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THE PREVALENCE AND ETIOLOGY OF MASTITIS IN FARMING

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Mastitis is the most unprofitable disease in dairy cattle breeding. It dominates all known forms of dairy farm organization. In Ukraine, farm dairy companies are reviving. Their veterinary management is taking shape, which has a significant impact on product quality. It is of great significance to study the indicators of pre judgment of milk quality for such enterprises to understand their position and role in the domestic dairy industry.

This paper introduces the research results on the dynamics and etiology of cow mastitis in «Podilska Marka» farm, Kamianets-Podilskyi district, Khmelnytskyi region. The highest frequency of mastitis (13%) was observed in summer (June to July) and winter (January). A maximum of 14 (6%) animals was sick repeatedly. Starting from calving, 20% of cows were sickest from days 121 to 305. The maximum recurrence of mastitis was observed in the last third of lactation and reached 10%. Among clinical mastitis, the serous form was more frequently observed. Purulent-catarrhal mastitis was determined in only 2% of sick animals. According to the clinical course, the following mastitis were observed: staphylococcal - 40.1%, coliform - 30.8%, streptococcal - 21.6%. In subclinical mastitis, Streptococcus agalactiae was isolated from 39.6% of pathological material, Staphylococcus aureus from 30.2%, and Escherichia coli from 26.5%.

Keywords: *farming, cows, mastitis, etiology, antibiotics.*

Formulation of the problem. Mastitis of cows is the most common and costly disease on farms of different ownership forms worldwide. The economic losses from mammary diseases are mainly due to reduced milk production, lower milk grade, culling of chronically infected cows and the cost of veterinary treatment. The greatest successes in addressing mastitis have been achieved in the countries of Northern Europe, the United Kingdom, the Netherlands, Switzerland, Canada, the USA, New Zealand, and Australia. The Five and Ten Steps programs that have been implemented with some specificity in these countries have made significant progress against the disease [1, 2]. IDF and NMC national chapters have reported a significant reduction in the incidence of mastitis in these countries over the past 30 years. In Finland, the percentage of cows with mastitis has decreased from 38% to 31%. Subclinical mastitis in Sweden has decreased to 26.5% and clinical mastitis to 6.4% [3]. In Switzerland, subclinical mastitis has the lowest rate in Europe, with only 17% of cows with this diagnosis being reported here. According to DairyCo, a non-profit organization of UK dairy farmers, careful implementation of individual mastitis control plans on dairy farms has resulted in a 36% reduction. Positive results have been achieved in Canada. According to [4] risks associated with subclinical mastitis in different provinces of the country do not exceed 23-26 cases per 100 cows per year [5, 6].

In Ukraine, the dairy industry is reviving at the level of farms and family farms. They occupy an intermediate position in total milk production between large farms and private farms. It is important to be aware of the level of veterinary management in such enterprises, as the quality of milk and, to a large extent, the possibility of further development of this sector of the dairy industry depends on it.

Analyze of recent research and publications. Mastitis in cattle in Ukraine is defined by domestic researchers as the main problem of the livestock industry. According to various estimates, the incidence of disease in cows reaches 30% on average, and in some farms in violation of conditions of maintenance, feeding, lack of proper veterinary care, and effective breeding work is constantly diagnosed. The researches carried out on milk farms of various forms of ownership showed that morbidity of cows with mastitis is too high – 28.3%, with clinical form of course 13.2%, and subclinical – 86.8%, that is 6.6 times more. In the public sector 36.9%, in farms 25.96%, and in individual farms 8.1% of cows with mastitis were found [7, 8]. During the dry period, there are more cows with clinical and subclinical mastitis than those lactating. Clinical mastitis in dry cows was found in an average of 7.2% (5-12.5%) and subclinical in 28.9% (19-35%) of animals [9, 10].

One of the main causes of premature culling of cows with mastitis is atrophy or induction of the

mammary gland quarters. Up to 30% of cows are discarded because of it. The time of productive use of animals is reduced. As a result, the average life expectancy of a cow does not exceed 5.5 - 6.5 years, and consequently, the production from her is only 3.5 to 4 years. Thus, each cow, which is realized on meat, will lose 3 - 4 calves and milk for several lactations [11, 12].

