124 Effects of temperature, pH, and pepsin on the stability of intrinsic phytase of rye, wheat, and barley. O. Esmaeilipour*, M. M. Van Krimpen*, A. W. Jongbloed2, L. H. De Jonge1, and P. Bikker2, 1 Wageningen University, Wageningen, the Netherlands, 2 Wageningen UR, Livestock Research, Lelystad, the Netherlands. 1 University of Tehran, Karaj, Iran.

An experiment was carried out to evaluate effects of temperature, pH, and incubation time on the stability of intrinsic phytases. The experiment was conducted as a 3*4*3 factorial arrangement with 3 feed ingredients (rye, wheat, and barley), 4 temperatures (T) (20, 38, 55, and 80°C), 3 pH levels (3, 5.5, and 8), and 3 incubation times (30, 60, and 120 min), with 2 replicates per treatment. After incubation at the designated conditions of T and pH, residual phytase activity of treatment groups as well as non-treated (reference) samples were measured. Stability was calculated as the ratio of the residual phytase activity of a treated sample to the reference sample times 100. Phytase activity of the reference samples of rye, wheat, and barley was 3.14, 1.77, and 0.66 FTU/g, respectively. Overall, rye showed the highest and barley the lowest stability (58% vs. 47%). Stability decreased with increasing T to 6.5% at 80°C. Stability of intrinsic phytase significantly decreased with increasing incubation time. Stability was highest at pH 3 and lowest at pH 8 (65% vs. 34%). Combinations of low pH (3 and 5.5) and low temperature values (20 and 38°C) resulted in the highest stability of intrinsic phytase (>90%). Wheat and rye phytases were stable at pH 3 (20 and 38°C) and 5.5 (20 and 38°C). Moreover, stability of intrinsic phytase of these feed ingredients was determined in different concentrations of pepsin (0, 5, and 10 mg/ml) at pH 2. Intrinsic phytases of wheat and rye were resistant to pepsin, but barley phytase was susceptible to pepsin and its stability decreased to 57% at 5 mg/ml pepsin concentration. It can be concluded that the effect of T on stability of intrinsic phytases was more destructive than the effect of pH or pepsin. Among the tested feed ingredients, rye had the highest overall stability. This knowledge may contribute to optimize within phytase activity, thereby reducing phosphorus excretion of monogastrics.

Key Words: intrinsic phytase, stability, temperature, pH, residual activity

125 Effect of NSP-enzymes and phytase combination on growth and bone mineralization in turkey fed wheat-corn-based diet. A. Preynat*, D. McIntyre2, G. Uzu1, and P. Dalibard2, 1 Adissaol France SAS, 92160 Antony, France, 2 Adissaol USA Inc., Alpharetta, GA.

The present experiment was carried out to investigate the benefits of a multi-enzyme complex (Rovabio Max) containing carbohydrases (Penicillium fumiculosum) and 6-phytase (Schizosaccharomyces pombe) activities on the performance of turkeys. One thousand BUT 9 male turkeys were distributed into 5 experimental treatments (8 replicates, 25 birds per pen): one positive control (PC) diet formulated to be adequate in nutrient and 2 negative control (NC1 and NC2) diets with a decrease in available phosphorus (~1.5 g AvP/kg), calcium (~1.2 g Ca/kg) and a gradual decrease in apparent metabolizable energy (AME) (NC1, ~80 kcal/kg and NC2, ~120 kcal/kg). The 2 NC diets were supplemented or not with Rovabio Max suppling 1,100 visco units of endo-β-1,4-xylanase, 100 AGL units of endo-β-1,3,4-(β)-glucanase, and 500 Phytase units of phytase per kg of feed. Body weight and feed intake were determined at 22, 35, 57, 77, 96 and 111 d. Phalanxes from 20 turkeys per treatment were collected for ash content determination at 111 d. During the total experimental period, animals fed NC1 and NC2 diets had the lowest weight gain and the highest feed conversion ratio (P < 0.01) with no effect on feed intake when compared with the PC group. Further reduction of AME in the NC2 diet did not significantly degrade more animal performances than NC1. Phosphorus and calcium deficiency significantly decreased bone mineralization of turkeys by 7% as compared with animals fed PC diet. Supplementation of the NC diets with the multi-enzyme complex significantly improved feed intake, weight gain and feed conversion ratio at the similar level of those obtained for the PC group. Moreover, the ash content was partially and fully compensated by enzyme addition for NC1 and NC2, respectively. These results confirm the efficiency of multi-enzyme complex containing NSP-enzymes and phytase to reduce the phosphorus, calcium and energy specifications of wheat-corn-based diets without performance losses.

