

for DMI and OMI were 4.36 g/kgw^{0.75} and 3.28 g/kgw^{0.75} with corresponding r² values of 0.84 and 0.87, respectively. Both calibration and validation results indicated that NIRS equations were successfully

developed, and could be used as a tool for predicting the intake of donkeys.

Key Words: Intake, Near Infrared Reflectance spectroscopy, Equine

Nonruminant Nutrition: Natural Phytobiotics for Health of Young Animals: Applications and Mechanisms

867 Natural phytobiotics for health of young piglets and poultry: Mechanisms and application. W. Windisch*¹ and A. Kroismayr², ¹University of Natural Resources and Applied Life Sciences, Vienna, Austria, ²BIOMIN GmbH, Herzogenburg, Austria.

In order to establish alternatives to antibiotic growth promoters (AGPs), phytogetic substances, especially essential oils, are of increasing interest actually. Herbs, spices, plant extracts and essential oils may have positive effects on performance of animals. For example, phytogetic substances derived from Oregano (*Origanum vulgare*), especially the major active substances thymol and carvacrol, are known to exert antimicrobial and bactericidal actions in vitro. Phytogetic substances can also lead to higher secretion of digestive enzymes and mucus, thus presumably stimulating transport rates of nutrients from intestinal lumen towards blood. As an additional effect phytogetic substances may protect intestinal tissue from microbial attack. In order to gather more information about mode of action of phytogetic feed additives, especially with respect to similarity to AGPs, a commercial essential oils blend was tested with a negative control group as well as a standard AGP (Avilamycin) in a 50days model study employing 120 weaner piglets. A subgroup of 3 x 12 animals was sacrificed at trial day 22 to collect chyme and tissue samples for analysis of chyme microbiology including microbial products, gut morphology, and mRNA expression of apoptotic and inflammatory markers in gut tissues. The study showed that the impact of essential oils on performance and aforementioned parameters was very similar to those of the antibiotic growth promoter (Avilamycin). Essential oils enhanced immune status of piglets and improved nutrient digestibility. Generally speaking, phytogetic feed additives can be considered to act similarly to other substances with growth promoting action (e.g. antibiotics, probiotics, organic acids) with the overall effect of promoted zootechnical performance.

Key Words: Phytobiotics, Essential Oils, Piglets

868 The use of bioactive herbal saccharides in China. X. Piao*¹, S. Yuan¹, S. W. Kim², D. Li¹, and D. Ou¹, ¹China Agriculture University, Beijing, China, ²Texas Tech University, Lubbock.

Immune disorders are common phenomena in human and animals due to immature immune system and stress, and thus they might be more susceptible to infection when exposed to a variety of micro-organisms. Bioactive saccharides like polysaccharide and/or oligosaccharide found in herbs are considered to be important components playing roles in immunomodulatory action and antioxidant activity. The structure and bio-activity of saccharides is, however, not fully understood. In this review, immune and antioxidant activities of the saccharides from Chinese herbs are introduced, including polysaccharids (*astragalus*, *ganoderma lucidum*, *phoma herbarum*, *lycium barbarum*, *lentinus edodes*, *angelica Sinensis*, *coriolus versicolor*, *misgurnus anguillicaudatus*, *spirulina platensis*, *cladonia furcata*, pumpkin polysaccharide) and oligosaccharide (mannan-, galacto-mannan-, isomalto-

fructo-, and xylo-oligosaccharide). Growing interests in herbal saccharides mainly arise from the emerging knowledge about their roles in: 1) enhancing T-cell mediated immune response and humoral immune response; 2) inhibiting the growth of tumour; 3) scavenging effects on active oxygen; 4) protective effects on the acute hepatic injury; 5) promoting wound healing and proliferation of endothelial cells in vitro; 6) decreasing total cholesterol and triglyceride; and 7) improving the impaired glucose tolerance. Considering these possible benefits but without drug residues and low side effects, the bioactive herbal saccharides can be a potential immunomodulating agent to improve health and immune function for life.

Key Words: Saccharide, Immunity, Antioxidant

869 Effect of a phytogetic feed additive on reproduction performance of sows. A. Kroismayr*^{1,4}, C. Hsun², M. Racousier³, and T. Steiner⁴, ¹University of Natural Resources and Applied Life Sciences, Vienna, Austria, ²BIOMIN America Inc, San Antonio, Texas, ³Universidad Mayor, Santiago, Chile, ⁴BIOMIN GmbH, Herzogenburg, Austria.