Mastitis is caused by a wide range of pathogenic agents that penetrate the milk ducts and reproduce in the cisternal udder. The severity of the disease depends on the response of pathogens and animal reactions to its effects. More than 120 species of various microorganisms were allocated from the udder sick mastitis of cows [13,14]. Of these, the most dangerous is *Streptococcus agalactiae*. Mastitis of staphylococcal etiology is common, due to the wide distribution of *Staphylococcus aureus* in the external environment. Unlike streptococci, which do not multiply outside the fabrics of the breast and other organs, staphylococci can live and multiply on the leather surface udder. Studies have shown that almost every second cow has a golden staphylococcus on the skin, which does not cause disease, but is a potential causative agent. Bacteria of the genus *Staphylococcus* are present in the first portions of milk of healthy cows in 80.9% of cases, in parenchyma milk in 52.4% of cases [15, 16].

Coliform mastitis is more often caused by *Escherichia coli*, which contains endotoxins in its cell wall, and some strains produce thermolabile exotoxin and thermostable enterotoxin. Infection occurs mainly through the duct, but sometimes also by the hematogenous route in various inflammatory processes in the intestine [17, 18, 19].

The purpose of our work was: To establish the etiology and incidence of mastitis in farm dairy cows «Podilska Marka» farm, Kamianets-Podilskyi district, Khmelnytskyi region.

Material and methods of research. The subjects were Ukrainian Black-and-White cows of different ages. The whole dairy farm is under control. Clinical mastitis was determined by the daily examination of cows during each milking by farm specialists according to standard udder clinical examination technique. Proportionality of quarters, pain sensitivity, increase of local and general temperature, swelling, mammary gland thickening, presence of secretion, and secretion quality was determined: an admixture of pus, change in color, consistency. Subclinical mastitis was determined based on the reaction of the secretion from each quarter with 2% mastidine immediately after milking. The diagnosis was confirmed bacteriologically in the Khmelnytskyi Regional State Laboratory of the State Service of Ukraine on Food Safety and Consumer Protection. The antimicrobial sensitivity of isolated isolates was identified using an *in vitro* disc-diffusion method using standard commercial discs.

The results of own research and they discussion. The study was conducted in 2020 and 2021. The farm «Podilska Marka» is in the stage of reforming and expanding the number of cattle. On the breeding stock of the Ukrainian Black-and-White dairy breed, bulls of the Holstein breed were used. Keeping animals on the farm is loose housing. The floor in the barns is wooden. The farm uses modern technologies for fattening, housing, and milking. The dairy herd consists of 230 cows with an average annual production of 8900 kg. Milk from cows is mainly of the highest grade and is sold to Vinkovetskyi Syrzavod LTD, Dairy Company Galychyna LLC, and IBA MILK LLC.

The incidence of clinical and subclinical forms of mastitis in dairy cows fluctuated within the year

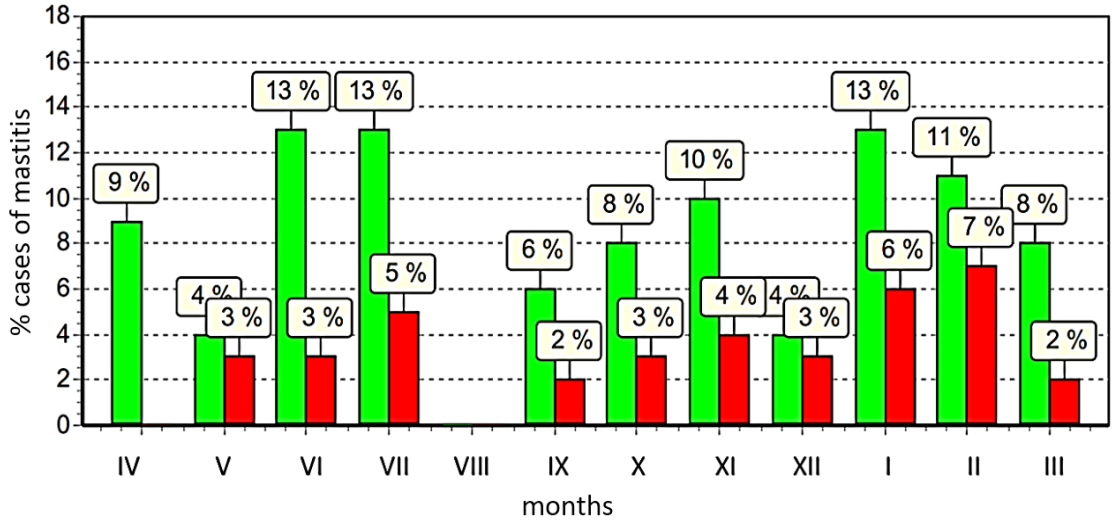

Fig 1. Incidence of mastitis in cows by months

(Fig.1).

