

## Sanitary practices associated with animal welfare in the control of mastitis in the dairy herd

Práticas sanitárias associadas ao bem-estar animal no controle de mastites do rebanho leiteiro

Prácticas sanitarias asociadas al bienestar animal en el control de mastitis en el hato lechero

Received: 07/12/2021 | Reviewed: 12/12/2021 | Accept: 14/12/2021 | Published: 22/12/2021

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### Abstract

Agricultural practices are a powerful tool with health management contributing to the improved performance of production of animal welfare. The study aimed to verify that farming practices are important tools in the control of bovine mastitis and the degree of knowledge of the producers with respect to the practices. Guided visits were carried out the rural properties, when they were distributed educational materials and tools, made from recyclable material, used in the management of sanitary practices related to animal welfare. To evaluate the physiological profile were collected biological samples such as: blood, feces and milk, and for assessing the sanity and animal welfare were used a questionnaire. Blind 20 cows were selected for a total of 79 rooms of which breast; 36 rooms were negative to the CMT, but 12 were of these were positive to *Staphylococcus* and microbiology microorganism of higher occurrence. Animal welfare was compromised by the incidence of Subclinical Mastitis, infestation of flies and the absence of prophylactic measures. It is concluded that the use of good agricultural practices is a suitable tool associated with the animal welfare and important in the identification of bovine mastitis, and a lack of information and knowledge regarding best practices, especially in relation to preventive management.

**Keywords:** Health practices; Animal welfare; Mastitis; Dairy herd.

### Resumo

As práticas agropecuárias são uma ferramenta poderosa com o manejo sanitário contribuindo para a melhoria do desempenho da produção de bem-estar animal. O estudo teve como objetivo verificar se as práticas agrícolas são ferramentas importantes no controle da mastite bovina e o grau de conhecimento dos produtores a respeito das práticas. Foram realizadas visitas guiadas às propriedades rurais, quando foram distribuídos materiais e ferramentas educacionais, confeccionadas com material reciclável, utilizadas no manejo das práticas sanitárias relacionadas ao bem-estar animal. Para avaliação do perfil fisiológico foram coletadas amostras biológicas como: sangue, fezes e leite, e para avaliação da sanidade e bem-estar animal foi utilizado um questionário. Foram selecionadas 20 vacas cegas em um total de 79 quartos, dos quais 36 quartos foram negativos para o CMT, mas destes 12 apresentaram cultivos positivos para *Staphylococcus* sendo o microrganismo de maior ocorrência. O bem-estar animal foi comprometido pela incidência de Mastite Subclínica, infestação de moscas e ausência de medidas profiláticas. Conclui-se que a utilização de boas práticas agrícolas é uma ferramenta adequada associada ao bem-estar animal e importante na identificação da mastite bovina, sendo a falta de informação e conhecimento sobre as melhores práticas, principalmente em relação ao manejo preventivo.

**Palavras-chave:** Práticas de saúde; Bem-estar animal; Mastite; Rebanho leiteiro.

## Resumen

Las prácticas agrícolas son una herramienta poderosa con manejo sanitario que contribuye a mejorar el desempeño de la producción de bienestar animal. El estudio tuvo como objetivo verificar si las prácticas agrícolas son herramientas importantes en el control de la mastitis bovina y el nivel de conocimiento de los productores sobre las prácticas. Se realizaron visitas guiadas a predios rurales, donde se distribuyeron materiales y herramientas didácticas, elaboradas con material reciclable, utilizadas en el manejo de prácticas sanitarias relacionadas con el bienestar animal. Para evaluar el perfil fisiológico se recolectaron muestras biológicas como sangre, heces y leche, y para evaluar la salud y el bienestar de los animales se utilizó un cuestionario. Se seleccionaron 20 vacas ciegas de un total de 79 cuartos, de los cuales 36 cuartos fueron negativos para CMT, pero de estas 12 mostraron cultivos positivos para *Staphylococcus*, siendo el microorganismo más frecuente. El bienestar animal se vio comprometido por la incidencia de mastitis subclínica, infestación de moscas y falta de medidas profilácticas. Se concluye que el uso de buenas prácticas agrícolas es una herramienta adecuada asociada al bienestar animal e importante en la identificación de la mastitis bovina, con falta de información y conocimiento sobre las mejores prácticas, especialmente en relación al manejo preventivo.

**Palabras clave:** Prácticas de salud; Bienestar animal; Mastitis; Hato lechero.

## 1. Introduction

The world chain of animal protein production has grown constantly, in parallel with consumer demands for products that fit their needs and social alignment (Alexandrino, et al., 2020).

