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Tul O.⁴, Jaśkowskij. M.³, Pareek Ch. S.^{1,2}, Miętkiewska K.^{1,2}, Kulynych S⁴., Panasova T⁴., Kone M. S⁵.

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¹Department of Basic and Preclinical Sciences, Institute of Veterinary Medicine, Faculty of Biological and Veterinary Sciences, Nicolaus Copernicus University, Torun, Poland.

²Division of Functional Genomics in Biological and Biomedical Research, Centre for Modern Interdisciplinary Technologies, Nicolaus Copernicus University, Torun, Poland.

³Department of Diagnostics and Clinical Sciences, Institute of Veterinary Medicine, Faculty of Biological and Veterinary Sciences, Nicolaus Copernicus University, Torun, Poland.

⁴Department of Surgery and Obstetrics, Faculty of Veterinary Medicine, Poltava State Agrarian University, Poltava, Ukraine. oleksandra.tul@pdaa.edu.ua

⁵Department of Infectious Pathology, Hygiene, Sanitation and Biosafety, Faculty of Veterinary Medicine, Poltava State Agrarian University, Poltava, Ukraine.

Abstract

Infection of the udder during the dry period can be the cause of mastitis in the postpartum period. Most often, we recorded mastitis in the winter-spring period (8.6 – 10.2 %). Studying the distribution of various forms of mastitis depending on the inflammation of the mammary gland, we most often detected serous mastitis in the farm (51 – 59 %) in the first weeks after parturition. To study the effectiveness of Bovaclox DC Xtra, two groups of cows with 5 heads were created. After the last milking, cows of the experimental group were intracisternal injected with Bovaclox DC Xtra into each quarter of the udder. Before the injection of the preparation, the udder of cows was examined for mastitis by the accepted methods and the reaction of the secretion of the udder with the California mastitis test was carried out. There were no signs of mastitis in cows of both groups. The udder condition was monitored on the

20th day after drying-off, 10 days before parturition, and 7 days after parturition. 7 days after parturition, a clinical examination of the cows of both groups was carried out. There were no signs of mastitis in the cows of the experimental group. And one cow in the control group had serous mastitis. The treatment was carried out by rubbing the Sanobit preparation into the skin of the udder with simultaneous massage of the udder from the bottom up, holding a short novocaine blockade of the udder nerves according to D. Logvinov. Clinical recovery of the animal occurred after 5 days of treatment.

Key words: antibiotics, cattle, dry period, lactation, mammary gland, mastitis.

Introduction

Under the conditions of Ukraine's integration into the EU, the requirements for the quality of raw milk and dairy products have increased, which has significantly sharpened the attention of veterinary specialists to the problem of mastitis in cows, which today cause significant economic damage due to loss of milk and a decrease in the competitiveness of Ukrainian dairy products [9]. The widespread use of machine milking, non-compliance with the technology of production processes, veterinary, sanitary and zoohygienic standards lead to an increase in the number of cows with mastitis [2]. Thus, according to the studies of many authors, mastitis disease covers from 10 to 70 % of the herd, and 8 – 16 % of cows get sick 2 times or more during lactation [3,13,16].

Inflammation of the mammary gland of cows is the cause of great losses, which can be divided into economic and social. The economic damage caused by mastitis concerns mainly cattle owners and dairy processing enterprises. First of all, this is a decrease in the productivity of cows, loss of milk due to a decrease in its synthesis in the mammary gland damaged by the inflammatory process. With clinical mastitis, milk loss can reach 20 – 30 % of milk yield per lactation. In recovered cows, milk yield is not fully restored in subsequent lactation, remaining approximately 10 % less [7].

With subclinical mastitis, the decrease in milk yield is less pronounced (up to 10 – 15 %), therefore it is not always noticed in time, however, due to its wide spread and duration of the disease, the losses from it are more significant. After the recovery of the cow, the function of the mammary gland is practically not restored by 100 % and in the vast majority of cases

ends with hypogalactia or agalactia, and in rare cases (10 – 15 %), even atrophy can be a consequence of mastitis [10].

