T173 Serial slaughter evaluation of growth-promoting implants on growth and carcass characteristics in calf-fed Holstein steers. J. L. Beckett*[1], L. D. Luqué[1], P. D. Bass[3], W. T. Nichols[2], and R. J. Delmore[1], [1]*California Polytechnic State University*, *San Luis Obispo*, [2]*Intervet Inc.*, *Millsboro, DE*, [3]*Colorado State University*, *Fort Collins*.

Growth and carcass characteristics of calf-fed Holstein steers implanted with and without growth-promoting implants were evaluated during a serial harvest study. A total of 120 steers (average initial weight = 127 kg) were randomly assigned to either receive implants (I; Syn C at d 0, Rev IS at d 120, and Rev S at d 240) or nonimplanted control (C). Steers were fed a finishing ration continuously from day 0 through 420. Steers were weighed every 30 days from day 0 through 420 days on feed. A total of 8-12 head per treatment group were harvested on days 0, 60, 120, 180, 240, 270, 300, 330, and 420. Data collected included HCW, REA, skeletal maturity, marbling score and fat thickness. Yield grade was calculated and quality grade was determined. By 90 d, I cattle were significantly heavier than C cattle. Average shrunk weights for I cattle were 137, 172, 214, 261, 314, 354, 410, 458, 489, 534, 580, 627, 660, and 695 kg compared with 137, 168, 208, 249, 295, 330, 372, 417, 445 481, 509, 547, 567, 570, and 597 kg for C cattle on days 0, 60, 120, 180, 240, 270, 300, and 420, respectively. Average HCW of I cattle was 19, 32, 39, 47, 59, and 56 kg heavier on day 120, 240, 300, 330, 360, and 420, respectively ($P<0.05$). Dressing percent increased linearly ($P<0.05$) from 53% on day 0 to 62% by d 420, but did not differ by treatment. Fat thickness was not significantly different between the treatments throughout the feeding period ($P>0.05$). I cattle tended to have larger REA than C cattle on days 120, 300, 360 and 420, but the effect was not significant ($P>0.05$). Average REA increased from 26 cm^2 on day 0 to 87 cm^2 on day 420. Marbling score tended to be greater for C cattle on days 120, 180, 270, 300 and 360 ($P>0.05$). Results of this study confirm that growth-promoting implants are effective throughout the growing period in calf-fed Holstein steers. Further, each successive implant is additive to prior growth enhancement.

Key Words: Holstein, Growth Promoters, Serial Harvest

T174 The effect of milk replacer composition on growth and body composition of Holstein heifer calves. S. R. Hill, K. M. Daniels*, K. F. Knowlton, R. E. James, R. E. Pearson, M. L. McGilliard, and R. M. Akers, *Virginia Polytechnic Institute and State University*, *Blacksburg*.

Twenty-four newborn Holstein heifer calves (n=6) were fed one of 4 milk replacers: 20/20 (fed at 450 g/d, 20% CP/ 20% Fat, 0.53% P); 28/20 (fed at 970 g/d, 28% CP/ 20% Fat, 0.55% P); 28/28 (fed at 970 g/d, 28% CP/ 28% Fat, 0.46% P); or 28/28+ (fed at 1460 g/d, 28% CP/ 28% Fat, 0.46% P). Calves were purchased from a commercial farm at 3±2 d and arrived in one of three groups. Treatments were assigned randomly within group. Calves were fed 3.4 L of colostrum twice within 16 h of birth. Upon arrival at the research farm, calves were fed a 20/20 milk replacer for the first two feedings. On d 3, treatments were imposed and calf starter (20% CP, 0.48%P) comprised of corn (44.4%), soybean meal (44.4%), cottonseed hulls (11.1%), and molasses (1.0%) was offered free choice. Calves were on study for ~63 d. Total collection of feed refusals, feces and urine was initiated on d 59±2d. Body weight and body size were measured weekly. Calves were harvested at 63 d to evaluate body composition and mammary development (reported elsewhere). Preplanned contrasts were used to compare 20/20 to all, 28/20 to 28/28, and 28/28 to 28/28+. Empty body weight (EBW) gain was greater in calves fed 28/28+ compared to 28/28, however those same calves also had a higher percent of EBW as fat. Calves fed 28/20 had the most protein gain compared to those fed extra energy (28/28) and also had a higher protein as a percent of EBW. The addition of fat to the milk replacer reduced protein gain (kg and % of EBW), increased fat gain (kg and % of EBW), and decreased ash gain (kg and % of EBW). Increasing the volume fed did increase protein gain, fat gain (kg and % of EBW) and ash gain. These results indicate that 20% fat may not be enough energy to support protein gain when CP is greater than 28% of the diet DM. However, frame growth appeared to increase when calves were fed the 28/20 compared to 28/28, indicated by increased ash gain and increased body measurements.

