

Evaluation of Novel Glycolic Acid Barrier Teat Dips Post Milking Compared to a Commercial Control Barrier Dip on Teat Health and Condition during Winter

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Melanie Matti, Undergraduate in Animal Science;
Leo Timms, Morrill Professor of Animal Science,
Iowa State University

Summary and Implications

This trial was designed to compare the teat conditioning properties of 4 experimental glycolic acid teat dip formulas over a period of 4-8 weeks, against a chlorine dioxide commercial formula. An 8 week trial was conducted at the ISU dairy to evaluate the teat conditioning efficacy of experimental formulas vs. Vanquish Barrier under winter conditions. Teat skin and teat end roughness was scored at each teat every 3d. Initially, 4 experimental formulas were tested for 3 weeks in trial. After that, 2 of those formulas were selected for continuation of the 8 week study period. Results showed that teat skin was maintained at the optimum level for the experimental and control product. Teat end condition tended to improve over time, but there were no significant differences between the experimental formulas 508-054-1 and 508-054-3 vs. Vanquish Barrier. Consumption of test formulas was also monitored and 508-054-3 consumed 45% more than Vanquish Barrier while the consumption of 508-054-1 was similar to that of its control. It was concluded that both 508-054-1 and 508-054-3 provided efficacious teat conditioning effects on teats over the 8 week winter trial period.

Introduction

Teat dipping with effective products is a critical control point for mastitis prevention, from a germicidal standpoint as well as excellent teat health and conditioning, especially during winter. This trial was designed to compare the teat conditioning properties of 4 experimental glycolic acid teat dip formulas over a winter period of 4-8 weeks, against a chlorine dioxide commercial formula (Vanquish Barrier, DeLaval).

Materials and Methods

Test site and farm management: The Iowa State Dairy farm was the trial site. A total of 4 pens were used with each pen serving as a trial. Cows were milked three times a day in a double 12 parallel parlor. Cows were pre-dipped (6 cow sequence), then forestripped (3 strips/teat), then dried with terry cloth towels prior to milker unit attachment. Automatic detachers were set at 2.0 lb. flow rate and 0 second delay. Predip included the use of a 500 ppm chlorine generating system (ECAcept, Ecalogix) A 1%

iodine dip (West Dip, WestAgro) was normally used in the farm before the trial.

Trial and dips: On average, 48 cows existed per pen, and 96 quarters were assigned to each formula in every pen (half udder design with left teats with control dip, right teats with experimental dips). Milkers were blinded as to the origin of the product. Four experimental products were used in the trial and were compared vs. a positive control (Vanquish Barrier, DeLaval). Pens assigned to this trial were as follows: Pen 5 (508-054-1), Pen 1 (508-054-2), Pen 8 (508-054-3) and Pen 7 (508-054-2), which corresponded to the milking order. For all study pens, Opti Blue (DeLaval) was used as a premilking disinfectant, and was applied using a non-return dip cup. All postmilking barrier disinfectants were applied using a non-return dip cup. The main features of the formulas tested are shown in Table 1 and dippers in parlor are shown in Figure 1.

Teat and product consumption data: The teat condition evaluations were performed by the scorer immediately after the milking unit was removed and before the post milking solution was applied. Product consumption was monitored for 9 different milkers over 22 milkings (January 20-28). Consumption was calculated and values are expressed as ml/cow/milking.

Statistical analysis: All statistics were analyzed using SAS 9.3, Inc. (Cary, New York). Summary statistics were generated first to observe the frequency distribution of the data collected. This output was generated using PROC FREQ. Results were analyzed using the mixed model procedure with PROC MIXED. The following model was applied:

$$Y = G + ti + wj + tij + c + ijk$$

Where G is the average of the independent variable, t = fixed effect of treatment, w = fixed effect of day of trial, the interaction between the two effects, c = random effect of cow, and ijk = the residual error. Quarter was included in the model as a repeated measure. Least square means were compared and adjusted based on Bonferroni option. Significance was declared at P<0.05

Results and Discussion

All cows were scored for teat condition 1 week before commencing the trial (January 14). Baseline teat condition scoring (day 0) was done on January 20 and then every 3 days all teats were scored until the trial ended. An assessment was made on February 5 (17 days) to select two formulas that would be tested for the complete 8 week period. Selection of formulas 508-054-1 and 508-054-3 was made based on perception by the investigator and milkers

and associated with product features and look and feel on teats. At this point in time no noticeable differences were observed in terms on skin dryness or irritation. For the selected formulas 508-054-1 and 508-054-3, the final teat scoring day was March 15, completing 55 days of exposure to the dips. Herewith is a more detailed description of teat condition results for the two selected formulas.