Dairy cattle is present in various properties of the rural settlements, usually being the main source of income of small producers. However, many face difficulty in staying in the activity because they are characterized by a low productive potential, with serious problems related to the quality of the milk and the sanity of the herd. In contrast to this fact, the more conscious consumers are increasingly demanding both with the quality of the product but also with creating standards with ethics (Molento, 2005). It is not feasible to transfer animal welfare assessment protocols developed for intensive systems to extensive systems or from rangeland- to pasture-based cattle because each system needs a different protocol (Kaurivi, et al., 2020). From the moment that we recognize animal sentience and we found that the interactions of animals with the environment interfere with their productive profitability, issues related to sanitary management started to be raised. The exact knowledge of the factors that intervene in the animal's productive life, given the example of the stress determined by environmental variations, makes it possible to adapt the management (Moraes, et. al.,2020).

The concern for animal welfare has been receiving prominence on the world stage, including in Brazil, where ever we find regulations that promote actions that improve the quality of life of the animals, as the Normative Instruction n° 56 which establishes general procedures of recommendations of good practices of well-being for farm animals and economic interest, created by the Ministry of Agriculture, Supplies and Livestock (Brazil, 2008).

The actions of PC-UFAL seek to understand the human-animal-environment relationship in the One Health panorama, in addition to guiding interventions in three main spheres of well-being, (Molento, 2007; Escodro et al. (2012), and physical, evaluating whether the animal is capable of normal organic growth and functioning, good health and maintenance of an adaptation to the adult life; behavioral, evaluating whether the environment is consistent with the one in which it evolved and adapted; mental, assessing whether the equine lives with a sense of mental satisfaction or at least mental stress free (Ribeiro, et al., 2020).

One of the alternatives to ensure the quality and productivity of milk and ensure good conditions of animal welfare is the implementation of good agricultural practices (BPA). The BPA are constituted by a set of rules and procedures aimed at ensuring the health, nutrition (food and water), welfare, the environment and safety of animals and milking hygiene, though, so that such practices are adopted, it is necessary to raise dairy farmers about the importance of the BPA (FAO, 2013). Properly planned assessments can identify risk factors for poor welfare, aid in the development of interventions, and be used to monitor and evaluate changes in practice (Dunston-Clarke, et al., 2020; Fraser, 2006; Knierim & Winckler, 2009).

Mastitis is one of the main causes of low quality and productivity of milk (Ballou, et al., 1995). In addition to cause economic losses, especially in reducing production and milk quality, mastitis brings serious problems for animal welfare since they are responsible for causing pain and discomfort to the animals, when affected by mastitis (Bond, et al., 2012).

The present work aimed to verify that the adoption of good agricultural practices is a good tool for the diagnosis of bovine mastitis and raise the small producer of rural settlements on the importance of the implementation of good agricultural practices related to animal welfare.

## **2. Methodology**

### **2.1 Welfare Assessment and Data Collection**

The study was conducted in four dairy properties (P1, P2, P3 and P4) belonging to the rural settlements, northwestern region of São Paulo State. 50% of the cows were selected in milk of each property. The sample group consisted of 20 bovine females (four P1, seven P2, five P3 and four P4) Girolanda breed, chosen at random, primiparous and multiparous, at different stages of lactation (initial, intermediate and final), with and without mastitis and breast 79 rooms in total, as a ceiling was nonfunctional.

At the time of the visit, the producers received guidance about the importance of good agricultural practices related to animal welfare when they were distributed and tools developed from pet bottles, for the mug test dark background and other containing antiseptic solution that should be used on roofs during the pre and post dipping. Were distributed folders and explanatory banners containing content the good agricultural practices of well-being related mainly to calves, milking, and animal health management. As a suggestion, we advise that the banner containing detail best practices procedures were fixed milking in the milking pens, making the applicability of the procedures in the routine of the producer.

To the profile of the production system of dairy properties and the ambience was applied a structured questionnaire-guided interview concerning the number of animals, breed, milk production, nutritional management, sanitary and hygienic management, control measures and prevention of mastitis.

The physical examination of mammary glands and the background dark mug test for the detection of clinical mastitis and California Mastitis Test (CMT) for the diagnosis of Subclinical Mastitis.

After the asepsis of the ceilings with alcohol 70% was performed the milk sample collection representing each breast rooms, forming a "pool" by animal, which was submitted immediately, evaluation of somatic cell count with the direct test portable DeLaval Cell Counter ®. The samples were seeded on blood agar culture media enriched with 5% defibrinated horse blood and MacConkey agar and incubated in bacteriological kiln immediately at 37° C, for a period of not less than 72 hours, being monitored every 24 hours. At the end of the incubation period were the cultures were considered as positive when the growth of three or more colonies of the same microorganism, and how contaminants to those who have three or more different agents (NMC, 1999). The cultures have been identified according to the characteristics and macromorphological, micromorphological and Gram stain. Later, for identification of microorganisms proceeded with the biochemical tests according to Quinn, et al. (1994).