Key Words: Milk Replacer, Calf, Body Composition

Immunology - Livestock and Poultry II

T175 Long-term consumption of resistant starch reduces T cell population and apoptosis in pig colon. M. Nofrarías*[1,2], D. Martínez–Puig[2], J.F. Pérez[2], and N. Majó[1,2], [1]*Centre de Recerca en Sanitat Animal (CReSA)*, *Bellaterra, Spain*, [2]*Universitat Autònoma de Barcelona*, *Bellaterra, Spain*.

The aim of the present study was to assess the effects of a long-term intake of resistant starch on the colonic fermentation and intestinal morphology, including lymphocytic infiltration, apoptosis and proliferation activities. Sixteen growing pigs were fed for 14 weeks on a diet containing a high amount (350 g/kg) of either raw potato starch (RPS; resistant starch type II) or corn starch (digestible starch). On day 97, pigs were euthanised and the gut weighed and sampled. Colonic digesta were analysed for short chain fatty acids concentration. Histological study was performed in tissue samples from proximal colon. The presence of T cells, cells undergoing apoptosis, and proliferative activity were also immunohistochemically determined. After 97 days, the colonic content from RPS pigs was heavier than for CS pigs (1.52 vs. 3.04 kg; $P<0.01$), producing a hypertrophy of tunica muscularis (428 vs. 529 µm; $P<0.01$). The concentration of butyrate was 3-fold higher in proximal colon digesta in RPS pigs (5.86 vs. 16.30 µmol/g; $P=0.02$). RPS fed pigs had reduced crypt depth (429 vs. 416 µm; $P=0.045$) and tended to diminish crypt cell proliferation (35.7 vs. 32.5 cells; $P=0.09$). Fermentation of RPS reduced ($P<0.05$) apoptosis, as number of immunopositive cells for cleaved caspase-3, in the crypts (0.62 vs. 0.32/crypt), lamina propria (1.41 vs. 1.16/1000 μm^2) and lymphoid nodules (5.9 vs. 3.9/1000 μm^2) in the colon. The numbers of intraepithelial T CD3+ cells (6.1 vs. 5.6/crypt; $P=0.027$) and the presence of mucosal lymphoid nodules (0.094 vs. 0.037/mm; $P=0.09$) were also reduced in the colon of RPS pigs. Results in colonic lymphocytic infiltration and apoptosis suggest that long term ingestion of RPS could induce lower immune reactivity in the hindgut.

Key Words: Resistant Starch, Intestinal Apoptosis, Pigs

T176 Utilization of alfalfa and its effects on the immune system during molt. J. L. McReynolds*, K. J. Genovese, H. He, C. L. Swaggerty, J. A. Byrd, D. J. Nisbet, and M. H. Kogut, *USDA-ARS-SPACR-FFSRU*, *College Sation, TX.*

