Postnatal morphogenesis of some histological parameters of the femur of broiler chickens taking probiotic

Nasriddin Dilmurodov[1*], *Shokhrukh* Doniyorov[1], *Elmurod* Mukhtarov[1], *Nilufar* Khudaynazarova[1], *Zoyir* Mirzoyev[1], *Zukhra* Normuradova[1], and *Gayrat* Eshmatov[1]

[1]Samarkand State University of Veterinary Medicine, Livestock and Biotechnologies, Samarkand, Uzbekistan

Abstract. The dynamics of changes in the diameter of osteoblasts, osteoclasts and sinusoidal capillaries of the red bone marrow in the epiphysis of the femur was studied in the postnatal morfogenesis of broiler chickens of the ROSS 308 cross, which were treated with probiotics and not used. It was found that the histological parameters of osteoblasts, osteoclasts and sinusoidal capillaries of the red bone marrow in the epiphysis of the femur have specific indicators in the postnatal morphogenesis of chickens. It was noticed that some histological parameters of the femur were higher in broiler chickens in the experimental group treated with probiotics, compared with chickens in the control group.

1 Introduction

Today, much attention is paid to the cultivation of broiler chickens while providing the population with high-quality meat and meat products. There are also many scientific studies devoted to the effective use of their biological properties in the care of poultry, the patterns of elimination of physiological processes, taking into account the morphofunctional changes that they undergo in their body, as well as the identification of factors affecting them. At various physiological stages of postnatal morphogenesis of broiler chickens, the study of the dynamics of changes in morphological and chemical parameters of bones, which are considered reserves of body minerals, as well as the influence of probiotics on these processes is of important scientific, theoretical and practical importance.

According to the authors, a violation of the mineralization process in bones is caused by a decrease in the level of calcium, phosphorus and vitamin C in the blood, and collagen leads to a violation of fiber synthesis. Osteoblast activity is controlled by hormones and other biologically active substances, as well as factors produced by osteoclasts and osteoblasts themselves [1, 4, 8, 10].

Osteoblasts synthesize and produce intercellular substances, participate in its liming, and control the intake of Ca and P into bone tissue from it. Collagen synthesized by osteoblasts makes up 90% of all proteins produced. The mineralization of the intercellular

* Corresponding author: Dilmurodovns@ssun.uz

substance occurs in two different ways, that is, the accumulation of hydroxyapatite crystals saturated with intracellular fluid next to collagen fibrils, as well as the accumulation of calcium phosphate and alkaline phosphatase in high concentrations, which are produced from special bubbles into the intercellular space and, as a result of absorption, contribute to the growth of hydroxyapatite [6-7].

Total values of linear dimensions and weight of bones of free legs of broiler chickens increase from the first days of postnatal morphogenesis to the 14th day, continuing this process at a later age without significant deviations, in chickens receiving probiotics at stages after the 14th day, higher than in chickens of the control group, there is an intensive increase in the thickness of the dorsal, palmar and plantar compact substance of the stylopodium bones by day 14, 28-reduction, thickening of the proximal and distal epiphysis, It was found that the peak is observed at the age of 35 days, and also that this process is most intense in chickens taking probiotics [3].

The control of osteoblast activity occurs under the influence of hormones and other biologically active substances, as well as osteoclasts and osteoblast-dependent factors produced by themselves. Inactive osteoblasts make up the majority and are formed from active osteoblasts. They maintain communication with each other and with osteocytes and form a system that controls metabolism in bone tissue and plays an important role in bone tissue reconstruction [5]. According to the authors, osteocytes are formed from osteoblasts and are considered the main secreted bone tissue cell surrounded by mineralized intercellular substance. At the same time, they lose their ability to divide, decrease in size, and lose their active synthetic activity. The function of osteocytes is to maintain the normal state of the intercellular substance. Osteocytes receive mechanical stress in a certain place of bone tissue, in response to signals, a local process of bone remodeling occurs.

