M166 Effects of arginine supplementation during early gestation (d 1 to 30) on litter size and plasma metabolites in gilts and sows. Jie Li[1], Huan Xia[1], Wei Yao[1], Tingting Wang[1], Jiliang Li[2], Xiangshu Piao[1], Phil Thacker[3], Guoyao Wu[4], and Fenglai Wang*[1], *[1]State Key Laboratory of Animal Nutrition, Ministry of Agriculture Feed Industry Centre, China Agricultural University, Beijing, China, [2]Tianjin National Breeding Pig Farm, Tianjin, China, [3]Department of Animal Science, University of Saskatchewan, Saskatoon, SK, Canada, [4]Department of Animal Science, Texas A&M University, College Station, TX.*

Two experiments were conducted, using typical commercial swine production conditions, to determine effects of dietary arginine supplementation during early gestation on the performance of gilts and sows. In Experiment 1, 62 Landrace gilts and 113 sows were used to evaluate the effect of dietary arginine supplementation during early gestation (d 1 to 30) on gilt and sow performance. On d 1 of gestation, all gilts and sows were randomly assigned to a corn-soybean meal basal diet supplemented with either 1.3% L-arginine-HCl or 2.2% L-alanine (isonitrogenous control). The total number of piglets born per litter for arginine-supplemented was increased ($P < 0.01$), compared with the control group. In Experiment 2, 155 Landrace sows were used to evaluate the effect of dietary arginine supplementation between d 1 and 14, d 15 and 30 or d 1 and 30 on sow performance. Among these sows, 24 with an average parity of 2.54 were used to determine the effect of dietary arginine supplementation on plasma amino acid composition and the concentration of plasma metabolites. The total number of piglets born per litter for arginine-supplemented sows tended to increase ($P = 0.08$), compared with the control group, with the greatest improvement in sows treated from d 1 to 14. The concentrations of nitric-oxide metabolites, arginine, proline, ornithine and spermidine were increased ($P < 0.05$) in the plasma of arginine-supplemented sows on d 14 and 28 of gestation, as were agmatine and putrescine on d 14 of gestation. The concentrations of urea and glutamine were lower in the plasma of arginine-supplemented than in the control group. These results indicate that dietary arginine supplementation in early gestation improved the reproductive performance and plasma biochemical metabolites in sows.

Key Words: arginine, early gestation, sow performance

M167 Limiting dietary lysine increased plasma concentration of total cholesterol in finishing pigs. Naresh Regmi*, Taiji Wang, Mark A. Crenshaw, Brian J. Rude, and Shengfa F. Liao, *Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS.*

Lysine is the first limiting amino acid (AA) in typical swine diets, and plays important roles in nutrient metabolism and growth performance of pigs. This research was conducted to study the effects of dietary lysine on blood plasma concentrations of protein, carbohydrate and lipid metabolites of pigs. Eighteen crossbred (Yorkshire × Landrace) finishing barrows and gilts (9/sex; BW 92.3 ± 6.9 kg) were individually penned in an environment-controlled barn. Pigs were assigned to 3 dietary treatments according to a randomized complete block design with sex as block and pig as experimental unit (6 pigs/treatment). Three corn and soybean-meal based diets were formulated to contain total lysine at 0.43, 0.71, and 0.98% (as-fed basis) for diets 1 (D1; lysine-deficient), 2 (D2; lysine-adequate), and 3 (D3; lysine-excess), respectively. After 4 weeks on trial, jugular vein blood was collected and plasma separated. The plasma concentrations of glucose, total protein, albumin, triglyceride, urea nitrogen (PUN), and total cholesterol were determined using an ACE Clinical Chemistry System (Alfa Wassermann, Inc.). Data were analyzed using the GLM Proc with pdiff (adjust = T) option of SAS. No differences were found between barrows and gilts in any of the measured metabolites. The plasma concentration of PUN was greater for pigs fed D1 than D3 ($P < 0.05$), and greater for pigs fed D3 than D2 ($P < 0.05$). The plasma albumin concentration was lower for pigs fed D1 than D2 or D3 ($P < 0.05$), and no difference between D2 and D3. The plasma total cholesterol concentration was greater in pigs fed D1 than D2 or D3 ($P < 0.05$), and no difference between D2 and D3. The plasma concentration of total protein, glucose or triglyceride did not differ among the 3 treatments. These results confirm that a diet deficient in one essential AA can lead to catabolism of other AAs and impair body protein syntheses, and that the excess amount of one AA over the requirement will be catabolized. However, the metabolic mechanism for the increased plasma total cholesterol concentration of finishing pigs by a lysine-deficient diet warrants further investigation. This research was supported by USDA-NIFA Hatch/Multistate Project 233803.

