and still be immunogenic. In this study, our aim is to construct a bivalent recombinant ILTV with S1 gene inserted into the TK gene region of ILTV genome. The bivalent recombinant ILTV will express S1 gene and one of the potential application is a bivalent recombinant DNA vaccine for IBV and ILTV. Firstly, TK gene and S1 gene from ILTV and IBV was isolated with PCR or RT-PCR respectively. TK gene was then inserted into the Hind III/Pst I site of pBK-RSV phagemid, designated the recombinant as pBK-TK. Secondly, S1 gene was then inserted into the SalI/EcoR I site of pBK-TK, resulting recombinant is called pBK-TK-S1 and confirmed with DNA sequencing. After that, linearized pBK-TK-S1 recombinant plasmid was transfected with the Chicken embryo kidney cell (CEK) which had already been infected with a virulent ILTV Beijing E2 strain 6hrs before using a liposome transfection kit. Transfection mixture was then incubated at 37°C in 5% CO2 in a humidified incubator for 5 days. The culture was frozen, thawed 3 times, and was passed it for two more times in CEF and incubated for the development of CPE. Viral DNA was prepared from transfection dishes with CPE was analyzed by PCR for the presence of the S1 gene. Positive samples were plaque purified and tested by PCR and immunofluorescence staining for the presence of the S1 gene. In conclusion, our result indicates a recombinant ILTV with S1 gene of IBV inserted into the ILTV genome has been successfully constructed, and efforts are under way to investigate the immune efficacy of this recombinant ILTV in chicken.

Key Words: ILTV, bivalent recombinant, S1 gene, TK gene, IBV

213 Histopathological changes of liver, lung and kidney in ascites syndrome in broiler chickens. Majid Bouzari1,2, Farihans Safi2, and Ghomaz Ulama2. 1Isfahan University, 2Tehran University, 3Private veterinary practitioner.

Ascites syndrome is one of the obscure problems in broiler chicken production around the world. The most prominent sign of it is accumulation of serum like fluid in the abdominal cavity. This is only a clinical sign not a specific disease and can be induced by many factors. Thus for controlling the syndrome, determining predisposing factors in each region is essential.

Eighty broiler chickens of 3-6 weeks age were examined. Forty eight affected and 32 control birds were selected and livers, lungs and kidneys were examined for histopathological changes. Chi-square test was used for statistical analyses.

In liver significant correlations were observed among thickness of capsule, sinusoidal dilation, interstitial fibrosis, necrosis of hepatocytes, infiltration of inflammatory cells, congestion and ascites syndrome (P<0.05). Biliary duct hyperplasia, vacuolation of hepatocytes and mitosis of paranchima of liver with no significant correlations were observed. Significant correlations were observed between congestion, glumerolar congestion and ascites syndrome only (P<0.05). Bacteriological examination of the flocks was suggested.

Key Words: Broiler, Ascites, Histopathology, Liver, Lung

214 Skeletal disorders in broiler chickens (Ross breed) in Iran. Majid Bouzari1, Sarang Soori2, and Kourosh Moradi3. 1Isfahan University, 2Mashad University, 3Private veterinary practitioner.

