

piglets CE supplementation resulted in higher fecal fat digestibility and tissue omega-3 fat deposition. In conclusion, feeding FS with or without CE supported lactic acid fermentors in the in the gastrointestinal tract.

Although overall low fat digestibility was observed high omega-3 retention in FS fed piglets was evident.

**Key Words:** Flaxseed, Carbohydrase Enzymes, Piglet

## Nonruminant Nutrition: Poultry Nutrition III

**W174 Biochemical profile of broilers fed diets supplemented with amylase from *Cryptococcus flavus* and *Aspergillus niger* HM2003.** C. S. Minafra<sup>2,1</sup>, J. H. Stringhini<sup>\*1</sup>, S. F. F. Marques<sup>1</sup>, M. A. Andrade<sup>1</sup>, C. J. Ulhoa<sup>1</sup>, and G. H. K. Moraes<sup>2</sup>, <sup>1</sup>Universidade Federal de Goias, Goiania, Goias, Brazil, <sup>2</sup>Universidade Federal de Viçosa, Viçosa, Minas Gerais Brazil.

In this experiment, the effect of alpha-amylase addition in broiler rations on biochemical serum parameters was evaluated. The enzyme were produced by *Cryptococcus flavus* (CF) in Enzymology Laboratory Biological Sciences, (UFG) and by *Aspergillus niger* HM2003 (AN) in the Biotechnology Center (UFRS). 360 day-old male Cobb chicks were allotted in heated batteries in the Veterinary College, (UFG). Enzymes were added in the first week and from eight to 21 days in a completely randomized design with six treatments and five replications of 12 chicks each. Treatments consisted of pre-starter diets without enzyme (RPSS), with CF amylase (RPSCry) and with AN enzyme (RPSAsp), and starter diets without enzyme (RPS), with CF amylase (RSCry) and with AN enzyme (RSAsp). Statistical analyses were done with SAEG 9.1, using Tukey test 10% probability. Blood were collected at seven and 21 days and centrifuged at 6.000 rpm in 10 minutes to obtain serum. Serum analysis of minerals Ca, P, Cl, K, alkaline phosphatase, and protein was done. No effect in concentrations of K and AP were observed at seven days and for Ca, Cl or AP at 21 d. At 7 d, higher concentration of Ca in RPSCry, P in RPSAsp, Cl in PSV and Prot in RPSVAsp. At 21 d, higher concentrations of Ca, Prot and K in RSVAsp. These parameters indicate serum profile of broilers but didn't characterize the effect of enzymes addition in rations.

**Table 1. Serum profile of Ca, P, Cl, K, TP and AP for broiler fed diets containing amylase from *Cryptococcus flavus* and *Aspergillus niger* HM2003**

7 days	VPS	VPSCry	VPSAsp
Ca (mg/dL)	5.7b	6.9a	6.0ab
P (mmol/L)	5.1b	4.8b	6.2a
Cl (mmol/L)	153a	124b	141ab
K (mmol/L)	6.4a	6.5a	6.12a
TP (g/dL)	1.8b	2.0b	2.5a
AP (UI/L)	970a	980a	975a
21 days	VS	VSCry	VSAsp
Ca (mg/dL)	6.0a	5.5a	5.5a
P (mmol/L)	5.7a	5.0b	5.0b
Cl (mmol/L)	124a	137a	139a
K (mmol/L)	4.5c	5.9b	6.7a
TP (g/dL)	3.6a	3.0b	3.1b
AP (UI/L)	969a	961a	970a

Different letters in the row differ by Tukey test (5%)

**Key Words:** Biotechnology, Enzymes, Serum Profile

**W175 Effects of graded levels of cottonseed cake on performance, haematological and carcass characteristics of broilers fed from day old to 8 weeks of age.** G. O. Adeyemo\* and O. G. Longe, University of Ibadan, Oyo, Nigeria.

Cottonseed cake (CSC) has been used as a cheaper alternative to soyabean cake (SBC) in livestock feeding and a source of dietary protein. There is, however, paucity of information on its nutritive value in chickens. This study evaluated the performance, haematological and carcass characteristics of chickens in which CSC replaced SBC in a nutritional experiment. One hundred and eighty day old chicks (DOC) were fed with 5 different diets, such that 0% (control), 25%, 50%, 75% and 100% of CSC replaced SBC from day old to 8 weeks of age. Average weekly gains (AWG), feed conversion ratio (FCR) and dressed weight (DWT) were monitored. Blood samples were collected and analyzed for differential white blood cell count (lymphocyte) and haemoglobin (Hb). Data were analysed using descriptive statistics and analysis of variance. Values of AWG and DWT ranged from 0.1kg to 0.4kg and 1.1kg to 1.8 kg respectively, with 100% CSC and control having the least and the highest values among the treatments. FCR ranged from 1.6 to 4.9. Values of lymphocyte and Hb ranged from 35.2 to 54.0 % and 8.5 to 11.1g/dl respectively. Birds on 75% CSC based diets had blood profile more comparable with the control than those of other diets. CSC can replace up to 75% SBC without adverse effects on performance, haematological values and carcass quality of the birds. This reveals CSC as a potent source of protein for meeting the CP requirements of chickens.

**Key Words:** Chicken, Cottonseed Cake, Performance

**W176 Serum biochemistry profile of broilers fed an enzymatic complex from *Trichoderma harzianum*.** S. M. F. Marques<sup>1</sup>, C. S. Minafra<sup>2,1</sup>, J. H. Stringhini<sup>\*1</sup>, P. M. Rezende<sup>1</sup>, M. A. Andrade<sup>1</sup>, M. B. Cafe<sup>1</sup>, and C. J. Ulhoa<sup>1</sup>, <sup>1</sup>Universidade Federal de Goias, Goiania, Goias, Brazil, <sup>2</sup>Universidade Federal de Viçosa, Viçosa, Minas Gerais Brazil.

This experiment were carried out to evaluate serum profile of broilers fed from 1 to 21 d diets with an enzymatic complex (EC) supplement produced by *Trichoderma harzianum*, composed by xylanase, amylase, cellulase and lipase. EC was produced in the Enzimology Laboratory of the Biological Sciences Institute of the Federal University of Goias (UFG). 480 day-old male chicks were allotted in heated batteries located in the Veterinary College (UFG). In the first experiment, EC supplementation was evaluated in pre-starter phase (1 to 7 days) and the second in starter phase (8 to 21 days) in a randomized block design with four treatments and five replicates of 12 chicks each. Treatments in Exp. 1 were: vegetable pre-starter diet non-supplemented (VPS), or supplemented (VPSE), animal by-products and vegetable diet non-supplemented (APS), or supplemented (APSE); in Exp. 2: vegetable starter diet non-supplemented (VS), or supplemented (VSE),

animal by-products and vegetable diet non-supplemented (AS), or supplemented (ASE). Feed and water were offered ad libitum. From one chick per treatment, blood was collected by heart puncture at 7 and 21 days of age for serum separation and analyzed for Ca, P, total protein, alkaline phosphatase, K, Cl. Data was analyzed using SAEG 9.1 and means compared as Tukey test (5%). At 7 days, higher concentrations for Ca; Cl and K in APS, VPS and VPSE, respectively, and higher concentrations for P was observed for the two highest concentrations, APS and VPS. But, for PA, higher results were obtained for VPS, APSE and VPS. No significance occurred for TP concentrations at 7 d and Ca at 21 d of age. At 21 d, highest concentration for P, K and AP for AS. Rations VS, VSE and ASE showed reduced Pt, K and Cl, respectively. These parameters indicate serum profile of broilers but didn't characterize the effect of enzymes addition in rations.

