265, 3,330, 3,400 ME/kg) and two lysine levels (1.0, 1.3%) during lactation (25 days), respectively. Gilts fed the high lysine diet gained more weight (p<0.01) and higher backfat thickness (p<0.05) than those fed the low lysine diets. A same trend was shown during lactation. Average daily feed intake was not affected (p>0.05) by either energy or lysine. Birth weight (p<0.001), weanling weight (p<0.001) and growth rate of piglets (p<0.001) were increased as lysine intake increased during lactation. High dietary lysine levels during lactation decreased wean-to-estrus interval (p<0.01). From the present study, it can be concluded that higher lysine levels than those recommended by NRC (1998) could improve the reproductive performance during late gestation and lactation in primiparous sows.

Key Words: Primiparous Sows, Energy, Lysine

W166 Effect of GnRH-analogue and chromium methionine supplementation on reproductive performance of the female pig. J. A. Romo*[1], R. Barajas[1], J. J. Valencia[2], E. Silva[3], and F. Juarez[1], [1]*FMVZ-Universidad Autonoma de Sinaloa*, *Culiacan, Sinaloa, Mexico*, [2]*FMVZ-Universidad Nacional Autonoma de Mexico*, *Mexico, D.F., Mexico*, [3]*FMVZ-Universidad de Colima*, *Colima, Colima, Mexico*.

To determine the effect of GnRH-analogue injection (GnRH-A) and chromium methionine (CrMet) supplementation on reproductive performance of young and multiparous sows, two experiments were performed. Experiment 1: One hundred twenty eight hybrid young sows were used, in a randomized experimental design with a factorial arrangement 2 x 2. Young sows were designed for receive: Diets supplemented or not with 0.4 ppm of Cr (Microplex®, Zinpro Co.) during tree subsequent reproductive cycles, and the application or not of 50 µg de GnRH-A (Fertagyl®, Intervet Lab) four days before of the weaned. Chromium addition and GnRH-A application had not effect (P > 0.16) on the litter size and litter weight at time born; however, the farrowing rate at first service after weaning was improvement (P < 0.02) both for Cr or GnRH-A used alone or together (76% vs. 89%). Cr supplementation diminished (P < 0.001) 35% the interval weaning-first oestrus (7.89 vs. 5.11 d), and GnRH-A application diminished (P = 0.02) 25% this variable (7.41 vs. 5.59 d). An interaction (P < 0.05) Cr x GnRH-A was found, where young sows receiving joint Cr and GnRH-A treatments shown the lowers values. Experiment 2: Two hundred thirty nine multiparous hybrid sows were used, to probe the same treatments that experiment 1. Cr addition and GnRH-A application had not effect (P > 0.23) on the litter size, litter weight at time born, and the farrowing rate at first oestrus after weaning of the multiparous sows. Cr supplementation diminished (P < 0.01) the interval weaning-first oestrus (5.36 vs. 4.53 d). An interaction (P = 0.04) Cr x GnRH was observed where sows receiving joint Cr and GnRH-A treatments had higher values than sows that received Cr only. These results suggest that both chromium supplementation and GnRH-A injection are able to improve reproductive performance in both young and mature sows.

Key Words: Chromium, GnRH-A, Sows

W167 Effects of yeast culture supplementation to lactation diet on lactation performance of sows. C. Vasquez*[1], A. T. Moore[1], C. R. Richardson[2], and S. W. Kim[1], [1]*Texas Tech University*, *Lubbock, TX, USA*, [2]*Texas State University*, *San Marcos, TX, USA*.