Skeletal disorders in broiler chickens are a significant cause of economic loss due to culling and death of affected birds. For determination of five different skeletal, tendon and ligament disorders in the legs of 3-6 weeks old broiler chickens (Ross breed), 400 chickens with different degrees of lameness and deformities were collected from several randomly selected flocks with total population of 50000. They were examined for clinical signs, changes in radiographs of live birds and gross pathological changes. Chi-square test was used for statistical analysis. Valgus was observed in 37% of the cases (36.2% males, 38.7% females). Torsion was observed in 37% of the valgus cases. No cases of angulation was observed. Varus was observed in 19% of the cases (24.6% males, 6.5% females). Angulation and torsion was observed in 100% and 10.5% of the varus cases respectively. Valgus-varus deformity (VVD) was observed in 0.45% of the total population. In 68.2% of the VVD cases significant displacement of gastrocnemius tendon was observed (P< 0.05). In radiological examination thickness of cortex of the medial surface of tibiotarsus bone was observed in 47.5% and 31.8% of the cases of the varus and valgus respectively. Dyschondroplasia was observed in 10% of the cases (11.6% males, 8% females). Tibial torsion was observed in 8% of the cases (7.2% males, 9.7% females). Osteochondrosis was observed in 4% of the cases (12% males, 4% females). In 22% of the cases other skeletal disorders were observed. In 52% of the cases ligament and tendon disorders were observed (44% displacement of gastrocnemius tendon, 5% rupture of lateral ligaments, 4% rupture of cruciate ligament). Significant difference was observed between males (63.4%) and females (36.6%). Cachexia, crippling, unilateral and bilateral joint swelling and fracture of fibula were observed in 14%, 11%, 27%, 27% and 2% of the cases respectively. Different disorders in right, left and both legs together were compared. Significant differences were observed among right (31%), left (10%) and both legs together (59%) (P< 0.05).

Key Words: Broiler, Ascites, Ross breed, Skeletal disorders, Breed

Saturday, PM, PHYSIOLOGY

215 Utilization of a Sperm Quality Analyzer (SQA) to assess semen traits in male turkey breeders. S. L. Neuman*, C. M. Braun, and P. Y. Hester, Department of Animal Sciences, Purdue University, West Lafayette, IN.

Turkey breeder semen was evaluated for quality and quantity through the use of a Sperm Quality Analyzer (SQA). The SQA provides a sperm motility index (SMI) which is influenced by sperm concentration, viability, and motility. A 33-week field study to assess the effects of dietary ascorbic acid (AA) on male turkey breeder reproductive performance showed that supplemental AA, as compared to control-fed birds, did not influence SMI values. Other measures of semen quality/quantity such as concentration, volume, and viability were also unaffected by the dietary AA treatments. However a linear decline was observed in the SMI as birds aged (P< 0.001). Subsequent in vitro experiments were conducted using 33- and 53-week old turkey breeder toms. Sperm was pooled per flock and diluted accordingly. The effect of varying sperm concentration on the SMI was evaluated. Semen dilutions greater than 10-fold resulted in a linear decline in SMI with regression equations that differed significantly (P< 0.0001) between 33 wk-old (y = -7x + 411, r² = 0.90) and 53 wk-old (y = -10x + 431, r² = 0.94) flocks. The SMI values were invariably higher for the younger flock versus the older flock. Additional in vitro analyses evaluated the effects of sperm viability and motility on the SMI under conditions of constant sperm concentration. Semen from 33- and 53-wk old flocks was diluted 25-fold with minimal essential medium (MEM). Incubated, live sperm was mixed in various proportions with thawed, dead sperm to determine changes in viability. Increased proportions of dead sperm caused a significant decline in the SMI in both flocks (P< 0.0001). To assess sperm motility, semen from the two aged flocks was incubated in vitro and MEM under either aerobic (motile) or anaerobic (immotile) conditions. Varied amounts of immotile and motile sperm samples were mixed. A linear increase in the SMI was observed as percent motile sperm increased (P< 0.0001). These results indicate that the SQA can detect differences in sperm concentration, viability, and motility using in vitro analyses.

Key Words: Sperm Quality Analyzer, Sperm motility, Sperm viability, Male turkey breeder

216 Estimation of Age in Wild Birds. R.C. Chaney Jr.*, M. Iqbal, and H. Klandorf, West Virginia University Morgantown, WV USA.