**Table 1. Serum profile of Ca, P, Cl, K, TP, AP in broilers fed an *Trichoderma harzianum* enzymatic complex**

7 days	VPS	VPSE	APS	APSE
Ca(mg/dL)	7.7ab	6.9b	8.9a	6.9b
P(mmol/L)	6.5a	3.8b	6.9a	3.7b
Cl(mmol/L)	149a	113c	1129c	130b
K(mmol/L)	4.8b	6.26a	5.15b	3.87c
TP(g/dL)	2.7a	2.4a	2.8a	2.4a
AP(UI/L)	895a	906a	813b	899a
21 days	VS	VSE	AS	ASE
Ca(mg/dL)	5.9a	7.2a	6.4a	6.1a
P(mmol/L)	6.2ab	6.2ab	7.7a	6.1b
Cl(mmol/L)	163a	135ab	144ab	128b
K(mmol/L)	4.4b	3.4b	5.8a	6.6a
TP(g/dL)	2.6ab	3.0a	2.8ab	2.3b
AP(UI/L)	892ab	865b	909a	888ab

Different letters in the row differ by Tukey test (5%)

**Key Words:** Biotechnology, Enzymes, Serum Profile

**W177 Feeding performance in laying hens fed diets containing DAS-59122-7 maize grain compared with diets containing non-transgenic maize grain.** C. M. Jacobs<sup>\*1</sup>, P. L. Utterback<sup>1</sup>, C. M. Parsons<sup>1</sup>, B. Smith<sup>2</sup>, M. Hinds<sup>2</sup>, D. Rice<sup>2</sup>, M. Liebergesell<sup>2</sup>, and T. Sauber<sup>2</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>Pioneer Hi-Bred International, Inc., Johnston, IA.

An experiment using 216 Hy-line W-36 pullets was conducted to evaluate the transgenic maize grain produced from a nonsegregating DAS-59122-7 line that contains the *cry34Ab1* and *cry35Ab1* genes from a *Bacillus thuringiensis* (*Bt*) strain, and the phosphinothricin acetyltransferase (*pat*) gene from *Streptomyces viridochromogenes*. Expression of the *cry34Ab1* and *cry35Ab1* genes confers resistance to corn rootworms, and the *pat* gene confers tolerance to herbicides containing glufosinate-ammonium. Pullets (20 wk of age) were placed in cage lots (3 hens/cage, 2 cages/lot) and were randomly assigned to one of three corn-soybean meal dietary treatments (12 lots/treatment) formulated with the following maize grains: near-isoline control (Control), conventional maize (Pioneer hybrid 3394), and transgenic test corn DAS-59122-7 (59122). The experimental diets were fed in mash form from 24 to 36 weeks of age. Differences between 59122 and Control group means were evaluated with statistical significance at  $P < 0.05$ . Body weight and gain, egg production, egg mass, and feed

efficiency for hens fed 59122 corn were not significantly different from the respective values for hens fed diets formulated with near-isoline maize grain. Egg component weights, Haugh unit measures, and egg weight class distribution were similar regardless of corn source. This research indicates that performance of hens fed diets containing 59122 maize grain, as measured by egg production and egg quality, was similar to that of hens fed diets formulated with the Control maize grain.

**Key Words:** *Cry34Ab1*, *Cry35Ab1*, Corn Rootworm

**W178 Effects of supplemental humic substances on egg production and quality in laying hens.** Q. Wang<sup>\*</sup>, H. J. Kim, J. H. Cho, Y. J. Chen, J. S. Yoo, and I. H. Kim, Dankook University, Cheonan, Choongnam, Korea.

The effects dietary of humic substances (HS) on egg production and egg quality were studied using 252 (55-wk old) ISA brown laying hens. They were divided into 21 groups of 12 hens each and seven groups (experimental units) were assigned to 1) CON (basal diet), 2) HS5 (basal diet + 5% humic substances) or 3) HS10 (basal diet +10% humic substances) in a completely randomized block design. Hens had free access to diets and water for 6 wk and egg production and egg quality were monitored over the 6-wk period. Results showed that 10% dietary HS decreased egg production and yolk diameter ( $P < 0.05$ ) compared to CON. Egg weight and yolk color were improved ( $P < 0.05$ ) in HS10 compared with CON. Egg shell breaking strength was increased ( $P < 0.05$ ) for hens fed HS5 diet compared with the others. There were no effects of treatments on egg shell thickness, yolk index, albumen height and haugh unit. The results suggested that the dietary supplementation of HS at 5 or 10% decreased egg production, but, HS5 could increase egg shell breaking strength. HS10 could increase egg weight and yolk color and decrease yolk diameter.

**Key Words:** Humic Substances, Egg Production, Egg Characteristics

**W179 Enzyme complex containing NSP-enzymes and phytase improves the performance of broilers fed corn or wheat-based diets.** A. V. Mori<sup>1</sup>, M. Francesch<sup>2</sup>, J. McNab<sup>3</sup>, A. Knox<sup>3</sup>, and P. A. Geraert<sup>\*1</sup>, <sup>1</sup>Adisseo France SAS, Commentry, France, <sup>2</sup>Institut de Recerca i Tecnologia Agroalimentaries, Reus, Spain, <sup>3</sup>Nutrition Ltd., Roslin, United Kingdom.

Two experiments were conducted to investigate the benefits of a multi-enzyme complex containing carbohydrase and phytase activities on the performance of Ross broiler chickens receiving corn or wheat-based diets. In Exp. 1, birds from 1 to 42 days were fed corn-based diets formulated to be phosphorus-restricted (reduction of 0.1% available phosphorus, [AP]) or phosphorus and energy-restricted (reduction of 0.1% AP and 60 kcal ME/kg), or phosphorus, energy and protein-restricted (reduction of 0.1% AP, 60 kcal ME/kg and 0.4% crude protein [CP]) in comparison to a positive control diet, meeting requirements for AP, ME and CP. In Exp. 2, birds from 1 to 40 days were fed wheat-based diets formulated to be phosphorus-restricted (reduction of 0.1% AP), or phosphorus and energy-restricted (reduction of 0.1% AP and 85 kcal ME/kg), or phosphorus, energy and protein-restricted

(reduction of 0.1% AP, 85 kcal ME/kg and 0.3% CP) in comparison to a positive control diet. In both experiments, the three reformulated diets were supplemented or not with Rovabio™ Max at 100 g/t. This multi-enzyme complex provided 1,100 visco units of endo- $\beta$ -1,4-xylanase, 100 AGL units of endo-1,3(4)- $\beta$ -glucanase, and 350 RPU of 3-phytase per kg of diet. Supplementation of the reformulated diets with the multi-enzyme complex improved ( $P < 0.05$ ) weight gain of birds (4.0% and 4.6% in Exp.1 and 2, respectively), and weight gain values were comparable to those observed in the positive control groups. Additionally, in both studies, feed conversion of birds fed enzyme-supplemented diets did not differ ( $P > 0.10$ ) from those of birds fed the positive-control diets. These results support that the dietary supplementation of multi-enzyme complex containing NSP-enzymes and phytase is efficient in reducing the phosphorus, energy and protein specifications of either corn or wheat-based diets without performance losses.

**Key Words:** Phytase, NSP-Enzymes, Broilers

**W180 Effects of fermented wild-ginseng culture by-products on egg productivity, egg quality, blood characteristics and ginsenoside concentration of yolk in laying hens.** H. D. Jang\*, J. H. Cho, Y. J. Chen, J. S. Yoo, and I. H. Kim, *Dankook University, Cheonan, Choongnam, Korea.*

The present study was to investigate the effect of fermented wild-ginseng culture by-product on egg production, egg quality and blood characteristics in laying hens. The animal used in the experiment were a total of 216 ISA brown laying hens (55 wk old). The experimental diets were basis diet (CON), 2.5% fermented wild-ginseng culture by-product replaced lupin in basis diet (WG1) and 5.0% fermented wild-ginseng culture by-product replaced lupin in basis diet (WG2). The laying hens were allotted into three treatments with six replicate pens per treatment by completely randomized design. Through the whole period of experiment, egg production was significantly increased in WG1 and WG2 treatments compared to CON treatment ( $P < 0.05$ ). Egg weight was significantly higher in WG2 treatment compared to CON treatment ( $P < 0.05$ ). Yolk color unit was greater in WG1 and CON treatments compared to WG2 treatment ( $P < 0.05$ ). Albumin height and haugh unit were significantly improved in WG1 treatment compared to WG2 treatment ( $P < 0.05$ ). Red blood cell was significantly lower in WG2 treatment than CON treatment ( $P < 0.05$ ). LDL cholesterol was significantly decreased in CON treatment compared to WG2 treatment ( $P < 0.05$ ). In conclusion, fermented wild-ginseng culture by-product could improve egg production and egg weight in laying hens.