Key Words: lysine, nutrient metabolite, pig

M168 The effect of dietary protein and amino acid concentration on certain production parameters of growing ostrich chicks (*Struthio camelus*). Tertius S. Brand*[1,2], Pieter D. Carstens[2], and Louw C. Hoffman[2], *[1]Directorate for Animal Sciences, Department of Agriculture, Western Cape Government, Elsenburg, South Africa, [2]Dapartment of Agricultural Sciences, Stellenbosch University, Stellenbosch, South Africa.*

The effect of 3 different dietary protein (with a specific associated amino acid profile) concentrations on certain production parameters in growing ostriches were investigated. Measured parameters included feed intake, feed conversion ratio, and growth rate. Basic abattoir mass, postmortem measurements of the commercial cuts of meat were also done. The crude protein and amino acid requirements of ostrich chicks for the different production phases (pre-starter; 19.0% CP, starter; 15.5% CP, grower; 14.25% CP and finisher; 12.6% CP) were predicted by a newly developed mathematical growth and optimization model for ostriches (Gous and Brand, 2008; Aust. J. Exp. Agric. 48:1266-1269). Three basic diets per production phase were then formulated to be 20% lower and 20% above these predicted levels for lysine, sulfur-containing amino acids, threonine, tryptophan and arginine (named diets with a low, medium or high protein content). In the study 18 groups of birds, with 10 birds per group were used as experimental animals and were alotted to the different treatments according to live weight. The 3 dietary treatments were evaluated with 6 groups of birds per treatment. The 3 diets with the different levels of dietary protein (with a specific amino acid composition related to the dietary protein content) were fed to the ostriches during each of the 4 production phases from hatching up to slaughtering. Feed and water was available ad libitum. Results were analyzed by ANOVA with dietary protein level as main effect. Differences were determined to be statistically significant at $P < 0.05$. Significantly lower values with the low protein diet for the final live mass of birds at slaughter at 300 d of age (respectively 89.6, 98.8 and 102.2 kg), cold carcass mass (respectively 41.2, 45.1 and 45.1kg) and thigh weight as well as for most of the weighed muscles were found, while values for the medium and high protein diet did not differ. Both ADG (respectively 338, 361 and 377 g/bird/day) and feed intake (respectively 1.63, 1.67 and 1.76

kg/bird/day) for the low protein diet was significantly lower than that of the high protein diet with the medium diet intermediate. Results indicated that birds that consumed the diet with the medium protein performed optimal in most cases, except during the starter phase where the high protein diet outperformed the other 2 diets. This study showed that feeding diets with a higher protein and amino acid content than that predicted by the model was unable to increase performance levels of growing ostriches in most cases.

Key Words: ostrich, amino acid requirement, dietary protein level

M169 Oral supplementation of tryptophan and pyridoxine to nursing piglets on performance and behavior after weaning. L. Bonagurio[1], P. C. Pozza*[1], T. J. Pasquetti[2], L. M. Diaz-Huepa[1], L. D. Castilha[1], L. A. C. Esteves[1], A. N. T. R. Monteiro[1], V. P. Ricardo[1], and N. Galoro[1], *[1]Universidade Estadual de Maringá, Maringá, Paraná, Brazil, [2]Universidade Estadual do Oeste do Paraná, Mchal Candido Rondon, Paraná, Brazil.*