Small population management (most zoo programs) attempts to pair not just the most genetically compatible, but the most completely compatible animals. If this ageing technique could be applied to living birds, it
could play a critical role in Species Survival Plans (SSPs) and the pairing of endangered species. Birds have few reliable indicators of ageing. We are using a biomarker of ageing, pentosidine (Ps), a product of non-enzymatic glycation which accumulates over the lifespan of the animal. The intent of this study was to determine if comparable change in Ps concentrations could be established in wild birds. We obtained skin samples from previously frozen birds of both known and unknown ages. The samples were analyzed for Ps concentrations. The preparation of the skin digest for pentosidine involves the removal of the epidermal and adipose layer from skin samples, homogenization in phosphate-buffered saline (PBS) pH 7.5, and the extraction with chloroform-methanol. Further preparation of the digest involves digestion in 6N HCl, purging with nitrogen gas, heating for 18 hours, evaporating the acid in a centrifuge-type vacuum drier, reconstituting in water and final filtering. Collagen was measured by a hydroxyproline spectrophotometric method and Ps was quantitated using reverse phase HPLC. Separations were achieved by the application of a linear gradient of 12-42% acetonitrile from 0 to 20 min in water and 0.01M HFBA. Final quantitation of pentosidine is made by comparing peak areas with the pentosidine standard curve injected under similar conditions. In agreement with results from mammalian studies, we have established that pentosidine is present in the skin of various species of wild birds and that the concentrations increase linearly with age (P<0.001). The results of this study demonstrate that not only is pentosidine present in the skin of avians, but that it can be used as a reliable determinant of age. Knowledge regarding the longevity of birds could provide insight into not only the dynamics of a specific sample of individuals such as are present in captive populations, but also into the variations in longevity of an entire population.

Key Words: Ageing, Pentosidine, Wild Birds, Small Population Management, Endangered Species

217 Role of Vasoactive Intestinal Peptide and Dopamine in Transcriptional Regulation of Prolactin in Turkey Pituitary Cells. A. Al-Kahtane*1, Y. Chaiseha1, and M. El Halawani2. 1Department of Animal Science, University of Minnesota.

It is well documented that vasoactive intestinal peptide (VIP) is a pro-lactin (PRL) releasing factor and it has shown in our laboratory, that stimulation of dopamine (DA) D2 receptors inhibited PRL secretion and PRL mRNA abundance in cultured turkey pituitary cells. The interactions between VIP and DA in the regulation of PRL gene transcription are not known. In this study, we examined the effects of VIP and DA D2 receptor agonist (R(-)-Propynloromorphine HCL) on PRL gene expression at the translational level in turkey primary pituitary cells. Pituitary cells collected from laying hens were treated with VIP (10^-7M), DA D2 receptor agonist (10^-12 - 10^-6 M), or VIP + DA D2 receptor agonist. Reverse transcription-polymerase chain reaction (RT-PCR) and nuclear run-on transcription assay were used to determine cytoplasmic PRL mRNA levels and nascent mRNA, respectively. The DA D2 receptor agonist inhibited VIP-stimulated PRL mRNA levels and PRL gene transcription, as well as basal PRL transcription, in a dose-related fashion. The DA D2 receptor antagonist (S(-)-eticoxiprole HCl) diminished the inhibitory effect of the DA D2 receptor agonist on VIP-stimulated PRL mRNA levels and PRL gene transcription. These results support the hypothesis that VIP and DA play a major role in the regulation of PRL gene expression in avian species. Moreover, these observations indicate that DAergic system inhibits PRL release and synthesis by antagonizing VIP at the pituitary level via DA D2 receptors. USDA Grant # 97-35203-4960

Key Words: Dopamine, VIP, Transcription, Prolactin, Pituitary

218 Neuroanatomical Relationship between Immunoactive Dopamine and Vasoactive Intestinal Peptide neurons in the Turkey Hypothalamus. K. Al-Zalai1* and M. El Halawani2. 1Department of Animal Science, University of Minnesota.