**Key Words:** Fermented Wild-Ginseng Culture By-product, Egg, Layer

**W181 Effects of enzyme addition to corn-soybean-meal-based diets on performance and processing yields of guinea fowl (*Numida meleagris*) broilers.** H. L. Santiago\*, J. A. Orama, and A. A. Rodríguez, *University of Puerto Rico, Mayagüez, Puerto Rico.*

Recent studies have demonstrated the benefits of supplementation with enzymes such as amylases and proteases to broiler diets based on corn

and soybean meal. However, these benefits cannot be extrapolated to the commercial production of other species of domestic animals. The objective of this study was to determine the effects of diet fortification with Avizyme (AV) on guinea broiler growth performance and processing yields. A total of 600 guinea keets were randomly assigned to four dietary treatments with 10 replications of 15 birds per pen and reared until market age (84 d) in a conventional poultry house. Treatments consisted in diets containing 0 (control), 0.025, 0.050, and 0.075% of AV. Birds and feed were weighed weekly until 84 d of age to determine body weight (BW), feed intake (FI) and feed conversion ratio (FCR). At 84 d, 50 birds per treatment were processed to evaluate carcass composition. The weights of new york dressed (NYD), hot ready to cook (HRTC), cold ready to cook (CRTC), and fat pad (FP) were obtained and yields calculated as a percentage from live BW. No differences among treatments were observed for BW, FI, and FCR during the first 28 d of growth. However, from 28 to 84 d of age diet fortification with AV significantly improved FCR and reduced FI when compared to the control diet. At 84 d of age, birds fed diets containing 0.025 AV had significantly lower FI than controls; while birds fed diets with 0.050 and 0.075 % AV had FI similar to the rest of the dietary treatments. Birds fed diets containing 0.025 and 0.075 % AV obtained lower FC than that of controls. Diets containing 0.050% AV had FC similar to the other AV inclusion levels or the control. No significant differences in mortality and processing yields (NYD, HRTC, CRTC, and FP) were observed among treatments. The data obtained suggests that supplementation of corn and soybean meal diets with at least 0.025% improve FCR of guinea broilers without affecting BW at market age and processing yields.

**Key Words:** Guinea Fowl, Avizyme, Performance

**W182 Dietary flaxseed supplementation affects broiler live performance.** V. L. Carney\*<sup>1</sup>, M. J. Zuidhof<sup>1</sup>, M. Betti<sup>2</sup>, B. L. Schneider<sup>1</sup>, R. A. Renema<sup>2</sup>, F. E. Robinson<sup>2</sup>, and D. R. Korver<sup>2</sup>, <sup>1</sup>*Alberta Agriculture and Food, Edmonton, Alberta, Canada,* <sup>2</sup>*University of Alberta, Edmonton, Alberta, Canada.*

This experiment was conducted as a 2 X 8 factorial, with two dietary levels of ground flaxseed (10 and 17%) and eight durations of inclusion in the diet prior to processing (0 [Control], 4, 8, 12, 16, 20, 24 and 35 d). Six hundred fifty-six Ross x Ross 308 mixed-sex broilers were evaluated in this study. Birds were weighed as a group each time feed was changed with each new duration. With more than 20 d of feeding duration, the diet containing 17% flaxseed significantly decreased BW and gain and increased feed conversion compared to the diet containing 10% ground flaxseed ( $p < 0.0001$ ). Feed intake was not significantly affected. A cost analysis showed that feeding flaxseed is costly due to production losses and increased feed costs. Feeding 10% flaxseed for 4 days increased cost per kg by \$0.073/kg. Cost of production was more than \$0.97/kg greater for the 17% flaxseed treatment fed for 35 days as compared to no dietary flaxseed. In conclusion, different levels and durations of flaxseed feeding significantly depressed broiler performance and increased associated costs of production.

**Key Words:** Flaxseed, Polyunsaturated Fatty Acids, Alpha-Linolenic Acid

**W183 Effect of alternate lutein and flaxseed enriched diet combinations on production parameters in laying hens.** D. Franco-Jimenez<sup>\*1,3</sup>, R. Renema<sup>1</sup>, M. Zuidhof<sup>2</sup>, and F. Robinson<sup>1</sup>, <sup>1</sup>University of Alberta, Edmonton, Alberta, Canada, <sup>2</sup>Alberta Agriculture, Food and Rural Development, Edmonton, Alberta, Canada, <sup>3</sup>California State Polytechnic University, Pomona.

A total of (144) 56 wk old Lohman White layers were randomly selected and assigned to individual cages (24/diet) with 14L:8D. The hens were fed during 60 days with a regular wheat soybean control (C) diet or enriched diets: 500ppm Lutein diet (L), 10% Flaxseed diet (F) as a source of omega fatty acids, Lutein and flaxseed diet (LF), Alternate one diet (LF1) (Alternating L and F diets every other day), and Alternate two diet (LF2) (Alternating L and F diets every second day). Egg production (EP), feed intake (FI), egg weight (EW) and body weight (BW) data were collected over time and analyzed using repeated measures and proc Mixed of SAS in a completely randomized design. Bone strength, ovary morphology, fleshing (breast weight) and fatness (fat pad) and other carcass characteristics were assessed at 65 wk of age on all birds using proc mixed of SAS. The results showed no treatment effect on EP, poor shell eggs, settable eggs, Haught unit, bone strength, shank with, shank length, and ovary and oviduct weight. Yolk color (Roche<sup>®</sup> fan) was higher when lutein is added to any of the diets ( $p < 0.05$ ). Shell quality (specific gravity, shell weight and shell thickness) was significantly reduced ( $p < 0.05$ ) on the LF1 and LF2 diets. Breast weight, liver weight and BW was significant reduced on diets containing flaxseed, while fat pad was lower on LF, LF1 and LF2 diets compared to control. Egg weight was lower for LF and LF2 diets and yolk weight was lower for all diets compared to C. Feed intake showed diet by time interaction with not specific pattern for diet over time; however, FI on LF1 and LF2 diets was higher during lutein feed days. These results indicate that using LF1 and LF2 diets do not affect EP, or reduce other production parameters dramatically, maintaining reproduction status and representing a good alternative for enrichment of the egg yolk with a possible reduction of the antagonistic effect observed for flaxseed over lutein incorporation.

**Key Words:** Laying Hens, Lutein, Omega Fatty Acids

**W184 Impact of different sources of dietary unsaturated fatty acids on productive performance and immunological status of broiler chickens subjected to heat stress.** M. N. Makled<sup>\*</sup>, A. A. El-Sebaie, O. S. Afifi, and A. A. Nafady, Assiut University, Assiut, Egypt.