The objective of this study was to evaluate the oral supplementation of Trp and pyridoxine to nursing piglets on performance and behavior after weaning. Forty 8 piglets (24 males and 24 females) from 8 sows were used. At d 14, 6 piglets per sow were divided into 3 treatments (2 animals/treatment) and were allotted in a randomized block design with 8 replicates. Treatments consisted of a Control (alanine + glucose + distilled water); Trp (3.5 g Trp/day + distilled water); Trp + pyridoxine (3.5 g Trp/day + 0.0095 g pyridoxine/day + distilled water). Each treatment was orally supplied 5 times/d and each dose contained 2.5 mL, totalling 12.5 mL/d. The supplementation was carried out during a 7 d period (d 14 to d 21 of age), and at d 21 piglets were weaned. After weaning, piglets from the same treatment were housed together in nursery pens and all animals, from each treatment, received the same pre-starter diet. During nursery period (d 21 to d 34) piglets were monitored in 3 different periods (at d 22, from d 28 to d 29 and from d 33 to d 34 of age) by a set of cameras. Behavior (standing, lying, eating, socializing, sitting and drinking) was assessed by an instantaneous sampling that was performed with intervals of 5 min to obtain the frequencies (%) of each behavior. Eating behavior was considered when pigs were eating at the feeders. Piglets' performance was evaluated in the nursing and nursery period. Piglets receiving oral Trp + pyridoxine showed higher body weight ($P = 0.06$) on the first day after weaning (d 21 to d 22) compared with the Control which probably affected the weight loss ($P = 0.06$) of piglets on the first day after weaning, which was lower for piglets that received oral Trp + pyridoxine. No changes in performance were observed in the remaining periods. From d 28 to d 29 piglets that received Trp supplementation in nursing period, with or without pyridoxine, showed a higher eating behavior ($P = 0.01$) than the Control, which probably affected eating behavior ($P < 0.01$) in the total period (from d 21 to d 34). It can be concluded that oral supplementation of Trp and its association with pyridoxine, one week before weaning, reduces the weight loss in the first day after weaning and increases eating behavior until 1 wk after weaning.

Key Words: postweaning stress, B6 vitamin, tryptophan

M170 Methionine + cysteine and its ratios for barrows from 15 to 30 kg. C. F. Muniz, P. C. Pozza*, A. C. Furlan, C. A. L. Oliveira, F. Sato, L. D. Castilha, L. A. C. Esteves, C. P. Sangali, and M. R. Fachinello, *Universidade Estadual de Maringá, Maringá, Paraná, Brazil.*

Aiming to determine the requirements of SID methionine + cysteine (SID Met + Cys) for barrows (15–30kg) 70 pigs (15.216 ± 0.540kg) were used, being distributed in 7 treatments with 5 replicates. A basal diet was formulated to contain 0.52% SID Met + Cys (0.26% SID Met + 0.26% SID Cys). Three treatments consisted in levels of SID Met + Cys (0.58, 0.64, 0.70%) that was maintained the 1:1 ratio between sulfur amino acids (using DL-methionine and L-cysteine) and other 3 treatments consisted in the same levels (0.58, 0.64, 0.70%), but not maintaining the 1:1 ratio (using only DL-methionine), assuring 0.55:0.45, 0.59:0.41 and 0.63:0.37 ratios. Performance, blood parameters, longissimus dorsi muscle depth (LD) and backfat thickness (BF) were evaluated. The sulfur linkages (S-S) in animals' bristles were determined by using a confocal microscope Senterra Raman. First- and second-degree models were fitted for the levels of SID Met + Cys (0.52, 0.58, 0.64, 0.70%) maintaining or not the 1:1 ratio and the low SID Met + Cys level (basal diet, 0.52%0) was used to fit models maintaining or not the 1:1 ratio. Initial body weight was also included as a covariate. A likelihood ratio test was used to determine the best fitting model (specific models for maintaining or not the 1:1 ratio or a common model for both situations). Linear Response Plateau was used to determine the better SID Met + Cys level when the model of second degree was fitted. The significance level adopted was $P < 0.05$. The average daily gain (ADG) was affected ($P < 0.01$) only when the 1:1 ratio was not maintained (using only DL-methionine), reaching a plateau at 0.661% of SID Met + Cys. The LD and BF were not affected. Plasma glucose increased ($P < 0.01$) and cholesterol decreased ($P < 0.01$) as SID Met + Cys increased in the diets when supplementing only DL-methionine in the diet. Homocysteine in the blood serum was not affected. In conclusion, barrows from 15 to 30 kg needs 0.661% of SID Met + Cys in the diet (7.88g/day) for a maximum ADG, being not necessary to maintain the 1:1 ratio between SID Met and SID Cys.

