

**M99 Developmental regulation of fructose and amino acid transporter gene expression in the small intestine of pigs.** X. Xiao\*, E. A. Wong, and K. E. Webb, Jr., *Department of Animal and Poultry Sciences, Virginia Polytechnic Institute and State University, Blacksburg.*

To evaluate the developmental regulation of nutrient transporter gene expression in the small intestine, piglets from each of seven sows were killed at birth (d 0), during lactation (d 1, 3, 7, 14, and 21) and post-weaning (d 22, 24, 28, and 35; weaned at d 21). Intestinal segments (duodenum, jejunum, and ileum) were collected for RNA isolation. The abundance of mRNA was determined by Northern blotting using probes specific for transporters of fructose (GLUT5), neutral amino acids (LAT2) and cationic amino acids [ $b^{0,+}$ AT, ATB(0)]. During lactation, there was an interaction ( $P < 0.01$ ) between time and segments for abundance of GLUT5 mRNA. Abundance of GLUT5 mRNA generally increased from d 1 to 7 and subsequently declined to d 14 in the jejunum and ileum. In duodenal tissue, abundance decreased from d 0 to

3 and then increased to d 21. Abundance of LAT2 mRNA declined ( $P < 0.001$ ) linearly from d 0 to 21. The LAT2 mRNA was predominantly distributed in the ileum ( $P < 0.05$ ). Abundance of  $b^{0,+}$ AT mRNA changed quadratically ( $P < 0.001$ ) from d 0 to 21. Abundance of  $b^{0,+}$ AT mRNA was greater ( $P < 0.05$ ) in the ileum and jejunum than the duodenum. There was an interaction ( $P < 0.001$ ) between time and segments in abundance of ATB(0) mRNA. Abundance generally increased from d 0 to 21 in the duodenum and ileum with the change in the ileum being greater. In the jejunum, abundance increased from d 0 to 7 and then decreased to d 21. During post-weaning, mRNA abundance of all transporters dramatically increased from d 21 to 22 or 24 and then rapidly decreased to d 24 or 28. Subsequent changes varied with transporter and intestinal segment. In conclusion, gene expression of these four nutrient transporters is not only differentially regulated by age but also differentially distributed among intestinal segments.

**Key Words:** Pig, Intestine, Amino Acid Transporter

## Nonruminant Nutrition: Weanling Pigs - Additives

**M100 Evaluation of organic acid blends and antibiotics for promoting growth of young pigs.** D. W. Giesting\*<sup>1</sup>, M. J. Pettitt<sup>2</sup>, and E. Beltranena<sup>2,3</sup>, <sup>1</sup>*Cargill Animal Nutrition, Minnetonka, MN*, <sup>2</sup>*Prairie Swine Centre, Inc., Saskatoon, SK, Canada*, <sup>3</sup>*Provincial Department of Agriculture-Alberta, Edmonton, AB, Canada*.

Two, 5-wk, post-weaning growth experiments were conducted to evaluate the effects of blended organic acids (OA) alone or in combination with antibiotics on young pig performance. In the initial study, two acidifier blends were each included at 0.4% to starter diets alone, or in combination with LS20 antibiotic (22 mg/kg each lincomycin+spectinomycin). In the first 2-wk phase, each additive treatment improved gain (ADG) and feed conversion (F/G) v. negative controls ( $P < .05$ ). ADG was 141, 178, 185, 187, 183 and 175 g/d for pigs fed the negative control (NEG), OA Blend A, Blend B, LS20, Blend A+LS20 and Blend B+LS20, respectively. F/G was improved ( $P < .05$ ) for each of the OA, LS20 or OA+LS20 treatments. F/G was 1.80, 1.49, 1.45, 1.50, 1.37 and 1.42, for the treatments, ordered as above. Differences were not significant in the subsequent 3-wk period ( $P > .10$ ). In experiment 1, OA blends improved performance similarly to LS20. In the second experiment, pigs were fed OAs (Blend C or Blend D), at 0.3% inclusion rate, ASP250 (110 mg/kg each of chlortetracycline and sulfamethazine, 55 mg/kg penicillin) or ASP250+Blend C. Pigs fed Blend C had 10% higher ADG (164 g/d) v. negative controls (148) ( $P > .10$ ); pigs fed Blend D gained 17% faster (175) v. controls ( $P < .10$ ). ASP250 improved ADG 33% (199) ( $P < .05$ ). ASP250+Blend C improved ADG 61% (238) ( $P < .05$ ). F/G was 1.38, 1.29, 1.33, 1.27 and 1.16 for negative control, ASP250, Blend C, Blend D and Blend C+ASP250, respectively. Only the combination of the OA blend and antibiotic improved ( $P < .05$ ) F/G significantly. In period 2, gain was increased 6% by either blend ( $P < .10$ ), 17% by ASP250 ( $P < .05$ ) and 20% by ASP250+Blend C ( $P < .05$ ). In this study, the antibiotic produced a stronger response than the OA blends, but an additive benefit was noted when the additives were used together. In these two experiments, OA blends improved ADG and F/G and enhanced the effects of antibiotics in promoting improved performance.

