Comparison of an Experimental vs. Commercial Dry Period Barrier Teat Sealant Dip on Teat Coverage Persistency and Teat Health (Trial 4)

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Summary and Implications

Mastitis research has shown 40-50% of intramammary infections (IMI) are contracted during the dry or non-lactating period with greatest percentages occurring during first and last two weeks of dry period. The ability to develop and apply external persistent barrier teat dip products (like a liquid bandage) that can persist for these 1 week periods could decrease IMI, thus improving animal health and performance, and product quality and safety. Objective of this study was to evaluate an experimental vs. commercial persistent barrier dry cow teat sealant dip with particular interest and comparisons of dip persistency in providing teat end protection, and overall teat end and skin health.

Two external teat sealants were applied to 24 animals for assessment of adherence to teat skin/teat end over a period of five days. Good coverage was obtained for both control and experimental products on the first day after application. By the third day, the control product T-Hexx DryTM was 2.4 times more likely to have teats covered than the experimental product 588-88-2. This same trend was maintained after five days, where the control product was 3.1 times more likely to have teats covered with the external teat sealant. The study showed that the control product was superior to the experimental product 588-88-2 over a five day period.

Introduction

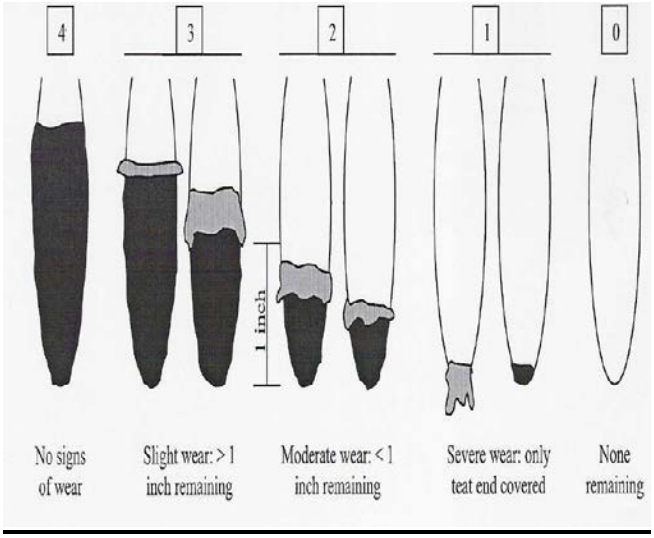
Mastitis research has shown that 40-50% of intramammary infections (IMI) are contracted during the dry or non-lactating period with the greatest percentages of these occurring during the first and last two weeks of the dry period. At these times, the mammary gland is in a transitional state. Immunological factors are preoccupied or suppressed, milk is not being flushed from the gland, and increased mammary pressure distends the teat, thus allowing for easier bacterial penetration through the streak canal. Both external persistent sealant (2-5 day adherence) dips and internal teat sealants have been developed and shown to decrease IMI rates, especially environmental mastitis, in dry cows/ springing heifers during the early dry and late prepartum periods when used properly. The ability to develop and apply external persistent barrier teat dip products (like a liquid bandage) that can persist for these 1 week periods could decrease IMI, thus improving animal health and performance, and product quality and safety. The objective of this study was to evaluate an experimental vs. commercial persistent barrier dry cow teat sealant dip with particular interest of dip persistency in providing teat end protection, and overall teat end and skin health.

Materials and Methods

1. **Dips used**: 2 dips were used in this trial. One dip was an experimental polymer dip (588-88-2, DeLaval) while the control dip was a commercial dry cow sealant product (T- Hexx Dry, Hydromer).
2. **Cows**: All protocols were approved by the ISU Committee on Animal Care. 24 dry cows (~ 2-4 weeks pre-calving) were used for the study. Cows were housed in a free stall barn with sand bedding and headlocks on the south side of the ISU dry cow barn. Cows were fed and locked up at 6:30 am Saturday, August 8, 2015 and dipping commenced.
3. **Animal ID and teat health evaluation** (initial and final): 24 dry cows in lockups were visually identified by eartag. All teats of all animals were cleaned and dried with terry cloth towels. If teats were visibly dirty, teats were pre-dipped first with a 350 ppm chlorine predip and then dried with the towel. Individual teat ends and teat skin for every animal were evaluated by one scorer using the system below at this time (initiation of trial) and again once the dip had completely been removed from the teat following dipping (final evaluation). Comparisons between dips as well as between evaluation periods were conducted.
4. **Teat dipping and dripping / drying evaluations**: Dip was dispensed into dixie cups for dipping and refilled as needed. 24 dry Holstein cows were dipped in a half udder design alternating right and left udder half teats between dips. A total of 48 quarters were assigned to each treatment, and each treatment had an equal number of quarters (n=12) assigned to a quarter location (LF, RF, LR, RR). Film or dip thickness, color, dip dripping and/or stringing of dip, and dip wastage via animal leg movement, etc. were noted. Some cows were photographed on day 0 (dip day) and day 1 and 3 post dipping (see end of report).
5. **Teat dip persistency evaluation**: Teat dip persistency or coverage of teats (especially teat ends) was conducted every 24 hours. Teat dip coverage was scored using a 0-4 scale: (4= complete teat adherence similar to originally dipped; 3 = dip starting to peel but on ¾ of teat; 2 = 50% of teat covered; 1 = teat end only covered; and 0 = dip completely off. Observations on

