Metabolism and Nutrition, Vitamins and Minerals

112 Metabolizability of diets with different calcium source granulometries and calcium:phosphorus ratio for broilers. R. A. De Araújo1, J. F. Durau1, A. Massuqueto2, E. C. Goes1, and P. Raijche de Oliveira1. 1Universidade Federal do Paraná, Curitiba, Paraná, Brazil, 2BRF S.A., Uberlândia, Minas Gerais, Brazil.

The aim of this study was evaluated the metabolizability of diets with different relation and granulometry of calcium and phosphorus for broilers. A total of 480 male broilers were distributed in a completely randomized design in a factorial 3 × 2, with 3 formulation strategies (FS): control with 1.34 Ca and Pt ratio; 500 FTU/kg of phytase with 1.70 Ca and P; 500 FTU/Kg and phytase with 2.06 Ca and P, and 2 granulometries of calcium source (oyster shell), coarse and fine (1354 and 428 μm), and 8 replicates with 10 animals each. All the diets were based on corn and soybean in the mash form. Birds received the same diet (1.13 Ca and Pt ratio) until 21 d of age, and from 22 to 28 were supplied the experimental diets. The first 3 d were for adaptation and 4 for total excreta collection. Were evaluated the coefficient of apparent metabolizability of dry matter (CAMDM), calcium (CAMCa) and phosphorus (CAMP) and apparent metabolizable energy (AME). Data were submitted to ANOVA and, when significant, means were compared by Tukey test. There was no significant interaction (P > 0.05) for CAMCa and CAMP. There was interaction for CAMDM and AME (P < 0.05), the treatment 2.06 Phy C had higher CAMDM, however AME lower than 2.06 Phy F. There was significant difference for CAMCa and CAMP (P < 0.05) for FS, when animals fed with lowest Ca and P-1.34 ratio presented lower CAMCa (< 0.05) for FS, when significant, means were compared with Tukey test at 5% probability. No difference was found between the treatments for FI and BWG (P > 0.05) (Table 1). Birds fed with CD had improved FCR (1.63) when compared with those fed with reduced Av. P diets (1.69) (P = 0.03), while FCR of birds fed diets based on Dig. P was similar to the other treatments (1.65). Treatments also did not affect %MR, %Ca and %P (P > 0.05) on tibia bones. Therefore, it was concluded that formulation of feed for broilers based on levels of available or digestible phosphorus guaranteed same performance and bone mineral composition.

Acknowledgements: Thanks to all colleagues at the Federal University of Paraná

Key Words: poultry, bone composition, phosphorus, mineral


The aim of this study was to evaluate the calcium reduction in diets with different vitamin D sources on the performance of broiler chickens from 1 to 42 d. A total of 504 d-old Cobb 500 chicks with a mean weight of 43.27 ± 1.08 g were housed in climate chambers with controlled average temperature and relative humidity. The birds were distributed in a completely randomized design with 8 treatments, in arrangement 2x4 factorial (2 sources of vitamin D: D3 or 25-OH-D3 x 4 levels of calcium - 100, 90, 80 and 70% of the Brazilian Tables for Poultry and Swine recommendation for stages 1 to 7, 8 to 21, 22 to 33, 34 to 42 d old, with 6 replicates and 9 birds per experimental unit. Experimental diets and water were provided ad libitum during the experimental period. Vitamin D sources were included in diets together with vitamin-mineral premix, providing approximately 2,760 IU of vitamin (D3 or 25-OH-D3). At the end of each stage (7, 21, 33 and 42 d) the feed intake was calculated based on difference between total feed and feed leftovers on the feeders and floor of climate chambers rooms to obtain the accumulated total feed intake at 21 and 42 d. The birds were weigh out at the beginning (d 1), at d 21 and at the end of the experimental period, for the determination of weight gain of animals from 1 to 21 and 1 to 42 d old. The feed conversion was calculated by dividing the feed intake by the weight gain. The obtained data were submitted to a variance analysis in a randomized design (DIC), using SAS software, model PROC GLM, considering the level of 5% of probability. The Student-Newman-Keuls (SNK) test was used for the average comparisons. There was no interaction (P > 0.05) for vitamin D sources and calcium levels on performance (GP, CR and CA) of broiler chickens in the periods from 1 to 21 and 1 to 42 d old. Thus, it was evidenced that the pattern of response of performance of the birds due to the reduction of Ca levels of the diets did not vary between sources of vitamin D evaluated. The reduction of the calcium level of the diets, regardless of the source of vitamin D, did not influence (P > 0.05) the performance of the birds in the different periods evaluated. There was no interaction (P > 0.05) for vitamin D sources and the Ca reduction levels of the diets for any of the blood variables analyzed at 42 d later. However, it was verified that, although vitamin D sources have not varied, the plasma level of Ca decreased (P < 0.05) due to the