The growth coefficient of the total parameters of the wing (forelimb) and bones of the hind limbs during the period from the initial to 570 days of postnatal morphogenesis of chickens towards the egg should be higher than the linear dimensions of bones by weight, the indicator of the width of the cross-sectional surface of the bones of the stylopodium in accordance with the morphometric parameters of bones should be equal to 168% of the value of postpartum morphogenesis of chickens. this indicator increases with increasing intensity to the level of the shoulder in the hip bone. it was found to be higher than that of the bone [2].

The main biochemical function of selenium is to ensure the activity and structural stagnation of the cell membrane and is part of the complex of the enzymatic system that ensures the normal course of metabolic processes in a living cell [9-23].

2 Materials and methods

The methodology of our research is described in more detail in article [24].

To obtain histological dimensions of bone samples of chicks, the following were performed:

- decalcification kit a whole sample of each individual drink, 100 ml of acidifying nitrogen 4 hours 8 hours of continuous time;
- washed in running water for 1 hour;
- 80 ºC, 90 ºC, 96 ºC, 100 ºC ethyl alcohol was administered for 1 day for dehydration purposes;
- for compaction, chloroform and 100 ºC ethyl alcohol were mixed for 1 day and chloroform for 1 day, then stored in paraffin in a thermostat for 2 hours at 37 ºC, 2 hours at 40 ºC and 2 hours at 60 ºC for hardening, the block was hardened in paraffin to wood for block binding, then 0,5 mkn was cut in the Semi-automated Microtome of HM 304 E, purified from paraffin in distilled water at 37 ºC, dried and washed in distilled water for 20

minutes, stained 3-5 minutes in hemotaxil and dried in the room for 20 minutes, in eosin, 0,5-1 minutes were painted and washed in distilled water for 20 minutes, dried in a room for 20 minutes, put the glass of the product in a saucepan for 1 minute and put 3 batarias on top of it, dripped from Canadian Balsam. Then the dimensions of the MB 200 microscope were obtained.

All numerical data obtained as a result of scientific investigations E.K.Merkureva underwent mathematical work on his style.

The growth factor to determine the dynamics of the change in the diameter of osteoblasts, osteoclasts and sinusoid capillaries of the red marrow, which are contained in the epiphyte of the thigh bone. It was determined using a formula developed by K.B.Svechin.

Mathematical-statistical analysis was performed on the Microsoft Excel spreadsheet of the computer using the Stoudent and Fisher criteria.

3 Results and Discussion

As a result of scientific research, it was noted that at different physiological stages of postnatal morphogenesis of broiler chicks in all groups, the change in the diameter of osteoblasts, osteoclasts and sinusoid capillaries of the red marrow in the structure of the epiphysis of the thigh bone manifests a specific dynamics.

The diameter of osteoblasts in the epiphysis of the hip bone increases slightly more intensively, from 0.89±0.03 μm to 1.86±0.06 μm (K=2.09; p<0.04) from the first to the 7th day of postnatal morphogenesis of group 1 chickens, practically unchanged on the 14th day, while on the 21st on the 1st day, it was increased to 2.7± 0.03 μm (K=1.49; p<0.01), the growth rate of chickens reached 3.0 times from the first day of postpartum morphogenesis to the 35th day.

Osteoblasts in the femoral epiphysis of group 2 chickens increase in diameter from 0.9±0.03 μm to 1.87±0.05 μm (K=2.08; p<0.03) from day 1 to day 7 of postnatal morphogenesis, increasing to 1,87±0,05 μm (K=2.08; P<0.03) by on the 14th day, and imperceptibly decrease it (K=0.97) on the 21st day, increase it to 2.71 ± 0.09 μm (K=1.5; p<0.04), on the 28th, on the 35th day, almost unchanged was observed.

Osteoblasts in the epiphysis of the femur of group 3 chickens rapidly increase in diameter from 0.92±0.03 μm to 1.9±0.06 μm (K=2.07; p<0.04) from the very beginning of postnatal morphogenesis to 7 days of age, reaching 1,9±0,06 μm (K=0,04), practically unchanged at 14-at daytime age, while at 21 days of age they reach 2.76±0.09 μm (K=0.09; K=1.48; p<0.04), which practically did not change in the following days.

