P444  Comparing dual-energy absorptiometry (DXA) to ashing for evaluating early bone mineralization of the duck skeleton. Z. Ingersoll* and N. P. Johnston, Brigham Young University, Provo, UT.

Dual energy absorptiometry (DXA) is used extensively to analyze the bone mineral status of humans and is becoming a more valuable instrument in small animal mineral analysis. We hypothesized that it would provide accurate results of progressive duck skeletal mineralization. To test the hypothesis the present study was designed to compare the late embryonic and the early post hatching mineralization of the Rouen duck skeleton using ashing or DXA to determine the mineral content (BMC). Thirty-nine Rouen ducklings were divided into groups of 3 for mineral analysis at 12, 15, 17, 20 and 25 d of embryonic development (ED) and 1, 3, 5, 6, 8, 9, 10 and 11 d post-hatch (PH). They were first scanned on a GE DXA scanner and subsequently dried and the whole body ashed at 650°C for 24-h. We assumed that ashing the bird provided the most accurate level of body mineralization or the standard and compared DXA results to that standard. Contrary to our hypothesis DXA consistently underestimated (P < 0.05) BMC from by as little as 52% at hatching to as much as 106% post-hatch; however, the DXA results tended more accurately reflect changes in BMC before hatching. The greatest % incremental increase (608%) in skeletal BMC occurred between 12th and 15th days ED and gradually diminished to 87% from d-20 to d-25 ED with a subsequent surge (138%) from d-25 to hatching and reaching a low point of 11% PH between d-3 and d-5. From that point forward there was a gradual increase to 37% at d-11. Ashed-tibias, long-bone mineralization, increased (P < 0.05) in BMC from hatching (32.8 mg) to 64.9, 93.0 and 127.3 mg (d-6, d-9, d-11). DXA proved not to be an accurate tool for evaluating the mineralization of post-hatched ducklings. The greatest % incremental increase in mineralization in the duck embryo occurred between d-12 and d-15 of development likely related to the shift in embryo mineral source from the yolk to the shell.

Key Words: mineralization, duck, skeleton, DXA, ash


Selenium is an essential element in spermatogenesis and male fertility. Selenium deficiency can lead to decreased number of sperm, decreased sperm motility and decreased ability of the sperm to fertilize the oocyte. In this study using ejaculate from Single Comb White Leghorn roosters, spermatozoa viability was evaluated to determine whether it was affected by rooster supplementation with inorganic selenium (sodium selenite; SS), or organic, yeast-derived selenium (Sel-Plex, Alltech Inc.; SP). At 22 wk of age roosters were randomly assigned to 3 treatment groups: Torula yeast low-Se diet (control, C); control diet + 0.3 ppm Se as SS; or control diet + 0.3 ppm Se as SP. At 57 wk and 71 wk of age ejaculate was taken from each rooster and stained using a nigrosin/eosin mixture. Sperm were imaged with a microscope and viable and non-viable sperm were enumerated. At 71 wk of age testes were removed, cut longitudinally, scored and exudates collected. RNA was extracted from the exudates and reverse transcribed to cDNA; gene expression levels were measured using real-time PCR. The genes of interest were Selenoprotein 1 (SEL1) and Glutathione Peroxidase 4 (GPX4); both antioxidant genes play a role in fertility. Sperm viability in birds 57 wk of age did not differ between treatments. At 71 wk of age, the number of dead sperm was greater in C roosters compared with those fed SS or SP diets (P = 0.04.) The percent of dead sperm tended to be greater for 71 wk-old birds fed C compared with those fed SS or SP (P = 0.08). Overall the percent of dead sperm was lower for 57 wk–old birds compared with 71 wk–old birds (P ≤ 0.01). Gene expression of GPX4 did not differ between diets. Gene expression of SEL1 was greater in SS supplemented birds (P = 0.03) and tended to be greater in sperm from SP-supplemented birds compared with control birds (P = 0.11.) These data indicate that Se supplementation has a protective effect on sperm viability in older roosters.