This study was conducted to determine the effect of yeast culture (Gro-Tec) supplementation to lactation diet on lactation performance of sows. Twenty-four pregnant sows were selected for this study. All pregnant sows were fed the same 2 kg gestation diet (12.2% CP, 3.1 Mcal ME/kg) per day until farrowing. Two sows did not farrow and thus eliminated from the study. Immediately after farrowing, sows were allotted to two dietary treatments (11 sows each). Treatments were: (1) CON (sows fed a corn-soybean meal basal diet during lactation); and (2) GT (sows fed a basal diet with 60 g yeast culture/day, top-dressed). The basal diet contained 19.2% CP and 2.37 Mcal ME/kg. Sows received yeast culture (top-dressed) from d 0 to d 17 of lactation (at weaning) according to their assignment. Within a treatment, litter size was set to 9 pigs by cross-fostering and this was done by 36 h post-farrowing. Sow had access to feed and water ad libitum during 17-d lactation. Voluntary feed intake was measured daily. Sow body weight was measured at d 0 (within 12 h farrowing), 7, 14, and 17 of lactation. Body weight of nursing piglets was also measured at d 0, 7, 14, and 17 of age. Sows weaned the litter at d 17 of lactation and moved back to gestation crates. Number of days-return-to-estrus was measured for each sow. Litter size and litter weight at birth did not differ between the treatment groups. Litter size at weaning did not differ between the treatment groups. However, litter weight gain of GT (18.1 kg) tended to be greater (P=0.052) than that of CON (16.6 kg). Body weight of sows after farrowing did not differ between the treatment groups. Body weight loss during the 17 d lactation period was 11.7 kg for CON and 17.3 kg for YC but there was no statistical difference. Voluntary feed intake of sows and days return-to-estrus did not differ between the treatment groups. This study indicates a possible benefit of yeast culture supplementation on litter weight gain.

Key Words: Yeast Culture, Sow, Litter Weight Gain

W168 Antibiotics, acidifiers or yeast on the productive performance of growing pigs challenged with *Salmonella cholerasuis*. A. A. Martinez*[1], J. Lopez[1], J. N. Vazquez[1], B. Merino[2], G. E. Lanz[2], and J. A. Cuaron[3], [1]*CENID-Microbiologia,INIFAP*, *Mexico*, [2]*PIEPEME, A.C.*, *Mexico*, [3]*CENID-Fisiologia Animal, INIFAP*, *Mexico*.

The effect of different feed additives used as non-antibiotic growth enhancers, under an induced salmonella infection, was studied using 96 pigs with an average BW of 42.18+ 7.02 kg. The animals were randomly assigned to six dietary treatments (given in four 21 days feeding phases): CON: Control (without additives); ATB: Antibiotic, Chlortetracycline (200 ppm) and furazolidone 220 ppm during feeding phase one and Tylosine (110 ppm) during feeding phase three; SC: Live yeast, *Saccharomyces cereviseae*, strain Sc47 at 3 kg/MT; BAC: Benzoic acid 5 kg/ton; COA: a commercial mix of organic acids that included Phosphoric cid, formic acid and lactic acid (2kg/ton); ORE: oregano extract 500 g /ton. During phase 4 no additives were used. Each treatment had 4 replicates with 4 pigs each. Performance was measured during 90d. On days 12 and 16, pigs were challenged orally with $1x10^9$ cfu of *Salmonella cholerasuis*, isolated from a clinical case. ADG decreased from day 12 to 34 post inoculation in all treatment groups, this growth depression was less severe (P<0.01) on pigs receiving BAC. Daily feed intake was similar (P>0.05) among treatments during all the study period. Accumulated ADG was greater (P<0.01) for ATB, SC and BAC (848, 804 and 830g respectively) vs. CON, COA and ORE (760, 760 and 769g respectively). The antibiotics used during phase 1 were specific for the control of Salmonella; in preious studies, SC has shown a great capacity to precipitate pathogenic salmonellae and BAC greatly reduces microbiological counts in feces; acidifying agents or herbal extracts have unspecific effects, thus these results are not surprising and give light to alternative preventive treatments for oral infections.

Key Words: Organic Acids, Yeast, Salmonella

W169 Benzoic acid as feed additive for growing pigs naturally infected with *Salmonella cholerasuis*. A. A. Martinez*[1], J. Lopez[1], B. Merino[2], J. Cervantes[3], and J. A. Cuaron[4], [1]*CENID-Microbiologia, INIFAP*, *Mexico*, [2]*PAIEPEME, A. C.*, *Mexico*, [3]*DSM Nutritional Products*, *Mexico*, [4]*CENID-Fisiologia Animal, INIFAP*, *Mexico*.