Key Words: carcass trait, homocysteine, sulfur amino acid

M171 Bioavailability of L-methionine relative to DL-methionine in weaned pigs. John K. Htoo*[1] and Georg Dusel[2], *[1]Evonik Industries AG, Hanau-Wolfgang, Germany, [2]University of Applied Sciences Bingen, Bingen am Rhein, Germany.*

Information about the relative bioavailability (RBV) of L-methionine (LM; 100% L-isomers, 99% purity) compared with DL-methionine (DLM; a 50:50 mixture of D- and L-isomers; 99% purity) for pigs is limited. A 21-d experiment was conducted to determine the RVB of LM compared with DLM to maximize the performance of 7 to 13 kg weaned pigs. A total of 168 weaned pigs (Topigs; initial BW of 7.01 ± 0.04 kg) were assigned to 7 dietary treatments with 6 pen replicates (2 barrows and 2 gilts/pen). A corn-wheat-soybean meal-whey powder and fish meal-based basal diet (BD) was formulated using analyzed ingredient AA contents and published SID coefficients to contain 0.27% standardized ileal digestible (SID) Met and 0.54% SID Met + Cys but adequate in all other AA (1.35% SID Lys) and contained 2,498 kcal/kg NE. Dietary treatments included (1) BD, (2) BD + 0.05% DLM, (3) BD + 0.10% DLM, (4) BD + 0.15% DLM, (5) BD + 0.05% LM, (6) BD + 0.10% LM, and (7) BD + 0.15% LM. Data were analyzed by ANOVA using the GLM procedure of SAS. Orthogonal-polynomial contrasts were used to determine linear and quadratic effects of increasing levels of DLM and LM on response criteria, and the effect of Met sources. The final BW at d 21 (11.73, 12.49, 12.74, 12.68, 12.42, 12.65, and 12.82 kg for diets 1 to 7) and overall ADG (224, 258, 271, 269, 255, 268, and 272 g/d for diets 1 to 7) increased linearly ($P < 0.05$) by graded additions with both Met sources. The ADFI increased linearly ($P = 0.03$) by graded additions with DLM but was not affected by LM additions.

The overall FCR (1.42, 1.32, 1.29, 1.31, 1.35, 1.32, and 1.29 for diets 1 to 7) improved ($P < 0.01$) linearly and quadratically by DLM additions and linearly by additions with LM. Performance responses (ADG, ADFI and FCR) of pigs fed diets supplemented with the same inclusion levels of DLM and LM were not different ($P \geq 0.487$). Based on ADG as a response of Met intake, the nonlinear asymptotic model estimated the RBV of 89% (95% confidence interval: 49–128%) for LM relative to DLM. In conclusion, the bioavailability of LM relative to DLM is not different to optimize the performance of 7 to 13 kg weaned pigs.

Key Words: bioavailability, DL-methionine, L-methionine

M172 Bioavailability of L-lysine sulfate compared with L-lysine·HCl to optimize performance of 12 to 25 kg pigs. J.P. Oliveira*[1], J.K. Htoo[2], L. F. T. Albino[1], M. I. Hannas[1], R. J.B. Rodrigueiro[3], N. A.A. Barbosa[3], and H. S. Rostagno[1], *[1]Federal University of Viçosa, Federal University of Viçosa, Viçosa, Minas Gerais, Brazil, [2]Evonik Industries AG, Evonik Industries AG, Hanau-Wolfgang, Germany, [3]Evonik Industries do Brasil, Evonik Industries do Brasil, São Paulo, Brazil.*