**Key Words:** Growth, Organic Acids, Antibiotics

**M101 Interaction between lactose, avilamycin and inulin on piglet growth performance and nutrient digestibility post-weaning.** K. M. Pierce\*<sup>1</sup>, J. J. Callan<sup>1</sup>, P. McCarthy<sup>2</sup>, and J. V. O'Doherty<sup>1</sup>, <sup>1</sup>*University College Dublin, Ireland*, <sup>2</sup>*Volac International Ltd, UK*.

One hundred and eighty piglets (24 d, 6.0 kg BW) were used to investigate interactions between lactose, avilamycin and inulin on growth performance and nutrient digestibility in post weaned piglets. The piglets were blocked on the basis of live weight and within each block assigned to one of six dietary treatments (6 pens/trt with 5 pigs/pen). The piglets were offered diets containing either a low (175 g/kg) lactofeed (LF70; 860 g/kg whey permeate, 140 g/kg soy bean meal; Volac International, UK) (LLF) or high (350 g/kg) LF70 (HLF) level with one of the following feed additives (FA) 1) 0 supplementation 2) 60 ppm avilamycin (Maxus, Elanco Animal Health, USA) (M) or 3) 15 g/kg inulin (I) in a

3 x 2 factorial arrangement. The starter diets were fed for 21 days and all diets contained chromic oxide at 150 ppm. There was an interaction ( $P < 0.05$ ) between LF70 and FA in daily gain (ADG) between d 0-21. The pigs receiving HLF had a higher overall ADG compared to pigs receiving LLF at 0 supplementation (368 vs 281 g/d). However, there was no difference between the LLF and the HLF when the diets were supplemented with either M or I. Inulin improved feed efficiency ( $P < 0.05$ ) between d 0-7 compared to Maxus or 0 supplementation (1.69 vs 2.50 vs 2.35 SEM 0.250). There was an interaction between LF70 and FA in fecal organic matter (OMD) and nitrogen (ND) digestibility ( $P < 0.05$ ). The HLF and the HLF+M treatments improved OMD (89.02 and 89.32 %) compared to the LLF and LLF+M (87.44 and 87.61 %). However, there was no difference between LLF and HLF when the diet was supplemented with I (89.31 vs 88.49 % SEM 0.49). The HLF+I resulted in a reduced ( $P < 0.05$ ) ND compared with the LLF+I. However, there was no difference between the LLF and the HLF when the diets received 0 or M supplementation. In conclusion, HLF improved ADG compared to LLF. Inulin inclusion improved FCR in the first week postweaning. The inclusion of inulin improved the OMD of diets low in LF70.

**Key Words:** Pigs, Lactose, Inulin, Avilamycin

**M102 Effects of probiotic supplementation on gut histometry and fecal microflora in weaned pigs.** V. Bontempo\*<sup>1</sup>, A. Di Giancamillo<sup>1</sup>, C. Domeneghini<sup>1</sup>, M. Fava<sup>1</sup>, C. Bersani<sup>1</sup>, R. Paratte<sup>1</sup>, E. Chevauux<sup>2</sup>, V. Dell'Orto<sup>1</sup>, and G. Savoini<sup>1</sup>, <sup>1</sup>*Department of Veterinary Sciences and Technologies for Food Safety, University of Milan, Italy*, <sup>2</sup>*Allemand Animal Nutrition, Blagnac, France*.

Two hundred weanling piglets averaging 25 d of age and  $5.0 \pm 0.5$  kg initial BW were assigned to two dietary treatments to determine the effects of supplementation with *Pediococcus acidilactici* on growth, gut histometry and fecal microbiota. Piglets were fed one of two liquid dietary treatments for 42 d after weaning: 1) Control (C), and 2) Control diet + *P. acidilactici* ( $1 \times 10^{10}$  cfu/g) (P). Piglets were weighed and fecal samples from 16 homogeneous piglets (8 per group) were collected at 0, 14 and 42 d. These piglets were sacrificed for histology and histometry at the end of the experiment. No significant difference in growth was observed within the groups. Diet affected gut histometry of the P animals: histometrical analysis revealed an increase in villi height (C: 300  $\mu$ m; P: 327  $\mu$ m; SE: 7.52;  $P < .01$ ) and crypt depth (C: 247  $\mu$ m; P: 287  $\mu$ m; SE: 10.31;  $P < .01$ ) of the ileum, as well as in an increase of the cecum crypt depth (C: 387  $\mu$ m; P: 423  $\mu$ m; SE: 13.07;  $P < .05$ ). A thicker mucous gel layer in the ileum of C piglets was also observed (C: 2.95  $\mu$ m; P: 2.35  $\mu$ m; SE: 0.07;  $P < .01$ ). Fecal *Lactobacillus* populations were increased by *P. acidilactici* addition when compared to C diet (C:  $10 \times 10^8$  cfu/g; P:  $27 \times 10^8$  cfu/g; SE:  $9.41 \times 10^6$ ;  $P < .05$ ), while no difference was observed in the *E. coli* populations. In conclusion, the addition of *P. acidilactici* to piglet diet resulted in positive effects on gut structure and in a greater concentration of possibly beneficial bacteria.