Growing concern about antibiotic growth promoters in animal nutrition has created efforts to use different plant compounds as possible natural alternatives. Phytogetics are a heterogeneous group of feed additives originating from fruits, herbs, spices or other plants. The aim of this study was to evaluate the effect of a defined phytogetic feed additive (Biomin® P.E.P. 1000), which contains essential oils derived from oregano, anise and citrus peels, on reproductive performance of sows. A feeding trial was conducted under guidance of Universidad Mayor, Santiago, Chile. In this study, eighty cross-bred (PIC 337x Camborough 22) sows were assigned to two dietary treatments with 40 sows per treatment. A gestation diet was fed restrictively (3 kg/d) from day 15 to day 3 before farrowing. Subsequently, a lactation diet was offered ad libitum until weaning. Diets based on corn, soybean meal and wheat by-products were either supplemented or not supplemented (Control) with a phytogetic feed additive (Biomin® P.E.P. 1000, 2 kg/t). Addition of phytogetics to the diets substantially increased feed intake in the lactation period. The average feed intake in lactation amounted to 7.070 and 7.238 kg (P>0.05) for the control and trial group, respectively. It is generally accepted that a higher feed intake in lactation together with improved digestion results in an increased supply of nutrients and energy for the piglets in the milk. Inclusion of phytogetics in diets of sows positively affected litter performance as well. Compared to the control group, phytogetics improved growth performance of piglets, resulting in higher body weights of piglets at weaning (6.15 vs. 5.90 kg, P>0.05). Average daily gain was 220 and 230 g (P>0.05) in the control and trial group, respectively. Compared to the control group, piglets in the trial group were 4 and 6% heavier at birth (15.52 vs. 14.93 kg, P>0.05) and weaning (65.81 vs. 61.83, P>0.05), respectively.

Key Words: Sows, Phytogetics, Essential Oils

870 Effects of phytobiotics on nursery pig performance. R. C. Sulabo^{*1}, J. Y. Jacela¹, J. M. DeRouchey¹, M. D. Tokach¹, F. Neher², R. D. Goodband¹, S. S. Dritz¹, and J. L. Nelssen¹, ¹Kansas State University, Manhattan, ²Biomim Inc., San Antonio, TX.

A total of 192 weanling pigs (initially weighing 5.85 kg and 22 ± 2 d of age, PIC) were used in a 42-d growth assay to determine the effects of phytobiotics (Biomim[®] P.E.P. 125 and 125T) on post-weaning growth performance. Pigs were blocked by initial weight and randomly allotted to one of four treatments: 1) negative control (feed containing no antibiotic or phytobiotic); 2) negative control + phytobiotic 1 (125 g/ton of Biomim[®] P.E.P. 125); 2) negative control + phytobiotic 2 (125 g/ton of Biomim[®] P.E.P. 125T), and 4) positive control (feed containing 140 g/ton of neomycin sulfate and 140 g/ton of oxytetracycline HCl; Neo/OTC). Each treatment had six pigs per pen and eight replications (pens). Phase 1 and 2 diets were fed from d 0 to 14 and d 14 to 42, respectively. Overall (d 0 to 42), ADG (g), ADFI (g), and G:F was 453, 642, and 0.71 for pigs fed the negative control; 481, 658, and 0.73 for pigs fed phytobiotic 1; 477, 649, and 0.74 for pigs fed phytobiotic 2; and 502, 705, and 0.71 for pigs fed the positive control. Pigs fed Neo/OTC had greater (P<0.03) ADG and ADFI than pigs fed the negative control diet and pigs fed diets with phytobiotics. Addition of phytobiotics to the nursery diet also increased (P<0.03) ADG and G:F compared to pigs fed diets without antibiotics and improved (P<0.01) G:F compared to pigs fed the positive control diet. No differences (P>0.38) were observed in ADFI between pigs fed the negative control diet and pigs fed either phytobiotic. Pigs fed diets with Neo/OTC had similar (P>0.28) G:F compared to pigs fed diets without antibiotics. No differences (P>0.52) were observed in ADG, ADFI, and G:F between pigs fed diets with phytobiotic 1 and 2. In conclusion, phytobiotics in nursery diets improved post-weaning growth performance when added to diets without antibiotics. Further research is needed to elucidate specific modes of action that caused positive effects in post-weaning growth and efficiency.

Key Words: Phytobiotics, Antibiotics, Nursery Pig

871 Dietary supplementation with *Acanthopanax Senticosus* extracts enhances the digestion and absorption of dietary protein and amino acids in weaned pigs. F. G. Yin^{*1}, X. F. Kong¹, Y. L. Yin¹, H. J. Liu¹, F. F. Xing¹, Q. H. He¹, T. J. Li¹, R. L. Huang¹, P. Zhang¹, and G. Y. Wu^{1,2}, ¹Institute of Subtropical Agriculture, The Chinese Academy of Sciences, Changsha, Hunan, China, ²Texas A&M University, College Station.