a) Teat dip appearance on teats

The pictures show the color and film presence of Vanquish Barrier (left) and 508-054-1 (right) on teats when cows entered the milking parlor (before pre milking sanitation). Product color and film persistence varied between cows. Teat preparation was effective in removing any leftover film on teats, but color persisted on some cows (Figure 2). These results were similar across all dips. Teat dip observations post dipping are also shown in Figure 2.

b) Teat skin condition

All quarters scored 1 at each scoring date, and therefore no statistical analysis could be conducted. All quarters maintained optimal teat skin health for the duration of the study.

c) Teat end condition

- **Pen 5:** There was a trend for teat end condition to decrease (improve) as the trial period progressed (Figure 3). However, no statistical differences could be observed between both groups. Within groups, the only difference that could be observed was in the Vanquish Barrier group, where the teat end condition score differed between the start of the trial and after 5 weeks in trial (Feb 23) ($P < 0.05$). On the other hand, the teat end scores of 508-054-1 decreased gradually over the first 6 ½ weeks and reached a score of 2.5, but then increased sharply over a 1 week period. Although this change was not statistically significant, it contrasted the teat end condition observed in the Vanquish Barrier group, where teat end condition leveled off and remained close to a score of 2.5 until the trial ended.
- **Pen 8:** Teat end condition gradually decreased (improved) over time for both groups, and there were no statistical difference between them. Within each treatment, some differences were observed (Figure 4). For Vanquish Barrier, the scores observed between Jan 23 to Feb 16 were mostly different to those observed at the end of the study, distinctively Mar 9 and 12 ($P < 0.05$). The sharp decrease in teat end condition observed Feb 16 to Feb 19 was not significant ($P = 0.42$). Afterwards, teat end remained relatively stable until the end of the study. A similar trend of teat end improvement was observed for 508-054-3. In this group, teat end values decreased progressively over time, reaching a final mean of 1.6. Some evident observable differences were confirmed, mainly teat end scores from the first 2½ weeks of study compared to those values observed near the end of the trial ($P < 0.05$).

d) **Weather:** The teat condition study was conducted under challenging winter conditions, where temperatures below 32°F were highly prevalent (48 out of 55 days = 87%, Figure 5). Cows were scored 1 week before the start of the study (Jan 14) and dipping with Vanquish Barrier and 508-054-1 and 508-054-3 started Jan 20, when the average temperature was 20°F. It was not until March 10 that average temperature rose above 40°F. In 21 out of 55 study days (38%) snow fell and in 32 out of 55 study days (58%) wind speed was higher than 10 MPH.

e) **Product consumption:** Product consumption was measured for each treatment following protocol indications and is detailed in Table 2. The average product consumption (ml/cow/milking) was 5.5 ml (Vanquish Barrier, range 3.3 ml – 7.4 ml), 5.3 ml (508-054-1, range 3.5 ml – 7.7 ml), 6.3 ml (508-054-2, range 3.5 ml – 9.9 ml), 8.0 ml (508-054-3, range 3.3 ml – 12.8 ml), and 6.7 ml (508-054-4, range 2.2 ml – 11.5 ml). The formulas that were tested for 8 weeks consumed 4% less (508-054-1, Pen 5) and 45% more (508-054-3, Pen 8) than Vanquish Barrier.

Overall summary and conclusion:

A trial was conducted at the ISU dairy to evaluate the teat conditioning efficacy of glycolic acid experimental formulas teat dip formulas compared to a commercial teat disinfectant based on chlorine dioxide. Trial was conducted in ambient temperatures that averaged 17°F, from January to March 2014. Formulas 508-054-1 and 508-054-3 were selected for the 8 week long study after a subjective assessment of the 4 test formulas after 3 weeks of study. Selection was based on product features and observations from the milkers.

Teat skin condition was maintained at optimum levels for the whole duration of study in both experimental and control formulas. Teat end condition efficacy was also not different between the test and experimental formulas. In fact, teat end condition improved over the study period while ambient temperature was still very low. Although no statistical differences could be observed between the test formulas and the control product, the effect of days in trial showed observable differences. Throughout the study, teat end condition decreased (improved) gradually in both experimental and control groups, so that in the end significant differences were observed between initial and final values.

