

87 A retrovirus insertion causes abnormal expression of the tyrosinase gene in recessive white chickens. C. M. Chang^{*1}, J. L. Coville¹, J. P. Furet², A. Oulmouden⁴, G. Coquerelle¹, D. Gourichon³, and M. Tixier-Boichard¹, ¹National Institute for Agronomic Research, UMR INRA/INA P-G, Jouy-en-Josas, France, ²National Institute for Agronomic Research, UEPSD, INRA, Jouy-en-Josas, France, ³National Institute for Agronomic Research, INRA, Nouzilly, France, ⁴INRA/University of Limoges, Limoges, France.

The purpose of this study was to identify the causal mutation in the tyrosinase (*TYR*) gene, which could explain the recessive white phenotype in chickens. A restriction fragment length polymorphism (RFLP) was first observed with 3 different enzymes in all chickens carrying the recessive white mutation at C locus, by using a total chicken *TYR* cDNA probe. Several partial probes were then used to confirm and localize the rearrangement region within intron 4. After amplifying intron 4 by long PCR, a major size difference was observed

between the mutant (14kb) and the normal genotype (around 7kb). The amplified fragment was digested by HindIII, then the intronic fragments obtained for the mutant and for the normal were cloned and sequenced. A complete retrovirus insertion was found in intron 4 of *TYR* gene of recessive white chickens. RT-PCR and quantitative RT-PCR tests were performed in order to compare and measure the gene expression level in both recessive white and wild type genotypes. The RT-PCR study showed that the *TYR* gene was transcribed in skin samples for both recessive white and the wild-type chickens, but with an apparently lower intensity in the recessive white genotype than in the wild type. The quantitative RT-PCR study showed that the expression level of *TYR* gene is at least 1000 times decreased in recessive white chickens. It is strongly suggested that the retrovirus insertion affects the splicing procedure and induces the abnormal expression of *TYR* gene in the recessive white chickens.

Key Words: Tyrosinase gene, Retrovirus, Recessive white

Nutrition: Amino Acids

88 Digestible sulfur amino acid requirement variation in broilers due to sex, rearing environment, and performance parameters. B. Lumpkins^{*} and A. Batal, University of Georgia, Athens.

Two experiments were conducted to evaluate variations in the estimated digestible sulfur amino acid requirement (DSAAR) for body weight gain (BWG) and gain to feed ratio (GF) due to sex and rearing environment from 7 to 21 d of age. Chicks were sexed immediately after hatch, and placed in either starter batteries or floor pens. A standard corn-soybean meal diet with 23% CP and 3,200 Kcal ME/kg was fed from 0 to 7d of age, after which the chicks were sorted and allocated to the experimental diets. The experimental diets were formulated to be isocaloric and isonitrogenous, and varied only in the level of digestible sulfur amino acid. The digestible sulfur amino acid levels were 0.54, 0.64, 0.74, 0.84, and 0.94% for Experiment 1, and 0.61, 0.71, 0.81, 0.91, and 1.01% for Experiment 2. The true sulfur amino acid digestibility was determined using the total fecal collection precision-fed rooster assay with adult cecectomized roosters. The DSAAR was estimated using one slope broken-line methodology. In Experiment 1, when chicks were reared in starter batteries, the estimated DSAAR based on BWG was higher for females (0.81%) than males (0.76%). However, the estimated DSAAR was higher for males (0.78%) than females (0.68%) based on GF. There was only a slight difference in the estimate DSAAR for males based on either BWG or GF. In females, the estimated DSAAR was higher based on BWG than GF. In Experiment 2, for chicks reared in starter batteries, the estimated DSAAR for males (0.73%, 0.75%) and females (0.73%, 0.74%) was very similar based on both BWG and GF, respectively. However, when the chicks were reared on the floor, the estimated DSAAR was higher for females (0.76%, 0.87%) than males (0.73%, 0.81%) based on BWG and GF, respectively. The estimated DSAAR, based on GF, was higher for chicks reared on the floor compared to chicks reared in the batteries. The inconsistent results suggest no real difference in the estimated DSAAR due to sex. The estimated DSAAR for maximal efficiency may be higher for both males and females when chicks are reared on the floor.

