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UDC 619:616-08-039.71:636.2 **Research article**

Alternatives to therapeutic and preventive methods for calves in the early postnatal period

Gaisa G. Absatirov, Adilbek K. Zholdasbekov, Izimgali N. Zhubantayev, Aiman A. Jumagaliyeva, Akbar M. Seraly

West Kazakhstan University of Innovation and Technology, Uralsk, Kazakhstan

Corresponding author: Akbar M. Seraly: akbar.seraly@gmail.com
Co-authors: (1: GA) absatirovgg@yandex.ru; (2: AZh) adilzhol@mail.ru
(3: IZh) zhubantayev_i@mail.ru; (4: AJ) bekovaaiman@mail.ru
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Abstract

Background and Aim. Calves in the early postnatal period are highly susceptible to infec-tious diseases, particularly gastrointestinal disorders. These pathologies often result from poor zoo-hygienic management and inadequate feeding practices, which activate opportunistic microflora and lead to clinical symptoms. Conventional treatment strategies frequently rely on antibacterial agents, raising concerns regarding antimicrobial resistance in dairy farming. This study aimed to evaluate alternative therapeutic and preventive methods that reduce the need for antibiotics in calf manage-ment.

Materials and Methods. The study was conducted under practical farm conditions characterized by suboptimal microclimate and feeding practices that contributed to gastrointestinal and respiratory disorders in calves. A locally produced antibacterial drug, *Timutin*, was used to assess ther-apeutic efficacy. Additionally, the probiotic *Vetom 3* was administered orally to evaluate its preven-tive effect on gastrointestinal diseases.

Results. Limited use of *Timutin* demonstrated noticeable therapeutic effectiveness in calves under unfavorable housing and feeding conditions, contributing to clinical improvement in gastroin-testinal and respiratory disorders. Preventive oral administration of the probiotic *Vetom 3* showed a positive effect, supporting the formation of a stable microbiocenosis and reducing the incidence of bacterial gastrointestinal diseases accompanied by diarrheal syndrome.

Conclusion. The findings indicate that alternative therapeutic and preventive measures such as controlled use of *Timutin* and probiotic supplementation with *Vetom 3* may effectively reduce gastrointestinal morbidity in calves while limiting reliance on antibacterial drugs. These approaches represent promising strategies for preventing antibiotic resistance in dairy farming.

Keywords: calves; gastrointestinal pathologies; antibacterial drugs; probiotics; blood bio-chemistry.

Introduction

Obtaining strong and viable young animals is the foundation for developing dairy farming. The health status of newborn calves determines their subsequent growth and development. This influences their ability to adapt to adverse environmental factors and fully express their genetic potential [1, 2, 3].

However, the technological and zoo-veterinary methods used in newly established dairy farms, such as housing, calving management, and calf rearing during the milk-feeding period, as well as the untimely implementation of specific therapeutic and preventive measures, do not ensure the birth of calves with high metabolic activity and resistance. As a result of these factors, a significant number of diseases among newborn calves are reported. In the nosological structure of neonatal calf pathology, gastrointestinal and respiratory diseases are most frequently observed [4, 5, 6].

Gastrointestinal disorders accompanied by diarrhoea may occur on a large scale, resulting in high morbidity and mortality. These diseases cause significant economic losses in animal husbandry due to the costs of preventive and therapeutic measures. High disease incidence is associated with the fact that

calves are born with an underdeveloped immune system, making this age group particularly vulnerable to gastrointestinal infections and unable to resist the negative impact of conditionally pathogenic microflora ingested orally. Such microflora quickly acquires virulence within the host, leading to high mortality [7, 8].

Since 2023, a large national programme to develop dairy farms has been implemented in Kazakhstan. As a result of the active use of state support measures for dairy farming, many farmers have entered the dairy sector, importing livestock from abroad. However, farmers do not always take into account the veterinary aspects of dairy farming, which are determined by farm specialization, the concentration of large numbers of animals in limited spaces, and the cyclical nature of production technology. When diseases occur among adult animals, especially gastrointestinal and respiratory diseases in newborn calves, farmers often indiscriminately use antibiotics and chemotherapeutic agents, such as Nitox, Penestrel, and Tylosin, which are widely available and sold without prescription. In such cases, antibiotics are used to combat the negative consequences of poor man-agement conditions [9, 10, 11].

The widespread use of antibacterial drugs for these purposes, along with their positive therapeutic effects, produces adverse side effects. Prolonged, unsystematic use of antibacterial agents reduces their effectiveness and leads to the emergence of resistant microorganism strains.