Key Words: NSP-enzymes, phytase, turkeys, formulation matrix, growth and bone mineralization

126 Effects of phytase and xylanase supplementation of diets fed to male broilers on nutrient digestion from 28 to 32 days of age. C. K. Gehring*1, M. R. Bedford2, and W. A. Dozier III1, 1 Auburn University, Auburn, AL, 2 AB Vista Feed Ingredients, Marlborough, UK.

This study evaluated 6 concentrations of phytase (0, 1,000, 2,000, 4,000, 8,000, and 16,000 U/kg) and 3 concentrations of xylanase (0 and 16,000 U/kg) on standardized ileal amino acid and energy digestibility in broilers. Enzymes were added to a corn-soybean meal-based basal diet formulated to contain adequate Ca (0.65%) and non-phytate P (0.33%). Eight hundred and 60 4 (12 per battery cage; 0.45 m² per bird) Ross × Ross 708 male broiler chicks were randomly distributed to 72 cages (6 replicates per treatment). From 1 to 28 d of age, broilers were fed common corn-soybean meal-based diets that were not supplemented with exogenous enzymes. Experimental diets (including 0.50% TiO₂) were provided from 28 to 32 d of age. On d 32, digesta from the distal ileum (a section spanning 4 to 30 cm upstream from the ileocecal junction) was collected from 8 birds per cage. Feed and digesta were analyzed for TiO₂, amino acid, and gross energy content. Only phytase main effects were observed on standardized ileal amino acid digestibility (SIAAD), and phytase and xylanase did not interact in their effects on any measured variable. The addition of 1,000 U/kg of phytase increased (P < 0.010) SIAAD of all amino acids with the exception of Ala (P = 0.085). Average SIAAD was increased by 1.74% with 1,000 U/kg of phytase. The response to phytase on SIAAD was more pronounced for Ser (3.0%) and Cys (2.5%) and less for Thr (1.5%), His (1.4%), and Met (0.7%). The addition of higher levels of phytase did not further increase SIAAD of any amino acid (P > 0.05) above the addition of 1,000 U/kg, although 2,000 U/kg significantly (P = 0.024) increased standardized Ala digestibility above the basal diet. Significant linear or quadratic effects of phytase (P > 0.05) were not observed. These results indicated that 1,000 U/kg of phytase increased amino acid utilization in corn-soybean meal-based diets formulated to contain adequate Ca and non-phytate P for broilers.

Key Words: phytase, xylanase, standardized ileal digestibility

127 Phytase affects the optimum calcium:phosphorus ratio in broilers. B. M. Nusairat*, P. W. Plumstead2, P. Kwanyuen3, A. B. Leytem4, and J. Brake1, 1 Department of Poultry Science, North...
This study was conducted to determine effects of calcium (Ca) on ileal phytate hydrolysis and if the optimum calcium:non-phytate phosphorus (Ca:NPP) ratio was altered when an E. coli phytase enzyme was added to broiler diets. A 2 × 4 factorial design was used with 4 dietary Ca levels from 0.36% to 1.16% and 2 levels of E. coli phytase (0 or 500 FTU/kg feed) with titanium dioxide as the marker. Male broiler chicks were fed a standard corn-soy starter diet to 15 d of age followed by 1 of 8 experimental diets with 4 replicate pens of 13 birds per interaction cell from 16 to 21 d of age. Excreta was collected from 19 to 20 d of age and distal ileal digesta was collected at 21 d and analyzed for phytate and phosphorus (P). E. coli phytase inclusion reduced ileal phytate concentration by 70%. Increasing dietary Ca decreased phytate hydrolysis in a step-wise manner when no phytase was added, but had much smaller effects on phytate hydrolysis in diets with E. coli phytase. Conversely, increasing dietary Ca resulted in a greater decline in ileal P digestibility when diets contained added phytase to the extent that there was no net increase in ileal P digestibility from phytate at the highest Ca level. Increasing dietary Ca increased P retention. The optimum Ca:NPP ratio that resulted in maximal P retention was determined by nonlinear regression to be reduced from 2.40:1 to 2.17:1 when diets contained phytate. In conclusion, high Ca levels had a greater negative effect on ileal P digestibility when diets contained E. coli phytase. However, the adverse effect of high calcium on P retention can be avoided by reducing total dietary Ca or maintaining a lower Ca:NPP ratio when adding phytase to feed.

