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and soy oil) on the fatty acid composition of chicken muscles and, especially, to raise the content of long chain n-3 PUFA (EPA and DHA) to decrease the n-6/n-3 ratio in broiler carcasses. Furthermore, the effects of the different fatty acid sources on oxidation stability of broiler meat as indicated by malondialdehyde(MDA) levels should be investigated. The chickens were divided into sixteen dietary groups, 100 chickens in each, with five replicates (20 birds per replicate). Chickens were kept in floor system, in individual 80 pens (0.80 x 1.50), with controlled environment conditions. Birds were given access to water and diets ad libitum that were formulated adding 2, 4, 6 and 8 % fat to a basal diet. The research results indicated that the n-6/n-3 ratio was lowest for fish oil ( $p < 0.05$ ) and the PUFA level changed depending on the type of oil. In this study tissues from broilers fed with fish oil diets had a statistically higher lipid peroxidation level ( $p < 0.05$ ). This fact can be attributed to the polyunsaturated fatty acid content that is known to be very prone to oxidation. The results of the current study indicate that feeding a diet containing a fat source leading to a desired fatty acid composition of the resulting tissue might customize the fatty acid profiles of broiler tissues.

**Key Words:** Broiler, Omega 3/6 fatty acids, Chicken meat, Fish oil, Antioxidants

**171 Evaluation of the efficacy of a commercial hydrated sodium calcium aluminosilicate to reduce the toxicity of aflatoxin and ochratoxin in broiler chicks.** A. Casarin<sup>1</sup>, M. Forat<sup>1</sup>, E. Soto<sup>2</sup>, M. Contreras<sup>3</sup>, and D. Zaviezo<sup>3</sup>. <sup>1</sup>Instituto Internacional Investigacion Animal, <sup>2</sup>Avimex Labs., <sup>3</sup>Special Nutrients.

Two experiments were conducted to study the efficacy of a low inclusion commercial HSCAS (Myco-Ad) in preventing the deleterious effects of Aflatoxin B1 (AFB) and Ochratoxin A (OCA) in broiler chicks. Arbor Acres broiler males individually caged were used in both experiments. The feed was experimentally contaminated with synthetic AFB or OCA from Sigma Labs, USA. In Experiment 1, 96 4-day-old chicks were randomly assigned four dietary treatments with 24 replications each. T I was a sorghum-soybean meal control diet, T II control + 2.5 kg/mt Myco-Ad, T III control + 7.5 ppm AFB, and T IV control + 7.5 ppm AFB + 2.5 kg/mt Myco-Ad. At 24 days of age, birds fed 7.5 ppm AFB contaminated diet showed severe macroscopic liver lesions, higher mortality, lower body weight, poorer feed conversion, and higher liver weight than chicks fed the control diet. The addition of Myco-Ad significantly prevented the impaired performance (BW 609 v 447 g; FC 1.62 v 1.92) and the gross liver lesions observed in chicks fed AFB. In Experiment 2, 64 7-day-old chicks were randomly divided into four dietary treatments with 16 replications each. T I was a sorghum-soybean meal control diet, T II control + 2.5 kg/mt Myco-Ad, T III control + 2 ppm OCA, and T IV control + 2 ppm OCA + 2.5 kg/mt Myco-Ad. Feeding OCA contaminated diet plus Myco-Ad resulted in statistically significant heavier (770 v 706 g) and more efficient (FC 1.65 v 1.78) broilers, with markedly reduced macroscopic kidney lesions than those fed 2 ppm OCA at 28 days of age. In both experiments, the addition of 2.5 kg/mt of Myco-Ad to chick diets did not show any statistical difference in performance compared to the control diet, demonstrating its lack of interference with the absorption of nutrients. These results indicated that Myco-Ad at 2.5 kg/mt was effective in preventing the toxic effects of AFB and OCA in broilers chicks.

**Key Words:** Myco-Ad, Aflatoxin, Ochratoxin

**172 Effects of insect chitosan supplementation on the performance and egg quality of laying hens.** D. Wang<sup>1,3</sup>, S. W. Zhai<sup>1,2</sup>, and Y. N. Xu<sup>2</sup>. <sup>1</sup>College of Forest, Northwest Sci-Tech University of Agriculture and Forestry, <sup>2</sup>College of Animal Science, Zhejiang University, <sup>3</sup>Institute of Applied Entomology, Zhejiang University.