Such a disease control protocol in dairy farming is unacceptable. In many countries with ad-vanced dairy industries, researchers have emphasised the risk of antibiotic resistance associated with such practices [12, 13, 14, 15]. Hence, there is an urgent need to intensify practical measures and scientific research on preventive strategies for animal health protection and public health standards in Kazakhstan. The aim of our research was to study alternative methods of therapy and disease prevention in calves during the early postnatal period, while minimising the use of antibiotics and chemotherapeutic agents [16-20].

Materials and Methods

To expand their dairy farming potential, in 2023, the Arystanov farm constructed a modern cowshed for 400 head of cattle and associated facilities, including a calf barn, a milking unit, and a maternity ward. In the second half of July 2024, the first batch of Holstein heifers arrived from Germany. The supplier, having artificially inseminated the heifers, planned mass calving for Decem-ber 2024 and January 2025. However, the contractors failed to construct the necessary farm facili-ties on time, including the calf barn, maternity ward, and veterinary station.

Consequently, after calving, the cows and newborn calves were kept in group pens in an adapted old cowshed. Monitoring of these housing conditions revealed several shortcomings: low temperatures, lack of sunlight, and twice-daily feeding with colostrum and, subsequently, milk, of-ten not from individual nipple drinkers. Due to these factors, 15 calves showed clinical signs of gas-trointestinal and respiratory diseases. Thermometry revealed elevated body temperature in most an-imals, reaching 40 °C.

The conditions for the Simmental calves at the Tolengut farm were somewhat better organ-ised. Here, the calves were kept in draft-free individual pens at an acceptable temperature (8-10 °C). Nevertheless, due to violations of sanitary and hygienic standards, such as improper cleaning and disinfection of feeding equipment (nipple drinkers) and infrequent cleaning of pens, some calves developed diarrhoea. Clinical signs of gastrointestinal lesions, including diarrhoea and elevated body temperature, were observed in four calves. For treatment, they received a five-day course of intramuscular injections of the drug *Timutin* (a relatively new drug produced in Kazakhstan from the group of diterpene antibiotics. It is included in the State Register of Veterinary Drugs and Feed Additives of the Republic of Kazakhstan. Produced by Epsilon LLP in Uralsk, West Kazakhstan region.) and the probiotic *Vetom 3*, administered with milk. The probiotic *Vetom 3* was produced by Research Center, LLC, Koltsovo, Novosibirsk Region (batch no. 070524, production date May 2024, shelf life: 4 years).

During the research period, a comparative analysis of the biochemical parameters of blood serum was performed for clinically healthy calves and those with gastrointestinal disorders at 1.5-2 months of age. Blood samples for biochemical studies were collected from the jugular vein using vacuum systems with clot activators. Laboratory analyses were performed on an automatic biochemical analyser. Biometric processing of the obtained results was conducted using Student's t-test for determining the significance of differences. Given the insufficiently favourable housing and feeding conditions,

to prevent complications associated with gastrointestinal and respiratory diseases, the relatively new domestically produced antibacterial drug *Timutin* was used at 1 ml per 12.5 kg of live weight for therapeutic purposes. The treatment course lasted 4 to 5 days, depending on clinical symptoms, with 1 injection administered per day. The drug *Timutin* is a relatively new preparation containing the active substance tiamulin, a semisynthetic derivative of the diterpene antibiotic pleuromutilin, produced by *Pleurotus mutulis*. According to GOST 12.1.007-76, *Timutin* is classified as a moderately hazardous substance (hazard class 3).

For the remaining 57 calves, the probiotic *Vetom 3* was administered orally with milk at 50 mg per 1 kg of live weight for prophylactic purposes. The veterinary specialists were advised to follow a prophylactic protocol with Vetom 3 through enteral administration three times daily for two weeks.

Results and Discussion

The application of the new domestic preparation, *Timutin*, and the probiotic *Vetom 3* demonstrated positive outcomes. After *Timutin* administration, clinical improvement was observed within three days, and diarrhoea symptoms ceased by day four or five. Table 1 presents the results of treatment and prevention of diseases in calves.