A total of 120 pigs were used to evaluate the effects of adding benzoic acid (BZA), alone or in combination with antibiotics, to enhance productive performance of growing-finishing pigs recovering from a natural salmonella infection (*Salmonella cholerasuis*) adquired at site 2 facility. With the appropriate use of antibiotics, the infection was apparently controlled and, twelve days after, pigs were moved (BW=18.9+1.2 kg) to a site 3 facility (day 0), where they were allotted to 6 treatments, from a 2x3 factorial arrangement: BZA (0 or 5 kg/ton); and the use of antibiotics: Control (none added), growth enhancement antibiotic (Virginiamicine, 10ppm) or therapeutic antibiotic for unspecific respiratory diseases (Tylosine, 110 ppm). Each treatment had 4 replicates with 5 pigs per replicate. On d-42 of the experiment, clinical signs of salmonellosis were observed and the presence of *Salmonella spp*., probably carried out from the site 2 facility, was confirmed by bacteriological studies. BZA and the use of antibiotics did not result (P>0.05) in an interaction for any of the response criteria. There were no differences among treatments (P>0.05) on morbidity, but mortality was reduced (P<0.08) after BZA and the therapeutic antibiotic compared with the control (1.2 and 2.4 vs. 6%). Daily feed intake was not affected by Treatments (P>0.05), but BZA and the therapeutic antibiotic improved daily weight gain (P<0.01) during the first 28 days; this response was sustained until day 49 (P<0.06), but later period responses were similar (P>0.24). After 105 days, use of the therapeutic antibiotic during recovery resulted in pigs 7kg heavier (P<0.01) and BZA gave an advantage of 4kg (P<0.06) in the same period, over Control and the antibiotic as a growth enhancer. Tylosine actes to prevent possible respiratory consequences; BZA could be of help in the control of intestinal problems, but apparently it is not a substitute for the therapeutical use of antibiotics.

Key Words: Benzoic Acid, Salmonella, Pigs

W170 Response of grower pigs to dietary inclusion of naked oats (Avena nuda). P. B. Lynch*[1], P. G. Lawlor[1], and J. Burke[2], [1]*Teagasc, Moorepark Research Centre*, *Fermoy, Co. Cork, Ireland*, [2]*Teagasc, Oakpark Research Centre*, *Carlow, Ireland*.

Naked oats (Avena nuda) is a crop with potential agronomic advantages when used in a cereal rotation in Ireland. In contrast to hulled oats

(Avena sativa) naked oats is low in fibre and high in oil and protein. The oats have been fed to pigs with varying degrees of success. The object of this trial was to evaluate naked oats as a direct replacement for wheat in diets for grower pigs in the weight range 14 to 34kg. Single-sex pairs of pigs (n=48) were used in a randomised complete block design with four treatments. The control diet contained (g/kg) barley - 225, wheat - 455, soya bean meal - 180, heat treated soya beans - 100, lysine HCl - 4, DL-methionine - 2, L-threonine - 1.5, minerals and vitamins. The diet contained (calculated values) 14.1 MJ digestible energy, 196g crude protein and 13g total lysine, 5.0g methionine, 3.5g cystine, 8.6 threonine and 2.5g tryptophan. Naked oats replaced wheat at 100, 200 and 300g/kg. The diets were fed ad libitum as 5mm pellets. Daily weight gain was 719, 695, 673 and 694 (NS, s.e. 23.7 g/day), feed conversion ratio (FCR) was 1.52, 1.59, 1.61 and 1.56 (s.e. 0.026) for control, 100, 200 and 300 inclusion levels. The quadratic effect for treatment differences in FCR was significant (P<0.05). It is concluded that naked oats can replace wheat in the diet of young growing pigs at up to 300g/kg.

Key Words: Naked Oats, Grower Pigs

W171 Comparison of growing swine performance when diets containing DL- methionine and cull chickpeas in substitution of soybean meal and corn. J. M. Uriarte*, J. F. Obregón, H. R. Guemez, O. S. Acuña, and F. G. Ríos, *Universidad Autónoma de Sinaloa*, *Culiacán, Sinaloa, México*.

