

Necrobacteriosis And Hoof Pathologies in High-Yielding Dairy Cattle Etiological Factors and Improvement of Diagnostic Approaches

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Abstract

This study investigates the etiological factors, clinical features, and diagnostic approaches of necrobacteriosis and various hoof diseases in high-yielding dairy cattle. Pathological samples collected from farms located in different regions of Uzbekistan were subjected to comprehensive clinical, epizootiological, and bacteriological analyses.

*The results identified *Fusobacterium necrophorum* as the principal causative agent of necrobacteriosis. In addition, the occurrence and distribution of the disease were found to be closely associated with housing conditions, zoohygienic management, feeding practices, and technological stress factors.*

The findings highlight the multifactorial nature of necrobacteriosis and emphasize the importance of integrated diagnostic approaches for accurate disease identification and effective control in modern dairy farming systems.

Keywords: Dairy cattle; necrobacteriosis; hoof pathologies; *Fusobacterium necrophorum*; epizootiology; pathogenic bacteria; diagnosis; prevention.

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1. Introduction

Hoof diseases and necrobacteriosis in high-yielding dairy cattle represent a significant economic challenge in modern livestock production systems. These conditions limit animal mobility, reduce productivity, and lead to substantial economic losses in dairy farms. Therefore, early detection, accurate diagnosis, and improvement of

preventive measures remain key priorities in contemporary veterinary practice.

Clinical, epizootiological, and bacteriological analyses of pathological materials obtained from cattle with lesions of the distal hoof region indicate that necrobacteriosis and other hoof diseases are widely распространены pathological conditions in certain dairy farms. In particular, these pathologies are more

frequently observed in large-scale industrial dairy complexes housing Holstein cows and heifers.

In epizootically unfavorable farms, diagnostic decisions are often made based solely on clinical signs without laboratory confirmation. As a result, a considerable proportion of dairy cows are culled annually, leading to significant production losses.

The main causes of culling include infections of hoof tissues by pyogenic microflora, necrobacteriosis, hoof rot, laminitis, pododermatitis, and other pathological conditions. Moreover, in many farms, biomaterials obtained from lame animals are not subjected to bacteriological examination, which complicates the accurate determination of disease etiology.

Aim of The Study

The aim of this study was to identify the main etiological factors involved in the occurrence and spread of necrobacteriosis and hoof diseases in high-yielding dairy cattle, as well as to improve diagnostic approaches based on scientific evidence.

Objectives

To achieve this aim, the following objectives were defined:

- to analyze the prevalence and epizootiological characteristics of necrobacteriosis and hoof diseases in high-yielding dairy cattle;
- to identify and evaluate the main etiological and predisposing factors contributing to the development of these diseases;
- to investigate the clinical manifestations and pathological changes associated with necrobacteriosis and hoof pathologies;
- to determine the role of bacteriological analysis in establishing an accurate diagnosis;
- to improve diagnostic approaches for necrobacteriosis and hoof diseases based on комплекс clinical, epizootiological, and laboratory data.

2. Methods

The study was conducted on high-yielding dairy cattle maintained in farms located in the Tashkent, Samarkand, Kashkadarya, and Syrdarya regions, which had been identified as epizootically unfavorable for

necrobacteriosis and hoof diseases over the past six years.

In addition to field investigations, laboratory experiments were carried out using laboratory animals (white mice) and various pathological materials obtained from affected animals.

Isolation and identification of microorganisms involved in the pathogenesis of necrobacteriosis and hoof diseases were performed in accordance with Bergey's Manual of Systematic Bacteriology and standard bacteriological techniques.

Clinical and epizootiological data were analyzed based on established veterinary methodological guidelines and relevant scientific literature.

Pathomorphological examinations included the analysis of hoof lesions, parenchymal organs (liver, heart, lungs, and kidneys), as well as necrotic foci in the gastrointestinal tract obtained from slaughtered animals. In live animals, pathological samples were collected directly from affected hoof tissues.

All pathological materials were examined using standard bacteriological and mycological methods. A modified biological assay was employed for the isolation of the causative agent of necrobacteriosis, and the pathogen was subsequently re-isolated from laboratory animals.

