T238 Viability of *Lactobacillus plantarum* in different protective agents and its effects on growth performance and immunity of weaned pigs. J. Wang, H. F. Ji*, R. L. Ge, S. X. Wang, D. Y. Zhang, and Y. M. Wang, *Institute of Animal Husbandry and Veterinary Medicine, Beijing Academy of Agriculture and Forestry Sciences*, *Beijing, China*.

This experiment was conducted to evaluate the effect of different protective agents on the viability of *Lactobacillus plantarum* after freeze-dried and the effects of *Lactobacillus plantarum* on growth performance and immunity of weaned pigs. The strain of *Lactobacillus plantarum* was originally isolated from the gastrointestinal tract of healthy weanling pigs in our laboratory and strains were identified through standard morphological, biochemical, physiological tests, and by 16s rRNA gene sequence analysis by the China Center of Industrial Culture Collection. *Lactobacillus plantarum* were freeze-dried for 24 h in the presence of 10 different combinations of skim milk powder, lactose, soluable starch, ascorbic acid, sodium glutamate, glycerin, L-cysteine, dextrine, and sucrose. The viable count of *Lactobacillus plantarum* reached 1.6×10^{12} cfu/g after freeze-dried under the protective agents of 16% skim milk powder + 2% lactose + 10% dextrin + 0.5% L-cysteine + 1.5% sodium glutamate, showed the highest viability. Sixty-four piglets weaned at 28 d of age (8.13 ± 0.35 kg BW), were divided into 4 groups comprising of control with chlortetracycline at 50 mg/kg, 3 treatments of different *Lactobacillus plantarum* levels (freeze-dried; 0.3%, 0.5%, and 0.7% of diet). The experiment lasted 30 3 d. The results showed that the supplementation of *Lactobacillus plantarum* at 0.3% of diet level had the same effect on average daily gain (ADG) (405 vs. 393 g/d), feed/gain (F/G) (1.95 vs. 1.98), and mortality rate (0% vs. 0%) ($P > 0.05$) compared with chlortetracycline addition. But the 0.5% and 0.7% of diet level showed lower ADG and significant higher F/G and mortality rate compared with control ($P < 0.05$). *Lactobacillus plantarum* supplementation at any level showed significant higher antibody titers against classical swine fever (OD at 630 nm, $P < 0.05$). The present study implies that freeze-dried *Lactobacillus plantarum* at 0.3% of diet may be the most ideal concentration in ensuring growth performance and immunity of weaned pigs compared with chlortetracycline.

Key Words: *Lactobacillus plantarum*, growth performance and immunity, weaned pigs

T239 Effect of dietary delivery controlled antioxidant on the performances of cold stressed broiler. V. Noirot*, *Phodé Laboratories*, *Albi-Terssac, France*.

A product based on the dietary antioxidant curcumin formulated with delivery vehicles designed to control the release in the digestive tract (Phodé Laboratories, France), was tested on 4 groups (0, 50, 500, and 1000 ppm doses in feed) of 6 replicate pens each containing 25 Ross × Ross broiler chickens. Temperature was decreased from 22.5 to 12°C beginning on d 18, to induce an oxidative stress. Birds were individually weighed at 7, 18, 30, and 38 d. Feed conversion was evaluated per pen at each weighing. Serum glutathione peroxidase (GSH-Px) was measured on 2 birds per pen at 37 d of age. Performance data were subjected to the Mixed model procedure of SAS with treatment as fixed, pen as random and time as repeated factors. Chi-squared tests were performed on mortality rates. Mortality rate over the first 30 d tended to be lower ($P = 0.10$) in birds given 50 ppm (0.6%) compared to control birds (1.9%). After 30 d birds receiving 50 ppm were heavier (2,331 kg) than control birds (2,299 kg) ($P < 0.05$). Feed conversion was improved ($P < 0.05$) over the period 0 to 18 d with the levels of 50 and 500 ppm (1.955 and 1.981 respectively) compared to control (2.072) and 1000 ppm (2.009). The GSH-Px levels were increased by 50 ppm (2341 IU/L) compared to the other treatments (1436, 1914, 1371 IU/L for 0, 500, 1000 ppm respectively). The 50 ppm dose reduced mortality associated with cold stress and improved feed conversion and growth before 30 d, but higher doses were not beneficial. The 50 ppm dose may improve birds' antioxidant status.

Key Words: antioxidant, chicken

T240 Effects of feeding oregano essential oil to broilers on ileal digestibility and performance under high altitude conditions. L. Betancourt*[1,3], C. Ariza-Nieto[2], and G. Afanador-Téllez[3], [1]*Universidad de La Salle*, *Bogotá, Colombia*, [2]*CORPOICA*, *Bogotá, Colombia*, [3]*Universidad Nacional de Colombia*, *Bogotá, Colombia*.