Key Words: broilers, phosphorus, calcium, phytase, non-phytate phosphorus

128 Influence of a highly soluble source of calcium and phytase on performance and bone ash of 21-day-old broiler chickens. C. L. Walk*, 1E. K. Addo-Chidie, 1M. R. Bedford, 1and O. Adeola, 21AB Vista Feed Ingredients, Marlborough, Wiltshire, United Kingdom, 2Purdue University, West Lafayette, IN.

Meeting the nutrient requirements of growing animals has yielded substantial research in regards to amino acids, metabolizable energy, and available P (aP). One area that requires further study is Ca solubility and digestion, especially in the presence of phytase. Previous in vitro research would suggest limestone is approximately 80% soluble in the acidic medium of the gastrointestinal tract, but decreased to 77% solubility in neutral conditions of the intestine, suggesting no further dissolution in the intestinal phase. Calcium must be soluble before it can be absorbed and an experiment was conducted to evaluate the influence of a highly soluble Ca source on performance and bone ash of broilers. Dietary Ca was supplied by Vistacal and monocalcium phosphate to provide 4 levels of Ca (0.45, 0.60, 0.75, or 0.90%). The dietary inclusion of Vistacal ranged from 0.5 to 2.0% and monocalcium phosphate was included at 1.09% to provide 0.32% aP. Each diet was supplemented with 0, 500, or 2500 FTU/kg phytase as a 4 × 3 factorial. An additional diet was formulated using 1.28% limestone and 1.76% monocalcium phosphate to contain 0.90% Ca and 0.45% aP (PC). Diets were fed to day-old Ross 708 birds for 21 d in 7 replicate cages of 8 birds per cage. Feed intake (FI) and body weight gain (BWG) were reduced (P < 0.05) in broilers fed 0.90% Ca from Vistacal compared with the PC and all other diets. Phytase increased (P < 0.05) FI and BWG in broilers fed 0.90% Ca from Vistacal to values comparable to the PC. There were no differences in FI or BWG among the broilers fed 0.45, 0.65, or 0.75% Ca from Vistacal or the PC. Phytase increased FI and BWG in broilers fed 0.45, 0.65, or 0.75% Ca from Vistacal, but this was not different from the PC. Tibia ash percent was reduced (P < 0.05) in broilers fed Vistacal without phytase at all Ca levels compared with the PC. Phytase increased (P < 0.05) tibia ash percent at all levels of Ca from Vistacal and this was comparable to the PC. In conclusion, feeding a highly soluble Ca source with phytase allows for significant reductions in dietary Ca while maintaining broiler performance and bone ash.

Key Words: cholecalciferol, phytase, broiler

129 The effects of feeding high concentrations of cholecalciferol and/or phytase on broiler chicks fed various concentrations of nonphytate phosphorus. J. Green* and M. E. Persia, Iowa State University, Ames.

Two experiments were conducted with Ross broiler chicks to investigate the effects of feeding high concentrations of cholecalciferol (D) and/or phytase (PHY) on performance variables when fed various concentrations of nonphytate phosphorus (nPP). Experiment 1 was arranged as a 5x3 factorial in a randomized design resulting in 5 dietary concentrations of nPP (0.20, 0.26, 0.33, 0.39 and 0.45%) and 3 of D (0, 7,500 and 15,000 IU/kg) fed for an 18 d period. The second experiment utilized a randomized design with a 4x2x2 factorial arrangement of treatments consisting of 4 dietary concentrations of nPP (0.15, 0.25, 0.35 and 0.45%), 2 of D (0 and 7,500 IU/kg) and 2 of PHY (0 and 1,000 FTU/kg) fed over a 15 d period. Chicks were housed in raised wire cages in an environmentally controlled room with ad libitum access to feed and water. Body weight gain (BWG), feed intake (FI) and feed efficiency (FE) were calculated over the duration of the each experiment. Tibia and excreta samples were collected at the end of each experiment to determine bone ash, expressed as total ash weight (AshW) and as a percentage of total tibia weight (AshP) and total tract P retention (TTPR). Vitamin D x nPP interactions were significant (P < 0.05) for BWG, FI, FE, AshW, AshP and TTPR for experiment 1. Increasing nPP increased performance and tibia ash without added D, but when 7,500 or 15,000 IU of D were added performance and tibia ash were similar among concentrations of dietary nPP. In experiment 2, there were main effects of PHY and nPP that resulted in significant (P < 0.05) increases in BWG, FI and FE. A significant (P < 0.05) PHY x nPP interaction was observed in both AshW and AshP. As expected, PHY was more efficient in improving tibia ash at lower dietary nPP than with higher dietary nPP. The supplementation of low nPP diets with cholecalciferol or phytase increased growth performance and tibia ash, although the response of chicks fed the cholecalciferol was inconsistent over the experiments.