Key Words: Sulfur amino acids, Sex, Rearing environment

89 Standardized ileal amino acid digestibility of crystalline amino acids is close to 100% regardless of the standardization method. D. Hoehler^{*1}, A. Lemme¹, C. O. Brito², and H. S. Rostagno², ¹Degussa Corporation, Kennesaw, Georgia, ²University of Vicosa, Vicosa, Minas Gerais, Brazil.

The use of methionine, lysine, threonine, and tryptophan supplements is common practice in animal nutrition. In the future, potentially some more amino acids might be commercially available for feed production. Amino acids from supplemental amino acid sources were often found to be 100% digestible based on the determination by total tract or excreta amino acid digestibility. This approach has some methodological drawbacks which can be overcome by determination of ileal amino acid digestibility. In the present experiment, 84 male ROSS 308 birds were distributed to 2 treatments with 6 replicates of 7 birds

each at 17 d of age. Birds were housed in metabolism crates. Experimental diets and water were offered for ad libitum consumption from day 17 to 22. Two experimental diets were formulated: a protein-free diet consisting mainly of starch but containing also oil, fiber, mineral and vitamin sources; and a test diet in which 9.1% of the starch of the protein-free diet (PFD) was replaced by a mixture of crystalline amino acids. At d 22 birds were slaughtered by cervical dislocation and ileal digesta from the terminal ileum was collected for digestibility determination. Ileal digestibility figures were corrected for basal endogenous amino acid losses determined firstly by feeding the PFD and secondly by using figures obtained by feeding enzymatically hydrolyzed casein (EHC, based on literature data). Basal amino acid losses at the terminal ileum were between 80 (Met, Trp) and 500 (Thr) mg/kg dry matter intake for individual amino acids. Standardized ileal amino acid digestibilities of crystalline amino acids were: Lys 100.3%, Met 99.6%, Met+Cys 98.7%, Thr 97.0%, Trp 101.6%, Arg 100.5%, Ile 99.9%, Leu 100.3%, and Val 99.9% when corrected for basal endogenous losses based on feeding the PFD diet. The digestibility figures are very close to 100% regardless of the way of standardization methodology (PFD or EHC), suggesting a complete absorption of crystalline amino acids until the terminal ileum in growing broiler chickens.

Key Words: Amino acids, Ileal digestibility, Broiler

90 Effects of age on amino acid digestibility in turkeys. O. Aimiwu^{*} and M. Lilburn, The Ohio State University/OARDC, Wooster.

In turkeys, there is not much documented research on the relationship between age and amino acid digestibility. Since the protein and amino acid requirements for poulters are the highest of all commercial poultry species, it is important to ascertain the digestibility coefficients of common feedstuffs at different ages so as to formulate diets as accurately and as economically feasible as possible. Three ileal amino acid digestibility trials were conducted to study the effects of age on the ability of poulters to digest protein from common protein sources. Poulters were fed semi-purified diets containing meat and bone meal (MBM), soybean meal (SBM), fishmeal and a commercial 60% CP blend (blend) as the sole sources of protein. Two complete diets formulated to commercial specifications were also tested. One diet contained corn with a high level of SBM (CS) and the other contained corn, fish meal and a lower level of SBM (CSF). There was an overall diet effect on digestibility ($P < 0.05$). At 5 d of age, poulters fed the diets containing MBM and fishmeal had significantly lower digestibility coefficients ($P < 0.05$) compared with 3 and 6 week-old poulters. There were no significant age effects on essential amino acid digestibility in poulters fed the commercial protein blend, CS and CSF complete diets except for threonine in the protein blend, histidine, methionine and valine for the complete diets, including lysine for the CS diet. It is therefore concluded that the effects of age on feed ingredient digestibility is influenced by the type of feed ingredient.

