

ment did not significantly affect any of the aforementioned parameters. In this study, 25 ppm supplemental L-carnitine in breeder hen diets did not impact subsequent egg yolk moisture or lipid content, or relative weight or moisture and lipid contents of the body, liver, or yolk sac of embryos at 18 d of incubation between 25 and 38 wk of breeder hen age.

**Key Words:** Broiler breeder, Carnitine, Embryo, Lipid, Moisture

**S81 Does sexual maturity alter the clearance of creatine kinase from female chicken plasma?** M. A. Mitchell\*, D. A. Sandercock, R. R. Hunter, A. Muthukrishnan, *Roslin Institute*.

Previous studies in this laboratory have demonstrated an apparent myoprotective effect of estrogen in female chickens both at normal sexual maturity and following administration of exogenous steroid. This action is characterized by a marked decrease in the plasma activity of the muscle enzyme creatine kinase (CK) although the precise mechanism remains to be elucidated. It has been suggested that alterations in the elimination of the enzyme from the circulation may contribute to this phenomenon. The present study examined this hypothesis. Two groups of female chickens of an Institute-bred brown leghorn line (J-line) were used. One group was designated immature (16-18 weeks of age) and the other mature (26-30 weeks of age) and were in lay. Birds were anaesthetized with urethane and a cannula was inserted in to the brachial vein and baseline blood samples were obtained. Birds from each age group received a 0.5ml bolus of a semi-purified preparation of skeletal muscle CK of known enzyme activity. Control birds received an equal volume of the Tris-EDTA muscle homogenization buffer. Serial blood samples were taken over a total period of 6 hours and plasma activity of CK was determined by spectrophotometry. Sexual maturity and associated elevated circulating estrogen was confirmed by measurement of plasma concentrations of triglyceride (TG), zinc (Zn) and calcium (Ca). Use of an appropriate model allowed calculation of total volume of distribution ( $V_d$ ) of CK, the half-life of elimination ( $t_{1/2}$ ) and the plasma clearance ( $C_{CK}$ ). Sexually mature females had reduced plasma CK activity and elevated plasma TG, Zn and Ca compared to immature birds. The  $V_d$  for CK was 75ml in immature and 88ml in mature birds. The corresponding  $t_{1/2}$  values were 233 and 252 minutes with  $C_{CK}$  values of 11ml/kg/hr and 10ml/kg/hr. There were no significant differences in these parameters between groups. It

is concluded that estrogen induced decreases in plasma CK activity are primarily a consequence of reduced release from muscle tissue and not from alterations in elimination or clearance.

**Key Words:** Myopathy, Creatine kinase, Estrogen, Broiler

**S82 Thermoregulatory and metabolic heat production responses during acute heat stress in genetically improved broiler chickens.** M. A. Mitchell\*, D. A. Sandercock, M. G. MacLeod, R. R. Hunter, *Roslin Institute*.

It has been proposed that artificial genetic selection for improved production traits in modern broiler lines is associated with both pathology and reduced effectiveness of some homeostatic systems. The high metabolic rate of rapidly growing birds may reduce their resistance to high ambient temperatures. The present study has compared the effects of acute heat stress upon deep body temperature regulation, metabolic heat production and some physiological indices of thermoregulatory effort in a fast growing broiler line (FG) and a slower growing genetic predecessor (SG). The metabolic heat production (MHP) responses to a 2 hour exposure to a temperature of 32°C + 70% relative humidity were determined in birds from the two lines at identical body weights by indirect calorimetry. Deep body temperatures were also recorded and venous blood samples obtained for determination of pCO<sub>2</sub> and pH before and after heat stress. Exposure to high thermal load induced a profound hyperthermia in both lines, rectal temperature increasing 2.6°C and 4.8°C in SG and FG birds. During heat stress mean heat production increased by approximately 20% (p<0.05) in both groups, the absolute increase being 55% greater in the FG birds. The peak changes in MHP during heat stress were 57% (p<0.005) and 35% (p<0.01) in the FG and SG groups respectively. There was no evidence of a greater thermoregulatory effort in the FG birds as the degree of hypocapnic alkalosis induced in the two lines was similar. It is suggested that fast growing broiler chickens may exhibit inappropriately elevated MHP responses during heat stress and that the heat loss mechanisms to dissipate the imposed heat load are inadequate. It is concluded genetic selection for improved growth in broiler chickens has detrimental effects upon thermo-tolerance through regulation of MHP and heat loss and that this may compromise their productivity and welfare by limiting their capacity to respond to thermal challenge.

