W183 Effects of purified zearalenone on serum reproductive hormone, immunoglobulin, antibody titer and spleen pro-inflammatory cytokines mRNA in young gilts. S. Z. Jiang*[1], Z. B. Yang[1], W. R. Yang[1], S. L. Johnston[2], and F. Chi[2], *[1]Department of Animal Sciences and Technology, Shandong Agricultural University, Taian, Shandong, China, [2]Amlan International, Chicago, IL.*

A study was conducted to evaluate the effects of 1 to 3 mg/kg purified dietary zearalenone (ZEA) on reproductive hormones, immune response, and antibody production in young gilts. Seven days postweaning, 20 gilts (LxYxD) (BW = 10.36 ± 1.21 kg) were randomly allotted to 4 treatments, which were 0, 1, 2, or 3 mg/kg additions of purified ZEA to a basal diet fed for 18 d. Data were analyzed using the GLM procedure of SAS with individual pig as the basis for analysis. Difference was determined as $P < 0.05$. Pigs received classical swine fever (CSF) vaccine 1-d before the study. Blood was collected on d-6 and d-12 for CSF antibody titer determination. Fasted pigs were injected with LPS (50 μg/kg BW) 3 h before blood collection and euthanasia on d-18. Blood samples were used for estrogen, progesterone, testosterone, LH, FSH, and prolactin measurements, and for IgA, IgG, IgM, and IL-2 level determination. Lymphocytes from the blood and spleen were used to determine the lymphocyte proliferation rate (LPR). Spleen mRNA of IL-1β, IL-6, IFN-γ, and TNF-α was determined by real time PCR. There was no difference on CSF titer levels on d-6 or 12 but d-18 titers decreased as ZEA increased ($P < 0.001$). A similar result was observed in IgG but there was no effect on IgA or IgM level. Serum testosterone, estradiol, LH, and FSH decreased as ZEA increased. Progesterone tended ($P = 0.058$) to decrease and prolactin increase with increasing ZEA. No effect was found in FSH level ($P > 0.05$). The IL-2 and LPR of blood and spleen cells decreased ($P < 0.05$) as ZEA increased. Spleen mRNA of IL-2 and IL-6 increased as ZEA increased. As ZEA increased IFN-γ mRNA decreased but TNF-α showed no effect. Dietary ZEA at 1 to 3 ppm level negatively affects the pig′s reproductive hormone, immunoglobulin, and antibody production, and may increase the inflammatory response.

Key words: zearalenone, immune response, hormone

W184 Ameliorate effect of Calibrin Z enterosorbent on serum reproductive hormone, immunoglobulin, antibody titer in young pigs fed purified zearalenone. S. Z. Jiang*[1], Z. B. Yang[1], S. L. Johnston[2], and F. Chi[2], *[1]Department of Animal Sciences and Technology, Shandong Agricultural University, Taian, Shandong, China, [2]Amlan International, Chicago, IL.*