A three months experiment was conducted to evaluate the effects of insect chitosan on the performance and egg quality of laying hens. 480 Hy-line Brown layers of 31-wk-old were randomly distributed into five experimental groups (96 birds per group) and fed rations containing 0 (controls), 1, 5, 10 and 20 g insect chitosan / kg diet. Each treatment consisted of four replicates of 24 birds. Chitosan was prepared from field cricket *Gryllus testaceus* that were harvested in Guanzhong district Shannxi province in China. Egg production and egg weights were checked daily. Feed consumption and feed conversion were determined weekly. Eggs laid in the last day of experiments period were collected and subjected to individual analysis for cholesterol percentage of yolk, Haugh units and yolk color. The main results were summarized as follows. Compared with the controls, the egg production increased 4.36% ( $P < 0.1$ ) and the

cholesterol percentage of yolk decreased 15.86% ( $P < 0.05$ ), while 1% insect chitosan was supplemented. Average egg weight, yolk, Haugh units and yolk color, feed intake and body weight gain were not affected significantly ( $P > 0.05$ ) by insect chitosan. The results indicated that a 1% insect chitosan supplementation to laying hens could improve the egg production and decrease the cholesterol percentage of yolk.

**Key Words:** Insect chitosan, Laying hen, Performance, Egg quality

**173 Effects of alfalfa based molt diets on cortical, cancellous and medullary bone qualities using pQCT.** W. K. Kim<sup>1</sup>, L. M. Donalson<sup>1</sup>, J. L. Stallon<sup>2</sup>, S. A. Bloomfield<sup>2</sup>, L. F. Kubena<sup>3</sup>, D. J. Nisbet<sup>3</sup>, and S. C. Ricke<sup>1</sup>. <sup>1</sup>Department of Poultry Science, Texas A & M University, <sup>2</sup>Department of Health and Kinesiology, Texas A & M University, <sup>3</sup>USDA-ARS, Southern Plains Agricultural Research Center.

A study was conducted to evaluate effects of alfalfa based molt diets on bone qualities using peripheral Quantitative Computed Tomography (pQCT). A total of 36 Single Comb White Leghorn hens (approximately 84 wk of age) were used for this study. There were six treatments: pre-laying control (PC), full fed (FF), feed withdrawal (FW), A90 (90% alfalfa/10% layer ration), A80 (80% alfalfa/20% layer ration), and A70 (70% alfalfa/30% layer ration). For the PC, hens were euthanized by CO<sub>2</sub> gas, and femurs were collected before molt started. At the end of the 9-day molt period, hens were euthanized, and femurs were collected to evaluate bone qualities using pQCT (Stratec XCT Research-M). Three slices 13 mm apart were scanned at the midshaft of femur and 2 slices 1.5 mm apart scanned 12 mm from the distal end. Scanning resolution was 70 microns. Total bone densities of the PC (553 mg/cm<sup>3</sup>) and FF (540 mg/cm<sup>3</sup>) were higher than the FW (457 mg/cm<sup>3</sup>) and A90 (460 mg/cm<sup>3</sup>) ( $P < 0.05$ ). There were no significant differences in total bone density among the PC, FF, A80 (492 mg/cm<sup>3</sup>), and A70 (483 mg/cm<sup>3</sup>). Medullary bone density of the PC (225 mg/cm<sup>3</sup>) were significantly greater than other treatments. The medullary bone densities of the A90 (87 mg/cm<sup>3</sup>), A80 (120 mg/cm<sup>3</sup>), and A70 (107 mg/cm<sup>3</sup>) fell between values for the FF (162 mg/cm<sup>3</sup>) and FW (72 mg/cm<sup>3</sup>) groups. There were not significant differences in cortical bone densities, total, cortical, medullary bone areas, and cortical thickness among the treatments. Cancellous bone densities of the PC (287 mg/cm<sup>3</sup>) and FF (220 mg/cm<sup>3</sup>) groups were significantly higher than the FW (136 mg/cm<sup>3</sup>) and A90 (126 mg/cm<sup>3</sup>) while there were no significant differences among the FF, A80 (166 mg/cm<sup>3</sup>), and A70 (158 mg/cm<sup>3</sup>) groups. These results suggest that medullary and cancellous bones are labile components of hen bones for bone resorption during molting, and alfalfa-based molt diets reduce medullary and cancellous bone resorption, decreasing overall bone loss during molting.

