Acta Scientific Veterinary Sciences (ISSN: 2582-3183)

Volume 5 Issue 7 July 2023

Research Article

Analysis of Epidemiological Indicators for Clinical and Subclinical Mastitis in a Dairy Cattle Herd

Gabriela Fratari Freitas, Thalita Vieira Vinhal, Luanna de Souza Fernandes, Gustavo Paula de Oliveira, Hemonielle Gomes de Melo Silveira and Sérgio Eustáquio Lemos da Silva*

Centro Universitário do Triângulo, UNITRI, Brazil

***Corresponding Author:** Sérgio Eustáquio Lemos da Silva, Centro Universitário do Triângulo, UNITRI, Brazil.

DOI: 10.31080/ASVS.2023.05.0699

Received: June 08, 2023

Published: June 28, 2023

Abstract

Bovine mastitis is a disease of extreme importance for the dairy production chain, since it causes economic losses in production. Mastitis is an inflammatory disease that affects the mammary glands. There are two forms of presentation of the disease, clinical and subclinical, and it is necessary to perform diagnostic tests to differentiate them. The present study aimed to verify the prevalence and incidence of mastitis in a dairy farm located in the southeast of the state of Goiás. For this research, the Somatic Cell Count (SCC) test was used. The results showed 54% prevalence of mastitis, a lower value compared to other studies. The incidence of clinical mastitis was also low, and it was possible to observe periods longer than 30 days without any identification of new cases, due to the care provided on the property, such as the correct management of the herd and milking, hygiene and use of skilled labor. According to the SCC findings, it can be inferred that the low values of the epidemiological indicators analyzed may be associated with good management and hygiene practices practiced on the property, reducing the prevalence and incidence of mastitis.

Keywords: Somatic Cells; SCC; Herd; Cattle Farming

Introduction

Brazil has been standing out all over the world through cattle ranching. One of the most important production chains is the dairy industry. The country produced approximately 33.8 million liters of milk in 2018, with approximately 17 million dairy mothers, having a relatively low average of 2,069 liters/cow/year [5]. What can impact this low average productivity is mastitis. It is estimated that such a disease has caused a 15% drop in milk production in the country.

Mastitis is an inflammatory disease that affects the mammary glands, being considered the main disease in dairy cattle worldwide, specifically in high-production animals. Its presentation occurs by pathological means in animals and by several physicochemical changes in milk [16].

Studies indicate that there are two types of mastitis, clinical and subclinical. Mastitis of the subclinical type is of greater impairment and requires specific diagnosis. It is characterized by not presenting noticeable changes in the milk or in the animal. However, there may be changes in the composition of milk, being observed high levels of chlorine, sodium, protein and casein, thus becoming a poor milk and with increased somatic cells [15].

The diagnosis of subclinical mastitis is given through the analysis of Somatic Cell Count (SCC), which is performed by laboratories accredited by the Ministry of Agriculture, Livestock and Supply (MAPA). This laboratory test is based on the epithelial cell count, and in order to perform the test, cows that present clinical mastitis, cows undergoing treatment and newly calved cows must be

excluded, because such specificities may alter the result of the diagnosis [11].

The results of CSS are presented through the analysis of the exam performed. A value less than 200,000 cells/thousand is considered healthy. With values above that, a result presented as a patient is obtained. Another way to diagnose the disease is through the California Mastitis Test (CMT), presented as an indirect way of diagnosing mastitis. This test is done based on the CCS, in which the junction of the reagent with the milk is made, forming a gel. The higher the coagulation of this gel, the higher the SCC [3].

Clinical mastitis is detected through changes in milk, such as changes in the color, presence of lumps, consistency, and even odor of the milk. The cow affected by the disease may present restlessness at the time of milking, presenting reddish udder, edema, temperature increase and hardening of the ceilings [15].