It has long been acknowledged that some plant essential oils exhibit diverse functional activities. Oregano essential oil (OEO) has been shown to possess antibacterial activity; however, comparison of ileal digestibility of nutrients due to the supplementation of different varieties of OEO is scarce in the literature. The aim of this study was to test the effect of OEO supplementation on apparent ileal digestibility (AID) of energy, protein and fat of broilers diets. Seven hundred fifty 1-day-old Hybro male broiler chicks were randomly allotted to one of the 6 treatment groups: Control (C), 500 ppm chlortetracycline (AB), 50 ppm of OEO from *O. vulgare* H. ground in Greece (OG) and 3 additional treatments with 200 ppm of OEO from 3 varieties ground in Sabana of Bogota-Colombia (2650 AMSL): *O. vulgare* H. (OH), *O. vulgare* L. (OL) and *O. majorana* (OM). During a 7-d period (14–21 d), the chicken received a diet with 0.5% chromium oxide as an indigestible marker. On the last day, 20 birds per treatment were slaughtered and Ileal digesta samples were collected and stored at −20°C. Dry matter, protein, fat, energy and chromium were analyzed in feed and ileal content and nutrients AID were calculated. AB group showed a higher AID of protein compared with control (83.7% vs. 75.3%, $P < 0.05$), but not significant differences ($P > 0.05$) were observed among the other treatments. Both OM and AB groups showed a higher value of AID for energy and fat compared with control (92.3%, 91.7% vs.84.2%) ($P < 0.05$). Additionally, OM and AB presented the highest body weight at 21d. ($P < 0.05$). These results suggest that the addition of EO from *O. majorana* to broiler diets could enhance their performance.

Key Words: oregano essential oil, protein digestibility, fat digestibility

T241 Utilization of glandless and standard cottonseed meal in broiler diets. C. Salas*, R. D. Ekmay, J. England, S. Cerrate, and C. N. Coon, *University of Arkansas*, *Fayetteville.*

A 42d study was conducted to determine the field performance and processing yield of broilers fed corn-soy diets containing glandless cottonseed meal (GCSM), commercial CSM (CCSM), or only corn/SBM (CSBM). The nutritional value of both CSM samples was determined and utilized to formulate grower (11–21d) and finisher (22–42d) diets. All broilers were fed a starter corn-soy diet from 1 to 10d. The inclusion level of GCSM and CCSM in corn-soy diets was 12.42% based on the gossypol content of the meals to expose the broilers to 200 and 4.1 ppm of free gossypol, respectively. An additional set of all diets was formulated by adding 500 units/kg of phytase and decreasing NPP by

0.10%. The grower and finisher nutrient contents were based on specifications for Cobb 500 and were formulated based on digestible AA. Body weight (BW), feed intake (FI), feed conversion ratio (FCR) and mortality were monitored. At 42d, 5 birds/pen were further processed. The carcass yield was determined and weight of fillet, tenders, wings, leg quarters and rack were expressed as % of chilled weight.
The broilers had significant differences in BW, FI and FCR at 21d ($P < 0.05$). The birds fed the GCSM + phytase diet were the heaviest (946g) followed by the birds fed the CCSM diet (923 g). Broilers fed the CCSM + phytase diet had the poorest BW gain (886 g) and the poorest FCR from 11-21d (1.62) compared to the other treatments ($P = 0.0136$). The FCR, BW and mortality were not significantly different at 42d. The results indicate the protein source did not produce a significant effect on % carcass yield, but had an effect on fillet, tender and leg quarters % yield. The processing data shows significantly higher ($P < 0.01$) % yield for breast meat (≥25%) and tenders (≥5%) for broilers fed the GCSM diets compared to the CSBM diets. Broilers fed CCSM diets produced a higher ($P < 0.01$) % yield of leg quarters (≥31.5%). These results indicate that broilers can be fed standard CSM in broiler grower and finisher diets if free gossypol in total diet does not exceed 200 ppm.

Key Words: broilers, cottonseed meal, performance

T242 TMEn and amino acid digestibility of glandless and commercial cottonseed meal for broilers. C. Salas*, D. R. Ekmay, J. England, S. Cerrate, and C. N. Coon, *University of Arkansas*, *Fayetteville*.

