

taining 0.49 to 0.69% Thr in a randomized complete block design using 10 pens with 10 birds each per treatment. New wood shavings were used as bedding. Lighting program, temperature, and other management practices were typical of commercial broiler chicken producers in the local geographic area. Data were analyzed by ANOVA and $p < 0.05$ (Scheffe) was considered statistically significant. Exponential regression analysis was performed to describe the dose-response relationship between performance criteria and increasing dietary Thr. Exponential regression equations were combined with economic parameters such as feed cost, L-Thr price and revenues per kg live weight in order to determine the dietary Thr level which minimized feed cost per kg weight gain or maximized earnings above feed cost. Increasing Thr levels from 0.49 to 0.69% resulted in improved weight gain, feed conversion, and breast meat yield. Responses followed non-linear trends for weight gain, feed conversion and breast meat yield with r^2 values of 0.96 to 0.98. Feed cost per kg weight gain and earnings above feed cost (gross margin) were calculated based on two scenarios, where costs of basal feed ranged from 130 to 160 US Dollars per ton, and L-Thr costs ranged from 2.50 to 3.50 US Dollars per kg. Revenues of 1.30 US Dollars per kg weight gain were assumed in both cases. Considering economics, optimum dietary Thr to Lys ratios were 65% for minimizing feed cost per kg gain and >69% for maximizing earnings above feed costs. These threonine levels were relatively constant across the various scenarios, i.e. neither feed nor threonine price variations significantly affected minimum feed costs or gross margins.

Key Words: Broiler, Threonine, Economics

S106 Lysine needs of heavy late-developing broilers. A. Corzo^{*1}, M. T. Kidd¹, W. S. Virden¹, W. A. Dozier, III², ¹Mississippi State University, ²USDA.

Data related to Lys needs for late-developing broilers is sparse. Two studies were conducted simultaneously to evaluate Lys needs for growth and carcass traits from 42 to 56 d of age for male and female broilers. In each study, 480 d-old Hubbard Ultra broiler chicks were randomly allocated to 96 pens and fed common feeds from placement up to 42 d of age. Then, a corn-soybean meal basal diet (3,200 kcal/kg; 15.0% CP) with progressive amounts of 0.08% dietary Lys from 0.68% (0.60% digestible) up to 1.10% was fed to broilers (7 treatments; 6 replications/treatment). In both studies, an isocaloric corn-soybean meal diet with 17% CP and 0.96% Lys (0.86% digestible) served as control (12 replications). Dietary Lys supplementation was accomplished by adding L-Lys-HCl to the basal diet at the expense of an inert filler. Regression analysis (95% of the maximum or minimum response) was performed to extrapolate dietary Lys optimization values. In both studies, broilers fed the control diet did not differ ($P > 0.05$) in BW, feed intake, or feed conversion when compared to those fed the dose-response diet at 0.96%, thus validating the

dose-response diet. Female broilers did not respond to dietary Lys for any parameter measured. Gradient addition of Lys improved feed conversion linearly ($P < 0.01$) with male broilers. Fillet weight, tender weight, and their composite had a linear increase ($P < 0.05$) with Lys supplementation in male broilers. Carcass yield, fillet yield, and total breast meat yield displayed quadratic responses, resulting in Lys optimization levels of 0.87, 0.93, and 0.93 %, respectively in male broilers. Based on results from this study, high-yield male broilers should be fed a minimum of 0.93% Lys (0.85% digestible) from 42 to 56 d of age. Lack of response on female broilers indicates that less dietary Lys may be needed for adequate growth.

Key Words: Amino acid, Breast meat yield, Broiler, Lysine

S107 Effect of feeding time on the reproductive performance of Pharaoh quail and Pekin duck. M. Petek^{*}, Department of Zootechnics, Faculty of Veterinary Medicine, University of Uludag, Bursa, Turkey.

Whether feeding early or late during the day can be used as a means to improve the fertility, hatchability, and embryonic mortality in quail and duck is unknown. Therefore, three feeding periods were used to measure the impact of feeding time on reproductive performance of Pharaoh quail (*Coturnix coturnix* Pharaoh) and Pekin Duck (*Anas platyrhynchos*). Male and female quail and duck breeders were housed colony cages and free-range housing systems, respectively. They were fed ad libitum between 0900 to 1300 or 1300 to 1700 or 24 h (control) daily. 738 quail eggs and 272 Pekin duck eggs were used to determine reproductive performance. Eggs were incubated in a commercial setter and hatcher. The setter was operated at $37.5 \pm 0.5^\circ\text{C}$ dry bulb and $29.0 \pm 0.5^\circ\text{C}$ wet bulb temperatures. The hatcher was operated at $37.0 \pm 0.5^\circ\text{C}$ dry bulb and $31.0 \pm 0.5^\circ\text{C}$ wet bulb temperatures. Eggs in the setter were turned 15 times per day. Three days after removing the chicks from the hatcher all unhatched eggs were classified as infertile, early dead, late dead, or dead pipped. Hatchability was calculated as the number of chicks hatched per fertile or total eggs. The fertility results were reported as apparent fertility on clear egg basis. All traits were analysed with Chi-square test using SPSS[®] computer software (version 10.00). Results indicated that feeding between 0900 to 1300 h reduced apparent fertility when compared with the effects of feeding between 1300 to 1700 or control in both species. Hatchability of total eggs was significantly increased in duck and significantly decreased in quail due to limited time of feeding. And also, the different feeding times affected the total embryonic mortality. Further investigations are needed to determine the optimum length of feeding time for each bird species. Meanwhile, the egg production of breeders must be evaluated in comparison with its beneficial or detrimental effects.