**Key Words:** Alfalfa based molt diets, pQCT, Cortical bone, Cancellous bone, Medullary bone

**174 A practical method for induced molting of caged layers that combines full access to feed and water, dietary L-thyroxine or thyroactive protein, and short day length.** R. F. Wideman, Jr.<sup>1</sup>, W. J. Kuenzel<sup>1</sup>, M. E. Chapman<sup>1</sup>, C. Golden<sup>1</sup>, and D. M. Hooge<sup>2</sup>. <sup>1</sup>Center of Excellence for Poultry Science, University of Arkansas, <sup>2</sup>Hooge Consulting Service, Inc.

Levothyroxine (L-thyroxine; T4) rises in the circulation of caged laying hens during 10-d feed withdrawal molt and is associated with cessation of egg production (EP), feather loss, and BW reduction. McDonald's, AVMA, and the egg consuming public increasingly consider feed withdrawal unacceptable. With a grant from United Egg Producers (Alpharetta, GA), 4 small-scale caged Hy-Line W-36 laying hen trials were conducted in 2 rooms to confirm the effect of injected T4, to examine the interaction of feed additive T4 with photoperiod (17 vs 8 h), and to evaluate iodinated casein with T4 activity as a feed additive to induce molt. In Exp. 1, daily (1330 h) i.m. injection of L-thyroxine-Na pentahydrate (0, 250, 500, or 1,000 µg/kg BW) to 50 60-wk-old hens (24° C, 17 h light) resulted in EP after 7 d of 80, 30, 5, and 0% (with 15 to 25% BW loss). Additionally, 2,000 to 4,000 µg/kg BW T4 daily injected hens had 0% EP by d 5 and 6, respectively. Oviducts and ovaries regressed in T4 groups. Feather loss in T4 groups began after 9 d and virtually all were shed in 7 to 10 d more. Feed intake decreased with increasing T4. In Exp. 2, 60 101-wk-old hens molted at 55 w were fed diets with 0, 10, 20, or 40 ppm T4 (L-thyroxine-Na pentahydrate; 24° C, 17 h light) for 6 or 10 d. No mortality occurred. The hens fed 40 ppm T4 shed most

feathers in 7 to 10 d, reached 0% EP in 10 d, lost 21% BW, had decreased % shell (6.6 vs 8.6% in control), but egg weight was unaffected. In Exp. 3, 90 96-wk-old hens molted at 80 wk were fed diets with 0, 20, or 40 ppm T4 for 10 d and given 17 or 8 h light. The 8 hr light decreased feed and T4 intake, weakening the response. In Exp. 4, iodinated casein prepared in the lab (T4 not assayed) induced molting with the same qualitative results as pure T4. A successful, patent pending T4 molting method was developed.

**Key Words:** Iodinated casein, Laying hen, Molt, T4, Thyroxine

**175 Results of commercial laying hen field trials using dietary *Bacillus subtilis* C-3102 spores (Calsporin®) with emphasis on egg shell quality.** D. M. Hooge<sup>\*1</sup>, M. Kato<sup>2</sup>, and K. Nishimura<sup>3</sup>, <sup>1</sup>Hooge Consulting Service, Inc., <sup>2</sup>Calpis Company, Ltd, <sup>3</sup>Quality Technology International, Inc. (QTI).