Immediately after collecting milk samples, 5 ml of blood were obtained by puncture of the jugular vein with the aid of vacutainer ® tubes containing anticoagulant (EDTA ethylenediaminetetraacetic-).

Feces were collected directly from the rectal ampulla of cows with the help of a glove of palpation. Stool samples were processed by following the technique of Gordon and Whitlock (1939) modified by Ueno and Gonçalves (1998) for count of eggs per gram of feces (EPG) of gastrointestinal nematodes.

## 2.2 Data Analysis

The cows were subjected to visual and tactile evaluation of bodily reserves at specific points of the body of the animal, according to the methodology proposed by Wildman et al. (1982), using a scale from 1 (very thin) to 5 (very fat), with range of 0.50 points.

The variables were tested by the Fisher exact test and Kruskal Wallis, adopting the significance level of 5%.

## 2.3 Ethics and Biosafety Committee

This research paper was approved by the Ethics Committee on the use of Animals, under protocol number 2013-04418.

## 3. Results and Discussion

The cattle of milk is the main agricultural activity of the properties evaluated. As noted in this study, the cows of the breed and crossbred Gir (Gir x Dutch) are widely used for milk production in Brazil due to its high capacity to adapt to the tropical climate and its satisfactory performance (Sharma, et al., 1996).

With respect to the type of food, it was found that most used the pasture as the main source, and nutritious food supplementation with bulky was held in the most critical periods of the year, when there was a shortage of pastureland being sugar cane, briquette and elephant grass (*Pennisetum purpureum*), the elements of choice. The property P1 is not provided to cows, and P2, P3 and P4 provided commercial concentrate on individual trough during milking lactating cows only according to the quantity of milk produced.

The animals had ad libitum access to water from well damn. The limitations on the consumption of water and the presence of shadow can compromise the level of animal welfare, especially in tropical climates (Armstrong, 1994). On all properties, manual milking was being performed once daily in the morning, with the presence of the calves at the foot of the cows. The calves were getting before the beginning of milking to promote the stimulus to the descent of the milk, remaining tied next to mothers, and at the end of milking were loose in the pasture. The milk was packaged in drums of milk and immediately after milking was driven to the cooling tank. The sale was held at the dairy in the region.

In general, the facilities of the properties were precarious and low technological level. On all properties mud accumulation was observed in the vicinity of milking installations, and also was P3 property observed accumulation of mud in the milking barn. The presence of mud accumulated in pens can cause discomfort, hygiene problems, and difficulty of the displacement of the animals, as well as influence the sanity of animals that are more exposed, especially diseases of environmental mastitis (Samantet, al., 2014).

Simple procedures for disinfecting the teats before milking were observed on P2 and no producer was soaking in disinfectant solution the teats after milking. According to Mandal et al. (2011), the simple disinfecting the teats before milking with a chlorinated solution to 750 ppm can cause on 91.3% reduction of coliform and 85.3% of *Staphylococcus coagulase* positive. Only the property P2 reported using the mug of dark background, however, its use was not held every day. No producer reported using the CMT test, and it is noteworthy that three of these producers were unaware of the practice of CMT. The use of the CMT is an important tool to diagnose the health conditions of the dairy herd and allows producers to take preventive measures for the more effective control of Subclinical Mastitis (Brito, et al., 1997).

The supply of food post milking is a management practice that stimulates the animals to remain standing until the closing of the sphincter, reducing the ceiling mastitis cases caused by pathogens (Costa, et al., 1998). The absence of the practice, probably favored the animals lie down immediately after milking, as noted in the property P4.

Intramammary antibiotic treatment for the dry cows was carried out on only a single property (P4). Second, Makovec & Ruegg (2003) such a procedure can eliminate 80% of mastitis in drying and prevent up to 80%, the emergence of new infections during the period.

The presence of ectoparasites was observed mainly ticks and fly-horns, and producers have reported perform the tactical control of ectoparasites, only when infestation levels were considered high by the producers.

The presence of ticks reduces the welfare of cows, as well as cause skin irritation, rash, and anemia, can transmit parasites that cause sorrow or disease Piroplasmosis, a parasitic tick (Furlong & Sales, 2007). Already the presence of horns fly is related to the transmission of diseases and especially stress that cause the animals in an attempt to get rid of these parasites causing productivity losses (Bianchin & Adams, 2002).