To determinate the effect of substitution of soybean meal and corn for cull chickpeas on growth performance, 48 pigs (BW = 27.475 ± 0.896 kg; Large white x Landrace x Large white x Pietrain) in groups of four were placed in 12 concrete floor pens (2.5 x 2.5 m). Pens were fed one fo three diets: 1) Diet with 17.21 % CP and 3.35 Mcal ME/kg, containing corn 71.0 %, soy bean meal 25 %, and premix 4 % (CONT); 2) Diet with 17.1 % CP and 3.35 Mcal ME/kg with corn 37 %, cull chickpeas 50 %, soybean meal 9 %, and premix 4 % (CHP50) and 3) Diet similar to CHP50 with 0.2 % of DL-methionine additioanated (CHP50M). Pigs were weighed at days 0 and 49 of experiments and feed intake was recorded daily. ADG and feed intake/gain ratio were calculated from these data. Body weigth at day 49 (56.063, 51.688 and 53.125 kg) were not affected (P=0.09) by CONT, CHP50 and CHP50M, respectively. ADG (0.584, 0.429 and 0.525 kg) was not similar (P=0.05) between CONT and CHP50. Feed intake (1.459, 1.441 and 1.472) was not modified (P=0.85) by treatments. Feed/gain ratio (2.506, 2.936, and 2.9811) was different (P=0.01) between CONT with CHP50 and CHP50M treatments. It is concluded, that cull chickpeas additionated with 0.2 % of DL-methionine can be used up 50 % in diets for growing pigs without affecting body weight, average diary gain and feed intake, but increased feed intake/gain ratio.

Key Words: Chickpeas, Growth Performance, Methionine

W172 Use of a selected clay in growing pigs fed zearalenone contaminated sorghum grain. J. Lopez[1], A. A. Martinez*[1], D. V. Gonzalez[1], and J. A. Cuaron[2], [1]*CENID-Microbiologia, INIFAP*, *Mexico*, [2]*CENID Fisiologia Animal, INIFAP*, *Mexico*.

Certain clays are used as feed additives to decrease the effects of mycotoxins. An experiment was conducted to evaluate the use of a selected clay (Mexsil)® on the prevention of growth depression of growing pigs consuming a grain naturally contaminated and with marginal toxic levels of mycotoxins. One hundred an twenty pigs (30.03 kg avg. initial BW), were allotted to 4 dietary treatments, from outcome groups formed by litter of origin, sex and weight, in a Randomized Complete Block design. Treatments were a 2x2 factorial arrangement: level of zearalenone (ZEA) in sorghum (LOW, 21.6 to 41.6 and HIGH, 111.2 to 146.6 mg/ton) and the addition or not of Mexsil®(Control and 5 kg/ton). Performance was measured during 98 days. As the inclusion of sorghum grain in three feeding phases, as well as the daily feed intake increased, the dose (µg/ kg BW) of ZEA received went from 1.66 to 0.91 for the LOW and from 5.87 to 2.98 for HIGH, for the feeding phases 1 to 3. For these reasons, differences in response to the addition of Mexsil®and the level on ZEA were greater during days 0 to 70 of the experiment. No clinical signs of mycotoxicosis were observed. Daily feed intake and feed efficiency were not affected by the level of ZEA (P>0.05), but ADG was lower (P<0.01) for pigs consuming the HIGH level of mycotoxins (755 vs. 837 g). Mexsil® addition improved (P<0.05) ADG (814 vs. 778 g) as was able to maintain gains of pigs consuming ZEA at higher levels. Mexsil® and ZEA did not result in an interaction for any of the response criteria. Use of this clay was effective to improve productive performance of pigs in presence of a subclinical levels of ZEA.

Key Words: Zearalenone, Clay, Pigs

W173 Effects of flaxseed and carbohydrase enzyme on portal blood short chain fatty acids, caecal digesta amine content and tissue fatty acid profiles in piglets. E. Kiarie*, B. A. Slominski, and C. M. Nyachoti, *University of Manitoba*, *Winnipeg, MB, Canada*.