Mastitis is one of the main diseases causing the culling of cows. From 19 % to 50 % of the total number of culled animals are cows with mastitis or with atrophy and induration of mammary gland particles. Premature culling reduces the productive use of cows to 3.5 – 4 years, which is complemented by the loss of milk and calves over several lactations [11]. Drinking colostrum from cows with mastitis can lead to gastrointestinal and pulmonary diseases and even death of the offspring [7].

Social losses are difficult to calculate, they are a consequence of the consumption of low-quality dairy products by people and especially by children. Poor-quality milk can cause allergies and diseases, the pathogens of which are transferred with its help [7,10]. The problem of eliminating mastitis and improving the sanitary quality of milk remains very important, which makes it urgent to find new means and ways to reduce the incidence of animals.

Material and Methods

The studies were carried out at the Dairy Farm No. 1 of the Limited Liability Company Investment-Industrial Company “Poltavazernoproduct” (LLC IIC “POLTAVAZERNOPRODUCT”) in Poltava region (Troitske village). The cows of black-and-white breed at the age of 5-8 years, with lactation of 4500 – 5000 kg, which were transferred to the dry state, were studied. To establish the effectiveness of Bovaclox DC Xtra for the prevention of dry mastitis, two groups of animals were created: experimental and control, 3 animals each.

Before starting, the condition of the mammary gland was examined in cows of both groups by observation, palpation and trial milking. The udder was examined from behind and on the sides, paying attention to the size, shape and placement of every fourth udder, teats, comparing them with each other, detecting possible deformations due to the presence of a pathological process. Examining the skin of the udder, we paid attention to the change in color and various injuries, integrity, and the state of the superficial blood and lymphatic vessels of the udder. By palpation of the udder, its consistency, density, local temperature, soreness, skin thickness, its swelling, cistern patency, nipple canal, state of the lymph nodes

(size, temperature, soreness) was determined.

Trial milking was carried out on a four-well plastic paddle. At the same time, attention was paid to the amount of secretion obtained from each fourth udder separately, and its quality: color, consistency, smell, the presence of clots, flakes. To exclude subclinical mastitis, a secretion reaction with a California mastitis test was used. The reaction was considered negative if the color of the secret did not change and there was no jelly-like clot [1].

After that, the cows of the experimental group were injected with Bovaclox DC Xtra in the cistern of every quarter. To prevent the entry of microorganisms into the cistern, the skin of the top of the teat was washed with soap and water and treated with iodized alcohol. Control of the udder condition was carried out on the 20th day after the launch, 10 days before calving and 7 days after calving. In the case of mastitis, the succulent and milk-producing feed were excluded from the diet of animals, water drinking was limited, and they were often milked. The treatment was carried out by rubbing the Sanobit preparation into the skin of the udder with simultaneous massage of the udder from the bottom up, holding a short novocaine blockade of the udder nerves according to D. Logvinov. Treatment was carried out until the disappearance of clinical signs of mastitis.

Results and discussion

Mastitis is an inflammation of the mammary gland that develops as a result of the action of mechanical, thermal, chemical and biological factors and is characterized by pathological changes in the tissues and secretions of the mammary gland [7]. The occurrence of mastitis is facilitated by the anatomical and functional features of the mammary gland, hereditary genetic predisposition to mastitis, deficiencies in feeding, especially before and after calving, feeding poor-quality forage, a sharp transition from one feed to another, intoxication against the background of gastroenteritis, atony of the proventriculus, poisoning with carbamide, nitrates, nitrites, poisonous plants, lack of animal husbandry, violations of the technology, sanitary and hygienic rules of machine milking, udder skin diseases (dermatitis, cracks, wounds, boils), obstetric and gynecological diseases (placental retention, uterine atony, endometritis, etc.) [10]. Moreover, anatomical and functional anomalies of the mammary gland play a significant role. Thus, cows with a goat-shaped udder are affected by mastitis 5 times more often than with a cup-shaped udder [11]. Mastitis affects 25 % of cows every

year, causing much more damage to dairy farming than all other diseases combined [16].

