

- 1 day marination groups were significantly ($P < 0.05$) higher than rest of the treatments. But after three days of storage, the 2h deboned fillets did not significantly differ ($P > 0.05$) from any of the treatment groups that were deboned 4h PM. It may be assumed that extended aging and marination led to a decrease in the shear values of early-deboned meat making it equally tender as post rigor-deboned meat. Thus extended aging and marination could significantly reduce the deboning time of the broiler carcasses without adversely affecting the meat quality parameters.

Key Words: extended aging, tenderness, deboning time, marination, poultry breast meat

S-M60 Effectiveness of DBDMH (1,3-Dibromo-5,5-Dimethylhydantoin) bromine chemistry in final immersion chiller and post-chill wash system. J.L. McNaughton* and M.S. Roberts, *Solution BioSciences, Inc., Salisbury, Maryland.*

The poultry industry continues to need an improved & sustained reduction in post-chill Salmonella incidence (SAL), with multiple interventions required. Management of *Escherichia coli* (EC), Aerobic Plate Count (APC) & SAL incidence is essential in meeting future USDA post-chill carcass bacteria criteria. Two trials were conducted to measure the effectiveness of bromine (Br_2) broad-spectrum antimicrobial

applied in either final chiller or combined with post-chill, in controlling poultry post-chill carcass EC, APC, & SAL bacteria, with the ultimate goal of achieving $<10\%$ SAL, and improving shelf-life. In both trials, poultry carcasses were spotted along the thigh, breast, & internal cavity with approximately 10^3 each EC & SAL bacteria. After a 1-hr drying period in which the bacteria were allowed to adhere to the poultry skin, carcasses were treated internally & externally with a Br_2 solution applied either final chiller for 15 min or combined with post-chill for various contact times. All carcasses were rinsed using the recommended whole bird rinse procedure. Rinses were plated & counted using standard microbiological techniques. Final chiller procedures were applied on each carcass at either 0, 4, 8, or 12 ppm free or active Br_2 addition during immersion chilling (15 min chill), in Trial 1, were washed for either 0, 5, 25, or 50 sec and, in Trial 2, for either 0, 15, 25, or 50 sec (both trials used 80-82 ppm total Br_2), and then dripped 10 sec before rinsing. Results required to achieve $<10\%$ SAL standard and acceptable bacteria counts (significance $P < 0.05$): (1) At least 12 ppm final chiller free Br_2 levels with at least 15 sec contact time and (2) A combination of both final chiller Br_2 , with <12 ppm free Br_2 , and post-chill wash in a multiple intervention approach. Conclusion is that either final chiller Br_2 addition or a combination with post-chill wash will achieve the desired SAL goal. EC, APC, and shelf-life (at least 4-day improvement over control) followed a similar pattern.

Key Words: bromine, DBDMH, processing, *Escherichia coli*, *Salmonella*

Monday, January 23 SCAD (Avian Diseases) I Room: B312

S-M61 Development of a predictable model for gangrenous dermatitis in broilers. S. Collett*, Y. Cho, J. Glisson, C. Hofacre, and M. Lee, *University of Georgia, Athens.*

Although first reported in the sixties GD has, until recently been of limited importance to the USA broiler industry. In a 2004 survey of US poultry veterinarians, 70% of respondents ranked gangrenous dermatitis (GD) as one of the top three most serious current disease entities' confirming that this is a re-emerging disease.

GD research is limited by the difficulty in predictably reproducing this multifactorial disease under research conditions. In an initial screening (18 treatments with 10 birds per treatment), field isolates and ATCC reference strains of the two most frequently recovered etiological agents (*Clostridium perfringens* type A and *Clostridium septicum*), in the vegetative form were administered by subcutaneous injection or full-thickness skin scratch contamination. It was concluded that 0.5 ml of an overnight brain heart infusion broth culture of *Clostridium perfringens* type A ($\sim 1 \times 10^8$ cfu/ml), in the vegetative form, administered by subcutaneous injection was the challenge method of choice.

To establish the repeatability and predictability of the GD induction model dose response (0.5 ml 1×10^8 - 1×10^6 cfu/ml) studies and comparisons of broth (cells and toxin), washed cells alone and toxin alone were tested repeatedly (6 consecutive experiments with 3 treatments and 50 birds per treatment).

This challenge model consistently induces gangrenous dermatitis lesions in 100% of the challenged birds.