Key Words: energy, metabolizability, minerals, oyster shell, phytase

113 Performance and bone mineral composition of broilers fed diets formulated with available or digestible phosphorus. L. S. Bassi1, A. V. B. Zavelinski2, L. M. Almeida1, L. H. A. O. Gomes1, F. O. Marx1, J. F. Durau1, and A. Maiorka1. 1Federal University of Paraná, Curitiba, Paraná, Brazil, 2BRF S.A., Uberlândia, Minas Gerais, Brazil.

In poultry diets, most of the phosphorus is unavailable to the bird due to its bound with phytase molecules. Therefore, it needs to be supplied through the inclusion of phytase and ingredients such as phosphates. The aim of this study was to evaluate the performance and bone mineral composition of broilers fed diets with formula based on available or digestible phosphorus’ levels. It was used 400 male broilers, from 1 to 42 d of age, distributed in a completely randomized design with 3 treatments and 10 replicates of 10 birds each. The birds received feed and water ad libitum. Feed was offered in mashed form, based on corn and soybean meal, with inclusion of phytase (10.000 FYT/g). Treatments varied according to the level of phosphorus (P): Control diet (CD), formulated with regular levels of available P (Av. P), based on Rostagno (2017); Diet formulated with regular levels of digestible P (Dig. P), based on Rostagno (2017); CD with 50% reduction on available P levels (50% Av) and feed conversion ratio (FCR) were calculated by weighing the birds and feed leftovers. At 42 d old, 10 birds of each treatment were euthanized and had tibia bones removed, cleaned with ether, and ashed at 550°C to analyze mineral residue (%MR), calcium (%Ca) and P (%P). All data collected was submitted to ANOVA among treatments, and when significant, means were compared with Tukey test at 5% probability. There was no difference between the treatments for FI and BWG (P > 0.05) (Table 1). Birds fed with CD had improved FCR (1.63) when compared with those fed with reduced Av. P diets (1.69) (P = 0.03), while FCR of birds fed diets based on Dig. P was similar to the other treatments (1.65). Treatments also did not affect %MR, %Ca and %P (P > 0.05) on tibia bones. Therefore, it was concluded that formulation of feed for broilers based on levels of available or digestible phosphorus guaranteed same performance and bone mineral composition.