Most sick animals were observed in June, July, and January: 30 cows (13% each) were sick during the month, of which 6, 12, and 14 animals, respectively, were re-infected. The incidence in May and December was the lowest, no more than 4%. Duplicate cases were the least in September and March (2% each).

Among clinical mastitis, the serous form was often observed; purulent-catarrhal mastitis was determined in only 2% of sick animals.

The study of morbidity of cows with mastitis by days, starting from calving (Fig.2) showed that cows were more often affected in the second and third period of lactation from 121 to 305 days. A total of 92 cases (46 cases per third) were found. In the same period, the incidence of recurrent diseases was 8% and 10%, respectively. Within the first 7 days after calving, 14 cows were found to have subclinical mastitis and one animal had a purulent-catarrhal form. Starting from the 15th day after calving, serious mastitis was observed in cows simultaneously with the subclinical course of the disease.

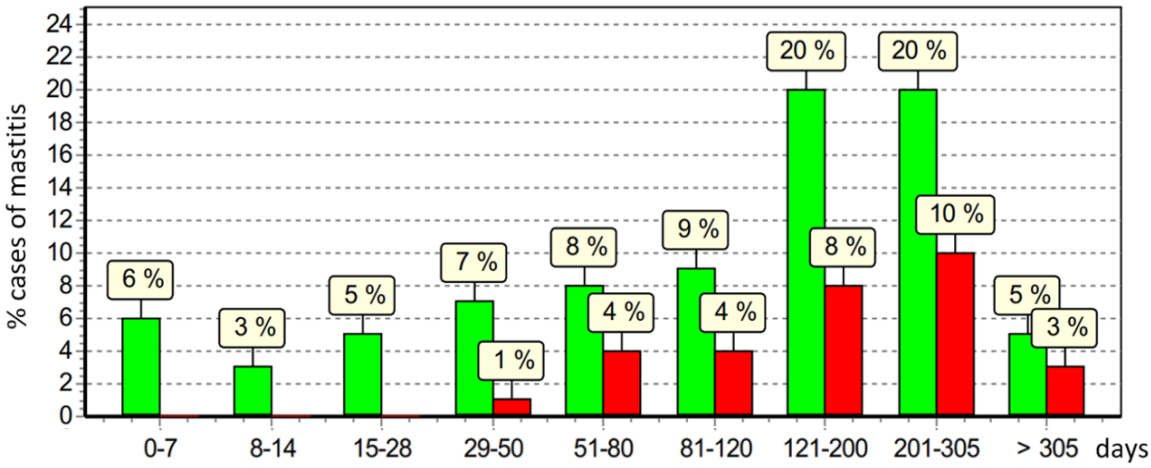

Fig 2. Mastitis incidence on a daily basis by after calving

Interesting results were obtained in a study of mastitis depending on lactation number (Fig.3). Mastitis occurred most frequently in cows of the third lactation (54 animals), of which 25 animals reappeared with the disease. In 6 animals, lesions were observed in the same quarter of the udder where they had appeared before.