Key Words: cholecalciferol, phytase, nonphytate phosphorus


A total of 1440 male broilers were used in a floor pen study to test efficacy of a newly developed heat stable phytase (Cibenza Phos, Novus International Inc.) in improving P utilization in broilers. Corn
soybean meal based diets were formulated to reflect typical US poultry industry nutrients specifications except P for starter (0–14 d), grower (14–28 d) and finisher (28–42 d) periods. Starter diets were crumbled and grower, finisher diets were in pellet form. Positive control diet was formulated to contain 0.45%, 0.41%, and 0.35% non phytate P (nPP) for starter, grower, and finisher diets respectively. Two negative control diets were obtained by reducing nPP by 0.10% or 0.20% at each phase. To the 2 negative controls, phytase was added at 250, 500, and 1000 units/kg resulting in a total of 9 treatments. Each diet was fed to 8 replicate pens of 20 birds. Body weight, FCR, feed intake, and mortality were measured at d 14, 28 and 42. At d 43, 5 birds per pen were taken for tibia breaking strength, tibia ash, and 1 bird per pen for tibia minerals measurements. Litter samples were collected by pen for Ca and P determination at the end of the trial. A reduction of dietary nPP by 0.10% significantly decreased 42-d body weight, 0–42 d FCR, tibia ash percentage, tibia P and Ca level of broilers, and all these measurements were recovered to the positive control level by supplementation of 250 units/kg phytase. Reducing dietary nPP by 0.20% significantly impaired body, FCR, feed intake, tibia breaking strength, tibia ash percentage, tibia P, Ca, and Zn level; phytase supplementation was effective in improving all these parameters. The responses to phytase was dose dependent, either linear or quadratic depending on dietary nPP and measurement. Tibia Fe, Mn and litter Ca levels were not significantly affected by dietary treatments. P excretion can be reduced significantly by lowering dietary nPP along with phytase supplementation without compromising growth performance and bone characteristics of broilers.

Key Words: phytase, broiler, phosphorus, excretion


A 56-d feeding trial was conducted with 96 1-d-old broiler chickens, which were fed diets based on corn, cowpea and soybean meal, to study the effect of microbial phytase enzyme supplementation on growth performance, phosphorus utilization, and tibia bone phosphorus and ash content in the birds. Four iso-nitrogenous and isocaloric diets were formulated to contain 4 different concentrations of microbial phytase concentrations of at 0, 250, 500, and 750 FTU/Kg diet. Each dietary treatment was offered ad libitum to 4 replicates of 6 birds each in a completely randomized design. Records of body weight and feed intake were obtained on weekly basis. On d 56, 3 birds from each replicate were selected for a 5-d nutrient digestibility study and 2 birds also were sacrificed for determination of tibia bone ash and phosphorus concentrations. Phytase supplementation significantly (P < 0.05) reduced feed intake and feed conversion ratio (FCR), and increased (P < 0.05) apparent phosphorus digestibility but had no significant effect on final weight, daily weight gain, tibia P, percent tibia ash and fecal P. The results suggest an improved growth performance and bone mineralization in broilers due to phytase supplementation.

