W205 Performance, nutrient utilization and gizzard development of broiler starters fed diets containing ground or whole corn. Y. Singh, T. J. Wester, G. Ravindran, and V. Ravindran*, *Massey University, Palmerston North, New Zealand*.

The influence of including 20% whole corn, differing in grain hardness, on the performance, nutrient utilization and gut characteristics of broiler starters was investigated. The experimental design was a 3 × 2 factorial arrangement of treatments evaluating corn hardness (hard, semi hard or soft) with diets based on ground corn or 20% of ground corn replaced by whole corn. The 3 corn cultivars were ground in hammer mill to pass through a 4 mm sieve and 6 diets were developed. Following mixing, all diets were cold pelleted. Each diet was fed to 6 replicate cages (8 birds per cage) from d 1 to 21 post hatch. Body weights and feed intake were recorded on a cage basis at weekly intervals. Mortality was recorded daily and data was corrected for mortality. Corn hardness and whole corn inclusion had no effect ($P > 0.05$) on the weight gain. Corn hardness had significant effect ($P < 0.05$) on feed intake and feed per gain, while these 2 parameters were unaffected ($P > 0.05$) by the inclusion of whole corn. Birds tended ($P = 0.08$) to consume more of the diets based on hard-corn than those based on soft-corn. Feed intake of diets based on semihard-corn did not differ ($P > 0.05$) from those based on hard- or soft-corns. Feed per gain of birds fed diets based on soft-corn was lower ($P > 0.05$) than those fed diets based on semihard-corn. Feed per gain of birds fed diets based on hard-corn was similar ($P > 0.05$) to those fed diets based on hard- and soft-corn. Inclusion of whole corn increased ($P < 0.05$) relative gizzard weights. The relative gizzard weights of birds fed hard- and semihard corn diets were higher ($P < 0.05$) than those fed the soft corn diets. Dietary AME was not influenced by dietary treatments. Ileal nitrogen digestibility was influenced ($P < 0.05$) by hardness, with soft corn diets having higher digestibility. Overall, these results indicate that 20% of whole corn can be substituted for ground corn in broiler starter diets with no adverse effects on growth performance

Key Words: whole corn, gizzard, broiler

W206 The effect of dietary vitamin C on growth performance, meat quality, immune function and antioxidant capacity of broilers. F. Z. Liu*, Z. Y. Niu, X. H. Wang, Y. N. Min, and H. Y. Wang, *College of Animal Science and Technology, Northwest A &F University, Yangling,Shaanxi, 712100 P. R. China*.

The purpose of this study was to evaluate the effect of dietary vitamin C on growth performance, meat quality, immune function and antioxidant capacity of 42-d-old broilers. Two hundred forty one-day-old broiler chicks were randomly divided into 3 treatments with 8 replicates of 10 birds. Birds were fed a corn-soybean meal basal diet supplemented with 0, 150, or 300 mg/kg vitamin C. The trial period was 42 d. We determined the index of growth performance, meat quality, immune function and antioxidant capacity of broilers in the experiment. Dietary Vitamin C supplementation significantly increased the ADG and ADFI of broilers ($P < 0.05$), but feed/gain ratio was not significantly affected ($P > 0.05$). Compared with the control diet, adding 300 mg/kg of vitamin C increased the breast muscle weight, declined the abdominal fat weight and liver weight ($P < 0.05$). The trail groups significantly increased the b* value of breast muscle, reduced the L* value of leg muscle ($P < 0.05$), and also had beneficial effect on the water-holding capacity and tenderness of leg muscle, and improved the quality of the chicken meat. Adding 300 mg/kg of vitamin C improved thymus index, bursa of Fabricius index and Newcastle disease antibody level compared with control-fed birds ($P < 0.05$). Compared with the control group, the vitamin C concentration in serum and breast muscle, the SOD, GSH-PX activity and A-TOC level were significantly higher in the 300 mg/kg supplementation ($P < 0.05$).