L-Lysine sulfate (Biolys), containing 54.6% L-Lys as well as other amino acids (AA) and phosphorus as fermentation co-products, is available as an alternative to L-lysine.HCl. A 21-d experiment was conducted to evaluate the relative bioavailability (RBV) on equimolar basis of Biolys relative to L-Lys.HCl (set at 100% availability). A total of 135 barrows (PIC; initial BW of 12.46 ± 0.55kg) were assigned to 5 treatments with 9 pen replicates (3pigs/pen) for 21 d. A Lys-deficient basal diet (BD) was formulated to contain 0.57% standardized ileal digestible (SID) Lys but adequate in all other AA. The diets included (1) BD, (2) BD + 0.128% L-Lys.HCl, (3) BD + 0.256% L-Lys.HCl, (4) BD + 0.183% Biolys, and (5) BD + 0.366% Biolys. The final BW on d 21 and the overall ADG increased linearly ($P < 0.01$) by adding both Lys sources. Feed intake was not different but F:G improved ($P < 0.01$) linearly by supplementing both Lys sources. Performance responses (ADG, ADFI, F:G) of pigs fed diets supplemented with the same inclusion levels of L-Lys·HCl and Biolys were not different ($P > 0.05$). Using multiple linear regression and the slope ratio the RBV estimates were 104.1 and 113.3% for Biolys relative to L-Lys·HCl to optimize ADG and F:G, respectively. In conclusion, Biolys and L-Lys·HCl are equally bioavailable on equimolar basis as Lys sources for 12 to 25 kg pigs.

Table 1 (Abstr. M172). Performance and bioavailability (BV) of L-Lys sulfate for piglets from 12 to 25 kg[1]

	BD	L-Lys HCl			Biolys			CV
Item	0.0%	0.128%	0.256%	Linear	0.183%	0.366%	Linear	(%)
BW, kg[2]	23.58^{B}	24.35^{AB}	25.23^{A}	0.01	24.39^{AB}	25.28^{A}	0.03	5.1
ADG[2]	0.530^{A}	0.566^{A}	0.608^{A}	0.01	0.568^{A}	0.611^{A}	0.03	10.4
F:G[2]	1.921^{A}	1.730^{B}	1.685^{B}	0.01	1.721^{B}	1.647^{B}	0.01	7.1
BV of Biolys vs. L-Lys·HCl	Intercept	b^{LH}	b^{BL}	Bioavailability				
ADG	0.634	0.392	0.408	104.1				
F:G	1.938	–1.103	–1.250	113.3				

^{A,B}Means within a row with different letters differ ($P < 0.05$) by the SNK test.
[1]Linear regression analysis; b^{LH} = L-Lys·HCl regression coefficients; b^{BL} = Biolys regression coefficients.

Key Words: bioavailability, L-Lys·HCl, Lys sulfate

M173 Pig's biochemical plasmatic variables response to methionine ingestion in a phase-feeding program or an individual daily feeding program. Aline Remus*[1,4], Dani Perondi[1], Jaqueline P. Gobi[1], Ines Andretta[2], Luciano Hauschild[1], Marie-Pierre L. Montminy[3], and Candido Pomar[4], *[1]FCAV-UNESP, Jaboticabal, SP, Brazil, [2]UFRGS, Porto Alegre,RS, Brazil, [3]Université Laval, Quebec, QC, Canada, [4]AAFC, Sherbrooke, QC, Canada.*

The effect of different methionine intakes and pig's individual response to this amino acid in precision feeding program is not completely known. The aim of this study was especially to evaluate the existence of methionine (met) toxicity in traditional group-phase-feeding program and in precision feeding program in which pigs are fed individually with daily tailored diets. Sixty pigs with initial BW of 25 kg (MSE = ± 2.23) were used in a 28-d trial, and were arranged in a 2 × 3 factorial randomized design testing: (1) 2 feeding programs (individual daily program (IDP) or a conventional 1 phase program by group (1PP) and (2) 3 methionine levels (70, 100, or 130% of recommended level). In the IDP pigs had the daily and individually SID lysine requirements (SIDLys) estimated using the Precision Feed model (Hauschild et al., 2012) and in the 1PP the phase SIDLys was established using the average pig of the population at day one (Rostagno et al., 2011). In both programs the amino acids profile was kept constant with exception of met. Blood samples were collected weekly at jugular vena after an 8-h fasting period and analyzed for alanine aminotransferase (ALT), aspartate aminotransferase (AST), creatinine (CK), plasmatic total protein (PTP), and protein C-reactive (CRP) levels. The variables were analyzed as a 2 × 3 factorial arrangement (confidence interval = 95%) using GLM procedure of SAS. The main effects included feeding program, methionine level, and their interaction (P × L). The met intake inside the IDP was 2.7, 3.7 and 6.0 g/day for the 70, 100 and 130% treatments, in the same order for the 1PP, the met intake was 4.6, 6.1 and 8.5 g/day. The PTP showed no differences among the treatments. The ALT and AST presented quadratic tendency for P × L interaction ($P < 0.10$). The CK showed a P × L interaction with quadratic effect ($P = 0.02$) and linear effect inside IDP program ($P = 0.02$). As the met requirement could increase in sanitary challenge the protein C-reactive was analyzed, and concentration was not influenced ($P > 0.05$) by programs or by methionine levels. Current results showed no evidence that supports toxicity of increasing the methionine until a lysine ratio up to 30% in both feeding-programs.