*Bacillus subtilis* C-3102 spores (Bs), in direct-fed microbial Calsporin®, are added to poultry feeds to maintain normal intestinal microflora and support live performance. The proposed mode of action is that Bs spores vegetate and use oxygen, creating a more anaerobic condition which promotes proliferation of lactic acid producing bacteria (e.g., Lactobacilli). Besides inhibiting certain pathogens (E. coli, Salmonella), this condition appears to increase utilization of calcium. U.S. Patent 6,660,294 (Dec. 9, 2003) was awarded to this "Poultry Eggshell Strengthening Composition", and trials cited in the patent application showed +5.2% average shell thickness improvement. Caged Hy-Line W-36 hen field trials were conducted in the U.S. midwest with 0 or 0.003% Bs spores (Calsporin®, 0.05% level) in feed, and microbes in fresh feces and egg breaking strength (EBS) or shell thickness (60 eggs/sampling) were determined. In Exp. 1 (140,000 hens/flock) at Site 1 (57 wk old), EBS was 3.26 kg (5 wk, 8 samplings) "before" and 3.33 kg (7 wk, 9 samplings) "during" Bs addition, with 3.20 kg expected (linear regression); est. +0.13 kg with Bs. At site 2 (94 wk old, molted), EBS was 3.08 kg (8 wk) "before" and 3.23 kg (7 wk) "during" ( $P < 0.01$ ), with 3.09 kg expected; est. +0.14 kg increase. In Exp. 2 (84,230 hens; 57 wk old), shell thicknesses in microns were: "before" 321 (5 wk), "during" 331 (7 wk), "Bs removed" 313 (2 wk), and "added again" 324 (9 wk). In some fecal samples prior to Bs supplementation, Lactobacilli/Total Anaerobes (cfu Log10/g) ratio was considerably below 50%, the desirable threshold level. The Bs improved shell quality.

**Key Words:** Bacillus subtilis, Calsporin, Direct-fed microbial, Laying hen, Shell quality

**176 Enhancement of pre- and post-hatch development of turkeys by in ovo feeding.** P. Ferket<sup>\*1</sup>, Z. Uni<sup>2</sup>, and O. Foye<sup>1</sup>, <sup>1</sup>North Carolina State University, <sup>2</sup>Hebrew University of Jerusalem.

The pre- and post-hatch period is critical for the development of turkeys because they have limited body reserves to fuel the hatching process and sustain them until they are adapted to utilizing external dietary nutrients. During this critical period, mortality may exceed 5% because of poor energy status, and they are highly susceptible to enteric disease. These problems may be alleviated by in ovo feeding, which administers exogenous nutrients into the amnion of turkey embryos at 22-23 days of incubation. Since the amniotic fluids are swallowed prior to pipping, the in ovo feed components may stimulate development to occur earlier than in conventional poults. Several experiments were conducted to test our hypothesis. In each experiment, eggs were injected with 1.5 to 2 ml saline in ovo feeding solutions into the amnion at 23 days of incubation and compared with controls (100 eggs/treatment). In experiment 1, 2 ml of the in ovo feeding solution, containing carbohydrates (maltose, sucrose, and dextrin), resulted in a 7.5% increase in body weight at hatch over controls (71.4 vs 66.4,  $P < .01$ ); however, this positive effect was not sustained past 3 days post-hatch. In experiment 2, the in ovo feed, containing egg white protein, increase body weight at hatch through until 12 days post-hatch by about 4% over controls. In experiment 3, 1.5 ml in ovo feed, containing egg white protein or dextrin, increased hatch weight by 6% and 7.5% ( $p < .05$ ), and increased breast muscle weight relative to body size by 22% over controls (3.3 vs 2.7% of body weight,  $p < .05$ ) and 11% (3.0% vs 2.7% of body weight), respectively. In ovo feeding of protein increased total liver glycogen by 158% at hatch and 56% at 7 days post-hatch ( $P < .05$ ). In contrast, in ovo feeding carbohydrates increased liver glycogen by 29% at hatch and 57% ( $p < .05$ ) at 7 days post-hatch.

These results demonstrate that the enhanced development by in ovo feeding can improve early growth and energy status of poults. In ovo feeding saline solutions containing egg white protein helped sustain the positive effects during the post-hatch period.

**Key Words:** In ovo nutrition, Turkeys, Body weight, Glycogen, Breast muscle

**177 Evaluation of the efficacy of a commercial hydrated sodium calcium aluminosilicate to reduce the toxicity of toxin T-2 in broiler chicks.** A. Casarin<sup>1</sup>, M. Forat<sup>1</sup>, E. Soto<sup>2</sup>, B. Fazekas<sup>3</sup>, J. Tanyi<sup>3</sup>, and D. Zaviezo<sup>\*4</sup>, <sup>1</sup>Instituto Internacional Investigación Animal, <sup>2</sup>Avimex, <sup>3</sup>Institute Veterinary Medicine, <sup>4</sup>Special Nutrients.