Osteoblasts in the epiphysis of the hip bone of broiler chickens of group 4 increase in diameter from 0.9±0.03 μm to 2.0±0.05 μm (K=2.22; p<0.03) from the first day of postnatal morphogenesis to 7 days of age, practically unchanged at 14 days of age, with a repeated increase in this indicator on the 21st day (K=1.44) and on the 35th day, it was noted that he exhibits the largest (3.01±0.1; K=1.08) size compared to lower ages, while the growth coefficient reaches 3.44 times during the studied stages.

The diameter of osteoclasts in the epiphysis of the hip bone increases from 0.34±0.01 μm to 0.53±0.02 μm (K=1.56; p<0.04) from the 1st to the 7th day of postpartum development of group 1 chickens with a gradual slight increase in it at the age of 14 days and older, that is, 0.65±0,01 μm on day 14, it was found that it reaches 2.03 times in μm (K=1.23; p<0.03), 0.69±0.02 μm on day 35 with a growth factor from 1 to 35 days.

The diameter of osteoclasts of group 2 increases intensively from the first day of postpartum morphogenesis of chickens to 7 days of age, reaching from 0.34±0.01 μm to 0.53±0.01 μm (K=1.56; p<0.03). It was noted that this bone index increased to 0.66±0.02

μm (K=1.25) over 14 days, leaving it virtually unchanged until the next 35 days compared to 14 days.

Osteoclasts in the epiphysis of the femur of broiler chickens of the 3rd group have a diameter of 0.34±0.01 μm on the initial day of postnatal morphogenesis, rapidly increasing by 7 days (0.55±0.02 μm, K=1.62; p<0.04), maintaining this condition on day 14 (K=1.27) it was 0.68±0.01 μm after 35 days (K=0.96; p<0.02).

Osteoclasts in the epiphysis of the hip bone of group 4 chickens increase in diameter from the 1st to the 7th day of postnatal development somewhat more intensively than in other groups, reaching from 0.34±0.01 μm to 0.59±0.02 μm (K=1.74; p<0.04), and on the 14th day 0.74±0.02 μm (K=1.25; p<0,03), practically unchanged on day 21, to 0.68±0.02 μm (K=0.73; p<0.03) on day 35, the growth coefficient is 2.0 times from 1st to 35-day-old chicks.

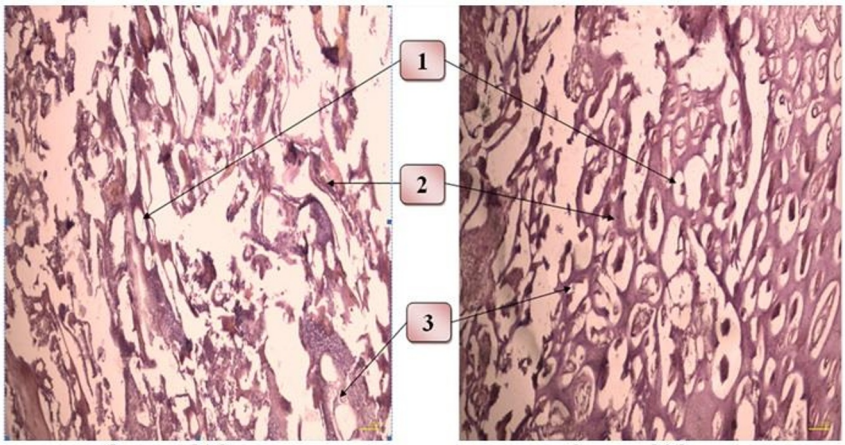
The diameter of the sinusoidal capillaries of the femoral joint of erythrocytes in group 1 increased intensively from the first day (1.13±0.03 μm) to 7 days of age of chickens, which was 2.35±0.05 μm (K=2.08; p<0.03), and at 14 days of age this condition also persisted (K=1,23), on the 21st day, its decrease (K=0.79), and at a later age, an increase was noted.