**Key Words:** Piglets, *Pediococcus Acidilactici*, Gut Histometry

**M103 Antimicrobials, probiotics, prebiotics and herbal extracts as growth promoters on performance of weanling pigs.** C. E. Utiyama\*, L. L. Oetting, P. A. Giani, U. S. Ruiz, and V. S. Miyada, *Escola Superior de Agricultura "Luiz de Queiroz" da Universidade de São Paulo, Piracicaba-SP, Brazil.*

One hundred and twenty 21-d-weaned pigs were used to compare five treatments with 12 replications (pens of two pigs each) per treatment in a 35-d randomized complete block design experiment. Treatments consisted of: control - basal diet of corn, soybean meal, dried whey, lactose and dried plasma; antimicrobial - basal diet plus antimicrobials (Zn bacitracin and olaquinox, 50 ppm of each); probiotic - basal diet plus 1300 ppm probiotic (*Bacillus subtilis* and *Bacillus licheniformis*); prebiotic - basal diet plus 3000 ppm mannanoligosaccharide; herbal extract - basal diet plus 500 ppm herbal extracts (garlic, clove, cinnamon, pepper and thyme). Antimicrobial agents improved ( $P < .05$ ) ADG during d 1-35 (+21.4%) and d 15-35 (+22%) post-weaning compared to pigs fed the control diet. Although not significant ( $P > .10$ ), ADG of pigs fed mannanoligosaccharide was 25.7% higher than those fed control diet during 1-14 days post-weaning period. Performance of pigs fed mannanoligosaccharide was intermediary between that of pigs fed the control and antimicrobial diets during d 15-35 and d 1-35 post-weaning. The herbal extracts did not improve pig performance ( $P > .10$ ) in any period. Probiotic did not improve the growth performance ( $P > .10$ ) of pigs. Mannanoligosaccharide seemed to be an alternative to antimicrobial agents as growth promoter of weanling pigs. However, dietary levels, how to incorporate in the diet, palatability, environmental conditions and mechanisms of action of all these alternative growth promoters should be better studied.

**Key Words:** Weanling Pig, Antimicrobial Agents, Alternatives

**M104 The effect of bacillus and active yeast complex supplementation on the performance, fecal bacillus counts and ammonia nitrogen concentrations in weaned pigs.** B. J. Min<sup>\*1</sup>, O. S. Kwon<sup>1</sup>, K. S. Son<sup>1</sup>, J. H. Cho<sup>1</sup>, W. B. Lee<sup>1</sup>, J. H. Kim<sup>2</sup>, B. C. Park<sup>3</sup>, and I. H. Kim<sup>1</sup>, <sup>1</sup>*Dankook University, Korea*, <sup>2</sup>*Agribands Purina Korea, Inc., Seoul, Korea*, <sup>3</sup>*CTC Bio. Inc., Korea.*

This experiment was conducted to investigate the effect of bacillus and active yeast complex supplementation on the performance, fecal bacillus counts and ammonia nitrogen concentration in weaned pigs. One hundred twenty LandraceYorkshireDuroc pigs (8.87±0.11 kg BW) were used in a 35 d growth assay. Dietary treatments included: 1) CON (control; basal diet), 2) AY (CON diet + 0.075% active yeast; BioSaf<sup>®</sup>), 3) BS (CON diet + 0.04% *bacillus subtilis* and *bacillus licheniformis* complex; BioPlus 2B#8482) and 4) YB (CON diet + 0.04% active yeast, 0.02% bacillus strains). During experimental days 0-14, ADG and ADFI were numerically higher in pigs fed active yeast diet than pigs fed other diets ( $P > .05$ ). For days 15-35, pigs fed dietary bacillus and active yeast complex diet were numerically higher in ADG and ADFI compared with others ( $P > .05$ ). For the entire period, ADG was greater for pigs fed active yeast, bacillus or complex diets than for pigs fed basal diet but without significant differences ( $P > .05$ ). ADFI and Gain/Feed were not affected by treatments ( $P > .05$ ). After 14 and 35 days of experiment, digestibility of dry matter was improved by 1.2-4.4% in pigs fed AY, BS and YB diets compared with pigs fed CON diet; also, digestibility of nitrogen was increased by 2.1-5.6% in AY, BS and TB treatments ( $P < .05$ ). Pigs fed bacillus and complex diet were higher in fecal bacillus counts than pigs fed basal diet ( $P < .05$ ). However, there is not a difference in fecal NH<sub>3</sub>-N concentration ( $P > .05$ ).