Thirty-six pigs (BW = 8.9 ± 0.2 kg) were used to evaluate the effect of Calibrin-Z (CZ) on the effects of zearalenone (ZEA) on immune response in piglets. The pigs were allotted to 6 treatments (TRT). The 6 TRT were: 1) Control (Con); 2) Con + 0.1% CZ; 3) Con + 1 ppm ZEA; 4) Con + 1 ppm ZEA + 0.1% CZ; 5) Con + 1 ppm ZEA + 0.2% CZ; 6) Con + 1 ppm ZEA + 0.4% CZ. Data were analyzed using the GLM procedure of SAS with individual pig as the basis for analysis. Each pig received classical swine fever (CSF) vaccine 1-d before the study, serum samples were collected weekly for CSF antibody titer determination. On d 21, blood and spleen samples were collected for hormone, immunoglobulin, interleukin (IL) cytokine analyses, and lymphocyte proliferation rate (LPR). Gilts fed TRT 3 had lower ($P < 0.05$) progesterone (75% of 1 and 2), and testosterone (74% of 1 and 2) levels than TRT 1 and 2. Adding clay improved serum hormone levels and the elevated hormone was clay dosage dependent. Male pigs fed TRT 3 showed similar results as gilts except serum estrodial was not different. Serum IgA and IgM were not different, IgG level was reduced ($P < 0.01$) in TRT 3 (77% of 1 and 2) compared with TRT 1 and 2. It increased linearly ($P < 0.05$) in TRT 4, 5, and 6 but remained lower ($P < 0.05$) than TRT 1 and 2 (84% of 1 and 2).The LPR from blood and spleen cells followed a trend similar to IgG. Serum IL-2 followed results similar to those of the hormones; pigs fed TRT 3 had the lowest IL-2 but an addition of 0.4% clay restored the levels equal to TRT 1 and 2. There was no difference on d-7 or d-14 on CFS titers. On d-21, pigs fed TRT 2 had the highest titer against CSF and greater ($P < 0.01$) than pigs fed TRT 3, 4, 5, and 6; but not different than TRT 1. Feeding 1 ppm of purified ZEA caused adverse effects on immunity in pigs; which were ameliorated by CZ. Feeding CZ without ZEA had the greatest antibody titer production, implying that the Calibrin-Z adds value to feed with or without a mycotoxin challenge.

Key words: zearalenone, titer, immunoglobulin

W185 Dietary effect of short-chain organic acids on growth performance, mortality, and development of intestinal lymphoid tissues in young non-medicated rabbits. C. Romero*[1], P. G. Rebollar[1], A. Dal Bosco[2], C. Castellini[2], and R. Cardinali[2], *[1]Universidad Politécnica de Madrid, Spain, [2]Università degli Studi di Perugia, Italy.*

This work aimed to test the effect of a dietary inclusion of formic and citric acids (0.4%) on growth performance, mortality, jejunal histology, and development of intestinal lymphoid tissues in growing non-medicated rabbits. For that purpose, a diet including the acids (diet A) was compared with a control diet (diet C). Sixty rabbits weaned at 28 d were submitted to each diet. At 56 and 77 d, 10 rabbits were slaughtered to assess cecal traits, jejunal histology, and follicular development in the caudal ileal Peyer′s patch and in the appendix. In the 56–77 d period, average daily weight gain of rabbits fed diet A was greater than that of control rabbits (48.0 vs. 43.9 g, $P = 0.019$). Mortality rate was not affected by the diet (6.12% on average). Cecal pH was lower at 77 than at 56 d (6.02 vs. 6.19, $P = 0.016$). The concentration of ammonia in the cecal contents increased from 9.62 to 14.2 mmol/l ($P = 0.003$) when rabbits reached 77 d of age. The appendix was heavier (9.75 vs. 4.30 g, $P < 0.001$), longer (13.3 vs. 10.4 cm, $P < 0.001$), and wider (1.74 vs. 1.45 cm, $P = 0.006$) at 77 than at 56 d. Rabbits of 56 d of age fed diet C had shorter villi than the mean value of the other 3 treatments (662 vs. 807 μm, $P < 0.001$). In the Peyer′s patch, the average follicle area was greater at 77 than at 56 d of age (118 vs. 88.4 × 10^3 μm^2, $P < 0.001$) and was also greater in rabbits fed diet C than in those fed diet A (109 vs. 97.5 × 10^3 μm^2, $P = 0.049$). In the appendix, no differences on the average follicle area were found at 56 d of age (115 × 10^3 μm^2) whereas, at 77 d, the area increase was higher for rabbits fed diet C than for those fed diet A (95.5 vs. 50.8%, $P < 0.001$). In conclusion, including formic and citric acids in growing rabbit diets improves weight gain, has a trophic effect on the jejunal mucosa, and controls the development of gut-associated lymphoid tissues.