One hundred and eight unsexed one-day old Ross broiler chicks were equally allotted to three groups. Group1 (control) was fed a basal diet containing 4% palm oil which is poor in polyunsaturated fatty acids (PUFA); group2 was fed the basal diet after replacing palm oil with 4% linseed oil which is rich in linolenic acid ( $\omega 3$ ); and group3 was fed the basal diet after replacing palm oil with 4% sunflower oil which is rich in linoleic acid ( $\omega 6$ ). The experiment lasted for 7 weeks, and the birds were subjected to heat stress (HS) started from the age of 28 days at 35°C for eight hours daily. At 4 weeks of age, all birds were injected intravenously in the wing vein with 0.5 ml of 15% sheep red blood cells (SRBCs) suspension in saline solution of packed SRBCs. Thereafter, different criteria were estimated weekly: body weight, feed efficiency, mortality, blood picture, serum T3 and T4 concentration,

and antibody titer response to SRBCs. Also, histopathological changes in bursa and thymus glands were examined at 7 weeks old. The obtained results indicated that different dietary sources of PUFA had no significant effect on the performance of broilers subjected to heat stress from 4 to 7 weeks of age. Meanwhile, their effects on immunological properties were variable. Sunflower oil caused significant increase of antibodies formation, RBCs count, and haematocrit at the first week of subjection to HS. After three weeks of HS, total leukocyte count in palm oil group was significantly lower than in linseed oil group or sunflower oil group. Lymphocytes % increased significantly in linseed oil group and sunflower oil group even before starting heat stress as compared with palm oil group, however, heterophils increased significantly in palm oil group as compared with the other groups. Hence, H/L ratio was significantly lower in linseed oil and sunflower oil groups. Histopathological examination indicated obvious increase in lymphocytes and thymocytes proliferation in bursa and thymus glands, respectively, in linseed oil and sunflower oil groups which may affect the immune potentiality of broilers.

**Key Words:** PUFA, Heat Stress, Immunity

**W185 Dietary supplementation with *atractylodes macrocephala koidz* polysaccharides enhances growth performance and development of immune organs in ducks.** L. L. Li<sup>\*1</sup>, Y. L. Yin<sup>1</sup>, B. Zhang<sup>2</sup>, G. H. Wen<sup>1,2</sup>, A. K. Li<sup>3</sup>, Z. P. Hou<sup>1</sup>, P. Zhang<sup>1</sup>, and G. Y. Wu<sup>1,4</sup>, <sup>1</sup>The Chinese Academy of Sciences, Changsha, Hunan, China, <sup>2</sup>Hunan Agricultural University, Changsha, Hunan, China, <sup>3</sup>Academy of State Grain Administration of China, Beijing, China, <sup>4</sup>Texas A&M University, College Station.

This study was conducted to determine the effects of dietary supplementation with *atractylodes macrocephala koidz* polysaccharides (AP) on growth performance and immune function in ducks. A total of 480 one-day-old Cherry Volley ducks were assigned randomly to one of 7 treatment groups, representing dietary supplementation with 0% (control), 0.2, 0.4, 0.6 or 0.8 AP or 0.02% terramycin (an antibiotic) to a corn- and soybean meal-based diet. There were 4 replicates for each treatment group, with 20 and 18 ducks per replicate in Phase I (d 1-14) and Phase II (d 15-28), respectively. All animals had free access to their respective diets and drinking water. In Phase I, dietary supplementation with 0.8% AP increased ADG by 10%, improved feed efficiency by 11%, and altered the ratios of the thymus and Bursa of Fabricius weights to BW ( $P < 0.05$ ). No effect of AP supplementation was observed on the ratio of spleen to BW or serum concentrations of IGF-I and IGF-II ( $P > 0.05$ ). In Phase II, dietary supplementation with AP had no effect on ADG or the ratios of the spleen, thymus, and Bursa of Fabricius weights to BW ( $P > 0.05$ ), increased feed efficiency and serum concentrations of IGF-I ( $P < 0.05$ ), and reduced serum concentrations of IL-6. In both phases, dietary supplementation with other doses of AP had no effect on ADG ( $P > 0.05$ ), whereas the antibiotic treatment improved feed efficiency ( $P < 0.05$ ) without altering the measured parameters of the immune function. These results indicate that dietary supplementation with 0.8% AP resulted in a beneficial effect on growth performance and development of immune organs in ducks.

**Key Words:** Polysaccharides, Herbs, Ducks

**W186 Production of low cholesterol eggs by dietary supplementation of probiotics and essential trace minerals in laying hen.** S. J. You\*, C. W. Kang, and B. Y. An, *KonKuk University, Seoul, Korea*.

For health-conscious consumers low cholesterol eggs may be an attractive and there were many efforts to reduce content of egg cholesterol using drugs, natural ingredients, mineral, etc. This experiment was conducted to develop dietary regimes for production of low cholesterol eggs by supplementing natural ingredients and trace minerals to laying hen feeds. Two hundred ten Hy-Line Brown layers, 53 weeks of age, used to investigate the effects of feeding diets containing various levels of probiotics and minerals such as copper and selenium on the content of egg yolk cholesterol. The layers were divided into seven groups and fed a commercial diet (control) or one of six experimental diets containing mixtures of various levels of probiotics (0.3, 0.5 and 0.7%), copper (100, 200 and 250 ppm) and selenium (0.3, 1.0 and 1.5 ppm) for 6 weeks. There were no significant differences in egg and eggshell qualities among the groups. The contents of egg yolk cholesterol of the birds fed the mixtures of various levels of probiotics, copper and selenium were significantly reduced by 13.9–25.6% as compared to those of the control ( $P < 0.05$ ). The expression of 3-hydroxy-3-methylglutaryl coenzyme A reductase mRNA was decreased by the dietary treatments ( $P < 0.05$ ). In conclusion, dietary mixtures of probiotics, copper and selenium were found to lower cholesterol contents of egg without any adverse effect on laying performance and egg qualities.

**Key Words:** Egg Cholesterol, Probiotics, Selenium

**W187 A dose response comparison of MINTREX® Zn versus Zn-methionine in the presence of a Cu-Zn antagonism in 19 day-old broiler chickens.** R. B. Shirley\*, C. W. Wuelling, T. R. Hampton, J. J. Dibner, and C. D. Knight, *Novus International, Inc., Saint Charles, MO*.

The following study evaluated the bioavailability of two zinc (Zn) sources, MINTREX® Zn (Mtx-Zn) and Zn-methionine (Zn-Met). The semi-purified basal diet contained 8.5 mg/kg (ppm) Zn and 10 ppm copper (Cu), to which Mtx-Zn or Zn-Met supplied up to 0, 15, 30, or 45 ppm total dietary Zn on an iso-nitrogenous, caloric and methionine-basis (seven treatments). Two additional treatments were added to the experiment by supplementing 250 ppm Cu from  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  in diets that contained a dietary Zn level of 30 ppm from either Mtx-Zn or Zn-Met. Broilers were fed the Zn-deficient basal diet for 7 d, and then fed the respective dietary treatments until 19 d. Performance, foot pad development, as well as tibia and hepatic mineral status were measured; tibia histology and foot pad scores were also evaluated. Data were analyzed by ANOVA; and pair-wise comparisons were made to determine if there was a difference in Zn sources at each level of supplementation. Broilers fed the Zn-deficient basal diet consistently had the poorest body weight gain, feed intake, feed conversion, percent tibia ash and tibia ash Zn, and foot pad score ( $p < 0.0001$ ). The addition of Mtx-Zn or Zn-Met resulted in a dose-dependent improvement in each of the latter parameters ( $p \leq 0.0001$ ). There was no difference in the efficacy of Zn sources when compared across the three levels of supplementation. Adding Cu at 250 ppm in the presence of 30 ppm Zn, however, reduced body weight gain ( $p = 0.0200$ ), tibia Cu ( $p = 0.0026$ ) and hepatic Cu ( $p = 0.0004$ ) in birds that consumed Zn-Met when compared to

birds consuming Mtx-Zn. These data indicate no difference in the bioavailability of the two Zn sources under standard laboratory battery cage conditions. However, data indicate greater bioavailability of Mtx-Zn in the presence of excess dietary Cu, the conditions under which one would expect improved bioavailability of a chelated trace mineral.

MINTREX® Zn is a trademark of Novus International, Inc. and is registered in the United States and other countries.

**Key Words:** MINTREX® Zn, Zinc methionine, Mineral antagonism

**W188 Use of enriched Selenium yeasts in laying hens diet: effects on production, metabolism, egg Se content and organ Se content.** G. Invernizzi\*, M. Ferroni, A. Agazzi, R. Rebutti, G. Savoini, A. Baldi, and V. Dell'Orto, *University of Milan, Milan, Italy*.