**Key Words:** Bacillus, Active Yeast, Pigs

**M105 Efficacy of addition of *B. licheniformis* and *B. subtilis* in pig diets from weaning to slaughter.** M. I. Gracia<sup>\*1</sup>, S. Hansen<sup>2</sup>, J. Sánchez<sup>1</sup>, and P. Medel<sup>1</sup>, <sup>1</sup>*Imasde Agropecuaria, S.L. Spain*, <sup>2</sup>*Chr Hansen A/S Denmark.*

A study was performed to evaluate the efficacy of a feed additive (EC No E1700) containing 1.6·10<sup>9</sup> CFU/g of *Bacillus licheniformis* DSM 5749 and 1.6·10<sup>9</sup> CFU/g of *Bacillus subtilis* DSM 5750 on performance of piglets from weaning at 28 d to slaughter at 95 kg. A total of 420 Large White x Landrace\*Large White pigs, 50 % males and females, was used. There were two treatments: 1) basal diet (control), and 2) basal diet with 400 mg probiotic/kg feed. The experimental design was

applied in the prestarter (28 to 41 d of age, 1.48 % lys), starter (41 to 64 d of age, 1.33 % lys), and grower (64 to 116 d of age, 1.07 % lys) periods. From d 116 to slaughter at 167 d of age all pigs received a common diet (0.92 % lys). Each treatment was replicated 15 times with 14 pigs housed together constituting the experimental unit. Pigs supplemented with the probiotic were heavier than controls at the end of the prestarter period (10.2 vs 9.8 kg;  $P < .05$ ) and at the end of the trial (94.7 vs 92.4 kg;  $P < .05$ ). During the prestarter period, piglets fed the probiotic grew faster (204 vs 174 g/d;  $P < .05$ ) and ate more feed (270 vs 247 g/d;  $P < .05$ ) than controls. No significant differences were observed during the starter or the grower periods, but considering the overall period, probiotic supplementation of pig diets improved ADG (627 vs 611 g/d;  $P < .05$ ) and ADFI (1,536 vs 1,491 g/d;  $P < .05$ ). No differences were observed for feed conversion between dietary treatments for any of the periods studied. These results suggest that the probiotic tested improves growth of pigs from weaning until slaughter.

**Key Words:** Probiotic, Performance, Wean to Finish Pigs

**M106 Isolation of *Bacillus* strains to inhibit pathogenic *E. coli* and enhance weanling pig performance.** D. S. Parrott\* and T. G. Rehberger, *Agtech Products, Inc., Manhattan, KS.*

*E. coli* causes edema disease and post-weaning diarrhea in swine. Previous research in our laboratory determined that these *E. coli* were a genetically diverse group. The objective of this research was to isolate *Bacillus* strains capable of inhibiting pathogenic *E. coli* and determine their effect on performance. Over 30,000 *Bacillus* isolates from environmental samples were screened using a replica plating technique against forty-eight *E. coli* strains isolated from six states. Twenty-five *Bacillus* strains were found to inhibit all of the *E. coli* strains. Two of the *Bacillus* strains were selected for feeding studies due to their higher level of inhibitory activity. Six replicate field trials involving a total of 1012 nursery pigs were conducted at a commercial farm. Each trial consisted of six pens with pigs blocked by weight into three blocks (heavy, medium, and light). For each trial, one pen of each block was assigned to either the standard nursery diet or standard nursery diet supplemented with the two *Bacillus* strains. Pigs were weighed by pen on days 0, 7, and 28. Feed consumed was recorded for each pen for the whole nursery time period. Mortality was also recorded. Data were analyzed using the PROC MIXED procedure of SAS and the effects of block and treatment, with day included, to take into account repeated measures and interactions, was evaluated. Pig weight was influenced by treatment ( $P < .01$ ), block ( $P < .0001$ ), treatment x block ( $P < .01$ ) and block x day ( $P < .01$ ). Heavy and light pigs fed the *Bacillus* strains had higher body weights than pigs fed the control diet at day 28 ( $P < .005$  and  $P < .01$ ). Feed intake in pigs in the light weight block was higher ( $P < .01$ ) whereas intake of pigs in the other blocks was similar (treatment x block,  $P < .05$ ). Feeding the *Bacillus* strains reduced mortality in the high ( $P < .01$ ) and the medium ( $P < .01$ ) weight blocks at day 28 (treatment x block x day,  $P < .09$ ). This study indicates feeding the *Bacillus* strains can decrease mortality and enhance weanling pig performance.