Cottonseed meal (CSM) is an alternative protein source for poultry diets, but CSM use is limited mainly due to the presence of gossypol. Cotton genetic cultivars are presently being developed with a significant lower concentration of gossypol in the seed.
A digestibility study was conducted to determine the TMEn and amino acid (AA) digestibility of a glandless (GCSM) and a commercial (CCSM) cottonseed meal. Thirty male broilers (42d) in individual cages were fasted for a 48 hr period and 30 g of GCSM, CCSM, and dextrose were each precision fed to ten broilers. The dextrose (protein-free) was utilized to estimate endogenous AA losses. Excreta were quantitatively collected after 48 hr and freeze dried for further analysis. The chemical composition, gossypol content, TMEn and digestibility coefficients for AA were obtained for both meals. The crude protein and fat content of the GCSM was higher than the CCSM (48% and 45%, 5.3 and 1.75%, respectively, as is basis). The CCSM had a higher content of total and free gossypol (1.52% and 0.161%, respectively, %DM) when compared to the GCSM (0.02 and .003%, respectively, %DM). The GCSM contained a thousand additional kcal (27% more) of TMEn than the CCSM (3975 vs 2963 kcal/kg, %DM), because the true DM digestibility was 97% compared to 78% for CCSM. The AA content was determined for both meals and was higher for the GCSM when compared to the CCSM, but both had higher contents than the reports in the literature. When compared with the literature, methionine content was 2-fold higher for both GCSM and CCSM; cystine was 74-84% and 84-93% higher for CCSM and GCSM, respectively. The true digestibility coefficients for essential AA ranged from 73.9% for isoleucine to 91.8% for arginine, for CCSM, whereas the digestibility coefficients for GCSM were all higher than 90% for the essential AA.

Key Words: broilers, cottonseed meal, amino acid digestibility

T243 Effects of coated sodium butyrate on the performance and gut morphology of broiler chickens. Y. Zou[1], Z. B. Yang*[1], W. R. Yang[1], S. Z. Jiang[1], G. G. Zhang[1], and R. Yu[2], [1]*Shandong Agricultural University*, *Tai-an, Shandong, China*, [2]*Kangdequan Feed Co., Ltd*, *Hangzhou, Zhejiang, China*.

An experiment was performed to assess the effects of dietary coated sodium butyrate (CSB) on growth performance and morphological aspects of small intestine in broiler chickens at different ages. Three hundred sixty 1-d-old Arbor Acres broilers were randomly distributed into 3 treatments with 3 pens of 40 each and were fed starter rations from d1 to 21 and finisher rations from d22 to 42. Dietary treatment included 1) BD (basal diet), 2) BD+ antibiotics (40 mg/kg bacitracin zinc and 8 mg/kg colistin sulfate), 3) BD+200 mg /kg CSB. Broilers were fed for ab libitum intake and had free access to water. Body weight and feed intake of chicks of each pen were measured weekly for determination of average daily gain (ADG), average daily feed intake (ADFI), and feed conversion rate (FCR). Twelve birds of each treatment were slaughtered at d14 and d35 of the experiment and the intestinal samples were removed to determine gut morphology. All broilers had similar ADFI over the entire experimental period. However, supplementation with 200 mg/kg coated sodium butyrate increased final weight and ADG ($P < 0.05$), but reduced FCR as compared with that of basal and antibiotics diets. Supplementation of CSB increased ($P < 0.05$) villus height of duodunum and jejunum and reduced ($P < 0.05$) the crypt depth at 14-d of age, but did not affect the morphology of ileum. The antibiotics supplementation significantly increased ($P < 0.05$) villus height of jejunum and ileum, but had no effect on villus height of duodunum and on crypt depth of the 3 segments at 14-d of age. Although broilers received butyric acid or antibiotics (zinc bacitracin 40 mg/kg + colistin sulfate 8 mg/kg) as feed additive at 35-d of age had greater villus height and lower crypt depth than the control chicks, the tendency were not significant among the 3 experimental groups ($P > 0.05$). In the current study conducted, the addition of coated sodium butyrate at 200 mg/kg level showed a positive effect on performance and intestinal morphology, and coated sodium butyrate can be a possible substance to replace antibiotics as growth promoters for farm animals.

Key Words: coated sodium butyrate, broiler, performance and gut morphology

T244 Study on the utilization of oregano essentials oils (oeo) by tilapia *Oreochromis niloticus* var. *chitralada* in a commercial production cycle. D. Rodriguez*[1,2], C. Ariza-Nieto[2], A. Munoz[1], and G. Afanador[1,2], [1]*Universidad Nacional de Colombia*, *Bogota, Colombia*, [2]*CORPOICA*, *Bogota, Colombia*.