**Key Words:** Broilers, Heat production, Thermoregulation, Heat stress

## Tuesday, January 25 SCAD (Avian Diseases) Room: B312

**S83 Transmission of blackhead disease (*Histomonas meleagridis*) from bird to bird by exposure to contaminated litter.** P. Armstrong\*, L. McDougald, *Department of Poultry Science, University of Georgia*.

Previous studies have shown that blackhead disease (histomoniasis) can spread from inoculated turkey poults to uninoculated poults in litter-floored pens and cages without the aid of invertebrate vectors. Other studies showed that birds could acquire histomoniasis by cloacal drinking after contact with liquid cultures. The exact mechanism by which birds acquire the infection under practical conditions is not known. The present series of experiments was designed to determine whether poults could acquire blackhead infections from contact with contaminated litter in the absence of infected birds. Groups of 8 2-wk-old poults were given the following treatments: 1) Uninfected, unexposed; 2) All birds inoculated; 3) 2 birds/cage inoculated with 100,000-300,000 histomonads from culture; or 4) no birds inoculated, but birds in these cages were switched repeatedly with birds in Treatment 2 so they would come in contact with contaminated litter. The experiment was repeated 3 times. Typically, most of the directly inoculated birds contracted blackhead and died or had severe lesions at necropsy. Some of the inoculated birds in Treatment 3 developed severe blackhead as a result of exposure to the directly inoculated birds in the cage. Of the birds exposed only to contaminated litter (Treatment 4), 4 birds in experi-

ment 1, 2 birds in experiment 2 and 2 birds in experiment 3 had lesions of histomoniasis in the ceca or were positive for histomonads by microscopy. These results suggest that it is possible for turkeys to become infected with blackhead through contact with contaminated litter. However most of the lesions seen were very mild (1 or 2) or were only positive by microscopy. Thus, further work will be needed to determine whether contact with contaminated litter is a significant factor in transmission of blackhead within a flock.

**Key Words:** Histomonas, Turkey, Blackhead disease, Epidemiology, Contamination

**S84 In vivo persistence of *Mycoplasma gallisepticum* vaccine strain 6/85 singly and following challenge by *Mycoplasma gallisepticum* F-strain.** J. D. Evans\*<sup>1</sup>, S. D. Collier<sup>1</sup>, G. T. Pharr<sup>2</sup>, S. L. Branton<sup>1</sup>, <sup>1</sup>USDA-ARS South Central Poultry Research Unit, <sup>2</sup>College of Veterinary Medicine, Mississippi State University.

Within the layer industry, commercially available attenuated strains of *Mycoplasma gallisepticum* (MG) are commonly used 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 persistence of the strain was monitored in 120 commercial layer chickens housed in biological isolation units (10 layer hens/unit) divided among 3 treatment groups: (1) commercial layer hens vaccinated with 6/85 at 10 wks of age (n=40); (2) commercial layer hens vaccinated with 6/85 at 10 wks of age and challenged with the F strain of MG (FMG) at 22 wks of age (n=40); and commercial layer hens vaccinated with 6/85 at 10 wks of age and challenged with FMG at 45 wks of age (n=40). The *in vivo* persistence of 6/85 was determined via culturing swabs of the choanal cleft and subsequent MG-specific *pvpA* PCR. Sampling included preliminary random sampling of 25% of the layer hens of each treatment group at 48 wks of age and subsequent sampling of all study participants at 59 wks of age. Preliminary results demonstrated 6/85 survivability in 10%, 30%, and 10% of layer hens vaccinated with 6/85 at 10 wks singly, layer hens vaccinated with 6/85 at 10 wks of age and FMG at 22 wks of age, and layer hens vaccinated with 6/85 at 10 wks of age and FMG at 45 wks of age, respectively.