Key Words: vitamin C, growth performance, broilers

W207 Quality and oxidative stability of vitamin E enriched chicken meat. Z. Y. Niu[1], X. H. Wang[1], Y. N. Min[1], F. Z. Liu*[1], and H. Y. Wang[2], [1]*College of Animal Science and Technology, Northwest A &F University, Yangling, Shaanxi, 712100 P. R. China*, [2]*Yulin Municipal Animal Husbandry Bureau, Yulin, Shaanxi, 719300 P.R. China*.

The objective of this work was to evaluate the quality and oxidative stability of vitamin E enriched-chicken meat. Two hundred forty one-day-old Avian broiler chicks were allocated to 3 treatments, one is the control group fed the basal diet, the other 2 fed the dietary vitamin E supplementation diet, containing 100, 200 mg/kg vitamin E respectively. Broilers were raised to 42 d. We determined the meat quality, the activities of antioxidant enzymes in serum and tissues and the MDA concentration of the breast muscle during the refrigeration. The result showed the dietary vitamin E supplementation has a positive effect on the meat quality of broiler chickens. The 100 mg/kg vitamin E supplementation increased the tenderness, yellowness (b*) of the breast muscle, declined the water-loss rate, lightness (L*) and yellowness (b*) of the leg muscle significantly ($P < 0.05$). Dietary vitamin E supplementation increased the concentration of vitamin E in serum and muscle, and then took effect on the antioxidation enzyme system, improved the activity of SOD and T-AOC, declined the MDA generation. The 200 mg/kg vitamin E supplementation had significantly improved the antioxidation ($P < 0.05$) and had more active effect than the 100 mg/kg supplementation. Dietary vitamin E supplementation improved the oxidative stability of meat refrigerated at 4°C, deferred the lipid oxidation. The TBARS in breast muscle of the dietary vitamin E supplementation group was significantly lower than the control group at the 8th d ($P < 0.05$).

Key Words: vitamin E, meat quality, broilers

W208 Dietary preferences of acids and salts in piglets. J. A. Suárez*[1], E. Roura[2], and D. Torrallardona[1], [1]*IRTA-Centre Mas de Bover, Constantí, Spain*, [2]*Lucta S.A., Barcelona, Spain*.

Compromised voluntary feed intake of piglets in the post-weaning period might be improved by increasing feed palatability. Eighteen double choice tests with a total of 600 post-weaned pigs (20–25 kg BW), were conducted to determine preference for 14 acids and 4 salts compared with a control (REF) diet. Each test was performed using 8 or 9 pens (replicates) of 3–4 pigs that were offered simultaneous access to 2 feeding hoppers (REF diet or diet containing one of the products (AC) being tested). Each test was performed during 3 consecutive 4d-periods, in which low, medium and high inclusion rates of the AC were evaluated, respectively. The AC were tested at 0.5, 1 and 1.5% of inclusion, except for benzoic and succinic acids that were tested at 0.25, 0.5 and 1%, and potassium diformate that was tested at 0.5, 1 and 2%. The preference for each AC and dose compared with REF was calculated as the percentage contribution of the AC diet to total feed intake. Mean preference values were compared with the neutral value of 50% using the Student's *t*-test. Values are presented in brackets ordered by increasing doses and those

with an asterisk are significantly ($P < 0.05$) different from 50%. Acids that improved feed preference (%) include the medium doses of citric (59.0, 69.8*, 56.8) and tartaric acids (54.2, 73.4*, 67.5) and the high doses of potassium diformate (57.2, 58.5, 65.9*) and sodium propionate (55.1, 58.1, 58.2*). There were no significant effects on feed preference with ascorbic (47.8, 49.6, 41.9), benzoic (45.0, 48.4, 50.8) and malic (50.0, 48.9, 34.8) acids or sodium butyrate (42.4, 51.1, 48.3). Finally, negative effects on feed preference were found with all the doses of acetic (32.5*, 29.9*, 16.6*) and caproic (29.1*, 27.8*, 22.1*) acids and some doses of butyric (35.9, 43.5, 21.2*), caprilic (33.0, 33.2*, 14.7*), formic (39.9, 35.6*, 24.9*), lactic (51.3, 38.4, 35.6*), phosphoric (28.9*, 34.4*, 35.6), propionic (52.1, 37.0, 25.6*) and succinic (36.9*, 41.6, 51.9) acids and calcium formate (29.9*, 35.8*, 38.1). We conclude that some AC significantly affect feed preference in pigs.