The regulation of avian prolactin (PRL) secretion by dopamine (DA) is controversial and remains largely unexplored, especially as it relates to the regulation of vasoactive intestinal peptide (VIP), the avian PRL releasing factor. The aim of this study was to investigate the distribution of DAergic and VIPergic neuronal systems in the turkey hypothalamus, and to explore the anatomical basis of proposed interactions between DA and VIP in the regulation of avian PRL secretion. In this study, we used double-labeling immunocytochemical methods to: 1) identify the DAergic neural system i.e. tyrosine hydroxylase (TH) immunoactive neurons which are not immunoreactive to dopamine b-hydroxylase (DBH) and 2) characterize the relationship between hypothalamic TH and VIP immunoreactive neurons. The results revealed the presence of DAergic neurons and fibers within the medial preoptic nucleus (POM), paraventricular nucleus (PVN), ventromedial nucleus (VMN), lateral septum (LS), lateral hypothalamus (LH), infundibular nuclear complex (INF), and median eminence (ME). The TH-immunoreactive cells and fibers were widely distributed and extended from the POM to the INF areas. However, the major cell groups were found in the POM, LH, and PVN. DBH-immunoreactive neurons and fibers were absent in these aforementioned hypothalamic areas, except for the LS, where fibers immunoreactive to both TH and DBH (adrernergic) were found. The distribution of VIP-immunoreactive cells and fibers is similar to that of TH-immunoreactivity, with clear intermingling between the two populations particularly in the hypothalamus. These results provide neuroanatomical evidence of the close association between the VIPergic and the DAergic systems in the turkey hypothalamus. USDA Grant # 97-35203-4906

Key Words: Prolactin, TH, VIP, Dopamine, Immunocytochemistry

219 Regulation of prolactin promoter in turkey primary pituitary cells. S.W. Kang1*, S. You2, E. Wong3, and M.E. El Halawani4. 1Dept of Animal Science, University of Minnesota, 2Dept of Animal Science and Technology, Seoul National University, 3Virginia Polytechnic Institute and State University.

Changes in circulating prolactin (PRL) levels in avian species are related to photoperiod and reproductive status. Photoinduced changes in pituitary PRL mRNA abundance and plasma PRL levels are partly due to changes in both PRL transcription rate and PRL mRNA stability. The regulation of turkey PRL promoter (tPRLP) activity during different reproductive stages remains largely unexplored. The present study examined: 1) the changes of tPRLP activity in primary pituitary cells of laying hens with and without VIP stimulation (1nM), and 2) tPRLP activity in pituitary cells of hens in different prolactinemic states. Transiently transfected primary pituitary cells with the 5’-flanking region of the turkey PRL gene fused to a luciferase reporter gene were used for measuring promoter activity. Luciferase mRNA expression was determined by quantitative RT-PCR. The deletion analysis of tPRLP indicated that the VIP-stimulated tPRLP activity was controlled by three major positive regulatory regions and two negative regions. In primary pituitary cells of hens in different prolactinemic states, tPRLP activities were positively correlated with circulating PRL levels. VIP treatment increased promoter activities in laying and photorefractory hens (intermediate prolactinemia), but not in non-photostimulated hens (hypoprolactinemia). Unexpectedly, tPRLP activity in incubating hens (hyperprolactinemia) was down-regulated by VIP. These results provide additional complementary evidence for a role of VIP in PRL transcription and suggest that changes of tPRLP activity are important in regulating pituitary PRL mRNA abundance and PRL secretion during the turkey reproductive cycle. USDA grant No. 97-35203-4960

Key Words: Prolactin, Promoter, Turkey, VIP, Pituitary

220 IL-1 suppresses progesterone production in vitro by granulosa cells of laying hens. M.A. Aldo1 and M.M. Beck1. 1University of Nebraska-Lincoln.