**Key Words:** Poultry, *Mycoplasma gallisepticum*, Vaccine, Egg production, Layers

**S85 Novel staining method to enhance gross identification of chicken peyer's patches.** L. Vaughn\*, P. Holt, R. Moore, H. Stone, *USDA, ARS, Southeast Poultry Research Laboratory.*

The chicken ileal peyer's patches are classified as secondary gut-associated lymphoid tissue. Young birds possess multiple peyer's patches which tend to regress in number as the bird ages. However, one peyer's patch located anterior to the ileocecal junction appears to be consistently present in a range of age groups. This single peyer's patch may serve as an important tissue site for monitoring the inflammatory & immunological responses of the host against enteric pathogens. However, peyer's patches of aging chickens are often difficult to observe grossly & a simple technique to enhance visualization of the peyer's patch is lacking. Therefore, we designed a novel staining method that is quick, easy & accurate for gross identification of the chicken peyer's patch. Segments of lower GI tract, jejunoileal junction extending distally to the colon, were excised from SPF white leghorn spent hens & commercial broilers 4-6 weeks of age. The GI segments were flushed with water or phosphate buffered saline (PBS) to remove ingesta & cellular debris. Then each was stained with Eosin-Y & Crystal Violet in sequential fashion. First, a diluted solution of Eosin-Y in PBS was infused into the gut segment via 20-30cc syringe with 14-16 gauge, 1 inch needle until the GI segment was fully distended. The stain was allowed to permeate for 1 minute then the Eosin-Y was gently extruded. Second, a diluted solution of Crystal Violet in PBS was infused into the GI segment. Upon addition of the Crystal Violet, the lymphoid tissue area became apparent at the GI serosal surface. The distal ileal peyer's patch appeared as a pale whitish-pink ovoid area with surrounding gut tissue stained light purple. The exact site of the peyer's patch lymphoid tissue could be delineated with the unaided eye & properly excised. Tissue was verified by histology. The novel Eosin-Y + Crystal Violet staining technique promotes the rapid identification of & accurate recovery of peyer's patch lymphoid tissue in the chicken. The method renders specific peyer's patch lymphoid tissue suitable for use in various research applications.

**Key Words:** Peyer's patch, Eosin-y, Crystal violet, GALT, Mucosal immunity

**S86 Enhancing DNA vaccine-induced production of avian influenza hemagglutinin subtype-specific reference antisera.** J. Pfeiffer\*, D. L. Suarez, C. W. Lee, *Southeast Poultry Research Laboratory, USDA-ARS.*

The most common means of producing reference influenza antisera against different hemagglutinin subtypes is by injecting chickens with live or killed whole virus preparations. It has been previously demonstrated that vaccination using DNA vaccines administered intramuscularly can be used to develop hemagglutinin-specific antisera without producing antibodies to other influenza proteins. The purpose of the current project was to expand on earlier research by finding adjuvants which would enhance production of this reference antisera. The pCI eukaryotic expression vector (EEV) was used to express the hemagglutinin gene of an H5 and H7 influenza virus. In the earlier study,

pCIneo was the expression vector used. One reason for using pCI for this experiment was due to the smaller size of this plasmid, such that almost 30% more plasmids could be administered for the same dose of DNA than pCIneo. Co-administered with these plasmids was either the chicken IFN-1 gene, also contained in the pCI vector, or CpG oligodeoxynucleotides. In addition, different cationic lipids were compared. Another approach involved pCI plasmids containing the CpG motif incorporated adjacent to the hemagglutinin gene sequence, in the same plasmid. Birds were vaccinated at four weeks of age, boosted once after four weeks, and bled at two-week intervals, beginning two weeks after initial vaccination. HI test was used to measure antibody titers. Compared to the previous study which had used pCIneo, the group receiving H5 of the exact same subtype in this experiment had higher antibody titers at both one and two months after initial vaccination. All of the adjuvants in the experimental groups appeared to enhance the antibody responses in comparison with the previous study. After the first vaccination, the IFN groups of both the H5 and H7 groups showed higher antibody titers than the other groups. It is likely that one of the adjuvants tested will show more potency than the others and be a possible candidate for use in the production of reference antisera.