91 Digestible lysine levels in the pre-laying and pre-peak periods for laying hens. R. M. Jardim Filho*, J. H. Stringhini, F. B. Carvalho, M. S. Matos, M. B. Cafe, and L. F. Reis, *Universidade Federal de Goiás, Goiania, Goiás, Brasil.*

Lysine has been used in laying hen diets to improve egg weight, albumen weight and performance. This experiment was carried out to evaluate the effects of different lysine levels in pre-laying diets for pullets. One hundred and sixty 16 weeks-old Lohmann LSL pullets were housed in poultry house and evaluated during 61 days, until 25 weeks of age. All diets were corn-soybean based and were isocaloric and isonutritive (protein, calcium, phosphorus, digestible amino acids, methionine+cystine, threonine, triptophan). The diets were provided in two phases: from 16 - 20 weeks (first egg) and 21-25 weeks, and were formulated according to Lohmann LSL manual requirements. Starting at 16 weeks, the photoperiod was increased 10 per week from 13 hours light per day was reached 16. The minimum and maximum temperatures observed were 10.6 C and 37.8 C, respectively, during the experimental period. A randomized block experimental design was used (two 16-week weight range: 1.000 - 1.116 and 1.117 - 1.226 kg) with four treatments (four levels of digestible lysine: 0.6, 0.7, 0.8 and 0.9%) and four replicates of ten chickens per experimental unit. Day at first egg, egg production, egg weight, feed intake, feed: gain ratio (kg/dz, and kg/kg), lysine intake, and live weight gain were evaluated. Data were submitted to polynomial regression (5%) analysis using the statistical software SAEG (2004). No significant differences were found in day at first egg, egg weight, feed intake (during the pre-laying or pre-peak phase), feed gain ratio (kg/kg) and weight gain. Significant linear responses ($P < 0.05$) were observed for feed-to-gain ratio expressed as kg/dozen eggs ($Y = 1.63159 - 0.000449606 X$; $R^2 = 0.92$), egg production ($Y = 60.75 + 0.0280 X$; $R^2 = 0.68$) and lysine intake ($Y = -8.73786 + 0.894044 X$; $R^2 = 0.98$). In this study, the highest level of digestible lysine (0.9%) fed to pullets from 16 weeks the greatest lysine intake and best production performance to 25 weeks led.

Key Words: Diet, Lysine, Pre-laying

92 The effect of supplemental glutamine on growth performance and immune response of broilers vaccinated and challenged with *Eimeria acervulina* and *Eimeria maxima*. S. Bartell* and A. Batal, *University of Georgia, Athens.*

An experiment was conducted to evaluate the effect of supplemental (supp) glutamine (Gln) on growth performance and immune response of broilers vaccinated and challenged with *Eimeria*. There were 12 experimental treatments in a 3 x 2 x 2 factorial design. Immediately after hatch, four replicate pens of thirty-five chicks were randomly assigned to one of three dietary treatments. The birds were fed either a corn-SBM control diet, a diet supp with 1% Gln for the starter period then fed the corn-SBM diet for the rest of the experimental period, or 1% Gln supp for the entire experimental period (0-42 d). All diets were formulated to be isocaloric and isonitrogenous. Immediately posthatch, half of the birds were vaccinated with *E. acervulina* and *E. maxima*. On d 0, 32 and 40 twelve chicks per treatment were sacrificed for duodenum, jejunum, bile, and blood sample collections. On d 19, half of the vaccinated and half of the non-vaccinated birds were challenged orally with *E. maxima* and *E. acervulina*. On d 25, five birds per pen were sacrificed for small intestine lesion scores. Weight gain and feed efficiency were significantly ($P < 0.001$) improved in vaccinated, non-vaccinated, challenged, or non-challenged birds when the chicks were fed diets with 1% Gln as compared to non-challenged, non-vaccinated chicks fed the control. Birds that were vaccinated and fed the diet supp with 1% Gln performed better than the vaccinated control birds ($P < 0.05$). Birds that were challenged and fed the diet supp with 1% Gln performed better than the challenged control birds ($P < 0.05$). The chicks fed diets supp with 1% Gln had lower lesion scores and less incidences of secondary infections than the control birds ($P < 0.05$). Concentrations of bile, intestinal and serum IgA and serum IgG and IgM were increased in the chicks fed diets with 1% Gln for 40 d ($P < 0.05$). The results indicate that the addition of Gln to the diet of broiler chicks improves growth performance and may stimulate development of the immune system when presented with a disease or vaccination challenge.