This form of presentation is the most severe, and it is necessary that the diagnosis and treatment protocol be performed in order to promote the recovery of the animal and ensure productivity. The diagnosis is given through the test of the mesh mug or black background, from which the changes in the milk are identified. In addition to the disease being present in animals, it is also present in the environment by the milking line or by the hands of the milker. In the epidemiological chain of bovine mastitis, bacteria of the genus *Streptococcus and Enterococcus* are capable of causing environmental and contagious mastitis. These bacteria cause an infection in the mammary gland of cattle. The bacterium *Streptococcus aureus* is the species most present in the issue of transmissibility of the disease, causing serious damage to the health of the population [3].

One of the places where there are greater risks of contamination and occurrence of mastitis is in the milking parlor itself. Using milking machines can cause injuries to the cows' roofs due to pressures and the number of pulsations of the machinery, among other factors. With this, the health of the udder is compromised, being more susceptible to contracting the disease in an environmental or contagious way. Therefore, the handling of milking in relation to its speed should be controlled, also considering the decrease in activity with the cow, because, according to the etiology of mastitis, infection by environmental pathogens has overcome contagious agents, which has reduced the effectiveness of the traditional disease control strategy [2].

The disease has risk factors for the animal population and for public health. Many microorganisms that are found in the milk of affected animals, such as bacteria of the genus *Staphylococcus* spp, can cause food-borne toxinfections. The methicillin-resistant *Staphylococcus aureus* strain causes nosocomial infections due to the transfer of genes that generate resistance to antimicrobials. It also produces toxins in humans that are not inactivated by pasteurization and boiling processes [14].

In relation to animals, this pathogen causes economic losses due to triggered factors, such as the drop in milk production and quality, in addition to generating an increase in animal disposal, as well as health losses because it is a contagious pathogen [4]. There is, therefore, the risk of major economic and public health losses.

The prevalence of a pathology is the proportion of cases existing in a given population and at a given time, allowing to analyze all patients in a given period or place. The incidence refers to the new cases of a certain disease in a population at the time of analysis [1]. That said, prevalence and incidence are measures of diseases that can help in the knowledge of the distribution of a disease, as well as in the establishment of control and prevention.

In view of the above, the general objective of this study was to investigate the incidence and prevalence of clinical and subclinical mastitis in a dairy farm located in the municipality of Cachoeira Alta, in the state of Goiás. The specific objectives were to point out the rates of morbidity, lethality and mortality due to mastitis, in addition to correlating health indicators with the risk factors of falling ill and with the epidemiological chain of the pathology.

Methodology

A study focused on the area of prevalence and incidence of clinical and subclinical mastitis was conducted in May 2020, conducted at Fazenda Reserva, located in the southeast of the state of Goiás, in the municipality of Cachoeira Alta. There were 55 Holstein dairy cows, producing an average of 19 kg of milk/cow/day, totaling a production of 1,045 liters of milk/cow/day with a calving interval of 13.5 months. Among all lactating animals, the SCC laboratory test was performed in 47 of these animals. Among the remaining 8 cows, 5 were newly calved and another 3 were undergoing treatment for clinical mastitis, thus making it impossible to perform the SCC test.

The material for analysis was collected on the property by a veterinarian and sent to a laboratory in the city of Goiânia, state of Goiás. Data were collected in the morning milking. It began at 5:45 a.m. and ended at 7:00 a.m. Milking is performed by a couple of employees twice a day. This couple performs the milking and sani-

tization of the entire structure. Milking is mechanized and follows a hygiene protocol.

Before starting the management with the animals, the equipment is sanitized and rested for a period of 30 minutes before the beginning of the milking. As soon as the animals arrive to be milked, the mug test is performed, pre-dipping, individual drying of the ceilings and, after everything is sanitized, the milking begins. After these procedures are completed, post-dipping and release of the animals to pasture are performed. At the end of all milking, a rinse is performed with warm water, without chemical, for the removal of milk residues. After that, water with alkaline product circulates in the teats at 75°C. Then another rinse with running water is performed. At the end of the process, natural water with acid is circulated for a period of 10 minutes for each type of product, ensuring that all the material is totally clean and free of bacteria.

