



TRIGGER FACTORS OF NECROBACTERIOSIS IN HIGH-YIELDING DAIRY CATTLE AND THE EFFECTIVENESS OF AN INTEGRATED PREVENTION MODEL

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ABSTRACT

This study investigates the main trigger factors involved in the development of necrobacteriosis in high-yielding dairy cattle and evaluates the effectiveness of an integrated prevention model targeting these factors. The results identified hoof rot, interdigital dermatitis, metabolic disorders, and technological stressors as key trigger factors contributing to disease development. The implementation of the integrated prevention model led to a reduction in disease incidence, stabilization of clinical conditions, and preservation of milk productivity. The findings demonstrate that a trigger factor-oriented approach is highly effective in controlling and preventing necrobacteriosis under modern livestock production conditions.

INTRODUCTION

In modern livestock production systems, achieving high productivity in dairy cattle remains a primary objective. However, intensive production conditions are often associated with increased physiological, metabolic, and immunological stress, which creates favorable conditions for the development of infectious diseases, including necrobacteriosis.

Necrobacteriosis is a widely distributed disease in high-yielding dairy cattle and is characterized by lameness, decreased milk production, reproductive disorders, and significant economic losses. The primary etiological agents of

the disease are *Fusobacterium necrophorum* and *Dichelobacter nodosus*, gram-negative anaerobic bacteria capable of producing toxins and enzymes that induce inflammation and necrosis in hoof tissues.

Importantly, these microorganisms alone are not always sufficient to initiate the disease process. This indicates that additional predisposing factors, commonly referred to as trigger factors, play a critical role in the onset and progression of necrobacteriosis.

Hoof rot, interdigital dermatitis, metabolic disorders, mineral and vitamin deficiencies, and technological stress factors are considered the main triggers



contributing to disease development. These factors compromise tissue integrity and immune function, thereby facilitating the activation and proliferation of pathogenic microorganisms.

Conventional preventive strategies are primarily focused on controlling infectious agents, while insufficient attention is given to eliminating these predisposing factors. As a result, the disease frequently recurs and may progress to chronic forms, reducing the effectiveness of therapeutic interventions.

Therefore, the development and scientific evaluation of an integrated prevention model targeting trigger factors represent an important objective for improving disease control in modern dairy farming systems.

AIM OF THE STUDY

The aim of this study was to identify the main trigger factors involved in the development of necrobacteriosis in high-yielding dairy cattle and to evaluate the effectiveness of an integrated prevention model targeting these factors.

OBJECTIVES

To achieve the aim of the present study, the following objectives were defined:

- to analyze the prevalence, epizootiological characteristics, and seasonal dynamics of necrobacteriosis in high-yielding dairy cattle;
- to evaluate hoof rot, interdigital dermatitis, metabolic disorders, and technological stress factors as the main trigger factors in disease development;
- to determine the relationship between clinical manifestations of necrobacteriosis and trigger factors

using epizootiological and statistical methods;

- to develop and implement an integrated prevention model targeting trigger factors under farm conditions;
- to assess the effectiveness of the proposed model based on disease incidence, recovery duration, and productivity indicators;
- to evaluate the economic efficiency of the integrated prevention model and develop scientifically grounded recommendations for its practical application.

MATERIALS AND METHODS

The study was conducted between 2022 and 2025 in dairy farms with different production systems located in various regions. High-yielding dairy cattle were selected as the study population. Observations were primarily carried out in cows during the early and mid-lactation periods, which are considered critical stages for the development of necrobacteriosis.

A comprehensive approach based on trigger factors was applied to investigate the disease. Necrobacteriosis was considered a multifactorial pathological process activated under the influence of endogenous and exogenous factors.

The main trigger factors evaluated in this study included:

- hoof rot;
- interdigital dermatitis;
- metabolic disorders (including subclinical acidosis);
- mineral deficiencies;
- technological stress factors such as inadequate feeding, poor hygiene, high humidity, insufficient exercise, high



IF = 9.2

stocking density, and inadequate ventilation.

Epizootiological analysis included the assessment of disease prevalence, seasonal dynamics, and relationships between clinical manifestations and identified trigger factors. Farms were evaluated comparatively to identify risk groups and patterns of disease occurrence.

Clinical examinations were performed to assess the general condition of animals, degree of lameness, and pathological changes in hoof and interdigital tissues, including swelling, exudation, necrosis, and signs of metabolic disturbances.

For laboratory analysis, samples were collected from affected hoof and interdigital tissues. The presence of *Fusobacterium necrophorum* was determined using standard microbiological methods under anaerobic conditions. In addition, hematological parameters were analyzed to evaluate the immune status of the animals.

To assess the effectiveness of preventive measures, animals were divided into control and experimental groups. The control group received conventional preventive measures, whereas the experimental group was subjected to an integrated prevention model targeting trigger factors.

The integrated model included:

- regular hoof care and trimming;
- improvement of hygienic conditions;
- use of hoof baths;
- dietary adjustments to correct metabolic disorders;
- control of animal movement;

- regular disinfection of housing facilities;- application of local antiseptic agents.

The effectiveness of the preventive measures was evaluated based on disease incidence, duration of clinical recovery, reduction in lameness severity, and milk productivity indicators. Statistical analysis was performed to compare differences between control and experimental groups.

RESULTS AND DISCUSSION

The results of the study demonstrated that necrobacteriosis is widely distributed among high-yielding dairy cattle and represents a significant cause of economic losses in dairy farming systems.

The prevalence of the disease varied considerably depending on farm management practices, hoof care quality, and environmental conditions. Higher incidence rates were observed in farms characterized by poor feeding balance, hard flooring, absence of bedding, high humidity, limited exercise, overcrowding, and inadequate ventilation.

These factors contributed to mechanical damage of hoof tissues, increased microbial contamination, and activation of infectious processes, thereby intensifying the epizootic situation.

Epizootiological analysis showed that necrobacteriosis was most frequently observed in cows during early and mid-lactation periods. This can be explained by increased metabolic stress, decreased immune resistance, and higher mechanical load on the hooves during peak productivity.



IF = 9.2

Seasonal analysis revealed a higher incidence of the disease during autumn and winter, which is associated with increased humidity and deterioration of hygienic conditions.

Clinical examinations identified lameness, interdigital swelling, exudation, and necrotic lesions as the main clinical signs. In many cases, necrobacteriosis occurred in association with hoof rot, leading to deeper tissue damage and more severe disease progression.

Laboratory analyses confirmed the presence of *Fusobacterium necrophorum* in affected tissues, supporting its leading etiological role. Hematological findings indicated inflammatory responses, including leukocytosis and neutrophilia, along with reduced erythrocyte and hemoglobin levels. Additionally, decreased immune status was observed in affected animals.

The implementation of the integrated prevention model in the experimental group resulted in a significant reduction in disease incidence compared to the control group. Clinical recovery time was shortened, and the severity of lameness decreased more rapidly.

Moreover, milk productivity remained stable in the experimental group, indicating the positive economic impact of the applied preventive measures. The integrated approach also contributed to reducing the risk of antimicrobial resistance by minimizing the need for intensive antibiotic therapy.

These findings confirm that necrobacteriosis should be considered a multifactorial disease in which trigger factors play a decisive role alongside infectious agents.

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