Two experiments were conducted to study the efficacy of a low inclusion commercial HSCAS (Myco-Ad) in preventing the deleterious effects of Toxin T-2 (T-2) in broiler chicks. Feed in both experiments was experimentally contaminated with synthetic T-2 from Sigma Labs, USA. In Experiment 1, 75 1-d-old Arbor Acres straight-run broilers individually caged were randomly distributed into three dietary treatments with 25 replications each. T I was a corn-wheat-soybean meal control diet, T II control + 1 ppm T-2, and T III control + 1 ppm T-2 + 2.5 kg/mt Myco-Ad. At 40 d of age, birds fed 1 ppm T-2 contaminated diet showed significant lower body weight, poorer feed conversion, smaller bursa and severe macroscopic oral lesions than chicks fed the control diet. The addition of Myco-Ad significantly prevented the impaired performance (BW 1840 v 1381 g; FC 2.02 v 2.12), bursa damage and the severe oral lesions observed in chicks fed T-2. In Experiment 2, 32 5-d-old Ross male chicks were randomly divided into four dietary treatments with 8 replications each. T I was a sorghum-soybean meal control diet, T II control + 2.5 kg/mt Myco-Ad, T III control + 1.25 ppm T-2, and T IV control + 1.25 ppm T-2 + 2.5 kg/mt Myco-Ad. Feeding T-2 contaminated diet plus Myco-Ad resulted in statistically significant heavier (1837 v 1563 g) and more efficient (1.89 v 2.19) broilers, with substantially reduced gross oral lesions and microscopic organs lesions (tongue, gizzard, thymus, bursa, spleen, liver, kidney) than those fed 1.25 ppm T-2 at 38 d of age. The addition of 2.5 kg/mt of Myco-Ad to chick diets did not show any statistical difference in performance and bone ash compared to the control diet, demonstrating its lack of nutrients absorption. These results indicated that Myco-Ad at 2.5 kg/mt was effective in preventing the toxic effects of T-2 in broilers chicks.

**Key Words:** Myco-Ad, Toxin T-2

**178 Effect of egg yolk antibodies on broiler performance.** J. S. Moritz<sup>1</sup>, A. S. Parsons<sup>1</sup>, N. P. Buchanan<sup>1</sup>, and J. L. Pimentel<sup>\*2</sup>, <sup>1</sup>West Virginia University, <sup>2</sup>Anitox Corp.

Past research has demonstrated that antibiotic feeding decreased urease and ammonia concentration in the gastro-intestinal tract and improved animal performance because less ammonia needed to be "detoxified" therefore saving energy for growth. Also under-processed soybean meal contains the anti-nutritional factor trypsin inhibitor. The objective of this study was to determine the effect of feeding egg-yolk antibodies against urease in combination with antibodies against soybean trypsin inhibitor. The antibodies were collected from the eggs of hyper-immunized Leghorn hens and fed to broilers as spray dried whole egg. A total of 2016 day-old straight run broilers were randomly assigned to 4 treatments. Each treatment was fed to a pen of 21 broilers and replicated 24 times. The treatments were 1) Control, 2) Control plus 50 mg BMD (bacitracin methylene disalicylate) /kg diet, 3) Control plus 100 mg anti-urease antibody/kg diet plus 100 mg anti-trypsin inhibitor antibody/kg diet and 4) Control plus 150 mg anti-urease antibody/kg diet plus 100 mg anti-trypsin inhibitor antibody/kg diet. Three-week body weight was significantly improved in the antibodies and antibiotic fed groups when compared to the control. In addition, 0-to-3-wk feed conversion (feed/gain) was significantly improved compared to the control when broilers were fed the combination of 150 and 100 mg/kg anti-urease and anti-trypsin inhibitor respectively. Overall 0-to-6-wk performance showed a numerical improvement in body weight (+2.4%) and feed conversion (3.5 points improvement) when broilers were fed the combination of 150 and 100 mg/kg anti-urease and anti-trypsin inhibitor respectively. Thus, the use of egg-yolk antibodies appears to be beneficial to broiler performance particularly in the starter feed.

**Key Words:** Egg yolk antibodies, Urease, Trypsin inhibitor, Growth, Feed conversion