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Rationale for the prevention of mastitis in cows during the dry period and after calving

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Abstract. Testing cows for mastitis before starting and treating all milch cows with a long-acting antimicrobial agent is an important component of the preventive preparation of animals for the dry period. In addition, determining the sensitivity of pathogens isolated on the farm and rotating antimicrobials increases the effectiveness of therapy and reduces the risk of resistant strains of microorganisms. The purpose of this study was to determine the preventive and therapeutic effects of preparations based on povidone-iodine and cefquinome sulfate for cows with mastitis. The following methods were used in the study: calculation of the total number of somatic cells by flow cytometry; California test; sensitivity to antimicrobial agents by agar disks; clinical and physiological method; statistical method. During the examination of cows for mastitis, it was identified that in the

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control group the number of somatic cells averaged 450 thousand/cm^3, the total number of microorganisms was 130 thousand. In cows of the experimental group, productivity was 23.6%, the number of somatic cells was 600 thousand/cm^3, microorganisms – 550 thousand CFU/cm^3. It was identified that the isolated microflora showed high sensitivity to the preparation based on povidone-iodine and cefquinome sulfate. Therefore, udder conservation for cows of the experimental group with signs of mastitis was conducted with a product based on povidone-iodine, which affected the increase in lactation and improvement of milk quality after calving. The criteria for milk in the experimental group at the end of the experiment corresponded to the grade extra – 30%, top – 60%, and first – 10%. As a result of the therapy, lactation improved in cows, and the quality of milk corresponded to the first grade. At the end of the study, the quality of milk in cows of the control group corresponded to the extra Grade – 10%, top – 40%, and first – 50%. The practical value of the study lies in the prevention of mastitis on the farm, improving the quality of the resulting products, reducing the cost of veterinary care and culling animals

Keywords: mammary gland inflammation; milk production; teat channels; pathogens of mastitis; somatic cells

INTRODUCTION

Mastitis is one of the most common diseases that occur in dairy cows and affects the productivity and health of animals. Symptoms of clinical mastitis in cows include changes in the physico-chemical and microbial composition of milk and pathological changes in the glandular epithelium. An artificial model of epithelial cells was developed to conduct analysis *in vitro* to examine the changes that occur in the mammary gland (Saed & Ibrahim, 2020; Xu *et al.,* 2021).

Mastitis is often caused by microorganisms such as *Escherichia coli*, *Staphylococcus aureus, Streptococcus dysagalactiae,* and *Streptococcus agalactiae* (Shkromada *et al.,* 2019). Therefore, for its treatment, veterinarians use antimicrobial agents, which include synthetic preparations that kill or slow down the growth of microorganisms. However, due to limitations in the use of antimicrobials and the emergence of resistance in microorganisms, researchers are developing new alternative methods for treating mastitis.

In addition, food mycotoxicoses caused by the presence of microscopic fungi *Aspergillus flavu* and *Aspergillus parasiticus in the feed can contribute to udder inflammation*. Animals experience acute and chronic poisoning. Researchers (Wang *et al.,* 2020) developed a method for detecting the toxin in feed. A limitation of the study is that the detection method was developed only in relation to aflatoxin. Therefore, it remains necessary to control the quality of feed for pregnant and lactating cows.

Researchers Xu *et al.* (2021) in the *in vitro* experiment determined the effect of the *T. Officinale* extract on *Staphylococcus aureus*. As a result, it was proved that the growth of *S. aureus* was suppressed after the application of phenolic extract *T. Officinale*. Researchers Zhu *et al.* (2022) also identified that the antimicrobial peptide MPX exhibits bactericidal activity against *S. aureus*. However, studies have not been replicated in production environments for the treatment of cows with bacterial mastitis caused by *Staphylococcus aureus*.

A probiotic-based method was also proposed to treat subclinical mastitis (Shkromada *et al.,* 2022). The authors determined that *B. megaterium* NCH 55 showed the ability to inhibit the growth of microorganisms. The limitation of the study lies in the individual sensitivity of each animal to a probiotic, the effect of which is difficult to trace due to the multi-vector effect on the body.

Treatment of clinical bacterial mastitis is a complex task, due to the speed of development of the process and the risk of infection of a substantial part of the livestock. Wang *et al.* (2019) proposed to use a specific antimicrobial peptide JH-3 for the destruction of *Salmonella enterica*. The results showed that treatment with a peptide at a dose of 40 mg/kg of JH-3 had the most pronounced therapeutic effect. In addition, all physiological and clinical parameters in mice were close to normal. The experiment was conducted under laboratory conditions with a test strain *Salmonella enterica* serotype CVCC541. There is no data on the effectiveness of the antimicrobial peptide JH-3 in production conditions against field strains of *Salmonella*.

