

# Evaluation of an Experimental Hydrogen Peroxide Post Milking Teat Dip on Teat End and Teat Skin Condition and Health

## A.S. Leaflet R2603

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### Summary and Implications

Objective of this study was to evaluate a prototype hydrogen peroxide based post milking teat dip versus a control commercial iodine based post milking teat dip on overall teat end and teat skin condition and health. Although there were no differences in teat end scoring and health between the iodine and hydrogen peroxide dip, there were significant differences in teat skin scores and % of rough/chapped/peeling teats with the hydrogen peroxide dipped teats showing higher skin scores and % peeling (1-2% v. 20-45%) and poorer skin condition. Histological evaluation showed premature skin peeling of normal skin (perakertatosis) on all hydrogen peroxide tissue samples. One teat on the control iodine side showed evidence of some dip freezing and damage and histological evaluation showed an inflammatory response on that teat). Changes to the hydrogen peroxide based dip need to be made in order to improve teat skin performance before it can be made commercially available.

### Introduction

Maintaining good teat end / skin health is recognized as an essential element in mastitis prevention and animal welfare. In addition to excellent germicidal activity, all teat dips should have both teat end and teat skin health data evaluation, and show excellent teat health prior to use and commercialization. Objective of this study was to evaluate a prototype hydrogen peroxide based post milking teat dip versus a control commercial iodine based post milking teat dip on overall teat end and teat skin condition and health using a split udder design. A split udder design study was performed to minimize risk of experimental bias and maximize chances of seeing teat dip effects.

### Materials and Methods

**Dips used:** Control dip was Soft Dine (.5% iodine with high skin conditioning: A&L Labs) and Treatment Dip was a prototype hydrogen peroxide dip (blue, viscous: A&L Laboratories).

**Cows:** All protocols were approved by the ISU Committee on Animal Care (IACUC # 10-06-6228-B). 48 early-mid lactation cows at the ISU dairy were used for the study.

**Trial design and farm practices:** Trial used a split udder design. Left teats of 48 cows (Pen 1: primarily

Holsteins) were post dipped with Soft Dine (control) while right side teats were dipped with a prototype blue, viscous, hydrogen peroxide dip (treatment). The trial was 5.5 weeks in duration where dipping with these dips was done for 4 weeks (12/16/2009 – 1/11/2010) sandwiched between .5 week periods where the herd used it's standard herd commercial pre and post dips (pre milking teat dip was a 0.25% iodine, 2% skin conditioning product (BacStop, IBA) and post dip was either a .5% iodine, 12% emollient iodine barrier dip (Transcend, IBA) or a powder based winter dip (Derma-Dry; IBA). All other farm and milking practices were similar across all 5 weeks.

Cows were milked twice a day in a double 12 parallel parlor. Cows were forestripped (3 strips/teat) and pre-dipped (6 cow sequence), then dried with terry cloth towels prior to milker unit attachment. Automatic detachers were set at 1.8 lb. flow rate and 1 second delay. All cows were housed in a single pen in a free stall barn with mattresses and separated manure solids bedding.

**Teat skin and teat end evaluations:** Data collection was initiated on December 11, 2009 and continued until January 17, 2010. Test products were applied starting Dec. 16 or on the 5<sup>th</sup> day of the trial following 2 baseline evaluations. Trial dips were discontinued on Jan.11 with one after trial baseline evaluation (return to herd's usual dips) approximately 1 week later. Teat skin and teat end scoring was performed using a variation of the Goldberg and Timms methods, respectively, by a single trained grader (Tables 1 and 2). Scoring was performed twice per week. Data was entered into an Excel database. Results were compiled and analyzed using SAS.

**Statistical models:** SAS was used in all data analysis. Mixed procedure of SAS with repeated measured (mixed model with quarter within cow as a repeated measure) were used to analyze teat skin and teat end data, with  $p < .05$  considered significant. GENMOD procedures of SAS with repeated measures (generalized linear model with quarter within cow as repeated measure) was used to analyze % cracked/rough teat ends and % dry/chapped teat skin data.

### Results and Discussion

**Teat skin scores** over the trial period for control and treatment dipped teats are shown in Figure 1.

- There were significant differences among dips with regards to teat skin health. Teats dipped with hydrogen peroxide based product had significantly higher teat skin scores (poorer skin condition) within one week of initiating dipping and remained that way throughout the experimental dipping period. Within one week post trial where herd dips were used, teat

skins were back to normal and not significantly different between udder halves.