Acknowledgements: Thanks to all colleagues at the Federal University of Paraná

Key Words: poultry, bone composition, phosphorus, mineral
For calcium and phosphorus digestibility of limestone and dicalcium phosphate for brown egg-laying hens in the final stage of laying. The objective of this study was to evaluate the calcium and phosphorus digestibility of limestone and dicalcium phosphate for brown egg laying hens in the final stage of laying. 72 Rhode Island Red laying hens (Embrapa: 75 weeks old) were distributed in a completely randomized design with 3 treatments and 8 replicates of 3 birds each. Treatments consisted of a basal diet for determination of endogenous loss, basal diet with addition of limestone, and basal diet with addition of dicalcium phosphate. The experimental period was 9 d: 4 d for adaptation to experimental diets and facilities, and then 5 d for total excreta collection, once a day, being performed in the morning. At the end of the experimental period, the feed intake, egg production, egg weight, fertility, embryonic mortality, hatchability and quail weight at hatch were recorded during a 6-wk evaluation period. Statistical significance was evaluated using ANOVA under a Randomized Complete Block Design with 3 treatments and 8 replicates of 3 birds each. There were no bird’s ages x Ca & AP recommendations for any of the measured variables. Younger birds showed lower (P < 0.05) feed intake, egg production, embryonic mortality but higher (P < 0.05) egg weight, fertility and hatchability than older birds. Quail weight at hatch was not affected (P > 0.05) by the bird’s age. On the other hand, with exception of the early embryonic, none of the other measured variables were significantly influenced (P > 0.05) by the level of Ca and AP recommendations. In conclusion, regardless the bird’s age, the reproductive performance of Japanese quail hens is not affected by the variety of calcium and available phosphorus recommendations existing in the literature.

**Key Words:** quail hen, egg production, egg weight, fertility, hatchability

### 115 Effect of different recommendations of calcium and available phosphorus on the reproductive performance of Japanese quail hens of two different ages

The objective of the present study was to determine the reproductive performance of Japanese quail hens of 2 different ages fed diets containing different recommendations of calcium (Ca) and available phosphorus (AP). A total of 864 female and 288 male Japanese quail (50% 12-wk old and 50% 32-wk old) were placed into 48 cages with 18 females and 6 males per cage. The Ca and AP recommendations evaluated, respectively, were 1) 3.20% - 0.40%; 2) 2.50% - 0.35%; 3) 3.10% - 0.45%; 4) 2.50% - 0.30%; 5) 3.15% - 0.41% and 6) 3.10% - 0.32%; hence, the total number of treatments were 12. Feed (as mash) and fresh water were provided ad libitum. Feed intake, egg production, egg weight, fertility, embryonic mortality, hatchability and quail weight at hatch were recorded during a 6-wk evaluation period. The search for better results has demonstrated the importance of certain ingredients in feed, such as oils and fats, which are essential for the supply of energy, so that the absorption of fat-soluble vitamins takes place properly. The objective of this study was to evaluate the influence of the use of different fat sources in diets containing different vitamin A supplementation levels on the performance of poultry from 1 to 42 d of age. For the study, 1,150 d-old chicks were distributed in a completely randomized design, in a 2X5 factorial scheme, with 2 (2) sources of lipids (soybean oil and palm fat) and 5 (5) vitamin A supplementation levels (0; 3,000; 6,000; 12,000; 24,000 IU kg⁻¹) resulting in 10 treatments with 5 replicates and 23 poultry per experimental unit (EU). The poultry submitted to the treatments were fed with rations without vitamin A supplementation from 1 to 3 days of age and vitamin A supplementation (premix) in the experimental diets started at 4th day of age. At the end of the experimental period, data on weight gain (WG), feed intake (FI) and feed:gain ratio were obtained. The results were evaluated by the statistical procedure PROC GLM (SAS, 2017), being submitted to ANOVA, polynomial regression as a function of vitamin A supplementation and the coefficients for not evenly spaced levels were obtained using orthogonal contrasts. The source of fat (soybean oil or palm fat) used in feed from 1 to 42 d of age did not interfere with WG, FI and feed:gain ratio of poultry. The results indicate that dietary vitamin A supplementation influenced WG, FI and feed:gain ratio during the period evaluated. A linear and quadratic responses were obtained for the WG and FI variables. For WG, the maximum response point was reached with supplementation of 13,240 IU kg⁻¹, and for FI the best supplementation occurred with 13,655 IU kg⁻¹. For vitamin A, however, the feed: gain ratio showed a linear response to vitamin A supplementation in diets. The fat source used in the diets did not interfere in the performance of the poultry and there was no interaction between the sources of fat used and the supplementation of vitamin A. The best performance of broiler from 1 to 42 d of age must be obtained with vitamin A supplementation ranging from 13,240 to 13,655 IU kg⁻¹ on diet.