Key Words: dermatitis, clostridium, model, chickens

S-M62 Serological response and *in vivo* persistence of *Mycoplasma gallisepticum* vaccine strain 6/85 in layers and broilers. J.D. Evans*, S.L. Leigh, S.D. Collier, and S.L. Branton, *USDA/ARS Poultry Research Unit, Mississippi State, Mississippi.*

Commercially available attenuated strains of *Mycoplasma gallisepticum* (MG) are commonly used within the layer industry to control MG-induced mycoplasmosis. Strain 6/85 is a commonly utilized vaccine strain which has been demonstrated to be safe due to reduced pathogenicity and transmissibility. To further examine the protection afforded by 6/85, the serological response to 6/85 vaccination and subsequent persistence of the strain was monitored in 80 pullets and 64 broilers in separate studies. The experimental subjects were housed in biological isolation units (10 pullets/unit or 8 broilers/unit) and were divided among 4 treatment groups: (1) sham-inoculated control subjects; (2) subjects vaccinated with 6/85 at the recommended dosage (1X); (3) subjects vaccinated with 6/85 at 8.3X the recommended dosage; and (4) subjects vaccinated with 6/85 at 15X the recommended dosage. Pullets were vaccinated at 8 wks of age and broilers at 1 wk of age. The *in vivo* persistence of 6/85 was determined via culturing swabs of the choanal

cleft and subsequent MG-specific PCR. Serological response was determined via serum plate agglutination (SPA) and enzyme-linked immunosorbent assay (ELISA). Sampling included weekly blood collection beginning 3 wks post-vaccination for the duration of the study and choanal cleft swabbings at study termination (pullets at 15 wks of age; broilers at 8 wks of age). MG-specific PCR of the pullets demonstrated 6/85 retention in 0%, 15%, 5%, and 15% in the control, 1X, 8.3X, and 15X treatment groups, respectively. Among broiler samples, MG-specific PCR indicated 6/85 in 0%, 0%, 12.5%, and 18.8% of the control, 1X, 8.3X, and 15X treatment groups, respectively. Associated serological results of all experimental subjects will be reported.

Key Words: poultry, *Mycoplasma gallisepticum*, vaccine, mycoplasmosis

S-M63 Necrotic enteritis association with eimeria acervulina and E. maxima. G. Mathis*¹ and C. Hofacre², ¹*Southern Poultry Research, Inc., Athens, Georgia*, ²*University of Georgia, Athens*.

Necrotic enteritis is a common poultry disease caused by *Clostridium perfringens*. Reductions in feed efficiency, lower weight gain, and mortality are associated with this disease. *Clostridium perfringens* can rapidly grow when disturbances in the intestinal microflora or damage to the intestinal mucosa occur. An example of damage to the intestinal mucosa occurs with coccidiosis. Restrictions on in-feed anticoccidial usage and increasing usage of live coccidial vaccines, increases the potential for Necrotic Enteritis in commercial broiler chickens. The objective of this study was to examine association and experimental reproduction of Necrotic Enteritis (NE) in broiler chickens using *Eimeria acervulina*, *E. maxima*, or a combination of the two. The study consisted of rearing 10 male chickens per cage from day of hatch until 22 days of age. The treatments were noninfected, *E. acervulina* (75,000 oocysts per bird) challenged, *E. maxima* (10,000 oocysts per bird) challenged, and a combination at the same dose levels of *E. acervulina* and *E. maxima*. Each treatment was replicated 4 times. Birds were coccidia challenged at 14 days of age and *Clostridium perfringens* challenged at 19, 20, and 21 days of age. The performance parameters measured were feed conversion, average live weight gain, NE mortality, coccidiosis lesion scores (Day 20) and NE lesion scores (Day 22). Birds infected with *E. maxima* alone were more significantly affected by NE than birds challenged with the combination of species or *E. acervulina* alone. The least affected birds were those inoculated with *E. acervulina* alone. This study showed that both *E. acervulina* and *E. maxima* can cause enough intestinal damage to allow *Clostridium perfringens* proliferation and NE development. Even though NE developed with *E. acervulina* alone, the primary *Eimeria* species causing NE was *E. maxima*.

Key Words: *E. acervulina*, *E. maxima*, necrotic enteritis, *clostridium perfringens*, coccidiosis

S-M64 A reovirus challenge study comparing protection in three commercial broiler flocks and an SPF broiler flock. K. Cookson*¹ and J. Giambrone², ¹*Fort Dodge Animal Health, Overland Park, Kansas*, ²*Auburn University, Auburn*.