When analyzing the reporting documentation of dairy farm No. 1, we found that for the period 2019 – 2021, mastitis accounted for 15 – 18 % of all (infectious and non-infectious) diseases of cows. Such a prevalence of mastitis causes significant losses to the economy, consisting of insufficient production of milk, deterioration of its biological, technological and nutritional qualities, costs for diagnosis and treatment of sick animals, their premature culling, high morbidity of young animals.

Studying the age and seasonal dynamics of mastitis, we found that the majority of sick animals were mainly 5 – 10 years old and had a high functional capacity of the udder. It is also characteristic that most of the animals fell ill during the winter. In the warm season, the incidence of mastitis was lower (Fig. 1).

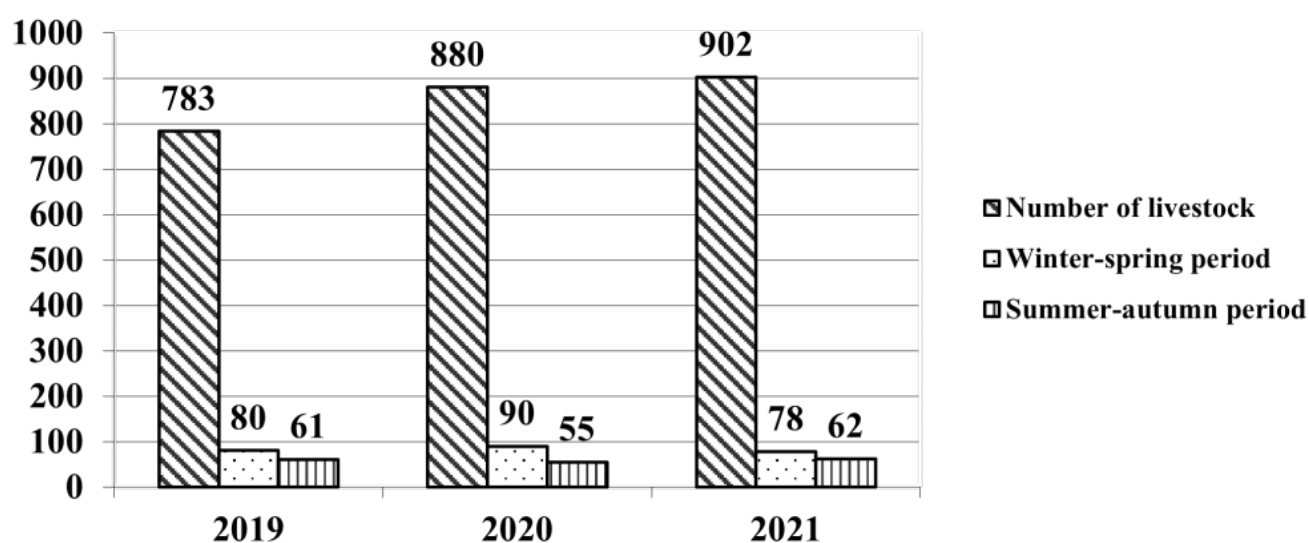


Fig. 1. Seasonal dynamics of the incidence of mastitis in cows

Analyzing the data in Figure 1, we can conclude that the incidence of mastitis in cows in the winter-spring period was higher and ranged from 8.6 to 10.2 %. Mastitis in the summer-autumn period was recorded less often (6.2 – 7.8 %).

When studying the distribution of mastitis depending on the lactation period of animals, it was found that more often cows get sick at the beginning of lactation (Table 2).

Table 2

Distribution of mastitis depending on the lactation period

Years	Total cows with mastitis, heads	Postpartum period		Lactation peak		Drying-off and dry period	
		heads	%	heads	%	heads	%
2019	141	65	46	46	32	30	21
2020	145	81	55	44	30	20	13,7
2021	140	73	52	39	37	28	20

Analyzing the data in the table, we can conclude that during the experimental period, mastitis was most often registered in the first weeks after postpartum, their number was from 46 to 55 % of all mastitis in cows. Mastitis at the peak of lactation was observed less frequently – from 30 to 37 %. The number of mastitis in cows during the drying-off and dry period was the lowest and it was from 13.7 to 21 % of all cases of mastitis in cows.