It is known that high environmental temperature (heat stress, HS) significantly reduces egg production, in part at least through disruption of reproductive hormones, progesterone P4, luteinizing hormone (LH), and estradiol. There are many well-documented systemic effects of HS that may affect these hormones, but very little is known about local mechanisms through which HS acts. IL-1 is increased by stress, including HS, and recently, in mammals, it has been shown that cytokines interleukin 1α and β (IL-1α, IL-1β) play a role in ovarian function. The role(s) of cytokines in the bird remains unclear. The aim of this study was to determine whether IL-1β has a role in ovarian function of laying hens and whether it might be a viable candidate for HS-induced reductions in the granulosa cell production of P4. The largest preovulatory follicles (F1) were collected from laying hens, and the granulosa cells dispersed enzymatically. The granulosa cell preparation was divided into two equal portions and each was incubated in RPMI medium with (IL treatment) or without (Control) 100ng IL-1β per ml for 5h at 39°C, washed, and viability determined. Approximately 100,000-viable cell aliquots from both
IL and Control incubations were further incubated in duplicate in 1.8 ml RPMI; cells from the IL treatment were incubated with 70ng/ml IL-1β and with (IL+LH) or without (IL-LH) 100ng LH for an additional 4h at 39°C. Control cell aliquots were also incubated for the additional 4h with (Control+LH) or without (Control) LH. P4 was measured in the supernatant by RIA. Compared to basal production of P4 (from Control cells), P4 in Control+IL samples was significantly (P=0.0001) lower. LH stimulation increased (P=0.0001) P4 in both Control+LH (by ≥600%) and IL+LH (by ≥500%) samples, but P4 was lower (P=0.057) in samples incubated with IL-1β. We hypothesize that IL-1β does play a role in ovarian function of hens and that HS may induce macrophages to produce it.

Key Words: Interleukin-1, IL-1, heat stress, progesterone, immune system

221 Identification of separate luteinizing hormone-(LH) and folliclestimulating hormone- (FSH) producing cells in the chicken pituitary. N. O. Puebla*, C. R. Parkhurst1, K. E. Clements1, J. A. Proudmann2, F. Vandensande3, and L. R. Berghman1. 1Texas A&M University, College Station, TX. USA, 2ARS-USDA, Beltsville, MD. USA, 3KU Leuven, Belgium.

Specific monoclonal antibodies (mabs) against chicken LH and FSH have identified separate LH- and FSH-producing gonadotrophs in the young and adult chicken. The present study addresses whether in the embryo, these cells also originate as separate cell types or whether they evolve from a common progenitor gonadotroph. Parasagittal paraffin sections of Bonin Holland Subclinate-fixed hens from 9- to 18-day old chicken embryos were used for immunofluorescent double staining experiments. Simultaneous detection of LH and FSH gonadotrophs was achieved using the combination of an anti-cFSH mab and an anti-cLH rabbit antiserum. Briefly, a mixture of both antibodies was applied to the sections and left for overnight incubation at room temperature. The next day the slides were rinsed and biotinylated goat anti-rabbit and goat anti-mouse rhodamine-X conjugate were applied simultaneously and incubated for one hour. Finally, FITC-conjugated streptavidin was added and left for 30 minutes. Sections were coverslipped with a drop of Vectashield and examined by fluorescence microscopy. At all embryonic stages studied, our data indicate the presence of single stained red (FSH-containing) and single staining green (LH-containing) cells with virtually no double staining. At day 9 of embryogenesis, LH cells seem more numerous than FSH cells in the male embryo, whereas in females, both gonadotrophs seem equally prominent. These data are in line with earlier reports of separate LH- and FSH- producing gonadotrophs in neonatal and adult chickens. Further research will be needed to definitively rule out the existence of a common progenitor gonadotroph in the chicken embryo at earlier stages of embryogenesis.

Key Words: FSH, LH, Gonadotrophs, Chicken pituitary, Embryogenesis

222 Influence of prefeeding OASIS™ on digestive enzymes in turkey poult infected with Poult Enteritis and Mortality Syndrome (PEMS). S. L. Jennette1, F. W. Edens1, C. R. Parkhurst1, and T. J. Walsh2. 1North Carolina State University, Raleigh, NC USA, 2Novus International, St. Louis, MO.