Carvacrol and thymol are the 2 main active components of oregano essential oil (OEO). The aim of this study was to investigate the effect of different ratios of carvacrol to thymol on growth performance of Nile Tilapia. Five hundred 20 8 10 g tilapia were randomly assigned to one of the 4 treatments groups: C) control group; HT) high thymol (Colombian native oregano); TC) thymol:carvacrol 1:1 ratio (Colombian native oregano+Greek Oregano); and HC) high carvacrol (Greek oregano). Fish were placed in 24 tanks during starter-finish phase and their performance was determined every other week until 550g of body weight. Data were analyzed under a completely randomized design using the GLM procedure of SAS. Specific growth rate (SGR) and daily growth coefficient (DGC) of fish fed HT were higher than those of fish fed both C and TC (1.5929, 1.5187 and 1.5015; 3.186, 3.000 and 2.986, %/day, respectively) ($P < 0.05$). Days to market (550g) of fish fed HT was lower than that of HC (165.7 vs 186.5) ($P < 0.05$), but not significant differences ($P > 0.05$) were noted among other treatments.

It can be concluded that natural Colombian native oregano, can act as a growth promoter when added to nile tilapia feed.

Key Words: Nile tilapia, oregano, carvacrol:thymol

T245 Dietary supplementation effects of oregano essential oils and two sources of fat on the performance of brown laying hens under high altitude conditions. D. Botero[1], F. Silva[1], L. Betancourt*[1,3], C. Ariza-Nieto[2], and G. Afanador-Téllez[3], [1]*Universidad de La Salle*, *Bogotá, Colombia*, [2]*CORPOICA*, *Bogotá, Colombia*, [3]*Universidad Nacional de Colombia*, *Bogotá, Colombia*.

Fish oils have been used to the incorporation of n-3 fatty acids into eggs, but this practice can exert a negative influence on their sensory properties. On the other hand, Oregano Essential Oil (OEO) has been shown to possess anti-oxidant activity. Thus, the aim of this study was to evaluate the effect of OEO carvacrol:thymol ratio and 2 sources of fat on production performance of laying hens and eggs sensory properties. One hundred sixty brown laying hens were randomly assigned to one of 8 treatment combination in a 4 × 2 factorial arrangement. Factors included were, source of fat, fish oil (FO) or palm oil (PO) and carvacrol:thymol ratio supplemented with 200 ppm of OEO; high carvacrol (HC), high thymol (HT), carvacrol:thymol 1:1 ratio (CT) and control (C) without OEO supplementation. Hens were housed in 80 conventional cages (2 per cage) and the study was conducted over a period of 16 weeks. Eggs were collected, numbered and weighed every day. Sensory evaluation was carried out with 40 tasters. When PO was used as a source of fat, the HC improved production egg, mass egg and feed conversion ratio; in contrast, HT and CT decreased egg production and egg mass ($P < 0.05$). The supplementation of OEO HC, HT and CT improved production performance ($P < 0.05$) when the source of fat was FO. HT significantly improved egg taste perception when FO was included in the diet; but HC improved it when PO was included ($P < 0.05$). It can be concluded that OEO can enhance laying hen performance and high thymol ratio has positive effects on flavor when FO is added to diet for functional eggs design.

Key Words: fish oil, n-3 FA, egg taste

T246 Effect of supplementing the diet of sows with a source of yeast-derived proteins during lactation on performances of sows and piglets. P.-A. Plante*[1,2], J.-P. Laforest[2], and C. Farmer[1], [1]*Agriculture and Agri-Food Canada, Dairy and Swine R&D Centre*, *Sherbrooke, QC, Canada*, [2]*Animal Science Dept., Laval University*, *Québec, QC, Canada*.

The impact of supplementing the diet of sows with a source of yeast-derived proteins (NuPro) during lactation on the performances of sows and their piglets was studied. Sixty-five crossbred sows were fed one of 3 levels of yeast proteins (YP) from 0 to 21 d of lactation. Treatments were: control without YP (CTL, n = 22); 30 g of YP per day (Y30, n = 22) and; 60 g of YP per day (Y60, n = 21). Jugular blood samples were obtained from sows on d 2, 7 and 20 of lactation to measure urea concentrations. Milk samples were obtained on d 7 and 20 of lactation for compositional analyses (fat, lactose, dry matter) and quantification of 5`monophosphate nucleotides. Litter size was standardized to 10 ± 1 at 48 h postpartum. Sow BW loss and backfat loss during lactation (from d 2 to 21) were recorded as well as weights of piglets on d 0, 2, 7, 14, 21, 24, 28, 35, 42, 49, and 56. Feed intakes of sows during lactation and of piglets for 5 wk post-weaning were noted. Statistical analyses were performed with PROC MIXED using an ANOVA with one factor (3 levels) according to a completely randomized design. None of the animal performance data differed between treatments ($P > 0.1$). Standard milk composition was also similar across treatments ($P > 0.1$). There were more nucleotides in milk on d 7 than on d 20 of lactation (means ± SD for AMP, CMP, GMP, IMP and UMP were 12.7 ± 2.8, 9.4 ± 2.1, 14.6 ± 2.8, 2.5 ± 0.7 and 281.3 ± 45.1 µmol/100 mL on d 7 and 6.0 ± 1.1, 3.6 ± 0.9, 7.5 ± 1.0, 1.5 ± 0.6 and 138.7 ± 15.4 µmol/100 mL on d 20; $P < 0.001$) but these concentrations were not affected by treatments ($P > 0.1$). On d 2 of lactation, circulating concentrations of urea tended to be greater for Y60 than CTL sows ($P = 0.1$). In conclusion, supplementing the diet of lactating sows with yeast proteins had no beneficial effect on sow and piglet performances.