Table 3

Types of mastitis depending on the inflammation of the mammary gland

Types of mastitis	2019		2020		2021	
	Number of cows, heads	%	Number of cows, heads	%	Number of cows, heads	%
All types of mastitis	141	100	145	100	140	100

Serous	76	53	85	59	71	51
Catarrhal	45	32	41	28	47	34
Purulent	5	3,5	3	2	5	4
Subclinical	15	11	16	11	17	12

Depending on the form of inflammation of the mammary gland, different forms of mastitis are recorded in this farm (Table 3). As can be seen from the table for the experimental period, serous mastitis was most often recorded, their number fluctuated in the range of 51 – 59 % of all cases of mastitis. The number of catarrhal mastitis was recorded from 28 to 34 % of all cows with mastitis. Subclinical mastitis was observed less frequently (11 – 12 %). And the number of purulent mastitis in cows was the smallest – 2 – 4 %.

A significant factor affecting the productivity of cows and the quality of the products obtained is mastitis [11]. Sick animals reduce milk yield, and after recovery they often lose the ability to produce milk in some parts of the udder due to their atrophy. Inflammatory processes developing in the mammary gland lead to changes in the chemical composition of milk, its physical and biological properties. Therefore, it loses its nutritional value, becomes unsuitable for processing, and the quality of dairy products produced from it decreases. [7].

According to scientists, the main causes of mastitis in cows are, first of all, a violation of the technological process and the “Rules for machine milking of cows”, as well as veterinary and sanitary requirements for milking and keeping cows, and the mode of operation of milking equipment that is inadequate to the physiological needs of animals [2,10].

Changing the operating mode of the milking machine in the initial and final phases of milking, reducing the level of vacuum pressure in the teat cups under the teat, and reducing the frequency of pulsation reduce the risk of mastitis [2].

The udder, just like the entire organism of the cow, needs time to recover [3]. The dry period is the time from drying-off to calving, when milk is not produced in the mammary gland and the cow is not milked. This period should last at least 40 days, but 50 to 70 days is

best. The highest productivity in subsequent lactation can be achieved if the dry period of cows lasts 60 days, and in first-calf heifers – 65 days. If the dry period lasts less than 40 days, the milk yield in subsequent lactation will be less. On dairy farms, one day a week should be set aside for drying-off cows. The breeding records on the farm must be carefully monitored to know the exact pregnancy age and to drying-off the cows 50 – 70 days before the expected calving [6].

The dry period plays an extremely important role in preparing cows for the next lactation. Quite often, dairy farms do not pay due attention to dry cows. Mastitis is very often the result of infections that cows are exposed to during the dry period. Cows are especially vulnerable to new infections that cause mastitis during the first two weeks of the dry period, two weeks before calving, and two weeks after calving [3].

In Ukraine and abroad, the most profitable way of veterinary prevention of mastitis during the dry period is the sanitation of the mammary gland “udder conservation” with antibiotic-containing drugs on a prolonged basis [13].

To prevent dry-standing mastitis, studies have been conducted on the effectiveness of Bovaclox DC Xtra for the prevention of mastitis in the dry period. For this, two groups of animals were created: experimental and control, 5 heads in each.

Before drying-off the cows of both groups, we examined the condition of the mammary gland by examination, palpation, and trial milking.

To rule out subclinical mastitis, a secretion reaction with the California mastitis test was used. The California mastitis test is a fairly simple and cost-effective way to quickly assess somatic cells in milk to detect mastitis. He does not need additional analysis and attempts to uphold.

In cows of both groups, we established a negative reaction: the liquid was homogeneous, non-viscous, without clots, blue or gray. Before the drying-off, we did not find any signs of mastitis in cows of both groups.