The milk withdrawn is destined, via channeling, to the cooling tank, being kept at a temperature of approximately 3°C until the moment of collection, which is carried out 4 times a week by a milkman of the company where the milk will be processed. In the milking parlor, cows have access to concentrate with 24% protein and mineral salt. Cows also have access to the Mombasa grass picketed pasture area. In times of drought, the animals are supplemented with silage, produced on the property itself.

Results and Discussion

According to the study by Busanello., *et al*. [3], who evaluated a large population of the herd from different regions, there was an average prevalence of 46.4% of subclinical mastitis in the country. The result of the CCS test performed on 47 animals from the Reserva farm showed that 23 animals presented values lower than 200,000 cells/mL. Therefore, 48.9% of the animals were considered healthy and 18 animals obtained SCC of 200,001 to 500,000 cells/mL, and 38.29% were considered sick. Six animals demonstrated SCC above 500,000 cells/mL. Therefore, 12.74% were considered ill, given the result of high concentrations in SCC, as shown in table 1.

CCS (cells/mL)	Number of animals tested	Percentage (%)
< 200.000	23	48,9
200.001 a 500.000	18	38,29
> 500.001	6	12,74

Table 1: SCC values obtained in mechanical milking higher and lower than 500,000 cells/mL.

In the work developed by the authors Barbosa., *et al*. [2], a research was carried out in 21 farms with different types of milking. A total of 629 milk samples from crossbred cows were analyzed. Farm number 6, where the results were closest to those of the Reserve farm, was used closed-loop mechanical milking, with 40 animals being analyzed. From the results, it was found that 45% (18 samples) of the sample presented values greater than 500,000 cells/mL, and 55% (22 samples) had the results lower than 500,000 cells/mL, which were higher when compared to the results of the Reserve farm, as shown in table 2. Thus, the results reported by Barbosa., *et al*. [2], corroborate the results in the present study, in which the milk samples presented a higher rate of mastitis in the type of mechanical milking than in the manual type.

CCS (cells/mL)	Number of animals tested	Percentage (%)
< 500.000	18	45
> 500.000	22	55

Table 2: Values of SCC obtained in mechanical milking, higher and lower than 500,000 cells/mL.

In view of the results found in the present study, the producer was advised to perform the management of the milking line to avoid contamination of other animals. He was asked to milk, first, the primiparous cows and those that had never had mastitis. Next, the cows that presented SCC lower than 200,000 cells/mL were milked, and then the cows that had results with values between 200,001 and 500,000 cells/mL, followed by the cows that had results above 500,001 cells/mL. Finally, the cows with clinical mastitis were milked. It was also advised to use a milking set intended only for newly calved cows and for cows using antibiotics, thus avoiding the spread of the disease. Thus, the incidence of mastitis on the property was reduced, reducing drug costs and increasing productivity.

The animal with subclinical mastitis has up to 70% of the production reduced, bringing harm to the owner. Of the animals affected by the disease, 8% of them require treatment, also causing the disposal of 8% of the milk produced. Unfortunately, 14% of the animals die or are discarded prematurely because they are not treated in time. The milk to be rejected must be disposed of correctly in a cesspool so that there is no contact with healthy animals, avoiding contamination. It is of paramount importance not to use this contaminated milk in the breastfeeding of the calves, as they will be the future producers. If there is contact with contaminated milk, these calves may develop resistance to treatment against the bacteria present [2].

According to a study by the authors Guilloux., *et al*. [9], what influenced the results of their research was the identification of small events that were added negatively to the results during data collection, such as the entry of 70 new animals without proper verification of their health, the ineffectiveness in pre-dipping, which was performed quickly (time less than 30 seconds) and even before the test of the teled mug, and a problem in the vacuum level, in which the correct to work would be 50 kpa, compared to the 45 kpa that was found.