Force molting of laying hens increases enteric foodborne pathogens in the reproductive tract, leading to contaminated eggs and progeny of infected hens. Currently, we lack a complete understanding of how conditions such as molting affect the immune system. Our laboratory is interested in continuing research on feeding alfalfa during a molt to evaluate its effects on heterophils function. Previous reports show that alfalfa is effective in inducing a molt as well as producing protection against *Salmonella enteritidis* (SE) organ invasion. Our laboratory has also shown that immune function is significantly reduced during molting. The present investigation was performed to evaluate heterophil function during an induced molt in hens fed alfalfa. Two replicate experiments utilized hens over 65 wk of age that were divided into 6 groups of 12 hens each and placed in individual laying cages. Two wk prior to dietary changes, hens were placed on an 8-h light and 16 h-dark photoperiod that continued for the 12-day experiment. Blood samples were taken from the hens during three sampling periods, 1-2d, 5-6d, and 11-12d. Treatments groups consisted of non-fed hens (NF), full-fed hens (FF) and alfalfa-fed hens (AF). Heterophil function was measured using several in vitro assays. We evaluated oxidative burst, degranulation, and phagocytosis. The results from the oxidative burst and degranulation assays showed significant ($P \leq 0.05$) increases when the AF birds were compared to the NF controls. Phagocytosis assays showed AF birds had similar net increases to FF birds when compared to the negative control. These results confirm that heterophil function is significantly reduced in NF birds during an induced molt. More importantly AF birds showed an increased immune response during a 12d molting period. Commercial integrators should consider using alfalfa when developing new molting programs.

Key Words: Chickens, Molting, Heterophils

T177 Effect of a direct fed microbial (PrimaLac®) on systemic immunity in developing broilers. C. C. Chiang[1], R. Qiu[2], J. Croom[2], L. Daniel[2], R. Ali[2], and M. Koci*[2], [1]*National Chung Hsing University*, *Taiwan*, [2]*North Carolina State University*, *Raleigh*.

Consumer and political concerns over the sub-therapeutic use of antibiotics in has led an interest in identifying alternative growth promoting dietary supplements such as direct fed microbials (DFM). DFM supplements have been used for decades to promote animal and human health however their mechanism of action is still unclear. The current study investigated the effects of DFM treatment on systemic immune responses in broiler chicks. Day-old broiler chicks were fed a control starter diet (CSD), or CSD plus PrimaLac® (PRM; 0.3% w/w). Each diet group was randomly divided into two treatment groups, one vaccinated i.v. with sheep red blood cells (SRBCs); the other mock vaccinated with normal saline (SAL). Chicks were vaccinated at 7 and 14 days of age, and monitored for the production of antibodies (Abs) against SRBCs by hemagglutination assay. Chicks fed the PRM diet produced higher titers of both total and β-mercaptoethanal resistant anti-SRBCs Abs as compared to the CSD group. Additionally, ex vivo stimulation of macrophages (Mϕ) isolated from PRM and CSD chicks demonstrated an increase in nitric oxide production by Mϕ from PRM treated chicks. Ex vivo analysis of circulating peripheral blood leukocytes (PBLs) suggested ATP utilization of PBLs from PRM-SAL chicks was lower than that of CSD-SAL chicks. However, the ATP utilization of PRM-SRBC chicks was greater than that of CSD-SRBC chicks. This suggests that while DFM may promote a more robust immune response, it may also be able to lower the maintenance cost of leukocytes in resting animals. Further investigation is needed to better understand this association.

Key Words: Probiotic, Direct fed Microbial, Immunity

T178 Effects of yeast culture in broiler diets on performance and immunomodulatory functions. J. Gao[1], H.-J. Zhang[1], S.-H. Yu[1], S.-G. Wu[1], I. Yoon[2], J. Quigley[2], and G.-H. Qi*[1], [1]*Feed Research Institute, Chinese Academy of Agricultural Sciences*, *Beijing, China*, [2]*Diamond V Mills, Inc.*, *Cedar Rapids, IA*.