Key Words: Feeding time, Hatchability, Quail, Duck

Tuesday, January 25 Environment/Management Room: B314

S108 Impact of woods around poultry farms on microclimate. G. Malone, G. Van Wicklen^{*}, S. Collier, University of Delaware.

Emissions of ammonia, dust, odor and noise from poultry operations are an increasing concern for the poultry industry from both an environmental and neighbor-relations standpoint. On-going research is evaluating the ability of a vegetative environmental barrier (VEB) to capture airborne emissions (ammonia, dust, odor) and surface plus groundwater nutrient losses around poultry houses. The purpose of this research was to assess the microclimate around poultry farms surrounded by trees. Four poultry farms were chosen to compare the microclimate of poultry houses surrounded by woods to those in open areas. Two farms were oriented in a north-south (NS) direction and two in an east-west (EW) direction. One NS farm and one EW farm were surrounded by woods, while the remaining two farms were situated in open areas. The open farms were surrounded by cropland with no trees within 450 ft. A weather station and 5 temperature-relative humidity recorders were deployed on a one-

month rotation with instrumentation first placed on each of the NS farms, then switched to the EW farms the next month. Data were collected for one year, two months on each farm during warm, moderate and cool weather. Open and wooded farms oriented NS had similar temperatures. From noon to 2 p.m., the wooded EW farm had a 2F rise in temperature over the open EW farm. The EW wooded farm had a 4F rise in temperature from 9AM to 4 PM during warm weather, and had 1.5F lower night temperatures during moderate and cool weather. The rise in mid-day, warm weather temperatures on the EW wooded farm reflects apparent heat accumulation on the S and W sides of the farm. Since this farm had a thick density of mature trees surrounding the farm, it is speculated the prevailing summer winds from the SW were restricted by the woods. To potentially avoid this heat buildup, when planting a shelterbelt of trees around a farm, more porosity (less vegetative density) may be needed on the prevailing summer time wind side of farms.

Key Words: Poultry housing, Trees, Vegetative barriers, Microclimate, Emissions

S109 Adverse effects of sub-optimal incubation temperatures on post-hatch performance and further processing yield. N. S. Joseph^{*1}, S. Lourens², E. T. Moran, Jr.¹, ¹*Dept. of Poultry Science, Auburn University*, ²*Dept. of Applied Poultry Research, Animal Sciences Group*.

Different incubation conditions can cause eggshell temperature (EST) to deviate from optimum. It was previously reported that altering from a constant EST of 37.8°C, to cause either low EST at the start of incubation or high EST at the end of incubation, significantly reduced hatchability and chick quality. The impact of these respective EST deviations on live performance to 6 weeks of age and processing yields are presented. A total of 1800 eggs from a single flock were divided and set in two setters. During the first 10 days of incubation, one setter was set to attain an EST of 36.6°C (low) while the other was set to 37.8°C and represented the control temperature. EST was measured daily using an infrared thermometer on sample eggs from each setter to monitor treatment intentions. On day 11, the temperature of the low EST setter was increased to 37.8°C in synchrony with the control setter until transfer. On day 18, half of the eggs from each setter were transferred to a hatcher set to continue the control of 37.8°C EST, while the other half was set in another hatcher to a high EST of 39.5°C. Hatched males were placed in 32 floor pens (25 chicks/pen), reared on common feed to 6 weeks of age then processed. Decreasing EST to 36.6°C from 37.8°C for the first 10 days led to reduced body weight gain at 3 and 6 weeks of age, while feed conversion and mortality were not affected. Hatcher temperature had no effect on live performance or further processing yield. Carcass weight was reduced in birds that had been incubated at low EST in the setter compared to controls. Abdominal fat pad was similar with both setter EST treatments on an absolute basis, but greater for the low EST treatment when expressed as a proportion of the carcass. Fillet weight and relative yield were reduced by incubation at a low EST as was relative yield of tenders. Low setter temperature adversely influenced live weight and processing yields while high hatcher temperature had no effect.

Key Words: Broiler, Incubation, Temperature, Live performance, Processing yield

S110 Measuring turkey semen sperm concentration and motility using the Sperm Quality Analyzer Vt[®]. K. Krueger^{*1}, U. Shalit², ¹*Diamond K Research*, ²*Medical Equipment Systems*.