**Key Words:** Swine, *E. coli*, *Bacillus*

**M107 Effects of dietary herbal extracts (Animon Plus) on growth performance and blood composition in nursery and growing pigs.** K. S. Son<sup>\*1</sup>, O. S. Kwon<sup>1</sup>, B. J. Min<sup>1</sup>, W. B. Lee<sup>1</sup>, J. H. Kim<sup>2</sup>, J. W. Hong<sup>1</sup>, I. H. Kim<sup>1</sup>, and H. S. Kim<sup>3</sup>, <sup>1</sup>*Dankook University, Cheonan, Korea*, <sup>2</sup>*Agribands Purina Korea, Inc., Seoul, Korea*, <sup>3</sup>*Kumbo Trading Co., Korea.*

Two experiments were conducted to investigate the effect of herbal extracts (including *Solanum xanthocarpum*, *Hedychium spicatum*, *Curcuma longa*, *Piper longum* and *Ocimum sanctum*) on the growth performance and blood composition in pigs. A total of 96 nursery pigs were randomly allocated into four treatments with six replications for four weeks (initial average BW 27.6 ± 2.63 kg). Dietary treatments included: 1) Con (Control), 2) AB (Control + 0.1% Antibiotics), 3) AM (Control + 0.1% Animon) and 4) ABAM (Control + 0.1% Antibiotics + 0.1% Animon). For the overall period, ABAM (562 g) treatment increased ADG compared to CON (500 g) and AB (506 g) treatments ( $P < .05$ ). The difference of IgG concentration was increased in pigs fed AM and ABAM diets compared to pigs fed AB diet ( $P < .05$ ). Pigs fed ABAM (3.5 g/dL) diet had higher albumin concentration than pigs fed

CON (2.9 g/dL) and AB (3.0 g/dL) diets ( $P < 0.05$ ). Lymphocyte concentration difference of AB and ABAM diets had increased by 9.51% compared to CON and AM diets ( $P < 0.05$ ). The digestibility of dry matter in ABAM treatment was increased by 5.3% compared to that of AB and AM treatments ( $P < 0.05$ ). However, no differences were found for total protein of serum and N digestibility of feces ( $P > 0.05$ ). In Exp. 2, a total of 75 growing pigs were randomly allocated to three treatments with five replications for 29 days (initial average BW  $40.22 \pm 2.82$  kg). Dietary treatments included 1) CON (Control), 2) AM1 (Control + 0.1% Animon) and 3) AM2 (Control + 0.2% Animon). For the total experiment, the pigs fed AM1 (887 g) and AM2 (894 g) diets had greater ADG than pigs fed CON (831 g) diet. The AM1 diet increased ADFI compared to the CON diet. In serum characteristics, difference of IgG concentration of AM1 and AM2 treatments were greater than those of CON treatment ( $P < 0.05$ ). Lymphocyte was greatest for AM1 and lowest for CON, with AM2 intermediate ( $P < 0.05$ ). In conclusion, herbal extracts were effective in growth performance, IgG, albumin, total protein and lymphocyte responses in pigs.

**Key Words:** Herbal Extracts, Growth Performance, Pigs

**M108 Efficacy of antimicrobials and herbal extracts as growth promoters of weanling pigs.** L. L. Oetting\*, C. E. Utiyama, P. A. Giani, U. S. Ruiz, and V. S. Miyada, *Escola Superior de Agricultura, Piracicaba-SP, Brazil.*

Two experiments involving a total of 80 weanling pigs (from 21 to 56 d of age) were conducted to compare antimicrobials and herbal extracts (HE) as growth promoters. Pigs were allotted to eight replications (pens of two pigs each) of five treatments in a randomized complete block design. Treatments consisted of: C - control, basal diet of corn, soybean meal, dried whey, lactose and dried plasma; A - basal plus antimicrobials (olaquinox, colistin, and Zn bacitracin, 50 ppm of each); HEa - basal plus 700 ppm HE; HEb - basal plus 1200 ppm HE; HEc - basal plus 2100 ppm HE. The HE consisted of a mixture of equal amounts of essential oils of thyme, clove (plus eugenol) and oregano (plus carvacrol). During d 1-14 post-weaning, DFI was higher ( $P < .05$ ) for A than for HEa and HEb (.326, .256 and .265 kg/d, respectively). ADG and BW were improved ( $P < .05$ ) when fed A compared to C and HEa (.229, .170 and .157 kg/d; and 8.63, 7.79 and 7.65 kg, respectively). For the overall 35d period, HEb resulted in lower DFI ( $P < .05$ ), ADG and BW ( $P < .10$ ) than A. ADG values were .350, .411, .335, .321 and .365 kg/d and BW values were 17.68, 19.83, 17.19, 16.68 and 18.19 kg for C, A, HEa, HEb and HEc, respectively. F:G was not affected ( $P > .05$ ) by dietary treatments and the values were 1.60, 1.46, 1.59, 1.53 and 1.52 for C, A, HEa, HEb and HEc, respectively. Pigs fed high dietary level of HE (2100 ppm) showed intermediary results between A and C diets for all pig performance variables. The results of this study showed that, probably, higher levels of HE should be used to improve weanling pig performance.