Key Words: selenium, sperm, gene expression, roosters


Parthenogenesis is the spontaneous embryonic development of an unfertilized egg that occurs in turkeys, chickens, and Chinese Painted quail. Recently it has been reported that albumen pH, gas exchange, and ion concentrations are different in eggs exhibiting unorganized parthenogenetic development at 10 d of incubation (DOI) as compared with unfertilized Chinese Painted quail eggs with no embryonic development. Therefore, the objective of this study was to determine changes in albumen pH, gas, and ion concentrations due to parthenogenesis on each of the first 12 DOI. Chinese Painted quail hens (137) were separated from males and individually caged before sexual maturity. Eggs were collected daily, stored for 0 to 3 d at 20°C and incubated at 37.5°C for 1 to 12 DOI before being broken open for analysis. Unfertilized eggs were examined from 0 through 12 DOI for the occurrence of embryonic development as well as albumen pH, O₂, CO₂, Ca²⁺, Na, and Cl concentrations. Eggs exhibiting parthenogenesis had lower albumen pH, O₂, and Cl concentrations yet higher CO₂, Ca²⁺, and Na concentrations over the entire length of incubation as compared with eggs with no parthenogenetic development. As incubation progressed, eggs that did not contain parthenogens exhibited decreasing O₂ concentrations, yet pH, Ca²⁺, and Cl concentrations increased. However, as the length of incubation increased in eggs containing parthenogenetic development, pH, O₂, and CO₂ concentrations decreased, yet Ca²⁺ increased much more rapidly over incubation than in eggs with no development. Interestingly, as parthenogen size increased, the concentration of CO₂ in albumen also increased, yet pH and O₂ decreased. This would suggest that some parthenogens may be viable even though normal embryonic differentiation has not occurred. In conclusion, eggs exhibiting parthenogenetic development continue to alter albumen pH, gas exchange, and ionic composition as incubation increases when compared with eggs with no parthenogenetic development.

Key Words: parthenogenesis, albumen, pH, ion concentrations, gas
Stable isotopes technique is being used as a tool for animal metabolism comprehension. In this study the natural variation of carbon-13 existent between C1, and C3 plants was used to evaluate the blood plasma turnover from 3 colonial broiler lineages. Sixty hundred one day old chicks from 3 colonial broilers breed (Label Rouge, Vermelho Pesado, Master Griss) were housed in the chicken barn of the School of Veterinary Medicine and Animal Science, Botucatu Campus. Birds were distributed in 3 groups. The first group (G1) received a diet predominantly consisted of C4 diet was replaced by C3 diet at 7 d old and the second group (G2) C4 diet was replaced by C3 diet at 7 d old and the third group (G3) at 14 d old. The weekly substitution of diets allowed evaluating the turnover during the whole studied period. Blood plasma samples were collected from 4 random birds per group in consecutive days (G1: zero to 21 d old; G2: 7 to 35 d old; G3: 14 to 49 d old) for carbon isotopic rate through mass spectrometry analysis. The isotopic rate were analyzed through the first-order exponential equation of OriginPro 8 Professional software which enables the calculation of the half-life of carbon-13 (Ducatti et al., 2002). Blood plasma from Label Rouge, Vermelho Pesado and Master Griss lineage showed a calculated carbon half-life of 1.42, 1.26 and 1.09 d (G1); 1.96, 1.13 and 1.02 d (G2); 1.64, 1.49 and 1.20 (G3), respectively. Master Griss lineage had the major blood plasma metabolic turnover in all periods.

**Key Words:** carbon-13, half-life, turnover, lineages

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**P449 Expression of potential adipocyte regulator FGFR3, GREM1, and IGFBP2 during early development in abdominal adipose tissue of broiler chickens.** A. Bohannon-Stewart,* G. Kelley, J. Donkor, B. Kimathi, C. Darris, J. Tyus, S. Nahashon, and X. Wang, Tennessee State University, Nashville.