**Key Words:** DNA vaccination, Hemagglutination inhibition, Reference antisera, Influenza, Adjuvant

**S87 Comparison of serological methods for the detection of antibodies to avian influenza in chicken, quails and turkey sera.** C. M. Lamichhane\*, E. Yeh, J. Wheeler, C. George, B. Glidewell, *Synbiotics Corporation.*

The novel enzyme-linked immunosorbent assay (ELISA) was developed for the rapid and efficient large scale screening of antibodies to Avian Influenza Virus (AIV). This study examines the sensitivity and specificity of the commercial AIV ELISA methods as they compare with that of the standard Agar-gel Immuno-precipitin (AGIP), and hemagglutination inhibition (HI) assays. The efficacy of the above serological methods to detect the antibody status in chicken, quail and turkey serum is reviewed.

**Key Words:** ELISA, AIV, Poultry

**S88 Sequence analysis of Turkey Astroviruses isolated from healthy and sick birds.** M. Pantin-Jackwood\*, E. Spackman, *Southeast Poultry Research Laboratory.*

The objective of this study was to determine the genetic variability of Astroviruses in Turkeys. Intestinal and fecal samples from turkey flocks from North Carolina and Virginia ranging in age from 1 to 10 weeks old were examined for the presence of Turkey Astrovirus (TAsV) by real time RT-PCR. TAsV was found in samples collected from flocks with poult enteritis and stunting as well as from healthy flocks. Segments of the polymerase and capsid genes of TAsV were amplified by RT-PCR, cloned, and sequenced. Sequences were compared with the published TAsV sequence (TAsV-2, Koci et al. 2000). The capsid gene nucleotide sequences of the TAsV isolates studied showed between 80% and 96% similarity with the corresponding region of TAsV-2. The deduced amino acid sequences showed a two amino acid deletion in half of the isolates. The TAsV isolates studied formed two well-defined groups, with isolates from healthy flocks clustered in one group and isolates from flocks with poult enteritis and stunting divided between both groups. Sequence analysis of the polymerase gene showed 95 to 98% similarity between the isolates studied but had only an 85% similarity with TAsV-2. The results indicate that there is significant genetic variation between TAsV isolates suggesting that more than one serotype of the virus could be present in the field.

**Key Words:** Turkey Astrovirus, Turkey, Poult enteritis, Stunting, Sequencing

**S89 A reovirus progeny challenge study comparing breeder flocks on two different inactivated IBDV/Reo programs.** K. Cookson\*<sup>1</sup>, J. Giambrone<sup>2</sup>, and J. Rodenberg<sup>1</sup>, <sup>1</sup>Fort Dodge Animal Health, <sup>2</sup>Auburn University.

Broiler progeny were taken from two 60 week-old sister flocks. The only difference between flocks was in the killed IBDV/reovirus program. Flock A/A received 2 shots of 100% bursal tissue origin (BTO) Vaccine A, while Flock B/A