Key Words: Glutamine, Eimeria, Immune response

93 The effects of sex and rearing environments on the digestible threonine requirement of broilers. B. Lumpkins* and A. Batal, *University of Georgia, Athens.*

Two experiments were conducted to evaluate variations in the estimated digestible threonine requirement (DTR) for body weight gain (BWG) and gain to feed ratio (GF) due to sex and rearing environment from 7 to 21 d of age. Chicks were sexed immediately after hatch, placed in either starter batteries or floor pens, and fed a standard corn-soybean meal diet with 23% CP and 3,200 Kcal ME/kg to 7d of age. The chicks were then sorted and allocated to the experimental diets. The experimental diets were formulated to be isocaloric and isonitrogenous, varying only in the level of digestible threonine. The digestible threonine levels used were 0.50, 0.60, 0.70, 0.80, and 0.90% in Experiment 1, and 0.48, 0.58, 0.68, 0.78, and 0.88% in Experiment 2. The true threonine digestibility of the diets was determined using the total fecal collection precision-fed rooster assay with adult cecectomized roosters. The requirements were estimated using one slope broken-line methodology. In Experiment 1, when the chicks were reared in batteries, there was no difference in the estimated DTR between males and females based on BWG (0.75%, 0.73%) and GF (0.74%, 0.74%), respectively. In Experiment 2, when chicks were reared in batteries, there was no difference in the estimated DTR between males and females based on BWG (0.69%, 0.69%) and GF (0.68%, 0.69%), respectively. The estimated DTR for BWG and GF was also not different within sexes. However, the DTR for chicks reared on the floor, based on BWG, was slightly higher for males (0.65%) than females (0.63%), but the estimated DTR, based on GF, was slightly higher for females (0.71%) than males (0.69%). The estimated DTR, based on BWG, was lower for males and females reared on the floor compared to the starter battery. The estimated DTR was not consistent between Experiments 1 and 2 for either males or females that were reared in batteries. However, there was no variation in the estimated DTR between sex within experiment or rearing environment. The results suggest that there is no difference in the estimated DTR when either based on BWG or GF due to sex or rearing environment.

Key Words: Threonine, Sex, Rearing environment

94 Amino acid density and L-threonine response in Ross broilers. W. S. Virden*, A. Corzo¹, W. A. Dozier, III², D. J. Burnham³, and M. T. Kidd¹, ¹Mississippi State University, Mississippi State, ²USDA-ARS, Poultry Research Unit, Mississippi State, Mississippi, ³Ajinomoto Heartland, Chicago, Illinois.

An experiment was conducted to examine the effect of feeding broilers diets containing high (H) or low (L) amino acid density during the finisher period. Also, the impact of L-Thr addition to diets differing in amino acid density was measured. Ross x 708 male broilers were placed in floor pens and fed common diets from d 1 to 34 that met or exceeded NRC (1994) recommendations. From d 35 to 55, dietary treatments consisting of H amino acid density (digestible Lys = 0.88%, TSAA = 0.69%, and Thr = 0.59%) or L amino acid density (digestible Lys = 0.82%, TSAA = 0.64%, and Thr = 0.55%), with or without the addition of dietary L-Thr were fed (9 replications/treatment). The average inclusion of L-Thr was 286 g/ton. On d 55, BW gain, feed conversion, feed intake, and mortality were measured. Also, on d 55, six birds per pen were selected, weighed, and processed so that carcass characteristics could be measured. This experiment was a factorial arrangement of treatments in a randomized complete block design. Pen was the experimental unit. There were no interactions between amino acid density and dietary L-Thr inclusion. No significant effects due to feeding dietary L-Thr occurred. BW gain, feed intake, carcass yield, and breast meat yield relative to live BW did not differ due to amino acid density. Birds fed diets containing H amino acid density had higher ($P < 0.05$) breast meat yield relative to carcass containing abdominal fat, lower ($P < 0.05$) feed conversion, and abdominal fat than birds fed diets with L amino acid density. Increasing amino acid density improved some aspects of broiler live performance and carcass traits, but the marginal reduction of the less limiting amino acids (i. e., Ile, Val, Arg, and Trp), as a result of dietary L-Thr inclusion, did not adversely affect any parameter measured.

Key Words: Broiler, Amino acid density, L-threonine

95 The effects of in ovo feeding of beta-hydroxy-beta-methylbutyrate (HMB) and arginine on jejunal expression and function in turkeys. O. Foye*¹, P. Ferket¹, and Z. Uni², ¹North Carolina State University, Raleigh, ²The Hebrew University of Jerusalem, Rehovot, Israel.

