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Changes in the Amount of Calcium and Phosphorus in the Composition of the Femur Bone of Broiler Chickens in Postnatal Ontogenesis

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Abstract: The dynamics of variations in the amount of calcium and phosphorus in the bone marrow of broiler chickens were investigated during their postnatal ontogenesis. From the first day of postnatal development to day 14, the amount of Ca and P in the femur of broiler chickens grew, then dropped until day 35. Until the 14th day of postnatal ontogeny, the process of increasing the amount of Ca and P in the femur of broiler chickens was shown to be somewhat expedited.

Keywords: poultry, chicken, broiler, postnatal ontogeny, femur bone, calcium, phosphorus, growth factor, relative amount, experiment, probiotic.

Introduction. Poultry farming is a profitable, prolific, and rapidly expanding field of animal husbandry. It is critical in feeding our people with a variety of high-quality dietary commodities, such as eggs and poultry. Poultry meat has a higher digestibility than meat from any other form of cattle. It's made up of a lot of different chemical ingredients. In 55-60 days, meat-eating chickens acquire 1,5-1,8 kg, ingesting an average of 2,6-2,8 kg of feed per 1 kg of fat.

According to some studies, when birds are fed, they absorb roughly 60% of the calcium in their diet. The authors point out that when birds are fed in the afternoon, only 50–60 % of the calcium is digested; nevertheless, calcium entering the body is fully assimilated in about 12 hours, therefore feeding birds at night yields excellent results [10, 11].

The dynamics of calcium and phosphorus storage norms in poultry diets, which are significant in the creation of bone tissue composition, were studied, and several laws were discovered. That is, as birds grow older, the amount of calcium in their mixed meal increases while the amount of phosphorus declines, resulting in an increase in the calcium-phosphorus ratio [1, 2].

In calcium metabolism, in addition to the calcium released as a result of bone tissue resorption, transient skeletal calcium absorbed into the bone is also involved and can move into the blood via physicochemical regularity. Fast-exchange and slow-exchange calcium fractions are separated in the exchange fund. Young animals have a higher overall quantity of exchangeable calcium fund than older animals, according to studies [8, 9].

The majority of the calcium complex and its free ions, according to the researchers, react with the acid residue of phosphoric acid in the small intestine. They then combine the high fatty acids palmitic, stearin, and oleic acid to generate water-insoluble molecules. This insoluble in water chemical is emulsified into fine-grained particles and transformed into a mixed micelle. Micelles have easy access

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to the cell membrane, allowing them to carry calcium into the bloodstream, where fat kilograms are released and contribute in the small intestine wall's re-synthesis process [15].

Ionized calcium in the serum, total calcium retention in bone tissue, bone strength, weight, size, and density are among the parameters for calcium delivery in poultry, according to some researchers [12].

Calcium creates distinct crystal lattices at different sources, according to studies, which impacts its absorption. Because of the pace of calcium absorption by the body of birds, the authors recommend feeding lime in the first half of the day [3, 4].

Calcium peroxide is an inorganic calcium-oxygen molecule that exhibits antibacterial properties while still retaining a substantial quantity of calcium in an easily absorbed state. When applied to birds, it boosts productivity, strengthens the body's defenses, and reduces stress. [13, 14].

Regular biochemical serum testing, according to a number of experts, is essential to identify and predict calcium insufficiency in poultry, as well as to take timely actions to prevent it. It's important to pay attention not only to the total amount of calcium in the blood, but also to the amount of excess phosphorus in the serum, as this leads to a calcium-to-phosphorus ratio violation and insufficient alkaline reserves in the blood. The process of calcium excretion from the blood is disrupted by a deviation in the calcium-phosphorus ratio, which reveals itself in all chickens after 2-3 days. [5, 6, 7]

Materials and methods. The research was carried out on the bones of broilers belonging to the 1-day “ROSS 308” cross, brought from Samarkand region "Dargom parranda fayz" LLC. Divided into 4 groups with 40 chicks in each. All group of chicks were fed the same ration and vaccinated on the farm. The first group of chicks were fed and watered; the second group of chicks were given food, water and prophylactic drugs; probiotics prepared from Bacillus subtilis isolated by SamIVM specialists for 7 days were added to the water of the third and fourth groups of chicks, i.e. 0.04 ml of probiotics were added to the chickens of the third experimental group for a period of 1 to 7 days; 0.08 ml of probiotics were added to the chicks of the fourth experimental group during this period. Broiler chick bones from the 1st, 7th, 14th, 21st, 21st, 28th and 35th day stages of the experiment were obtained for scientific examination.

To determine the amount of calcium and phosphorus elements in the ash content of the bone, the ash content in the crucibles was transferred to the stupa and pulverized until a mass was formed. Residues of 1 g of ash were measured on an analytical balance. The residue of the ash obtained was dissolved in the same crucible in 10 ml of 25% hydrochloric acid solution, which was stirred continuously with a glass rod. The resulting solution was transferred to a 250 ml container. The crucible was shaken several times with distilled water and placed in the same flask. The volume of the solution in the flask was then made up to 250 ml with distilled water and the solution was thoroughly mixed. The solution was analyzed after settling.

All numerical data obtained as a result of scientific research were mathematically processed by the method of E.K. Merkureva.

To determine the dynamics of change in muscle age, the growth factor was determined using a formula developed by K.B. Svechin.

Mathematical-statistical analysis was performed on a computer's Microsoft excel spreadsheet using Student and Fisher criteria.

Results and their analysis. Scientific studies have shown that changes in the amount of Ca and P in the bone composition in the postnatal ontogeny of broiler chickens show specific dynamics.