Key Words: amino acid requirement

M174 Effects of dietary supplementation of branched-chain amino acids on growth performance, nitrogen balance, and whole-body protein turnover in piglets. Liufeng Zheng, Hongkui Wei*, Chuanshang Chen, Quanhang Xiang, and Jian Peng, *Department of Animal Nutrition and Feed Science, College of Animal Science and Technology, Huazhong Agricultural University, Wuhan, Hubei, China.*

The aim of the study was to investigate the effects of dietary BCAA supplementation on growth performance, N balance, and whole-body protein turnover in piglets from 8 to 21 kg. Twenty-eight individually caged Large White × Landrace barrows were randomly assigned to 1 of 4 dietary groups (n = 7). All 4 diets were fortified with Lys, Met, Thr and Trp to satisfy the SID AA requirements recommended by NRC (2012). Diet PC was a positive control diet (19.5% CP); diet NC was a reduced-CP negative control diet (16.7% CP); diets T1 and T2 were reduced-CP diets to which 0.17% Ile, 0.16% Val, and 0.24% Leu or 2-fold dose of each BCAA were added, respectively. Nitrogen balance was determined

over 5 subsequent days at the beginning of the 3rd week of the experiment. Whole-body protein turnover was determined by using the end product method after a single oral dose of ^{15}N-glycine. All data were analyzed using the One-way ANOVA and Duncan's procedures. The results showed that NC group had decreased ADG, ADFI and absolute N retention compared with the PC group, which were restored in T1 and T2 groups ($P < 0.05$). Total N excretions (g/d) were reduced ($P < 0.05$) in NC, T1 and T2 groups compared with PC group. There was no difference between PC and NC groups for protein synthesis, whereas T1 and T2 groups had higher ($P < 0.05$) protein synthesis than NC group. No difference in protein degradation were detected among 4 groups. There was no difference between T1 and T2 groups except for a higher N excretions in T2 group. These results indicate dietary BCAA supplementation improves growth performance and dietary N utilization for protein accretion in piglets.

Table 1 (Abstr. M174). Effect of dietary BCAA supplementation on growth performance in piglets

Item	PC	NC	T1	T1	SEM	*P*-value
ADFI, g/d	714^{a}	558^{b}	707^{a}	721^{a}	20	<0.01
ADG, g/d	422^{a}	322^{b}	449^{a}	452^{a}	15	<0.01
G:F	0.59^{ab}	0.58^{b}	0.64^{a}	0.63^{a}	0.01	0.03
N excretion, g/d	6.14^{a}	3.74^{c}	3.59^{c}	4.83^{b}	0.23	<0.01
N retention, g/d	12.95^{a}	8.72^{b}	11.48^{a}	12.15^{a}	0.45	<0.01
Protein synthesis, g of N/(kg$^{0.75}$·d)	36.29^{ab}	26.21^{b}	37.82^{a}	36.52^{a}	2.30	0.05
Protein degradation, g of N/(kg$^{0.75}$·d)	34.44	24.81	36.15	34.71	1.84	0.14

^{a,b}Within a row, means without a common superscript letter differ ($P < 0.05$).