In ovo feeding (IOF), administration of nutrients into the amnion prior to pipping, may enhance growth performance by enhancing intestinal development and function. We studied the effects of IOF arginine (ARG) and HMB on brush boarder enzyme activity and nutrient absorption. Jejunal expression of aminopeptidase (AP) and sucrase-isomaltase (SI), Na⁺ glucose transporter (SGLT-1), peptide transporter (Pept-1) and jejunal activity of leucine AP, sucrase (S) and maltase (M) were evaluated in Hybrid poults. At 23 d of incubation, 4 IOF treatment groups of 100 eggs were subjected to a factorial arrangement of 2 levels ARG (0% or 0.7%) and 2 levels HMB (0% and .1%) in 1.5 ml of .4% saline. Poults were provided feed and water ad libitum within 24 hours after hatch. Samples from the mid-jejuna were taken at 25 days of incubation (25E), hatch, 3, 7, and 14 d. IOF of HMB + ARG greatly enhanced S and M activity at the 25E and at 14-d, over the non-injected controls (C) (p<0.05). Jejunal S and M activities were 3-fold greater in poults in ovo fed ARG + HMB than all other treatments at 14-d (p<0.05). Jejunal S activity was enhanced at hatch and 7-d in poults IOF ARG over all other treatments with independent and main effects of HMB and ARG (p<0.05); while jejunal M activity was enhanced at hatch by IOF ARG and HMB + ARG over C and HMB with a significant main effect of HMB (p<0.05). Jejunal LAP activity was improved by IOF of HMB + ARG over C at 25E, hatch, 3-d and 14-d with a significant HMB X ARG interaction effect (p<0.05). There was an HMB X ARG interaction effect on jejunal Pept-1, SGLT-1 and SI expression levels at hatch, 3d, and 7 d (p<0.05). At 25E, IOF of HMB enhanced jejunal Pept-1 expression over the (C) (p<0.05). At hatch, Pept-1, SGLT-1 and SI jejunal expression was enhanced by IOF of HMB in comparison to C (p<0.05). In ovo feeding may enhance early growth by improving intestinal function and development, which may provide the nutrients and energy needed for more rapid growth during the post-hatch period.

Key Words: In Ovo Feeding, Nutrient transporters, Brush border enzymes

96 The effect of glutamine manufacturing on growth performance and the development of the immune system of broilers. S. Bartell* and A. Batal, University of Georgia, Athens.

An experiment was conducted to evaluate the effect of supplemental (supp) glutamine (Gln) as compared to similar amino acids (AA) on growth performance development of the immune system of broiler chickens. Immediately after hatch six replicate pens of ten chicks were randomly assigned to one of eight dietary treatments for 21 d. All diets were formulated to be isocaloric and isonitrogenous. The birds were fed either a corn-soybean meal control diet or a diet supp with bacitracin dimethylene salicylate (BMD), 1 or 2 % Gln, 1% Gln (China source), 1% His, 1% Glu, or 1% Asp. Various AA were used to determine if the benefits of Gln supp observed in previous studies were due to the manufacturing of Gln. His was evaluated because it is processed via a similar fermentation method as Gln, Glu is the acid form of Gln, and Asp is the most similar to Gln in chemical structure. Gln from a source in China was used to determine if there are differences due to sources. On Day 0, 7, and 21 two chicks per pen were sacrificed for duodenum, jejunum, bile, and blood sample collections and weights. On d 14, five birds per pen were injected I. V. with a 0.05% solution of SRBC. On d 21, blood was collected to determine SRBC antibody titers. Weight gain and feed efficiency were significantly (P<0.001) improved when chicks were fed diets supp with 1% Gln as compared to chicks fed the control diet and all the other dietary treatments. Supplementing the diet with 2% Gln, 1% His, and 1% Gln (China) significantly depressed weight gain (P<0.05) and 1% His and 2% Gln appeared to be toxic. Concentrations of bile, intestinal and serum IgA, serum IgG, serum IgM, and the antibody titer in response to SRBC were significantly higher at 21 d in the chicks fed diets supp with Gln (P<0.05) when compared to the other dietary treatments. The immune benefits observed in the birds fed diets supp with 1% Gln and not for the 1% Glu indicate that the amine form and not the acid form needs to be supp in the diet. The results indicate that the addition of Gln to the diet of broiler chicks improves growth performance and may enhance the development of the immune system.