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The amount of calcium in the femur bone was 10,03 ± 0,13 % on day 1 of postnatal ontogeny of broiler chickens in the first experimental group, at 7 days, this figure is almost unchanged (10,75 ± 0,12 %, K = 1,07; p < 0,02), slightly increasing at 14 days (11,01 ± 0,23 %, K = 1,02; p < 0,02) and decreasing in subsequent stages, i.e. at 21 days was equal to 10,25 ± 0,23 % (K = 0,93), at 28 days was equal to 9,15 ± 0,31 %, and at 35 days was equal to 7,74 ± 0,22 % (K = 0,85; p < 0,03). The amount of phosphorus in the bone of this experimental group was slightly lower than the amount of calcium in broiler chickens on day 1 (6,27 ± 0,06 %; p < 0,01), and at 7 days this figure was almost unchanged (6,59 ± 0,08 %, K = 1,05; p < 0,02), a slight increase in 14 days (7,13 ± 0,09 %, K = 1,08; p < 0,02) and a decrease in subsequent stages were observed, i.e. at 21 days was 6,75 ± 0,13 %, at 28 days was 6,41 ± 0,16 %, and at 35 days was 6,03 ± 0,13 % (p < 0,03). During the studied stages of postnatal development of broiler chickens, it was observed that the relative growth rate of calcium in the hip bone was 0,9 times, and the relative value of phosphorus was 0,96 times.

In the second experimental group, the calcium content of the femur bone of broiler chickens was 10,57 ± 0,05 % on the 1 day of postnatal ontogeny, with a rapid increase on day 14 (12,53 ± 0,17 %, K = 1,09; p < 0,02) and a gradual decrease in subsequent stages, i.e. 11,68 ± 0,25 % (K = 0,93) on day 21, 10,84 ± 0,14 % on day 28, 10,15 ± 0,15 % (K = 0,94; p < 0,02) on day 35. Phosphorus content in the femur bone of broiler chickens in this group was 6,28 ± 0,04 % on day 1 and 6,67 ± 0,08 % (K = 1,06; p < 0,02) on day 7 of postnatal ontogeny, on the 14th day it increased to 77,24 ± 0,08 % (K = 1,09; p < 0,02), and in the following stages it increased to 6,82 ± 0,1 % (K = 0,94; p < 0,02) on the 21st day, on day 28 it decreased to 6,53 ± 0,1 % (K = 0,96), and on day 35 it decreased to 6,16 ± 0,15 %. The growth rate of bone relative calcium was 0,96 times during the period from day 1 to day 35 of postnatal ontogeny in broiler chickens, and the ratio of phosphorus was 0,98 times.

In the third experimental group, the relative amount of calcium in the femur bone of broiler chickens was 10,55 ± 0,05 % on the 1 day of postnatal development, up to 11,52 ± 0,13 % on day 7, and increase to 13,11 ± 0,17 % (K = 1,14; p < 0,02) on day 14 and decrease in the following days, i.e. by 12,24 ± 0,17 % on day 21 and by 11,38 ± 0,14 % on day 28 and on day 35 it was noted to be 10,69 ± 0,13 % (K = 0,94; p < 0,02). The relative amount of phosphorus in the femur bone increased from 6,28 ± 0,04 % to 7,38 ± 0,11 % from the 1st to the 14th day of postnatal ontogeny of broiler chickens, or 1,1 times the growth rate compared to 7 days, and in the following days insignificant decrease, i.e. 6,97 ± 0,07 % on day 21, 6,65 ± 0,14 % (K = 0.95; p < 0,03) on day 28, and 6,22 ± 0,11 % on day 35. The relative growth rate of calcium in bone content was 1,01 times during the period from the first day of postnatal development of broiler chickens to 35 days, and the relative value of phosphorus was 0,99 times.

In the fourth experimental group, on the first day of postnatal ontogeny of broiler chickens, the relative amount of calcium in the femur bone was 10,57 ± 0,07 %, which increased to 11,53 ± 0,14 % on day 7 and a rapid increase of 13,45 ± 0,29 % (K = 1,17; p < 0,03) on day 14, from 21 days to 35 days imperceptible, i.e. 12,58 ± 0,16 % decrease was at 21 days, 11,72 ± 0,16 % (K = 0,93; p < 0,02) decrease was at 28 days and 11,08 ± 0,21 % (K = 0,95; p < 0,02) decrease was at 35 days. The amount of phosphorus in the bones of broiler chickens is slightly lower than the amount of calcium in 1 day, is 6,27 ± 0,05 % and in 7 days it is 6,85 ± 0,11 %, in 14 days it increases to 7,74 ± 0,82 % (K = 1,13; p < 0,02), during the remaining period of postnatal ontogeny, this indicator decreased insignificantly, by 7,29 ± 0,11 % at 21 days, by 6,97 ± 1,11 % at 28 days, and by 6,63 ± 0,9 % (K = 0,95) at 35 days. It was observed that the coefficient of growth of calcium in the femur bone of broiler chickens was 1,05 times from the first day of postnatal ontogeny to 35 days, and the coefficient of growth of relative phosphorus was 1,06 times.

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Conclusion:

- it was noted that the relative amount of calcium and phosphorus in the femur bone of broiler chickens increased from the first day of postnatal ontogeny to day 14, and decreased from day 21 to day 35;
- all experimental groups observed that the process of increasing the amount of calcium and phosphorus in the femur bone of broiler chickens was somewhat accelerated until the 14th day of postnatal ontogeny and showed the highest rate on this day;
- The increase in calcium and phosphorus content in the femur bone was characterized by the fact that from the first day to the 14th day of postnatal ontogeny, experimental group 4 with the addition of 0,08 ml of probiotics to water was slightly higher in broiler chickens than in other experimental groups.

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