received one shot of BTO Vaccine B and one shot of Vaccine A. To compare the passive reovirus protection of the two programs, broiler progeny were challenged under controlled conditions. **Study Design:** Broilers were bled and housed in Horsfall isolator units in groups of 20. Two groups were challenged by intratracheal (IT) gavage at 3 days of age using malabsorption strain 2408. At 10 days of age the remaining birds were challenged by foot pad (FP) inoculation with either saline, 2408 or tenosynovitis isolate S1133. All dosages were titrated at 4.0 logs<sub>10</sub> (chick ID50). At 14 days of age, the IT challenged birds and non-challenged controls were weighed. At 20 days of age all birds were weighed and FP inoculated birds were lesion scored using the following system: none (0), mild—half of FP swollen (1), moderate—entire FP swollen and swelling extends into shank (2) and severe—swelling extends into the opposite FP (3). **Broiler Results:** Day of age serology in A/A broilers 1,216 GMT, 70% CV. B/A broilers 1,981 GMT, 41% CV. Body weight suppression after 2408 IT challenge 29.5% at 14 days and 23.1% at 20 days in A/A, compared to no weight suppression in B/A. Bursal atrophy 21% of A/A broilers at 20 days compared to 10% in the B/A group. Foot pad lesions against 2408 and 1133 challenge were significantly higher in A/A broilers (1.50 and 1.55 average scores) compared to B/A broilers (.85 and 1.05). Protection rates from grade 2-3 lesions were about twice as high in B/A broilers. **Conclusion:** The difference in reovirus broiler serology conferred by the different killed IBDV/reovirus programs correlated to differences in susceptibility to 3 day IT and 10 day FP reovirus challenge. A/A broilers had significant weight suppression and twice the incidence of bursal atrophy after 3 day IT challenge. They also had significantly higher average lesion scores after 10 day FP challenge

Comparison of broiler progeny reovirus performance of two breeder flocks

Treatment	Intratrach. Challenge		Foot pad protection		Foot pad Lesion scores	
	14d BWs	20d BWs	2408	1133	2408	1133
A/A challenge	249g*	446g*	45	35	1.50**	1.55**
A/A controls	353g	734g	—	—	0.00	0.00
B/A challenge	391g	649g	75	65	0.85*	1.05*
B/A controls	395g	650g	—	—	0.00	0.00

\*Significant difference from controls \*\*significant difference from flock b/a.

**Key Words:** Reovirus, Progeny, Intratracheal, Foot pad, Bursa-derived

**S90 Yeast derived sigma C protein induced immunity against reovirus.** H. Wu<sup>\*1</sup>, Y. Williams<sup>1</sup>, K.-S. Gunn<sup>1</sup>, N. Singh<sup>2</sup>, R. Locy<sup>2</sup>, J. Giambrone<sup>2</sup>, <sup>1</sup>Alabama State University, <sup>2</sup>Auburn University.

Avian reoviruses (ARVs) can result in disease and generate economic losses in the poultry industry. Vaccines against ARV may not provide full protection and can cause adverse reactions. The coding sequence of the sigma C protein from strain S1133 was expressed in *Schizosaccharomyces pombe*. Sigma C protein expression in yeast was demonstrated by Western-blotting, and the protein was evaluated for its ability to protect specific-pathogen free (SPF) chickens against challenge with the virulent S1133 strain. Serological and challenge infection data showed the efficacy of the recombinant vaccine administered orally in chickens. Yeast-expressed sigma C protein administered at weekly intervals induced antibody as determined by ELISA. Protection induced by the low dose (0.5mg purified yeast-expressed sigma C protein /chicken) or the high dose (1.0mg purified yeast-expressed sigma C protein /chicken) was 64% and 91%, respectively. The commercial vaccine (VaVac) administered once or twice provided 82% protection. Results showed the potential of an orally administered recombinant vaccine prepared in yeast against reoviruses in poultry.

**Key Words:** Avian reovirus, Sigma C protein, Orally immunization

**S91 Development of a high-throughput quantitative real-time RT-PCR assay for rapid detection of exogenous avian leukosis virus.** B. Mozisek<sup>\*</sup>, J. El-Attrache, <sup>1</sup>Texas A&M University.