This study was conducted to determine the effects of dietary supplementation with *Acanthopanax senticosus* extracts (ASE) on the digestion and absorption of protein and amino acids in weaned pigs. Sixty piglets weaned at 21 d of age were randomly assigned to one of the three treatment groups, representing supplementation with 0 (control) or 0.1% ASE or 0.02% colistin (an antibiotic) to a corn- and soybean meal-based diets for 28 d (n=20 pigs/group). On d 0, 7, 14 and 28 post the initiation of ASE supplementation, venous blood samples were obtained from 5 pigs per group and sera were analyzed for amino acids. On d 28, pigs were euthanized to obtain digesta from the terminal ileum for determining total amino acids. The results indicated that serum concentrations of total amino acids in all groups of pigs were gradually increased (P<0.05) with increasing age. On d 28, serum concentrations of His and Lys in ASE-supplemented pigs were higher (P<0.05) than those in the other two groups, whereas serum concentrations of Thr in ASE-supplemented pigs were higher (P<0.05) than those in colistin-supplemented pigs. Serum concentrations of Phe, Tyr, Leu, Ile and Ala in ASE-supplemented pigs were higher (P<0.05) than those in the control group. Concentrations of Phe, Tyr, Leu, Ile, Ala, Gly, Asp, Glu, His, Lys and Ser in the digesta of in ASE-supplemented pigs were lower (P<0.05) than those in the other two groups. Further, concentrations of Val, Arg and Thr Ser were lower (P<0.05) in ASE-supplemented pigs than those in colistin-treated pigs. Collectively, these findings suggest that dietary supplementation with ASE enhances the digestion and absorption of protein or amino acids in weaned pigs.

Key Words: Herbal Extracts, Amino Acids, Weaned Pigs

Nonruminant Nutrition: Weanling Pig Nutrition

872 Effect of organic acids and antibiotic growth promoters on growth performance, gastrointestinal pH, intestinal microbial populations and immune responses of weaned pigs. Z. Li¹, D. Li¹, G. Yi^{*2}, J. Yin¹, and P. Sun¹, ¹China Agricultural University, Beijing, P.R. China, ²DaChan NorthEast Asia Corp, Beijing, P. R. China.

Two experiments compared the effects of feeding organic acids and antibiotic growth promoters (AGP) in weaned pigs. Nursery pigs (N=96, 7.80 ± 0.07 kg) were allotted to a control or supplemented with AGP (200 ppm chlortetracycline plus 60 ppm Lincospectin), 0.5% potassium diformate, or 0.5% dry organic acid blend ACTIVATE Starter DA. During 4 weeks postweaning, pigs fed AGP or ACTIVATE had better ADG (P<0.03) and GF (P<0.04) than controls. On d 14 postweaning, control pigs had the lowest fecal lactobacilli counts among all treatments (P<0.02), whereas pigs fed AGP or ACTIVATE tended to have lower fecal E. coli counts compared to the controls (P<0.08). Serum IGF-1 levels of pigs fed AGP was greater than control pigs (P<0.03). Weaned pigs (N=24, 5.94 ± 0.33 kg) were used

to evaluate AGP and ACTIVATE on performance, gastrointestinal measurements, and immune response of E. coli K88+ challenged pigs. Pigs were fed a control, or supplemented with AGP (100 ppm colistin sulfate, 50 ppm Kitasamycin plus 60 ppm Olaquinox), 0.5, or 1% ACTIVATE. During d 5 to 14 after E. coli K88+ challenge, pigs fed AGP, 0.5, or 1% ACTIVATE had higher gain than controls (P<0.01). Furthermore, control pigs had the worst GF among all treatments (P<0.03). On d 14, compared to the control pigs, pigs fed 0.5% ACTIVATE had higher lactobacilli in the duodenum, and pigs fed AGP and 1% ACTIVATE tended to have higher lactobacilli in the ileum (P<0.08). Pigs fed AGP, 0.5% or 1% ACTIVATE diets tended to have lower ileal E. coli counts compared to the controls (P<0.08). Serum interleukin-6, cortisol, or digesta pH values were not affected by treatment (P=0.11). These results indicate that AGP and organic acid blend ACTIVATE can improve growth performance of weaned pigs, mainly via modulating intestinal microflora populations or somatotrophic axis.

Key Words: Antibiotics, Growth Performance, Organic Acid