It was observed that the diameter of the sinusoidal capillaries of the femoral joint of the red brain increases to 2.36±0.06 μm (K=2.07) from day 1 to day 7 in group 2 chickens, to 2.91±0.07 μm (K=1.23) on day 14 and reaches 3.05±0.11 μm on the 35th day.

The diameter of the sinusoidal capillaries of the red bone marrow of group 3 chickens at the studied stages of postnatal morphogenesis showed the same dynamics of change as in the other group.

It was found that the diameter of the sinusoidal capillaries of the femoral joint in chickens of group 4 at all stages of postpartum development is slightly higher than in chickens of other groups in terms of the dynamics of changes.

Thus, the total values of the diameter of osteoblasts, osteoclasts and sinusoidal capillaries of the red bone marrow in the femur of broiler chickens increase from the first days of postnatal morphogenesis to 14 days, decrease by 21 days, and by 35 days this indicator increases significantly, the total values of the diameter of sinusoidal capillaries of the bone marrow and red brain from the first day of postpartum development up to 7 days of age, 4 experimental groups were given 2 ml (1.0 x 10^9 CFU) of probiotic per 1 liter of drinking water, They were characterized by higher rates in broiler chickens than in other experimental groups.



1-sinusoidal capillaries; 2- osteoblasts; 3- osteoclasts. Stained with hemotoxylin-eosin dyes. Oc-10 X Ob-40

Fig. 1. Histological image of the femur of broiler chickens.

4 Conclusion

- In broiler chickens, it was found that the total diameter of osteoblasts and sinusoidal capillaries of the red bone marrow in the femur increases rapidly from the first day to the 14th day of postnatal morphogenesis and significantly increases the indicator to the 35th day, the diameter of osteoclasts in the epiphysis of this bone increases to the 14th day of postnatal morphogenesis- broilers.
- Broiler chickens of all experimental groups had a coefficient of increase in the total diameter of osteoblasts in the epiphysis of the femur – 3.0 times in chickens of the first group, 2.99 times in the second group, 3.08 times in broiler chickens of the third group and 3.44 times in chickens of the fourth group.
- From the 1st to the 7th day of postnatal morphogenesis of broiler chickens, it was found that osteoclasts in the epiphysis of the femur have an accelerated increase in diameter, that is, their growth coefficient is 1.56 in group 1, 1.56 in group 2 and 1.56 in groups 3 and 4 when probiotic administration, respectively 1.62 and 1,74.
- Total values of the diameter of osteoblasts, osteoclasts and sinusoidal capillaries of red bone marrow in the epiphysis of the femoral joint were obtained from a suspension of a probiotic containing Bacillus subtilis in 2 ml (1.0 x 10^9 CFU)/ 1 liter of drinking water per day from the first day of postpartum development to its 7th day in experimental group 4, obtained by mixing it has been proven.

References

1. M. Lukic, Z. Pavlovski, Adequate calcium nutrition and quality of egg shell and bones in layers – innovative approach, Biotechnology in Animal Husbandry, **27**, 485-497 (2011)
2. N.B. Dilmurodov, N.E. Khudaynazarova, Chickens in the egg direction postnatal in morphogenesis, free wing bones are morphometric changes in performance, Journal is Veterinary Medicine, Special issue, ISSN: 2091-554-3, 44-46 (2023)
3. Sh.Z. Doniyorov, Postnatal morphogenesis of free leg bones of broiler chickens taking probiotic, PhD. diss…, Samarkand, 169 (2022)
4. F.G. Silversides, D.R. Korver, K.L. Budgell, Effect of strain of layer and age at photostimulation on egg production, egg quality and bone strength, Poultry Science, **85**, 1136-1144 (2006)
5. L.V. Buseva, Age-related morphology of the skeleton and muscles of the shoulder girdle of "Hisex-brown" cross chickens, Abstract of thesis...candidate of veterinary sciences, Bryansk, 24 (2011)
6. T.N. Lenkova, T.A. Egorova, I.G. Sysoeva, L.V. Krivopishina, Chelated form of silicon in feed for broilers, Poultry farming. M., 4, 21-24 (2015)
7. G.P. Melekhin, N.Y. Gridin, Physiology of poultry (Kolos, Moscow, 1977)
8. Z.I. Nabokov, The effect of mineral supplements on the productivity of turkeys, Poultry farming, **7**, 41-42 (2015)
9. L.L. Oshkina, A.V. Komzalova, G.A. Trifonov, The influence of selenium-containing drugs on the morphological parameters of the blood of stud bulls, Niva Volga region, **4**, 75-78 (2012)
10. V.V. Chernenok, Yu.I. Simonov, L.N. Simonova, Y.N. Chernenok, Clinical laboratory blood tests. Indicators are normal and pathological, Publishing house of the Bryansk State Agricultural Academy, Bryansk, 34 (2011)