Key Words: acidifiers, palatability, feed intake

W209 Impact of different nutrients on the development of hyperhomocysteinemia in neonatal piglets. M. E. Côté-Robitaille*[1,2], C. L. Girard[1], F. Guay[2], and J. J. Matte[1], [1]*Dairy & Swine R & D Centre, Agriculture and Agri-Food Canada*, *Sherbrooke(STN-Lennoxville), QC, Canada*, [2]*Department of Animal Sciences, Laval University*, *Quebec city, QC, Canada*.

The present experiment aimed to determine if the rapid post-natal development of hyperhomocysteinemia in piglets can be regulated by exogenous dietary provision of nutrients involved in homocysteine (Hcy) metabolism as methyl donors (betaine and choline), methyl user (creatine), or for catabolism (vitamin B_6). Those nutrients were given either separately or in association. Twenty sows were artificially inseminated and fed gestation and lactation diets supplemented with folic acid (10 mg/kg) and vitamin B_{12} (200 ug/kg). At birth, piglets were identified and weighed. A blood sample was also taken before ingestion of colostrum to measure plasma Hcy concentration. Eight piglets in each litter received daily an oral liquid bolus of one of the 8 following treatments: 1) saline, 2) betaine (50 mg/kg BW), 3) choline (70 mg/kg BW), 4) creatine (300 mg/kg BW), 5) pyridoxine (200 ug/kg BW), 6) treatments 2 and 5, 7) treatments 3 and 4, 8) treatments 2, 3, 4 and 5. During lactation, piglets were weighed and blood samples were collected on d 1, 7, 14 and 21. Growth from birth to 21 d of age was not influenced by treatments ($P = 0.13$). Overall plasma concentration of Hcy was very low at birth (2.49 ± 0.17 μ*M*), increased sharply at 8.33 ± 0.93 μ*M* within 24 h and at 14.21 ± 0.99, 18.28 ± 1.00 and 18.05 ± 0.81 μ*M* at 7, 14 and 21 d of age, respectively. Treatment 8 decreased ($P = 0.05$) plasma Hcy concentration by 23% as compared with treatment 1 but there was no interaction between treatments and age ($P = 0.11$). Hcy profiles in other treatments did not differ ($P = 0.09$) from that of saline. Therefore, plasma Hcy concentrations were markedly reduced by combination of all nutrients. Nevertheless, even minimum values remained high (over 15 μ*M*) as compared with other species (3 to 10 μ*M*, in cows, rats and humans) and the question remains, as whether hyperhomocysteinemia, an unhealthy condition for those young and fragile animals, is harmful for piglets or inversely, whether a greater reduction of plasma Hcy is beneficial. This need to be assessed with further criteria of post-natal growth and development using a large number of animals.

Key Words: homocysteine, growth, suckling piglets

W210 Effects of fermented soybean meal on growth performance, nutrient digestibility, blood profiles and fecal microorganisms in weanling pigs. J. H. Lee*, J. S. Yoo, H. J. Kim, Q. W. Meng, S. M. Hong, and I. H. Kim, *Department of Animal Resource and Science, Dankook University*, *Cheonan, Choongnam, Korea*.