Reovirus infections have received increasing attention over the past few years. This study's objective was to compare reovirus maternal antibody status to protection in several broiler flocks. **Study Design:** 20 broilers from three commercial flocks were bled at day of age. The remaining chicks, including the SPF flock, were housed in Horsfall units

at 20 per isolator. At 3 days of age a set of birds were challenged intratracheally (IT) with 4.0 logs₁₀ (chick ID50) malabsorption strain 2408. At 10 days of age another set of birds were challenged by foot pad inoculation (FP). A third set remained unchallenged. At 3 weeks of age all birds were necropsied and examined for lesions consistent with reovirus infection (i.e., bruised, swollen or ruptured hock tendons, congested liver or spleen, proventriculitis). **Results:** By far the most common gross reovirus lesion involved the hock tendon. Day of age ELISA profiles of each flock as well as gross lesion incidence are listed in the table. **Discussion:** There was a strong correlation between reovirus ELISA profile and incidence of lesions post challenge. Serology was not performed to confirm the SPF flock was seronegative. However, this flock did have the highest rate of lesions as well as significant weight suppression (12% and 18%) after IT and FP challenge, respectively. The broiler flocks had lower incidences of lesions and the differences between them correlated well with the incidence of chicks with low starting reovirus titers. This study shows that reovirus chick challenge can potentially measure flock differences in protection levels. It also shows the benefit of higher maternal antibodies when flocks are placed in a high challenge environment.

Reovirus day of age ELISA profiles and gross lesion incidence post challenge

Group	Idx GMT	ELISA %CV	Flock profile birds in 0-2 titer group	Incidence of IT challenge	lesions p.c. FP challenge
Flock A	4,940	38.6	0%	5%	16%
Flock B	3,582	32.8	15%	10%	25%
Flock C	3,285	50.5	33%	16%	32%
SPF D	ND	ND	ND	60%	63%

ND = testing not performed

Key Words: reovirus, broilers, SPF, ELISA, protection

S-M65 Transgenic plant expressed sigma C protein induced immunity against avian reovirus. H. Wu*¹, K.-S. Gunn¹, S.-R. Singh¹, N.-K. Singh², R.-D. Locy², and J.-J. Giambrone³, ¹*Alabama State University, Montgomery*, ²*Auburn University, Auburn*, ³*Auburn University, Auburn*.

Avian reoviruses (ARVs) can result in economic losses in the poultry industry. Vaccines against ARVs may not provide full protection and some may cause adverse reactions. The coding sequence for the sigma C protein from strain S1133 of avian reovirus was expressed in a laboratory plant, *Arabidopsis thaliana*. Sigma C protein expression was demonstrated by Western-blotting. The transgenic protein was evaluated for its ability to protect specific-pathogen free (SPF) chickens against challenge with the virulent S1133 strain. Serological and challenge data showed the efficacy of the recombinant plant vaccine administered orally at weekly intervals for 3 weeks. Transgenic plant expressed sigma C protein induced antibody as determined by ELISA. Protection against challenge induced by the plant expressed sigma C protein administered orally and subcutaneous was 70% and 90%, respectively. The commercial vaccine (VaVac) provided 80% protection, whereas chickens primed

with the commercial vaccine and boosted with plant-expressed sigma C protein had 90% protection. Results were similar to our previous research with infectious bursal disease virus, which showed that the transgenic plant expressed protein can be an effective booster vaccine for chickens primed with commercial live vaccines.

Key Words: avian reovirus, sigma C protein, plant vaccine, oral immunization

S-M66 Effect of avian adenovirus infection in broiler breeder progenies infected with chicken anemia and infectious bursal disease viruses. I. Alvarado*, P. Villegas, F. Perozo, and L. Purvis, *University of Georgia, Athens.*

A significant protection provided by maternal antibodies against avian adenovirus serotypes 8 and 11, previously associated with the inclusion body hepatitis and hydropericardium syndrome, was observed in breeder progenies after challenge at 1 and 7 days of age. At two weeks of age, in the presence of low maternal antibodies against avian adenovirus (AAV), chicken anemia virus (CAV) and infectious bursal disease virus (IBDV), birds from the same progenies were challenged with either the FAV serotype 8, a field CAV strain and/or the IBDV Edgar strain. The level of protection against clinical disease was evaluated in these progenies.