Researchers Fotina *et al.* (2018) identified that depending on the degree of mammary gland inflammation, the species composition of somatic cells can vary. Thus, the number of macrophages and eosinophils in milk increases from 1.5 to 4 times, respectively. It is proved that the number of somatic cells in the evening milk yield is 30% higher than in the morning milk yield. The results obtained by the researchers are limited only to goat's milk, so it is not known whether there is a certain pattern in cow's milk.

Mastitis has a predominantly bacterial aetiology, so treatment is often based on the use of antibiotics (Kober *et al.*, 2022). However, due to the increase in antimicrobial resistance every year, the effectiveness of treatment decreases. A new antimicrobial agent based on triazole was developed as an alternative to antibiotics (Karpun *et al.,* 2021). However, the spectrum of action of the sensitivity of this tool was tested only on *Salmonella pullorum, Salmonella typhimurium, Salmonella enteritidis, Escherichia coli* O2.

Blanchet *et al.* (2021) concluded that it is necessary to change the old methods of treating mastitis based

on antibiotics and test new therapeutic agents. However, researchers faced the problem of using live probiotic cultures for the treatment of mastitis.

Prevention of mastitis in the herd is very important, especially when preparing cows for the dry period. When developing a set of necessary measures for the control and prevention of mammary gland inflammation on the farm, a multi-vector approach is necessary. It should be considered that it is impossible to completely get rid of the disease in a dairy herd, but the risks of spreading mastitis pathogens among livestock can be reduced. Researchers Zigo *et al.* (2021) considered the possible causes of mammary gland inflammation in cows, but specific methods of prevention and treatment of the disease were not proposed.

Studies, conducted by Muturi (2020), showed that udder inflammation in cows affects milk production and culling of sick cows. However, the author did not suggest measures to prevent subclinical mastitis on farms.

After calving, cows have the most difficult first three weeks, when postpartum stress can lead to inflammation of the udder. For the treatment of mastitis in lactating cows, there is a fairly limited amount of preparations, due to the risk of absorption into milk. I. Holko *et al. (*2019) investigated isolated pathogens of mastitis: coagulase-negative staphylococci, *Escherichia coli, Staphylococcus aureus, Streptococcus uberis, and Streptococcus agalactiae* and identified a high overall resistance to aminoglycosides (streptomycin, neomycin) in dairy farms in Slovakia, but studies did not propose an alternative solution to this problem.

The purpose of the study was to establish the effect of preparations based on povidone-iodine and cefquinome sulfate on the body of cows in the treatment of mastitis. The objectives of the study were: determination of mastitis patients in a herd of cows; examination of antimicrobial activity of preparations based on povidone-iodine and cefquinome sulfate; identification of the therapeutic effect of the products based on povidone-iodine and cefquinome sulfate for cows with mastitis.

MATERIALS AND METHODS

The study was conducted on the dairy farm of the North-Eastern region of Ukraine "Agrofirma Lan" on Holstein cows in the period of February-August 2022 in accordance with directive 2010/63/EU (Hartung, 2010), which was approved by the conclusion of the Commission on ethics and bioethics of the Faculty of Veterinary Medicine of Sumy National Agrarian University dated 11.04.2022.

Examination of cows for subclinical mastitis. Milk tests for mastitis were performed two weeks before the dry period and after calving for 4 weeks to dry off the cows. Milk samples were obtained in sterile vessels. Determination was performed using the California test (Bhutto *et al.*, 2012), SCC (somatic cell count), and QMAFAnM (Quantity of mesophilic aerobic and facultative anaerobic microorganisms) in each cow. The total number of somatic cells was calculated by flow cytometry using the SomaCount Flow Cytometer device. QMAFAnM in cow's milk was determined by the bacterial method. Endo agar elective media were used for the *Salmonella* and *Escherichia* microorganisms indetification; yolk-salt agar (Chistovich) – *Staphylococcus aureus;* Saburo agar – mould fungi and yeast. PCR (polymerase chain reaction) was also used to determine *Mycoplasma spp.* in milk. The number of colony-forming units was determined in CFU/cm^3 according to DSTU 7357:2013 "Milk and milk products. Methods of microbiological monitoring".