Key words: gut histology, lymphoid tissue, organic acids

W186 Casein glycomacropeptide and mannan-oligosaccharides reduce the enterotoxigenic *E. coli* (ETEC K88) adhesion to IPEC-J2 cell line. R. G. Hermes*[1], E. G. Manzanilla[1], S. Martin-Orue[1], J.

F. Perez[1], and K. C. Klasing[2], *[1]Universitat Autonoma de Barcelona, Barcelona, Catalonia, Spain, [2]University of California, Davis, Davis.*

The aim of this study was to elucidate the ability of different feedstuffs sources to block the attachment of ETEC (K88) to the intestinal pig epithelium using an in vitro model. An adhesion test was done in polystyrene 96-well plates covered with an IPEC-J2 (intestinal porcine epithelial cell line isolated from the jejunum epithelia of neonatal piglets). Triplicates samples of wheat bran (WB), casein glycomacropeptide (CGMP, Lacprodan, Arla Foods, Denmark), mannan-oligosaccharides (MOS, Bio-Mos, Alltech, USA) or *Aspergillus oryzae* fermentation extract (AO, Fermacto, Molimen S.L., Spain) were evaluated as likely blockers of the ETEC attachment. Feedstuffs were diluted in PBS at 0.8% (w/v), sonicated 3 times, and centrifuged. Supernatant (1mL) of feedstuffs were incubated first with 1mL of an ETEC K88 strain (10^8 cfu/mL diluted in PBS), isolated from a clinical case of colibacillosis in piglets, for 30 min at room temperature and second with the IPEC-J2 monolayer cell culture in the well plates at 37°C/5% CO_2 for 1 h. After that, plates were washed twice with sterile PBS to remove non-attached bacteria and then CO_2-independent media was added to promote the growth of attached bacteria. Plates were incubated at 37°C/10h in a spectrophotometer and optical density (OD, 650 nm) was recorded every 10 min. The OD data were analyzed by nonlinear regression using SAS. The resulting parameters thus obtained were used to calculate the delay time (h) for the cultures to reach an OD of 0.05 ($t_{OD = 0.05}$). Analysis of variance of the $t_{OD = 0.05}$ values between treatments was done using the PROC GLM of SAS. Results showed that CGMP and MOS delayed ($P < 0.05$) $t_{OD = 0.05}$ to 3.4 ± 0.07 and 3.5 ± 0.26 h, respectively, in comparison to the negative control (2.4 ± 0.13 h). The values obtained for WB (3.2 ± 0.05) and AO (3.0 ± 0.06) were intermediate and different ($P < 0.05$) from the negative control. Our results suggest that some dietary ingredients may act as "anti-adhesive" compounds against pathogenic *E. coli*, which may have a positive effect on the intestinal health.

Key words: casein glycomacropeptide, mannan-oligosaccharides, *E. coli* K88

W187 The effects of a galactoglucomannan-arabinoxylan complex on eimeria acervulina infection in broiler chicks. T. A. Faber*[1], R. N. Dilger[1], A. C. Hopkins[2], N. P. Price[3], and G. C. Fahey[1], *[1]University of Illinois, Urbana, [2]Temple-Inland, Diboll, TX, [3]National Center for Agricultural Utilization Research, Peoria, IL.*

