

Efficacy of Extended Therapy of *Staphylococcus aureus* with Intramammary Cefuroxime

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Introduction

Staphylococcus aureus is a major pathogen causing intramammary infection in dairy cattle. Antibiotic therapy of *S. aureus* during lactation results in cure rates of between 4 and 92%. The cure rate is influenced by age of cow, stage of lactation, SCC, duration of infection, front vs. rear glands, number of quarters, bacterial colony counts and resistance to penicillin. Increasing the duration of therapy increases the cure rate. For example, bacteriological cure rates of *S. aureus* of 6%, 56% and 86% were achieved following 0, 2 or 8 intramammary treatments with the lincosamide pirlimycin. The current study aimed to assess the efficacy of extended therapy of *S. aureus* with the second generation cephalosporin, cefuroxime.

Materials and Methods

Cows (n=61) from a spring calving dairy herd with an elevated bulk tank SCC were selected on the basis of having a SCC of >200,000 SCC/ml at the first herd test of the lactation. Cows were examined with a California Mastitis Test (CMT) and those glands with a CMT >1 (on a 0 to 3 scale) were aseptically sampled for bacteriological culture. Cows (n=34), from which 1 or more glands were culture positive for *S. aureus* (total n=55 glands), were blocked by number of glands within cow with *S. aureus* then ranked by herd test SCC before being assigned randomly within blocks of 3 to no, 3 or 6 intramammary infusions at 12 h intervals with 250 mg cefuroxime sodium (Spectrazol Milking Cow, Schering-Plough Animal Health, Upper Hutt, New Zealand). Enrolled glands were re-sampled at 41 and 48 days after the first treatment. Cure was defined as having occurred where *S. aureus* was isolated from neither of the both post treatment samples. The probability of cure was modeled with main effect being treatment (0, 3 or 6 tubes) on cure at quarter level (yes/no). Potential confounders including age of the cow (categorized into 6 groups), log₁₀ SCC before treatment commenced (continuous), stage of lactation (continuous; days), production before treatment commenced (continuous; milk

solids kg/day), clinical mastitis in that quarter previous to treatment (categorical, yes/no), number of quarters infected with *S. aureus*/cow (categorical), quarter placement (categorical) and CMT score prior to treatment (categorical) were examined at univariate level. None of these potential confounding variables was significant (i.e. all p>0.2) and so were not included in the final model. To account for the non-independence of gland within cow, the confidence intervals were adjusted by the variance inflation factor (pscale; Proc GENMOD, SAS 9.1). A log link function was used as exponentiation of the coefficients produces relative risks. Effect of treatment on log₁₀ SCC and milks solids (i.e. milk fat + milk protein in kg/cow/day) production 43 days post treatment was analyzed using ANOVA with treatment as the main effect.

Results

The least square mean (95% confidence intervals) cure proportions were 0.13 (0.03-0.53), 0.24 (0.10-0.56) and 0.53 (0.32-0.87) for glands treated with 0, 3 or 6 tubes respectively. The cure proportion tended to be higher following treatment with 6 tubes compared to 0 tubes (RR=4.2 (95% CI 0.73-24.4); p=0.07) and for 6 tubes compared to 3 tubes (RR=2.2 (95% CI 0.8-6.0); p=0.11). There was no difference in log₁₀ SCC or milk production at the herd test 43 days post-treatment among the treatment groups (both p>0.3).

Significance

This study demonstrates that increasing the duration of therapy with the second generation cephalosporin, cefuroxime, from 0 to 3 and 6 tubes resulted in a tendency for a higher bacteriological cure rate in glands infected with *S. aureus*. Similar results have been reported following therapy with the lincosamide, pirlamycin following 0, 2 or 8 treatments. The economics of extended therapy under the low input/low return pastoral production system used in New Zealand remains to be determined.