Key Words: Glutamine, Immune system, SRBC

97 Effect of methionine level on broilers submitted to immunological stimulus. L. Rubin¹, A. Ribeiro*¹, C. Canal¹, A. Kessler¹, L. Kratz¹, A. Santos¹, J. Barbi², R. Gonzalez-Esquerre², and M. Vazquez-Anon², ¹UFRGS, Porto Alegre, RS, Brazil, ²Novus International, St Louis, Missouri.

A variety of nutrients has been suggested to have immunoregulatory actions; however, their interactions in broilers fed practical diets are limited to a few published studies. Methionine (Met) is the first limiting amino acid for poultry and due to its widespread functions, beyond muscle accretion; it could play an important role in challenged broilers. The present trial aimed to test if there was an optimum level of digestible sulfur amino acids (DSAA) interacting with immunological stimulus. The stimulus was based in a strong vaccination program, in order to simulate field challenge. Three levels of DSAA (0.72; 0.82; 0.92% from 1 to 21-d and 0.65; 0.75; 0.85% from 22 to 42-d of age) and two vaccination schedules (VSA or VSB) were used. Alimet feed supplement (an 88 % aqueous solution of 2-hydroxy-4-methylthio butanoic acid) was used as source of Met. One-d-old Cobb males broilers, submitted to VSA were vaccinated against infectious bronchitis, Marek and Fowl Pox and at 14-d against Gumboro. The VSB was a positive control without vaccination. Freund's Adjuvant was injected at 28 d of age, in a 0.5ml dose, intramuscularly, in all treatments. At 40-d of age 0.1 ml of avian tuberculin was injected in one wattle and 24 h latter a qualitative analysis was done measuring its diameter. The experiment was statistically analyzed as a 3x2 factorial with 6 treatments and 6 replicates. No interactions between DSAA and VS were observed. Birds receiving the highest dietary DSAA had greater weight gain (WG) at 42-d. Poorest feed conversion was seen for the lowest dietary DSAA. Vaccinated birds showed lower WG and feed intake until 21-d of age. At 28-d of age, no more differences in performance were observed between VS groups. No differences in wattle diameter were observed across DSAA levels or VS. The results show that commercial levels of DSAA could be underestimated for modern broiler strains.

Key Words: 2-hydroxy-4-methylthio butanoic acid, Broilers, Immunological stimulus

98 Effect of dietary methionine on breast muscle accretion and protein expression. A. Corzo*, M. T. Kidd, A. Shack, and S. C. Burgess, Mississippi State University, Mississippi State.

Certain nutrients have a profound effect on breast meat yield, particularly Met and Lys. A study evaluated the effect that dietary Met has on growth, carcass traits, and protein expression in breast muscle of broilers. A common diet was fed to 1-d-old Ross 708 male broilers from placement until 21 d of age. Birds were then fed either Met deficient (0.33% Met, 0.37% Cys; MD) or Met adequate (0.48% Met, 0.37% Cys; MA) mash diets, ad libitum, from 21 to 42 d of age (3 pens/trt; 12 broilers/pen). At 42 d of age, live performance parameters were measured. Also, a section of muscle tissue was dissected from the cranial region of the left side pectoralis major (3 birds/trt). Sections were prepared by solubilization and in-solution tryptic digestion, and analyzed by tandem mass spectrometry. All remaining birds were processed and their carcass characteristics determined.

Broilers fed the MA diet had higher (P < 0.01) carcass weight and yield, and lower (P < 0.01) abdominal fat percentage than those fed the MD diet. Weight and yield of pectoralis major and minor muscles were higher (P < 0.01) in broilers fed the MA diet. Furthermore, broilers fed MD had increased (P < 0.01) breast meat yield variability; thus, MA fed birds resulted in improved breast meat yield uniformity. After mass spectrometry analyses, the six pectoralis muscle samples resulted in a combined identification of one hundred and ninety proteins identified using a Turbo-SEQUENT algorithm. Similar number of proteins were observed for both treatments. Certain proteins appeared to be expressed in muscle of chickens fed MD diets. However, while some these proteins may represent potential markers for breast meat yield status as affected by dietary Met supply, explanation for their presence is elusive and requires further research.