**Key Words:** vitamin, soya oil, palm fat, poultry, performance

### 116 Calcium and phosphorus digestibility of limestone and dicalcium phosphate for brown egg-laying hens in the final stage of laying

C. Sordi, F. C. Tavernari, N. Drexheimer, S. C. Salguero, L. F. T. Albino, 1Udesc, Chapecó, Santa Catarina, Brazil, 2Embasa Suínos e Aves, Concórdia, Santa Catarina, Brazil, 3IFC, Concórdia, Santa Catarina, Brazil, 4UFV, Viçosa, Minas Gerais, Brazil.

The objective of this study was to evaluate the calcium and phosphorus digestibility of limestone and dicalcium phosphate for brown egg laying hens in the final stage of laying. 72 Rhode Island Red laying hens (Embrapa: 75 weeks old) were distributed in a completely randomized design with 3 treatments and 8 replicates of 3 birds each. Treatments consisted of a basal diet for determination of endogenous loss, basal diet with addition of limestone, and basal diet with addition of dicalcium phosphate. The experimental period was 9 d: 4 d for adaptation to experimental diets and facilities, and then 5 d for total excreta collection, once a day, being performed in the morning. At the end of the experimental period, the feed intake, egg production, egg weight, fertility, embryonic mortality, hatchability and quail weight at hatch were recorded during a 6-wk evaluation period. For feed (as mash) and fresh water were provided ad libitum. Feed intake, egg production, egg weight, fertility, embryonic mortality, hatchability and quail weight at hatch were recorded during a 6-wk evaluation period. Statistical significance was evaluated using ANOVA under a Randomized Complete Block Design with 2 x 6 factorial arrangements and Tukey’s test for multiple comparisons. There were no bird’s ages x Ca & AP recommendations for any of the measured variables. Younger birds showed lower (P < 0.05) feed intake, egg production, embryonic mortality but higher (P < 0.05) egg weight, fertility and hatchability than older birds. Quail weight at hatch was not affected (P > 0.05) by the bird’s age. On the other hand, with exception of the early embryonic, none of the other measured variables were significantly influenced (P > 0.05) by the level of Ca and AP recommendations. In conclusion, regardless the bird’s age, the reproductive performance of Japanese quail hens is not affected by the variety of calcium and available phosphorus recommendations existing in the literature.

**Key Words:** quail hen, egg production, egg weight, fertility, hatchability

### 117 Performance evaluation of broilers fed diets containing soybean oil and palm fat, with different vitamin A supplementation

V. D. L. Savaris, J. Broch, L. Walchholz, J. L. Damasceno, C. Eyng, R. V. Nunes, 1UNIOESTE, Universidade Estadual do Oeste do Parana, Campus Marechal Cândido Rondon, Paraná, Brazil, 2UEM, Universidade Estadual de Maringá, Maringá, Paraná, Brazil.