Determination of microflora sensitivity to antimicrobial agents. Isolated microorganisms from milk were examined for antimicrobial sensitivity by agar discs in Petri dishes. Antibiotics of various groups and agents based on povidone-iodine and cefquinome sulfate were used in the study (Garkavenko *et al*., 2021).

Investigation of the therapeutic effect of the use of preparations based on povidone-iodine and cefquinome sulfate. The experimental group consisted of 10 heads. Cows in the dry period (6 weeks before calving) after the last milking were intracisternally injected once into each quarter of the udder at a dose of 10 g of povidone-iodine-based agent. Therewith, cows of the control group (10 animals) had their udder preserved with a jelly-like substance without the use of an antimicrobial agent. After calving, SCC in milk, QMAFAnM, and milk productivity were determined in control and experimental animals. Animals with elevated SCC and QMAFAnM values and reduced milk production were treated with cefquinome sulfate-based agents to treat udder inflammation. The results were recorded for 4 weeks. When conducting experiments, DSTU 3662:2018 "Raw cow milk" was adhered to.

Statistical analysis. The Microsoft Excel 2010 programme and Fisher-Student statistical analysis were used, considering statistical errors and data probabilities of more than 95% to analyse the results obtained ($p<0.05$).

All experimental studies were conducted in accordance with modern methodological approaches and in compliance with the relevant requirements and standards, in particular, they meet the requirements of DSTU ISO/IEC 17025:2005 (2006). The keep of animals and all manipulations were conducted in accordance with the provisions of the procedure for conducting experiments and experiments on animals by scientific institutions (Law of Ukraine No. 249, 2012), the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (European convention…, 1986).

RESULTS AND DISCUSSION

Results of the examination of cows for subclinical mastitis. Cows were prepared for the dry period after a thorough examination for mastitis since it is necessary to dry

off the animals with a healthy udder. Therefore, at the beginning of the experiment, all the cows that were preparing for such a procedure were examined. SCC and QMAFAnM were determined in their milk (Fig. 1).

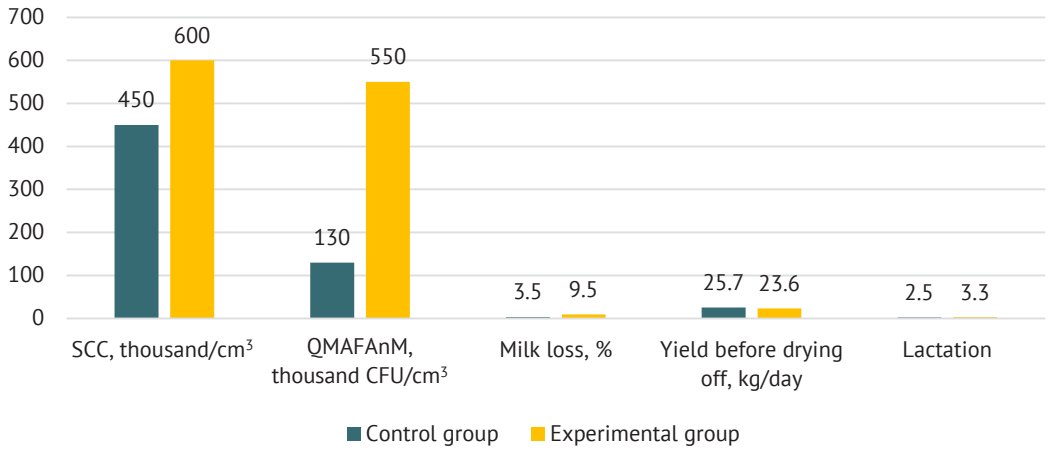

Figure 1. *Results of the examination of cows for mastitis before starting drying off (on average)*
Source: *compiled by the authors*

In the control group, the average number of somatic cells was 450 thousand/cm³, QMAFAnM – 130 thousand CFU/cm³, the estimated loss of milk at such indicators is 3.5%, milk yield – 25.7 kg/day. The main share of the control group consisted of cows of the second lactation. The experimental group included animals mainly of the third lactation with milk productivity of 23.6 kg/day before drying off. On average, in the experimental group, SCC was 600 thousand/cm³, QMAFAnM – 550 thousand CFU/cm³. A control group of ten cows was formed, the milk of which showed a low content of somatic cells and microorganisms. For healthy cows, udder conservation was conducted with a jelly-like sealant without the antimicrobial agent, to prevent microorganisms from entering the milking canal during the period of drying off. During the examination of cows for mastitis, isolated pathogenic microorganisms were monitored (Fig. 2).