**Key Words:** Herbal Extract, Weanling Pig, Performance

**M109 Effect of dietary melatonin on serum melatonin level and growth performance of weaned pigs.** G. H. Lee, J. G. Kim\*, and K. Y. Whang, *Korea University, Seoul, Korea.*

A 21-d experiment was conducted to determine the effect of dietary melatonin on the serum melatonin level and growth performance of weaned pigs. Sixty-four pigs ( $8.2 \pm 0.28$  kg) were randomly allotted to one of four treatments: control (CON), 0.5 ppm melatonin (M1), 1 ppm melatonin (M2), and 2 ppm melatonin (M3). Diets were formulated to contain 3,525 ME kcal/kg, 1.49 % lysine, 0.26 % tryptophan and the other nutrients met or exceeded the NRC (1998) requirements. Pigs were allowed free access to the diet and water. Pigs were sampled weekly by jugular venipuncture between 1300 and 1600 h to determine the serum melatonin (SMT) level. Samples were analyzed by a direct radioimmunoassay. The SMT levels of the M1, M2, and M3 were linearly increased by dietary melatonin level at day 7, 14, and 21 ( $P < 0.001$ ). Interestingly, the SMT level of M1, M2, and M3 reached the highest level at day 7, and decreased at day 14 and further decreased at day 21. The weight gain was shown to decrease as the dietary melatonin level increased. The ADG of M2 and M3 were lower ( $P < .01$ ) than that of CON. However, ADFI tended to decrease as the dietary melatonin level increased (but not significantly). In conclusion, although the dietary melatonin increased the SMT, there was no positive effect on the growth in weaned pigs.

Item	CON	M1	M2	M3	SEM	P-value
Serum Melatonin, pg/mL						
d0	3.0	3.6	2.2	2.8	1.03	NS
d7	4.2 <sup>a</sup>	189.7 <sup>b</sup>	326.8 <sup>c</sup>	425.9 <sup>d</sup>	29.3	0.001
d14	7.1 <sup>a</sup>	116.4 <sup>b</sup>	183.5 <sup>c</sup>	279.7 <sup>d</sup>	21.3	0.001
d21	5.8 <sup>a</sup>	79.2 <sup>b</sup>	163.5 <sup>c</sup>	262.9 <sup>d</sup>	27.0	0.001
Growth Performance						
ADG, kg	0.63 <sup>a</sup>	0.61 <sup>ab</sup>	0.60 <sup>bc</sup>	0.57 <sup>c</sup>	0.01	0.01
ADFI, kg	0.81	0.81	0.78	0.75	0.02	NS
G/F	0.78	0.75	0.77	0.76	0.01	NS

**Key Words:** Dietary Melatonin, Pigs, Growth Performance

**M110 Botanical additives masked by a flavor do not affect feed intake, growth, or fecal consistency in weanling pigs.** E. Roura\*<sup>1</sup>, R. Fontanillas<sup>1</sup>, and P. Bikker<sup>2</sup>, <sup>1</sup>*Lucta SA Barcelona, Spain,* <sup>2</sup>*Schothorst Feed Research, Lelystad, The Netherlands.*

Previous reports show that addition of botanicals to nursery diets may significantly reduce feed intake interfering with the assessment of potential benefits in piglets. A four-week trial was carried out at the Schothorst Feed Research, to study the effect on pig performance and fecal consistency after weaning of three botanicals (internal reference number [Ref] 44 with 3% capsicum, Ref 45 3% capsicum & 50% chicory extract, and Ref 46 50% chicory extract) dosed at 0.1, 0.2 & 0.4% for Ref 44 and 45, and 0.1 & 0.2% for Ref 46. Except for the negative control (T1) diet, a cherry-honey flavor was applied to all diets aimed at masking the botanicals (T3 through T10) or flavoring the control (T2). In total 300 piglets (26 d of age) were blocked by weaning weight (avg. 8 kg) and offspring and randomly allocated to treatments. Piglets received Phase 1 (0-14 d) and Phase 2 (15-28 d) growth promoters & acidifier-free diets. Compared to control T1 application of flavor alone (T2) numerically ( $P > 0.05$ ) increased feed intake (5%) and daily gain (6%) in the four-week period. The flavor seemed to prevent depression of feed intake normally associated with botanical additives except for the highest inclusion of Ref 45 (T8) particularly when compared to the positive control T2 (12% decrease;  $P < 0.05$ ). Inclusion of botanicals Ref 44 and 46 did not have significant effects compared to control T1 and tended to perform worse than piglets on the flavored control T2. Feed conversion ratio and fecal consistency were not affected by treatments. It is concluded that, overall, compared to a negative control, the three botanical additives tested did not improve gut health or performance of weanling pigs. The reduction on feed intake observed in previous works was largely avoided presumably due to a compensatory effect of the addition of the flavor. Treatment with a flavor alone tended to improve feed intake and daily gain.

