BRIEF COMMUNICATION

Teat spraying before calving and *Streptococcus uberis* clinical mastitis in heifers

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ABSTRACT

Mastitis caused by the environmental pathogen *Streptococcus uberis* is a significant problem for New Zealand dairy farmers. Previous work on teat-spraying heifers three times a week for three weeks prior to calving demonstrated that a decrease in *S. uberis* teat-end contamination reduced the proportion of quarters infected with *S. uberis* at calving. This study evaluated the effect of teat-spraying heifers in the dry period for its ability to reduce *S. uberis* clinical mastitis (CM) after calving. Heifers from five commercial dairy herds (n=343) and one research farm (n=54) were enrolled to the study. Half of the animals from each herd were assigned to a Sprayed and the other half to a Not Sprayed group. Both groups were brought to the dairy three times a week, beginning three weeks prior to predicted calving dates and heifers in the Sprayed group were teat-sprayed with a commercially available iodine-based teat sanitizer. Cases of CM that occurred in the week after calving were sampled and submitted for bacteriological analysis. Incidence of *S. uberis* CM was 50% lower in the Sprayed, affecting 3.6% heifers *vs*. 7.4% heifers of the Not Sprayed group (P=0.085). There was an indication that teat-spraying heifers three weeks prior to calving may have positive benefits in the reduction of CM caused by *S. uberis* after calving.

Keywords: mastitis; pre-calving; teat spraying; clinical mastitis; management.

INTRODUCTION

Environmental mastitis caused by *Streptococcus uberis* is a major problem for New Zealand dairy farmers. The majority of clinical cases caused by this pathogen occur in the dry and calving periods (Williamson *et al.,* 1995; Pankey *et al.*, 1996). Strategies for reducing the incidence of new intramammary infections (IMI) around calving in heifers are few. Existing options include the use of antibiotics pre-calving (Oliver *et al*., 2003), and use of barrier-type teat sealants (Timms *et al*., 1987) or internal teat sealants in the dry period (Woolford *et* al., 1998; McDougall *et al.,* 2005; Parker *et al.*, 2007). Barrier type teat sealants are currently not available in the New Zealand market but internal teat sealants have been tested with a reasonable degree of success (McDougall *et al.*, 2005). Teat spraying heifers in the dry period is another management option which has shown promising results (Lopez-Benavides *et al.*, 2006). However, because of the small scale of the study, the effects of spraying on the incidence of clinical mastitis (CM) post-calving could not be determined. This field study examined the effect of three times weekly teat spraying of the calving herd on the incidence of clinical mastitis post-calving, using a larger number of animals across several farms and locations.

MATERIALS AND METHODS

Animals and experimental design

Heifers from five commercial herds (n=343) from around New Zealand and from the Dexcel Lye research farm (n=54) were included in the study. Two commercial herds were located in the Waikato, one in Taranaki, one in Northland and one in Southland. Farmers volunteered to take part in the trial and were selected for their ability to follow the required protocol and maintain good records. They were also undertaking herd testing through Livestock Improvement Corporation and recorded farm events in MINDApro software v4.4 (Livestock Improvement Corporation, Hamilton, New Zealand). For each farm, all heifers were split evenly into Sprayed and Not Sprayed groups based on approximate calving date. Heifers on the Sprayed group were marked with long-lasting stock marker paint for easy identification in the dairy. Animal manipulations were approved by the Ruakura Animal Ethics Committee. Trial began when the farmer set up the calving herd, three weeks prior to planned start of calving. Heifers were enrolled in each group three weeks prior to individual predicted calving date. All animals were brought to the dairy three times a week (Monday, Wednesday and Friday), when marked animals were sprayed with a commercially available iodine-base teat sanitizer at a dilution of 1:4. After teat spraying, all animals were released for

Table 1: Incidence of *S. uberis* clinical mastitis (CM) and herd test SCC (±SD) of heifers Sprayed or Not Sprayed with an iodine-based teat sanitizer in the late dry period.

Treatment	Heifers (n)	First herd test (n)	Mean SCC (x 10^3 cells/mL) P=0.814	CM heifers/100 heifers *S. uberis* P=0.085	CM heifers/100 heifers Total P=0.960
Sprayed	195	189	148 ± 420	3.6	12.8
Not Sprayed	202	191	179 ± 619	7.4	11.4
Total	397	380			

grazing. Heifers finished the trial eight days following calving.