Thanks to Alltech for financial support.

Key Words: sow, lactation, yeast proteins

T247 Microencapsulation of *Lactobacillus plantarum* and its effects on growth performance of weaned pigs. J. Wang, H. F. Ji*, L. J. Lv, S. X. Wang, D. Y. Zhang, and Y. M. Wang, *Institute of Animal Husbandry and Veterinary Medicine, Beijing Academy of Agriculture and Forestry Sciences*, *Beijing, China*.

This experiment was carried out to study the most suitable method and wall material for microencapsulation of the probiotic bacterium *Lactobacillus plantarum* to maintain cell viability during gastric challenge, and the effect of *L. plantarum* microcapsule on growth performance of weaned pigs. Strains of *L. plantarum* were individually encapsulated using different method of extrusion or emulsion. The optimum wall material formula of making microcapsule was studied through the orthogonal experiment. The survival of planktonic cells and encapsulated cells of *L. plantarum* treated with simulated gastric juice were detected. The results showed that extruded microcapsules were larger and more uniformly shaped. The viable count was reached 7.76×10^{10} cfu/g under the wall material formula as 3% alginate, 4% skim milk, 6% milk sugar, and 2% calcium chloride. When planktonic cells and encapsulated cells of *L. plantarum* were subjected to simulated gastric juice challenge at pH 2.1 for 3 h. The survival of *L. plantarum* cells treated with simulated gastric juice was significantly better ($P < 0.05$) when microencapsulated. Thirty-two piglets weaned at 28 d of age (8.11 ± 0.32 kg BW), were divided into 2 groups comprising of control diet with *L. plantarum* (0.5% of diet) and diet with *L. plantarum* microcapsule (0.5% of diet). The experiment lasted 30 d. The results showed that the supplementation of *L. plantarum* microcapsule had higher average daily gain (ADG) (390 vs. 326 g/d; $P < 0.05$) and lower diarrhea rate (3.25 vs. 6.67) and mortality rate (0 vs. 6.25) compared with control. In general, microencapsulation using selected wall material formula by extrusion was found to provide bacteria significantly greater protection ($P < 0.05$) against simulated gastric juice, and had positive effect on growth performance of weaned pigs.

Key Words: *Lactobacillus plantarum*, microencapsulation, weaned pig

T248 Effect of xylo-oligosaccharides on growth performance, enzyme activity and volatile fatty acid production of post-weanling pigs. H. S. Huang[1], S. Zhou[1], Z. B. Yang*[2], W. R. Yang[2], and L. Xiao[3], [1]*Qinghai University*, *Xining, China*, [2]*Shandong Agricultural University*, *Taian, Shandong, China*, [3]*Shandong Longlive Bio-technology Co., Ltd*, *Dezhou, Shandong, China*.

The experiment was conducted to assess the effects of Xylo-oligosaccharides (XOS) on growth performance, volatile fatty acid (VFA) production and intestinal enzyme activity of piglets. A total of 300, 28-d-old post-weanling pigs were randomly assigned to one of 6 dietary