The Sperm Quality Analyzer[®] (SQA Vt) has been revised by Medical Equipment Systems, Inc., Caesarea, Israel and now employs separate technologies for measuring total sperm concentration (TSC) and motile sperm concentration (MSC) in avian semen. The SQA Vt technology is unique and different from versions previously reported in the literature. Separate electro optical technology is used for TSC and MSC determination, and the unit features on board digital video microscopy and capturing of digital video of sperm motility for further analyses. To verify the SQA Vt estimate of TSC and MSC, semen was collected and pooled from 15 sixty week old turkey breeder males. Pooled semen was thoroughly mixed 50:50 with a commercial turkey semen diluent and divided into two equal volume aliquots before placing in a slush ice bath. One of the aliquots was frozen (liquid nitrogen) and thawed twice to render the sperm cells immotile. Combinations of the two aliquots were then mixed at different volume ratios to produce a series of samples with similar TSC, but varying MSC. At each mixture ratio, TSC was estimated using the SQA Vt prescribed protocol, conventional spectrophotometry, and hemocytometer methods. MSC was measured using the SQA Vt and by capturing digital images of each sample and analyzing a minimum of 500 sperm cells per sample. In different trials, the correlation (r) between the SQA Vt sperm motility measurement and visual scoring ranged from 0.70 to 0.92. Correlation (r) between the SQA Vt for TSC and conventional spectrophotometry or hemocytometer counts ranged from 0.80 to 0.91. Intra and inter device CV were below 5% for both TSC and MSC. Data suggest that the SQA Vt is a more rapid, accurate, and repeatable method of estimating TSC and MSC in turkey semen than conventionally used methodologies.

Key Words: Turkey, Semen analysis, Sperm motility

S111 Use of the Sperm Quality Analyzer Vt[®] as a dosimeter in commercial turkey breeder operations. K. Krueger^{*1}, U. Shalit², ¹*Diamond K Research*, ²*Medical Equipment Systems*.

Although the commercial turkey industry depends solely upon artificial insemination (AI) for economic reproduction, little progress has been made in commercial turkey AI systems in the past 20 years. With the advent of short term storage methodologies developed in the 1980's and the move toward housing males in specialized "stud" facilities, there was a trend toward dosimetry based on total sperm cell concentration (TSC). However, due to the lack of repeatable and reliable methods of estimating sperm cell concentration and quality, many commercial companies have reverted back to preparing AI doses based on volume rather than sperm cell numbers. The Sperm Quality Analyzer Vt[®] has the ability to rapidly and accurately measure both TSC and motile sperm cell concentration (MSC) in avian semen. A Beta field trial with a commercial turkey breeding company was conducted to investigate the use of the SQA Vt as a dosimeter for preparing insemination doses. SOP at the Beta site was to prepare insemination doses such that they contained approximately 45% neat semen. Without changing the company's procedures, the SQA Vt was used to measure TSC and MSC from over 300 pools of extended turkey semen. The range in total and motile sperm per insemination dose ranged from 155 to 388 and 129 to 344 million, respectively. The average total and motile sperm per insemination dose was 254 +/-43 and 215 +/-38 million, respectively. Reducing the motile sperm cell dose target to 200, 175, or 150 million motile sperm per AI would have increased the number of AI doses by 7%, 23%, and 43%, respectively. Using the SQA Vt as a dosimeter in commercial turkey artificial insemination systems should not only improve efficiency, but also help prevent fertility problems related to either variable or low sperm cell concentration and/or viability.

Key Words: Turkey, Semen analysis, Sperm motility, Artificial insemination

S112 Effects of storage time and position followed by two turning frequencies during incubation on hatchability of broiler hatching eggs. O. Elibol¹, J. Brake^{*2}, ¹*University of Ankara*, ²*North Carolina State University*.

Hatching eggs from two old (60 and 62 wk) broiler breeder flocks were stored for 3 or 14 d at 18 C and 75% RH while being held large end up (LEU) or small end up (SEU). These eggs were then turned either 24 or 96 times per day during subsequent incubation in two experiments. Treatment groups had four replicate incubation trays of 150 eggs each. As expected, hatchability of fertile eggs declined with length of storage in both experiments (P<0.001). This was due to increases (P<0.001) in both percentage early and late dead embryos in both experiments. Hatchability of fertile eggs was increased (P<0.01) by SEU storage in both Experiments 1 and 2 with early dead (Exp. 2) and late dead (Exps. 1 and 2) both affected. There were storage time x storage position interactions for hatchability of fertile eggs and percentage late dead in both experiments as hatchability of fertile eggs was less decreased and percentage late dead reduced when the eggs were subjected to extended storage in the SEU position compared to the LEU position. A similar reduction in percentage early dead due to this interaction was observed in Experiment 2. Turning 96 times/day increased hatchability of fertile eggs compared to turning 24 times/day due mainly to a reduction in percentage early dead in Experiment 2 only. A significant interaction of storage time x turning in incubation for hatchability of fertile eggs and percentage early dead in Experiment 1 suggested that eggs with extended storage (14 d) benefited more from turning 96 times/day than turning 24 times/day during subsequent incubation.