After that, we injected the cows of the experimental group into the tank every quarter with Bovaclox DC Xtra, a combined antibacterial drug for intracisternal injection. The composition

of the medicinal product includes a combination of semi-synthetic penicillins – ampicillin and cloxacillin, which provides a wide spectrum of its antimicrobial action in relation to the most often isolated microorganisms in mastitis: staphylococci (*Staphylococcus spp.*), including penicillin-resistant streptococci (*S. agalactiae*, *S. uberis*, *S. dysagalactiae*), corynebacterium (*Corynebacterium pyogenes*), arcanobacterium (*Arcanobacterium pyogenes*), escherichia (*E. coli*) [4].

The mechanism of action of antibiotics is to inhibit transpeptidase and carboxypeptidase, which prevents the synthesis of the bacterial cell wall, leading to an osmotic imbalance in bacteria and their death [5].

The preparation, due to the use of sparingly soluble salts of antibiotics and a special base in its composition, has a long-term bactericidal effect; its intracisternal administration to cows during the dry period makes it possible to provide a therapeutic effect for 7 weeks [4].

The udder condition was monitored on the 20th day after drying-off, 10 days before parturition, and 7 days after parturition.

7 days after parturition, a clinical examination of the cows of both groups was carried out. In the cows of the experimental group, which were injected with Bovaclox DC Xtra, all physiological parameters were normal, and no signs of mastitis were observed. And in one cow of the control group, a slight depression of the general condition was observed. Half of the udder was enlarged by 1.5 – 2 times, had a dough consistency, was hyperemic, hot, and painful, and the skin of the udder was swollen and tense. The teat was also enlarged, swollen and painful. The supramammary lymph node is enlarged.

The secret from the affected quarter was thin, watery, bluish in color, containing small flakes of casein. There was a decrease in milk production by 50 % of the unaffected half. We diagnosed serous mastitis.

In our opinion, the occurrence of serous mastitis is obviously associated with infection of the udder during the dry period, due to a violation of the zoohygienic conditions for keeping cows and the sanitary condition of the udder.

At the first stages of mastitis development, succulent and milk-producing feeds were excluded from the animal's diet, watering was limited, and milk was frequent. The treatment was carried out by rubbing the Sanobit drug into the skin of the udder with simultaneous massage of the udder from the bottom up, holding a short novocaine blockade of the udder nerves according to D. Logvinov. On the 5th day of treatment, the animal recovered, and no clinical signs of serous mastitis were observed.

Thus, as a result of the studies, we found that the use of Bovaclox DC Xtra prevents the formation of mastitis during the dry period, does not require additional veterinary costs during the dry period, reliably protects the udder from the development of infection during the dry period, and prepares the mammary gland parenchyma for the next lactation. Prevents milk loss due to mastitis at the beginning of lactation. Increases milk production in subsequent lactation by 2.5 – 3 %. Our studies are consistent with the data of scientists who studied the effectiveness of intramammary preparations in the treatment of dry mastitis in cows [3,5,13,17,19].

Some scientists argue that the use of cloxacillin and ampicillin in combination with other antibiotics is more effective in controlling mastitis in cattle compared to cloxacillin and ampicillin alone [15,18,20].

To date, antibiotic resistance has raised concerns about the use of antimicrobials for the treatment of mastitis, not only because of the general concern about the use of antibiotics in animal production but also because there is increasing evidence of resistant strains of bacteria associated with livestock in human infections [8,14]. However, studies by New Zealand scientists examining antimicrobial resistance of mastitis-causing *Staphylococcus aureus* strains isolated from New Zealand dairy cattle found no presence of antimicrobial resistance genes, suggesting that the usefulness of these treatments has persisted [12].

Conclusions. Thus, it can be concluded that for the period 2019 – 2021, mastitis disease accounts for 15 – 18 % of all (infectious and non-infectious) diseases of cows. More mastitis was observed in the winter-spring period (8.6 – 10.2 %) than in the summer-autumn period. Depending on the period of lactation, mastitis was most often observed in the first weeks after parturition. В этот экспериментальный период чаще всего регистрировали серозный мастит (51 – 59 %). It has been established that the use of Bovaclox DC Xtra

intracisternal after the last milking prevents dry mastitis in cows.

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