treatments with 5 replicates of 10 piglets each. Treatments included control diet without Xylo-oligosaccharides and test diets supplemented with 40, 60, 80, 100 and 120 mg XOS /kg DM, respectively. Average daily gain (ADG), average daily feed, intake feed (ADFI) and gain ratio (F:G) were measured weekly of each replicate. Diarrhea piglets were recorded 3 times a day to determine diarrhea rate (DR). Five piglets of each treatment were slaughtered at d28 of the experiment and the intestinal contents were removed to determine intestinal VFA (gas chromatography) and digestive enzyme activities (colorimetric method). All pigs had similar ADG and ADFI but XOS diet decreased ($P < 0.05$) DR. However, Supplementation with 40, 60 and 80 mg XOS /kg DM had lower ($P < 0.05$) F:G as compared with that of control. Increasing supplementation of XOS linearly ($P < 0.05$) and quadratically ($P < 0.05$) increased concentrations of acetic acid, propionic acid and butyric acid in the jejunum, ileum and cecum. Lipase activity was quadratically ($P < 0.01$) increased in the duodenum, jejunum and ileum, trypsin activity was linearly ($P < 0.05$) increased in duodenum and jejunum, as well as amylase activity was linearly ($P < 0.05$) increased in the ileum with the increasing supplementation of XOS. In conclusion, supplementation of XOS decreased DR and 40, 60, 80 mg XOS/kg DM reduced F:G. Concentrations of VFA were linearly ($P < 0.05$) and quadratically improved in jejunum, ileum and cecum. Lipase activity and tryptic activity were linearly ($P < 0.05$) and quadratically ($P < 0.05$) increased in duodenum and jejunum and lipase activity and amylase activity were linearly ($P < 0.05$) and quadratically ($P < 0.05$) changed in the ileum with the increasing supplementation of XOS.

Key Words: xylo-oligosaccharides, pigs, volatile fatty acid and enzyme activity

T249 Effect of short-term benzoic acid and chlortetracycline treatment of feed on splanchnic metabolism of valine in growing pigs. N. B. Kristensen*[1], R. G. Engberg[1], B. B. Jensen[1], J. V. Nørgaard[1], H. D. Poulsen[1], H. D. Zacho[2], and N. M. Sloth[3], [1]*Aarhus University*, *Tjele, Denmark*, [2]*Viborg Hospital*, *Viborg, Denmark*, [3]*Danish Agriculture and Food Council*, *Aarhus, Denmark*.

The present study aimed to investigate the effects of short-term feed treatment with benzoic acid (BA) and chlortetracycline (CTC) on portal-drained visceral (PDV) metabolism of arterial [U-13C]Val as well as portal absorption and hepatic uptake of Val in growing pigs fed a low-protein diet. Eight female pigs (70 ± 2 kg BW) fitted with permanent indwelling catheters in the abdominal aorta, v. cava, hepatic portal vein, hepatic vein, and the mesenteric vein were used in the study. Pigs were fed a diet based on wheat (72%), soybean meal (12%), and barley (10%), supplemented with crystalline Lys, Met, Thr, Trp, and Val (0.08%), and containing 14.7% crude protein (as fed). Intake was restricted to 3.6% of BW/d. Pigs were randomly assigned to either control (CON; basal diet) or treatment (TRT; basal diet + 10 g BA and 0.7 g CTC/kg feed). Feed was offered in 3 equal sized meals at 8-h intervals and treatments were applied for 24 h. Blood samples were collected hourly during the last 8 h of the treatment period. Primed continuous infusion of [U-13C] L-Val (0.085 ± 0.005 mmol/h) into the v. cava was initiated 1 h before first sampling. Plasma samples were analyzed for AA by GC/MS and C-13 abundance in Val was determined using GC/C/IRMS. Data were analyzed using the MIXED procedure in SAS by a model including the fixed effects of treatment and block and with pig by block designated as a random effect. The arterial concentration of Val tended ($P = 0.07$) to increase with TRT (0.47 ± 0.02 mmol/L) compared with CON (0.41 ± 0.02 mmol/L). The PDV extraction of arterial Val (4.6 ± 0.4%) did not differ ($P = 0.21$) among treatments. The net portal flux of Val tended ($P = 0.10$) to be less for TRT, but the portal absorption of Val corrected for PDV uptake of arterial Val did not differ ($P = 0.82$) among treatments. The net hepatic and net splanchnic fluxes of Val were not affected by treatment ($P = 0.61$ to $P = 0.94$). Data indicate that upper gut microbial deamination is without quantitative importance to availability of Val in growing pigs fed a low-protein diet added crystalline Val.

Key Words: amino acid, metabolism, pig

T250 Characterization of the gastrointestinal microbiota in neonatal piglets from sows supplemented a *Bacillus*-based direct fed microbial. A. Baker*, E. Davis, and T. Rehberger, *Danisco*, *Waukesha, WI*.