Pathological samples were cultured on Kitt–Tarozzi medium, meat-peptone broth and agar, as well as Sabouraud medium. The diagnosis of necrobacteriosis was confirmed by the isolation of pathogenic strains of *Fusobacterium necrophorum*.

Based on the obtained results, different forms of lesions associated with necrobacteriosis and hoof diseases were classified according to clinical, pathomorphological, and laboratory diagnostic criteria.

3. Results and Discussion

The results of clinical, epizootiological, and laboratory studies conducted in livestock farms across different regions of Uzbekistan demonstrated that necrobacteriosis and hoof diseases are among the most widespread pathological conditions in dairy cattle. In certain farms, these diseases were observed across different categories of animals.

Observations indicated that necrobacteriosis and hoof pathologies were frequently detected in productive dairy

cows and heifers. A higher incidence of the disease was recorded during the winter season, which was associated with housing conditions, feeding practices, and the level of compliance with veterinary and hygienic standards.

Breed-related susceptibility was also identified as a significant factor influencing disease prevalence. In particular, Holstein cattle showed a higher incidence of hoof diseases and necrobacteriosis compared to other breeds. In addition, housing systems played an important role, as hoof lesions were more frequently observed in tethered housing systems than in loose housing systems.

These conditions disrupt the physiological growth and structural balance of the hoof horn, contributing to the development of laminitis, pododermatitis, and white line disease.

Prolonged standing on hard or uneven surfaces, especially under tethered conditions and in milking facilities with high technological load, intensifies aseptic inflammatory processes. Under such conditions, microcirculation is impaired, creating a favorable environment for anaerobic bacteria, particularly *Fusobacterium necrophorum*.

Necrobacteriosis frequently develops as a result of mixed infections and is characterized by inflammatory and necrotic processes in the soft tissues of the hoof. Pathological changes manifest in the form of ulcers, abscesses, and phlegmon, primarily localized in the inner hoof region and rudimentary digits.

Laboratory analyses revealed that, in addition to *Fusobacterium necrophorum*, other microorganisms such as micrococci, staphylococci, streptococci, enterococci, *Escherichia coli*, *Proteus* spp., and other gram-negative bacteria were also isolated. These findings confirm that necrobacteriosis is commonly associated with polymicrobial bacterial communities.

The disease was most frequently observed in recently calved cows and heifers, typically presenting as lameness affecting one or both limbs. The introduction of new animals into herds without proper veterinary control, as well as the persistence of pathogens in previously contaminated housing facilities, were identified as important factors contributing to disease transmission.

5. Conclusions

Necrobacteriosis and hoof diseases in cattle represent multifactorial pathological processes affecting the distal parts of the limbs. These conditions may develop under

the influence of infectious and non-infectious factors, including bacterial, viral, and fungal agents.

The development of the disease is largely associated with reduced general or local immune resistance, which facilitates the penetration of opportunistic microorganisms into tissues via endogenous or exogenous routes.

One of the main reasons for the widespread occurrence of necrobacteriosis and hoof diseases is the lack of regular clinical examination of animals and insufficient implementation of preventive measures adapted to the multifactorial nature of the disease.

Accurate diagnosis requires a comprehensive approach based on clinical signs, epizootiological data, pathomorphological findings, and laboratory results.

The isolation of pathogenic strains of *Fusobacterium necrophorum* from laboratory animals remains a key criterion for confirming the diagnosis of necrobacteriosis. However, the results of the present study indicate that this microorganism is not detected in all cases clinically diagnosed as necrobacteriosis, suggesting a more complex etiological structure of the disease.

6. Practical Recommendations

- Regular clinical examination of the hoof region should be implemented in farms for early detection of necrobacteriosis and hoof pathologies;
- Pathological samples obtained from lame animals or animals with inflammatory lesions of hoof tissues should be subjected to bacteriological analysis to identify *Fusobacterium necrophorum* and associated microorganisms;
- Proper zoohygienic conditions should be maintained, including reduction of moisture and contamination, as well as appropriate flooring management;
- Regular hoof care and the use of preventive hoof baths (both liquid and dry) should be applied;
- Newly introduced animals should undergo veterinary inspection and quarantine measures when necessary;
- Clinical and pathomorphological findings, as well as photographic materials obtained during the study, can be used as additional diagnostic tools in veterinary practice.

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