Poult Enteritis and Mortality Syndrome (PEMS), a highly contagious and transmissible disease of turkey pouls, causes high rates of morbidity, mortality and stunting of survivors. The gastrointestinal (GI) tract is targeted in PEMS infections resulting in significant pathology, prevention of nutrient digestion, and malabsorption. OASIS™ (Novus, International, St. Louis, MO) has been shown to enhance GI tract development and improve growth and feed conversion of PEMS infected pouls. The current experiment was conducted to determine if OASISTM prefeeding would affect digestive enzyme activity in the GI tract. A 2 x 2 factorial arrangement of treatments was used with pouls assigned randomly to the following treatments: (1) Negative Control, no prefeeding; (2) Positive Control, OASISTM prefeeding; (3) PEMS, no prefeeding; (4) PEMS, OASISTM prefeeding. Nonserviced BUTA pouls were obtained from a commercial breeder and transported 3 h of harvesting an environmentally controlled isolation facility where they were held in poult boxes. The pouls in each quadrant were wing-banded, weighed individually, and returned to their respective quadrant. At this time, OASISTM was added to two quadrants per poult box. After being held for 24 h, pouls were weighed and placed, 10 per pen, into brooding batteries where they were provided with a turkey starter diet on an ad libitum basis. Control (120) pouls were in an isolation room separate from pouls to be PEMS (360) challenged. At 7 d of age, PEMS challenge was accomplished by oral gavage with 0.1 mL of a 10% suspension of Coronavirus virus negative PEMS fecal material. Samples of duodenum, jejunum, and ileum were collected every 2 d during the 21 d study and assayed for alkaline phosphatase, acid phosphatase, lipase, maltase, amylase, and sucrase. Enzyme activity was higher (P < 0.05) in the Control and PEMS pouls fed OASISTM, compared to nonprefed pouls. The improved growth of PEMS-challenged pouls fed OASISTM appears to be associated with providing this nutritional supplement during the holding period.

Key Words: OASISTM, PEMS, Digestive enzymes

223 The relationship of insemination sperm concentration and hen age on the number of holes hydrolyzed in the perivitelline membrane. B. D. Fairchild1, V. L. Christensen2, and L. G. Bagley3. 1North Carolina State University, Raleigh, NC USA, 2Tarheel Turkey Hatchery, Raeford, NC USA.

Previous work demonstrated a significant increase in early embryonic mortality (EEM) in eggs from young turkey breeder hens (32 to 34 WOA) when compared to hens in mid production (44 to 46 WOA). Preliminary data indicated that increased sperm concentration during insemination decreased the incidence of EEM in eggs from young hens. One possible explanation for decreased susceptibility to EEM is higher sperm concentration and speed, which could be altered binding of sperm cells/hydrolyzing of the perivitelline layer by spermatozoa when hens of different ages were inseminated with 25, 50, 100, 200, 400 or 800 million viable sperm cells. The hens were inseminated two times within the first 10 d of production and were inseminated two more times at 12 and 13 wk of age. The holes hydrolyzed in the perivitelline membrane were counted in all eggs produced in the 3 wk following each insemination period. There was no interaction between hen age and sperm insemination dose. The number of holes hydrolyzed were significantly greater in younger hens than older hens, and the 400 and 800 million insemination doses were significantly greater than the other four insemination doses. Since there was no interaction between hen age and insemination dose, the results suggest that factors other than sperm binding have an influence on EEM. In conclusion, increased insemination doses result in increased sperm binding and eggs from younger hens have a greater capacity to bind sperm cells than eggs from older hens.

Key Words: Turkeys, Hen age, Sperm hydrolysis, Vitelline membrane, Early embryonic mortality

224 Effects of melatonin supplementation on the ontogeny of immunity in Large White turkey pouls. C. B. Moore* and T. D. Siopes, North Carolina State University, Raleigh, N.C, U.S.A.