Direct fed microbials (DFMs) supplemented in sow diets may confer health benefits to the host and the piglets by reducing pathogens in the sow and environment. In this study we evaluated the effect of a *Bacillus*-based DFM on the gastrointestinal microbiota of neonatal piglets. A total of 208 sows were divided into 2 treatments: a control diet and the control diet supplemented with a *Bacillus*-based DFM (3.75×10^5 cfu/g feed). Twenty-one piglets sampled from each sow treatment group were killed on d 3 of lactation as well as 15 piglets per treatment on d 10 of lactation. Terminal restriction fragment length polymorphism (T-RFLP) was used to characterize the microbiota in the ileum and colon of the piglets using 3 enzymes (MspI, BstUI, and *Hae*III) to generate terminal restriction fragments (TRFs). The presence and quantity of TRFs were compared between control and DFM pigs and presumptively identified using the Microbial Community Analysis III (MiCA 3) database. There was a greater incidence and quantity of TRFs B423 and H330 (Binary $P = 0.01$, 0.08; Quantitative $P = 0.01$, 0.05 respectively), putatively identified as *Lactobacillus gasseri/johnsonii*, in the ileum of pigs nursing sows supplemented with DFM at d 3. TRF peaks B423 and H330 were also greater (Binary $P = 0.01$, 0.08; Quantitative $P = 0.01$, 0.01 respectively) in the colon of pigs nursing sows supplemented with DFM at d 3. Peaks M495 and B394, putatively identified as *E. coli*, were greater (Binary $P = 0.01$, 0.04; Quantitative $P = 0.01$, 0.01 respectively) in the colon of the control pigs at d 3. At d 10, both presence and quantity of *Lactobacillus* species were greater ($P < 0.05$) in the colon of the DFM treatment. Additionally, there was a tendency for TRFs B227 and H257 (Binary $P = 0.07$, 0.07 respectively), putatively identified as *Clostridium perfringens*, to be present in the ileum of the control pigs at d 10 compared with treated pigs. The results of this study demonstrate the ability of a DFM to influence the gastrointestinal microbiota of a neonatal piglet through supplementation of the DFM to the sow.

Key Words: T-RFLP, swine, direct-fed microbial

T251 Cloning of a porcine trypsinogen gene and over-production of the protein as a feed additive. F. Wang[1], H. Zhao[1], X. J. Xia[1], and X. G. Lei*[1,2], [1]*Int. Ctr. of Future Agriculture for Human Health, Sichuan Agri. Univ.*, *Chengdu, China*, [2]*Cornell University*, *Ithaca, NY*.

Trypsin is a serine protease that plays a key role in the activation cascade of pancreatic digestive enzymes, and may be used to improve feed protein digestion by young animals. To produce a recombinant pancreatic trypsinogen, we used RT-PCR to amplify the full-length cDNA of porcine trypsinogen gene (submitted to GeneBank: FJ969506.1) from the porcine pancreas mRNA and inserted the DNA fragment into the pPICZαA expression vector (Invitrogen, Shanghai, China). The plasmid construct was transformed into *Pichia pastoris* X33 cells, and the transformants were screened by SYBR-green quantitative real-time RT-PCR analysis (ABI 7900HT, Applied Biosystems, Foster City, CA) for high levels of expression. After the transformants were induced by 0.5% methanol for 98 h, the extracellular recombinant trypsinogen contain-

ing a histidine tag in the C terminus was purified using Ni-Sepharose affinity chromatography (GE Healthcare, Piscataway, NJ). The purified protein exhibited a molecular mass of approximately 30 kDa as determined by SDS-PAGE analysis. The successful expression of the recombinant trypsinogen in *P. pastoris* enabled us to further study the enzyme function in animal feed.

Supported by the 863 program (2007AA100602 and 2007AA100601-6) and by the Chang Jiang Scholars Program of the Chinese Ministry of Education (XGL).

Key Words: porcine, trypsinogen, feed enzyme, *Pichia pastoris*, gene expression

T252 Effects of various cereals on nursery pigs: Specific bacteria identified from the gastrointestinal tract. Y. Liu*, M. Rossoni, J. Barnes, and J. E. Pettigrew, *University of Illinois*, *Urbana*.

A study was conducted to evaluate the influence of different cereal grains on the bacterial populations in the gastrointestinal tract of young weaned pigs. A total of 24 pigs (7.71 kg BW) were weaned at 21 d of age and randomly allotted to one of 4 treatments. Each diet contained corn, barley, rolled oats, or rice as the only cereal. Pigs were allowed ad libitum access to feed and water throughout the 14-d experimental period. At the end of the experiment, all pigs were killed to collect mucosal and digesta samples from ileum and distal colon. Denaturing gradient gel electrophoresis (DGGE) was used to assess the microbial population structures. In a few cases, specific bands were present in most pigs fed one treatment, but absent from most pigs fed other treatments. Major bands were excised and sequenced to identify the bacterial species that appear or disappear under different cereal treatments. The results showed that most pigs fed barley lacked significant populations of several species of *Sphingomonas* that were often present in the distal colon digesta and mucosa of pigs fed the other cereals. Most pigs fed rice differed from those fed other cereals in having a significant distal colon mucosal population of a *Corynebacterium* species but lacking a species of *Veillonella*. In conclusion, feeding of different cereals as sources of energy altered microbial diversity in the GI tract, especially with regard to *Sphingomonas* species.