Adipose tissue not only stores excess energy but also actively regulates feed intake and metabolism. To dissect physiological networks that govern the development of adiposity, we have previously screened gene expression profile in abdominal adipose tissue and identified FGFR3, IGFBP2 and GREM1 as potential regulatory factors for fat deposition in broiler chickens. These genes displayed substantial differential expression between fat and lean chickens. It is of interest to assess the ontogeny of these genes and their responses to dietary caloric concentration during early development. One-day-old broiler chicks were fed either a low or a high caloric diet from hatch to 8 weeks of age (WOA). The low caloric diet (LCD) contained 21% crude protein (CP) and 3,040 kcal of metabolizable energy (ME)/kg of diet and the high caloric diet (HCD) contained 23% CP and 3,340 kcal ME/kg of diet. Differences in dietary caloric content markedly affected bodyweight of the broiler birds. The mRNA abundance of the FGFR3, IGFBP2, CCL4, and GREM1 genes in the abdominal adipose tissue was assayed at 2, 4, 6 and 8 WOA using RT-qPCR. Preliminary data from the RT-qPCR assays indicate that the expression of FGFR3, IGFBP2, and GREM1 was not affected by changes in dietary caloric concentration. Their expression levels were also not changed in abdominal fat tissues during development from 2 to 8 WOA.

**Key Words:** broiler chicken, adipocyte, IGFBP2, GREM1, FGFR3

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**P450 Loss of fat tissue with increased lipolysis in laying quail.** S. Yang, Y. Suh, Y.-M. Choi, S. Shin, and K. Lee,* The Ohio State University, Columbus.

Accumulation of lipids in poultry eggs generally require the participation of tissues involved in lipid metabolism in producing and transporting lipids to the developing oocytes. The goal of the current study is to investigate changes in expression of genes and proteins involved in lipid metabolism in the adipose and liver at pre- (45-d without yolk), onset (45-d with yolk), and active (80-d) laying stages of quail (6 per group) and to relate with physiological changes required for lipid accumulation in the eggs. Decreased fat mass by 60% (P < 0.05) in the active laying quail, compared with the onset of laying quail, is largely resulted from the decrease in adipocyte cell size (P < 0.001). Further analysis of the relative amount of genes and protein involved in lipolysis revealed that adipocyte triglyceride lipase (ATGL), not only has higher protein expression, but a higher level of phosphorylation in adipose tissue of the active laying quail. In addition, relative amounts of transcripts of comparative gene identification-58 (CGI-58), an activator of ATGL, were significantly higher (P < 0.05) in adipose tissue of actively laying...
The stable isotope technique has been applied in physiological research increasingly, showing as a promising alternative for studies of processes related to digestion, absorption and nutrients metabolism in animals, as well as in the traceability of animal origin ingredients in the broiler feeding. However, complementary studies are necessary to broaden the knowledge of isotopic assimilation in avian tissues. To determine the turnover of blood serum of broiler chicks at the initial growth phase through the natural variation of carbon-13 existent between C3 and C4 plants 100 one-day-old male Cobb chicks were used. At birth, the isotopic signature of carbon-13 of bird tissues was used. Since birds were housed, they received diets containing predominantly C3 plants (based on corn). Since birds were housed, they received diets containing predominantly C3 plants (based on rice) to evaluate the turnover of broiler plasma. Blood plasma samples were collected at 0, 0.5, 1, 1.5, 2, 3, 5, 7, 9, 11, 14, 17 and 21 d old (5 birds/day) to determine the isotopic ratio of carbon by mass spectrometry (IRMS). The data of isotopic ratio were linearized using the method of Cerling et al. (2007) being observed only one metabolic pool. Then, obtained isotopic ratios were analyzed through the first-order exponential equation $\delta^{13}C = -26.31‰ + 7.22‰ \times e^{-0.3435t}$ (r² = 0.96), with a half-life (ln2/k) of 2.02 d, namely about 50% of the blood plasma turnover in initial phase occurs in 2 d.

Key Words: development, enhancement, metabolism, tracers

The use of stable carbon isotopes for estimating turnover of blood serum in broiler chickens. C. Ducatti1,2, V. C. Pelícia1, A. C. Stradiotti1, P. C. Araujo2, E. T. Silva2, M. M. P. Sartori1, C. R. S. Kruliski1, J. C. Denadai1, J. R. Sartori1, and A. C. Pezzato3 São Paulo State University, School of Veterinary Medicine and Animal Science, Botucatu Campus, Botucatu, SP, Brazil, 2São Paulo State University, Institute of Bioscience, Botucatu, SP, Brazil, 3F APESP, São Paulo, Brazil.