Key Words: Turning, Egg storage, Egg position, Hatchability, Broiler hatching eggs

S113 Effect of in ovo feeding solution osmolality on hatching turkeys. P. Ferket^{*1}, J. de Oliveira¹, A. Ghane², Z. Uni³, ¹*North Carolina State University*, ²*University of Guelph*, ³*Hebrew University of Jerusalem*.

In ovo feeding (IOF) is a technology in which late term embryos consume external nutrients as they imbibe the amnion fluid prior to pipping. IOF can improve the yield and weights of poults at hatch, as well as enhance enteric development and early growth. These positive responses not only depend on

the nutrient composition of the IOF solution, but may also depend on the volume and osmolality (Osm) constraints of the IOF solution administered into the amnion. The objective of this study was to determine the optimum Osm of IOF solutions administered to turkey embryos at 23 d of incubation (23E) on %Hatch and hatch weights (HW). At 20 d of incubation, viable turkey eggs were assigned according to equal weight distribution to IOF treatment groups of ca. 40 eggs. In exp 1, a basal IOF solution containing .1% NaCl + 24% dextrin (200 mOsm) was mixed with a summit IOF solution containing 2% NaCl + 10% maltose + 24% dextrin (1476 mOsm) to produce 4 other IOF solutions of 451, 667, 923, and 1218 mOsm. In experiment 2, isocaloric IOF solutions of 253, 542, 863, 1176, and 1455 mOsm were prepared using .4% NaCl solution containing various levels of dextrin and glucose. In both experiments, 1 ml IOF solution was injected into the amnion of 23E embryos and the eggs returned to standard incubation conditions along with non-injected control eggs until hatch was pulled at 28E. In exp 1, non-injected control embryos had 77% hatch, whereas % hatch increased to a maximum of 88% ($p < .05$) by IOF solutions < 451 mOsm, then decreased as IOF Osm increased further. Embryo mortality increased from 5.7% at IOF 667 mOsm to 11.4% at 1476 mOsm. In comparison to the 65.2 g non-injected controls, IOF increased HW increased quadratically to a max. of 67.3 g at ca. 700 mOsm, but decreased as Osm increased further. In exp 2, the non-injected controls had 70.7% hatch, but % hatch increased quadratically to a max. of 91.7% ($p < .04$) at IOF of ca. 650 mOs. In comparison to the 62.8 g non-injected controls, IOF increased HW to a max. of 67.5 g at IOF of 550 mOsm. Based on max. % Hatch and HW, the optimum Osm for 1 ml IOF for turkey embryos is between 400 and 650 mOsm.

Key Words: Turkeys, In ovo feeding, Hatchability, Hatch weight, Osmolality

S114 Field assessment of walking ability in commercial broilers. T. S. Cummings^{*1}, P. A. Stayer², A. B. Webster³, ¹Mississippi State University, ²Sanderson Farms, ³University of Georgia.

The National Chicken Council's Audit Guideline does not specify a percentage of birds in a given flock which should not have impaired walking ability, but there are other audits schemes which do. Gait scoring systems have been developed which assess the walking ability of broilers, but these systems tend to be too detailed for use in the field. Thus, the purpose of this pilot project was to utilize a modified, practical method for standardizing broiler walking ability in a commercial setting. We compared lameness levels in two different ages of broilers: 50 vs 60 days. A single house on each farm was entered, and 20-30 birds were trapped using collapsible pens in four separate areas of the house for a total of 100 birds. The four areas of the house were at the fan end and cool cell end along the walls and in the center. The birds were released from the pens by opening one end of the collapsible pen and allowing the birds to walk out on their own. If the birds were reluctant to walk, they were encouraged to do so by gently moving towards them or gently pushing them by hand or foot. A score was assigned to each bird as they walked based upon the following criteria: normal (0) – no obvious lameness detected; impaired (1) – birds with any obvious impairment but able to walk at least several steps; downer (2) – severe impairment of walking ability and often can not walk. This data along with other flock indices such as mortality and culls from 64 flocks was collected.

The overall percentage of birds with impaired gaits was not high. Results indicated that the average percentage of birds with gait abnormalities was slightly higher (3%) in the older flocks, but this correlates with field expectations. Surprisingly, the wall versus the center sampling demonstrated little difference in rate of gait score abnormality, hence it may not be necessary to utilize all areas as outlined. Interestingly, there may be a difference found in gait score between the fan end and inlet end of the house in the older flocks, but this difference was not tested statistically. This project describes a simple gait scoring method which can readily be taught for use in the field.

Key Words: Gait scoring, Broilers, Animal welfare, Lameness

S115 Plasma corticosterone levels in commercial broilers. J. Thaxton^{*1}, P. Stayer², M. Ewing², J. Rice², ¹Mississippi State University, ²Sanderson Farms, Inc.