Key Words: branched-chain amino acid, piglet, growth performance

M175 Standardized ileal digestibility of amino acids in single cell protein and tuna fish meal fed to growing pigs. A. R. Son* and B. G. Kim, *Konkuk University, Seoul, Republic of Korea.*

The objective was to determine the apparent ileal digestibility (AID) and standardized ileal digestibility (SID) of CP and AA in 2 sources of single cell protein (SCP) and fish meal (FM) fed to growing pigs. The SCP1 (produced in Korea) contained 88.0% DM, 65.1% CP, 2.8% ether extract, and 4.2% ash; the SCP2 (produced in China) contained 90.4% DM, 75.6% CP, 1.3% ether extract, and 4.3% ash; and the FM (tuna fish meal produced in Korea) contained 85.2% DM, 54.9% CP, 8.8% ether extract, and 19.8% ash. Eight barrows (initial BW = 41.3 ± 1.2 kg) surgically fitted with a T-cannula in the distal ileum were allotted to a replicated 4 × 4 Latin square design. Three experimental diets were formulated to contain 25% SCP1, SCP2, and FM, respectively, which were the sole source of nitrogen in each experimental diet. A nitrogen-free diet was also prepared. All experimental diets contained 0.5% chromic oxide as an indigestible index. Values for the AID and SID of most indispensable AA in the SCP1 and FM were greater ($P < 0.05$) than those in the SCP2. There were no differences in the AID and SID of most indispensable AA between the SCP1 and FM. In conclusion, the digestibility of most indispensable AA in the SCP1 and FM were greater than those in the SCP2.

Contd.

Table 1 (Abstr. M175). Apparent ileal digestibility (AID) and standardized ileal digestibility (SID) of AA in SCP (n = 7 and 7) and FM (n = 8)

	AID				SID			
Item	SCP1	SCP2	FM	SEM	SCP1	SCP2	FM	SEM
Arg	41.7^{b}	22.0^{c}	53.0^{a}	3.6	55.7^{b}	38.5^{c}	70.3^{a}	3.6
His	41.1^{a}	25.3^{b}	41.2^{a}	4.1	51.9^{a}	36.1^{b}	53.5^{a}	4.1
Ile	43.0^{a}	21.9^{b}	45.8^{a}	5.1	52.1^{a}	32.7^{b}	58.4^{a}	5.1
Leu	46.5^{a}	28.1^{b}	53.5^{a}	4.4	54.1^{a}	36.8^{b}	63.9^{a}	4.4
Lys	81.5^{a}	22.4^{c}	48.5^{b}	3.8	84.3^{a}	36.6^{c}	59.2^{b}	3.8
Met	63.0	63.0	53.3	7.0	66.4	66.9	59.7	7.0
Phe	40.3^{a}	25.0^{b}	46.6^{a}	4.4	49.9^{a}	35.5^{b}	57.8^{a}	4.4
Thr	30.0^{a}	13.7^{b}	28.2^{ab}	5.2	43.6^{ab}	29.6^{b}	48.5^{a}	5.2
Trp	25.1^{ab}	−11.7^{b}	30.7^{a}	11.2	40.7^{ab}	10.1^{b}	52.5^{a}	11.2
Val	34.4^{a}	18.2^{b}	39.2^{a}	4.7	45.5^{a}	31.4^{b}	56.2^{a}	4.7

Key Words: single cell protein, digestibility, swine

M176 Apparent and standardized ileal digestibility of amino acids in soybean meal and canola meal in finished pigs. Juan Edrei Sanchez*[1], Ignacio Arturo Dominguez[1], Ernesto Morales[1], Jose Luis Yañez[2], and Miguel Cervantes[3], *[1]Universidad Autonoma del Estado de Mexico, Toluca, Estado de Mexico, Mexico, [2]Universidad Autonoma de Tlaxcala, Tlaxcala, Tlaxcala, Mexico, [3]Universidad Autonoma de Baja California, Mexicali, Baja California, Mexico.*