**Teat end scores** over the trial period for control and treatment dipped teats are shown in Figure 2.

- There were no significant differences among dips with regards to average teat end scores and teat end health, and no adverse effects of dips were seen.
- Teat end scores were higher and more variable initially due to weather and all teats showed increased teat end scores during last 2 weeks of trial due to colder temperatures.

**Percentages of dry/chapped teats** (teat skin >1) for control /treatment dipped teats are shown in Figure 3.

- There were significant differences among dips with regards to teat skin health (dryness and chapping).
- Teats dipped with hydrogen peroxide based dip had significantly higher teat dryness, chapping, and especially peeling (20-45% of teats) within one week of initiating dipping and remained that way throughout the experimental dipping period compared to control dipped teats (1-2%).
- Within one week post trial where herd dips were used, teat skins were normal and not significantly different between udder halves (2 v 6%).

**Percentages of rough / cracked teats** over trial period for control and treatment dipped teats are shown in Figure 4.

- There were no significant differences in % rough/ cracked teats between trial dips!
- There was initially a higher % of rough teats due to winter weather on all teats.
- % of rough teat end decreased for both dips during the trial until the last week where both dips showed higher % of rough/ cracked teats due to colder weather.

**Histological teat tissue evaluations:** Any teat tissue abnormalities were evaluated by placing the peeling/ scabbing tissue in a plastic tube with formaldehyde and then submitted to Dr. Mark Ackermann, ISUCVM for histological analysis. Figure 5 shows a tissue sample from the only teat dipped with the iodine dip that showed scabbing during cold weather. Tissue has evidence of damage and trauma, and an inflammatory response characterized by neutrophil infiltration. Figure 6 shows a tissue sample from one of the hydrogen peroxide based dipped teats (20 teats showed this response and analysis). Histological tissue analysis showed perakeratosis and premature sloughing of nucleated health normal tissue.

### Overall Summary

Although there were no differences in teat end scoring and health between the iodine and hydrogen peroxide dip, there were significant differences in teat skin scores and % of rough/chapped/peeling teats with the hydrogen peroxide dipped teats showing higher skin scores and % peeling (1-2% v. 20-45%) and poorer skin condition. Histological evaluation showed premature skin peeling of normal skin (perakeratosis) on all hydrogen peroxide tissue samples. One teat on the control iodine side showed evidence of some dip freezing and damage and histological evaluation showed an inflammatory response on that teat. Changes to the hydrogen peroxide based dip need to be made in order to improve teat skin performance before it can be made commercially available.

**Table 1. Teat Skin Scoring Scale.**

Score	Description
0	Teat skin has been subjected to physical injury ( stepped on/ frost bite)
1	Teat skin is smooth, soft and free of any scales, cracks, or chapping.
2	Teat skin shows some evidence of scaling especially when feeling (areas of dryness by feeling drag when sliding a gloved hand along the teat barrel &/or seeing areas of lower reflective sheen to the surface of the skin).
3	Teat skin is chapped. Chapping is where visible bits of skin are visibly peeling.
4	Teat skin is chapped and cracked. Redness, indicating inflammation, is evident.
5	Teat skin is severely damaged / ulcerated / open lesions.

**Table 2. Teat End Scoring Scale (0\*- 5).**

Teat End Scoring system	Degree of hyperkeratosis or callousing				
Cracking	none	minor	mild	moderate	severe
No cracking	1	1.5	2	2.5	3
Cracked	---	3.5	4	4.5	5