Consumption records showed that there was equal use of 508-054-1 compared to Vanquish Barrier, and that the consumption of 508-054-3 was 45% higher than its control.

It is concluded that the experimental formulas tested: 508-054-1 and 508-054-3 are equally able to maintain good teat skin condition, as well as help improve teat end condition over the winter period.

Table 1. Characteristics of products tested

Trial ID Label	Vanquish Barrier	Experimental Teat Dip 508-054-1	Experimental Teat Dip 508-054-2	Experimental Teat Dip 508-054-3	Experimental Teat Dip 508-054-4
Pen	5,1,8,7	5	1	8	7
Udder side	Left	Right	Right	Right	Right
Use	Requires mixing	RTU	RTU	RTU	RTU
Amount supplied (gal)	20	10	10	10	10
Emollients	7.5%	10%	10%	10%	10%
Color	Yellow	Blue	Blue	Blue	Blue



Figure 1. Farm labeling and preparation of containers and dip cups



Figure 2. Teats prior to premilking preparation and after milking following post dipping (Vanquish Barrier on left teats, experimental barriers on right teats).

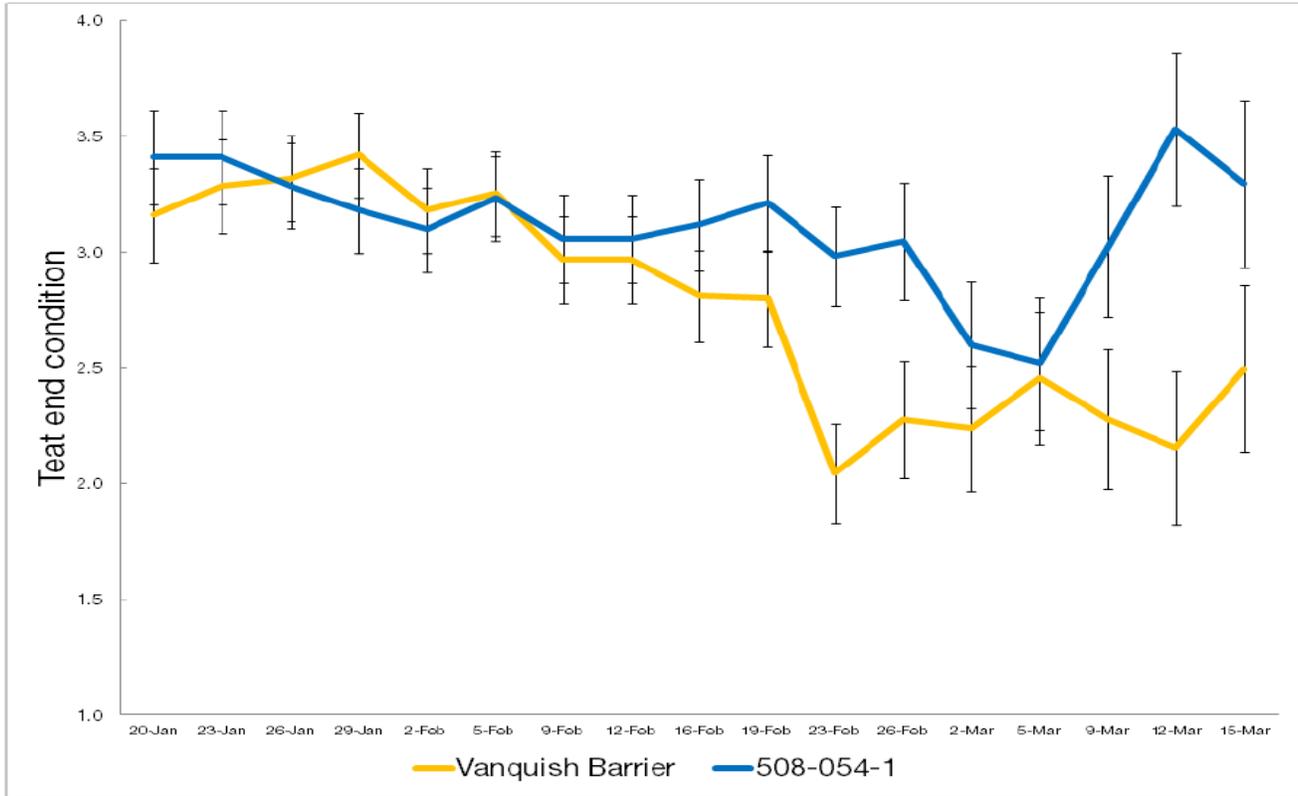


Figure 3. Teat end condition means (\pm SEM) for Vanquish Barrier and 508-054-1 for the 8 week trial period.

