

# Evaluation of risks of violative milk residues following extra-label topical administration of tetracycline for digital dermatitis in dairy cattle

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## Introduction

Digital dermatitis (DD) is a commonly found foot lesion in cattle at the time of hoof trimming. At this point in time there are no licensed antimicrobials available for DD in North America, and DD is commonly treated with topical tetracycline antimicrobials at varying doses. This usage of topical tetracycline is extra-label drug use, and limited data is available to evaluate the risk of violative milk residues following treatment. Previous work that has evaluated the risk of violative milk residues only looked at one dosing regimen and used a tetracycline formulation that is currently not widely used by professional hoof trimmers or veterinarians. The objective of this project was to determine if various application methods or tetracycline dosages would result in tetracycline residue levels in milk.

## Materials and Methods

This study aimed to enroll 50 cows in one commercial 700 cow dairy farm milking 3X. This farm was recruited to participate due to a history of having a significant number of animals with DD. In the milking parlor cows were visually screened for the presence of the M2 stage of DD on more than one foot. In the parlor, selected animals had day 0 milk samples collected and directed to the hoof-trimming chute. In the hoof-trimming chute all feet were examined and if the cow had 2 feet affected with the M2 stage of DD they were enrolled. At the time of enrollment the level of pain associated with the lesion was measured with an algometer and a digital photograph was taken. Enrolled cows were randomly allocated according to a pre-determined randomization table to 1 of the 5 following treatment groups: 2W (2000 mg of tetracycline hydrochloride (TETHCL) in a powder form under a bandage), 2P (2000 mg of TETHCL mixed with propylene glycol as a paste), 5W and 5P (5000mg of TETHCL) and 25W (25,000mg of TETHCL). After enrollment milk samples were taken from all enrolled cows after udder preparation at approximately 8, 24, 32, 48, 56, 72, 96, 120, 144 and 168 hours post treatment.

Bandages were removed from cows at 48 hours and cows were re-evaluated for lesion progression after 120 hours. Milk samples were immediately frozen and stored. Once all samples were collected, frozen milk samples were shipped to a commercial laboratory and analyzed for tetracycline residues using a commercial immunoassay (CHARM ROSA) and liquid chromatography–mass spectrometry (LC-MS). The CHARM ROSA has a detection limit of 10-30 ppb and the LC-MC test has a detection limit of 1 ppb and a limit of quantification of 10 ppb. For the analysis samples were considered positive if a residue was detected greater than the limit of quantification and violative if the residue level exceeded the current maximum residue limit for tetracycline of 100 ppb in Canada.

## Results

A total of 20 cows were enrolled in this study resulting in 4 cows in each treatment group. Over all sampling times a total of 21/213 cows were positive using LC-MS and 8/211 with the CHARM ROSA. None of the individual samples test above the 100 ppb using the LC-MC. Based on LC-MS the number of cows with at least 1 positive milk sample post treatment was 4/4 in 25W, 3/4 in both 5W and 2P and 2/4 in 2W. Except for 1 cow with a positive test at 168 hours in the 2PASTE group, the cows testing positive in the other groups all occurred between 8 and 72 hours post treatment. Based on the CHARM ROSA the number of cows with at least 1 positive was 4/4 in 25W, 2/4 in 2P and 1/4 in 2W. No difference was found in lesion progression between the 5 treatment groups.

## Significance

Based on these results it is clear that there is a high risk of a positive test on CHARM ROSA in individual animals when tetracycline is applied a high doses to acute DD lesions. If significant numbers of animals are treated in a herd with these high doses the risk of a positive bulk tank CHARM ROSA tetracycline residue exists.