Key Words: phytase, phosphorus digestibility, performance, broilers

One experiment was conducted to evaluate the effects of calcium (Ca) and phosphorus (P) levels during the finisher phase on performance and mineral retention of Heritage broilers. All diets were corn-soybean meal based with 10 to 12% of DDGS. Celite (1%) was used as a marker in the finisher phase. Common starter and grower diets were fed from 1 to 17 and 18 to 35 d of age, respectively. Broilers consumed the finisher diets from 36 to 49 d of age, which were formulated to contain combinations of 4 levels of Ca (0.38, 0.54, 0.70, 0.86%) and 4 levels of nPP (0.17, 0.25, 0.33, 0.41%). There were 6 replicate pens per treatment and each pen received 8 male and 8 female day-old chicks, individually identified and randomly assigned. Body weight (BW) gain, feed intake, and feed conversion ratio (FCR) were assessed at the end of each dietary phase, and all chickens were individually weighed at 35 and 49 d of age to determine flock uniformity. At 45 d of age, fresh fecal samples were collected and Ca and P retention evaluated. Data were analyzed as a completely randomized block design by response surface methodology using JMP. Results indicated that female BW gain increased linearly as P levels increased during the finisher phase (P ≤ 0.1). No significant effects of Ca and P levels fed in finisher diets were observed on male BW gain or on feed intake. A quadratic effect (P ≤ 0.01) of P levels was observed on FCR both during the finisher phase and from 0 to 49 d of age. Flock uniformity at 49 d was affected by the interaction between the levels of Ca and P (P ≤ 0.01). Calcium and P retention, evaluated at 45 d of age, showed an interaction effect (P ≤ 0.05) of Ca and P levels used in finisher diets. Taking into account these results, it was concluded that the levels of Ca and P fed to Heritage broilers in the finisher phase affect their live performance and also should be considered for minimizing mineral excretion.

Key Words: calcium, phosphorus, live performance, mineral retention

132 Effects of calcium and phosphorus levels during the finisher phase on Heritage broilers: I. Performance and mineral retention. M. R. Dalmagro1, A. P. McElroy2, and M. R. Bedford1, 1AB Vista Feed Ingredients, Marlborough, Wiltshire, United Kingdom, 2Virginia Tech, Blacksburg.

Previous research indicated dietary limestone increased gizzard pH in laying hens and urinary pH in grow/finisher pigs. An increase in gastric pH from limestone may reduce pepsin activity and reduce crude protein digestibility. An experiment was conducted to determine the influence of 2 levels of dietary Ca from limestone and 3 levels of phytase on broiler performance, bone ash, gastrointestinal pH, and Ca, P and apparent ileal crude protein digestibility. Cobb 500 broilers were allowed ad libitum access to one of 6 corn/soy diets from 0 to 16 d. Experimental diets were formulated to contain 1.0% or 0.64% Ca from 1.21 or 0.43% limestone, respectively. Each diet was then supplemented with 0, 500, or 5000 FTU/kg phytase to create a 2 × 3 factorial. Dicalcium phosphate was added at 0.77% in all the diets to yield 0.61% total P. Broiler feed intake (FI), body weight gain (BWG), or mortality was not affected by dietary Ca or phytase. Feed efficiency was improved (P < 0.05) as dietary phytase increased. Tibia ash percent was reduced (P < 0.05) as dietary Ca decreased, but improved with phytase addition (P < 0.05). Gizzard and ileal pH were reduced (P < 0.05) in broilers fed 0.64% Ca compared with 1.0% Ca. Phytase at 5000 FTU/kg increased (P < 0.05) pH in the gizzard, duodenum, jejunum, and ileum. Gizzard Ca solubility and apparent ileal P digestibility...
were increased ($P < 0.05$) in broilers fed 0.64% Ca compared with broilers fed 1.0% Ca. Apparent ileal Ca digestibility was increased ($P < 0.05$) in broilers fed 1.0% Ca compared with broilers fed 0.64% Ca. Apparent ileal crude protein digestibility was reduced in broilers fed 1.0% Ca. Phytase improved apparent ileal crude protein digestibility in broilers fed 1.0% Ca, but did not have an effect on broilers fed 0.64% Ca, which resulted in a Ca x phytase interaction ($P < 0.05$). In conclusion, a certain amount of Ca is necessary for adequate tibia ash formation. However, high dietary Ca from limestone increases gastric and ileal pH and reduces apparent ileal P and crude protein digestibility.