Sixty-four laying hens were assigned to four experimental treatments of 16 animals each allotted in cages per pair: C, control, SS, sodium selenite, Y1, treatment one, Y2, treatment two. All hens were fed the same basal diet (CP 18.30%, EE 6.03%, NDF 10.60%, Ca 3.34% on as-fed basis) without organic Se either than in the feedstuffs (C), plus 0.4ppm sodium selenite (SS), plus 0.4ppm of selenium and *S. cerevisiae* strain 1 (Y1), plus 0.4ppm of selenium and *S. cerevisiae* strain 2 (Y2) for eight weeks from starting laying. Productive performances were evaluate weekly, while egg samples for selenium content were collected on day 0, 18, 36 and 56 of laying period. Blood serum samples for metabolic profile (ALT, AST, ALP, NEFA, total protein, total bilirubin, albumin, cholesterol, glucose, urea content) and Se status were collected at slaughtering. Se organs content (liver, muscle, and skin) was determined on samples collected at slaughtering. No differences were detected on laying rate ( $P > 0.05$ ). Serum metabolites did not shown any statistical differences except for lower AST levels in Y1 (167UI/l) and in Y2 (170UI/l) than SS (249UI/l;  $P < 0.05$ ). Se egg content was significantly increased in Y1 and Y2 than C and SS (respectively: 1.6ppm, 1.4ppm, 0.5ppm and 0.9ppm on DM basis;  $P < 0.001$ ). Serum Se content was higher in Y1 and Y2 than other groups (Y1=0.33ppm, Y2=0.31ppm, C=0.15ppm, SS=0.21ppm on DM basis;  $P < 0.05$ ). In the same way liver Se content (Y1=1.92ppm, Y2=2.56ppm, C=1.36ppm, SS=1.65ppm;  $P < 0.01$ ), skin Se content (Y1=0.40ppm, Y2=0.43ppm, C=0.22ppm, SS=0.31ppm on DM basis;  $P < 0.05$ ), and muscle Se content (Y1=1.22ppm, Y2=0.94ppm, C=0.42ppm, SS=0.39ppm on DM basis;  $P < 0.05$ ) were higher in enriched Se yeast groups. The administration of Se enriched live yeasts in laying hens significantly increased the serum and organs Se content with no detrimental effect on productive performance.

**Key Words:** Selenium Yeast, Laying Hen, Sodium Selenite

**W189 Performance of alternative meat chickens for organic markets: Impact of genotype, methionine level, and methionine source.** A. C. Fanatico\*, T. O'Connor-Dennie, C. M. Owens, and J. L. Emmert, *University of Arkansas, Fayetteville*.

Synthetic forms of the amino acid methionine (MET) will be banned from organic poultry diets in the future under the USDA National Organic Program. For organic producers possible alternatives include the use of slow-growing genotypes, which may have lower MET

requirements, and feed formulations utilizing only intact protein sources of MET (no synthetic MET). Three genotypes with different growth rates (Slow, Medium, and Fast) were given a low-MET basal diet or diets containing intermediate or high MET levels that were formulated with or without synthetic DL-MET; thus 5 experimental diets were fed to each genotype. Digestible MET levels (for the low, intermediate, and high MET diets) were 0.30%, 0.36%, and 0.42% in the starter phase, 0.26%, 0.30%, and 0.34% in the grower phase, and 0.22%, 0.26%, and 0.30% in the finisher phase. Twenty male birds were randomly assigned to pens with 5 replicate pens per treatment. Slow, Medium, and Fast birds were raised to 77, 63, and 49 d of age, respectively, and placement of the different genotypes was staggered in order to process all birds on the same day. Carcass and parts yield were calculated from 5 birds from each replicate. Genotype had a significant impact on weight gain, feed intake, feed efficiency, and yield ( $P < 0.05$ ). The Fast birds had higher weight gain, feed efficiency, carcass and parts yield than slower-growing birds. Level of MET had a numerical but not significant impact on weight gain and feed efficiency. However, breast yield of all genotypes was affected by MET level, with higher breast yields from treatments with higher levels of MET ( $P < 0.05$ ). The Slow genotype had lower breast yield than Fast but higher wing and leg yield ( $P < 0.05$ ). Diet formulation without DL-MET (using intact-protein diets with higher crude protein levels) did not compromise growth or yield. These data exhibit the impact of genotype and MET level on performance of birds for organic markets, and demonstrate the use of intact-protein sources as an alternative to synthetic DL-MET.

**Key Words:** Organic, Methionine, Slow-Growing Poultry

**W190 Fractional protein synthesis rate in breast muscle and liver tissues of broiler breeder hens before and after sexual maturity based on using  $^{15}\text{N}$ -Phe, and LC-MS and GC-C-IRMS.** M. K. Manangi\* and C. N. Coon, *University of Arkansas, Fayetteville*.

Protein turnover is a continuous process of protein synthesis and degradation in the living system. The literature indicates that though whole body protein synthesis increases, the proportion of these proteins synthesized [i.e. the fractional synthesis rate (FSR),  $k_s$ ] each day declines. The main objective of this study was to measure  $k_s$  for breast muscle and liver tissues in broiler breeder hens at 22 wk (before laying) and 26 wk (after first egg) of age. One hundred, 20 wk old, broiler breeder hens (Cobb500) of uniform body weight were placed in individual breeder cages and fed following breeders' recommendation. Seven birds of uniform body weight were selected each sampling time. Birds were injected with a flooding dose of L-Phe solution (150mM, 38 atom percent excess [ $^{15}\text{N}$ ]Phe prepared from L-Phe ( $^{15}\text{N}$ , 98%+)) via wing vein at a rate of 10 mL/kg body weight. Plasma, muscle, and liver samples were collected after a 10 min isotopic incorporation period. Acid-soluble fraction, extracted in 2% (w/v) perchloric acid, containing free amino acids was separated from the protein precipitate, and the free and protein-bound Phe enrichment ratios ( $^{15}\text{N}:^{14}\text{N}$ ) were measured using LC-MS (High Performance Liquid Chromatography Mass Spectrometry) and GC-C-IRMS (Gas chromatography-Combustion-Isotope Ratio Mass Spectrometry), respectively. The results indicate a decline ( $P=0.1856$ ) in  $k_s$  from 38.96%/d at 22 wk to 32.84%/d at 26 wk for muscle and a significant ( $P<0.05$ ) increase in  $k_s$  from 79.65%/d at 22 wk to 106.36%/d at 26 wk for liver. In conclusion, the decline in  $k_s$  for muscle and increase in  $k_s$  for liver at sexual maturity shows that breeders are changing tissue protein

synthesis rate in conjunction with egg formation. A better understanding of breeder changes in breast muscle and liver FSR, protein degradation rates, and protein accretion may provide an opportunity to optimize the pullet rearing program, body composition, and breeder intake of nutrients for the purpose of increasing hatching egg production.

**Key Words:** FSR, Broiler Breeder Protein Degradation

**W191 Effects of methionine versus cystine supplementation on egg production parameters and feather quality in Bovan strain laying hens from 20 to 70 weeks of age.** S. E. Scheideler\*, P. Weber, and S. Shields, *University of Nebraska, Lincoln*.

A study was conducted to test the effects of sulfur amino acid supplementation from either methionine (M)(DL-methionine) or cystine (C) (from feather meal) on feather quality and egg production parameters in laying hens from 20 to 70 wks of age. Hens were fed 7 dietary treatments in three phases. Phase I was an 18% protein (P) basal diet with .33% M and .37% C. Diets 2-4 had added M to .38, .40 and .42 % M and diets 5-7 had .41, .44 and .45% C added to the basal C levels. Phase II was a 16 % P basal diet with .28% M and .32% C. Diets 2-4, had added M to .32, .33 and .34% M and diets 5-7 had .32, .36 and .42% added C. Phase III was a 15% P basal diet with .28% M and .35% C. Diets 2-4, had added M to .32, .34 or .37% M and diets 5-7 had .38, .40 or .43% C. Diets were isocaloric and formulated to meet Bovan strain nutrient intake recommendations. Diet significantly affected egg production (EP) during all 3 phases of the trial. During P I, hens fed the highest levels of M (.42%) or C (.45%) had greater EP compared to the other levels of M and C supplementation. This trend was continued through P II and III. However, the lower levels of M and C supplementation did not benefit EP above the basal diet levels of M and C. Egg weights (EW) were only significantly affected during P II, during which time hens fed the highest level of M (.34%) had the greatest EW, followed by hens fed .32% C. C and M supplementation during P III inconsistently improved EW. Feather scores (FS) were conducted every 2 wks during the trial using 2 different scoring systems; a method developed by Tauson and the scales used by Webster and Humik. Results indicate no sig effects of diet M or C on feather scores, but sig effects of age (Phase) on FS, with rapid deterioration of FS during P II and III of the study. In summary, FS is more controlled by age than diet M or C during the first cycle of EP from 20-70 wks of age.