Key Words: Breast meat, Methionine, Proteomics

99 Methionine sources and sodium levels impact broilers performance under Brazilian summer conditions. A. Ribeiro^{*1}, A. Kessler¹, T. Viola¹, J. Barbi², R. Gonzales-Esquerre², and M. Vazques-Anon², ¹DZ-UFRGS, Porto Alegre, RS, Brazil, ²Novus International, St Louis, Missouri.

Methionine (Met) is the first limiting amino acid for poultry and has an important role in other livestock and companion animal feed formulations. The two main sources of synthetic Met available to the animal feed industry are Alimet feed supplement (an 88% aqueous solution of 2-hydroxy-4-methylthio butanoic acid; HMTBA) or as dl-methionine (DLM). Sodium (Na) is a mineral that plays a role in amino acid nutrition, active transport absorption, and feed and water intake. The present trial aimed to study the effect of three Na levels (0.15:0.20:0.25/0.12:0.17:0.22% fed from 7 to 21 and 21 to 49 days, respectively) and two Met sources (HTMBA and DLM) added on an equal molar basis to a corn-soybean meal based vegetable diets deficient in Met on performance of broilers subjected to tropical summer conditions in Brazil. The experiment was statistically analyzed as a 3x2 factorial with 6 treatments and 7 replicates. No significant interactions between Met source and Na levels were found. At the end of the study, HMTBA birds showed significantly higher weight gain (WG; $P < 0.05$) and feed conversion (FC; $P < 0.02$) than DLM birds across Na levels. The coefficient of variation for WG or FC was below 3%. There was no Na response for WG and feed intake, but birds fed the higher level had the best FC ($P < 0.03$). The idea that vegetable diets can lead to feathering problems, because of lower total sulfur amino acid levels in feed was not evidenced in this trial. Cannibalism or feather pecking was not observed among birds and Met sources did not influence feathering differently. From this study it can be concluded that birds fed vegetable diets and reared under tropical Brazilian conditions may have better performance when fed high dietary Na levels and supplemented with HMTBA rather than DLM.

Key Words: Methionine, 2-hydroxy-4-methylthio butanoic acid, Heat stress

100 Response to lysine levels over dynamic development of broilers. S. Clemente-Hernández¹, F. Salvador², and E. O. Oviedo-Rondón^{*1}, ¹Stephen F. Austin State University, Nacogdoches, Texas, ²Universidad Autónoma de Chihuahua, Chihuahua, Chihuahua, México.

Optimum lysine (Lys) levels have been estimated for maximum breast development for each dietary period. Recent reports indicate improved breast meat yield when dietary Lys levels are increased over current recommended levels. This project evaluated the effects on live performance and carcass traits when increasing or decreasing by 10% the optimum (O) Lys levels during three dietary phases in broiler raised to 42 d of age. Basal corn-soybean meal diets were formulated to achieve recommended O total amino acid (AA) contents for each period. The O digestible Lys levels used in each period were 1.20, 1.09 and 0.98, respectively. Higher (H) or lower (L) Lys diets were obtained by addition of Lys HCl or replacement with sand. Diets were analyzed for crude protein and total AA. A total of 3,360 male Cobb-500 chickens were placed under simulated commercial conditions in 96 floor pens. Chickens were fed with one of these three diets (L, O, and H) during starter (0-17d), grower (17-35d), and finisher (35-42d) phases, for a final factorial combination of 27 feeding treatments, with 3 or 4 replicates per treatment. Carcass and parts yield were determined at 30 and 42 d of age. Data was analyzed by Mixed Model Proc for repetitive measurements, and GLM Proc of SAS. Tukey's test and orthogonal contrasts were used for mean separation. Results indicated a significant ($P < 0.05$) effect of Lys levels for BWG, FI and FCR for every dietary period. However, no significant ($P > 0.05$) differences were observed in live performance from 1 to 42 d of age. Low starter Lys level had significant ($P < 0.05$) carryover effects over BWG and FI during grower and finisher periods. Dressing and breast meat yield percentages were affected ($P < 0.05$) by Lys levels at 30 and 42 d. These results confirm that Lys levels required for maximum live performance at 42 d of age are lower than those for maximum breast development. No consistent benefits of altering the optimum Lys levels across dietary phases were observed.