Abor Acres chicks (n = 960, 1 d old) were randomly assigned to 4 dietary treatments with different levels (0, 2500, 5000 and 7500 mg/kg of the diet) of a commercial yeast culture product (Diamond V XP™ Yeast Culture; YC) to investigate the effects of YC on performance and immunomodulatory function in broilers. Broilers were housed in a three-layer batteries and fed corn-soybean meal based diets for 42 d. Each treatment consisted of 12 replicate pens with 20 broilers per pen. Feed intake and body weight were measured on d 1, 21 and 42. Nutrient digestibility was determined at 2 and 5 wk by total fecal collection. On d 21 and 42, twelve broilers per treatment were sacrificed for gut morphology and immune function measurements. Broilers were vaccinated with Newcastle Disease Virus (NDV) by eye drop on d 7 and 21 and antibody titer was determined on d 14, 21, 28, and 35. Compared with the control group, including YC at 2500 mg/kg improved ($P < 0.05$) ADG and feed efficiency on d 22-42 and 1-42. Yeast culture supplementation did not affect ($P > 0.05$) ADFI. Supplemental YC tended to increase ($P < 0.1$) digestibility of Ca on d 14 and 35 and P on d 14, but did not affect ($P > 0.05$) digestibility of energy, protein, and DM at 14 and 35 d. Added YC increased ($P < 0.05$) antibody titers to NDV on d 14, 21, 35 and 42. Dietary YC increased ($P < 0.05$) serum lysozyme activity and IgM content on d 21 and 42 but did not affect ($P > 0.05$) serum IgA or IgG on d 21 and 42. Added YC increased ($P < 0.01$) secretary IgA content in duodenum on d 21 and 42. Villus height of duodenum, jejunum, and cecum on d 21 and duodenum on d 42 were increased ($P < 0.05$) for broilers fed diets containing 2500 mg/kg of YC. Results suggest that supplementation of YC in broiler diets can improve growth performance, increase the calcium and phosphorous digestibility, and intestinal villus height. Immune functions could be modified with the inclusion of YC in the broiler diet.

Key Words: Immune Function, Yeast Culture, Broiler

T179 Dietary polyunsaturated fatty acids modulate immune responses in dairy cows characterized by an elevated plasma trans-10, cis-12 CLA and n-3 fatty acids but not cis-9, trans-11 CLA. M. Bharathan*, D. J. Schingoethe, R. S. Kaushik, K. F. Kalscheur, G. Moorkanat, and A. Hippen, *South Dakota State University*, *Brookings*.

Fatty acid composition of the diet can affect the membrane fatty acid composition of immune cells resulting in altered membrane-mediated

functions like eicosanoid production and signal transduction. To study the effect of dietary fatty acids on immune response, 12 lactating Holstein dairy cows were randomly assigned to one of four dietary treatments which included control (CTRL), control with 0.5% fish oil (FO), 10% condensed corn distillers solubles (CCDS), and 10% CCDS with 0.5% fish oil (CSFO). Cows were fed individually as total mixed ration once daily for ad libitum consumption for 28 d. Blood samples were collected on d 0, 7, 14, 21 and 28 to isolate peripheral blood mononuclear cells (PBMC) for proliferation assays and phenotypic characterization of bovine leukocyte markers, and whole plasma for analysis of fatty acid composition. Results indicated that feeding of these diets did not affect proliferation of lymphocytes but percentages of CD4+ and CD8+ T-cells decreased, CD14+ cells increased and MHC class II+ cells tended to increase in cows fed CSFO compared to CTRL. In this experiment, total fatty acids in the plasma did not differ due to diet, while total n-3 fatty acids in the plasma (102.9, 135.9 117.9 and 162.2μg/mL of plasma for CTRL, FO, CDS and CSFO, respectively) increased ($P < 0.01$) in CSFO and tended ($P < 0.09$) to increase with FO compared to CTRL. Cis-9, trans-11 C18:2 (conjugated linoleic acid; CLA) in plasma did not differ among diets; however, trans-10, cis-12 C18:2 CLA increased ($P < 0.02$) in CSFO compared to CTRL. Trans-11 C18:1 concentration (8.6, 15.6, 15.0 and 27.8 μg/mL of plasma) increased ($P < 0.01$) in cows fed CSFO while trans-10 C18:1 remained unaffected. Thus a diet rich in polyunsaturated fatty acids appears to decrease cell mediated immunity, but it may increase the innate immune responses and antigen presentation.