The search for better results has demonstrated the importance of certain ingredients in feed, such as oils and fats, which are essential for the supply of energy, so that the absorption of fat-soluble vitamins takes place properly. The objective of this study was to evaluate the influence of the use of different fat sources in diets containing different vitamin A supplementation levels on the performance of poultry from 1 to 42 d of age. For the study, 1,150 d-old chicks were distributed in a completely randomized design, in a 2X5 factorial scheme, with 2 (2) sources of lipids (soybean oil and palm fat) and 5 (5) vitamin A supplementation levels (0; 3,000; 6,000; 12,000; 24,000 IU kg⁻¹) resulting in 10 treatments with 5 replicates and 23 poultry per experimental unit (EU). The poultry submitted to the treatments were fed with rations without vitamin A supplementation from 1 to 3 days of age and vitamin A supplementation (premix) in the experimental diets started at 4th day of age. At the end of the experimental period, data on weight gain (WG), feed intake (FI) and feed:gain ratio were obtained. The results were evaluated by the statistical procedure PROC GLM (SAS, 2017), being submitted to ANOVA, polynomial regression as a function of vitamin A supplementation and the coefficients for not evenly spaced levels were obtained using orthogonal contrasts. The source of fat (soybean oil or palm fat) used in feed from 1 to 42 d of age did not interfere with WG, FI and feed:gain ratio of poultry. The results indicate that dietary vitamin A supplementation influenced WG, FI and feed:gain ratio during the period evaluated. A linear and quadratic response (P < 0.05) was obtained for the WG and FI variables. For WG, the maximum response point was reached with supplementation of 13,240 IU kg⁻¹, and for FI the best supplementation occurred with 13,655 IU kg⁻¹. For vitamin A, however, the feed: gain ratio showed a linear response to vitamin A supplementation in diets. The fat source used in the diets did not interfere in the performance of the poultry and there was no interaction between the sources of fat used and the supplementation of vitamin A. The best performance of broiler from 1 to 42 d of age must be obtained with vitamin A supplementation ranging from 13,240 to 13,655 IU kg⁻¹ on diet.

**Key Words:** vitamin, soya oil, palm fat, poultry, performance
This study was conducted to evaluate the effects of commercial product of canthaxanthin (10.0%) containing lignosulphonate (62.8%) (CCX) administered via in ovo injection on hatchability and hatch window. A total of 780 fertile eggs from Cobb 500 broiler breeder flocks were distributed in a randomized block design (3 setters), with 5 treatments and 12 replicates (13 eggs in each replicate). Treatments were: 1) eggs inoculated with 0.5 mL of distillate water (control group); 2) eggs inoculated with 0.5 of distillate water and 0.35 mg of CCX; 3) eggs inoculated with 0.5 of distillate water and 0.45 mg of CCX; 4) eggs inoculated with 0.5 of distillate water and 0.55 mg of CCX of VE and 5) eggs inoculated with 0.5 of distillate water and 0.65 mg of CCX. The temperature and relative humidity of the setters were set at 37.7°C and 59%, respectively. At 17.5 d of incubation, eggs were sanitized with iodine alcohol (2%) and CCX solution was inoculated in the amniotic fluid. After inoculation, eggs were placed in air-permeable bags to isolate the treatment and distributed in hatchery trays. The temperature and relative humidity of the hatcheries were set at 36.7°C and 70%, respectively. For the hatching rates (ratio between the number of fertile incubated eggs and the number of hatched chicks), the fertility rate was taken to be 90.0% (which was informed by the company that donated the eggs). The hatch window study began when the first chick hatched, and each window had a duration of 6 h and the incubation trial was halted when it reached 504 h of incubation. Data were analyzed with ANOVA and means were compared by Tukey’s test (P < 0.05). The highest hatching rate (P < 0.05) was observed from the control group (79.82%) in comparison with the inclusion of 0.45, 0.55 and 0.65 mg of CCX. Thus, inclusion of 0.65 mg of CCX presents worse hatching results (32.99%). The shortest hatch window (20.0 h) was observed for broiler chicks that received only distillate water (P < 0.05). No difference in hatch window was observed (P > 0.05) between the treatments supplemented with 0.35; 0.45; 0.55 and 0.65 mg of CCX (26.5; 28.5; 24.0 and 26.5 h, respectively). In conclusion, in ovo injection of commercial product of canthaxanthin containing lignosulphonate at 17.5 d of incubation worsens the hatching results and increases hatch window.

Acknowledgements: The authors acknowledge the assistance of the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) for providing funds for participate in the event.