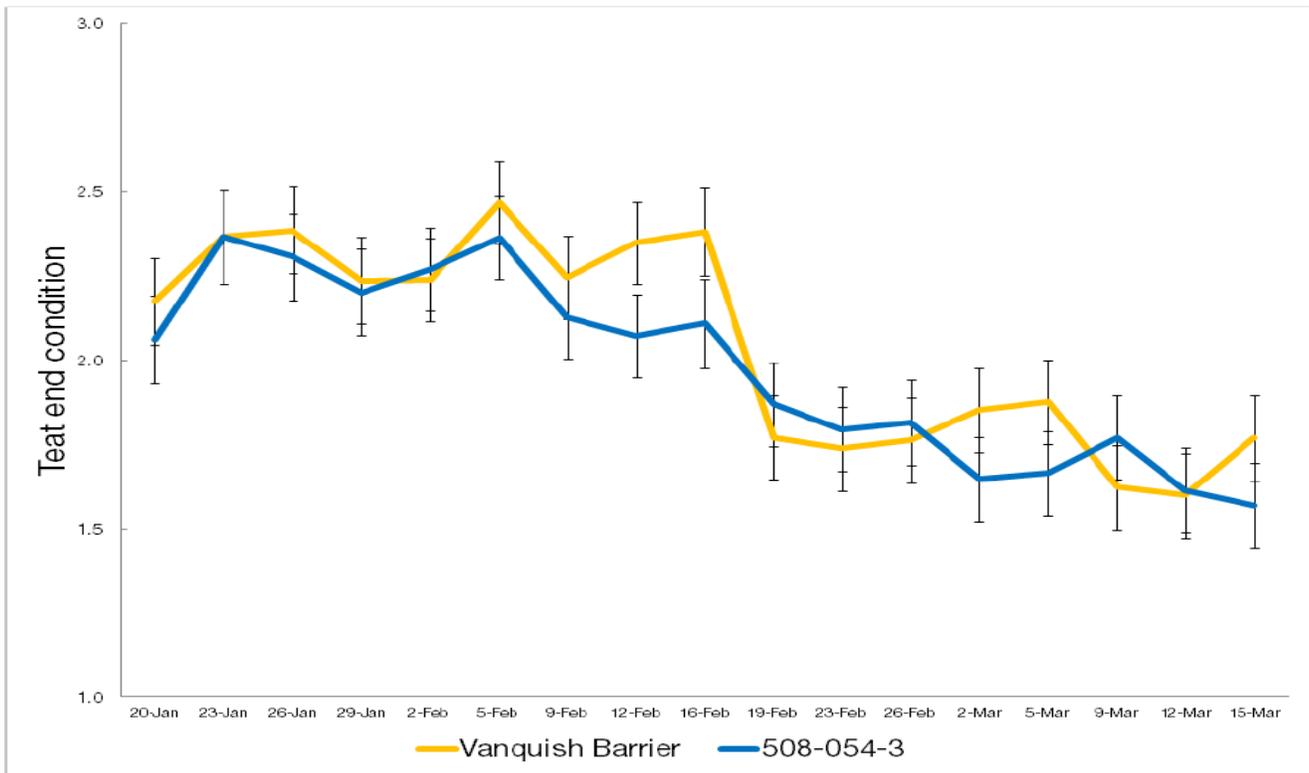


Figure 4. Teat end condition means (\pm SEM) for Vanquish Barrier and 508-054-3 for the 8week trial period.