Key Words: Polyunsaturated Fatty Acids, Dairy Cows, Immune Response

T180 Plasma prostaglandin and cytokine concentrations in periparturient Holstein cows fed diets enriched in saturated or trans fatty acids. C. Rodriguez-Sallaberry*, C. Caldari-Torres, W. R. Collante, C. R. Staples, and L. Badinga, *University of Florida*, *Gainesville*.

Multiparous (n = 18) and primiparous (n = 12) Holstein cows were utilized to examine the effect of feeding a calcium salt of trans octadecenoic acids (tFA) on plasma prostaglandin (PG) and cytokine concentrations. The control diet was made isocaloric by addition of a highly saturated fat supplement (RBF). Dietary treatments were initiated approximately 28 d prior to expected calving date and continued through d 21 postpartum. Prepartum and postpartum diets were formulated to be isolipidic, containing 1.5% RBF and 1.8% tFA (DM basis). Multiparous cows were heavier (+ 32%) and tended to produce more milk (+ 15%) than primiparous cows. Average plasma NEFA concentration was higher in multiparous cows (+ 70%) than first lactation heifers at 3 wk of lactation. Periparturient tFA supplementation increased plasma $PGF_{2\alpha}$ metabolite (PGFM) concentration in multiparous cows, but not in primiparous cows. Concentrations of PGE_2, tumor necrosis factor-alpha (TNF-α) and interleukin-4 (IL-4) in plasma did not differ between diets and parities. Peripartum tFA supplementation tended to decrease the incidence of postpartum metritis in lactating Holstein cows. Results further confirm that multiparous cows are heavier and produce more milk than first-lactation heifers and raise the possibility that peripartum tFA supplementation may improve the immune competence of the early lactation dairy cow through alteration of peripheral $PGF_{2\alpha}$ concentration.

Key Words: Fat, Cytokine, Dairy Cow

T181 Natural antibody (anti-gal) is a sensitive means for evaluating the effects of diets on turkey humoral immunity. P. Cotter*[1], M. Hulet[2], and A. E. Sefton[3], [1]*Cotter Laboratory*, *Arlington, MA*, [2]*The Pennsylvania State University University*, *University Park*, [3]*Alltech Inc.*, *Guelph, ON, Canada*.

The influence of dietary supplements and growth promoters on immunity in turkeys was studied in serum from four groups of hens. Samples were obtained on d 84 from 10 hens each on two diets and hatched from two breeder flock sources. Diets contained 4% NuPro® in pre-starter and 2% in starter, or penicillin in starter. Natural antibodies reactive with the α-gal epitope (Galα1-3Galβ1-4GlcNAc-R) were detected by rabbit cell agglutination. A strongly agglutinating (HA1) pattern may be differentiated from a minority of weakly agglutinating (HA2) antibody by distinctive clumping. HA1 are presumably predominated by IgM whereas HA2 are IgG. Collectively anti-gal is the most abundant antibody in avian serum and is formed as a response to gut microflora. Microtiter results indicated a significant diet x origin interaction ($P > 0.01$) for HA1 the IgM antibody, but not for HA2. HA1 titers were higher in penicillin fed hens than in NuPro® fed hens from one origin but lower in penicillin fed hens from the second origin. Total IgM, measured by immunodiffusion, indicated a significant effect of breeder flock origin ($P > 0.03$) but there was no diet effect. Complement lysis and IgG agglutination were not affected by diet or breeder flock origin. The immunity parameters of HA1 and total IgM mirrored performance measurements of BW, BWG, feed intake, and feed conversion ($P < 0.0001$) as being affected by origin but not by diet. Poults sourced in VA had lower BWG and lower feed intake which paralleled their lower IgM agglutination titers and lower total IgM. MN sourced poults fed Penicillin had higher IgM agglutination compared with NuPro® fed poults but the reverse was true for poults sourced in VA. The mechanism exerting the source effect is unknown but may lie in yolk composition, perhaps acting via maternal antibody. These might determine gut flora establishment and so account for antibody variation. Thus anti-gal sensitivity indicates its utility as an immunity adjunct in nutritional studies in the turkey.