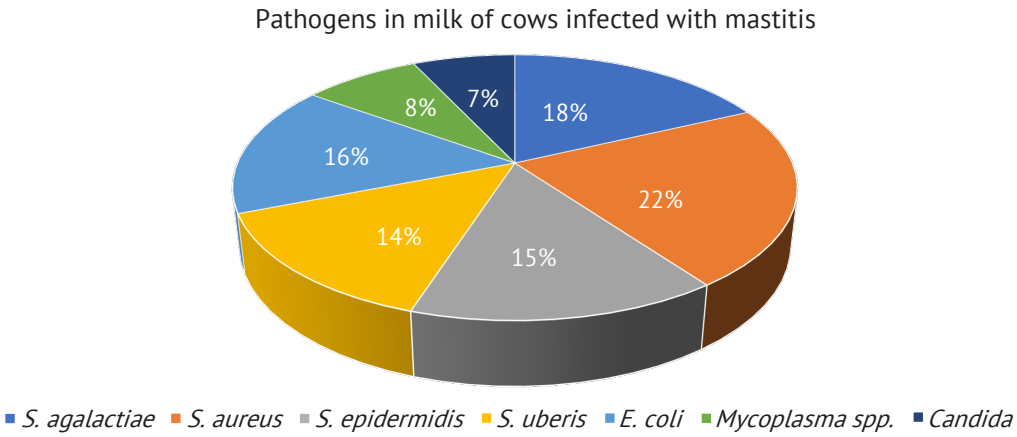

Figure 2. *Monitoring of mastitis pathogens in cows before the period of drying off*
Source: *compiled by the authors*

The conducted studies established the predominant number of isolated pathogens of *S. aureus* (22%), *S. agalactiae* (18%), *E. coli* (16%), *S. epidermidis* (15%), and *S. uberis* (14%).

Thus, a change in the structure of the udder, such as a deformity, can be used as a sign of inflammation. Therefore, animals with deformed udders and teats were not used in the experiment, due to possible individual health problems that may affect the overall result of the experiment.

Results of the study of antimicrobial activity of products based on povidone-iodine and cefquinome sulfate. In cows of the experimental group, where SCC and QMAFAnM had high indicators, udder sealing was performed with a preparation to which the isolated microflora showed sensitivity (Fig. 3).

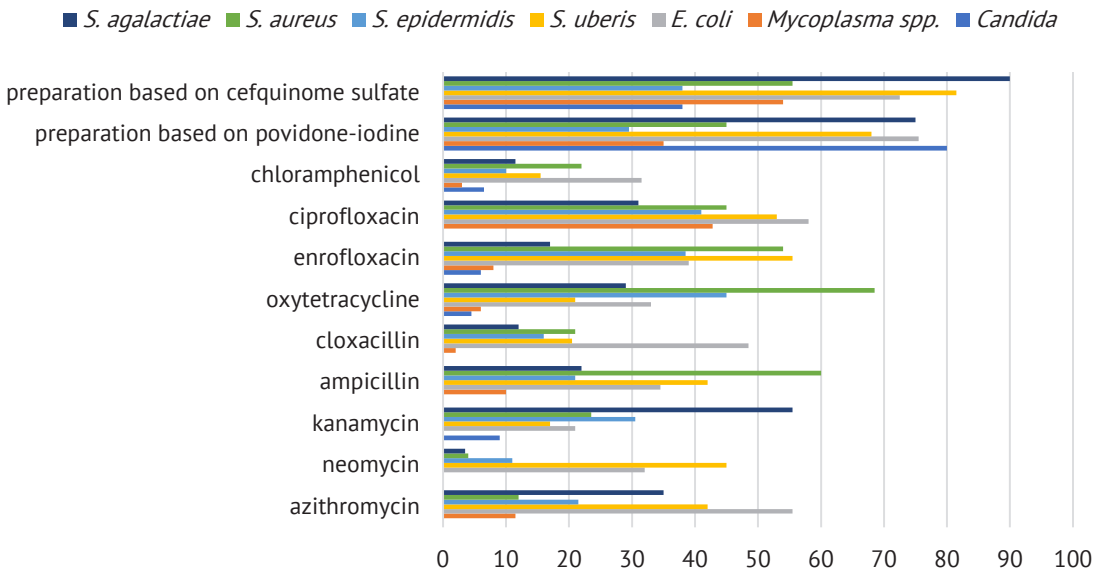

Figure 3. *Sensitivity of mastitis pathogen isolates to antimicrobial agents (%)*
Source: *compiled by the authors*