We previously demonstrated that piglets fed flaxseed (FS)-containing diets with or without a multi-carbohydrase enzyme (CE) blend had reduced ileal microbial activity. Further studies were conducted to determine portal venous plasma short chain fatty acids, cecal spermidine, loin and liver fatty acid profiles and fecal fat digestibility. Ninety-six weaned pigs (6.1 kg initial BW) were assigned to 4 diets in a completely randomized design (6 replicate pens of 4 pigs each). Diets consisted of a basal diet containing 0% or 12% FS and were fed with or without CE containing pectinase, cellulase, mannanase, xylanase, glucanase and galactanase activities. Diets were fed for 28 d after which time fresh fecal samples were collected and 1 pig per pen was held under a surgical plane of anesthesia to sample portal blood. Pigs were then killed by an intracardiac injection of sodium pentobarbital (110mg/kg) to sample cecal digesta, liver and loin area tissues (loin muscle plus back fat). Piglets fed FS diets had lower portal acetic acid (0.58 vs. 0.72, mmol/L; P = 0.05) and higher lactic acid (3.17 vs. 2.21, mmol/L; P = 0.04) compared with those fed non-FS diets. In the caecum, FS diets resulted in lower spermidine levels (0.65 vs. 0.98, PPM; P = 0.01) compared with non-FS diets. Flaxseed fed piglets had lower omega-6 to omega-3 fatty acid ratios in the liver and loin area (1.7 vs. 4.1, g/100g; P = 0.0001 and 3.5 vs. 6.6, g/100g; P = 0.0001, respectively) compared to non-FS diets. Pigs fed FS diet had lower (P = 0001) fecal fat digestibility compared with pigs fed non-FS diets. There tended to be an interaction between FS and CE in fat digestibility and tissue omega-3 fat deposition such that in FS fed

piglets CE supplementation resulted in higher fecal fat digestibility and tissue omega-3 fat deposition. In conclusion, feeding FS with or without CE supported lactic acid ferementors in the in the gastrointestinal tract. Although overall low fat digestibility was observed high omega-3 retention in FS fed piglets was evident.

Key Words: Flaxseed, Carbohydrase Enzymes, Piglet

Nonruminant Nutrition: Poultry Nutrition III

W174 Biochemical profile of broilers fed diets supplemented with amylase from *Cryptococcus flavus* and *Aspergillus niger* HM2003. C. S. Minafra[2,1], J. H. Stringhini*[1], S. F. F. Marques[1], M. A. Andrade[1], C. J. Ulhoa[1], and G. H .K. Moraes[2], [1]*Universidade Federal de Goias*, *Goiania, Goias, Brazil*, [2]*Universidade Federal de Viçosa*, *Viçosa, Minas Gerais Brazil*.

In this experiment, the effect of alpha-amylase addition in broler rations on biochemical seru parameters was evaluated. The enzyme were produced by *Cryptococcus flavus* (CF) in Enzymology Laboratory Biological Sciences, (UFG) and by *Aspergillus niger* HM2003 (AN) in the Biotechnology Center (UFRS). 360 day-old male Cobb chicks were allotted in heated batteries in the Veterinary College, (UFG). Enzymes were added in the first week and from eight to 21 days in a completely randomized design with six treatments and five replications of 12 chicks each. Treatments consisted of pre-starter diets without enzyme (RPSS), with CF amylase (RPSCry) and with AN enzyme (RPSAsp), and starter diets without enzyme (RPS), with CF amylase (RSCry) and with AN enzyme (RSAsp). Statistical analyses were done with SAEG 9.1, using Tukey test 10% probability. Blood were collected at seven and 21 days and centrifuged at 6.000 rpm in 10 minutes to obtain serum. Serum analysis of minerals Ca, P, Cl, K, alkaline phosphatase, and protein was done. No effect in concentrations of K and AP were observed at seven days and for Ca, Cl or AP at 21 d. At 7 d, higher concentration of Ca in RPSCry, P in RPSAsp, Cl in PSV and Prot in RPSVAsp. At 21 d, higher concentrations of Ca, Prot and K in RSVAsp. These parameters indicate serum profile of broilers but didn't characterize the effect of enzymes addition in rations.

