

The Strength of the Distal Animal Bones during the Postnatal Ontogeny of Sheep under Different Natural Conditions

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Abstract: In various physiological stages of the postnatal ontogeny of Karakol and Hisori sheep raised in the regions of Uzbekistan with different natural conditions, the compact substance and the degree of strength of the tubular bones in the distal part of the legs were studied. It was observed that the thickness of the compact substance of the metapodial bones is higher in animals with adequate conditions in the mountainous region;

Due to the location of the bones in the leg skeleton and the level of weight force applied to them, the maximum force used to break the calcaneus was found to be higher than that of the palmar bone; the highest values of the strength limit of bones about compression are observed at 3 and 18 months of postnatal development, and at the following stages, this process practically stops, and even in 36-month-old animals, its significant decrease is noted.

Keywords: black sheep, Hisori sheep, postnatal ontogeny, compact substance, distal, palm, heel, metapodium, strength limit, maximum braking force.

Enter. Along with forming the skeleton of vertebrates, bones perform very important vital functions. This function them is manifested in the storage of many macro-microelements, which are important in the exchange of mineral substances directly involved in maintaining the homeostasis of the body, protecting internal organs and structures, and maintaining immunocompetent organs.

The postnatal development of organisms is directly related to the external natural conditions in which they live, and it does not bypass any organ. In particular, the morphofunctional state of bones, and developmental characteristics at different physiological stages of postnatal ontogeny of an animal are caused by various factors of natural conditions. Knowing the morphophysiological changes that occur in their bodies under the influence of the external environment is of great theoretical and practical importance in the rational use of agricultural animals, which creates an opportunity for early diagnosis of pathological changes related to metabolic disorders in them, and the development of effective prevention methods.

Materials and methods. Scientific research works were carried out on the metapodial bones of the legs of Karakol and Hisori sheep at different stages of postnatal ontogeny, raised in ecologically adequate and man-made areas of our republic.

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 complete fracture strength at a compression speed of 10 mm/min using a 2PG-10 testing machine that automatically recorded the load force. The indicators of the force used for breaking were expressed in kilograms of force.

All numerical data obtained as a result of scientific investigations were subjected to mathematical processing according to the method of E.K. Merkureva.

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

Results and their analysis. In our research, it was observed that the surface of the compact substance of the palmar bone increases rapidly up to 3 months of age in Karakol sheep, and it thickens almost uniformly up to 60 months in adequate conditions, while in extreme conditions, this indicator increases significantly at the 18-month stage and remains unchanged in the following stages. It was noted that the contribution of the surface of the compact substance of this bone is the highest at 18 months of age, and slightly decreases at 36 months of age, regardless of the living conditions of the breed sheep.

The speed of growth of the surface of the compact substance of the heel bone varies slightly depending on the living conditions of the animals, that is, such a situation occurs at 3, 18, and 60 months in Karakol sheep in adequate conditions, in 6, 18, 60 months in extreme conditions, and 3, 18, 60 months in Hisori sheep. observed.

Although the surface of the compact substance does not have large differences until the 18th month of the postnatal ontogeny of the animals, it was observed that the differences increase according to their living conditions in the later stages. For example, it was noted that this indicator is higher in animals in adequate conditions compared to those in extreme conditions. It was also noted that the surface of the compact substance in the palmar bone is smaller than that of the calcaneus, and in Hisori sheep it is higher than in the Karakol breed.

Therefore, the thickness of the compact substance increases with certain changes at various stages of postnatal development of animals, and this process is inextricably linked with their breed and living conditions. The high level of this indicator in the animals of the mountainous region confirms the results of our research on Karakol sheep. The fact that our data do not correspond partially to the conclusions of S.A. Kutya, and I.A. Varchenko [1], in our opinion, is because the authors conducted their experiments mainly on laboratory animals.

As a result of our research, it was found that the compressive strength limit of metapodial bones, as their other morphometric and chemical indicators, shows certain characteristics during postnatal ontogeny, depending on the living conditions and breed of animals. That is, the highest indicators of the limit of strength about compression of the palm bone were observed at 3 and 18 months of postnatal development, and at the following stages, this process practically stopped, and even in 36-month-old animals, a significant decrease was noted.

Although the variation of the strength limit of the calcaneus concerning compression between the stages of postnatal ontogeny was similar to this indicator of the palmar bone, it was noted that it was higher than that of the palmar bone in all animals.

It should be noted that in proportion to the amount of macro- and microelements in metapodial bones, especially in the last stages of postnatal ontogenesis from 18 months, animals in adequate conditions are higher than those in extreme conditions, and the differences are visible in the heel bone. Because calcium and phosphorus salts are the main components that affect the biomechanical and morphological properties of bones.

It was found that during the postnatal development of sheep, the maximum bone-breaking force changes about the thickness of the compact material, the limit of compressive strength, and the chemical composition. it was noted that the maximum force exerted was higher than that of the palmar bone.

Therefore, although this index of bones has almost no interbreeding differences, it was found to be lower in animals living in extreme conditions than in animals living in adequate conditions, especially at the 18-month stage of postnatal development. So, if this situation is analyzed based on the data of some authors [2, 3, 4, 5, 6], then this stage of postnatal ontogenesis is the period of physiological

maturation of animals, which indicates a somewhat higher sensitivity to the factors of the external environment.

Conclusions.

1. the thickness of the compact substance of the metapodial bones increases with certain changes at different stages of the postnatal development of animals, this process is inextricably linked with their breed and living conditions, in particular, this indicator is observed to be higher in animals kept in adequate conditions in mountainous areas;
2. it was noted that the maximum force used to break the heel bone is higher than that of the palmar bone due to the location of the bones in the leg skeleton and the level of the weight force applied to them;
3. the highest indicators of the compressive strength limit of the studied bones are observed at 3 and 18 months of postnatal development, and at subsequent stages, this process practically stops, and even in 36-month-old animals, it significantly decreases.

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