**Key Words:** Piglets, Botanicals, Flavor

**M111 Effect of bedding with mycotoxin contaminated straw and low levels of dietary mycotoxin on piglet performance.** B. E. Strickler and P. Spring\*, *Swiss College of Agriculture, Zollikofen, Switzerland.*

The aim of this study was to evaluate the effect of using mycotoxin-contaminated straw as bedding for weaning piglets fed diets with and without mycotoxin adsorbent on animal performance. The trial was set up as a complete randomized block design with 18 groups of 5 weaning piglets each (BW: 8.5 kg). Piglets received a starter diet (14.0 MJ/kg DE, 16.5% CP and 1.20% lysine) and water ad libitum. Treatments were as follows: Control: bedding with 200 g of wood shavings/hd/d; Straw: bedding with 200 g of contaminated straw/hd/d; Straw+Adsorbent: bedding with 200 g of contaminated straw/hd/d plus diet with 2000 ppm of mycotoxin adsorbent (Mycosorb#8482, Alltech Inc.). Straw was contaminated with 821 ppb deoxynivalenol (DON), 528 ppb zearalenone (ZEA) and < 50 ppb T-2 toxin. The piglets were also exposed to a natural infection with HPS (*Haemophilus parasuis*). Feed intake, ADG FCR, medical treatments and fecal scores were recorded. Data were analyzed by ANOVA and means were compared using the test of Tukey-Kramer. The mycotoxin-contaminated straw had no effect on piglet performance. However, the mycotoxin adsorbent led to improved performance during the first trial period. The feed was designed to contain low levels of

mycotoxin, however analyses revealed 220 ppb on DON, < 10 ppb ZEA and < 50 ppb T-2. The data suggest that in piglets exposed to weaning stress and a natural infection with HPS, DON levels as low as 220 ppb can decrease performance. From day 15-20, all piglets were treated with Vital TSS (Trimethoprimium, Sufathiazolum and Sulfidimidinum). This treatment effectively controlled the HPS infection. During this trial phase no differences in performance were recorded between treatments, indicating that a reduction in stress level did allow the piglets to cope with 220 ppm of dietary DON. Mycotoxin-contaminated straw did not affect piglet performance or health. However, low levels of dietary DON led to a reduction in performance in piglets exposed to weaning and microbial stress. Mycotoxin adsorbent can help in alleviating the negative effects on performance.

Table 1: Effect of contaminated straw and mycotoxin adsorbent on piglet performance

Parameter	Control	Straw	S + Adsorbent	SE
ADFI, g (d1-14)	346	334	378	15.3
ADFI, g (d15-28)	752	705	705	24.3
ADFI, g (d1-28)	549	520	542	17.6
ADG, g (d1-14)	218a	226a	276b	11.5
ADG, g (d15-28)	520	473	500	21.6
ADG, g (d1-28)	369	350	388	13.6
FCR (d1-14)	1.65c	1.54cd	1.38d	0.06
FCR (d15-28)	1.44	1.48	1.42	0.05
FCR (d1-28)	1.48	1.48	1.41	0.03

a,b P<0.05; c,d P<0.10

**Key Words:** Straw, Mycotoxin, Piglet

## Forages and Pastures

**M113 Nutritive quality of *Poa pratensis* in model grassland communities exposed to ground-level ozone.** D. Dodson<sup>\*1</sup>, J. Bender<sup>2</sup>, J. Lin<sup>1</sup>, and R. Muntifering<sup>1</sup>, <sup>1</sup>Auburn University, Auburn, AL, <sup>2</sup>Federal Agricultural Research Center, Braunschweig, Germany.

Tropospheric (i.e., ground-level) ozone (O<sub>3</sub>) is the most significant phytotoxic air pollutant in the US and Europe, and its concentration globally is expected to increase by 0.3 to 1.0%/yr for the next 50 yr. Because interspecific plant competition is theorized to amplify O<sub>3</sub> stress, especially early in the growing season, a phytometer-based approach was utilized to investigate effects of exposure to elevated O<sub>3</sub> on nutritive quality of *Poa pratensis* (phytometer) and four competitor species (*Anthoxanthum odoratum*, *Achillea millefolium*, *Rumex acetosa* and *Veronica chamaedrys*) representative of an extensively managed, species-rich grassland community of Central Europe. Model plant communities (mesocosms), in which *P. pratensis* was grown in monoculture and in mixed cultures with each of the competitor species, were placed into open-top chambers and exposed continuously during April and May to carbon-filtered air + 25 ppb O<sub>3</sub> (control) or non-filtered air + 50 ppb O<sub>3</sub> (elevated O<sub>3</sub>). *Poa pratensis* was harvested from mesocosms at the end of the exposure period and assessed for relative food value (RFV), which was predicted from concentrations of NDF and ADF. Across all mono- and mixed cultures, concentrations of NDF, ADF and lignin were greater ( $P < 0.001$ ), and RFV was lower ( $P < 0.001$ ) for *P. pratensis* grown under elevated O<sub>3</sub>. Increased concentrations of lignin were considerably greater than could be explained on the basis of increased concentrations of NDF and ADF, consistent with the general mechanism of plant response to environmental stress. Concentrations of cell wall constituents and N were not affected by competition, and N concentration was not affected by exposure to elevated O<sub>3</sub>. While effects of early-season O<sub>3</sub> stress on RFV of *P. pratensis* were not amplified by interspecific competition, exposure to elevated O<sub>3</sub> decreased RFV of *P. pratensis* by an

**M112 Influence of diet on microbial community structure and activity in the intestinal tract of weaning pigs.** A. Piva<sup>\*1</sup>, L. Magnani<sup>1</sup>, G. Casadei<sup>1</sup>, P. P. Gatta<sup>1</sup>, K. M. Selig<sup>2</sup>, and J. A. Patterson<sup>2</sup>, <sup>1</sup>University of Bologna, Italy Via Tolara di Sopra, 50, Ozzano Emilia (BO), <sup>2</sup>Department of Animal Sciences, Purdue University, West Lafayette, IN.