Fermentable carbohydrates are thought to enhance the ability of the gastrointestinal tract to defend against pathogenic infection. We hypothesized that a mannose-rich, galactoglucomannan-arabinoxylan (GGM-AX) complex would positively affect the immune status and prevent weight loss resulting from acute coccidiosis (*Eimeria acervulina*) infection. Using a completely randomized design, day-old commercial broiler chicks (n = 160; 4 reps/treatment; 5 chicks/rep) were assigned to one of 4 corn-soybean meal-based diets containing supplemental GGM-AX (0, 1, 2, and 4%) that replaced dietary cellulose. On d 8 post-hatch, an equal number of chicks on each diet were inoculated with either distilled water (sham control) or *E. acervulina* (1×10^6 oocysts). All birds were euthanized on d 7 post-inoculation for collection of cecal contents and duodenal tissue. At 7 d post-inoculation, infected birds fed the 0% GGM-AX treatment had heavier ($P < 0.03$) body weights than infected birds fed 1 or 2% GGM-AX. Feed intake was decreased ($P = 0.01$) by coccidial infection, but not affected by dietary treatment ($P = 0.69$). Cecal pH was greater ($P < 0.01$) in infected birds compared with uninfected birds. As dietary GGM-AX increased, cecal pH linearly decreased ($P = 0.001$), regardless of infection status. Coccidial infection increased ($P < 0.02$) cecal concentrations of propionate, butyrate, and total short-chain fatty acids, but not acetate ($P = 0.28$). Additionally, cecal propionate concentration decreased ($P < 0.01$) as dietary GGM-AX supplementation increased, whereas acetate, butyrate, and total SCFA concentrations were not affected by diet ($P \geq 0.48$). Dietary GGM-AX did not affect mRNA expression of interferon-gamma, interleukin (IL)-6, or IL-15 cytokines in duodenal tissue. An infection x diet interaction ($P = 0.02$) was observed for duodenal IL-12β and IL-1β mRNA expression. Based on these data, we conclude that GGM-AX supplementation was unable to mitigate the negative impact of an acute *E. acervulina* infection in broiler chicks.

Key words: chick, coccidiosis, galactoglucomannan oligosaccharide

W188 The effects of feed-borne *Fusarium* mycotoxins on performance, serum chemistry, and hematology of fryer rabbits. M. A. Hewitt*, M. Brash, and T. K. Smith, *University of Guelph, Guelph, Ontario, Canada.*

Mycotoxins are secondary metabolites produced by fungal synthesis. In many species, the effects of *Fusarium* mycotoxins have been documented. Very few studies, however, have been conducted on rabbits. The objective of the current study was to determine the effects of feeding grains naturally contaminated with *Fusarium* mycotoxins on growth and metabolism of fryer rabbits. Thirty 5-wk old male New Zealand white rabbits were used. Each rabbit was randomly assigned to 1 of 3 diets: (1) a control, (2) contaminated diet and (3) contaminated diet + 0.2% Glucomannan mycotoxin adsorbent (GMA). The control diet contained 0.2µg/g deoxynivalenol (DON), the contaminated diet contained 4.3µg/g DON and the GMA diet contained 4.9µg/g DON. Zearalenone and 15-acetyl DON were minor contaminates. The rabbits were given feed and water ad libitum for 21 d. Feed intake was measured daily and water intake was measured every 3 d. On d 21, blood samples were taken for serum chemistry analysis, and tissue sections were taken for pathology. Data was analyzed by ANOVA using a PROC GLM model. A Tukey test was used to compare least squares means among treatments and comparisons were considered significant at $P \leq 0.05$. Average daily gain was increased in rabbits fed the GMA diet ($P < 0.05$), and feed efficiency and average daily water intake were increased in rabbits fed the contaminated and GMA diet, when compared with controls ($P < 0.05$) (Table 1.1). Urea levels were also increased in rabbits fed the GMA diet and alkaline phosphatase (ALP) levels were decreased in rabbits fed the GMA diet when compared with controls ($P < 0.05$) (Table 1.1). An increase in water consumption could indicate improper kidney function. The increased weight gain seen in rabbits fed both the contaminated and GMA diets could be reflected by the increased water consumption. High urea and low ALP levels are signs of impaired protein metabolism. It was concluded that the feeding of diets naturally contaminated with *Fusarium* mycotoxins could adversely affect protein metabolism in immature rabbits.