Table 1 – Results of Therapeutic and Preventive Drug Use at Arystanov and Tolengut Farms

№	Farm name	Number of calves (under 2 months)	Number of sick calves	Treatment course with Timutin (days)	Number of dead calves	Recovery rate (%)	Probiotic prevention (Vetom 3)	Disease recurrence
1	Arystanov	74	17	4–5	2	88	74	No recurrence
2	Tolengut	68	4	5	–	100	68	No recurrence

However, stopping all use of antibacterial agents remains difficult at present. Their rational use is still justified for sick calves, especially during the first 10 days of life, as this period does not involve forced slaughter and poses no risk of antibiotic residues or antibiotic resistance that could affect public health. Furthermore, the reasonable use of antibacterial agents in our study is justified by the fact that the heifers were not immunised during pregnancy, meaning no antibodies were produced against gastrointestinal diseases for subsequent transfer via colostrum.

Gastrointestinal diseases in calves are characterised by changes in blood biochemical parameters compared with healthy animals. The comparative characteristics of blood serum indicators are presented in Table 2.

Table 2 – Biochemical indicators of calf blood serum

Blood serum indicators	Clinically healthy calves	Sick calves
Total protein, g/L	66.4±8.53	54.3±14.8
Calcium, mmol/L	4.9±0.08	3.8±0.24
Phosphorus, mmol/L	1.9±1.48	1.3±0.25
Iron, μmol/L	32.1±11.6	20.12±12.3
Urea, mmol/L	2.2±0.8	2.4±0.94

Blood serves as a test system that reflects metabolic disturbances and the effects of poor veterinary and sanitary conditions, as well as improper feeding. These factors influence the gastrointestinal tract function in calves, as reflected in their biochemical blood parameters.

Among biochemical indicators, total protein concentration is one of the objective criteria that characterise the level of metabolism and the functional state of the animal. When protein metabolism is impaired, the immune system cannot provide effective protection against potential pathogens. In sick calves, the total protein concentration decreased by 18.2%. The calcium and phosphorus levels in sick calves were also lower than in healthy ones, may be associated with dehydration and insufficient

mineral intake through feeding. Iron plays an important physiological role in metabolism, as it is part of haemoglobin, myoglobin, and enzymes involved in biological oxidation and haematopoiesis. In clinically healthy calves, iron levels were 37.4% higher than in diseased animals. A characteristic feature of calf blood and urea chemistry is the nitrogen content. The urea concentration in the blood of calves with gastrointestinal disease increased slightly (2.4±0.94 mmol/L vs. 2.2±0.8 mmol/L), which may reflect the activation of protective mechanisms to maintain homeostasis during illness.

As noted earlier, the main factors contributing to gastrointestinal diseases in calves were violations of zoo-veterinary housing standards, feeding regulations, and non-compliance with veterinary and sanitary requirements. To reduce the use of antibiotics and limit the spread of antibiotic resistance, we applied the probiotic *Vetom 3* as an alternative to prevent diarrhoea and dysbiosis in calves. The preparation was administered orally, both individually and in groups, mixed with milk as a freshly prepared solution at a dose of 1.5 g per head twice daily. The probiotic was given to 57 calves aged up to 1.5 months for 12 days. During and after the administration of the probiotic *Vetom 3*, no cases of diarrhoea were observed in calves, which can be explained by its antagonistic action against pathogenic microflora and its ability to neutralise accumulated toxic products.

Conclusion

The results of this study indicate that the occurrence of gastrointestinal diseases in calves during the early postnatal period, as well as the prevalence, severity, and outcome, depend on the overall body condition of the animal, its natural resistance, and the conditions under which the calf is kept after birth and during subsequent rearing. The feeding, housing, and management deficiencies identified at Arystanov and Tolengut farms contribute to reduced body resistance and typically lead to more severe disease.

At present, a complete rejection of antibacterial agents is difficult. It is acceptable to use such drugs for diseased calves, especially during the first ten days of life, because forced slaughter is not practised in this period, meaning that the development of antibiotic resistance and the potential impact on public health are minimal. Furthermore, the rational use of a relatively new, domestically produced antibacterial drug is justified, as the heifers were not immunised during pregnancy with vaccines that promote immunity; thus, no antibodies against gastrointestinal diseases were produced and transferred through colostrum. The probiotic Vetom 3 demonstrated sufficient effectiveness in the prophylaxis of gastrointestinal diseases, as it contributes to the formation of a healthy microbiocenosis, helping calves avoid bacterial infections associated with diarrheal syndromes.

Authors' Contributions

GA and AZh: Conceptualized and designed the study, conducted a comprehensive literature search, analyzed the gathered data and drafted the manuscript. IZh and AJ: Conducted the final revision and proofreading of the manuscript. All authors have read, reviewed, and approved the fi-nal manuscript.

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