Weaning is the hardest step in the lifespan of a pig, and is often characterized by microbial imbalance, changes in intestinal structure and function, scours, low performance, or even death. Different nutritional strategies were studied relative to their ability to modulate intestinal microflora and performance. Three diets were fed over 5 weeks as follows: 1) standard U.S. diet with plasma protein, carbadox, zinc oxide and copper sulfate (US), 2) standard plant-protein-based European diet (EU) 3) EU diet + TRILAC (US Patent # 6,217,915) as a source of tributyrin and lactitol (TL). Performance was recorded at 7, 21, and 35 days, along with NH<sub>3</sub>, VFA and Lactic Acid Bacteria (LAB) count in cecum, colon and jejunum. Despite any effects recorded during the first week, after 21 days US diet fed piglets reported significantly ( $P < 0.05$ ) greater LW (11.36 kg, SE=0.42, n=30) and Feed Efficiency (0.53, SE=0.03, n=5), compared to EU (LW=9.38 kg; FE=0.39), or TL (LW=9.83 kg, FE=0.40) fed piglets. No differences were noticed between EU and TL treatments. A similar pattern was recorded at the end of the study (35 d) when US fed animals showed the highest ( $P < 0.05$ ) LW (18.87 kg, SE=0.62, n=25) whereas Feed Efficiency did not differ among groups. NH<sub>3</sub> was not affected by any treatment throughout the study, whilst colonic VFA concentration after 21 days was higher in EU and TL groups compared to US piglets (+27% and +77%, respectively,  $P < 0.03$ ). Moreover TL diet increased ( $P < 0.01$ ) LAB count in the cecum ( $9.02 \pm 0.36$  log 10 cfu/g feces) and colon ( $9.15 \pm 0.28$  log 10 cfu/g feces) of piglets than did US diet ( $7.50 \pm 0.44$  and  $8.03 \pm 0.45$  log 10 cfu/g feces, respectively). In conclusion a standard US diet added with plasma protein, carbadox, zinc oxide and copper sulfate out-performed a plant-protein-antibiotic-free European diet. Nevertheless the addition of tributyrin and lactitol together beneficially affected microbial balance and fermentation products leading to a LW numerically between those of US and EU formulations.

**Key Words:** Weaning Pigs, Intestinal Microbiota, AGP Alternatives

average of 10%, which is sufficient to have nutritional implications to its utilization by herbivores.

**Key Words:** Tropospheric Ozone, Forage Quality, *Poa pratensis*

**M114 Effect of increased cutting height of corn silage on nutritive value, milk yield and milk composition.** D. Dominguez-Diaz<sup>\*2</sup> and L. D. Satter<sup>1,2</sup>, <sup>1</sup>Dairy Forage Research Center, USDA-ARS, Madison, WI, <sup>2</sup>Dairy Science Department, University of Wisconsin-Madison, Madison.

The objective of this study was to evaluate the effect of increasing cutting height of a conventional corn hybrid (Golden Harvest H8250) from 20 cm (Normal cut corn silage, **NC**) to 61 cm (High cut corn silage, **HC**) on the nutritive value of corn silage, milk yield and milk composition. Thirty six multiparous and six primiparous Holstein cows averaging 70 days in milk (SD±16) and 45.2 kg milk/d (SD±6.4) were randomly assigned to the NC or HC diets following a 1-wk pretrial period. The experiment was a single reversal design with two 6-wk periods. The silages were chopped at 0.95 cm theoretical length of cut and stored in plastic bag silos. The NC and HC diets contained 65% forage, of which 70% was corn silage and 30% alfalfa silage. Increasing cutting height reduced DM yield by 8.3%, and increased grain content by 11.6% and decreased stalk by 38.5%. The concentration of DM, CP and starch were increased 9.1, 4.8 and 22.3% with the HC silage, and NDF, ADF and ADL concentrations were reduced by 9.9, 14.9 and 23.5%. Corn silage pH was slightly increased with the HC treatment. DMI was similar between the NC and HC diets (24.4 and 24.6 kg/d). The HC treatment increased yield of milk ( $P \leq 0.03$ ) and 3.5% FCM ( $P \leq 0.19$ ) compared to the NC diet (40.4 vs. 39.3 and 41.6 vs. 40.8 kg/d). Feed efficiency was increased ( $P \leq 0.06$ ) with the HC treatment (1.66 vs. 1.62). Milk composition, body weight and body weight change were unaffected by treatment.

**Key Words:** Cutting Height, Corn Silage