In addition, the production property consisted of 405 lactating animals. The increase in cases of clinical mastitis was relatively high, and the treatment used was being ineffective. After epidemiological analysis and performance of SCC in lactating animals, it was possible to observe that the greatest results were caused by the contagious form of the disease (mainly *S. aureus and S. agalactiae*) [9].

Several agents may be involved in the occurrence of mastitis in a dairy herd [12]. These microorganisms have two classifications. The first is termed as environmental agents, that is, agents that cause environmental mastitis. The second classification is termed as contagious agents, which lead to a picture of contagious mastitis.

Environmental agents are microorganisms found that survive in the environment that cows circulate, such as recreational areas, tractor track, milking parlor, bed, water and in the feces themselves. According to Melo [12], these agents cause clinical mastitis and are considered as opportunistic. Its greatest occurrence occurs in the period in which there is more humidity and high temperatures. The most common agents are *Streptococcus dysgalactiae*, *Streptococcus uberis, Streptoccocus bovis*, *Escherichia coli, Klebsiella pneumoniae*, *Enterobacter aerogenes, algae* such as *Prototheca zopfii*, yeasts and fungi [10].

To avoid this type of agent, it is necessary to perform a good sanitary management, performing the proper cleaning of the places, such as milking parlor and stables, preventing bacteria from proliferating with the accumulation of feces or standing water, for example. In addition, it is emphasized that it is necessary to remove animals with some infection (metritis, chronic mastitis or open wounds) that may contaminate the environment or the herd, thus evidencing the importance of correct management with animals, especially with those who are sick. It is also important to have a suitable place where animals can be kept [12].

On the other hand, contagious agents are beings that barely survive in the environment, since they need animals to survive. Melo [12], Kulkarni and Kaliwal [10] mention that contagious pathogens have a high survival rate in the udder and mammary gland of animals, and the most common pathogens in these cases are *Staphylococcus aureus*, *Streptococcus agalactiae* and *Mycoplasma* spp. To carry out the control of this type of agent it is evident how essential is the effective care of the ceilings of the animals in relation to exposure to the main means of contamination.

According to Fonseca and Santos [8], it is necessary to pay special attention to the management of milking, suggesting the following procedures: make correct disinfection of the milking in particular of the teats; use of pre-dipping and *post-dipping* as disinfection of the ceiling (always give preference to the disposable paper towel in the drying of the ceiling and never reuse it in more than one ceiling); offer adequate training to the milker; offer, also, a balanced diet to increase the immunological resistance of the animals; and to milk the cows in treatment always after the herd is healthy.

In addition to these measures, it is essential to emphasize that prevention is always the best way for any herd to always remain healthy and with good zootechnical and productivity indexes. In short, Melo [12], points out that it is necessary to establish, on the farm, the preventive treatment in the drying of cows and the treatment of lactating animals. In addition, it is essential to be aware of the SCC of the storage tank of milked milk, and it is ideal that it does not exceed 200,000 cells/ml, thus indicating that contagious mastitis is well controlled.

High levels of SCC in tank milk indicate high levels of subclinical infection. Hiring new employees, not used to the milking routine, can cause stress for the animals and failures in the management of milking. High levels of stress can increase CCS, especially in cases of clinical mastitis. Therefore, it is necessary to perform the milking line correctly so that there is no spread of the disease in other animals [7].

The cases of mastitis bring significant losses to the dairy chain, generating a drop in production, the disposal of milk and the early disposal of producers [6]. In order to stimulate the producer in the prevention of this problem, Normative No. 62 is in force, with the purpose of directing producers to produce type A milk with an average of SCC less than 600,000 cells/mL, with a Total Bacteria Count (CBT) of less than 500,000 cells/mL. Following this normative, the final product has a higher quality [13].