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The use of stable carbon isotopes for estimating turnover of blood serum in broiler chickens. C. Ducatti1,2, V. C. Pelícia1, A. C. Stradiotti1, P. C. Araujo2, E. T. Silva2, M. M. P. Sartori1, C. R. S. Kruliski1, J. C. Denadai1, J. R. Sartori1, and A. C. Pezzato3 São Paulo State University, School of Veterinary Medicine and Animal Science, Botucatu Campus, Botucatu, SP, Brazil, 2São Paulo State University, Institute of Bioscience, Botucatu, SP, Brazil, 3F APESP, São Paulo, Brazil.

Distinct stable isotopes have been used as tracers in organs and animal diet showing a great potential for the traceability of animal ingredients in poultry feeding through the evaluation of broiler tissues. However, it is necessary to broaden the knowledge of isotopic assimilation in avian tissues. To determine the blood plasma turnover of broiler chicks at the initial growth phase through the natural variation of carbon-13 existent between C3 and C4 plants 100 one-day-old male Cobb chicks were used. At birth, the isotopic signature of carbon-13 of bird tissues was similar to their female broiler breeders which consumed a diet containing predominantly C3 plants (based on corn). Since birds were housed, they received diets containing predominantly C3 plants (based on rice) to evaluate the turnover of blood plasma. Blood plasma samples were collected at 0, 0.5, 1, 1.5, 2, 3, 5, 7, 9, 11, 14, 17 and 21 d old (5 birds/day) to determine the isotopic ratio of carbon by mass spectrometry (IRMS). The data of isotopic ratio were linearized using the method of Cerling et al. (2007) being observed only one metabolic pool. Then, obtained isotopic ratios were analyzed through the first-order exponential equation $\delta^{13}C(t) = \delta^{13}C(i) + [\delta^{13}C(i) - \delta^{13}C(f)]e^{-kt}$ of Minitab software resulting in the equation: $\delta^{13}C = -26.31‰ + 7.22‰ \times e^{-0.3435t}$ (r² = 0.96), with a half-life (ln2/k) of 2.02 d, namely about 50% of the blood plasma turnover in initial phase occurs in 2 d.

Key Words: development, metabolism, carbon-13

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Turnover of blood plasma of broiler chicks. J. R. Sartori1, V. C. Pelícia1, C. Ducatti1, P. C. Araujo*1, A. C. Stradiotti1, J. C. R. Rezende1, M. M. P. Sartori1, E. T. Silva2, J. C. Denadai2, N. C. Alexandre1, I. M. G. P. Souza1, A. C. Pezzato1, W. T. Silva1, and P. D. G. Pacheco1 São Paulo State University, Faculty of Veterinary Medicine and Animal Science, Botucatu Campus, Botucatu, SP, Brazil, 2Universidade de São Paulo, Institute of Bioscience, Botucatu, Botucatu, SP, Brazil, 3University of Tehran, Tehran, Iran.

Blood pressure (BP) monitoring is increasingly common in veterinary practice. The high BP is a major factor contributing to the susceptibility of broilers to cardiovascular disorders and cardiopulmonary systems. This study evaluated the effects of dietary supplementation of dried olive leaves on BP, weight of right and left ventricles in broilers. The experiment included normal temperature (NT) and cold temperature (CT) using 1000 d old male broilers (Arian strain). Birds were assigned in a completely randomized design with 5 treatments and 4 replicates with 20 birds per replicate. The treatments included 1-control, 2-antihypertensive drug propranolol (4mg/kg body weight), 3-0.5%, 4-1% and 5-1.5% olive leaf powder. Arterial blood pressure was measured on brachial artery of concious birds via indirect method by using of pediatric cuff and Vascular Flow Detector (SONICAID-BV102R) at end of the experiment. At 42 d of age, all of survival birds were chosen and eutanized to determine right ventricle (RV) and left ventricle (TV) weights. Results showed that mean of blood pressure between treatments were different (P < 0.01) in CT. In CT, use of olive leaf showed an antihypertensive effect on blood pressure. The weight of RV, TV and RV/TV ratio between treatments were different (P < 0.01). According to results of this experiment, olive leaf can be reduced BP and RV/TV ratio, therefore, supplementation of olive leaf in broiler diets at levels of 1 - 1.5% could be recommended.

Key Words: olive leaf, blood pressure, right ventricle, left ventricle, broiler