Key Words: antioxidant, broiler chick, hatch window, incubation, pigments

119 Vitamin E in ovo supplementation improves the oxidative status of the newborn chick. I. C. S. Araújo*1, B. N. Caiado2, J. P. Machado2, M. A. Mesquita2, and N. S. M. Leandro2, 1Departamento de Zootecnia, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil, 2Departamento de Zootecnia, Universidade Federal de Goiás, Goiânia, Goiás, Brazil

Embryonic nutrient supplementation by in ovo injection is a viable technology that can be used in researches and industry. This study was conducted to evaluate the effects of vitamin E (VE) administered via in ovo injection on oxidative status of newborn chicks. A total of 780 fertile eggs from Cobb 500 broiler breeder flocks were distributed in a randomized block design (3 setters), with 3 treatments and 12 replicates (13 eggs in each replicate). Treatments were: 1) eggs inoculated with 0.5 mL of sunflower oil (control group); 2) eggs inoculated with 0.5 of sunflower oil and 27.5 IU of VE; 3) eggs inoculated with 0.5 of sunflower oil and 38.5 IU of VE; 4) eggs inoculated with 0.5 of sunflower oil and 49.5 IU of VE and 5) eggs inoculated with 0.5 of sunflower oil and 60.4 IU of VE. The temperature and relative humidity of the setters were set at 37.7°C and 59%, respectively. At 17.5 d of incubation, eggs were sanitized with iodine alcohol (2%) and VE solution was inoculated in the amniotic fluid. After inoculation, eggs were placed in air-permeable bags to isolate the treatment and distributed in hatchery trays. The temperature and relative humidity of the hatcheries were set at 36.7°C and 70%, respectively. At hatch, organs of 3 chicks per replicate (36 birds per treatment) were collected to evaluate oxidative variables. Total protein quantity and catalase (CAT) enzyme activity present in the liver and breast muscles were measured. Data were analyzed with ANOVA and means were compared by Tukey’s test (P < 0.05). Chicks that received 60.4 IU of VE in ovo had the highest level of total proteins in the liver (P < 0.05), while no significant difference was observed among the other treatments (P > 0.05). Liver CAT activity was higher in the group that received 49.5 IU of VE compared with the group that did not receive in ovo VE. The results of chick breast muscle analysis showed lower protein concentration in chicks that did not receive in ovo VE. The inoculation of 38.5 IU of VE had the highest level of total proteins in the breast muscle (P < 0.05). No differences were observed (P > 0.05) between the treatments for CAT in breast muscle. In conclusion, in ovo injection of vitamin E at 17.5 d of incubation improved oxidative status of newborn broiler chick.

Acknowledgements: The authors acknowledge the assistance of the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) for providing funds for participate in the event.

Key Words: α-tocopherol, broiler, in ovo feeding, liver, oxidative status

120 Manganese requirement for broiler chickens from 20 to 40 days of age according to source of supply. M. M. Saldanha1, A. R. Chagas Abreu1, L. F. Rocha1, L. F. B. Freitas2, and L. J. Camargos Lara1, 1Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil, 2Universidade Federal de Lavras, Lavras, Minas Gerais, Brazil