Table 1. Effect of feed-borne *Fusarium* mycotoxins[1]

Diet	Average Gain (g)	Feed Efficiency (g/g)[2]	Average Water Intake (ml)	Urea (mmol/L)	Alkaline Phosphatase (U/L)
Control	37.08	0.347	142.49	3.19	212.6
Contaminated	40.33	0.377	173.45	3.57	171.8
GMA	41.02	0.385	184.4	3.85	162.6
SEM	± 1.0	± 0.01	± 7.69	± 0.164	± 12.1
1 vs. 2	NS[3]	0.05	0.02	NS	NS
1 vs. 3	0.026	0.011	0.002	0.024	0.02
2 vs. 3	NS	NS	NS	NS	NS

[1]Values are mean ± SEM; for each diet n=10.

[2]Total Weight Gain/Total Feed Consumption.

[3]$P > 0.05$.

Key words: rabbit, *Fusarium* mycotoxins, water consumption

W189 Effects of plant extracts on peripheral blood immune cells and inflammatory mediators of weaned pigs experimentally infected with a pathogenic *E. coli*. Y. Liu*[1], M. Song[1], T. M. Che[1], J. A. Soares[1], D. Bravo[2], C. W. Maddox[1], and J. E. Pettigrew[1], *[1]University of Illinois, Urbana, [2]Pancosma SA, Geneva, Switzerland.*

A study evaluated the effects of 3 different plant extracts (PE) on immune responses of weaned pigs experimentally infected with a pathogenic F-18 *E. coli*. Weaned pigs (n = 64, 6.3 ± 0.2 kg BW, 21 d old) were housed in individual pens in disease-containment chambers for 15 d: 4 d before and 11 d after the first inoculation (d 0). Treatments were in a factorial arrangement: with or without an F-18 *E. coli* challenge (toxins: LT, STb, and SLT-2; 10^{10} cfu/3 mL oral dose; daily for 3 d from d 0) and 4 diets (a nursery basal diet (CON), 10 ppm capsicum oleoresin (CAP), garlic (GAR), or turmeric oleoresin (TUR)). Blood was collected on d 0, 5, and 11 to measure total and differential white blood cell (WBC) counts and serum tumor necrosis factor-α (TNF-α), interleukin-10 (IL-10), transforming growth factor-β (TGF-β), C-reactive protein (CRP), and haptoglobin (Hp). The *E. coli* infection increased ($P < 0.05$) lymphocytes (LYM), TNF-α, and Hp on d 5, and WBC, neutrophils (NEU), LYM, monocytes (MONO), and Hp on d 11, but decreased ($P < 0.05$) IL-10 on d 5 and TGF-β on d 11 compared with the unchallenged group. In the *E. coli* challenged group, CAP decreased ($P < 0.05$) TNF-α (61.8 vs. 79.6 pg/ml) and Hp (823 vs. 1400 μg/ml) on d 5, and WBC (21.6 vs. 32.2 × 10^3/μl) and NEU (10.3 vs. 17.0 × 10^3/μl) on d 11; GAR decreased ($P < 0.05$) LYM (5.35 vs. 8.25 × 10^3/μl) and Hp (888 vs. 1400 μg/ml) on d 5, and WBC (23.0 vs. 32.2 × 10^3/μl), LYM (7.63 vs. 13.48 × 10^3/μl), and Hp (164 vs. 1272 μg/ml) on d 11; TUR decreased ($P < 0.05$) TNF-α (63.1 vs. 79.6 pg/ml) on d 5 and NEU (10.2 vs. 17.0 × 10^3/μl) on d 11 compared with the CON. In the unchallenged group, on d 5, CAP decreased ($P < 0.05$) Hp; GAR increased ($P < 0.05$) MONO and decreased ($P < 0.05$) Hp compared with the CON. PE did not affect IL-10, TGF-β, and CRP in both sham and *E. coli* challenged groups. In conclusion, the 3 PE tested affected total WBC, the populations of immune cells, and inflammatory mediators in *E. coli*-infected piglets, which may be beneficial to pig health.