Key Words: cereal, microbial diversity, nursery pigs

T253 Effects of dietary benzoic acid supplementation on net portal absorption and hepatic uptake of amino acids in growing pigs. N. B. Kristensen*[1], H. D. Zacho[2], J. V. Nørgaard[1], and H. D. Poulsen[1], [1]*Aarhus University*, *Tjele, Denmark*, [2]*Viborg Hospital*, *Viborg, Denmark*.

The present study aimed to investigate the effects of adding 1% benzoic acid (BA) to a standard finishing diet for growing pigs on net portal, net hepatic, and net splanchnic fluxes of amino acids (AA). It was hypothesized that BA supplementation would increase the portal absorption of AA, increase hepatic glycine uptake, and decrease splanchnic glycine release. Eight female Duroc × (Danish Landrace × Yorkshire) weighing 63 ± 1 kg at time of sampling and fitted with permanent indwelling catheters in the abdominal aorta, hepatic portal vein, hepatic vein and the mesenteric vein were used in the study. Pigs were fed a diet based on barley and soybean meal with intake restricted to 3.6% of BW/d. Pigs were allocated to 4 sampling blocks and randomly assigned to either control (CON; basal diet) or BA treatment (B; 10 g benzoic acid as top-dress; VevoVitall, DSM Special Products, Rotterdam, The Netherlands) within block. Feed was offered in 3 equal sized meals and blood samples collected hourly for 8 h with first sampling 0.5 h before feeding. Plasma samples were pooled by catheter and pig and analyzed for individual AA by a GC/MS based isotope dilution method following silylation. Data were analyzed using the MIXED procedure in SAS with a model including the fixed effects of treatment and block and with pig by block designated as a random effect. Amino acid fluxes were analyzed as the net flux in grams of AA per kg feed. The net portal flux of Ala and Thr increased ($P < 0.05$) and the net portal flux of His and Lys ($P < 0.10$) tended to increase with B compared with CON. The net hepatic uptake of Gly was not affected by treatment ($P = 0.91$), but the net hepatic uptake of Ser increased ($P = 0.02$) with B compared with CON. The net splanchnic release of Ser tended ($P = 0.08$) to decrease with B compared with CON. No effects of treatment were detected for net splanchnic flux of any AA other than Ser. Impact of benzoic acid supplementation on AA absorption and metabolism warrants further considerations on AA nutrition of pigs supplemented with benzoic acid.

Key Words: pigs, benzoic acid, amino acid metabolism

T254 Effects of dietary Stafac inclusion level on the growth performance and carcass characteristics of growing–finishing pigs. C. L. Puls*[1], M. Mercedes[1], M. Ellis[1], A. M. Gaines[2], B. A. Peterson[2], B. F. Wolter[2], and M. Kocher[2], [1]*University of Illinois*, *Urbana*, [2]*The Maschhoffs*, *Carlyle, IL*.

The effect of dietary Stafac inclusion level on the growth performance and carcass characteristics of growing-finishing pigs was evaluated from 40.0 ± 1.45 kg to 127.8 ± 1.13 kg BW. A randomized complete block design was used with 1 treatment (Stafac inclusion level) and 2 levels (0 and 10 g/ton). Diets were formulated to meet or exceed NRC (1998) recommendations for nutrient requirements. A total of 144 barrows housed in pens of 9 were used with 8 replicates/treatment level. Pigs were weighed at the start and end of the study, and every 2 weeks during the interim period; all feed additions were recorded. At the end of the study, pigs were harvested at a commercial plant and carcass measures were taken. There was no effect ($P > 0.05$) of Stafac inclusion level on live weight growth performance. Mortality levels were 2.8 percentage units lower for pigs fed Stafac compared with controls; however, this difference was not significant ($P > 0.05$). Including Stafac in the diet increased ($P < 0.05$) carcass yield by 0.7 percentage units and, consequently, improved ($P < 0.01$) carcass G:F ratio by 4%. In conclusion, including Stafac in the diet of growing-finishing pigs (at 10 g/ton) did not improve live weight growth performance in this study; however, the potential reduction in mortality levels and increases in carcass yield and carcass feed efficiency are of economic significance and need to be verified.

Key Words: pigs, growth, Stafac