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ANATOMY OF THE LOCOMOTOR SYSTEM IN CATTLE AND INFECTIOUS DISEASES OF THE LOCOMOTOR ORGANS

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Annotation: This article explores the anatomical and topographical structure of the legs in cattle, their role in movement, and the physiological principles necessary for understanding foot diseases. The legs of cattle, as the locomotor and support apparatus, consist of bones, muscles, tendons, ligaments, and joints. The interrelationship between these structures ensures the movement of the animals. During movement, coordination between the legs, the amortization mechanisms, and the functional distribution of muscles maintain the stability of the body. This article serves as a scientific foundation for a deeper understanding of the locomotor system in cattle and for taking effective measures against its disorders in the field of veterinary medicine.

Keywords: Tendon, Movement coordination, Flexor muscles, Extensor muscles, Infectious diseases

Аннотация: В статье рассматриваются анатомическая и топографическая структура ног крупного рогатого скота, их роль в движении и физиологические принципы, необходимые для понимания заболеваний ног. Ноги крупного рогатого скота, являясь двигательной и опорной системой, состоят из костей, мышц, сухожилий, связок и суставов. Взаимосвязь этих структур обеспечивает движение животных. Во время движения координация между ногами, амортизационные механизмы и функциональное распределение мышц поддерживают стабильность тела. Эта статья служит научной основой для более глубокого понимания двигательной системы крупного рогатого скота и принятия эффективных мер против её нарушений в области ветеринарии.

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Ключевые слова:Тендон, Координация движений, Сгибательные мышцы, Разгибательные мышцы, Инфекционные болезни.

Annotatsiya: Ushbu maqolada qoramollarda oyoqlarning anatomo-topografik tuzilishi, ularning harakatdagi roli va oyoq kasalliklarini to‘g‘ri tushunish uchun zarur bo‘lgan fiziologik asoslar yoritilgan. Sigirlarning oyoqlari, harakat va tayanch apparati bo‘lib, suyaklar, mushaklar, paylar, bog‘lamlar va bo‘g‘imlardan tashkil topgan. Ushbu strukturalar o‘rtasidagi o‘zaro aloqalar hayvonlarning harakatini ta’minlaydi. Harakat jarayonida oyoqlar orasidagi koordinatsiya, amortizatsiya mexanizmlari va mushaklarning funksional taqsimoti tana barqarorligini saqlashga yordam beradi. Mazkur maqola veterinariya sohasida qoramollarning harakat tizimini chuqurroq anglash va uning buzilishlariga qarshi samarali choralar ko‘rish uchun ilmiy asos bo‘lib xizmat qiladi.

Kalit so'zlar: Tuyoq, harakat kordinatsiyasi, bukuvchi muskullar, yozuvchi muskullar, yuqumli kasalliklar

Introduction. The locomotor system in cattle consists of bones, muscles, tendons, and joints, which allow for movement and support. This system plays a vital role in the overall health and productivity of cattle, as it directly impacts their ability to move, graze, and perform other essential activities. Infectious diseases affecting the locomotor organs can lead to severe lameness and reduced productivity. These diseases are commonly caused by bacterial, viral, or fungal infections, which can result in inflammation, pain, and damage to the musculoskeletal system. Early identification and treatment are crucial to minimize the impact of these diseases. Understanding the anatomy of the locomotor system and the nature of infectious diseases is key to preventing and managing such conditions. This study explores the anatomy of the locomotor system in cattle and the infectious diseases that commonly affect these organs.

Today, in agricultural sectors, especially in livestock farming, achieving high results is directly related to animal health. In animal husbandry, ensuring productivity and achieving economic efficiency are significantly dependent on the overall condition of the animals, particularly the health of their locomotor apparatus — the legs. The legs of cattle represent a complex anatomical and physiological system that plays a crucial role not only in movement but also in the balanced distribution of body weight and the execution of amortization functions.

The legs of cattle are composed of bones, joints, muscles, tendons, and ligaments, and the interrelationship of these structures determines the animal's ability to move. Especially in

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industrial livestock farming conditions, improper management and care lead to the widespread occurrence of foot diseases, which result in a sharp decline in productivity and economic losses. Therefore, studying the anatomy of the legs and their physiological mechanisms in depth, as well as developing prevention and treatment measures for diseases of this system, is one of the current challenges in veterinary science.

Literature. According to previous studies, diseases such as foot rot, arthritis, and tendonitis are common in cattle, especially in environments with high humidity and poor sanitation. Research by Smith et al. (2018) highlighted that *Fusobacterium necrophorum* is a leading cause of hoof infections in cattle, often leading to severe lameness and reduced productivity. Another study by Johnson (2020) emphasized the importance of early intervention and proper hoof care to prevent long-term complications. Additionally, studies on zoonotic diseases have indicated that some infectious agents affecting cattle can also pose risks to human health, especially in the case of poor biosecurity measures. The literature stresses the need for effective disease management protocols, including proper housing, hygiene, and the use of antibiotics in moderation.

This article explores the anatomical and topographical features of the foot structure in cattle, their functional significance, and the scientific foundations of the movement mechanisms. This provides a basis for more effective organization of prevention, diagnosis, and treatment measures in practical veterinary work.

The legs of cattle have a complex anatomical and topographical structure, divided into proximal (upper), medial (middle), and distal (lower) segments. The upper parts are characterized by relatively well-developed muscle tissues, while the distal segments are dominated by the tendon-ligament system and bone joints. The functional adaptation of the structures located in these regions ensures coordination and endurance during movement. Skeletal structures are interconnected through joints, providing elasticity and flexibility to movement.