Key Words: avian adenovirus, CAV, IBDV

S-M67 Sequence comparison of ORF1, E3 and fiber genes from different isolates of Turkey Hemorrhagic Enteritis Virus. F. Pierson*, N. Beach, X. Meng, N. Sriranganathan, R. Duncan, and C. Larsen, *Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg.*

Turkey Hemorrhagic Enteritis Virus (THEV) is a *Siadenovirus* that causes disease in turkey poulters characterized by splenomegaly, depression, bloody diarrhea, and death. The purpose of this study is to determine which viral genes are involved in virulence. A previous study comparing the full-length genome sequences of a virulent field isolate and an avirulent vaccine strain revealed point mutations resulting in putative amino acid changes in seven viral gene products. Further sequencing allowed narrowing of the focus from seven genes to three: ORF1, E3, and fiber. ORF1 and E3 encode non-structural proteins that have unknown function. The fiber is the structural protein responsible for target cell adhesion. The ORF1, E3, and fiber genes were sequenced in eleven different strains of THEV: four tissue culture vaccine strains, four virulent field isolates, the VA avirulent strain (VAS), the VA Virulent strain (VVS), and a pheasant vaccine strain. PCR primers amplifying overlapping gene segments were designed based on the sequence of the VAS. After amplification, both strands of each PCR product were sequenced. Although the data reveals a high level of homology (99.9%) between all of the strains, there are several mutations found in each strain. Virulent strains can be easily differentiated from the vaccine strains based on common mutations in the ORF1 and E3 genes. The virulent field isolates differed substantially from the VVS in all three genes. It is difficult to predict which of the three candidate genes is responsible for virulence, or if it is a combination of factors. The biological mechanism responsible for intestinal lesion formation and mortality is not known, though there is strong evidence that it is immune mediated. Several mutations were found in the fiber knob, but none that clearly differentiate the virulent strains from the vaccine strains. It is possible that ORF1 and E3 are responsible for interference with host cell cycle regulation much like E1A in mammalian adenoviruses. Future studies will attempt to clarify the roles of ORF1 and E3 during infection.

Key Words: siadenovirus, hemorrhagic enteritis, turkey, virulence, sequence

Monday, January 23 Nutrition II Room: B313

S-M68 Limiting dietary amino acid response surface estimates for growing broilers. A.C. de Leon*¹, A. Corzo¹, W.B. Roush², and M.T. Kidd¹, ¹Mississippi State University, Mississippi State, ²USDA-ARS, Mississippi State, Mississippi.

The aim of this study was to obtain a model to predict digestible Lys, TSAA and Thr levels that optimized performance of broilers from 15 to 35 d of age. Ross x Ross 308 broilers (935) were allotted to 85 floor pens at d 1. Birds were fed common diets to d 15. At d 15, dietary independent variables were digestible Lys (X_1 ; 0.95, 1.05 and 1.15%), digestible TSAA (X_2 ; 0.70, 0.77 and 0.84%) and digestible Thr (X_3 ; 0.60, 0.66, and 0.72%), and were optimized using a 3-factor, 3-level Box-Behnken design. The design layout involved 12 design points of amino acid levels equidistant around a center point. The center point was replicated 5 times creating 17 treatments (5 study replications). One corn and soybean meal diet was used. Analyzed amino acid levels of corn and soybean meal were utilized for linear programming formulation. Diets con-

tained 3,175 kcal ME/kg and were adequate or surplus in nutrients except Lys, TSAA and Thr. Dependent variables were weight gain (Y_1), feed intake (Y_2), feed:gain (Y_3), carcass weight (Y_4), carcass yield (Y_5), front half weight (Y_6), front half yield (Y_7), back half weight (Y_8), back half yield (Y_9), abdominal fat weight (Y_{10}), abdominal fat percentage (Y_{11}) and mortality (Y_{12}). Quadratic ($Y_2, Y_3, Y_5, Y_7, Y_{10}$ and Y_{11}) and cross product (Y_6 and Y_9) differences ($P=0.05$) were detected. Response surface methodology predicted maximal response (%) levels of dietary amino acids (X_1, X_2, X_3) for: Y_2 , 1.13, 0.93 and 0.83, respectively; Y_3 , 1.07, 0.77 and 0.65, respectively; Y_5 , 1.01, 0.78 and 0.68, respectively; Y_7 , 1.00, 0.78 and 0.67, respectively; Y_{10} , 1.08, 0.79 and 0.66, respectively; and Y_{11} , 1.09, 0.78 and 0.66, respectively. Average recommendation of quadratic responses for digestible Lys, TSAA and Thr were 1.06, 0.81 and 0.69, % respectively. Cross-product digestible amino acid interactions for Y_6 and Y_9 resulted in TSAA and Thr to Lys ratios of 0.72 and 0.67, and 0.75 and 0.66, respectively. Response surface digestible