Key words: *E. coli*, plant extracts, weaned pigs

W190 Acute toxicity of aqueous extract of *Moringa oleifera* leaf in growing poultry. J. O. Ashong* and D. L. Brown, *Cornell University, Ithaca, NY.*

The objective of the present study was to evaluate the safety of an aqueous extract of *Moringa oleifera* and its impact on feed intake in growing poultry. At 21 d of age, 75 White-leghorn type chicks were weighed and randomly divided into 5 groups, G1, G2, G3, G4 and G5. Chicks in G1, G2, G3, and G4 were gavage (orally) with aqueous moringa extract: 200, 400, 800, 2000 mg/kg BW, respectively, while chicks in G5 were gavage with distilled water (control group). Each group was made up of triplicates with 5 chicks per replicate. All chicks were fed basal chick feed. All the chicks were observed at the first 6 h and once daily thereafter over 14 d for signs of abnormal behavior and/or toxicity and mortality. Daily feed intake and weekly BW were recorded for the duration of the study. Post-trial postmortem examination conducted included weighing of kidney, liver and heart and biochemical analyses such as uric acid, thyroxine (T4), creatinine, aspartate transaminase (AST), alkaline phosphatase (ALP), cholesterol and total protein. Liver and kidney tissues were harvested for histopathological examination. There were no observed signs of abnormal behavior and/or toxicity and mortality in the course of the study. Macroscopic and microscopic observations showed no alterations and differences in the liver and kidneys of G1, G2, G3, G4 and G5 even though the liver weight was heaviest in G4 and lightest in G2. Similarly, there were no differences in feed intake and weight gain among the treatment groups. In the biochemical study, no changes and differences were observed among circulating biochemical indicators ($P > 0.05$); however, ALP decreased ($P < 0.05$) with increasing moringa leaf extract concentration, while total protein and albumin also decreased ($P < 0.05$) with increasing moringa leaf extract from 400 to 2000 mg/kg BW. In conclusion, oral administration of an aqueous extract of moringa at doses of 200, 400, 800 and 2000 mg/kg BW for 14 d to growing poultry did not induce any short-term toxicity and had no impact on feed intake

Key words: *Moringa oleifera*, acute toxicity, poultry

W191 Effects of spray-dried plasma on growth and reproductive responses of pregnant mice to lipopolysaccharide as a model for inflammation in sows. M. Song*[1], Y. Liu[1], J. A. Soares[1], J. J. Lee[1], T. M. Che[1], J. M. Campbell[2], J. Polo[2], J. C. O'Connor[3], and J. E. Pettigrew[1], *[1]University of Illinois, Urbana, [2]APC Inc., Ankeny, IA, [3]University of Texas Health Science Center, San Antonio.*

A study evaluated the effects of spray-dried plasma (SDP) on growth and reproductive responses of pregnant mice (C57BL/6 strain) to lipopolysaccharide (LPS; *Salmonella typhimurium*) as a model for inflammation in sows. The mated female mice (n = 250; 4 replicated groups, 62 or 63 mice/group) were shipped from Bar Harbor, ME to Urbana, IL on the day the vaginal plug was found (gestation day (GD) 1), arriving at the laboratory on GD 3. They were housed in individual cages, randomly assigned to dietary treatments with or without 8% SDP (SDP or CON), and fed for 15 d. The diets were formulated to similar ME, CP, and AA levels without antibiotics. On GD 17, pregnant mice (n = 61; 26.5 ± 1.65 g BW) were randomly assigned to intraperitoneal injections with or without 2 μg LPS in 200 μL PBS (LPS or PBS) and euthanized 6 h (6H) or 24 h (24H) later. Measurements were growth performance, pregnancy loss, fetal death, average live fetal and placental weight (WT), and organ WT (intestine, liver, spleen, and lung). The SDP improved BW gain (6H: 0.13 vs. −0.14 ± 0.12 g, $P = 0.06$; 24H: 0.81 vs. 0.30 ± 0.08 g, $P < 0.05$), feed intake (6H: 0.20 vs. 0.06 ± 0.05 g, $P < 0.05$; 24H: 2.8 vs. 2.4 ± 0.18 g, no significant (NS)), G:F (6H: no data; 24H: 0.30 vs. 0.11 ± 0.03, $P < 0.05$), average live fetal WT (6H: 0.65 vs. 0.56 ± 0.03 g, $P < 0.05$; 24H: 0.76 vs. 0.71 ± 0.02 g, $P = 0.09$), and the ratio between average live fetal and placental