This study was conducted to evaluate the effects of 2 types of fermented soybean meal on growth performance, nutrient digestibility, blood profiles and fecal microorganisms in weanling pigs. A total of 144 [(Landrace × Yorkshire) × Duroc] pigs (6.66 ± 0.29kg) were randomly allocated to 6 treatments with 6 replications per treatment and 4 pigs per pen. The experiment lasted for 6 weeks and consisted of 2 phases. The dietary treatments were as follows: Phase1 (0–3 wk) 1) FSA1 (basal diet + 5% fish meal + 5% fermented soybean meal with *Aspergillus oryzae*), 2) FSB1 (basal diet + 5% fish meal + 5% fermented soybean meal with *Bacillus subtilis*), 3) SPC (basal diet + 5% fish meal + 5% SPC), 4) FSA2 (basal diet + 2.5% fish meal + 7.5% fermented soybean meal with *Aspergillus oryzae*), 5) FSB2 (basal diet + 2.5% fish meal + 7.5% fermented soybean meal with *Bacillus subtilis*), 6) FSB3 (basal diet + 1% fish meal + 9% fermented soybean meal with *Bacillus subtilis*); phase 2 (3–6 wk) 1) FSA1 (basal diet + 2% fish meal + 4% fermented soybean meal with *Aspergillus oryzae*), 2) FSB1 (basal diet + 2% fish meal + 4% fermented soybean meal with *Bacillus subtilis*), 3) SPC (basal diet + 2% fish meal + 4% SPC), 4) FSA2 (basal diet + 1% fish meal + 5% fermented soybean meal with *Aspergillus oryzae*), 5) FSB2 (basal diet + 1% fish meal + 5% fermented soybean meal with *Bacillus subtilis*), 6) FSB3 (basal diet + 6% fermented soybean meal with *Bacillus subtilis*). During phase 1 (0–21d), the ADG was higher ($P < 0.05$) in the SPC group than the FSB3 group and its G:F ratio was increased ($P < 0.05$) when compared with other treatments. The DM and N digestibility was highest ($P < 0.05$) in the FSB1 group during wk 0–3. The DM and N digestibility were highest in the FSB2 group. Fermented soybean meal had no effects on the blood profiles except that it led to lower creatinine levels ($P < 0.05$) in the FSM group. Overall, the results of this experiment revealed that fermented soybean meal could partially replace fish meal in the diets of weanling pigs.

Key Words: fermented soybean meal, digestibility, weanling pigs

W211 Effects of probiotics (Agarie) supplementation on growth performance, nutrient digestibility, fecal microbial, fecal noxious gas emission and blood characteristics of finishing pigs. J. H. Jung*, J. H. Lee, J. P. Wang, X. Ao, S. M. Hong, and I. H. Kim, *Department of Animal Resource and Science, Dankook University*, *Cheonan, Choongnam, Korea*.

This study was conducted to evaluate the effects of probiotics (Agarie) supplementation on growth performance, nutrient digestibility, fecal microbial content, fecal noxious gas emission and blood characteristics of finishing pigs. A total of 60 pigs [(Landrace × Yorkshire) × Duroc, initial body weight 56.48 ± 1.66kg)] were used for this 42 d feeding trial. Dietary treatments included 1) CON (basal diet), 2) P1 (CON + 0.1% probiotics) and 3) P2 (CON + 0.2% probiotics). There were 3 dietary treatments with 5 replicate pens per treatment and 4 pigs per pen. There was no significant difference in the ADG observed among the groups ($P > 0.05$). The G:F ratio was higher in the P2 group than the CON group ($P < 0.05$). P2 treatment showed a higher dry matter and energy digestibility value than the CON and P1 groups ($P < 0.05$). No significant differences were observed in the fecal Lactobacillus levels among the groups; however, the fecal *Escherichia coli* levels were lower in the P2 group than the CON group ($P < 0.05$). The ammonia, H_2S and total mercaptan levels were higher in the P1 and P2 groups than the CON group ($P < 0.05$). Blood characteristics were not affected by probiotics ($P > 0.05$). In conclusion, the results showed that supplementation of the diet with 0.2% probiotics influenced the G:F ratio, dry matter,

energy digestibility, fecal *Escherichia coli* and fecal noxious gas levels in growing pigs.

Key Words: probiotics, digestibility, pigs

W212 Effect of type of grinding of barley and alfalfa hay on jejunal histology and crude mucin excretion of growing rabbits. C. Romero[1], N. Nicodemus[1], J. D. Rodriguez[1], A. I. Garcia[2], G. G. Mateos*[1], and C. de Blas[1], [1]*Universidad Politecnica de Madrid*, *Madrid, Spain*, [2]*NUTRECO Poultry and Rabbit Research Center*, *Casarrubios del Monte, Spain*.