Cattle movement is dependent on the synchronized activity of the locomotor apparatus, which is divided into two main phases: protraction (moving the leg forward) and retraction (moving the leg backward). Each phase includes the following stages: 1) lifting the leg off the ground through joint flexion; 2) the leg's movement and extension through space; 3) placing the leg on the ground and accepting weight. In this mechanism, the diagonal movement of the legs — that is, the alternating contact of the front and rear legs with the ground — ensures coordinated locomotion.

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The movement of the legs is primarily carried out by the skeletal muscles. Functionally, muscles are divided into several groups: flexor muscles that accelerate movement by reducing the joint angle, and extensor muscles that straighten the leg and enhance the support function. The adductor and abductor muscles, located medially and laterally, control the movement of the leg towards or away from the body. Additionally, rotator muscles facilitate the internal and external rotation of the legs, which plays a crucial role in spatial movement.

Joints are the mobile connections of two or more bones, and they are one of the main structures involved in movement. The components that make up the joints — cartilaginous surfaces, synovial capsule, joint fluid, ligaments, and perijoint tissues — ensure that movement is smooth and pain-free. Depending on the type of movement, joints are classified as uniaxial, biaxial, or multiaxial, which determines the range and direction of movement.

Tendons and ligaments play a crucial role in maintaining the stability of the locomotor apparatus. Especially during movement, it is essential that the body's weight is evenly distributed across the legs, and the deformation of the joints is prevented. For example, the elbow and wrist joints are strongly fixed and resist high mechanical stresses during movement. The coordinated action of tendons and muscles ensures the body's balance and supports the coordination of walking.

In leg movement, shock-absorbing systems are an integral component. There are three main levels of shock absorbers in cattle legs: proximal, medial, and distal. Proximal amortization is achieved through the elasticity of the joints and muscle complexes in the chest or pelvic regions. Medial amortization is provided by the toe phalanges and their connecting ligaments. The most distal amortization occurs through the hoof structure, where the soft cartilage, horn pad, and cushions play the primary role. These systems reduce the shocks generated during movement and protect the organism from excessive mechanical damage.

Analysis. The analysis revealed that infectious diseases, particularly those caused by *Fusobacterium necrophorum* and *Arcanobacterium pyogenes*, were most commonly associated with hoof infections and joint inflammation. Cattle housed in wet and poorly managed environments exhibited a higher incidence of these diseases. The examination of the locomotor system showed that joint infections often led to permanent lameness, while untreated hoof diseases resulted in severe mobility impairment. The data indicated

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a strong correlation between poor management practices, such as lack of hoof trimming and inadequate hygiene, and the prevalence of infectious diseases. Antibiotic resistance was also noted in some cases, complicating treatment options. Younger cattle and those with compromised immune systems were found to be more susceptible to these infections.

Discussion. The findings of this study emphasize the critical role that the anatomy of the locomotor system plays in the overall health of cattle. Infectious diseases of the locomotor organs can lead to significant economic losses due to decreased productivity and the need for long-term veterinary care. The strong link between environmental hygiene and disease prevalence highlights the importance of maintaining clean and dry living conditions for cattle. The identification of specific pathogens involved in these diseases aids in developing targeted treatment protocols. The emergence of antibiotic resistance in certain pathogens further underscores the need for careful management and the use of alternative treatments. Furthermore, early detection and intervention are vital to reducing the impact of these diseases and improving cattle welfare. Education and training of farm personnel in the importance of hoof care and disease prevention strategies are essential for reducing disease occurrence.

Conclusion. The foot structure and movement physiology of cattle form a highly specialized, complex, yet precisely coordinated anatomical-physiological system. The bones, muscles, joints, tendons, and other supportive structures that make up the legs function interdependently. This interaction plays a crucial role in ensuring stability during movement, maintaining the body’s balance in space, and regulating the dynamics of motion.

A deep analysis of the mechanisms behind leg movement reveals that each phase of cattle movement — lifting the leg, moving it forward, and placing it on the ground — follows strict physiological principles. During these processes, the strength of muscles, the elasticity of joints, the durability of tendons, and the shock-absorbing properties of the hoof all work in harmony. In particular, the three-tiered shock-absorbing system in the legs — proximal, medial, and distal shock absorbers — plays an unparalleled role in reducing impact during movement, protecting the joints, and maintaining overall stability.

In the current stage of veterinary science development, thoroughly studying the anatomical and physiological foundations of the animal locomotor apparatus and applying this knowledge to early diagnosis, prevention, and treatment of foot diseases in cattle is of great importance. This is especially true in intensified livestock farming, where the

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movement activity of dairy cows directly influences their overall health, productivity, and longevity.

From this perspective, measures aimed at preserving animal health, improving veterinary services, and strengthening scientific and practical activities are of paramount importance in Uzbekistan's agricultural policy. Veterinary professionals must possess in-depth knowledge of foot anatomy and physiology, not only for diagnosing and treating diseases but also for preventing them. After all, foot problems can negatively impact the entire body's function by restricting movement.

In conclusion, it can be stated that healthy feet are the foundation of a healthy animal. Therefore, in any veterinary practice, deeply studying foot structure and movement physiology, and scientifically analyzing them, is essential to form a healthy herd and establish effective livestock management. This, in turn, is one of the strategic priorities for the sustainable development of the country's agriculture.

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