Key Words: Anti-Gal, Turkey Immunity, Growth Promoters

T182 Effects of feeding blends of grains naturally contaminated with Fusarium mycotoxins on immunocompetence of turkeys. C. K. Girish*, T. K. Smith, H. J. Boermans, and N. A. Karrow, *University of Guelph*, *Guelph, Ontario, Canada*.

An experiment was conducted to examine the effects of feeding blends of grains naturally contaminated with Fusarium mycotoxins on immunological indices (including functions) of turkeys. The efficacy of polymeric glucomannan mycotoxin adsorbent (GMA, Mycosorb®, Alltech, Inc., Nicholasville, KY) in preventing the adverse effects of Fusarium mycotoxins was also evaluated. Three hundred 1-d-old male turkey poults were fed wheat, corn and soybean meal-based starter (0-3 wk), grower (4-6 wk), developer (7-9 wk), and finisher (10-12 wk) diets formulated with uncontaminated grains, contaminated grains and contaminated grains + 0.2 % GMA. Feeding contaminated grains to turkeys significantly increased percent CD4+ lymphocyte populations during wk 6, however there was no change in the percent CD8+ and B-lymphocyte populations. Contact hypersensitivity to dinitrochlorobenzene, which is a CD8+ T-cell-mediated delayed type hypersensitivity response, was significantly decreased after 24 hr and 72 hr by feed-borne mycotoxins compared to controls. Supplementation of the contaminated diet with GMA prevented the decrease in response

after 24 hr. Mitogenic responsiveness of peripheral lymphocytes to concanavalin A and pokeweed was not affected by the feeding of contaminated diet. The feeding of contaminated grains did not significantly alter the serum (IgA, IgM and IgG) or bile (IgA) immunoglobulin levels. In contrast, the secondary antibody (IgG titer) response against sheep red blood cell antigens (CD4+ T cell dependent) was significantly decreased after feeding contaminated grains to turkeys compared to controls and GMA prevented this. It was concluded that the feeding of grains naturally contaminated with Fusarium mycotoxins exerts adverse effects on some of the immunological indices of turkeys and that GMA prevented many of these effects.

Key Words: Fusarium Mycotoxin, Antibody-mediated Immune Trespons, Turkeys

T183 Phage display selection and characterization of single-chain recombinant antibodies against *Eimeria tenella* sporozoites. D. Abi-Ghanem*[1], S. D. Waghela[1], D. J. Caldwell[1], H. D. Danforth[2], and L. R. Berghman[1], [1]*Texas A&M University*, *College Station*, [2]*USDA/ARS*, *Beltsville, MD*.

An antibody library against *Eimeria tenella* sporozoites was constructed by phage display. Total RNA was isolated from the spleen, bone marrow, and ceca of immunized chickens, and was used to reverse-transcribe cDNA. Heavy and light antibody variable genes were amplified from cDNA by PCR. The single-chain antibody fragment (scFv) was obtained by a secondary overlap PCR with primers that incorporate SfiI restriction sites, thus allowing for subsequent cloning into the phagemid vector pComb3X. Vector and scFv were digested with SfiI, ligated, and transformed into competent XL1-Blue *Escherichia coli* cells by electroporation, yielding a library of 7.4 x 10^7 total transformants. The culture was grown under carbenicillin selective pressure, rescued with helper phage, and the antibody-displaying phage was precipitated by PEG/NaCl, and subsequently used in five panning rounds against cryopreserved *E. tenella* sporozoites. Panning on whole cells offered the advantage of isolating antibodies against native epitopes, but required readily available sporozoites for every round of selection. A 1000-fold increase in phage output and a 3,000-fold enrichment were obtained after three rounds of panning, as the binding clones became the dominant population in the library. Ten clones were randomly selected from the last round of panning, and their nucleotide sequences were aligned and compared to chicken germ-line sequences. Analysis of the light chain variable regions revealed possible donor pseudogenes involved in gene conversion events. Possible somatic hypermutation events, a consequence of affinity maturation, were also identified. Soluble antibody was produced in a non-suppressor *E. coli* strain, purified by nickel affinity chromatography, and characterized by immunoblotting. In an immunofluorescence assay, this recombinant antibody showed specific binding to *E. tenella* sporozoites.