The aim of this work was to test the effects of particle size of barley and alfalfa hay on jejunal histology and mucin dynamics in fattening rabbits. The basal diet contained 27.5% alfalfa hay, 24.0% barley, 19.9% sunflower meal and 15.0% sugar beet pulp. There were 4 treatments arranged in a factorial structure 2 × 2 with grinding (coarse, 4.5 mm vs. fine, 1.5 mm) and ingredient (barley vs. alfalfa hay) as main effects. Percentage of large particles (>0.315 mm) ranged from 48.8 to 54.1% DM as diets contained finely or coarsely ground ingredients. Thirty-two rabbits (8 rabbits/treatment) were fed these diets from weaning (35 d; 877 ± 81 SD g BW) to slaughter (46 d; 1430 ± 180 SD g BW). Villi height decreased by 13.1% when rabbits received the diet containing alfalfa hay ground coarsely (704 vs. 612 μm; $P < 0.05$). Moreover, rabbits fed diets including coarse alfalfa hay had deeper crypts (121 vs. 92.1 μm; $P < 0.05$) and lower villus to crypt ratios (5.08 vs. 7.66; $P < 0.001$) compared with those fed the diets based on fine alfalfa hay. An increase in crude mucin excretion (from 12.6 to 21.7 g DM; $P < 0.01$) was observed in rabbits fed the coarse barley diet when alfalfa hay was ground coarsely. Nitrogen concentration in crude mucin excreted was unaffected by treatment (4.00% DM on average). In parallel with results for crude mucin, an increase in sialic acid excretion (from 43.2 to 72.2 mg; $P < 0.01$) was observed in rabbits fed the coarse barley diet when alfalfa hay was also ground coarsely. The present work determines a mean value of 4.45 g N/kg DMI for endogenous ileal nitrogen flow in growing rabbits when results of both crude mucin excretion and its N content are considered. In conclusion, the diet containing coarsely ground barley (4.5 mm) and finely ground alfalfa hay (1.5 mm) slightly enhanced jejunal mucosa morphology and decreased ileal crude mucin excretion.

Key Words: growing rabbit, dietary particle size, crude mucin

W213 Effects of freeze-dried *Lactobacillus reuteri* M8 on growth performance and intestinal microflora in broiler chickens. D. Y. Zhang, H. F. Ji*, S. X. Wang, J. Wang, and Y. M. Wang, *Institute of Animal Husbandry and Veterinary Medicine, Beijing Academy of Agriculture and Forestry Sciences*, *Beijing, China*.

The objective of this study was to evaluate the effect of supplementation of freeze-dried *Lactobacillus reuteri* M8 on growth performance and intestinal microflora of broilers. The strain M8 was isolated from the cecum mucosa of healthy Beijing You Fowl in our laboratory. Ninety, one-day-old, unsexed Avian broilers (45.20 ± 0.10 g BW) were randomly distributed into 3 groups with 3 replicates per group and 10 broilers per replicate comprising of control (basal diet), 20 mg/kg zinc bacitracin supplementation (antibiotic diet), and 0.3% freeze-dried *L. reuteri* M8 supplementation treatment. The experiment lasted 42 d. The ADG, ADFI, and feed conversion ratio were determined at 21 and 42 d, the intestinal microflora was measured at the end of the experiment. The results showed that there were no significant differences on ADG, ADFI, and feed conversion ratio among the treatments during the first 3 wk. However, birds fed the diet containing freeze-dried *L. reuteri* M8 had improved ($P < 0.05$) ADG compared with control fed broilers (82.77 vs. 77.85 g/d) and the antibiotic fed group (82.77 vs. 79.55 g/d) during 21 to 42 d of age, and there was no difference between control diet and antibiotic diet. Feeding the diet containing freeze-dried *L. reuteri* M8 significantly increased the number of *Lactobacilli* in the cecum mucosa compared with either control (9.87 vs. 8.76 cfu/g, $P < 0.01$) or antibiotic (9.87 vs. 9.68 cfu/g, $P < 0.05$) groups. While no difference in the number of *Lactobacilli* existed in faeces. The numbers of *Escherichia coli* in the cecum mucosa and feces were not significantly affected by diet. This experiment indicated that *L. reuteri* M8 would be a beneficial bacterium with regard to enhancing growth performance and improving intestinal bacteria of broilers.