Avian leukosis viruses (ALVs) have caused significant economic losses worldwide in meat-type chickens by diminishing feed conversion, inciting neoplas-

tic disease, and increasing mortality. The most recently discovered subgroup, ALV-J, was first isolated in the late 1980s and continues to cause serious mortality and production problems worldwide in the commercial broiler industry. To counter the problems associated with ALV-J, primary breeder companies have adopted eradication programs of infected birds in order to produce virus free breeding stock. The gold standard for ALV laboratory diagnosis consists of virus isolation in cell culture coupled with antigen-capture (ac) ELISA to detect exogenous ALV p27 capsid protein. This approach is laborious and time consuming, taking 7 to 9 days to complete and has often been proven to be inconsistent and lack sensitivity due to the ability of the infected bird to transiently and/or intermittently shed infectious virus. In order to increase sensitivity and provide a rapid analysis, a QRRT-PCR assay was designed and developed by this laboratory to detect exogenous ALV subgroups, while excluding amplification of endogenous viral sequences within the chicken genome. The high-throughput feasibility of this assay was further facilitated by the use of magnetic bead technology to isolate viral and proviral nucleic acids from individual samples in a 96-well plate format. The sensitivity of the resulting one-tube hydrolysis probe based reaction developed in this study was calculated to amplify approximately 20 copies of in vitro transcribed RNA. Validation studies were conducted with plasma samples and results of these studies show high correlation between virus isolation and QRRT-PCR. This method allows for a rapid endpoint assay by the real-time quantification of ALV RNA copy numbers, is extremely sensitive, specific, and easy to perform in a high throughput manner. This contemporary method of ALV detection has the potential to be instrumental in the eradication of ALV from primary breeding stock.

**Key Words:** ALV, High-throughput, Quantitative, RRT-PCR, Magnetic-beads

**S92 Gizzard and proventricular lesions in broiler chicks at hatch.** J. Giambrone<sup>\*1</sup>, T. Dormitorio<sup>1</sup>, L. Li<sup>2</sup>, F. Hoerr<sup>2</sup>, D. Poole<sup>3</sup>, <sup>1</sup>Auburn University, <sup>2</sup>C. S. Roberts Veterinary Diagnostic Laboratory, <sup>3</sup>Degussa Corporation.

Broiler chickens in the southeastern United States and Mexico have focal to confluent hemorrhages and erosions in the mucosal lining (koilin) of the gizzard. The condition affects many flocks in a production complex, and involves chicks from multiple breeder flocks of various ages. Lesions occur in the hatchery before placement. In the broiler house, stunted birds have fecal-soiled feathers around the cloaca. At necropsy, affected chicks have focal to confluent or linear erosions and roughening of the gizzard lining, frequently with brown or red discoloration indicative of hemorrhage. The proventriculus may have yellow coagulum adhered to gland openings. From two broiler complexes, we examined chicks in the hatchery from 15 broiler breeder flocks, ages 28 to 63 weeks of age. Gizzards with gross lesions were divided, with proventriculus attached, for viral studies and portions were fixed in neutral buffered formalin for histopathology. Tissues were similarly collected from three-day-old broilers with gizzard lesions in four flocks. At necropsy, gross lesions in the gizzard were as described above.

Histologic examination showed multifocal to confluent hemorrhage in the koilin. Affected regions of koilin had incomplete fusion and were discontinuous. Many sloughed epithelial cells were also present. In some, the hemorrhage was represented by nuclei of degenerated erythrocytes occurring in a laminar pattern with normal koilin forming between the hemorrhage and the mucosa. In others, acute hemorrhage occurred at the interface of the mucosa and the fused koilin layer. Some sections of pancreas had infiltrates of heterophils in periductal interstitial tissue; duodenum and proventriculus had no conclusive findings. In three-day-old broilers, the hemorrhages were less obvious, however, acute, locally extensive hemorrhage and koilin disruption occurred in some. The cause of this condition is not known, however, both noninfectious and infectious etiologies are under investigation.

**Key Words:** Gizzard, Proventriculus, Lesions, Broilers, Hatch

**S93 Experimental reproduction of transmissible proventriculitis in broilers.** T. Dormitorio<sup>\*1</sup>, J. Giambrone<sup>1</sup>, F. Hoerr<sup>2</sup>, <sup>1</sup>Auburn University, <sup>2</sup>C.S. Roberts Veterinary Diagnostic Laboratory.