Today much concern is being expressed about stocking density as it relates to the well being and welfare of broilers. One of these concerns is whether stock-

ing densities used in commercial broilers operations causes stress and adversely affects welfare of birds. The primary indicator of the stress condition in broilers is elevated plasma corticosterone (CS) levels. Therefore, the purpose of this study was to evaluate plasma CS levels in broilers reared under commercial conditions by contract growers. Eight contract growers were involved in this study. Broilers were reared in three different housing types and these were solid wall houses (2), dark curtain side walls (5) and clear curtain side walls (1). Tunnel-type fan ventilation systems were used in all houses. The lighting schedule was and light intensity program was 24L:0D at 3 lux during d0-7, 19L:5D at 2 lux during d8-14, 20L:4D at 0.5 lux during d15-22, and 22L:2D at 0.5 lux from d 22 until processing. Stocking density was either 0.074 or 0.084m² and birds were processed at 47 to 61 days of age. Birds were fed starter, grower, finisher and withdrawal diets that insured optimal performance. Servicemen collected blood samples (by cardiac stab within 45 sec) into heparinized test tubes from 12 chickens from each house at designated times from 17-18d, 35-39d, 43-47d, 49-53d, and 59-61d of age. Plasma CS was determined by an ELISA method. The highest single CS value recorded was 1.07ng/mL and the lowest individual CS value was 0.34ng/mL. The mean CS level for all 192 birds was 0.60 ng/mL \pm SEM of 0.01. Results indicate that the production system employed by contract growers in this study did not cause physiological stress in broilers.

Key Words: Stress, Broilers, Corticosterone

S116 Lighting program (duration) and nutrient density effects in broilers destined for fast food markets. J.B. Hess^{*1}, S.F. Bilgili¹, E.R. Miller², ¹Auburn University, ²Aviagen NA.

Lighting Programs (light duration) are commonly used to reduce broiler mortality by modulating growth. The degree of live and yield performance influence due to lighting programs depends on a number of factors. This trial compared live performance and processing yields in Ross 308 broilers raised to a body weight of 4.3 lb. (32 days). Lighting treatment included 23 hrs throughout (Long) vs an 18:6 L:D program from 4-29 days (Short). Light intensity was stepped down from 2.5 to 1.0 foot candles over the growout. Eight light controlled chambers were placed on each lighting program with 2 feeding programs offered in each chamber. Feeding programs represented Aviagen standards vs an industry average program in terms of nutrient density. Starter (1 lb), grower (14-28 days) and finisher (28-32 days) feeds were fed. Twenty birds per trt group (10 males and 10 females) were processed at 32 days of age. At 14 days, birds on the Long program and Aviagen feeding program showed higher BW. Little difference existed at 32 days, although females were heavier on the Aviagen program (4.05 vs 3.96 lb). Higher nutrient density (Aviagen) showed better FCR at 14 days (1.106 vs 1.137), with no further significant effects due to lighting or feed program. Increased feed density improved lean carcass and front half wt, but yield differences were not significant. Fat pad wt and yield were reduced with the Aviagen feeding program (1.6 vs 1.8% abdominal fat) while long day lengths reduced fat pad wt only. Significant reductions in meat yield due to short day length were noted for fillet (16.0 vs 16.5%), tender (3.66 vs 3.73%) and total white meat (19.7 vs 20.2%). Increased nutrient density improved fillet (16.6 vs 16.0%), tender (3.8 vs 3.6%) and total white meat yields (20.3 vs 19.6%) ($p < .05$). Long day length improved tender weight to a higher degree when higher density feeds were fed. White meat yields were reduced in small broilers by the lighting regime used with little change in final body weight. Nutrient density measurably improved meat yields with few interactions with the lighting programs.

Key Words: Broiler, Light Duration, Lighting Program, Nutrient Density, Meat Yield

S117 Comparison of methods to evaluate bone mineralization. F. Yan, C. A. Keen, K. Y. Zhang, P. W. Waldroup^{*}, University of Arkansas.

Extraction of lipid from tibiae of broilers in the AOAC (1990) recommended procedure is often a rate-limiting step in evaluation of bone mineralization. In addition, environmental concerns may limit the use of solvents to extract lipids. A study was conducted to compare various alternative methods of evaluating bone mineralization in young (0-21 d) broiler chicks. Male chicks of a commercial broiler strain were fed diets ranging from deficit to surfeit in supple-

mental phosphorus. At 21 d all surviving birds were killed. From each bird, the toes were removed from the right leg and the foot (from the tibiotarsal junction) was removed from the left leg. After drying, these were ashed with no lipid extraction. Tibiae from the right leg were taken and subjected to lipid extraction prior to ashing; tibiae from the left leg were ashed without lipid extraction. Estimates of phosphorus requirements by nonlinear regression using each of the measurements resulted in similar values. A high correlation existed between each of the alternative measures and values from extracted tibiae, with unextracted tibia ash appearing to have the highest relationship ($R^2 = 0.95$) followed by foot ash ($R^2 = 0.92$) and toe ash ($R^2 = 0.88$). Considerations for using any of these alternative methods are the greater amount of organic matter that is burned off in ashing which might create problems with alarm systems in laboratories, possible differences in lipid metabolism due to nutrition, disease, or other factors, and effect of age of the chick.