According to the results of the conducted studies, it was identified that the isolated microflora showed high sensitivity to a preparation based on povidone-iodine and cefquinome sulfate (Garch *et al.,* 2020). The most resistant were the bacteria of *Mycoplasma spp.* genus and yeast fungi of the *Candida genus*. Udder hygiene is very important and affects the risk of developing subclinical mastitis caused by staphylococci and streptococci, which are identified in large numbers on the udder skin (Paliy *et al.*, 2021). Therefore, in animals of the experimental group that had an increased content of SCC and QMAFAnM, udder conservation was conducted with a povidone-iodine-based agent to prevent the development of intramammary infection.

Results of determining the therapeutic effect of preparations based on povidone-iodine and cefquinome sulfate for use in cows with mastitis. After udder conservation, the control and experimental groups were monitored for the entire pregnancy period of cows. After calving, cows were re-examined for mastitis and their productivity was monitored (Table 1).

Table 1. *Cow productivity indicators*

No.	Productivity before drying off		Post-calving productivity			
	kg/day		kg/day			
	identification number of the animal		I week	II week	III week	grade
Control group						
1	**4520**	25	27	30	30	extra
	QMAFAnM, thousand CFU/cm³	195	287	134	100	
	SCC, thousand/cm³	360	489	430	387	
2	**8023**	24	18	24	28	first
	QMAFAnM, thousand CFU/cm³	196	1020	800	480	
	SCC, thousand/cm³	254	986	550	395	
3	**3645**	26	20	25	29	first
	QMAFAnM, thousand CFU/cm³	120	1123	870	500	
	SCC, thousand/cm³	347	1045	956	460	
4	**0123**	28	22	25	30	top
	QMAFAnM, thousand CFU/cm³	145	350	300	215	
	SCC, thousand/cm³	420	480	420	400	
5	**6231**	31	25	31	35	top
	QMAFAnM, thousand CFU/cm³	150	450	300	280	
	SCC, thousand/cm³	419	467	412	400	

Table 1, Continued

No.	Productivity before drying off		Post-calving productivity			
	kg/day		kg/day			
	identification number of the animal		I week	II week	III week	grade
6	**6045**	25	26	29	32	first
	QMAFAnM, thousand CFU/cm³	245	480	430	378	
	SCC, thousand/cm³	456	440	423	356	
7	**7630**	24	26	28	31	top
	QMAFAnM, thousand CFU/cm³	234	369	350	240	
	SCC, thousand/cm³	350	420	345	304	
8	**7656**	25	25	25	27	first
	QMAFAnM, thousand CFU/cm³	206	506	480	403	
	SCC, thousand/cm³	436	490	380	354	
9	**7659**	22	20	25	30	top
	QMAFAnM, thousand CFU/cm³	156	320	300	300	
	SCC, thousand/cm³	340	400	456	380	
10	**0355**	24	28	32	34	first
	QMAFAnM, thousand CFU/cm³	120	320	300	360	
	SCC, thousand/cm³	350	456	400	490	
	Experimental group					
11	**0348**	28	29	30	30	extra
	QMAFAnM, thousand CFU/cm³	500	316	300	100	
	SCC, thousand/cm³	610	400	368	350	
12	**0944**	24	27	29	31	top
	QMAFAnM, thousand CFU/cm³	523	290	312	300	
	SCC, thousand/cm³	515	450	380	345	
13	**0956**	26	29	29	30	first
	QMAFAnM, thousand CFU/cm³	515	438	400	325	
	SCC, thousand/cm³	645	450	433	400	
14	**6269**	27	29	29	32	extra
	QMAFAnM, thousand CFU/cm³	527	345	307	100	
	SCC, thousand/cm³	644	419	400	370	
15	**6735**	25	26	27	29	top
	QMAFAnM, thousand CFU/cm³	513	250	245	234	
	SCC, thousand/cm³	512	456	380	382	
16	**6957**	24	29	30	30	extra
	QMAFAnM, thousand CFU/cm³	556	300	218	98	
	SCC, thousand/cm³	550	420	400	385	
17	**7645**	25	29	30	32	top
	QMAFAnM, thousand CFU/cm³	540	420	360	250	
	SCC, thousand/cm³	660	500	430	400	
18	**7823**	24	26	29	30	top
	QMAFAnM, thousand CFU/cm³	557	320	300	250	
	SCC, thousand/cm³	680	450	435	390	
19	**0368**	23	25	26	29	top
	QMAFAnM, thousand CFU/cm³	690	357	360	280	
	SCC, thousand/cm³	700	510	480	445	
20	**0657**	25	27	29	30	top
	QMAFAnM, thousand CFU/cm³	670	420	320	240	
	SCC, thousand/cm³	720	538	470	398	