0\* zero score – physical injury of teat not associated with trial

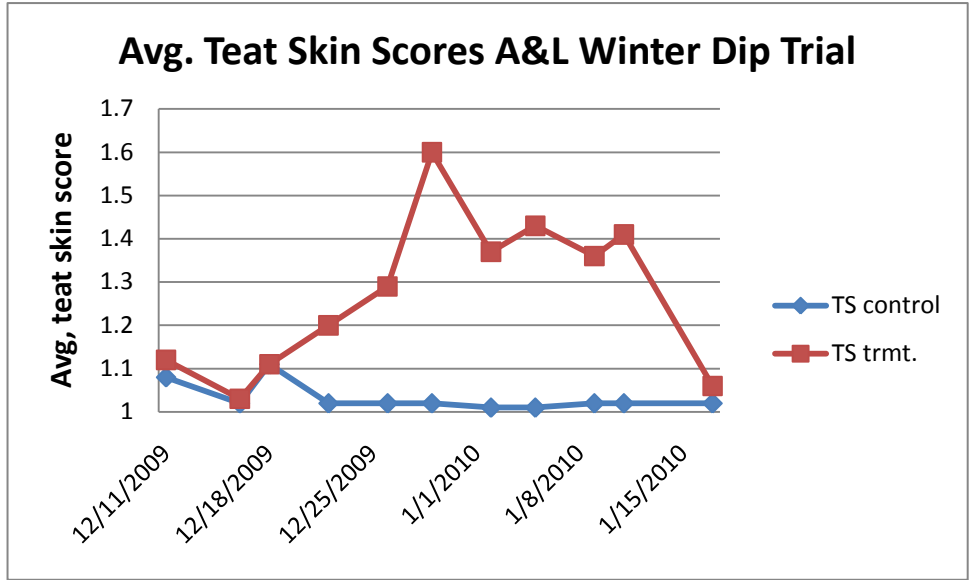
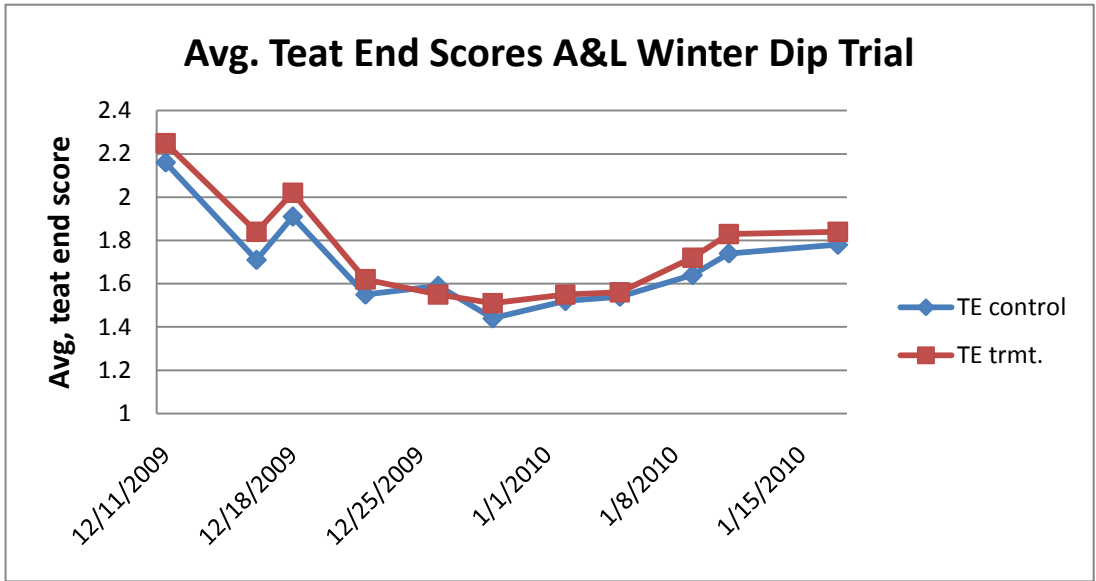


Figure 1. Average teat skin scores for control teats (left side teats – Soft Dine) and treated teats (right side teats – hydrogen peroxide). Teat skin scores from Dec 18 – Jan. 11 reflect trial dips. Other dates represent where normal herd dips were used (2 scorings prior and one following trial).



\*\* No significant differences between control and treatment dips.

Figure 2. Average teat end scores for control teats (left side teats – Soft Dine) and treated teats (right side teats – hydrogen peroxide). Teat skin scores from Dec 18 – Jan. 11 reflect trial dips. Other dates represent where normal herd dips were used (2 scorings prior and one following trial).