Key Words: Phage Display, *Eimeria Tenella*, Single-Chain Antibody

T184 Immune stimulatory CpG oligodeoxynucleotides reduces *Salmonella enterica* subsp. Arizonae organ colonization and mortality in young turkeys. H. He*, K. J. Genovese, C. L. Swaggerty, and M. H. Kogut, *Food and Feed Safety Research Unit, Southern Plain Agricultural Research Center, USDA-ARS*, *College Station, TX*.

Synthetic oligodeoxynucleotides (ODN) containing CpG dinucleotides (CpG ODN) mimics bacterial DNA and are stimulatory to innate immune system in most vertebrate species. The immunostimulatory activities of CpG ODN have been studied extensively and well characterized in human and murine immune cells. However, information on immune responses of avian species to CpG ODN is limited. We have previously investigated immune stimulatory activities of CpG ODN in turkey immune cells. Here, we have further demonstrated that immune stimulatory CpG ODN increases resistance of young turkeys to *Salmonella* infection. In this study, the newly hatched turkeys, obtained from a commercial source, were given CpG-ODNs or a control ODN that does not contain CpG motif at 50 µg/bird via intra-peritoneal (i.p.) injection. Twenty-four hours after the CpG-ODN treatments, turkeys were challenged with live *Salmonella enterica* subsp. Arizonae (SEA) (suspended in PBS). For the organ colonization experiment, 0.5-1x10^7 cfu/bird was given orally to the turkeys. For the mortality experiment, 0.5-1x10^7 cfu/bird was given to the turkey via i.p. injection. Twenty-four hours after the oral SEA challenge, birds were euthanized with CO2 and liver and spleen were aseptically removed from each bird and cultured for the organ colonization of SEA. The mortality was monitored for a period of 7 days after i.p. SEA challenge. A significant reduction ($p<0.05$) of organ invasion by SEA was observed in turkeys pretreated with CpG-ODNs containing the immunostimulatory GTCGTT motif. These CpG-ODNs also significantly reduced mortality of turkeys with acute peritoneal infection of SEA. Our study provides evidence that immunostimulatory CpG-ODN stimulated innate immune activities and enhanced the resistance to infectious pathogens in neonatal turkeys.

Key Words: CpG ODN, Infection, Turkey

T185 Responese of bovine lymphocytes to different CpG motifs. J.-W. Lee*[1] and X. Zhao[2], [1]*National Pingtung University of Science and Technology*, *Neipu, Pingtung, Taiwan*, [2]*McGill University*, *Ste-Anne-de-Bellevue, Quebec, Canada*.

The immunostimulatory effects of bacterial DNA or synthetic CpG oligodeoxynucleotides (ODNs) on mammal cells have been demonstrated, which makes CpG a potential adjuvant for vaccines. However, the immunostimulatory effect of CpG is species-specific and depends on the sequence of CpG mofits. A CpG fragment (2135), containing 3 identical copies of 5′-GTCGTT-3′ motif, was previously reported to have the strongest effects on bovine cells. Based on the sequence of 2135, we replaced the 5′-GTCGTT-3′ motif with 11 other sequences containing CG and investigated their effects on proliferation of bovine peripheral blood mononuclear cells (PBMC). Results showed that the CpG fragment containing 3 copies of 5′-GACGTT-3′ motif had the highest stimulation index (SI) (7.91 ± 1.19). We therefore further examined the effect of this CpG fragment on cytokine expression in bovine PBMC at the transcriptional level by using real-time PCR. Among the 6 cytokines analyzed, the mRNA expression of IL-6, IL-12, IL-21, and IFN-α was increased > 2 fold in response to this CpG fragment. However, the increase was not statistically significant due to large variations among animals. A vaccine trial is currently being carried out to evaluate the antibody response induced by this CpG fragment as the adjuvant.

Key Words: Bovine, Adjuvant, CpG