Turkey pouls were randomly selected on the day of hatching and placed in floor pens. All birds were given a daily photoperiod of 16L:8D for 28 days. Two treatment groups (n=50) were established receiving either no melatonin or 50µg/ml melatonin. Melatonin was provided continuously via drinking water. The cellular and humoral immune responses were evaluated for each treatment group starting at 0, 1, 7, 14, and 21 days post-hatch. To evaluate the cellular immune response a cutaneous basophil hypersensitivity reaction to phytohemagglutinin (PHA-P) was measured at each time interval. Data was expressed as a percent change in wing-web thickness 24 hours post-PHA-P injection. To evaluate the humoral immune response, primary antibody titers were determined 7 days post intravenous injection with a Chukar red blood cell (CRBC) suspension. In addition, the bursal, thymic and splenic weights were measured. Within both treatment groups, the cellular and humoral immune responses significantly increased with time. Inoculation at day 0 resulted in pouls with a robust cellular immune response that continued to increase at 7 and 14 days of age and peaked with inoculations at 21 days of age. The humoral immune response was significant following antigenic challenge at 7 days post-hatch. This response continued to improve at 14 and 21 days. Melatonin administration did not affect the developmental time of immunity, but the cellular and humoral immune responses were elevated at 7, 14 and 21 days of age in the presence of melatonin as compared to controls. There was no significant time x treatment interaction in either immune response. Also, no significant difference in immune tissue development was seen between treatments. These data
suggest differing development times for the cellular and humoral immune responses. In addition, the developing cellular and humoral immune responses can be significantly enhanced by melatonin supplementation during the brooding phase.

**Key Words:** Melatonin, Cellular immunity, Humoral immunity, Immune response, Turkey

**225  Cardio-Pulmonary Function in Normal and Heart Taurine Depleted Broilers Exposed to Low Oxygen Levels.** C. A. Ruiz-Feria* and R. F. Wideman, Jr., University of Arkansas, Fayetteville AR.

Previous studies indicated cardiac intracellular Taurine may be released into the plasma as a protective mechanism to counteract hypoxemic stress during the pathogenesis of ascites in broilers. The present study was conducted to evaluate the cardio-pulmonary responses to breathing low oxygen in male broilers reared in stainless steel cages at 16 C, and provided with either tap water (NOR group, n=11) or water containing 3% β-Alanine as an antagonist of cardiac Taurine uptake (ALA group, n=12). Tissue analysis demonstrated cardiac Taurine was depleted in ALA birds. Anesthetized broilers were prepared at 35 to 49 d of age for measurement of pulmonary and mean systemic arterial pressure (PAP and MAP, respectively, mm Hg), and cardiac output (CO, mL/min/Kg BW). Control values (CTL) were recorded for 20 min after surgical preparation was completed, then birds were exposed to air containing 11.8% O2 (LO2) for 2 (first) and 4 (second) min, with room air restored for 15 min after each LO2 exposure (Recovery, REC). Data were analyzed with a Repeated Measures ANOVA and the T test was used to evaluate differences between the two groups within a sampling period (SigmaStat). Within 60 sec of both LO2 exposures, CO and PAP were significantly reduced in ALA birds compared with CTL values, while NOR birds had a reduction only at the end of the first, but not in the second LO2. Within 30 sec of both LO2, MAP was reduced in both groups compared with CTL values, but the decrease was more pronounced in ALA birds. During the CTL and REC periods ALA birds had higher PAP (26.8 VS 21.9) and CO (181.6 VS 141.1) than NOR birds, but similar MAP (101.8 VS 104.1). However, during the LO2 exposure PAP and CO was not different between groups, while MAP was lower in the ALA group (63.3 VS 77). The ALA birds appeared to have higher demand for Oxygen, as evidenced by the higher CO and PAP compared with NOR birds. At the same time, LO2 exposure appeared to have a more severe effect on the cardio-pulmonary function of ALA birds.

**Key Words:** Taurine, β-Alanine, Ascites, Cardio-Pulmonary Function, Low Oxygen Exposure

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**Saturday, PM, PROCESSING AND PRODUCTS**