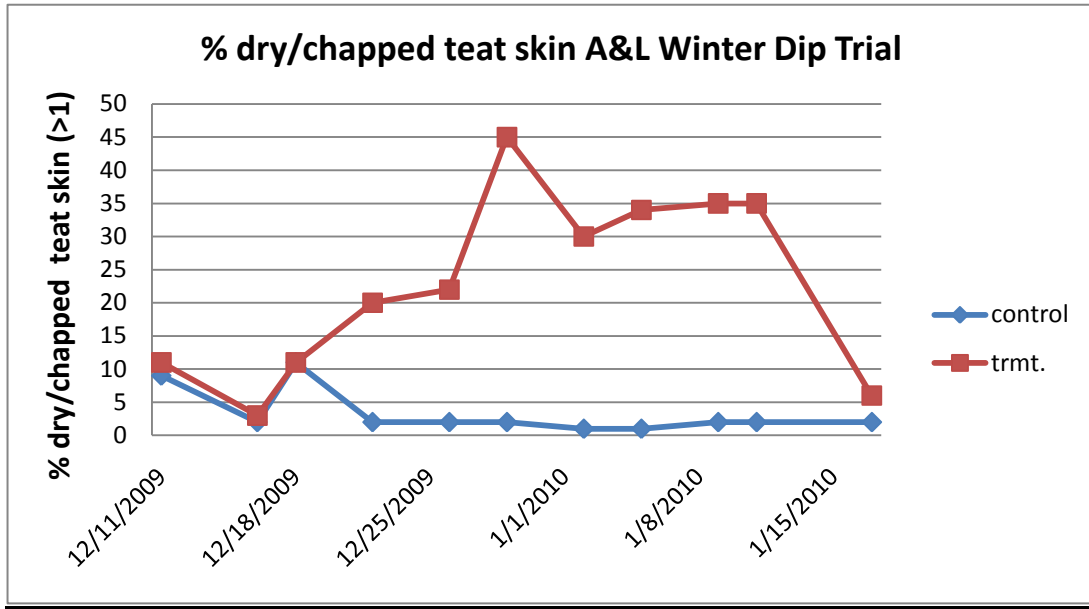
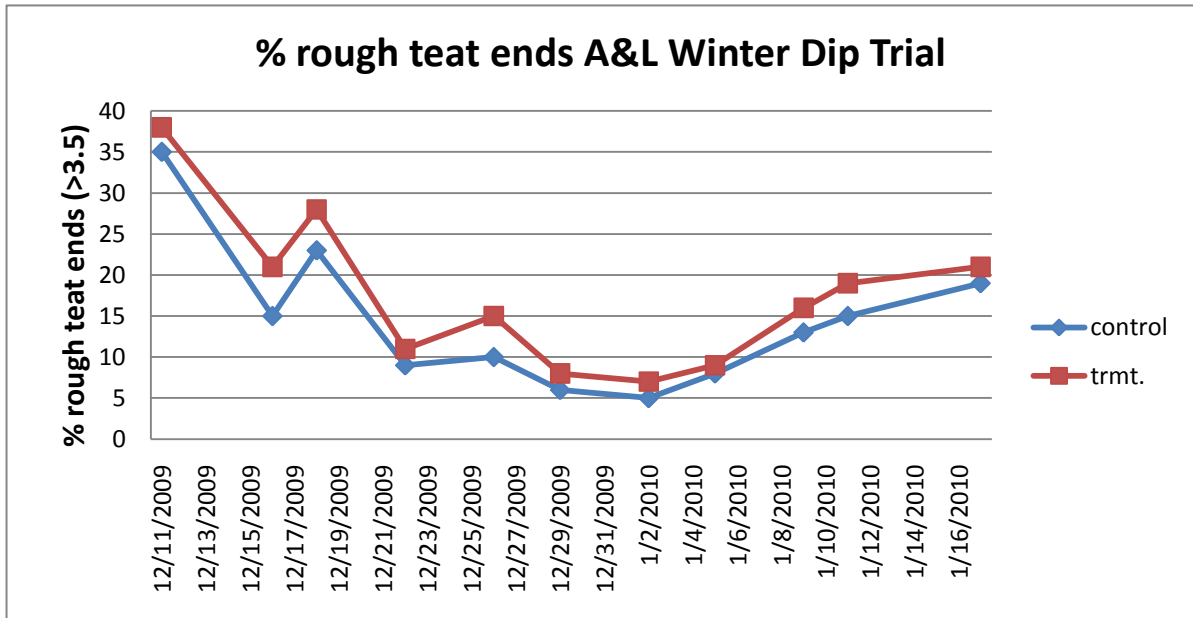
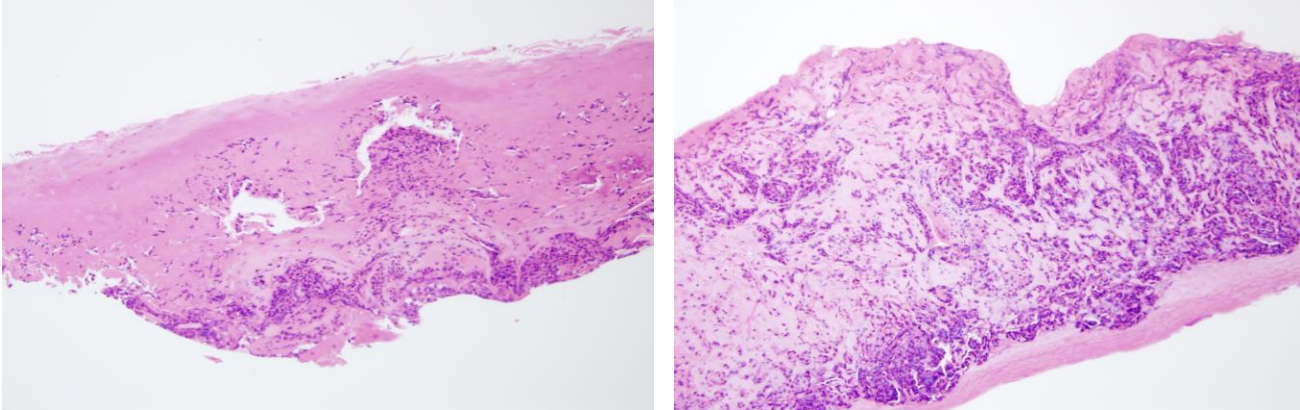