Within the past 15 years, transmissible proventriculitis (TP) have occurred frequently in broiler flocks in the southeastern United States. Broilers suffering from this disease have increased feed conversion and poor growth rate. At

necropsy, the proventriculi are enlarged with thickened walls. Microscopically, the glands are dilated, with necrosis of secretory cells, hyperplasia of ductular epithelium and mucosal and glandular inflammation caused by lymphocytic infiltration. The mucosa has cystic lesions and expansion of the lamina propria. These microscopic inflammatory lesions are distinct from lesions caused by noninfectious causes of enlarged proventriculi.

Currently, the cause of this condition is not known. Studies have implicated viruses such as reovirus, adenovirus, infectious bronchitis virus and infectious bursa disease virus (IBDV).

A proventricular homogenate (2054) that originated from clinically ill broiler from northern Alabama caused both gross and microscopic lesions typical of TP at 14 days post infection (PI) of one-day-old SPF broilers. Proventriculi of 2054-infected chickens were significantly enlarged and the lesions were con-

sistent with those seen in commercial chickens diagnosed with TP at the Alabama State Diagnostic Laboratory. Infected chickens did not seroconvert to IBDV. Moreover, on the 14th day PI, IBDV RNA was not detected and bursa did not atrophy; their size and weight were the same as controls. Microscopic examination of the bursae showed neither lymphocytic depletion nor inflammatory reaction typical of IBD.

The TP agent was present in the 2054 homogenate and it may not be IBDV, as evidence of IBDV was not apparent when TP was fully reproduced. This agent(s) that caused TP will be isolated, purified and identified, then re-inoculated back into chickens with the main goal of fulfilling Koch's postulates to ascertain etiology of TP.

**Key Words:** Proventriculus, Lesions, Broilers, IBDV, Etiology

## Tuesday, January 25 Nutrition Room: B313

### **S94 Metabolizable energy of feed grade and pet food grade poultry by-product meals.** N. Dale<sup>\*1</sup>, W. Dozier<sup>2</sup>, <sup>1</sup>University of Georgia, <sup>2</sup>USDA-ARS.

The by-products of poultry processing are popular ingredients in both poultry feed and animal protein blends. During the past decade, poultry by-product meal (PBM) has become available in two basic forms, popularly referred to as feed grade and pet food grade poultry by-product meal. The pet food grade variety is assumed to have been produced using higher quality inputs. Previous reports from this laboratory documented the proximate composition, amino acids, and fat stability of these products. The current study was conducted to determine the metabolizable energy of these ingredients.

Eight PBM samples, four feed grade and four pet food grade, were submitted by commercial feed mills located in the Delmarva region and also the southeastern U.S. during the spring of 2004. Samples were evaluated for proximate composition and TMEn. No significant differences were noted in the TMEn of the pet food grade vs. feed grade PBM (3351 and 3249 kcal/kg, respectively, 95% DM). However, the standard deviation for the feed grade samples (333 kcal/kg) was approximately 10X greater than that of the pet food grade (36 kcal/kg). In this set of samples, protein was significantly higher in the pet food grade, while ash was numerically higher in the feed grade samples ( $P < .12$ ).

Previously published prediction equations for the metabolizable energy of PBM tended to underestimate the caloric value of currently produced feed grade and pet food grade PBM. However, the higher values obtained in this study are reasonable based on the energies and digestibilities of respective protein and fat components.

**Key Words:** Poultry by-product meal, feed grade, pet food grade, metabolizable energy

### **S95 Optimizing dietary energy for profit and performance of two strains of White Leghorns.** M. Bryant<sup>\*</sup>, G. Wu, D. Roland, Auburn University.