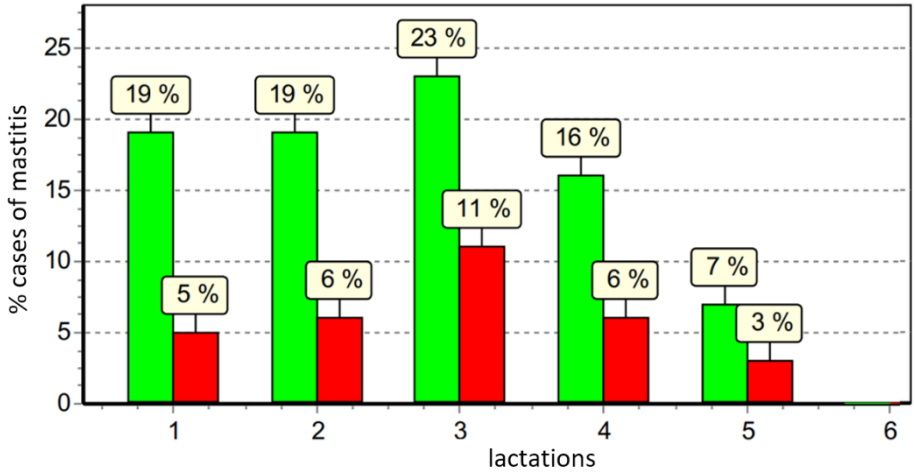

Fig 3. Dynamics of mastitis by lactation

When analyzing the distribution of mastitis by quarters (Table 1), it was found that the posterior right quarter of the udder was affected most often (33.6%). The same quarters were more frequently affected repeatedly (37.5% of all repeats).

In the course of bacteriological tests of milk samples from cows with the clinical and subclinical course, the following strains of pathogens were isolated: *Streptococcus agalactiae, Staphylococcus*

aureus, Staphylococcus epidermidis, *Escherichia coli, Proteus mirabilis and Enterococcus spp.*

Table 1. **The affection of udder quarters in mastitis**

Front left		*Front right*	
Cases	30	Cases	22
The number of cows	22	The number of cows	18
Number of repetitions	8	Number of repetitions	4
Back left		*Back right*	
Cases	31	Cases	42
The number of cows	28	The number of cows	33
Number of repetitions	3	Number of repetitions	9

In the clinical course of the disease, staphylococcal mastitis was most frequently identified at 40.1%. Coliform mastitis occurred in 30.8% and streptococcal mastitis in 21.6% of cases. In subclinical mastitis *Streptococcus agalactiae* was isolated from 39.6% of pathological material, *Staphylococcus aureus* 30.2% and *Escherichia coli* 26.5%.

The results of the determination of the sensitivity of pathogenic epizootic strains of bovine mastitis pathogens to 26 antibacterial substances are given in the table 2.

Table 2. **Sensitivity of isolates of microorganisms to antibiotics (*M±m*)**

The name of the drug	Sensitivity (no growth zone, mm)				
	E. coli	*S. aureus*	*Str. agalactiae*	*Proteus mirabilis*	*Enterococcus*
Amoxicillin	20±0,01	27±0,01	20±0,01	-	9±0,01
Amikacin	-	-	10±0,02	-	15±0,01
Ampicillin	-	22±0,01	-	-	-
Benzylpenicillin	-	-	-	-	-
Vancomycin	-	14±0,02	-	-	-
Gentamicin	20±0,06	-	18±0,04	13±0,02	16±0,01
Danoflox	-	21±0,01	12±0,01	-	12±0,01
Doxycycline	20±0,02	18±0,06	20±0,06	16±0,01	18±0,03
Erythromycin	-	-	-	-	-
Kanamycin	18±0,01	-	-	12±0,02	-
Clarithromycin	-	21±0,03	-	-	21±0,01
Clindamycin	-	-	-	-	-
Lincomycin	-	-	-	-	-
Levomicetin	31±0,02	17±0,06	-	-	17±0,02
Norfloxacin	-	16±0,01	-	-	16±0,04
Nitrofurantoin	-	13±0,01	12±0,01	-	13±0,01
Neomycin	16±0,06	11±0,04	-	12±0,03	11±0,04
Ofloxacin	-	15±0,06	-	-	15±0,06
Polymyxin	14±0,03	12±0,02	-	13±0,02	12±0,01
Streptomycin	21±0,02	-	-	-	-
Tetracycline	16±0,01	-	8±0,03	-	-
Tobramytsin	19±0,01	-	-	-	-
Cefotaxime	22±0,02	21±0,01	22±0,04	-	21±0,02
Cefazolin	-	18±0,02	-	-	18±0,03
Cefrriaxon	-	12±0,01	-	-	12±0,04
Ciprofloxacin	-	16±0,04	18±0,03	-	16±0,06

Studies have shown that the epizootic strains of agalactiae streptococcus were resistant to 18 of the 26 antibacterial drugs, to which the cultures of bacteria were checked for sensitivity. Epizootic strains of *Staphylococcus aureus* were found to be resistant to 11 antibiotics. They showed moderate resistance to 5 drugs (vancomycin, nitrofurantoin, cefazolin, ceftriaxone, and ciprofloxacin). Epizootic strains of *E. coli* and *Proteus* also showed high resistance to most of the antibiotics used.