**Key Words:** Feather Score, Methionine, Cystine

**W192 Comparison of various methods for endogenous ileal amino acid flow determination in broiler chickens.** A. Golian\*<sup>1</sup>, W. Guenter<sup>1</sup>, D. Hoehler<sup>2</sup>, and C. M. Nyachoti<sup>1</sup>, <sup>1</sup>*University of Manitoba, Winnipeg, MB, Canada*, <sup>2</sup>*Degussa Corporation, Kennesaw, GA*.

The purpose of this study was to compare estimates of ileal endogenous amino acid flow (IEAA) determined in broiler chicks with a nitrogen-free diet (NfD), diets containing intact casein or enzymatically hydrolyzed casein (EHC) and the regression method (RM). Male Ross broiler chicks were fed a commercial starter diet from d 1 to 15 of age and the following test diets from d 15 to 21: a NfD and diets containing 5, 10 or 15% casein or EHC as the sole protein source. All

diets contained chromic oxide as a digestibility marker. Each diet was assigned to six replicate cages, each with 10 birds. On d 21, birds were killed to sample ileal digesta. Compared with the NfD, the average IEAA values for the casein or EHC diets were higher ( $P < 0.05$ ) for all AA except for Arg, Phe and Pro whose values for casein and NfD diets were similar. The ileal flow of Met, Cys, Lys, Val and Ser in birds fed the casein or EHC diets were similar ( $P > 0.10$ ) but the flow of all other AA was higher ( $P < 0.05$ ) in EHC-fed birds than in those fed the casein diet. Feeding increasing levels of casein or EHC linearly ( $P < 0.01$ ) increased ileal AA flow. Estimates of IEAA obtained with the RM were similar ( $P > 0.10$ ) for all AA except for His (103 vs. 64 mg/kg DM) and Ser (418 vs. 577 mg/kg DM) whose values were higher and lower, respectively, for casein than for EHC ( $P < 0.05$ ). Compared with the NfD method, IEAA values obtained with the RM were similar for all AA except Met (69 vs. 77 mg/kg DM) with casein and Ile (209 vs. 321 mg/kg DM), Val (281 vs. 341 mg/kg DM) and Ser (357 vs. 577 mg/kg DM) with EHC that were higher ( $P < 0.05$ ). The present results show that IEAA values determined with NfD, EHC and casein diets are different for some AA and that, for most AA, values obtained with the NfD and the RM involving feeding graded levels of casein or EHC are comparable. Thus, using IEAA values obtained with either the NfD method or the RM to calculate standardized ileal AA digestibilities will give similar values.

**Key Words:** Ileal Endogenous Amino Acid Flow, Broilers

**W193 Ideal ratio of Arg, Ile, Met, Met + Cys, Thr, Trp, and Val relative to Lys for 28 to 34-week-old laying hens.** S. Roberts\*<sup>1</sup>, B. Kerr<sup>2</sup>, D. Hoehler<sup>3</sup>, and K. Bregendahl<sup>1</sup>, <sup>1</sup>Iowa State University, Ames, <sup>2</sup>NSRIC, USDA/ARS, Ames, IA, <sup>3</sup>Degussa Corporation, Kennesaw, GA.

Seven separate experiments were conducted with Hy-Line W-36 hens to determine the ideal ratio of Arg, Ile, Met, Met + Cys, Thr, Trp, and Val relative to Lys for maximal egg mass (EM). The experiments were conducted simultaneously and were each designed as a randomized complete block design with 60 experimental units (each consisting of 1 cage with 2 hens) and 5 dietary treatments. The 35 treatment diets were made from a common basal diet (2,987 kcal/kg ME; 12.3% CP), formulated using corn, soybean meal, and meat and bone meal. The true digestible (TD) amino acid contents in the basal diet were determined using the total fecal collection precision-fed assay with adult cecectomized roosters. Crystalline L-Arg, L-Ile, L-Lys, DL-Met, L-Thr, L-Trp, and L-Val (all considered 100% TD) were added to the test diets at the expense of cornstarch to make the respective test amino acid first limiting and to yield 5 graded inclusions of the test amino acid. Hens were fed the treatment diets from 26 to 34 wk of age, with the first 2 wk considered a depletion period. Egg production was recorded daily and egg weight was determined weekly on 48-h eggs; EM was calculated as egg production  $\times$  egg weight. The requirement for each amino acid was determined using the broken-line regression method and the ideal amino acid ratio was subsequently calculated. Consumption of Arg did not affect EM, thus an optimum ratio could not be derived. The daily TD amino acid requirements used to calculate the ideal amino acid ratio for maximum EM were 426 mg Ile, 538 mg Lys, 253 mg Met, 506 mg Met + Cys, 414 mg Thr, 120 mg Trp, and 501 mg Val. The ideal amino acid ratio for maximum EM was Ile 79%, Met 47%, Met + Cys 94%, Thr 77%, Trp 22%, and Val 93% on a TD basis relative to Lys.

**Key Words:** Ideal Amino Acid Ratio, Laying Hen, Egg Mass

**W194 Carcass yield of modern vs 1970's heritage broilers fed drug free recommended and low protein diets.** A. Golian\*<sup>2</sup>, T. A. Woyengo<sup>1</sup>, C. Bennett<sup>3</sup>, W. Guenter<sup>1</sup>, and H. Muc<sup>1</sup>, <sup>1</sup>University of Manitoba, Winnipeg, Manitoba, Canada, <sup>2</sup>University of Ferdowsi, Mashhad, Iran, <sup>3</sup>Manitoba Agriculture, Food and Rural Initiatives, Winnipeg, Manitoba, Canada.

Six hundred mixed sex day-old chicks from each of a modern (Ross, RS) and two 1970's heritage breeds (HB1 and HB2) broilers were randomly placed in 10 floor pens and fed two diets containing 3050 kcal ME/kg and either 22 or 19% crude protein (5 pens/diet/breed) from 1 to 30 d of age. All the birds were fed the diet containing 19% crude protein from 31 to 63 d of age. Comparisons of carcass yield cuts were carried out at 49 and 63 d of age. On the day of slaughter 10 birds from each pen were wing banded and deprived of feed at 4:00 AM, weighed at 8:00 AM, shipped and processed 9-10 h after feed removal. Carcasses were chilled on ice overnight, weighed and cut into parts. The level of dietary protein influenced ( $P < 0.01$ ) carcass yield and skinless breast fillet but not any other cuts at 49 d of age. Carcass yield of modern RS birds was greater ( $P < 0.01$ ) than for the HB1 and HB2 breeds (69.2, 65.8 and 65.6%, respectively). Skinless breast fillet as percent of carcass was 24.1, 18 and 17.5% for the RS, HB1 and HB2 breeds, respectively. Boneless skinless thighs were heavier ( $P < 0.05$ ) in RS vs. heritage breeds whereas thigh skin, thigh fat, drumsticks, wings and rack as a percent of carcass were smaller ( $P < 0.01$ ) for RS birds than the heritage breeds. A significant diet by breed interaction was only observed for carcass yield and breast fillet. At 63 d of age, diet had no effect ( $P > 0.05$ ) on carcass yield, however breast fillets were larger ( $P < 0.01$ ) for birds fed the 22% protein diet to 30 d of age. In general the breed response was the same as at 49 days. At 63 d of age carcass yield was significantly ( $P < 0.01$ ) greater for males than females whereas the opposite was true for breast fillet yield. Overall the modern day broiler is superior in carcass yield and breast fillet yield.