Source: *compiled by the authors*

Animals that were preparing for the dry period were selected in the control group, and their indicators (somatic cells and the number of microorganisms in milk) were within the normal range, that is, they corresponded to the grade not lower than the first. Before launching, each cow was injected with sealant into all four udder lobes. For healthy cows in the control group, a jelly-like sealant without an antimicrobial agent was used. Animals of the experimental groups were treated with a preservative based on povidone-iodine to treat existing subclinical mastitis and prevent the occurrence of a new infection during the dry period. In addition, animals the milk values of which did not correspond to the grade and tended to worsen were given a separate course of treatment.

As the results in the table show, in cows of the control group before the dry period, SCC and QMAFAnM were within the normal range and corresponded to a grade not lower than the highest. Milk yield for this period was low in cows of the control and experimental groups, which corresponds to productivity before drying off. Therefore, pre-drying off performance was not considered. Cows that were selected in the experimental group had high SCC and QMAFAnM before starting, which is a sign of the development of subclinical mastitis.

After calving, cows in the control group of ten heads – two had high SCC and QMAFAnM, which is 20%. A study by Tomanić *et al.* (2023) shows that when antimicrobial preservatives are no longer used, udder health worsens. In cows of the control group, a conventional sealant without an antimicrobial agent was used to preserve the udder. During the period of drying off, an intramammary infection developed in the udder and after calving, which is a stress factor, the cows showed signs of mastitis (Ndahetuye *et al.,* 2022).

The milk yield of Cow No. 8023 decreased by 25% compared to the pre-drying off period. In the first week, QMAFAnM increased by 420.3%, SCC – 288.2%, which indicates inflammation of the udder. In cow No. 3645, in the first week after calving, productivity worsened by 23.0%, QMAFAnM indicators increased by 835.8%, SCC – 201.1%, compared to the dry period. Cows No. 8023 and No. 3645 were treated with cefquinome sulfate, 8 g of which was injected intracisternally into the affected quarter of the udder from a syringe tube every twelve hours three times. Previously, studies have shown that the isolated microflora was sensitive to the cefquinome sulfate-based agent.

After the treatment in the second week, the productivity of cow No. 8023 increased by 33.0%, QMAFAnM indicators decreased by 22.0%, and SCC – 44.2% compared to the first week. Animal No. 3645 also had improved performance indicators by 25% after treatment, QMAFAnM – 22.5%, SCC – 9.3% compared to the period before treatment.

In the third week, the productivity of cow No. 8023 increased by 16.6%, QMAFAnM decreased by 40.0%, SCC – 28.2%, compared to the second week after calving. In cow No. 3645, milk yield increased by 16.0% during the third week, QMAFAnM – 42.5%, SCC – 51.9%, compared to the second week.

In cow No. 4520, lactation increased in the first week after calving by 8.0%, in the second and third – 20.0%. Therewith, the indicators of QMAFAnM and SCC changed during the study period, but in the third week, the quality of milk corresponded to the extra grade.

After the calving of cow No. 0123, productivity changed during the study period. In the first week, lactation decreased by 21.4%, in the second – 10.7%, and increased in the third week – by 7.1%, compared to the period of drying off. The quality of milk corresponded to the top grade.

Cow No. 6231 after calving was 19.4% less productive in the first week, and in the second – the indicators corresponded to the initial values before the drying off. At the end of the experiment, lactation increased by 12.9%, and the quality of milk corresponded to the top grade. After calving, animal No. 6045 showed an increase in lactation by 4.0%, in the second week – 16.0%, and in the third – 28.0%. Therewith, the milk criteria corresponded to the first grade.

In cow No. 7630, milk production increased by 8.3% in the first week, 16.6% in the second, and 29.2% in the third, compared to the period before drying off. The quality of the milk corresponded to the top grade. Cow No. 7656 after calving had productivity in the first and second weeks similar to the drying off period. In the third week, lactation increased by 8.0%, and the quality of milk was of the first grade.