11. V. Holik, Management of Laying Hens under Tropical Conditions Begins During the Rearing Period, Lohmann Information, **50**, 16-23 (2015)
12. K. Kehavarz, A comparison between cholecalciferol and 25-OH- cholecalciferol on performance and eggshell quality of hens fed different levels of calcium and phosphorus, Poultry Science, **82**, 1415-1422 (2003)
13. C. Castillo, M. Cuca, A. Pro, M. Gonzalez, E. Morales, Biological and economic optimum level of calcium in White Leghorn laying hens, Poultry Science, **83**, 868-872 (2004)
14. Ju.A. Romanova, D.E. Morkovkin, Ir.N. Romanova, K.A. Artamonova, A.A. Gibadullin, Formation of a digital agricultural development system, IOP Conference Series, Earth and Environmental Science, **548**, **3**, 032014 (2020)
15. J.R. Roberts, Factors affecting egg internal quality and egg shell quality in laying hens, Journal of Poultry Science, **41**, 161-177 (2004)
16. L.I. Podobed, The use of special forms of structured limestones in optimizing the mineral nutrition of farm animals and poultry: a practical guide, Printing House, Odessa, 104 (2010)
17. S. Canan Bolukbasi, Saban Celebi, Necati Utlu, The Effects of Calcium and Vitamin D3 in Diet on Plasma Calcium and Phosphorus, Eggshell Calcium and Phosphorus Levels of Laying Hens in Late Laying Production Period, International Journal of Poultry Science, **4**, **8**, 600-603 (2005)
18. G. Rakhmanova, N. Dilmurodov, Z. Normuradova, E. Mukhtarov, S. Yakhshiyeva, Dynamics of changes in morpho-histological parameters of the ovary of the egg-bearing hens in postnatal ontogenesis, In BIO Web of Conferences, **95**, 01041 (2024)
19. G. Rakhmanova, N. Dilmurodov, D. Fedotov, Z. Normuradova, E. Mukhtarov, Features of changes in morphometric indicators of ovaries of laying hans during postnatal ontogenesis, In E3S Web of Conferences, **463**, 01007 (2023)
20. J. Tursagatov, N. Dilmurodov, Characteristics of changes in postnatal ontogenesis of the compact substance thickness of the stylopodian bones of coral sheep, In BIO Web of Conferences, **95**, 01012 (2024)
21. B. Kuliyev, G. Eshmatov, E. Bobonazarov, B. Mukhtarov, S. Akhmedov, Pathomorphological changes in sheep paramphistomatosis. In BIO Web of Conferences, **95**, 01042 (2024)
22. D.T. Muhamediyeva, L.U. Safarova, D.I. Umarov, Application of a genetic algorithm in solving problems of environmental protection in agro-industrial production, E3S Web of Conferences, **480**, 03021 (2024)
23. K.T. Boymurodov, K.B. Yunusov, A.N. Egamkulov, U.R. Fayzullayev, Saprobic index of bivalve mollusks of families Unionidae and Sorbiculidae distributed in the aquatic ecosystems of Uzbekistan, E3S Web of Conferences, **407**, 01003 (2023)
24. S.Z. Doniyorov, N.B. Dilmurodov, O.N. Choriyev, Changes in the Amount of Calcium and Phosphorus in the Composition of the Femur Bone of Broiler Chickens in Postnatal Ontogenesis, International Journalof InnovativeAnalyses and Emerging Technology, **2(2)**, 21-25 (2022)