Egg producers use a wide range of dietary energy levels for commercial leg-horns. This study was designed to compare the effect of four diets with increasing energy levels on two strains (Bovans White and DeKalb White) of commercial layers and to compare their responses. Hens (768) from each strain were housed three per cage in an environmentally controlled cage house. The study was conducted as a randomized block design to control for cage level effects. Each experimental unit consisted of four adjacent cages (12 hens) with 16 replicates per treatment. Hens were fed one of four diets with increasing amounts of added fat (0, 1.68, 3.36 and 5.05 %) to yield 2719, 2798, 2877 and 2959 kcal/kg of energy. Diets were fed for 16 weeks (21-36 weeks of age). Both strains at all energy levels peaked in egg production between 95% - 97%. Bovans Whites had higher average (wk21-36) egg production (85.8% vs 80.2%) and higher average feed consumption (106 g/h/d vs 103 g/h/d) than DeKalb Whites ( $p < .05$ ). The Bovans Whites had lower average egg weights (60.8 g vs

61.6 g) and lower average egg specific gravity (1.089 vs 1.091) than DeKalb Whites ( $p < .05$ ). There were no interactions between strain and diet. Increasing dietary energy levels by adding fat had a linear effect on both egg weights increasing from 60.9, 61.0, 61.5 to 61.4 grams and feed consumption decreasing intake from 108, 105, 103 to 101 g/h/d. Egg specific gravity was also decreased with increasing energy levels from 1.090 to 1.089 ( $p < .05$ ). Dietary energy level had no effect on egg production, body weight and hen mortality. Hens adjusted their feed intake to compensate for the differences in dietary energy resulting in the same 5.8 kcal/g egg for all diets. An economic analysis of the data indicated that the profitability of using fat is dependent on the price of fat, grain, protein and the price spread of eggs due to size.

**Key Words:** Energy, Hens, Fat

### **S96 Growth responses and meat yield of broilers provided three and four feed programs formulated to moderate and high nutrient density during a 56-day production period.** W. Dozier, III<sup>\*1</sup>, R. Gordon<sup>2</sup>, M. Kidd<sup>3</sup>, S. Branton<sup>1</sup>, <sup>1</sup>USDA, ARS, South Central Poultry Research Laboratory, <sup>2</sup>Gold Kist, Inc., <sup>3</sup>Department of Poultry Science, Mississippi State University.

Broiler chickens marketed to heavy weights are typically provided either a three- or four-phase feeding program. High nutrient density diets improve live performance and meat yield, but economical advantages are dependent upon live cost and net return based on meat yield. This study examined live performance and meat yield responses of broilers provided three- or four-phase feeding programs formulated to a high (H) or moderate (M) nutrient density during a 56-d production period (4 treatments and 8 replications/treatment). The periods consisted of 1 to 17, 18 to 35, and 36 to 56 d, or 1 to 17, 18 to 35, 36 to 46, and 47 to 56 d. Sixteen-hundred and sixty-four Ross x Ross 508 chicks (26 males and 26 females per pen; 0.08 m<sup>2</sup>/bird) were randomly distributed to 32 floor pens. Birds were provided H and M up to 35 d and from 36 to 56 d. However, half of the birds in this period (36 to 56 d) received H and M diets from 36 to 46 d and 47 to 56 d. In the three-phase feeding program, amino acid nutrient regimes for the 36 to 56-d period represented average amino acid levels of the four-phase feeding program from the 36 to 46-d and 47 and 56-d periods. Providing a three vs. four-phase feeding program did not influence broiler growth performance or breast fillet yield. From 1 to 35 d, BW gain and feed conversion were better ( $P = 0.001$ ) in birds fed H vs M diets. In the three-phase program, birds receiving H diets had higher cumulative BW ( $P=0.05$ ) and BW gain ( $P=0.05$ ), fillet weight ( $P=0.06$ ), and tender weight ( $P=0.04$ ) over birds fed M diets. Although providing a four-phase feeding program is advantageous based on diet cost, increasing nutrient density with a three-phase program provided benefits with performance and meat recovery. However, benefits of providing a three-phase program based on live performance and breast meat yield in comparison to the four-phase feeding were not realized in this experiment.

**Key Words:** Broiler, Amino acid, Phase-feeding