Table 1. Serum profile of Ca, P, Cl, K, TP and AP for broiler fed diets containing amylase from *Cryptococcus flavus* and *Aspergillus niger* HM2003

7 days	VPS	VPSCry	VPSAsp
Ca (mg/dL)	5.7b	6.9a	6.0ab
P (mmol/L)	5.1b	4.8b	6.2a
Cl (mmol/L)	153a	124b	141ab
K (mmol/L)	6.4a	6.5a	6.12a
TP (g/dL)	1.8b	2.0b	2.5a
AP (UI/L)	970a	980a	975a
21 days	VS	VSCry	VSAsp
Ca (mg/dL)	6.0a	5.5a	5.5a
P (mmol/L)	5.7a	5.0b	5.0b
Cl (mmol/L)	124a	137a	139a
K (mmol/L)	4.5c	5.9b	6.7a
TP (g/dL)	3.6a	3.0b	3.1b
AP (UI/L)	969a	961a	970a

Different letters in the row differ by Tukey test (5%)

Key Words: Biotechnology, Enzymes, Serum Profile

W175 Effects of graded levels of cottonseed cake on performance, haematological and carcass characteristics of broilers fed from day old to 8 weeks of age. G. O. Adeyemo* and O. G. Longe, *University of Ibadan*, *Oyo, Nigeria*.

Cottonseed cake (CSC) has been used as a cheaper alternative to soyabean cake (SBC) in livestock feeding and a source of dietary protein. There is, however, paucity of information on its nutritive value in chickens. This study evaluated the performance, haematological and carcass characteristics of chickens in which CSC replaced SBC in a nutritional experiment. One hundred and eighty day old chicks (DOC) were fed with 5 different diets, such that 0% (control), 25%, 50%, 75% and 100% of CSC replaced SBC from day old to 8 weeks of age. Average weekly gains (AWG), feed conversion ratio (FCR) and dressed weight (DWT) were monitored. Blood samples were collected and analyzed for differential white blood cell count (lymphocyte) and haemoglobin (Hb). Data were analysed using descriptive statistics and analysis of variance. Values of AWG and DWT ranged from 0.1kg to 0.4kg and 1.1kg to 1.8 kg respectively, with 100% CSC and control having the least and the highest values among the treatments. FCR ranged from 1.6 to 4.9. Values of lymphocyte and Hb ranged from 35.2 to 54.0 % and 8.5 to 11.1g/dl respectively. Birds on 75% CSC based diets had blood profile more comparable with the control than those of other diets. CSC can replace up to 75% SBC without adverse effects on performance, haematological values and carcass quality of the birds. This reveals CSC as a potent source of protein for meeting the CP requirements of chickens.

Key Words: Chicken, Cottonseed Cake, Performance

W176 Serum biochemistry profile of broilers fed an enzymatic complex from *Trichoderma harzianum*. S. M. F. Marques[1], C. S. Minafra[2,1], J. H. Stringhini*[1], P. M. Rezende[1], M. A. Andrade[1], M. B. Cafe[1], and C. J. Ulhoa[1], [1]*Universidade Federal de Goias*, *Goiania, Goias, Brazil*, [2]*Universidade Federal de Viçosa*, *Viçosa, MInas Gerais Brazil*.

This experiment were carried out to evaluate serum profile of broilers fed from 1 to 21 d diets with an enzymatic complex (EC) supplement produced by *Trichoderma harzianum*, composed by xylanase, amylase, cellulase and lipase. EC was produced in the Enzimology Laboratory of the Biological Sciences Institute of the Federal University of Goias (UFG). 480 day-old male chicks were allotted in heated batteries located in the Veterinary College (UFG). In the first experiment, EC supplementation was evaluated in pre-starter phase (1 to 7 days) and the second in starter phase (8 to 21 days) in a randomized block design with four treatments and five replicates of 12 chicks each. Treatments in Exp. 1 were: vegetable pre-starter diet non-supplemented (VPS), or supplemented (VPSE), animal by-products and vegetable diet non-supplemented (APS), or supplemented (APSE); in Exp. 2: vegetable starter diet non-supplemented (VS), or supplemented (VSE),