Key Words: Tibia ash, Foot ash, Phosphorus, Broilers, Toe ash

S118 Alternate AM/PM feeding to induce zero egg production during the molt. P. Ruzsler*, C. Novak, *Virginia Polytechnic Institute and State University.*

Daily feeding at alternate times (am/pm) every day during the period of induced molting was studied on 4 strains of leghorns. This approach was used to determine if zero egg production was possible when molting with no days of feed withdrawal. In a 12 week study, 171 hens housed 3 per cage at 464 square centimeters per hen were fed either a 9.7% CP & 1100 Kcal/kg diet (LO), a 9.7% CP & 1430 Kcal/kg diet (HI) or a 14% CP & 2750 Kcal/kg commercial molt diet (COM) using a day-length of 10 hours. The amount of feed consumed in 4 hours was fed at 8 a.m. on day one and at 5 p.m. on day two followed at 8 a.m. on day three, etc. for 28 days. They were then fed ad libitum a 17% CP & 2795 Kcal/kg layer diet and exposed to increasing day-lengths until 16 hours was reached at 10 weeks. Significant strain differences as described in the Breeder Management Guides were observed for body weight, feed intake and egg production. The LO treatment had lost 34.4% body weight by 28 days followed by COM treatment with 31.9% and HI with 29.5%. Feed intake ranged from 35 to 45g/bird/day up to 28 days rising to a compensatory high of 160g following ad libitum feeding during the 5th week, then dropping to 115-125g for the remaining weeks. Egg production before the molt was between 75 and 80%. The LO treatment reached zero production in the third week followed by the HI and COM treatments during the fourth week. All treatments started production during the sixth week reaching a peak level of 87 to 90% by the 10th week. The W-36 strain delayed increasing their egg production approximately 7-10 days after the initial start-up resulting in 6 fewer eggs per hen housed when compared to the other strains. They may have overcome this difference in a full length trial. Egg weight ranged between 60 and 64 grams per egg. The 4 strains used (Bovans, Lohmann, Hyline W-36 and W-98) did achieve zero production and returned to optimum production levels under the alternate feeding time procedure.

Key Words: Molting, Alternate feeding times, Egg production

S119 The use of Bio-MOS (Mannan-oligosaccharides) in coccidia control strategies in broilers. R. Cortes¹, J. Garcia^{*2}, ¹UNAM, ²Alltech Inc.

The loss of activity of some anticoccidial drugs and the need for alternative control programs for broilers has led to investigation of new nutritional strategies. In countries such as Mexico, where skin pigmentation has a market value, coccidian infection has an especially large negative impact. Mannan oligosaccharide supplementation has been associated with improved skin/carcass condition in field studies, which may be associated with coccidial infection. Day old chicks (1000) were randomly assigned to 1 of 4 supplement programs with or without coccidial challenge. Treatments consisted of 1) Standard program: Nicarbazine, an anticoccidial drug (CD) (120 g/ton) in starter diets and Salinomycin (66 g/ton) in the finisher diet. Bacitracin, an antibiotic growth promoter (AGP) (55 g/ton). 2) Mannan oligosaccharide (Bio-Mos, Alltech Inc.) 1 kg/ton days 1-49, no AGP, CD supplementation days 15-44. 3) Bio-Mos days 1-21 and CD days 22-49. 4) Standard program without coccidia challenge. Treatments 1, 2, and 3 were challenged on day 24 with 25 000 oocysts (*E. acervulina*) in the feed. There were 5 replicates of 50 chicks per

treatment. All groups were fed xanthophylls from day 35-49. All birds were subjected to feed restriction, 12 h per day from day 22 to day 42. There were no differences in body weight at day 21. Body weight at day 49 was highest ($P < 0.05$) in birds given Bio-Mos during the whole period with CD days 15-44. Feed conversion ratio (FCR) was numerically improved at day 21 in birds given Bio-Mos, and at day 49 FCR was better in the non-infected group and birds receiving Bio-Mos the whole period without AGP. At day 6 of post infection there were no lesions due to *E. acervulina* and oocysts counts were negative for this species. Counts of other species of *Eimeria* were normal. There were no clinical problems during the study; and no differences in mortality due to treatment. Skin pigmentation was unaffected. Mannan oligosaccharides can be a useful part of a nutritional strategy against coccidia, reducing the impact on performance of coccidial challenge.