Conclusions. Seasonality of mastitis in cows on farming in loose housing has been established. Animals were sickest in June, July, and January from 121 to 305 days after calving on the third lactation. Recurrences did not exceed 11%. Regardless of the form of inflammation, clinical mastitis lesions predominated in the posterior right quarters of the udder (33.6%). Clinical and subclinical mastitis was found to be caused by associations of bacterial pathogens in different variations, the spectrum of which is represented by *Streptococcus agalactiae, Staphylococcus aureus, Staphylococcus epidermidis*, *Escherichia coli, Proteus mirabilis, Enterococcus spp.* The obtained cultures of pathogens showed resistance to most antibacterial agents used in the treatment of mastitis.

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ПОШИРЕННЯ ТА ЕТІОЛОГІЯ МАСТИТІВ У ФЕРМЕРСЬКОМУ ГОСПОДАРСТВІ

Л. Строяновська, Т. Супрович

Наведено результати дослідження показників, які є головними при визначенні якості ветеринарного менеджменту підприємства, що виробляє молоко. Зокрема досліджено динаміку маститів та їх етіологію у корів фермерського господарства «Подільська марка» Кам'янець-Подільського району Хмельницької області. Максимальна частота маститів (13%) спостерігалась влітку (червень – липень) і взимку (січень). Повторно максимально хворіло 14 (біля 6%) тварин. Починаючи з отелення найчастіше 20% корів хворіли починаючи з 121 до 305 доби. Максимальна повторюваність маститів спостерігалася в останній третині лактації і сягала 10%. Серед клінічних маститів максимально спостерігалася серозна форма, при якій найчастіше визначався стафілококовий мастит – 40.1%. Коліформний мастит проявлявся у 30.8%, а стрептококовий – у 21.6% випадків. При субклінічному маститі Streptococcus agalactiae виділявся з 39.6% патологічного матеріалу, Staphylococcus aureus – 30.2% та Escherichia coli – 26.5%. Епізоотичні штами агалактійного стрептококу були резистентними до 18 з 26 антибактеріальних препаратів. Штами золотистого стафілококу виявилися стійкими до 11антибіотиків, а до 5 проявили помірну резистентність.

Ключові слова: *фермерське господарство, корови, мастит, етіологія, антибіотики*

РАСПРОСТРАНЕНИЕ И ЕТИОЛОГИЯ МАСТИТОВ В ФЕРМЕРСКОМ ХОЗЯЙСТВЕ

Л. Строяновская, Т. Супрович

Приведены результаты исследования показателей, которые являются главными при определении качества ветеринарного менеджмента предприятия, производящего молоко. В частности, исследована динамика маститов и их этиология у коров фермерского хозяйства «Подольская марка» Каменец-Подольского района Хмельницкой области. Максимальная частота маститов (13%) наблюдалась летом (июнь - июль) и зимой (январь). Повторно максимально болело 14 (около 6%) животных. Начиная с отела чаще всего 20% коров болели начиная с 121 до 305 суток. Максимальная повторяемость маститов наблюдалась в последней трети лактации и достигала 10%. Среди клинических маститов больше встречалась серозная форма, при которой чаще всего определялся стафилококковый мастит – 40.1%. Колиформный мастит проявлялся в 30.8%, а стрептококковый – в 21.6% случаев. При субклиническом мастите Streptococcus agalactiae выделялся из 39.6% патологического материала, Staphylococcus aureus – 30.2% и Escherichia coli – 26.5%. Эпизоотическая штаммы агалактийного стрептококка были резистентными к 18 из 26 антибактериальных препаратов. Штаммы золотистого стафилококка оказались устойчивыми к 11 антибиотикам, а к 5 проявили умеренную резистентность.

Ключевые слова: *фермерское хозяйство, коровы, мастит, этиология, антибиотики/*