In the first week after calving, the productivity of cow No. 7659 decreased by 9.0%, in the second week it increased by 13.6%, and in the third week – 36.4%. The milk quality corresponded to the top grade. In cow No. 0355, lactation after calving increased in the first week by 16.6%, in the second – 33.3%, and in the third – 41.6%, and corresponded to the first grade. In general, for the entire period of the study, the quality of milk in cows of the control group corresponded to the extra grade – 10%, top – 40%, and first – 50%. Accordingly, the farm suffered funds loss due to the deterioration of product quality.

After calving in all cows of the experimental group, the levels of SCC and QMAFAnM were within the normal range and did not tend to increase. Prior to the drying off, cows in this group showed signs of subclinical mastitis (Bari *et al.*, 2022) and therefore udder conservation was conducted using a povidone-iodine-based preparation. During the dry period, udder treatment was conducted and milk quality and productivity indicators returned to normal (Keefe, 2012). Thus, the productivity of cow No. 0348 increased by 3.5% in the first week after calving and 7.1% in the second and third weeks. The quality of the milk corresponded to the extra grade.

After calving, the lactation of cow No. 0944 increased by 12.5% in the first week, 20.8% in the second, and 29.1% in the third, compared to the pre-drying off

period. The quality of the product corresponded to the top grade. In cow No. 0956, productivity in the first and second weeks increased by 11.5%, and in the third – 15.3%, the milk quality indicators corresponded to the first grade. In the first and second weeks after calving, the lactation of cow No. 6269 increased by 7.4%, and in the third week – 18.5%. The quality of the milk corresponded to the extra grade.

In cow No. 6735, lactation increased by 4.0% in the first week, in the second – 8.0%, and in the third – 16.0%, compared to the period before drying off. According to the criteria, the milk corresponded to the top grade. The first week after calving was favourable for cow No. 6957, productivity increased by 20.8%, and in the second and third – by 25.0%. The quality of the milk was the extra grade. For animal No. 7645, the first week began with an increase in milk yield by 16.0%, the second – 20.0%, the third – 28.0%. The milk grade met the top criteria.

Cow No. 7823 after calving had productivity higher by 8.3%, in the second week – 20.8%, in the third – 25.0%, compared to the period of drying off. The quality of the product corresponded to the top grade. In the first week, cow No. 0368 had an increase in lactation by 8.6%, in the second – 13.0%, in the third – 26.0%. Therewith, the quality of the milk corresponded to the top grade. In cow No. 0657, milk productivity after calving increased by 8.0% in the first week, 16.0% in the second, and 20.0% in the third. The resulting product corresponded to the top grade. At the end of the experiment, the overall productivity of the cows of the experimental group was high and corresponded to the quality of the extra grade – 30%, top – 60%, and first – 10%.

Studies showed that the number of somatic cells averaged 450-600 thousand/cm^3, and the number of mesophilic microorganisms and facultative anaerobic microorganisms was 130–550 thousand CFU/cm^3, productivity ranged between 23.6–25.7 kg/day. The results obtained indicate the beginning of the development of subclinical mastitis. Researchers Müller *et al.* (2023) established that there is a need to treat cows during the dry period, but not all microorganisms show the same sensitivity to the antibiotic.

Microorganisms were isolated from the cows' milk: *S. aureus* (22 %), *S. agalactiae* (18 %), *E. coli* (16 %), *S. epidermidis* (15%), and *S. uberis* (14%), which are the main causative agents of mastitis in the animal husbandry. According to (Hasan *et al.*, 2022), about 137 species of microorganisms can cause mammary gland inflammation in cattle. The main cause of subclinical mastitis in cattle and other animal species is considered to be bacteria.

Damage to the udder and teats contributes to the penetration of microorganisms into the teat channels and can cause subclinical mastitis (Sharun *et al.*, 2021). Paliy *et al.* (2021), identified that careful mechanical washing of the udder before milking with special brushes cleans and stimulates the teats, which allows for reducing microbial contamination and preventing infection of the teats.

Many factors contribute to the high prevalence of mastitis in dairy cows on farms. These components include the method of keeping (tethered or loose), hygiene of the room and feed, floor quality, quality of milking equipment, udder sanitation, etc. (Neculai-Valeanu & Ariton, 2022). A particularly important period for dairy cows is the period of three weeks before and after calving (Zhao *et al.*, 2020). During this period, health problems may occur. Creating conditions for the timely adaptation of animals to a new physiological state requires an appropriate balanced diet and compliance with sanitary conditions of keep (Cheng *et al.,* 2020).

Z. Kovačević *et al.* (2022) determined that, despite calving, selective treatment of cows with mastitis before drying off allows for reducing the overall use of antibiotics in the dairy herd. Due to changes in the technology of keeping animals, it became necessary to control the occurrence of mastitis, which is caused by conditionally pathogenic microorganisms from the environment (Ruegg, 2017).