Despite the properties evaluated virtually adopt the good practice of milking was not verified cases of clinical mastitis. All rooms rated breast presented negative results to the test of the mug of dark background and none of the cows were observed changes evident in the mammary glands.

Of the 79 breast rooms evaluated in the CMT, 37 (46.84%) presented a positive reaction (tab. 1). The stage of lactation ( $p = 0.549$ ) and the number of delivery ( $p = 0.416$ ) did not influence significantly the results of CMT. Cows in late lactation have a higher amount of positive score to CMT, probably due to lower milk production and greater scaling epithelial tissue (Fagan, et al., 2008).

With respect to the determination of the CCS emerged that despite observing high values of CCS on P3 property (median 1,  $24 \times 10^5$  cells/mL) when compared to the properties P1, P2 and P4 that showed median of 3,  $92 \times 10^5$  células/mL, 2,  $127 \times 10^5$  células/mL,  $0 \times 10^5$  células/mL, respectively, were not significant difference of CCS among the cows of the evaluated properties ( $p = 0.3216$ ). When considering the value limit of CCS of  $5 \times 10^5$  células/mL, determined by Normative paragraph 62 of the Ministry of Agriculture, Livestock and Supply (MAPA) from July 2014, only property P3 would not be with legislation.

According to Brito et al. (1999), as used for antiseptis procedures before and after milking, associated with adoption of milking line have been identified as one of the main factors contributing to the decrease of the CCS.

In the microbiological examination, of the 79 rooms there was a higher frequency of assessed breast isolation of contagious pathogens, with predominance of the bacteria of the genus *Staphylococcus*, followed by *Corynebacterium* spp. (Table 1). *Staphylococcus aureus* is recognized as the primary etiological agent, in cases of subclinical mastitis in dairy herds (Ferreira et al., 2006). The high presence of bacteria of the genus *Corynebacterium* is indicative of absence or flaw in the aseptic process of ceilings after milking (Brito et al., 1999).

**Table 1** Isolation of microorganisms versus California Mastitis Test (CMT) score of bovine milk samples from rural settlement properties -São Paulo- Brazil

Microbiology culture	score CMT				Total	
	Negative n%	+	++	+++		
<i>Staphylococcus</i> sp	3 (3,80)	12 (15,19)	11 (13,92)	5 (6,33)	34 (43,04)	
<i>Corynebacterium</i> spp.	4 (5,06)	4 (5,06)	1 (1,27)	-	12 (15,19)	
<i>Bacillus</i> spp.	2 (2,53)	3 (3,80)	-	-	5 (6,33)	
<i>Arcanobacterium</i> spp.	2 (2,53)	-	1 (1,27)	-	3 (3,80)	
<i>Culture mix</i>	1 (1,27)	-	-	-	1 (1,27)	
no bacterial growth	24 (30,8)				24 (30,8)	
Total	36 (45,47)	6 (7,59)	19 (24,05)	13 (16,46)	5 (6,33)	79 (100)

*culture mix* \**Staphylococcus* spp. + *Arcanobacterium* spp. Source: Survey data.

Considered the results of the CMT and microbiological examination showed that in 36 rooms that breast reacted negatively to the CMT bacteria isolation occurred in 12 of these breast rooms. The CMT test is not sensitive to identify subclinical mastitis in its early stages when the increase of the cell count of infected animals (Orange & Machado, 1994).

In relation to the ECC was not identified extremely thin or obese cows, animals take advantage of good nutritional status, showing 2.5 to 3.5 between ECC. The cows that show the extremes of ECC are at greater risk of having metabolic problems and diseases, reduction in milk production and difficulty at the time of calving (Ferguson, et al., 1994).

Parasitological examination all samples evaluated presented negative results to count nematodes by grams of feces. The adult bovine animals acquire immunity to helminth around 18 months of age and eliminate a few eggs of parasites in the stool, corroborating the results of lower infestation of helminths in cows of this work (Baran, et al., 2013). The analysis of the hemogram introduced significant changes indicative of diseases infectious and parasitic diseases.

The main challenge is still to break with the distrust of the settlers. However, it is only with people's awareness of the direct relationship between well-being and productivity that it will definitely contribute to improving the quality of life of farm animals. All producers were aware of the animal's quality of life, but it is very difficult to provide such practices since the socioeconomic and health conditions of the families are precarious.

#### 4. Conclusion

Therefore, we can conclude that the use of agricultural practices is suitable for the identification of bovine mastitis, however, there is a lack of knowledge in relation to good animal welfare practices, mainly related to preventive management. The producers awareness of the implementation of good agricultural practices in the dairy activity proved to be fundamental to improving the conditions of animal welfare, productivity and quality of milk, promoting the improvement of collective well-being. In this context, other works must be carried out with the same objective.

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