Supplementation of trace mineral in poultry diet is usually done in excess. Consequently, it results in high levels of excretion what might cause wastage and environmental pollution. The objective of this study was to establish inorganic and chelated form of manganese (Mn) requirements using performance data, bone quality and liver Mn concentration, from 20 to 40 d of age. A total of 1,350 male Cobb broiler chickens were distributed in a completely randomized experimental design with 9 treatments and 6 replications. From one to 12 d of age all birds received a supply of 70 mg of Mn/kg, from 13 to 19 d of age birds did not receive any supply of Mn in feed. From 20 to 40 d of age experiment began with following supplemental treatments: 0, 35, 70, 105 or 140 mg of Mn/kg on sulfate and proteinate form. After feed analysis, Mn dietetic levels for each treatment were: 13.2 mg of Mn/kg, feed with Mn sulfate with 45.4, 85.0, 119.0 and 151.4 mg of Mn/kg, and feed with Mn proteinate with 46.7, 82.8, 120.0 and 151.7 mg of Mn/kg. For broiler performance it was analyzed weight gain, feed intake and feed conversion of broiler chickens. At the age of 40 d, 6 birds of each treatment were slaughtered and were removed tibia, femur and liver. It was determined ash and Mn content for tibia, and liver (with gallbladder) concentration. Femur samples were submitted to mechanical essay to determine bone strength. Data was analyzed by software R, and Mn requirements were established by linear and quadratic regressions models (P ≤ 0.05). Dietetic Mn concentration in both forms (sulfate and proteinate) did not affect broiler performance from 20 to 40 d of age. The inclusion of Mn sulfate interfered with results of bone strength, the estimation of Mn requirement was 73.9 mg of Mn/Kg. Inclusion of Mn proteinate on feed increased linear values of bone ash content. The higher the sulfate and proteinate inclusion were, the greater were tibia Mn concentration. However, both forms of Mn did not have any effect on liver Mn concentration.
Dietetic Mn concentration in both forms (sulfate and proteinate) did not affect broiler performance 20 to 40 d of age. However, inclusion of 73.9 mg sulfate of Mn/kg presented the best bone strength, and can will be indicated for reducing lost about break bones.

**Key Words:** bone, broiler, chelate, manganese, requirement

**121  Manganese requirement for broiler chickens from 1 to 20 days of age according to source of supply.** M. M. Saldanha*1, D. P. Vaz2, P. C. Cardeal3, M. V. Triginelli4, and L. J. Camargos Lara1,

1Unividade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil, 2DSM, São Paulo, São Paulo, Brazil, 3Viali Soluções Integradas para o Agronegócio, Belo Horizonte, Minas Gerais, Brazil.

Due to continuous genetic improvement of broiler chickens, update of nutritional requirements on feed formulation is necessary. The objective of this study was to establish inorganic and chelated form of manganese (Mn) requirements using performance data, bone quality and liver Mn concentration, from one to 20 d of age. A total of 1,350 male Cobb broiler chickens were distributed in a completely randomized experimental design with 9 treatments and 6 replications. Levels of Mn supply were: 0, 35, 70, 105 or 140 mg/kg on sulfate and proteinate form. After feed analysis, Mn dietetic levels for each treatment were: control with 12.2 mg of Mn/kg, feed with Mn sulfate with 48.3, 82.0, 117.0, and 150.0 mg of Mn/kg, and feed with Mn proteinate with 46.5, 80.0, 115.0, and 154.0 mg of Mn/kg. For broiler performance it was analyzed weight gain, feed intake and feed conversion of broiler chickens. At the age of 20 d, 6 birds of each treatment were slaughtered and were removed tibia, femur and liver. It was determined ash and Mn content for tibia, and liver (with gallbladder) Mn concentration. Femur samples were submitted to mechanical essay to determine bone strength. Data was analyzed by software R, and Mn requirements were established by linear and quadratic regressions models ($P \leq 0.05$). Dietetic Mn concentration in both forms (sulfate and proteinate) did not affect broiler performance until 20 d of age. The higher the sulfate and proteinate inclusion were, the greater were bone strength. Increasing Mn sulfate and Mn proteinate had a quadratic effect in Mn concentrations on tibia and liver. Bone ash content was only affected by Mn sulfate supply, the estimation of Mn requirement was 97.9 mg of Mn/kg. Mn supply does not affect broiler performance, but modifies Mn content of tibia and liver. Besides that, it improves linearly bone strength with feed supply. This justify the supply with high levels of Mn: 150.0 mg of Mn sulfate/kg and 154.0 mg of Mn proteinate/kg, because bone strength is an important parameter to avoid slaughterhouse losses.

**Key Words:** broiler, manganese, mineral, nutrition, requirement