Studies showed that the prevention of mastitis in cows during the dry period is based on the timely culling of sick animals and their treatment before drying off. It is also necessary to use a sealant with antimicrobial properties to preserve the udder. In addition, after calving, it is necessary to continue to monitor the manifestations of subclinical mastitis and rotate antimicrobial agents in a timely manner, to which the isolated microflora shows the greatest sensitivity.

CONCLUSIONS

In healthy animals of the control group, the number of somatic cells was 450 thousand/cm^3, the number of mesophilic aerobic and facultative anaerobic microorganisms was 130 thousand CFU/cm^3, and productivity – 25.7 kg/day. Animals of the experimental group with signs of mastitis had a somatic cell count of 600 thousand/cm^3, the number of mesophilic aerobic and facultative anaerobic microorganisms – 550 thousand CFU/cm^3, and productivity – 23.6 kg/day.

Microflora isolated from the milk of sick cows (*S. aureus* (22%), *S. agalactiae* (18%), *E. coli* (16%), S. *epidermidis* (15%), and *S. uberis* (14%)), showed high sensitivity to products based on povidone-iodine and cefquinome sulfate, except for bacteria of the *Mycoplasma spp.* genus and yeast fungi of the *Candida* genus.

It was identified that 20% of cows that underwent udder conservation without the use of antimicrobial agents had high indicators of SCC and QMAFAnM. Therefore, sick cows were treated with a cefquinome sulfate-based agent in each affected quarter of the udder, 8 g from a syringe tube every twelve hours three times. During the week, the productivity and quality of milk were restored to the first grade. In animals of the control group, at the end of the study, milk quality

corresponded to the following grades: extra – 10%, top – 40%, first – 50%.

Cows of the experimental group, for which the udder was preserved using a preparation based on povidone-iodine, after calving had a healthy udder and milk quality that corresponded to the extra grade – 30%, top – 60%, first – 10%. During the entire study period after calving, no treatment was applied to the animals, and no signs of subclinical mastitis were recorded. The prospect of further research is to determine the possible dependence of the occurrence of mastitis on the lactation period in cows.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Обґрунтування профілактики маститу корів в сухостійний період та після отелення

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Анотація. Дослідження корів на мастит перед запуском та обробкою всіх дійок протимікробним засобом тривалої дії є важливим компонентом профілактичної підготовки тварин до сухостійного періоду. Крім того, визначення чутливості ізольованих в господарстві патогенів та проведення ротації антимікробних засобів збільшує ефективність терапії та зменшує ризик виникнення резистентних штамів мікроорганізмів. Метою цього дослідження було визначення профілактичного та терапевтичного ефекту засобів на основі повідон-йоду та цефквіну сульфату для корів, хворих на мастит. У роботі були використані наступні методи: підрахунок загальної кількості соматичних клітин методом проточної цитометрії; каліфорнійський тест; чутливість до протимікробних засобів методом дисків на агарі; клінічний та фізіологічний метод; статистичний метод. Під час дослідження корів на мастит було встановлено, що у контрольній групі кількість соматичних клітин в середньому склала 450 тис/см^3, загальна кількість мікроорганізмів – 130 тис. У корів дослідної групи продуктивність становила 23,6 %, кількість соматичних клітин – 600 тис/см^3, мікроорганізмів – 550 тис. КУО/см^3. Встановлено, що виділена мікрофлора проявляла високу чутливість до засобу на основі повідон-йоду та цефквіну сульфату. Тому консервацію вимені коровам дослідної групи з ознаками маститу проводили засобом на основі повідон-йоду, що вплинуло на збільшення лактації та покращення якості молока після отелення. Критерії молока в дослідній групі по завершенню експерименту відповідали ґатунку «екстра» – 30 %, «вищий» – 60 %, «перший» – 10 %. В результаті проведеної терапії у корів покращилася лактація, і якість молока відповідала ґатунку «перший». По завершенню дослідження у корів контрольної групи якість молока відповідала ґатунку «екстра» – 10 %, «вищий» – 40 %, «перший» – 50 %. Практична цінність дослідження полягає у профілактиці маститу у господарстві, поліпшенні якості отриманої продукції, зменшенні витрат на ветеринарне обслуговування та вибракування тварин

Ключові слова: запалення молочної залози; молочна продуктивність; дійкові канали*;* збудники маститу; соматичні клітини