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Change of Morphometric Indicators of Shoulder Bone during Postnatal Ontogenesis of Egg-Layer Chicken

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Summary. The dynamics of changes in the linear dimensions of the free bones of the wing (forelimb) of egg hens in postnatal ontogenesis was studied. The absolute indices of the linear dimensions of the free bones of the wing accelerate from the first day of postnatal ontogenesis to 16 days of age, and this state continues until the period of physiological maturity of chickens, that is, up to 168 days of age, while the growth rate from 280 days to 570 days of age slows down due to the intensification of the process of their egg production.

Key words: birds, chickens, wings, bone, humerus, radius, ulna, postnatal ontogenesis, absolute index, length, width, thickness, growth factor.

Relevance of the topic. Providing the population with quality food products remains one of the urgent issues of the present time. In this regard, the place of poultry farming is incomparable, and it is considered one of the most effective and promising branches of animal husbandry. When obtaining eggs and meat products from poultry, it is important to take into account the physiological characteristics of their organism and use them on a scientific basis.

The bone system of birds, in addition to performing support-mechanical and protective functions in the body, is the main organ that stores the reserves of calcium, phosphorus and a number of other macro-microelements, which are important for maintaining the continuity of metabolism.

The order of ossification of the chicken embryo skeleton was studied, this process occurs from the 8th to the 21st day of incubation, partial ossification of the leg bones begins on the 10th day, and on the 17th day of the breast bones, in which growth in length It is noted that the process slows down from the 11th to the 12th day and from the 17th to the 19th day of incubation [5].

Many scientific studies have been conducted on the development of bone structures during postnatal ontogeny. The development of most bones takes place in three stages, i.e. membrane, calcification and ossification. Nevertheless, the development of some bone structures occurs independently of these processes, such bones include the spine and individual bones of the skull. The development of the bones of the legs and chest goes through the above three stages. In this case, the process of ossification is somewhat important and it takes place in four stages, that is, in the first stage, the surface of the ankle is covered with a layer of bone tissue and perichondrial bone is formed. In the second stage, the core of the uncle softens to a mucous state. In the third stage, as a result of the accumulation of calcareous structures in the intercellular space, the process of calcification of the tumor occurs, after which the cells of the tumor are removed with the help of special erosive agents of the tumor. In the fourth stage, the internal ossification process takes place by inserting bone tissue into the bone marrow on the inner surface of the perichondral bone by osteoblasts [1, 2, 3, 4, 8].

The free bones of the hind legs are composed of thighs, calves and paws. At the proximal end of the femur there is a head and a bulge that connects to the pelvis. At the distal end of the bone there is a coil that connects to the tibia. Calf skeleton consists of large and small bones. Birds are characterized by the development of the greater tibia, and two articular surfaces are formed in its distal area, which

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unite the entire proximal row of calcaneus. The lesser tibia is reduced and fused with the greater tibia. The hind paw consists of the heel, metatarsal and toe bones. There are ossified parts of the groin of flightless birds.

It has been determined in scientific studies that the back legs of birds develop like the front leg and its belt, the first feathers are recorded on the fourth day, and the emergence of the foaling centers on the sixth day of incubation. According to the authors, the second stage of femur ossification of the chicken embryo begins on the 10th day of incubation, and the third stage on the 17th and 18th days. It is at this time that blood vessels and nerve endings grow and form the bone marrow with the remaining part of the bone marrow.

As a result of scientific research, the unique connection of the scapula, vertebral and coracoid bones to the chest in birds creates a special functional opportunity in flight, that is, the use of the coracoid bone as a support for the bones and muscles of the shoulder girdle during flight, such a morphological relationship ensures the maximum saving of muscle energy in the change of its size and configuration. determined.

A multilevel factor analysis was performed to study changes in the structure of the avian humerus associated with bipedal locomotion, and 23 angular osteometry and linear indices were determined in domestic chickens. According to the researchers, with the emergence of bipedal locomotion, the weight is distributed evenly on the leg, the first factor is the weight of the chicken, in which the weight is located below the bone neck and passes through the center of body weight and acts against the force that compresses the bone. Under the influence of this factor, the femur differentiates. The second factor is the transverse size of the proximal and distal epiphysis, the superior-inferior dimension of the bone head, which ensures the transfer of the chicken's weight to the lower part of the leg. The right femur is actively involved in keeping the body vertical and additionally shortens the distance between the ankles where the hip retractor muscles attach. The left femur provides rotational movement of the hip joint.

When researchers studied the relative amount of gray matter and total organic matter in the humerus of chicks, they found that probiotics accelerate the metabolism process due to the positive effect on the microflora of the digestive tract of broiler chicks, and this, in turn, creates an opportunity to increase the reserve of mineral salts in the bone, from the first day of postnatal ontogeny of chicks. During the period up to 35 days, it was noted that the relative amount of ash increases, while the amount of total organic matter decreases.