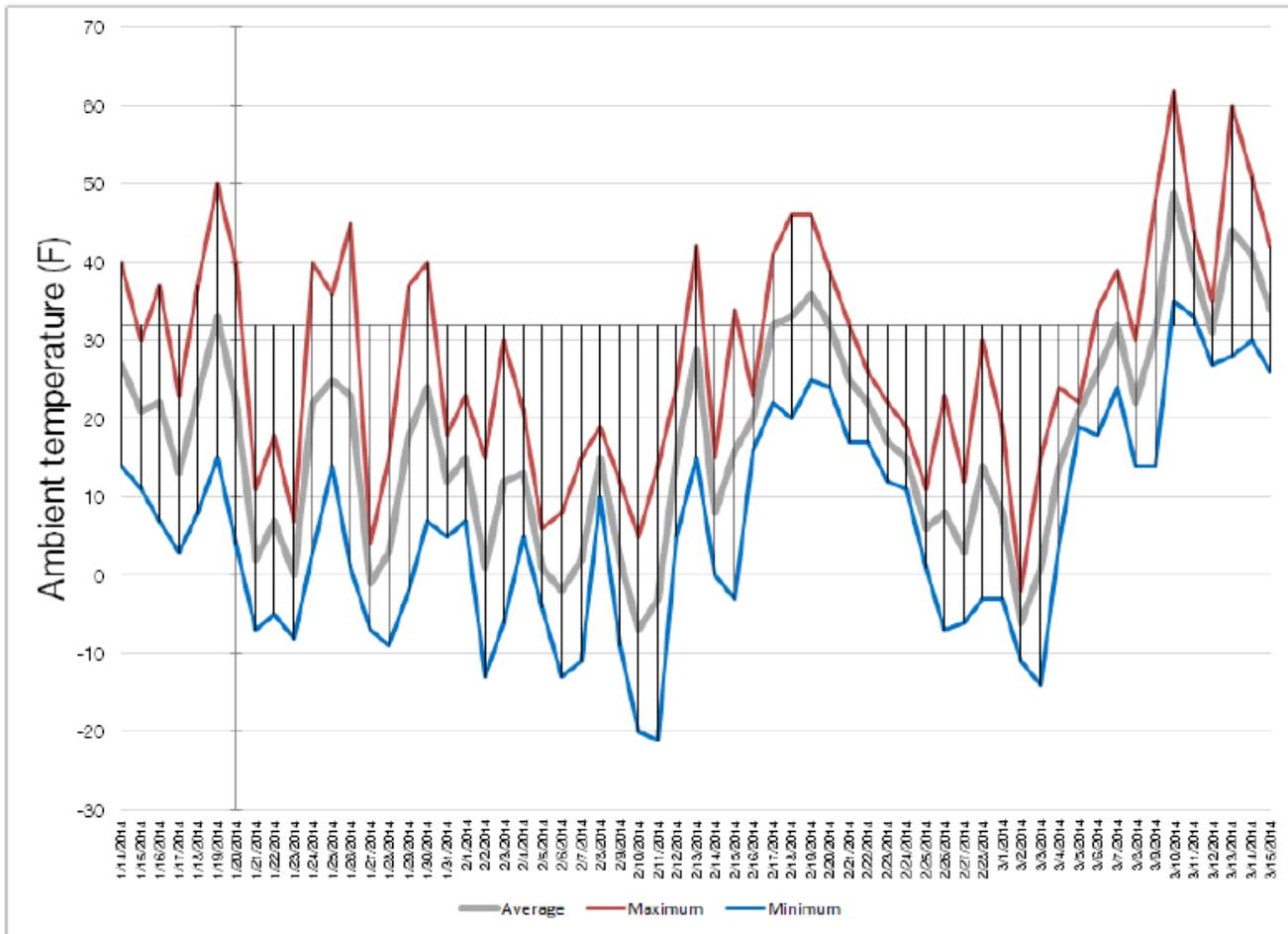


Figure 5. Temperature observed during the experimental period (Source: WeatherUnderground (www.wunderground.com))

Table 2. Average product consumption (ml/cow/milking) summary

Milker	Milkings (n)	Vanquish Barrier	508-054-1	508-054-2	508-054-3	508-054-4
A	5	6.6	7.7	8.3	12.0	11.5
B	4	5.4	4.1	4.1	6.9	4.4
C	4	5.5	5.4	6.2	7.5	7.0
D	3	3.3	5.7	9.9	12.8	6.5
E	2	4.2	3.5	3.5	4.2	2.2
F	1	7.4	6.3	8.3	8.3	10.7
G	1	5.2	5.6	4.8	3.3	3.3
H	1	6.4	5.6	6.7	11.7	10.0
I	1	5.0	4.3	4.8	5.0	4.8
Average		5.5	5.3	6.3	8.0	6.7