**Key Words:** Broiler, Breed, Carcass Yield

**W195 Performance and carcass parameters of broiler chicken from 1 to 45 d fed with different levels and source of vitamin D.** J. A. G. Brito<sup>1</sup>, A. G. Bertechini\*<sup>1</sup>, J. C. C. Carvalho<sup>1</sup>, R. L. Rios<sup>1</sup>, J. O. B. Sorbara<sup>2</sup>, and F. J. Piraces<sup>2</sup>, <sup>1</sup>Universidade Federal de Lavras, DZO, Lavras, MG, Brazil, <sup>2</sup>DSM Nutritional Products, Sao Paulo, SP, Brazil.

Different levels and source of vitamin D were investigated in this study. 1500 male Cobb 700 were allocated in 100 wire cages with feed and water ad libitum. Ten programs of vitamin D supplementation according to the broiler chicken age were study (1-21 d; 22-38 d and 39-45 d) with four levels of vitamin D (20-16-10; 37,5-30-18,75; 87,5-70-43,75 and 137,5-110-68,75 mg/ton) another two treatments were add with both source of vitamin D (D3 and 25(OH)D3) and two treatments with both source of vitamin D (50 D3 + 37,5 25(OH)D3; 40 D3 + 30 25(OH)D3; 25 D3 + 18,75 25(OH)D3 and 50 D3 + 70 25(OH)D3; 40 D3 + 56 25(OH)D3; 25 D3 + 35 25(OH)D3 mg/ton). The experimental design was a complete randomized in a factorial arrangement (4 levels of vitamin D supplementation according to the bird age and 2 source of vitamin D) plus two treatments (with both source of vitamin D) with 10 replications. The feed were base in corn/soybean meal without growth promoter and with 500 FTU/ton feed of phytase. Performance parameters as body weight gain (BWG, g), feed intake (FI, g), and feed conversion were analyzed from 1 to

45 d. Carcass yield, breast yield and leg yield were evaluated at 45 d of age. Feed intake and body weight gain were statistical higher for the treatments with combined source of vitamin D. Carcass yield was proximally 1% higher when the 25(OH)D3 were used compared to vitamin D3. Feed conversion, breast yield, and leg yield were not affected by the level or source of vitamin D.

**Table 1. Performance and carcass yield at 45d**

Source	Program/age	FI	BWG	Carcass Yield
D3	20-16-10	5322	3051	75.0
D3	37.5-30-18.75	5275	3054	73.9
D3	87.5-70-43.75	5286	3057	74.5
D3	137.5-110-68.75	5312	3078	74.5
Mean D3		5299	3060	74.5b
25(OH)D3	20-16-10	5302	3053	75.1
25(OH)D3	37.5-30-18.75	5291	3068	75.9
25(OH)D3	87.5-70-43.75	5305	3064	75.0
25(OH)D3	137.5-110-68.75	5325	3081	75.8
Mean 25(OH)D3		5306	3067	75.5a
D3+25(OH)D3	50+37.5; 40+30; 25+18.75	5369	3104	75.7
D3+25(OH)D3	50+70; 40+56; 25+35	5385	3123	75.7
Mean D3+25(OH)D3		5377a	3114a	75.7
Mean Factorial		5302b	3063b	75.0

**Key Words:** Vitamin, Performance, Carcass

**W196 Performance and bone characteristics of broiler chicken from 1 to 21 d fed with different levels and source of vitamin D.** J. A. G. Brito<sup>1</sup>, A. G. Bertechini<sup>\*1</sup>, J. C. C. Carvalho<sup>1</sup>, E. J. Fassani<sup>1</sup>, J. O. B. Sorbara<sup>2</sup>, and F. J. Piraces<sup>2</sup>, <sup>1</sup>Universidade Federal de Lavras, DZO, Lavras, MG, Brazil, <sup>2</sup>DSM Nutritional Products, Sao Paulo, SP, Brazil.

Different levels and source of vitamin D were investigated in this study. 1500 male Cobb 700 were allocated in wire cages with feed and water ad libitum. From 1 to 21 d four levels (800; 1500; 3500 and 5500 IU) of vitamin D were provided by two source of vitamin D (D3 or 25(OH)D3 known as HyD) another two treatments were add with both source of vitamin D 2000 IU by D3 + 1500 IU by Hy-D; and 2000 IU by D3 + 2800 IU by Hy-D. The experimental design was a complete randomized in a factorial arrangement (4 levels of vitamin D supplementation and 2 source of vitamin D) plus two treatments (with both source of vitamin D) with 10 replications. The feed were base in corn/soybean meal without growth promoter. Performance parameters as body weight gain (BWG, g), feed intake (FI, g), and feed conversion (FC, g/g) were analyzed from 1 to 21 d. Bone ash (%), calcium (%), phosphorus (%) and tibial dyschondroplasia (TD, %) were evaluated at 21 d of age. At 21 d-age the feed intake was affected just when the level of vitamin D was marginal with statistical higher feed intake with D3. The BW gain at 21 d were higher (P<0.05) when the two source of vitamin D were combined. The feed conversion at 21 d was statistical better when the highest levels of vitamin D were combined. The percentage of Ca on bone were statistical higher for 25(OH)D3 source just when the level of supplementation were between 25 and 37,5 mg of D3/ton feed. TD were lower (P<0.05) in the birds that received just Hy-D or when combined with D3.

**Table 1. Performance from 1 to 21 d-age and bone ash, calcium, and TD at 21d.**

Source	Level	FI	BWG	FC	Ash	Ca	TD
D3	20	1124a	804	1.40	52.1	19.3b	75
D3	37.5	1111	805	1.38	54.1	19.4B	75
D3	87.5	1112	813	1.37	54.3	20.2	58
D3	137.5	1123	821	1.37	54.4	19.8	50
Mean D3		1117	811b	1.38	53.8b	19.7	65b
HyD	20	1104b	806	1.37	53.4	20.1a	58
HyD	37.5	1115	810	1.38	54	20.2A	50
HyD	87.5	1113	811	1.37	54.1	20	42
HyD	137.5	1117	821	1.36	54.4	20.1	33
Mean HyD		1112	812b	1.37	54b	20.1	46a
D3+HyD	50+37.5	1146	823	1.39a	54.5	20.1	42
D3+HyD	50+70	1140	835	1.37b	54.1	20.2	50
Mean D3+HyD		1143	829a	1.38	54.3a	20.1	46

a, b; A, B (P<.05)

**Key Words:** Vitamin, Bone, Performance

**W197 Performance and carcass yield of four quail genetic groups selected for meat production.** C. Móri, E. A. Garcia, A. C. Pavan, A. Piccinin, C. C. Pizzolante, R. M. S. Emediato\*, A. B. G. Faitarone, M. R. Scherer, D. A. Berto, and S. A. Maestá, São Paulo State University, Botucatu, São Paulo, Brazil.

The study aimed to evaluate the performance and carcass yield of four meat quail genetic groups. It was used one thousand and two hundred quail of 1 day of age until it have complete 42 days of age. The birds were allocated in a completely randomized design with four treatments (A, B, C and D) and five replicates of 60 birds each. The quails were weighted once a week in order to evaluate weight gain and feed consumption. Mortality rate was recorded daily. When the birds have completed 42 days of age, ten quails from each replication were identified and slaughtered in order to evaluate carcass and cuts yield. During the experimental period, the genetic group C has shown higher values for final weight and daily weight gain. No differences were observed among groups for feed consumption, feed efficiency, mortality, carcass weight, carcass yield and breast percentage. Genetic group D has shown higher values for wings, legs and breast meat percentage. In conclusion, there are differences of performance and carcass and cuts yield among quail genetic groups selected for meat production present on Brazilian market.

