

Comparison of the effect of systemic and local antibacterial therapy to control staphylococcal intramammary infection in prepartum heifers

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Abstract: This study was conducted to compare systemic versus intramammary administration of antibiotics in eliminating intramammary infection (IMI) of *Staph. aureus* in Holstein heifers. Heifers approaching parturition were randomly assigned into 4 groups of 30. Group 1 to 3 received Nafpenzal-DC (DC), Tylosin (TY), Enrofloxacin (EN), respectively and group 4 received no treatment (control). Postpartum cure rates were 93, 83, 70 and 47% in heifers of Group 1 to 4, respectively ($p < 0.05$). The cure rates in heifers that belonged to DC and TY groups were higher than that in control group ($p < 0.01$). There was no significant difference between the cure rates of TY and DC groups and between EN and TY groups. Cure rate in DC group was greater than that in EN group ($p < 0.05$). In conclusion, prepartum systemic treatment by Tylosin, which is easier to apply and prevents injuries for both heifer and milker, might replace DC treatment for controlling staphylococcal mastitis in dairy heifers. *J. Vet. Res.* 62, 2: 7-9, 2007.

Key words: heifers, *Staph. aureus*, mastitis control.

Introduction

Staphylococcal intramammary infection (*Staph. IMI*) is recognized as a common problem of dairy heifers (1, 4, 6, 7, 8). *Staphylococcus aureus* (coagulase negative or positive) can be isolated from the teat canals of heifers which have previously been regarded as uninfected (5). The infection in dairy heifers may damage the developing secretory tissues reducing the future milk production in such animals (1, 9). In another study, we showed that systemic injections of Tylosin and Enrofloxacin were reliable alternatives for conventional dry-cow therapy in controlling staphylococcal IMI in dry multiparous cows (2). The efficacy of antibiotics for treating IMI in unbred and primigravid heifers has been demonstrated by a few researchers (6, 10). Ninety per cent of the naturally and 100% of the experimentally infected heifers treated in such manner remained

uninfected for at least two months postpartum (8). The objective of the present study was to compare the effects of systemic and local therapy to control staphylococcal IMI in primigravid prepartum heifers.

Materials and Methods

In a large dairy farm (800 Holstein milking cows), with the history of high prevalence of staphylococcal mastitis in lactating cows and acute forms of the disease in first-calf heifers, 120 culture-positive primigravid heifers were selected for the study. The selected heifers approaching parturition (14 to 7 days prepartum) were kept in the maternity area. A standard teat sanitation method was practiced using 70% ethanol. A composite secretory material was collected from each heifer in a sterile screw-capped bottle, discarding the first secretions, and was then transported to the laboratory in appropriate conditions for culture. Samples were then cultured in

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blood Agar and MacConkey's preparations using standard bacteriological methods (3) to identify and differentiate *staphylococcus aureus* coagulase positive. The isolates of mixed infections were discarded from the study.

The culture-positive heifers were randomized by the systematic and lottery methods into four groups: The first heifer in dry-cow (DC), the second in tylosin (TY), the third in Enrofloxacin (EN) and the fourth in the control group (C). The segregation continued until 120 heifers completed their course of treatment making the following groups: 1) DC (n=30) that received an intramammary infusion of Nafpenzal[®] DC (Intervet International, Holland) containing sodium nafcillin (100mg), procaine benzyl penicillin (300mg) and dihydrosptreptomycin (100mg) in each quarter. 2) TY (n=30) that received an intramuscular injection of 5mg/kg BW tylosin 200 solution (Tylan[®], Elanco. Animal Health, Elililly) for 3 days. 3) EN (n=30) that received 2.5 mg/kg BW enrofloxacin (Baytril[®], Bayer, Bayer Leverkusen) subcutaneously for 3 days. 4) C (n=30) that did not receive any treatment and served as control. Immediately after the treatment all groups were teat dipped using a standard iodophor teat dipped to seal the teat ends. Immediately after parturition, a composite colostrum sample was collected from each heifer and cultured for *Staphylococcus aureus* coagulase positive. Data were analyzed using chi-square tests comparing treated groups and the control. Each treatment group was also compared with the control.

Results

Postpartum cure rates were 93% (28/30), 83% (25/30), 70% (21/30) and 47% (14/30), for DC, TY, EN and Control groups, respectively (Table 1). The cure rates among groups were significantly different ($p=0.0003$). The highest cure rate belonged to the DC group which was significantly higher than that of the control ($p=0.0002$), followed by TY group which was also significantly higher than that of the control ($p=0.006$); however, there was no significant difference between the DC and TY groups ($p>0.05$). Furthermore, there was also no significant difference

Table 1. Results of the therapeutic effects of the local and systemic methods on staphylococcal IMI in Holstein heifers.

Groups	Number of infected prepartum heifers	Number of heifers cured	Cure Rate (%)
Dry cow preparation (DC)	30	28	93a
Tylosin (TY)	30	25	83ab
Enrofloxacin (EN)	30	21	70bc
Control (C)	30	14	47c

abc Values within column with different superscripts differ ($p<0.05$).

between EN and the control and between EN and TY groups ($p>0.05$).

Discussion

Heifers are exposed to many of the same microorganisms that cause IMI in lactating and non-lactating cows. A high prevalence of staphylococcal IMI (37.1%) of heifers has been reported in prepartum heifers (8). In our study, 120 heifers were positive for *staphylococcus aureus* (coagulase positive) out of 190 heifers, showing a high prevalence of the bacteria in heifers (63.1%). The herd was experiencing both clinical and subclinical cases in heifers and cows. As the heifers, and not the quarters, were the target for the treatment, a culture positive composite sample was sufficient to start the course of treatment. Very high cure rates, which had been shown among first-lactating heifers (83.3%; 8), were also present in this study (93% and 83% for DC and TY groups, respectively).

In DC group, the relatively underdeveloped mammary glands of heifers, compared with those of mature cows, might allow the bacteria to stay in close contact with the antibiotic for a sufficient period of time (a period of 7 to 14 days prepartum). Intramuscular injections of tylosin for 3 days also provided adequate time for distribution of the antibiotic in the mammary tissue. According to Trinidad study (10), three heifers monitored weekly, had residues of antibiotics in all quarters after intramammary treatment during the prepartum



period over the course of 3 months. One of the pregnant heifers had a premature calf 3 weeks after treatment and residues were detected in the milk for just 5 days after calving. This was not followed in this study; however it seems quite logical that both local and systemic methods of antibiotic therapy are safe when applied in the non-lactating period. Oliver and Mitchel (1983) also assayed composite colostrums samples for antibiotic residues from 186 cows treated during the non-lactating period and reported that 2.2% of the samples were positive for antibiotic residues (6). We think that with injection of tylosin intramuscularly, the risk of the antibiotic residues may be lower than the intramammary infusions, considering sufficient withdrawal time.

In conclusion, since in primigravid heifers close observation in the intensive staphylococcal mastitis control programs is required, practical methods should be considered to eliminate the bacteria in these reservoirs. Intramammary infusion of a dry-cow preparation was the most effective method to cure IMI in prepartum heifers (93%). However, in large dairy herds, it is almost impractical, tedious, dangerous and not easily acceptable by the farm personnel. Additionally, this may introduce environmental bacteria and fungi into the quarters by unsanitary manipulation of the udder. Intramuscular injections of tylosin may eliminate *staphylococcus aureus* from the prepartum heifer udder. However, we could not show a significant difference between tylosin and dry-cow preparation cure rates.

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