Key Words: Coccidia, MOS, Pigmentation, Broiler

S120 Dietary strategy to suppress ochratoxicosis in poultry. G. Schatzmayr^{*1}, S. Nitsch¹, D. Schatzmayr^{*1}, E. Binder², I. Politis³, ¹*Biomim GmbH*, ²*Erber AG*, ³*Agricultural University of Athens.*

Ochratoxin A (OTA) is a mycotoxin impairing health and performance of poultry. Preventive measures to avoid the formation of OTA were not successful in the past and therefore new strategies to counteract mycotoxins in feed are needed. A very promising method is the use of microorganisms that biotransform mycotoxins to non- or less toxic metabolites.

In this study several environments were screened for microorganisms capable of degrading ochratoxin A. More than 20 new strains with the capability to detoxify OTA could be isolated and characterized. These strains were classified based on OTA- degradation velocity, influence of different culture media on OTA cleavage, function in environments with low pH- values and redox potentials and antibiotic resistance pattern. Based on the obtained results *Trichosporon mycotoxinivorans* (MTV) was chosen to be used in a feed additive and tested in feeding trials.

Two hundred day-old broiler chicks were assigned randomly to one of 4 experimental treatments (a=control, b=OTA, c=OTA and MTV and d=MTV). Performance parameters were recorded over a period of 42 days and blood samples were collected for the isolation of macrophages and heterophils.

After 42 days animals just receiving OTA (b) had a tentatively lower live weight in comparison to control (a) and trial groups (c, d) (a=1882g, b=1802g, c=1879g and d=1885g). There was a significant decrease in the viability of macrophages and heterophils isolated from chicks receiving OTA-contaminated feed compared to cells from the control birds. The dietary inclusion of MTV blocked the negative effect on cell viability. Furthermore the significant decrease in total cell-associated and membrane bound urokinase-plasminogen activator in macrophages and heterophils caused by OTA could be abolished by MTV. Compared to all the other groups, heterophils isolated from chicks receiving OTA-contaminated diet produced lower amounts of superoxide anion compared to all other diet groups. This study clearly demonstrated that *Trichosporon mycotoxinivorans* (Biomim®MTV) is able to neutralize toxic effects of ochratoxin A in broiler chicken.

Key Words: Ochratoxin A, Detoxification, *T. mycotoxinivorans*, Immune suppression, Ochratoxicosis

S121 Biotransformation- A way to deactivate non-adsorbable mycotoxins in broilers. V. Starkl^{*}, *Biomim Austria.*

Mycotoxins are known to pose a great risk to animals. In general they are very different in their chemical structure and therefore it is impossible to deactivate all of them via adsorption. However, some of them, like Aflatoxin, can be adsorbed but others e.g. Trichothecenes need to be deactivated using a different strategy. Specific enzymatic degradation is a sophisticated approach that already proved its efficacy in various university and field trials. In the following trial different strategies to counteract the adverse effects of T-2 toxin were compared. A total of 180 male broiler of Ross 308 were used for the trial. The experimental diets were fed for 28 days. Each dietary treatment was replicated 5 times with 6 broilers per replicate. Besides a negative control (Group 1) and

a positive control (Group 2), a product based on biotransformation (Group 3), a product based on adsorption by mannano-oligosaccharides (Group 4), one aluminosilicate (Group 5) and an organoclay (Group 6) were tested. For groups 2-6 a contamination of 2 ppm T-2 toxin was chosen. Feed intake, weight gain and feed conversion were evaluated weekly to test both the negative impact of T-2 toxin as well as the possible positive impact of the 4 tested feed additives. Additionally the serum activity of two enzymes, aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) was determined. At the end of the experiment the animals were sacrificed and examined for gross lesions. Fur-

thermore, the relative organ weight of liver, heart, spleen, proventriculus, gizzard and bursa Fabricius was recorded. Statistical analysis of the obtained data clearly showed that the effects of T-2 toxin in broilers were overcome by the product based on specific enzymatic degradation of mycotoxins. Furthermore Groups 4-6 showed significantly higher gizzard weights compared to control. No significant differences were found for the serum activity of LDH, however, serum AST activity was significantly lower in Group 6.

Key Words: Biotransformation, T-2 toxin, Performance, Mannano-oligosaccharide, Aluminosilicate

Tuesday, January 25 Nutrition Room: B315

S122 Testing the optimum blend of fine:large particle size limestone and dietary calcium levels for the Hy-Line W-36 and W-98 strains of White Leghorn hens. S. Scheideler*, M. Jalal, T. Weber, *University of Nebraska.*