**Key Words:** Cuts Yield, Meat Quail, Slaughter

**W198 Effects of genotype and plane of nutrition on performance and carcass composition of guinea fowl (*Numida meleagris*) broilers raised in the tropics.** V. Diaz\*, H. L. Santiago, and A. A. Rodríguez, University of Puerto Rico, Mayagüez, Puerto Rico.

Genetic selection of guinea stocks has improved production efficiency but studies directed to evaluate the nutritional requirements of new genotypes are limited. A total of 675 keets from three genotypes diverging in their genetic background; a native genotype (NG) and two commercial genotypes (CG1, CG2) were raised under three feeding regimes to market age. The three experimental diets provided a low



(LPN), intermediate (IPN), and a high (HPN) plane of nutrition based on the CP and ME of diets. Birds and feed were weighed at the end of the starter (35 d), grower (63 d), and finisher (84 d) periods to obtain body weight (BW), feed intake (FI), and feed conversion (FC). At 84d, 35 birds per treatment were randomly selected and processed to evaluate carcass composition. The weights of New York dressed (NYD), ready to cook (RTC), and fat pad (FP) were obtained and yields calculated as a percentage from live BW. A significant main effect of genotype for BW was found at 35, 63, and 84 d where both CG birds had similar but significantly heavier BW than NG birds. A significant effect of diet was observed at 35 and 84 d, where birds fed HPN diets had significantly heavier BW weights than those fed IPN and LPN diets. At all ages, CG1 and CG2 had similar but significantly lower FC compared to NG. However, no significant differences were

observed for FI. There was a significant genotype and plane of nutrition interaction where birds of the CG1 fed HPN and IPN diets and CG2 fed IPN diet had significantly heavier NYD and RTC weights. Carcass RTC yields of CG were significantly higher compared to NG birds. Guineas of the NG had significantly lower percentage of FP than both CG evaluated. Birds raised under a HPN and IPN regime had significantly FP yield than those raised under a LPN regime. This investigation confirms that genetic selection has made significant improvements on performance and carcass traits of guinea broilers. The results showed that improvements in performance traits and processing yields may be obtained when CG are raised under a HPN regime.

**Key Words:** Guinea, Genotype, Nutrition

## Physiology & Endocrinology - Livestock and Poultry: Reproductive Physiology

**W199 Influence of post-AI nutrition on blood urea nitrogen, progesterone, and pregnancy.** G. A. Perry\*, B. L. Perry, J. R. Nelson, and J. A. Walker, *South Dakota State University, Brookings.*

Research has shown that changes in nutrition can have an effect on reproductive performance. Our objective was to determine the effect of post-AI nutrition on BCS, blood urea nitrogen (BUN), progesterone, and pregnancy rates. Forage-developed Angus-cross heifers (n = 336) were synchronized with the Select Synch+CIDR protocol (d -7 100 µg GnRH and CIDR; d 0 25 mg PG and removal of CIDR; Estrus detected for 72 h and heifers bred 12 h after detection in estrus; heifers not in estrus were bred with an injection of GnRH at 72 h). Each breeding period was equally divided into three treatments: 1) heifers returned to feedlot (LOT), 2) heifers were moved to pasture (PASTURE), or 3) heifers were moved to pasture and supplemented with 2.22 kg/hd/d of dried distillers grains plus solubles (SUPP). Blood samples were collected on d -7, 0, 2, 14 and 42 (pregnancy determination; analyzed by repeated measures). BCS were determined on d -7 and 42. All heifers were in similar ( $P = 0.78$ ) BCS ( $5.4 \pm 0.05$ ) on d -7, but on d 42 SUPP ( $5.9 \pm 0.04$ ) were in greater condition ( $P < 0.01$ ) than LOT ( $5.8 \pm 0.04$ ) which were in greater condition ( $P < 0.01$ ) than PASTURE ( $5.4 \pm 0.04$ ). All treatments had similar ( $P > 0.14$ ) BUN concentrations on d -7 ( $129 \pm 1$ ), but on d 2, 14 and 42 SUPP had greater ( $P < 0.01$ ) BUN concentrations compared to both LOT and PASTURE. There was no difference in BUN concentrations between pregnant and open heifers ( $P = 0.37$ ). Progesterone concentrations were similar among all heifers ( $P \geq 0.05$ ) on d 0 and 2. SUPP had greater progesterone on d 14 ( $P = 0.02$ ) compared to LOT, and on d 14 and 42 PASTURE had greater progesterone ( $P < 0.02$ ) compared to LOT. Progesterone was similar ( $P > 0.16$ ) for open and pregnant heifers on d 0 and 2, but greater ( $P < 0.04$ ) in pregnant heifers on d 14 and 42. There was no difference among treatments in pregnancy rates ( $P > 0.64$ ; 57, 56, and 59% for SUPP, LOT, and PASTURE; analyzed by chi-square). In summary, supplementing forage-developed heifers after insemination increased BCS and BUN concentrations, but had no effect on pregnancy rates.

**Key Words:** Heifers, Fertility, Post-AI Nutrition

**W200 Effect of dietary  $\omega$ -3 polyunsaturated fatty acid supplementation on hormone and metabolite concentrations and corpus luteum size in beef heifers.** S. Childs\*<sup>1,2</sup>, J. M. Sreenan<sup>1</sup>, A. A. Hennessy<sup>3</sup>, C. Stanton<sup>3</sup>, M. G. Diskin<sup>1</sup>, and D. A. Kenny<sup>2</sup>, <sup>1</sup>Teagasc Animal Production Research Centre, Athenry, Co. Galway, Ireland, <sup>2</sup>University College, Dublin, Ireland, <sup>3</sup>Teagasc Moorepark Food Research Centre, Co. Cork, Ireland.

Supplementation of cattle diets with fishoil has been reported to improve fertility. Though the mechanisms involved remain unclear, it is thought that constituent  $\omega$ -3 polyunsaturated fatty acids ( $\omega$ -3 PUFA) eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids may mediate this effect. The objective of this study was to examine the effect of level of a high  $\omega$ -3 PUFA product on a number of important reproductive variables. Heifers (n=40) were randomly assigned to a concentrate and straw (80:20) based ration supplemented with one of four levels of a high  $\omega$ -3 PUFA product to provide on a DM basis: (1) 0g (C); (2) 62g (T2); (3) 129g (T3) or (4) 273 g (T4) of EPA and DHA combined. Diets were offered for 45 days and were isolipid and isonitrogenous. Heifers were oestrous-synchronised and plasma samples were collected to determine progesterone (P<sub>4</sub>) and oestradiol (E<sub>2</sub>) concentrations on day of oestrus (0) and on days 4, 7, 10, 14 and 16 post oestrus. Corpus luteum (CL) size was measured on day 7. Samples for fatty acids (FA) and cholesterol analysis were collected on day 16. FA methyl esters were separated by gas chromatography. P<sub>4</sub> and E<sub>2</sub> were measured by RIA. Data were analysed using repeated measures ANOVA. There was a positive linear effect of dietary  $\omega$ -3 PUFA on plasma EPA ( $P < 0.0001$ ) and both positive linear ( $P < 0.01$ ) and quadratic ( $P < 0.05$ ) components to the effect on plasma DHA. Plasma cholesterol was similar for C, T2 and T3, and higher ( $P < 0.05$ ) for T4 compared with C or T2. There was no effect of treatment ( $P > 0.05$ ) on E<sub>2</sub>. CL diameter was greater ( $P < 0.05$ ) on T3 and T4 than C or T2. On day 14, P<sub>4</sub> concentrations were higher on T4 than on C and T2 ( $P > 0.01$ ) but did not differ between other treatment comparisons ( $P > 0.05$ ). Omega-3 PUFA supplementation may increase P<sub>4</sub> concentrations around the critical period of maternal recognition of pregnancy. This increase may be mediated through increased substrate availability and/or CL size.

**Key Words:** Omega-3 PUFA, Reproductive Hormones, Fertility