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Incidence of mastitis and bacterial findings at clinical mastitis in Swedish primiparous cows—Influence of breed and stage of lactation

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ABSTRACT

Mastitis is a common disease also among primiparous dairy cows. Identification of the extent and type of problem is important to initiate correct control measures. In Sweden, unique national production and disease databases are available. The main aim of the study was to investigate the occurrence of mastitis, measured by the annual incidence of veterinary-treated clinical mastitis (VTCM) and geometric mean of monthly milk somatic cell count (SCC) recordings in Swedish primiparous cows in relation to older cows during 2002–2006 with emphasis on breed differences. Other aims were to study differences between primiparous and older cows in the distribution of bacterial findings at clinical mastitis, and the occurrence of VTCM and bacterial findings in relation to stage of lactation using data from a Swedish field study performed 2002–2003. Descriptive statistics and univariable analyses were used in the investigations. During 2002–2006 approximately 10% of Swedish primiparous cows experienced VTCM each year, while the geometric mean SCC of Swedish primiparous cows was approximately 65,000 ml^{-1}. Both parameters were lower than in older cows. Primiparous cows of the Swedish Red (SR) breed had better udder health than cows of the Swedish Holstein (SH) breed. The overall distribution of udder pathogens was similar in primiparous and older cows. In primiparous cows, most VTCM occurred during the first week after calving, and *Staphylococcus aureus* and *Streptococcus dysgalactiae* were the most common udder pathogens during this period. Better control measures directed at these infections are warranted around calving to reduce the risk of mastitis in primiparous cows.

1. Introduction

The investments during the upbringing of dairy heifers make the primiparous dairy cows very valuable. It is therefore essential that they remain healthy to make the investment worthwhile. Unfortunately, mastitis is a common disease among primiparous cows (Barkema et al., 1998; Valde et al., 2004; Nyman et al., 2007). Identification of the extent and type of problem is important to initiate correct control measures against mastitis.

When possible, investigating trends in mastitis over time at the national level can give useful information. In Sweden, approximately 78% of the dairy herds and 86% of the dairy cows are enrolled in the Swedish official milk-recording scheme (SOMRS; Olsson et al., 2001). Moreover, only veterinarians are allowed to initiate an antibiotic

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treatment and every treatment must be reported to the Swedish animal disease recording system (SADRS; Emanuelson, 1988). These two systems are linked, which gives unique possibilities for studies of the dairy cow population.

In Sweden, the two main dairy breeds are the Swedish Red (SR) and the Swedish Holstein (SH), each contributing approximately half of the population (Swedish Dairy Association, 2006). Breed differences in mastitis incidence have been reported (e.g. Bendixen et al., 1988; Elbers et al., 1998), but data on primiparous cows are scarce.

To optimise preventive measures for mastitis in primiparous cows, information on risk periods in relation to calving is important. In previous studies, most cases of clinical mastitis (CM) in primiparous cows occurred early in lactation (Myllys and Rautala, 1995; Barkema et al., 1998; Valde et al., 2004; Svensson et al., 2006; Nyman et al., 2007).

Knowledge of the spectrum of udder pathogens causing CM in dairy cows is also important for prevention and control of udder health problems. As primiparous cows often experience a different environment and management than older cows, especially pre-calving, this may result in a different microbial profile associated with mastitis. The variety of udder pathogens could also differ depending on stage of lactation.

The main aim of this study was to investigate the occurrence of mastitis, measured by the annual incidence of veterinary-treated clinical mastitis (VTCM), and the geometric mean of milk somatic cell counts (SCC) at monthly milk recordings, in all Swedish primiparous cows enrolled in the SOMRS in relation to older cows during the years 2002–2006 with emphasis on differences between the breeds SR and SH. Other aims were to study differences in the distribution of bacterial findings at CM between primiparous and older cows, and to study the occurrence of bacterial findings in relation to stage of lactation using data from a Swedish field study performed 2002–2003.

2. Material and methods

2.1. Animals in the national database

All cows (340,235–380,340 cows/year) included in the SOMRS 2002–2006 were used when studying occurrence of mastitis in primiparous cows (132,157–139,428 cows/year) in relation to older cows, and differences between the breeds SR and SH. Annual data on VTCM (number of diagnosed cases per 100 cows) and geometric mean milk SCC emanating from monthly milk recordings were collected (Swedish Dairy Association, Stockholm). According to the criteria set by the Swedish Dairy Association cases of VTCM where the same cow was treated again within 2 weeks were not included.

2.2. Field study on bacteriological findings associated with CM

Field practitioners from the whole country were asked to collect a specified number of milk samples per region and season from cases of CM in 2002–2003. Information on parity and days in milk was also collected when available. The cows included were geographically distributed in a manner comparable to the total distribution of cows in Sweden. Only lactating cows were included in the study. A CM case was defined as a cow with CM not treated earlier in the lactation and with a composite SCC below 200,000 cells/ml at the previous monthly milk recording. Quarter milk samples from affected udder quarters were collected aseptically by the field practitioner. Milk samples (10 μl) were directly cultured on 5% bovine blood agar plates. The agar plates were incubated at 37 °C for 16–24 h, and evaluated in accordance with the routine of each field veterinarian. All agar plates were sent to the National Veterinary Institute for bacteriological verification. The growth on the plates was evaluated at the laboratory and additional tests were performed in accordance with routines at the laboratory. *Staphylococcus aureus* was determined by means of colony morphology, CAMP-reaction and coagulase reaction. Other staphylococci were not determined to the species level, but considered as coagulase negative staphylococci (CNS). For typing of streptococci to the species level, 12 biochemical reactions (hippurate, esculine, salicine, sorbitol, mannitol, raffinose, lactose, saccharose, inuline, trehalose, starch and glycerine) and CAMP-reaction were used. For isolates not confirmed with these methods, Lancefield grouping (Streptex, Murex Biotech Limited, Dartford, UK) was used. Gram-negative bacteria with typical colony morphology and positive for *p*-nitrophenyl-β-D-glucupyranosiduronic acid (PGUA) and indole were considered as *Escherichia coli*. For Gram-negative bacteria that could not easily be determined as *E. coli*, oxidase reaction and API 20 E (bioMérieux, Craponne, France) or API 20 NE (bioMérieux, Craponne, France) was used. To confirm growth of *Arcanobacterium pyogenes* colony morphology, Gram staining and culture in 3% CO_2 was used. *Bacillus* spp., yeasts and *Corynebacterium* spp. were confirmed by means of colony morphology and Gram staining. The milk samples was considered infected when growth of at least one colony forming unit (CFU) of *S. aureus*, or at least three CFU of other bacteria were detected. Milk samples were cultured from a total of 987 udder quarters from 829 dairy cows, and 1056 bacterial diagnoses were obtained. In 1014 of those information on parity was available, and 38% (n = 385) of those 1014 originated from primiparous cows.

2.3. Statistical analyses

Descriptive statistics were given for the various studies. Data based on all cows included in the SOMRS were not analyzed statistically as they represented the whole cow population. Differences in the distribution of bacterial diagnoses between parities and within stages of lactation were tested using Chi-square analysis. Significance levels are given in the results section when appropriate.

3. Results

During the study period 2002–2006, approximately 10% of all Swedish primiparous cows enrolled in the SOMRS were veterinary-treated for CM each year, and the geometric mean SCC of Swedish primiparous cows was