Key Words: Broilers, Lysine, Breast development

101 Growth responses, plasma metabolites, nitrogen excretion, and ammonia production of male broilers provided diets varying in amino acid density. W. A. Dozier, III^{*1}, M. T. Kidd², A. Corzo², D. Miles³, and S. L. Branton¹, ¹USDA-ARS Poultry Research Unit, Mississippi State, Mississippi, ²Mississippi State University, Mississippi State, ³USDA-ARS Forage and Waste Management, Mississippi State, Mississippi.

Increasing amino acid density early in life has shown to increase subsequent growth performance and breast meat yield. However, reducing nutrient density as birds reach market weight will decrease nitrogen content of excreta and may reduce ammonia production as well as allow for growth comparable to a higher CP regimen. This study examined growth performance, plasma metabolites, nitrogen excretion, and ammonia production of male broilers during a 35 d production period. Two-hundred and forty Ross x Ross 708 male broilers were randomly assigned into Petersime batteries having raised wire floors (5 birds/cage) at one d of age. Dietary treatments consisted of four feeding regimens formulated to moderate (M) or high (H) amino acid density based on an ideal amino acid pattern. Diets were fed from 1 to 7, 8 to 19, and 20 to 35 d. Feeding regimen treatments were 1) HHH; 2) HHM; 3) HMM; 4) MMM. Each treatment was represented by 12 replicate pens. At d 26, blood was collected from one bird/pen for the determination of plasma total protein and uric acid concentrations. A 48 h total excreta collection period (33 to 35 d) was conducted to assess nitrogen excretion and ammonia production.

Feeding the H amino acid density diet until 19 d of age improved ($P = 0.02$) BW gain. Broilers fed the HHH regimen had improved ($P = 0.03$) cumulative BW gain and feed conversion, but feed consumption and mortality were unaffected. Plasma total protein and uric acid were similar among the treatments. From 33 to 35 d, increasing amino acid density increased ($P = 0.04$) nitrogen excretion and ammonia production. We conclude that reducing amino acid density during the final phase of growth decreased nitrogen excretion and ammonia production but cumulative feed conversion was compromised.

Key Words: Ammonia, Amino acid, Broiler

102 Influence of dietary peptide levels on endogenous amino acid flow in broiler chickens. V. Ravindran^{*}, S. M. Rutherford, D. V. Thomas, P. C. H. Morel, and P. J. Moughan, Massey University, Palmerston North, New Zealand.

The traditional approach of determining endogenous nitrogen and amino acid flows is to feed the bird a diet devoid of protein. This method has been criticised since lack of protein may result in reduced digestive enzyme secretion and rate of protein turnover in the gut. Recent reports suggest that dietary protein and peptides exert a positive influence on endogenous amino acid flows, but limited data is available on the effects of dietary concentrations of protein or peptides. In the present study, the enzyme-hydrolysed casein (EHC) method was used to determine the effect of dietary peptide level on ileal nitrogen flows in broiler chickens. Five experimental diets containing EHC at 0, 5, 10, 15 and 20% were formulated. All diets contained 0.3% titanium oxide as an indigestible marker. Each diet was fed ad libitum to four pens (6 birds/pen) of male broilers from 28 to 35 days of age. On day 35, terminal ileal contents were collected and endogenous nitrogen flows were determined using the ratio of titanium in the diet and ileal digesta. The endogenous flow of nitrogen and most amino acids was similar ($P > 0.05$) between birds fed the protein-free diet and those fed the 5% EHC diet. Increasing dietary EHC levels from 5 to 20% significantly ($P < 0.05$) increased the endogenous flow of amino acids. The only exception was the flow of proline, which decreased ($P < 0.05$) with increasing EHC levels. The amino acid composition of endogenous protein differed ($P < 0.05$) between the protein-free diet and the EHC diets. The concentrations of glutamic acid, glycine, leucine and histidine were greater ($P < 0.05$) and those of proline, arginine and cystine were lower ($P < 0.05$) with the EHC method compared to the protein-free diet method. These results demonstrate that the magnitude of losses of endogenous amino acids from the small intestine of broiler chickens are influenced by the dietary levels of peptides.

Key Words: Enzyme hydrolyzed casein, Endogenous amino acid flow, Broiler chicks