Final Considerations

The results of SCC in the animals of the Reserve farm were due to good management and hygiene practices, reducing the incidence of clinical and subclinical mastitis. From what was analyzed, it can be concluded that the incidence of clinical mastitis is low, and it is possible to observe periods longer than 30 days without any identification of new cases due to the care provided on the property, such as the correct management of the herd and milking, hygiene and the use of skilled labor.

Bovine mastitis is considered a disease that causes great damage to milk production, reducing the quantity and quality of milk. To have a good productivity performance of the herd, it is necessary to adhere to good management practices and, mainly, to a biosecurity protocol. In addition, preventive actions are essential, such as cleaning and disinfection of facilities and equipment. Early diagnosis is of paramount importance to prevent new incidences of mastitis in the dairy herd.

As a result of the inflammatory changes of the mammary gland, there may be several damages to the industry and, mainly, to consumers who use milk, since contaminated milk can cause health problems, either by the presence of transmissible pathogens or by drug residues administered in order to treat the mastitis present. Bovine mastitis should be a reason for attention and concern of cattle ranchers and specialists, who need to master the knowledge related to the disease in order to avoid economic losses and preserve milk quality.

Bibliography

1. Rouquayryol M Z. "Introduction to Modern Epidemiology". (2nd ed.). Coopmed APCE Abrasco (1992).

2. Barbosa C P., *et al*. "Incidence Of Mastitis In Cows Submitted To Different Types Of Milking In Dairy Farms In The Triângulo Mineiro Region". *Bioscience Journal* 25.6 (2009): 121-128.

3. Busanello M., *et al*. "Estimation of prevalence and incidence of subclinical mastites in a large population of Brazilian dairy herds". *Journal of Dairy Science* 100.8 (2179): 6545-6553.

4. Carvalho A S S., *et al*. "Susceptibility of Staphylococcus aureus isolated from raw milk to commercial antibiotics". *Brazilian Animal Science* 19 (2018): 1-8.

5. Carvalho G., *et al*. "Indicators: Milk and Dairy Products". Embrapa Dairy Cattle (2020).

6. Costa EO. "Importance of mastitis in the country's milk production". J*ournal of Continuing Education of CRMV-SP* 1 (1998) 3-7 .

7. Dohoo I R and Meek A H. "Somatic Cell Counts in Bovine Milk". *The Canadian Veterinary Journal* 23.4 (1982): 119-125.

8. Fonseca L F L and Santos M V. "Milk quality and mastitis control". Read (2001).

9. Guilloux A G A., *et al*. "Epidemiological analysis of an outbreak of bovine mastitis in a dairy farm in the State of Rio Grande do Sul". *Acta Scientiae Veterinariae* 36.1 (2008): 1-6.

10. Kulkarni A G and Kaliwal B. "Bovine mastitis: a review". *International Journal of Recent Scientific Research* 4.5 (2013): 543-548.

11. Matioli G P. "Influence of milk from mastistic cows on the yield of minas frescal cheese. UFLA (2000).

12. Melo L J U N. "Mastitis in cattle herds: Literature review [Monograph, Instituto Federal Goiano – Morrinhos]" (2020).

13. Ministry of Agriculture, Livestock and Supply. Normative Instruction No. 62, of December 29, 2011. Amends the technical regulation on the identity and quality of chilled raw milk. Ministry of Agriculture, Livestock and Supply (2011).

14. Oliveira GC., *et al*. "Microbiological profile of Streptococcus spp. as causative agents of clinical mastitis in several regions of Brazil". *Journal of Continuing Education in Veterinary Medicine and Animal Science of CRMV-SP* 14.3 (2016): 74-74.

15. Peres Neto F and Zappa V. "Mastitis in dairy cows - literature review". Rev. Scientific Electronic Veterinary Medicine, year 9.16 (2011).

16. Smith ATF. "Mastitis: Questions and Answers". (1. ed.). EDUFRPE (2019).