Tenderness of chicken breast meat largely depends on two major factors, 1. the metabolic status of the muscle at the moment of boning and 2. the progress of proteolytic breakdown of the cytoskeletal proteins at the moment of consumption. A delicate balance between the course of pH and temperature decline, the rise in intracellular Ca2+ concentration and the depletion of energy sources like ATP, will determine whether the muscle will still be able to shorten at boning as well as the course of the enzymatic fragmentation of the cytoskeleton and the sarcomere. This balance will be the result of the condition of the bird at the moment of slaughter in combination with processing factors like stunning, scalding, plucking and chilling. In a factorial experimental design we studied the effect of feed withdrawal, and electrical stimulation following plucking, on the course of the postmortem metabolism of the breast muscles in relation to the tenderness (shear force measurements) at 7 boning moments (0.5, 1.5, 3, 6, 10, 24 and 72 hrs post mortem). Shear force measurements were performed either immediately after boning or after boning and subsequent aging during 72 hrs of aging. Six hours post mortem pH levels, R-values, metabolites and shear force, measured after aging, have (almost) reached their final levels independent of the metabolic status of the animal as affected by feed withdrawal. These results indicate that rigor mortis was reached by this time. Electrical stimulation accelerated post mortem shear decline and adenosine break down expressed as R-value, indicating that the onset of rigor mortis was brought forward. Differences have been found in shear values of boned breast meat measured directly after boning and shear values measured after boning and subsequent aging during 72 hours. These differences are probably due to proteolytic breakdown of the cytoskeleton.

**Key Words:** Rigor mortis, Shear force, Metabolites, Proteolysis, Electrical stimulation

**227  Effect of broiler transport cage height on live shrink.** N. L. Taylor*, D. L. Fletcher, J. K. Northcutt, and M. P. Lacy, University of Georgia, Athens, GA.

Experiments were conducted to determine if transport cage height affects the live shrink and defecation pattern of market-age broilers. In two experiments, broilers were held in litter-floored pens with free access to feed and water. In each experiment, four independent trials were conducted over a two week period (N=648). Nine birds were randomly placed into nine experimental transport cages (bird density 447 cm²/bird). The cages were constructed with open wire fabric (square mesh approximately 2.5 x 2.5 cm) with perforated wooden tops set at the following heights:

short, 15.2 cm; normal, 22.9 cm; and tall, 68.6 cm. The cages with broilers were weighed, placed over pre-weighed manure catch pans and held for eight hours at 26 C. The cages and pans were re-weighed to determine shrink and excreta weight, and the feces examined to enumerate cecal plugs. In the first two preliminary trials, the birds held in the short cages exhibited a significantly greater percentage live shrink. However, observations that the wooden top cage design may have contributed to a temperature difference in the short cages led to redesign of the tops to be made from the same wire fabric as the rest of the cages to allow better ventilation and heat dissipation. In the next six trials, cage height had no significant effect on live shrink (4.2%), collectable excreta (1.8%), or differences in the number of cecal plugs. These results show that transport cage height had no significant effect on live shrink, defecation patterns, or shedding of cecal plugs by broilers.

**Key Words:** Broiler live shrink, Transport cages, Cecal plugs, Live bird holding

**228  The Evaluation of Elbow Distance as a Non-destructive Method for Determining Rigor Mortis Development in Broiler Carcasses.** L. C. Cavitt* and A. R. Sams, Poultry Science Department, Texas A&M University, College Station, TX.

With accelerated processing techniques such as postmortem electrical stimulation becoming a commercial practice, processors are interested in ways to monitor rigor mortis development to determine optimum deboning time in broiler carcasses. Two of the most common methods to follow rigor development are the measurements of muscle pH and sarcomere length; both of which are destructive, time intensive, and cannot easily be adapted at commercial line speeds. Measurements based on the distance between the elbows of broiler carcasses may reflect the contractile state of the breast muscle, which relates to rigor mortis development. Sixty commercial type broilers in each of two trials were slaughtered at seven weeks of age. At 0.25 h, 1.5 h, 3 h, and 6 h postmortem, carcasses were evaluated for the distance between the elbows. At each time point, both breast muscles were harvested from the birds and sampled for pH and sarcomere length analysis. The fillets were then aged on ice overnight and cooked at 24 h postmortem for shear value analysis. The pH and shear value means decreased over time, while sarcomere length means steadily increased with age, suggesting an overall increase in rigor development. elbow distance decreased with rigor development and was significantly correlated with shear value and sarcomere length (P < 0.05) and pH (P < 0.01). These results indicate that elbow distance could be a useful nondestructive tool for automating the measurement of rigor development in commercial processing plants.

**Key Words:** Rigor Mortis, Tenderness, Meat Quality, pH, Sarcomere Length