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Risk factors for the occurrence of new and chronic cases of subclinical mastitis in dairy herds in southern Brazil

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ABSTRACT

The aim of this research was to evaluate the risk factors for new and chronic subclinical intramammary infections (IMI) using the monthly somatic cells count of dairy cows. The study took place at 30 dairy herds with approximately 1,700 cows in lactation. Data characterizing the dairy farms and their milking management were obtained from a survey questionnaire. The somatic cells count values from 2 consecutive months were used to classify cows as either healthy or with new or chronic infections. A chi-squared test was used in the analysis of subclinical IMI to evaluate associations between each independent variable, followed by logistic regression to estimate the risk of a new infection in healthy cows and of chronic infection in cows with new infections. Factors increasing the odds ratio of a cow developing a new case of subclinical mastitis were (1) cows with more than 3 lactations, (2) cows with a mean hyperkeratosis score above 3, (3) cows with the udder below the hock, (4) cows with very dirty udders, and (5) milking of infected animals before healthy cows. Factors increasing the risk of a subclinical chronic infection compared with new cases of subclinical mastitis were (1) a lack of regular maintenance of milking machinery, (2) cows over 100 d in lactation, and (3) cows with the udder on or below the hock. The risk factors identified in this study can be used in IMI control programs to reduce the frequency of new and chronic cases of subclinical mastitis.
Key words: dairy herd, intramammary infection, odds ratio, somatic cell

INTRODUCTION

Bovine mastitis it is one of the main diseases affecting dairy herds worldwide (Ruegg and Pantoja, 2013). Mastitis causes many problems, both in the organoleptic and microbiological characteristics of the milk and in terms of drug costs, discarded milk, and early cow replacement (Halasa et al., 2007; Janzekovic et al., 2009; Geary et al., 2012). The SCC in milk is an important tool for the diagnosis of subclinical mastitis and is internationally accepted as a criterion for evaluating the health of a cow's mammary gland (Dohoo and Leslie, 1991; Bradley and Green, 2005; Ruegg, 2006; Cicconi-Hogan et al., 2013). Monthly reports of a cow's SCC allows for the monitoring of the frequency, prevalence, and incidence of mastitis (Ruegg, 2003; Madouasse et al., 2010). The month-to-month monitoring of SCC in cows is an important tool for making decisions for the prevention of subclinical IMI (Schukken et al., 2003; Souza et al., 2011).

Several SCC parameters have been used to classify the health status of a cow's mammary gland (Dufour and Dohoo, 2013), whereas for studies with composite milk samples, the threshold of 200,000 cells/mL is generally used for confirmation of disease with the goal of reducing diagnostic mistakes (Djabri et al., 2002; Schukken et al., 2003; Madouasse et al., 2010, Madouasse et al., 2012; Rhoda and Pantoja, 2012). A study of dairy herds in Ontario, Canada, found that the maximum limit of 200,000 cells/mL resulted in a sensitivity between 73.0 and 89.0 and a specificity between 75.0 and 90.0 for the detection of disease prevalence (Dohoo and Leslie, 1991). In another study using the same SCC limit, Schepers et al. (1997) found a sensitivity and specificity of 74.5 and 89.6, respectively. Pantoja et al. (2009a) concluded that cows with SCC values above 200,000 cells/mL before drying-off had a higher risk of subclinical mastitis in the first month after calving. Pantoja et al. (2009b) observed a higher prevalence of clinical mastitis in animals with the mammary quarters classified as chronically infected (SCC >200,000 before drying-off and after calving) than in animals with mammary quarters classified as healthy (SCC <200,000 before drying-off and after calving). Souza et al. (2011)

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found that the risk of chronic infection was higher in cows of herds that had a high prevalence of subclinical mastitis (herds with SCC from the bulk tank higher than 750,000 cells/mL). Thus, month-to-month monitoring of the SCC values of individual cows is broadly used to estimate the mammary gland infection status on dairy farms (Cook et al., 2002). The use of a SCC threshold of 100,000 cells/mL have been proposed by some authors (Schwarz et al., 2010; dos Reis et al., 2011) for SCC of individual mammary quarters of cows. However, it should be note that in composite samples, the value of SCC is diluted by the noninfected mammary quarters.