WT (6H: 6.1 vs. 4.9 ± 0.6, $P = 0.07$; 24H: 7.2 vs. 6.4 ± 0.8, NS), and reduced spleen WT (6H: 0.29 vs. 0.35 ± 0.03% of BW, $P = 0.08$ (SDP effect larger under the LPS challenge (interaction, $P = 0.09$)); 24H: 0.29 vs. 0.25 ± 0.01% of BW, NS) compared with the CON. There were no interactions between diet and challenge on the other responses. The LPS challenge reduced BW gain and feed intake, and increased pregnancy loss (48 vs. 0%, $P < 0.05$), fetal death (5.3 vs. 0.6%, $P = 0.08$), and spleen WT compared with the PBS challenge. In conclusion, SDP improved growth performance of pregnant mice and their fetal WT after the challenge, but did not affect pregnancy loss or fetal death.

Key words: mice, reproductive responses, spray-dried plasma

W192 Effects of spray-dried plasma on immune responses of pregnant mice to lipopolysaccharide as a model for inflammation in sows. M. Song*[1], Y. Liu[1], J. J. Lee[1], J. A. Soares[1], T. M. Che[1], J. M. Campbell[2], J. Polo[2], J. C. O'Connor[3], and J. E. Pettigrew[1], *[1]University of Illinois, Urbana, [2]APC Inc., Ankeny, IA, [3]University of Texas Health Science Center, San Antonio.*

A study evaluated the effects of spray-dried plasma (SDP) on immune responses of pregnant mice (C57BL/6 strain) to lipopolysaccharide (LPS; *Salmonella typhimurium*) as a model for inflammation in sows. The mated female mice (n = 125; 2 replicated groups, 62 or 63 mice/group) were shipped from Bar Harbor, ME to Urbana, IL on the day the vaginal plug was found (gestation day (GD) 1), arriving at the laboratory on GD 3. They were housed in individual cages, randomly assigned to dietary treatments with or without 8% SDP (SDP or CON), and fed for 15 d. The diets were formulated to similar ME, CP, and AA levels without antibiotics. On GD 17, pregnant mice (n = 17; 27 ± 1.7 g BW) were randomly assigned to intraperitoneal injections with or without 2 μg LPS in 200 μL PBS (LPS or PBS) and euthanized 6 h later to collect gestational tissues (uterus (U) and placenta (P)). Measurements were pro-inflammatory cytokines (PRO; tumor necrosis factor-α (TNF-α) and interferon-γ (IFN-γ)) and anti-inflammatory cytokines (ANTI; interleukin-10 (IL-10) and transforming growth factor-β1 (TGF-β1)) by ELISA, and total protein (TP) using Bradford's reagent and bovine serum albumin to normalize those cytokines. The LPS challenge increased ($P < 0.05$) PRO and reduced ($P < 0.05$) ANTI in both U and P, except IL-10 in P, compared with the PBS challenge (Table). The SDP reduced ($P < 0.05$) PRO in U and P and ANTI in U only compared with the CON (Table). The SDP attenuated the LPS effect on PRO (interactions: TNF-α in P ($P = 0.09$), IFN-γ in U ($P = 0.08$) and P ($P < 0.05$); Table). In conclusion, SDP attenuated acute inflammation caused by LPS.