Milk samples and bacteriology

After calving, CM quarters were sampled in duplicate before antibiotic treatment. Quarters with CM were diagnosed by the farmer, based on milk appearance (clots, strings or blood) and udder swelling. The milker collected duplicate foremilk samples from the infected quarter following recommended procedures (NMC, 1999). Samples were maintained at -20°C until processing in the laboratory. At the laboratory, 100 µL of each sample were spread-plated onto an Esculin Blood Agar media plate and incubated at 37°C for 48 hours (NMC, 1999). The causative mastitis pathogen was identified by positive isolation (>10 colony forming units/ml) from both samples.

Statistical analysis

Regression analysis with binomial proportions was used to analyse differences between Sprayed and Not Sprayed groups, considering only *S. uberis* CM cases that occurred in the first eight days post-calving (GenStat Release 8.1, VSN International, Oxford, England). For each farm, SCC data from the first herd test for all animals (n=380) were downloaded from MINDApro and $\log_{10}$ transformed before ANOVA analysis. Comparison of SCC between both treatments and of heifers infected with *S. uberis* at calving and those free of infection were analysed using regression analysis. Data are presented as raw means ± SD.

On the commercial farms, complete data was obtained from 343 heifers. A further 56 heifers were enrolled to the study but due to calving before entering the calving herd or because of treatment for CM in the dry period, data from these heifers were not included.

RESULTS

Teat-spraying in the dry period and clinical mastitis

Heifers on the Sprayed group were on treatment for an average of 19 ± 14 d and the Not Sprayed group for 20 ± 14 d. In the Sprayed group, a negative association was observed between number of days in treatment and occurrence of *S. uberis* CM post calving (P=0.035). The incidence of *S. uberis* CM was the same in both groups on treatment for up to three weeks, but the difference was noticeable for heifers enrolled for a longer period of time. Only one *S. uberis* CM case was observed in the Sprayed group on treatment for more than three weeks, compared to ten *S. uberis* CM cases observed in the Not Sprayed group. Incidence of *S. uberis* CM post-calving was not different for both groups (Sprayed = 3.6% heifers *vs*. Not Sprayed = 7.4% heifers; P=0.085), although a trend existed for reduced CM incidence in the Sprayed group. On a quarter basis, the incidence of *S. uberis* CM was 1.2% (Sprayed) *vs*. 2.2% (Not Sprayed) (P=0.094).

On average the first herd test occurred 46 ± 21 d after calving and no differences were observed in heifer SCC between Sprayed (148,000 cells/ml) and Not Sprayed (179,000 cells/ml) groups (P=0.814; Table 1). Regardless of group, heifers with *S. uberis* CM post-calving had a high SCC in the first herd test. Twenty heifers that were diagnosed with *S. uberis* at calving had an average SCC of 835,000 cells/ml at the first herd test compared to an average SCC of 127,000 cells/ml for 360 heifers that were free of *S. uberis* infection (P<0.001).

DISCUSSION

This study evaluated the effectiveness of teat spraying heifers in the weeks prior to calving with the aim of reducing *S. uberis* CM post-calving on commercial farms. Previous work showed promising results in the ability of an iodine-based

teat sanitizer to reduce *S. uberis* numbers on teat-ends which led to a reduction in sub-clinical mastitis observed at calving (Lopez-Benavides *et al*., 2006). Results from this study suggested that teat spraying heifers pre-calving may have a beneficial effect on *S. uberis* CM post-calving. Furthermore, number of days on treatment was found to be important for the reduction of *S. uberis* CM. Future studies will need to expand the study population and other factors such as ideal timing of treatment relative to calving, the frequency of teat spraying, and products more suitable for providing long-term dry period protection.

Herd test SCC was similar between both treatment groups probably because the incidence of CM was similar between them and also because on average, herd testing happened six weeks after calving, when IMI recovery had occurred for the majority of infected heifers. However, heifers with *S. uberis* CM at calving still had a high SCC at the first herd test. It is believed that herds with a high proportion of heifers infected with *S. uberis* would undoubtedly observe a negative effect on the bulk milk SCC (BMSCC). For herds with a high incidence of heifer mastitis, teat spraying in the dry period could help to reduce the incidence of *S. uberis* IMI at calving and could possibly play an important role in maintaining BMSCC at low levels in the weeks following calving. Meeting milk quality standards and a BMSCC <400,000 cells/ml in the early season is a challenge for farmers. The aim of maintaining a low BMSCC in this critical period could benefit from this type of management strategy which can be implemented with ease during the dry period.

In conclusion, this study suggests that teat spraying heifers in the weeks prior to calving could be a practical management tool for reducing the incidence of *S. uberis* CM post-calving. Farmers that have feed pads adjacent to the dairy and which are used for supplementary feeding in the dry period could easily adopt this strategy into their management practices. Nevertheless, more studies are required to prove the significance of teat spraying in the dry period, to optimise the frequency and duration of the treatment, or the longevity of the teat sanitizer on teat-ends.

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