The analysis of mastitis risk factors can help identify measures to improve mammary gland health in dairy herds, and such analysis is often based on a combination of diagnosis and monitoring systems (Gambôa et al., 2004). Thus, the identification of risk factors associated with the occurrence of IMI can help improve programs for the prevention and control of mastitis in dairy herds (Olde Riekerink et al., 2006; Piepers et al., 2007). Many factors can influence SCC values, including milking management, parity, DIM, and even the month and season of the year (Laevens et al., 1997; Skrzypek et al., 2004; Osterås et al., 2006; Lievaart et al., 2007; Olde Riekerink et al., 2007; Cunha et al., 2008; Jansen et al., 2009). New methods of analysis have allowed researchers to identify with greater accuracy management practices that reduce the SCC level of individuals and of whole herds. In a review of 36 scientific papers, Dufour et al. (2011) observed that management practices usually associated with lower SCC values were the use of gloves by milkers during milking, periodic maintenance of milking machines, teat disinfection after milking, and milking cows with high SCC counts or clinical mastitis last. Cicconi-Hogan et al. (2013) observed that such management practices as monthly monitoring of SCC values, vaccination, and postmilking teat disinfection were associated with decreased SCC values for milk in bulk tanks.

Any mastitis prevention and control program should also consider the risk factors for mastitis associated with milking machines. Wenz et al. (2007), evaluating management practices in dairy herds, observed that the use of automatic cluster removers was associated with lower SCC values in bulk tank milk. Inadequate milking practices or poorly maintained equipment can also be related to the appearance of lesions at the ends of the teats (Capuco et al., 1994; Schukken et al., 2003). Sousa (2008) found the absence of automatic cluster removers to be highly associated with the occurrence of teat end lesions.

For each mammary gland infection status, specific risk factors are known (Schukken et al., 1990; Elbers et al., 1998; Schukken et al., 2003). However, studies of the risk factors for mastitis are never definitive because it is impossible to evaluate, in a single study, all the potential risk factors in a herd (Souza and Brito, 2011). Therefore, the present study aimed to evaluate risk factors for new cases of subclinical IMI and the persistence of such infections by using monthly SCC values of milk cows in dairy herds in southern Brazil.

MATERIALS AND METHODS

Herds and Data

The study was conducted in the western, midwestern, southern, and highland regions of the state of Santa Catarina, in southern Brazil, and involved 30 dairy farms enrolled in the DHI test of the Santa Catarina Association of Cattle Breeders (ACCB, Florianopolis, Brazil), with monthly information about milk yield, milk composition, and SCC of cow composite samples. This area of Brazil is composed of 2 regions, one with a humid subtropical climate with a hot summer and the other with a humid temperate climate with a temperate summer according to Köppen (EPAGRI, 2005). These regions have the greatest number of herds enrolled in the DHI test in the state.

The study involved 1,700 lactating cows, with 1,080 Holstein, 575 Jersey, and 45 Holstein × Jersey cross. The cows were milked 2 or 3 times a day in milking machines, with the milk stored in bulk tanks. On average the dairy farms had 47.1 lactating cows, whereas 13.3% of the herds had up to 20 cows, 36.7% had 21 to 40 cows, 26.7% from 41 to 60 cows, 13.3% from 61 to 80 cows, and just 10.0% had more than 80 dairy cows. The study used data from 11,159 DHI dairy assessment tests, conducted from December 2011 to November 2012, that recorded information about breed, parity, DIM, milk, SCC, and date of calving.

At the beginning of the experiment, a survey questionnaire was distributed to the dairy farmers to obtain information about their herd size, the structure of their farm, and factors related to mastitis (techniques used in the management of milking and milking facilities, drugs used, and the disposal of animals infected with mastitis). Three technical visits were made to each farm, from March to December 2012, at intervals of approximately 3 mo, to evaluate teat end hyperkeratosis, the depth and cleanliness of the udder, and to update the database containing information on lactating cows, as described herein.