Table 1. Effect of SDP on immune responses in gestational tissues of pregnant mice to LPS

Cytokines/ TP	CON PBS	CON LPS	SDP PBS	SDP LPS	SEM	*P*-value LPS	*P*-value SDP	*P*-value Interaction
Uterus, pg/mg								
TNF-α	4.1	9.8	1.7	6.0	1.00	<0.05	<0.05	NS*
IFN-γ	0.33	4.2	0.11	1.8	0.52	<0.05	<0.05	0.08
IL-10	57	44	40	38	3.8	0.09	<0.05	NS
TGF-β1	571	421	317	248	45	<0.05	<0.05	NS
Placenta, pg/mg								
TNF-α	1.7	9.7	1.2	7.1	0.55	<0.05	<0.05	0.09
IFN-γ	0.13	0.79	0.08	0.31	0.07	<0.05	<0.05	<0.05
IL-10	24	26	29	28	5.0	NS	NS	NS
TGF-β1	492	454	299	300	37	NS	<0.05	NS

*NS = not significant.

Key words: immune responses, mice, spray-dried plasma

W193 Wheat bran and casein glycomacropeptide may regulate the immune response of IPEC-J2 cells challenged with enterotoxigenic *E. coli* (ETEC K88). R. G. Hermes*[1], E. G. Manzanilla[1], S. Martin-Orue[1], J. F. Perez[1], and K. C. Klasing[2], *[1]Universitat Autonoma de Barcelona, Barcelona, Catalonia, Spain, [2]University of California, Davis, Davis.*

The objectives of the present study were to measure the innate immune response of the IPEC-J2 cell line challenged with an ETEC (K88) or a non-fimbriated *E. coli* (NFEC), and measure the impact of feedstuffs on the response. Triplicates samples of wheat bran (WB), casein glycomacropeptide (CGMP, Lacprodan®, Arla Foods, Denmark), mannan-oligosaccharides (MOS, Bio-Mos®, Alltech, USA) or *Aspergillus oryzae* fermentation extract (AO, Fermacto®, Molimen, Spain) were evaluated. Feedstuffs were diluted in PBS at increasing doses of 0.1, 0.2, 0.4 and 0.8% (w/v), sonicated 3 times and centrifuged. Then, 1mL of feedstuffs supernatants were incubated (30 min./room temperature) with 1mL of ETEC K88 or NFEC cultures (10^8 cfu/mL, diluted in PBS), added to confluent monolayer of IPEC-J2 cells and incubated for 2 h at 37°C/5% of CO_2. Cells were washed twice with sterile PBS, and IL-8 and TNF-α expression was quantified using Cyclophilin-A, as a housekeeping gene, and related to a non-challenged treatment. Gene expression results were analyzed by ANOVA using the PROC GLM of SAS. The ETEC K88 challenge increased ($P < 0.05$) the inflammatory response, compared with NFEC challenge for IL-8 (33.1 ± 5.44% vs. 6.8 ± 2.42%) and TNF-α (28.9 ± 4.92% vs. 1.8 ± 0.85%) gene expression. Regarding the effect of feedstuffs, the incorporation of WB or CGMP reduced ($P < 0.05$) the IL-8 (7.3 ± 5.26% and 15.4 ± 9.54%, respectively) and TNF-α gene expression (13.0 ± 7.67% and 6.9 ± 3.94%, respectively) in comparison to the AO treatment (IL-8, 35.8 ± 4.08% and TNF-α, 25.9 ± 4.67%). The incorporation of MOS promoted an intermediate response for IL-8 (19.1 ± 6.40%) and similar results to WB and CGMP for TNF-α (13.3 ± 4.49%). In summary our results suggest that WB and CGMP regulate the inflammatory response of IPEC-J2 cells to an ETEC (K88) challenge, likely due to interference in microbial adhesion to the epithelial cells.

Key words: wheat bran, casein glycomacropeptide, *E. coli* K88