Figure 3. Percentages of dry / chapped teat skin for control teats (left side teats – Soft Dine) and treated teats (right side teats – hydrogen peroxide). Teat skin scores from Dec 18 – Jan 11 reflect trial dips. Other dates represent where normal herd dips were used.

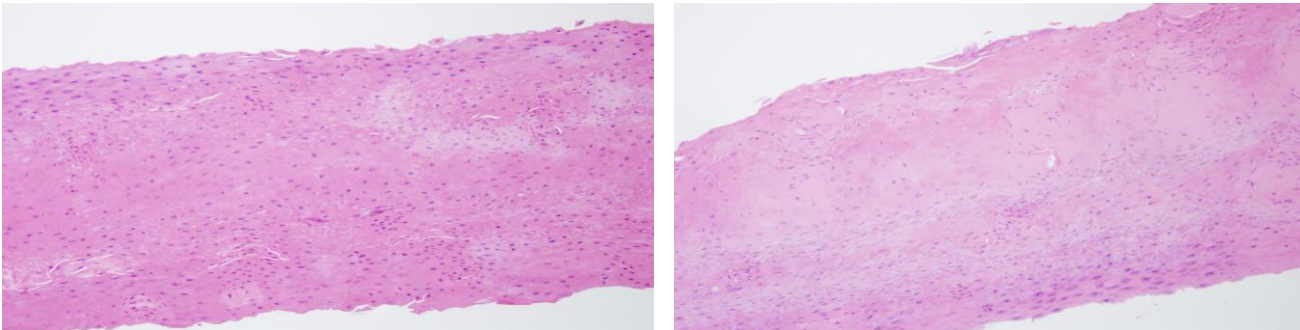


\*\* No significant differences between control and treatment dips.

Figure 4. Percentages of cracked / rough teats for control teats (left side teats – Soft Dine) and treated teats (right side teats – hydrogen peroxide). Teat skin scores from Dec 18 – Jan 11 reflect trial dips. Other dates represent where normal herd dips were used (2 scorings prior and one scoring following trial dips).



**Figure 5. 7330 LF Teat tissue dipped with iodine based dip that cracked and scabbed during the cold weather (neutrophil infiltration and inflammation). This was the only cow/teat dipped with the iodine based dip that showed any teat skin problem.**



**Figure 6. Typical teat tissue peeling (perakeratosis with nucleated cells) following post milking teat dipping with an experimental hydrogen peroxide based teat dip. 20 cows exhibited this peeling.**