In México the production of soybeans and canola seeds are limited; the countries exporters of these ingredients to Mexico are United States and Canada for oil extraction and animal feed. The remainder after oil extraction in these ingredients is used in swine nutrition. Digestibility studies in soybean meal and canola meal have been conducted in other countries, however, the digestibility of these ingredients in Mexico is unknown. A study was conducted to determinate apparent ileal digestibility (AID) and standardized ileal digestibility (SID) of amino acids (AA) for soybean meal and canola meal. Six Ileal-cannulated barrows (75.1 kg BW) were fed 3 diets in a replicated 3 × 3 Latin square design in finished pigs in 3 periods, which consisted at 2.8 maintenance over 3 periods consisting of a 5-d diet adaptation, 2-d collection of feces, and a 2-d collection of ileal digesta. In the total AID of AA was similar ($P > 0.05$) between soybean meal and canola meal, and had 79.62 and 78.60%, respectively. With respect to lysine and threonine the soybean meal had higher ($P < 0.05$) AID values in 84.7 *vs* 78.4 and 74.4 *vs*. 70.8%, respectively, than canola meal. The AID in methionine was higher ($P < 0.05$) 3.88% in canola meal than soybean meal. for SID, all indispensable AA was higher ($P < 0.05$) in the soybean meal that canola meal except for methionine that was higher ($P < 0.05$) in canola meal (3.61%-units) that soybean meal. The digestibility of AA in the present study was lower compared with other studies. The difference may be due to the varieties of soybean meal and canola meal used for feed pigs, furthermore, The temperature used in the process of oil extraction in soybean and canola seeds is the main factor that could affect the quality of AA, decreasing the digestibility of CP and AA.

Key Words: soybean meal, canola meal, digestibility

M177 Nutritional value of soybean products for growing pigs. Tofuko A. Woyengo*[1,2], Jorge Yañez[1,3], and Ruurd T. Zijlstra[1], *[1]University of Alberta, Edmonton, AB, Canada, [2]South Dakota State University, Brookings, SD, [3]Universidad Autónoma de Tlaxcala, Tlaxcala, México.*

A study was conducted to determine the standardized ileal digestibility (SID) of AA and calculate NE value for 9 soybean products. Ten ileal-cannulated barrows (30 kg BW) were fed 10 diets in a 10 × 6 Youden square at 2.8 × maintenance requirement for energy. The 10 diets were 9 cornstarch-based with 1 soybean co-product as the sole source of protein, and cornstarch, sucrose, canola oil and soybean product as energy source; and an N-free diet with cornstarch, sucrose, and canola oil as energy source. The ratio of cornstarch to sucrose and canola oil in soybean product diets was identical to the N-free diet to allow calculation of energy digestibility of soybean products by difference. The SID of AA for the soybean products was calculated using the N-free diet. The macronutrient profile of the 9 soybean products ranged from 35.4 to 65.8% CP, 1 to 21% ether extract, and 10.1 to 28.1% NDF. The SID of Lys ranged from 86 to 97% (Table 1). Apparent total-tract digestibility of GE digestibility was lower ($P < 0.05$) for high-ether extract than low-ether extract soybean products. The NE value ranged from 2.3 to 4.5 Mcal/kg of DM, and did not differ among the soybean products. In conclusion, the soybean products had high SID of AA, and hence they can serve as a good source of AA in swine diets. However, ether extract may hinder energy digestibility in the soybean products.

Table 1 (Abstr. M177). Lysine, ether extract (EE), and NDF content; Lys and GE digestibility; and NE value for soybean products fed to growing pigs[1]

	Soybean products								
Item	1	2	3	4	5	6	7	8	9
CP, % DM	51.6	58.1	65.2	60.7	71.8	55.0	50.2	40.8	38.5
Lys, % DM	3.31	3.56	4.19	3.58	4.49	3.33	3.09	2.52	2.32
EE, % DM	1.55	1.18	1.51	2.11	0.98	1.31	1.99	23.3	20.7
NDF, % DM	11.1	13.7	22.7	30.6	22.6	13.1	16.7	12.7	16.6
SID of Lys, %	89.4^{bc}	96.5^{a}	95.8^{ab}	90.6^{abc}	92.1^{abc}	86.2^{c}	95.4^{ab}	91.0^{abc}	86.7^{c}
ATTD[2] of GE, %	91.0^{ab}	90.1^{ab}	81.9^{bc}	90.3^{ab}	88.7^{ab}	83.9^{abc}	91.7^{a}	76.4^{c}	76.8^{c}
NE, Mcal/kg of DM	2.92	2.92	2.71	3.01	2.93	2.73	2.97	2.96	2.88

^{abc}Means within a row without a common superscript differ ($P < 0.01$).
[1]SEM and *P*-values are respectively: 2.7 and 0.02 for SID of Lys, 1.2 and 0.01 for ATTD of GE, and 0.13 and 0.58 for NE.
[2]ATTD = apparent total-tract digestibility.

Key Words: soybean, digestibility, pig