Key Words: *Lactobacillus reuteri*, growth performance and intestinal microflora, broiler chickens

W214 Weaned piglet responses to *Escherichia coli* K88$^+$ (ETEC) oral challenge when fed diets containing a *Saccharomyces cerevisiae* fermentation product with or without in-feed antibiotics. E. Kiarie*[1], S. Bhandari[1], D. O. Krause[1], M. Scott[2], and C. M. Nyachoti[1], [1]*University of Manitoba*, *Winnipeg, MB, Canada*, [2]*Diamond V Mills*, *Cedar Rapids, IA*.

Ninety weaned piglets (17 d of age; 5.5 ± 0.19 kg BW) were used to investigate the effects of a *Saccharomyces cerevisiae* fermentation product on the growth performance and gastrointestinal (GIT) measurements upon *Escherichia coli* K88$^+$(ETEC) oral challenge. Pigs (3/pen) were randomly allotted to one of 6 diets with 5 replicate pens/diet. Treatments were: negative control (NC, no additives), positive control (PC, 0.04% chlortetracycline + 0.004% Denagard, Novartis Inc., Canada), *S. cerevisiae* fermentation product (NC+0.2% XPC, Diamond V Original XPC, Cedar Rapids, IA), and PC+XPC (0.1, 0.2, or 0.4% XPC). On d 7, pigs were orally inoculated with a 6 mL dose of 2×10^9cfu/ml of ciprofloxacin-resistant ETEC. On d 10 and 14, performance measures were recorded and GIT samples were obtained. Before challenge, pigs receiving additives (PC, XPC, PC+XPC) had higher ($P < 0.05$) ADG and G:F compared with NC pigs (227, 194, 234, 242, 237 vs. 161 g/d; 0.79, 0.77, 0.85, 0.82, 0.88 vs. 0.66 g/g, respectively). Pigs fed NC+0.2% XPC did not differ ($P > 0.10$) in performance from PC+0.2% XPC pigs. After challenge (d 8–10), ADG and ADFI were higher ($P < 0.05$) for pigs receiving additives compared with NC (187, 170, 371, 231, 233 vs. 138 g/d; 291, 357, 409, 351, 397 vs. 312 g/d, respectively). Day 8–14, ADG and ADFI were higher ($P < 0.05$) for pigs receiving all additives compared with NC (348, 260, 369, 362, 364 vs. 222 g/d, 344, 379, 434, 399, 416 vs. 331 g/d respectively). Large intestine mass tended to be less ($P < 0.10$) for pigs receiving additives (19.5 vs. 22.8 g/kg BW). Pigs fed NC+0.2% XPC had less ($P < 0.05$) large intestine mass than those receiving PC+XPC (16.4 vs. 17.7, 23.4, 18.6). Results suggest that XPC supports weaned piglet growth performance during an ETEC challenge with or without in-feed antibiotics.

Key Words: *E. coli* K88, piglet performance, *S. cerevisiae* fermentation product

W215 Developing an efficient *E. coli* expression system for producing a recombinant antimicrobial peptide plectasin. M. Y. Xie[1], L. H. Sun[1], Z. 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*.

Plectasin is the first identified defensin-type antimicrobial peptide and was isolated from the saprophytic ascomycete fungus *Pseudoplectania nigrella*. Because plectasin has potent activity against gram-positive