**Key Words:** calcium, phosphorus, phytase, broiler, digester digestibility


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With the objective to evaluate the hen response to different Ca and P feed concentrations, 1,344 40-weeks-old-Hy Line W36 hens were randomly allocated to 4 treatments, with 8 replicates of 42 hens each (14 hen cages with 3 hens per cage). The birds were housed in an open hen house with curtains; feed and water were provided ad libitum. The trial lasted 20 weeks. The treatments were as follows (expressed by production phase; 40 to 50 and 50 to 60 weeks-old); T1, sorghum-SBM-15% DDGS diet; Ca 4.01, Av. P 0.43 and Ca 4.35, Av. P 0.46 Av. P g/h/d (Hy Line manual 2009, HL2009), T2 as T1 with Ca 3.84, Av. P 0.39 and Ca 4.20 and 0.36 Av. P g/h/d (Hy Line manual 2003, HL2003), T3 as T2 minus 0.04% Ca and 0.04% Av. P, and T4 as T3 + 4 ppm Rovimix Hy D (50 ppb 25-OH-D3). All other nutrients were formulated to fulfill the W36 hen nutritional requirements. Data were analyzed as a CRD. Following the results: egg production (%) ($P < 0.05$); T1, 82.7%; T2, 84.8%; T3, 82.4%; T4, 83.5%. Feed conversion ($P < 0.03$); T1, 1.856; T2, 1.823; T3, 1.850; T4, 1.822. Egg mass (g/h/d) ($P < 0.01$); T1, 50.4; T2, 52.3; T3, 50.4; T4, 51.3. The hens fed HL2009 Ca and P recommendations showed lower egg production and worse FC, than the hens fed HL2003 Ca and P recommendations. The hens fed T3 with the lowest Ca and P levels, showed a lower productive performance compared with T2 and similar to the hens on T1, however, hens fed T4, the diet with lowest Ca and P levels + Hy D showed a productive performance equal to the hens fed HL 2003 Ca and P values. These hens were slaughtered from each group at 5% and peak egg production. Blood (to separate the serum), eggs, muscle and organs were collected to digest by the wet digestion method and mineral estimation (mg/L) by atomic absorption spectrophotometer was done. The serum Zn was found significantly high in G4 as compared with G1 and G2. The Zn in muscle and brain found high in G3 comparatively. The Mn in egg in G2 and brain in G3 found high from G1. The Mn level of kidney and liver decreased in G4 as compared with G1. The muscle and brain Fe concentration increased in G3 as compared with G1, while kidney and liver Fe was high in G3 and G1 as compared with other 2 groups. The liver Cu concentration decreased in G2 and G4 as compared with G1. The literature has various reports regarding the impact of mineral supplementation, their organic/inorganic status, different level of supplementation and binding efficacy of different supplemented substances with the minerals. There is no such report regarding the efficacy of probiotic and symbiotic supplementation in the molted layers on the dynamics of mineral metabolism and fate in the body. In current study an immense relationship was seen with the probiotics and serum zinc availability. The decreased level of liver and kidney minerals and enhanced concentration of brain and muscle in supplemented groups is showing their efficiency to conserve these minerals to play significant role in various body functions.

**Key Words:** molt, layers, trace minerals, protein, probiotics


AAAP abstract†


The effect of injecting graded levels of selenium (Se) as seleno-L-methionine (Se-Met) or sodium selenite (Na2SeO3) in the yolk of fertile broiler breeder eggs at Day 10 of incubation on tissue Se concentration and embryo viability was investigated. Eggs were injected with 0.1 mL of a phosphate buffered saline solution containing 0, 2.5, 5, 10, 20 or 40 μg Se as either Se-Met or Na2SeO3. Two replicate groups of 25 fertile eggs were used for each treatment. After candling, the eggshell surface above the air cell was disinfected, a small hole was drilled, the Se solution was injected, the hole was sealed with glue, and the egg was returned to the incubator. Breast muscle, heart, liver and lung samples were taken from 5 viable embryos per replicate group on Day 20 for Se analysis. Embryo viability values on Day 18 (range = 78 to 98%) and on Day 20 (range = 71 to 90%) were not significantly affected by treatments. In addition, there was no significant effect of treatments on...
Injecting graded levels of Se resulted in linear increases in tissue Se concentration for both Se sources for all tissues. However, significantly higher \( (P < 0.001) \) linear regression coefficients were obtained with Se-Met, compared with Na\(_2\)SeO\(_3\). The highest slope ratios for Se-Met:Na\(_2\)SeO\(_3\) were observed with lung (2.9) and heart (3.6) tissues. The results of this study indicate that injecting broiler breeder eggs with Se as Se-Met or Na\(_2\)SeO\(_3\) up to 40 μg Se/egg at Day 10 of incubation has little effect on embryo viability. Furthermore, injecting Se-Met results in greater Se tissue accumulation, compared with injecting the same amount of Se as Na\(_2\)SeO\(_3\).

**Key Words:** in ovo injection, selenium, embryo viability, selenomethionine, broiler

†This abstract from the American Association of Avian Pathologists (AAAP) is available in the AVMA Convention Notes at [www.avmaconvention.org](http://www.avmaconvention.org) and at [www.aaap.info/2011meeting](http://www.aaap.info/2011meeting).