In the postnatal ontogeny of chicks, scientific studies were conducted on the development of some histological structures of the stylopodium bones, and the absolute indicators of the diameter of the red marrow of the humerus, the width of the sinusoid capillaries of the red marrow, in accordance with other morphometric dimensions of the bone, increase significantly during the period from the first day to the 14th day of postnatal ontogenesis. On the 21st day, these indicators were found to decrease slightly and to increase rapidly until the 35th day. Therefore, the absolute dimensions of these microstructures of the humerus were observed to be slightly higher in chicks given probiotic compared to controls.

The purpose of the study is to study the morphometric characteristics of wing bones in the stages of postnatal ontogenesis of laying hens.

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 were taken as research objects. The chickens were slaughtered, bled, and the wing and leg bones were removed from the body and weighed on an analytical scale. Linear dimensions and weights of bones were obtained according to generally accepted morphometric methods.

Numerical data of morphometric 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 change of morphometric dimensions depending on age, 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 ontogenesis was determined by the formula developed by K.B. Svechin:

Research results. It was observed that the absolute indicators of the linear dimensions of the free bones of the wings (forelegs) of chickens in the direction of the egg show specific dynamics at different physiological stages of postnatal ontogenesis.

The absolute indicator of the length of the humerus of chickens increases rapidly from the first day of postnatal ontogenesis to the 16th day, from 2.25 ± 0.02 cm to 3.22 ± 0.07 cm, or during this period its growth coefficient is 1.26 times. and was observed to continue this process for the next 168 days. This indicator of bone at 35 days - up to 3.95±0.12 cm (K=1.22; p<0.03), at 85 days - up to 5.81±0.11 cm (K=1.47) , at 120 days - up to 7.8±0.08 cm (K=1.34; p<0.02), at 168 days - 8.31±0.12 cm (K=1.06; p<0.04), and at 280 days this size decreased to 8.15±0.18 cm and at 420 and 570 days it remained almost unchanged (respectively: 8.07±0.21 cm, K=0.99; 7, 95±0.12 cm; p<0.03). It was found that the growth coefficient of the absolute index of the shoulder bone length reaches 3.11 times during the period from the first day of postnatal development of chickens to 570 days of age.

The absolute indicator of the width of the shoulder bone from the first 1 day of postnatal development of chickens to the 16th day is 0.23±0.01 cm to 0.27±0.01 cm (K=1.17), 0.38±0.01 to the 35th day. cm (K=1.4; p<0.03) and maintaining this state until the next 570 days of study, i.e. at 85 days – 0.49±0.01 cm (K=1, 28), 0.68±0.02 cm (K=1.38) at 120 days, 0.72±0.02 cm (K=1.05) at 168 days, 0.75 up to ±0.01 cm (K=1.04), up to 0.77±0.01 cm (K=1.02) at the 420-day stage, and 0.78±0.02 cm (K=1, 04; p<0.03). It was noted that the growth coefficient of the absolute index of bone width increased by 3.39 times from one day to 570 days of postnatal ontogeny of chickens.

It was observed that the absolute index of the thickness of the humerus shows dynamics proportional to the absolute index of the bone width during the period from the first day of postnatal ontogeny of chickens to the 570th day. That is, the absolute size of the bone thickness is equal to 0.19±0.01 cm in one-day-old chicks, and 0.23±0.01 cm in 16-day-old chicks (K=1.21; p<0 .03), at 35 days - up to 0.31±0.01 cm (K=1.34), at 85 days - up to 0.4±0.01 cm (K=1.29; p<0.02) , increasing to 0.54±0.01 cm (K=1.35) at 120 days, up to 0.58±0.02 cm (K=1.07) at 168 days, and increasing this indicator until 570 days unchanged, i.e. up to 0.61±0.01 cm (K=1.05) at 280 days of postnatal development, 0.63±0.02 at 420 days (K=1.03; p<0.03) it was found to reach 0.65±0.02 cm (K=1.06) at the age of 570 days. It was observed that the coefficient of growth of the absolute index of the thickness of the shoulder bone increased up to 3.42 times during the period from the first day of postnatal ontogeny of chickens to 570 days of age.

In conclusion:

- it was observed that the absolute parameters of the linear dimensions of the free bones of chickens in the direction of the egg from the first day of postnatal ontogenesis to the 16th day, and this state continues until the physiological maturity of the chickens, i.e., 168 days.
- from the 280th to the 570th day of the postnatal development of chickens, it was found that the growth rate of the absolute indicators of the linear dimensions of the free bones of the wing decreases due to the increase in their egg-laying process;

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