bacteria, in particular *Streptococcus pneumonia*, with no hemolytic effect and low toxicity, it has great nutritional and therapeutic potentials. The objective of this study was to develop an efficient *E. coli* expression system to produce a recombinant plectasin. Based on the published plectasin sequence, we obtained the full-length double-stranded gene by PCR after we synthesized and annealed 2 overlapping single-stranded DNA fragments. The full-length DNA fragment was ligated into an expressing vector pET-32a(+) (Merck, Shanghai, China) and delivered into the *E. coli* strain Rosetta cells (DE3) (Merck, China). A Trx-plectasin fusion protein with a molecular mass of approximately 22.4 kDa was produced by the transformants, and represented over 60% of the total bacterial protein. This fusion protein was readily cleaved by enterokinase, resulting in the designated plectasin peptide with a molecular mass of approximately 4.4 kDa. Using a microdilution broth method, we found similar antimicrobial activity between our recombinant and the native plectasin. In conclusion, we have successfully developed an efficient *E. coli* expression system to produce a functional antimicrobial peptide plectasin for further animal tests and industrial applications.
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Key Words: plectasin, gene expression, protein purification, antimicrobial peptide

W216 In vivo evaluation of charcoal to prevent post-weaning pig diarrhea in an *Escherichia coli* K88 challenge experiment. C. Ionescu*[1], S. Meshkibaf[2], S. Bhandari[2], F. Zhu[2], E. Khafipoor[2], M. C. Nyachoti[2], D. Bravo[1], and D. O. Krause[2,3], [1]*Pancosma*, *Geneva, Switzerland*, [2]*Department of Medical Microbiology and Infectious Diseases, University of Manitoba*, *Winnipeg, MB, Canada*, [3]*Department of Animal Science, University of Manitoba*, *Winnipeg, MB, Canada*.

Pig post-weaning diarrhea is a leading cause of morbidity and mortality in the industry. The pathophysiology is commonly linked to *Escherichia coli* K88 (ETEC). Sub-therapeutic doses of antibiotics in diets has traditionally been used to prevent disease. With the rise of resistance, this practice is no longer acceptable. An ETEC challenge model was used to investigate the efficacy of non-activated charcoal (NAC) to prevent disease. The NAC had been selected for its binding properties to ETEC. Thirty-six pigs (19 ± 2 d old) were allotted to 6 treatments in a completely randomized design. The treatments were as follows: Basal diet (NC); NC + 0.15% Aureo SP-250 (PC); NC + 0.1, 0.5, 1, or 2% NAC. Pigs initial weights were 6.19 ± 0.22 kg. On d 7, all pigs were orally challenged with 6 mL of ETEC (≈109/mL). Post-challenge, fecal scours were measured daily (0, normal to 3, severe diarrhea). Seven days post-challenge, the pigs were euthanized and gut samples taken to enumerate ETEC and generic E. coli. The ETEC was levofloxacin resistant allowing for differential enumeration. ANOVA was made for treatment comparison and linear correlation coefficients were calculated between NAC doses and the different parameters. PC had the best ADG, ADFI, and G/F ($P < 0.05$). There was no correlation between NAC dose and ADG ($P = 0.43$) or ADFI ($P = 0.12$). There was a correlation between NAC doses and fecal scours ($R^2 = 0.96$, $P < 0.01$). This data was confirmed by correlation observed between NAC dose and ETEC counts in colon ($R^2 = 0.75$, $P = 0.055$) but not generic E. coli ($P = 0.32$). We conclude that NAC can be an effective dietary agent to reduce scouring in ETEC infected piglets. NAC does not appear to have negative effects on ADG and ADFI in antibiotic free diets.

Key Words: charcoal, ETEC, pig

W217 Effects of feed-borne *Fusarium* mycotoxins and an organic mycotoxin adsorbent on immune cell dynamics in the jejunum of broiler breeder pullets infected with *Eimeria maxima*. G. N. Girgis*, J. R. Barta, N. A. Karrow, H. J. Boermans, C. K. Girish, and T. K. Smith, *University of Guelph*, *Guelph, Ontario, Canada*.