A trial with a 2 x 2 x 3 factorial arrangement of 2 strains (Hy-Line W-36 and W-98) laying hens, 2 levels dietary Ca [average (3.65 – 3.85 g/hen/day) versus high (4.10 – 4.55 g/hen/day) and 3 limestone particle size feeding programs was conducted to ascertain the optimum particle size combination of fine:large limestone in laying hens from 18 to 70 weeks of age. The 3 limestone particle size feeding programs were: 1. 50:50 blend of fine:large particle limestone throughout the trial (18-70 wks); 2. 75:25 blend from 18-20 wks, 65:35 from 21-40 wks, 50:50 from 41-50 wks, 40:60 from 51-60 wks and 30:70 fine:large particle size from 61-70 wks, 3. 100% fine from 18-40 wks and 50:50 fine:large from 41-70 wks of age. The W-98 strain consumed more feed, weighed more and produced larger eggs with more albumen and less yolk and shell than the W-36 strain. Higher dietary Ca benefited the W-98 strain, increasing feed intake, hen weight, egg production and egg weight at different time periods of the trial. Higher Ca also improved overall egg specific gravity and % grade A eggs during the trial. Limestone particle size had no significant effects on feed intake, egg production or egg weight during this trial. Percent wet and dry shell and egg specific gravity were less for hens on Program 3 (100% fine) during the peak lay period (21-40 wks of age). After hens on this program switched to the 50:50 blend, the eggshell quality measurements recovered to normal. There were no significant differences between limestone particle size Program 1 or 2 during this trial. Thus, a 50:50 blend of fine:large particles size limestone will meet the laying hens needs for optimum egg production and shell quality. The higher level of dietary Ca was beneficial for the W-98 strain. The W-36 strain was more efficient at utilizing the lower levels of dietary Ca. For maximum yolk yield and egg shell quality, the W-36 strain was the preferred strain in this trial.

Key Words: Calcium, Limestone, Particle Size, Layer Strain, Egg Quality

S123 Effect of an E. coli-derived phytase (Quantum) on performance in broilers fed with or without a coccidiostat or cocci-vaccine in a low nutrient diet. C. Wyatt*, T. Parr, M. Araba, M. Bedford, *Zymetrics, Inc.*

Using a step-wise regression model to analyze our broiler dataset it was found that the use of a coccidiostat impacted the response to feeding a thermo-tolerant phytase (Quantum TM; Q). A 50-day used litter floor pen study was conducted with 64 pens of 17 male broilers to evaluate the response to Q phytase supplemented into a diet with or without a coccidiostat. The commercial positive control (PC) four-phase corn/soya/meat-bone meal diets were formulated with the negative control (NC) diets containing .05% less Ca, .13% less AvP, 45 kcal/kg less ME and .03% less TLYS for each phase. NC diets were fed with no drug and cocci-vaccine (NC), with salinomycin (S) but no cocci-vaccine (NC-S), or with cocci-vaccine (broilers were vaccinated using a spray cabinet

at day 0) but no drug (NC-CV). All NC diets were fed without or with 500 U/kg Q phytase except for NC-CV, which had a 1000 U/kg level resulting in 8 total diets. Day 21 cocci lesion scores were taken from 3 birds/pen within the intestinal tract for *E. acervulina* (Ea), *E. maxima* (Em) and *E. tenella* (Et). Birds fed S had significantly lower incidences of gross lesions for Ea and Em compared to no drug or CV birds. No differences in treatments were observed for gross lesions for Et and all micro lesions. Phytase had no impact on cocci lesion scores. Day 40, broilers fed Q phytase had significantly heavier BW (~10.5%) and higher FI compared to NC diets and the PC group. There were no significant differences in BW and FI between NC groups without Q phytase, but BW was lighter than the PC group. NC-S fed birds with Q phytase had significantly better FCR than any other treatment. Day 50, Q phytase fed birds had significantly heavier BW than the NC and PC groups, which was directly related to the increase in FI. NC-S diets with Q phytase had significantly better (~3.8%) FCR than the PC group. The findings suggest exposure to cocci will impact performance, although the response to Q phytase supplementation was not related and no interaction.

Key Words: Broiler, E.Coli-derived phytase, Performance, Nutrient reduction, Cocci challenge

S124 The effect of phytase in broiler diets on secretions in the gastrointestinal tract and TME. V. Pirgozliev*¹, T. Acamovic¹, M. R. Bedford², ¹*Scottish Agric. College, Zymetrics.*

A precision feeding study was conducted to compare the effects of three dietary levels of phytase on the endogenous secretions of the gastrointestinal tract (GIT), and TME of diets when fed to broilers. Fifty male Ross broilers were used and five dietary treatments (soya/maize (SM) diet, SM+ 250, +500, +2500 IU/kg phytase and a glucose only diet). Each treatment had 10 replicates in a randomised block design. The GIT secretions, measured as sialic acid, decreased when the amount of dietary phytase increased (P<0.05). The TME for diets with 500 and 2500 IU phytase/kg tended to be higher compared to the two diets with no phytase and phytase at 250 IU/kg despite using a constant correction for endogenous secretions from starved birds. The results obtained in this study are in accord with previous research involving myoinosol phosphate-enriched ingredients (Cowieson et al, 2004) which also demonstrated that phytase supplementation decreased the losses from the GIT in birds. An increase in the production of endogenous material in the GIT, which is then excreted, involves losses of amino acids and energy from the animal which is nutritionally expensive. It can be concluded that decreases in secretions from the GIT in the presence of phytase, is a mechanism involved in the mode of action of dietary phytases and which accounts for improvements seen in the performance of birds.

Key Words: Phytase, Endogenous losses, Broilers, TME