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CHARACTERISTICS OF CHANGE IN POSTNATAL ONTOGENESIS OF THE STRENGTH OF CHICKEN STYLOPODIAL BONES

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Summary

The dynamics of changes in the maximum force breaking the stylopodial bones of egg-laying chickens and their strength limit during postnatal ontogeny were studied. determined. The strength limit of stylopod bones is proportionally higher than the maximum bone-breaking force until the first 35 days of postnatal ontogeny of egg-laying chickens, especially at the age of 168 days. it was found to be higher in the femur than in the shoulder.

Keywords

chickens, stylopodium, humerus, femur, maximum breaking strength, strength limit, postnatal ontogeny, growth factor.

Enter. The strength of the bones is directly related to the amount of calcium, phosphorus salts, and many other macro-microelements in their content, and the speed of the metabolism of mineral substances in the body is reflected in these indicators.

The supporting organs of birds, especially the bone system, are different from those of farm animals, they are formed under the influence of many factors during postnatal development and show certain morphofunctional characteristics. Especially in laying hens, during the egg formation process, the rapid release of the main mineral substances in the bones into the blood affects the level of strength and, in turn, the morphofunctional indicators of the bones.

Research was conducted on the development of wing and leg bones in broiler chicken embryos from the seventh to the twenty-first day of incubation. The authors note that the first primary ossification centers appear on the ninth day of incubation, and this is important for the timing of the formation and ossification process. On the nineteenth day of incubation, the ossification of the centers in all

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the bones of the skeleton, except the bones of the wrist, elbow, and wrist, is completed. Researchers have compared the ratio of the thickness and width indicators of bone structures when assessing the level of bone development [2].

The ossification point of the tubular bones begins in the middle of the ankle stage. The rapidly calcifying thin layer of the bone cast begins to be covered with the cells of the inner layer of the periosteum, hypertrophied and degenerated chondrocytes are placed between them and the diaphysis, and they are surrounded by the mineralized cast. This layer forms the periosteal bone cuff. After the primary bony cuff is clearly defined, it begins to be supplied with blood vessels at various points [4].

Electron microscopy of the progress of endochondral ossification in chickens shows that a pericellular sheath of bone laminae is formed around the osteoblasts and is composed of very small amorphous material and partly collagen fibrils, this material consists of osteoid ready-to-form bone mineral [3].

The role of lipids in calcifying tissue morphogenesis has been studied, and according to the authors, organophilic lipid material can be found at mineralization sites in all biologically calcifying tissues. The great importance of lipids in the mechanism of mineralization of bone tissue is based on the loss of lipid substance from the place where minerals accumulate in diseases such as rickets and scurvy, which hurt calcification. It has been noted that this substance appears again with the restoration of calcification after the intake of vitamin D and ascorbic acid by the body [5].

The relative stability of the shape and development of the skeletal elements of the locomotor apparatus is a result of adaptation to the conditions of the living environment in the course of evolution. The evolutionary regeneration of the locomotor apparatus of birds is the consequence of the pulling force of muscles and tendons, differentiation and integration of muscles, the effect of the gravitational force of the external environment, and the effect of resistance to the aerodynamic force during flight [1].

The purpose of the study is to study the characteristics of changes in the chemical composition of stylopod bones at different physiological stages of postnatal ontogeny of egg-laying chickens.

Research materials and methods. Scientific research work was carried out in the laboratory of the Department of Animal Anatomy, Histology, and Pathological Anatomy of SamDVMChBU. 1, 16, 35, 85, 120, 168, 280, 420, and 570-day-old hens belonging to the "Dekarb" cross were taken as research objects. The chickens were

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slaughtered and bled, and the wing (front leg) and hind leg bones were removed from the body and weighed on an analytical scale.

The strength of the bones was tested in the air-dry state according to the method of A.V. Bezmaternykh, Yu.M. Malofeevlar. For this, cylinders were cut from the middle part of the bone diaphysis with a height of one to three times the diameter. The surface of the sections was leveled to the minimum deviation (0.1-0.15 mm) of the parallel sides, and the area of the compact substance of each sample was determined by the marks on the millimeter paper. Then, each cylinder was tested for compressive strength and full fracture strength using a testing machine that automatically recorded the load force. The fracture force values were expressed in milligrams of force.

Numerical data of indicators obtained as a result of the research were processed using the methods of variation statistics using Microsoft Excel computer programs.

To determine the dynamics of changes depending on the age of the indicators, the growth coefficient was calculated. The growth factor was determined by dividing the indicators of the bones of older chickens by the corresponding indicators of younger chickens, and the entire examined period of postnatal ontogeny was determined by the formula developed by K.B. Svechin.

The obtained results and their discussion. It was observed that the maximum force breaking the stylopodial bones of egg-laying chickens and the limit of strength of bones at different stages of postnatal ontogenesis show specific characteristics in connection with the physiological processes taking place in their body, especially in the supporting organs.