Adverse effects of feed-borne *Fusarium* mycotoxins on the performance and metabolism of poultry have been described in the literature. There is a lack of information, however, regarding the effects of these mycotoxins on intestinal immune response to infections. Intestinal epithelium could be exposed to high concentrations of mycotoxins following ingestion of contaminated feed. An experiment was conducted to investigate the effects of feed-borne *Fusarium* mycotoxins and a polymeric glucomannan mycotoxin adsorbent (GMA) on immune cell dynamics in the jejunum of broiler breeder pullets using an *Eimeria maxima* infection model. Four groups of female Ross 308 broiler breeder chicks were fed a control diet, a diet naturally contaminated with *Fusarium* mycotoxins, contaminated diet plus GMA, or control diet plus GMA. Contaminated diets contained up to 6.5 μg/g deoxynivalenol (DON), 0.47 μg/g 15-acetyl-DON and 0.73 μg/g zearalenone. Pullets received a primary oral inoculation (1,000 oocysts/bird) with *E. maxima* USDA strain 68 at 2 weeks of age and a secondary oral inoculation (30,000 oocysts/bird) with the same strain at 4 weeks of age. The percentages of immune cell subsets in jejunal tissues collected at d 0, 3, 6 and 14 post-primary infection and d 0, 1, 2, 3 and 6 post-secondary infection were evaluated by immunohistochemistry and image analysis using ImageScope software. Data were analyzed by ANOVA and Tukey's test was used to compare least squares means among treatments ($P \leq 0.05$). Diet-related differences in $CD4^+$ cell, $CD8^+$ cell and macrophage recruitment pattern into the jejunum were observed following both the primary and secondary infections. It could be concluded that feed-borne *Fusarium* mycotoxins and GMA have the potential to modulate immune response to coccidial infections.

Key Words: *Fusarium* mycotoxins, coccidia, immune cells

W218 The granulated barley provided during growing or finishing period improves the carcass quality and increases the intramuscular fat content in muscle of heavy pigs. A. Daza[1], M. A. Latorre*[2], and C. J. López-Bote[3], [1]*Universidad Politécnica de Madrid*, *Spain*, [2]*Universidad de Zaragoza*, *Spain*, [3]*Universidad Complutense de Madrid*, *Spain*.

A total of 48 Duroc × (Large White × Landrace) gilts of 46.8 ± 1.39 kg of body weight (BW) were used to study the effect of the diet on growth performance, carcass characteristics and intramuscular fat content in the Longissimus dorsi muscle. Experimental diets were provided ad libitum according to the following treatments: i) a control diet with 3,210 kcal metabolizable energy (ME)/kg, 13.73% crude protein (CP) and 0.62% digestible lysine (Lys) from 45.6 to 127.8 kg BW (group C), ii) the control diet from 47.0 to 91.8 kg BW and granulated barley with 3,020 kcal ME/kg, 10.2% CP and 0.26% Lys from 91.8 to 129.7 kg BW (group C+GB) and iii) granulated barley from 47.9 to 93.1 kg BW and the control diet from 93.1 to 135.1 kg BW (group GB+C). The dietary treatment was replicated 8 times and the replicate was a pen with 2 gilts. The C group grew faster ($P \leq 0.05$) and tended to have better feed conversion ratio ($P \leq 0.10$) than GB+C group with C+GB group being intermediate. The GB+C gilts showed a compensatory growth during the finishing period. Although no effect was observed on carcass weight and yield, carcass length was higher ($P \leq 0.01$) in GB+C and C+GB than in C group and ham length and weight were higher ($P \leq 0.05$) in GB+C than in C gilts. Also, C group had lighter ($P \leq 0.001$) forelegs, loins and sirloins than GB+C and C+GB groups. The weight

and yield of total main lean cuts (ham+foreleg+loin+sirloin) was higher ($P \leq 0.001$) in GB+C than in C gilts with C+GB being intermediate. The subcutaneous backfat thickness was higher in C+GB than in C gilts with GB+C being intermediate ($P \leq 0.001$) and the C+GB and GB+C gilts had higher intramuscular fat content in meat than C gilts ($P \leq 0.001$). The dietary treatment had no influence on color, shear force or cooking losses of the loin but thawing losses were lower ($P \leq 0.05$) in GB+C and C+GB than in C gilts. It is concluded that gilts fed granulated barley during growing period had the best carcass quality characteristics. Also, granulated barley provided during growing or finishing period increased intramuscular fat percentage in gilt meat.

Key Words: barley, carcass quality, pigs