Maximum force breaking stylopod bones. The absolute indicator of the maximum force breaking the humerus was slightly higher on the first day of postnatal ontogeny of chickens and was 1.39±0.02 kN, and this indicator gradually decreased until the next 120 days, i.e. at 16 days - 1.25±0. 01 kN (K=0.9; $p<0.03$), at 35 days – 1.23±0.02 kN (K=0.98; $p<0.02$), at 85 days – 1.18± 0.02 kN (K=0.96 $p<0.04$), and 0.96±0.01 kN (K=0.81; $p<0.03$) in 120 days. This indicator of the humerus in 168-day-old chickens increased insignificantly compared to 120-day-old chickens (1.03±0.01 kN; K=1.07) and remained unchanged in the next studied young, that is, at 280 days – 1.02±0.01 kN (K= 0.99; $p<0.03$), and it was observed that it was 1.01±0.01 kN at 420 and 570 days. During the period from one day to 570 days of postnatal ontogeny of chickens, the coefficient of growth of the maximum force breaking the humerus was found to decrease to 0.72 times.

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The absolute indicator of the maximum force that breaks the femur, in proportion to this indicator of the shoulder bone, is high (1.49±0.02 kN) on the first day of postnatal development of chickens, and it gradually decreases until the next 120 days, that is, at 16 days - 1.32±0 up to .02 kN (K=0.88; p<0.03), at 35 days - up to 1.24±0.02 kN (K=0.93; p<0.03), at 85 days - 1.23 ±0.02 kN (K=0.03; p<0.03), in 120 days - to 1.21±0.02 kN (K=0.98; p<0.03), from 168 days a slight stagnation of the indicator was observed. That is, in 168 days - 1.26±0.01 kN (K=1.04; p<0.03), in 280 days - 1.31±0.02 kN (K=1.04; p<0, 03), at 420 days – 1.29±0.02 kN (K=0.98; p<0.03) at 570 days – 1.23±0.02 kN (K=0.93; p< 0.04) was noted. It was found that the coefficient of growth of the absolute indicator of the maximum force breaking the femur was reduced to 0.82 times during the period from 1 day to 570 days of postnatal ontogeny of chickens.

Therefore, the maximum force that breaks the stylopod bones of young chicks is slightly higher than that of older chicks can be explained by the higher level of elasticity because the amount of total organic substances in the bones is higher than the amount of mineral substances. It was also noted that the maximum bone-breaking force was higher in the femur than in the shoulder.

Strength limit of stylopod bones. The absolute index of the strength limit of the humerus of chickens in the direction of the egg is 442.0±4.58 N/mm2 on the first day of postnatal ontogeny, and this indicator decreases noticeably until the next 35 days, i.e. at 16 days – 326.0±3.27 N/mm2 (K=0.73; p<0.03), at 35 days - 297.0±3.44 N/mm2 (K=091; p<0.03), and a sharp decrease at 85 and 120 days (respectively: 81.0±1.69 N/mm2, K=0.27; 68.0±2.0 N/mm2, K=0.84, p<0.03), 168 days old, i.e. physiological age and at the age of 120 days it increased (76.0±1.54 N/mm2, K=1.12; p<0.04). This indicator of the shoulder bone was significantly reduced in 280-day-old chickens compared to young chickens (27.0±0.61 N/mm2, K=0.35; p<0.02), almost unchanged in the later stages of postnatal ontogenesis, and 420-day-old chickens - 30.0 to ±0.7 N/mm2 (K=1.11; p<0.02), at 570 days - 38.0±1.11 N/mm2 (K=1.4; p<0.03) was observed to be It was found that the coefficient of growth of the absolute index of strength of the humerus decreased to 0.08 times during the period from one day to 570 days of postnatal ontogeny of chickens.

The absolute index of the strength limit of the femur was slightly higher in the postnatal ontogeny of chickens than in the first adults, this indicator was 464.0±7.16 N/mm2, and in the next 16 days – 378.0±5.35 N/mm2 (K= 0.81; p<0.03), decreasing to 327.0±3.41 N/mm2 at 35 days, worsening of this situation until 120 days, i.e. at 85 days to 87.0±2.97 N/mm2 (K=0.26), and in 120 days it decreased to 71.0 ±1.69 N/mm2 (K=0.81; p<0.03). This femur index increased by 1.19 times (85.0±1.96

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N/mm2; p<0.03) in 168-day-old chickens compared to young chickens, and significantly decreased in 280- and 420-day-old chickens (respectively, 44.0±1, 45 N/mm2, K=0.51; 38.0±1.17 N/mm2, K=0.86), and at 570 days 56.0±2.0 N/mm2 (K=1.47; p <0.02) was found. It was noted that the coefficient of growth of the absolute index of the strength limit of the femur decreases by 0.12 times from the first day of postnatal ontogeny of chickens to the 570th day.

conclusion:

- it is observed that the maximum force that breaks the stylopod bones is spent more in young chickens than in older chickens, and this situation can be explained by the higher level of elasticity because the amount of total organic substances in the bones is higher than the amount of mineral substances;

- the limit of strength of stylopodium bones is proportional to the maximum bone-breaking force until the first 35 days of postnatal ontogeny of chickens in the egg direction, and the process of sharp reduction of these indicators, especially at the age of 168 days, is correlated with their egg-laying speed.

- it was noted that the maximum bone-breaking force and the strength limit of the bones are higher in the femur than in the shoulder bone.

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