dip shearing, flaking, or tearing were also recorded. Each teat was given a score (day when dip last seen) and means and medians for each dip were calculated.

6. **Statistical analysis:** Multinomial regression was used to test the differences in the proportion of teats in the different adherence scores (4, 3, 2, 1, and 0) 1 to 5 days after dipping, using the GENMOD procedure of SAS (version 9.4). The experimental product was compared relative to the control product T-Hexx Dry™. Statistical significance was set at 0.05. The OR were calculated for each comparison.



Results and Discussion

1. **Teat end and teat skin health**
   - There were no differences among dips with regards to teat skin and end health. All teats had excellent teat skin and end health before dipping and after dip removal.

2. **Teat dip film coverage:** No problems were observed for both products when applying onto teats. The products flowed very easily when applied (Figure 1). The product 588-88-2 looked thin, and when some teats were dipped, they appeared almost transparent. Over time, the experimental product 588-88-2 remained on some teats, but it also sheared easily, which may have sped up its fall off from teats, as shown in Figure 2.

3. **Teat dip persistency and coverage:** Data are presented for adherence of both products on teats for up to five days (Table 1). However, cows were monitored for up to seven days. Twelve quarters of the control product had covered teats by day 6 and five quarters by day 7. On the other hand, four quarters of the experimental product were still covered by day 6 and one by the seventh day. Products on teats are shown in Figures 1 and 2. Multinomial analysis showed that the control product always had a higher number of teats in scores associated with better teat coverage, and this was evident for days 2, 3, 4 and 5 (Table 1 and Figure 3). After two days, T-Hexx Dry™ was 6.5 times more likely to have teat coverage than 588-88-2. After three days (2.4x), four days (2.6x) and five days (3.1x), the control product was always more likely to have higher scores associated with teat coverage, as shown in Table 2.

Overall Summary

Two external teat sealants were applied to 24 animals for assessment of adherence to teat skin/teat end over a period of five days. Good coverage was obtained for both control and experimental products on the first day after application. By the third day, the control product T-Hexx DryTM was 2.4 times more likely to have teats covered than the experimental product 588-88-2. This same trend was maintained after five days, where the control product was 3.1 times more likely to have teats covered with the external teat sealant. The study showed that the control product was superior to the experimental product 588-88-2 over a five day period.

Table 1. Adherence of external teats sealants on teats of dry cows over a period of five days after initial application.

Treatment		Quarters (n)					Coverage*
	Hours	Score 4	Score 3	Score 2	Score 1	Score 0	
T-Hexx Dry™ (n = 48)	24	48	-	-	-	-	48 (100%)
	48	39	4	2	2	1	47 (90%)
	72	17	1	9	10	11	40 (77%)
	96	7	1	5	15	20	28 (58%)
	120	3	1	3	8	33	15 (31%)
588-88-2 (n = 48)	24	42	3	1	2	-	48 (100%)
	48	19	7	7	7	8	40 (83%)
	72	6	7	6	8	21	27 (56%)
	96	3	2	3	7	33	15 (31%)
	120	-	-	4	2	42	6 (13%)

Table 2. Multinomial analysis results when comparing 588-88-2 vs. T-Hexx Dry.

Time after application (h)	*P* value	Odds ratio**	95% Confidence Interval
24*	-		
48	<0.001	6.5	2.7 – 15.9
72	0.017	2.4	1.2 – 5.1
96	0.017	2.6	1.2 – 5.7
120	0.032	3.1	1.1 – 8.9

*No analyses could be conducted because the control group had all teats in score 4
**Odds ratio is the coverage odds in the control group divided by the coverage odds in the experimental group

Figure 1. Adherence of products on teats at day of application (dark blue = T-Hexx Dry, light blue = 588-88-2)

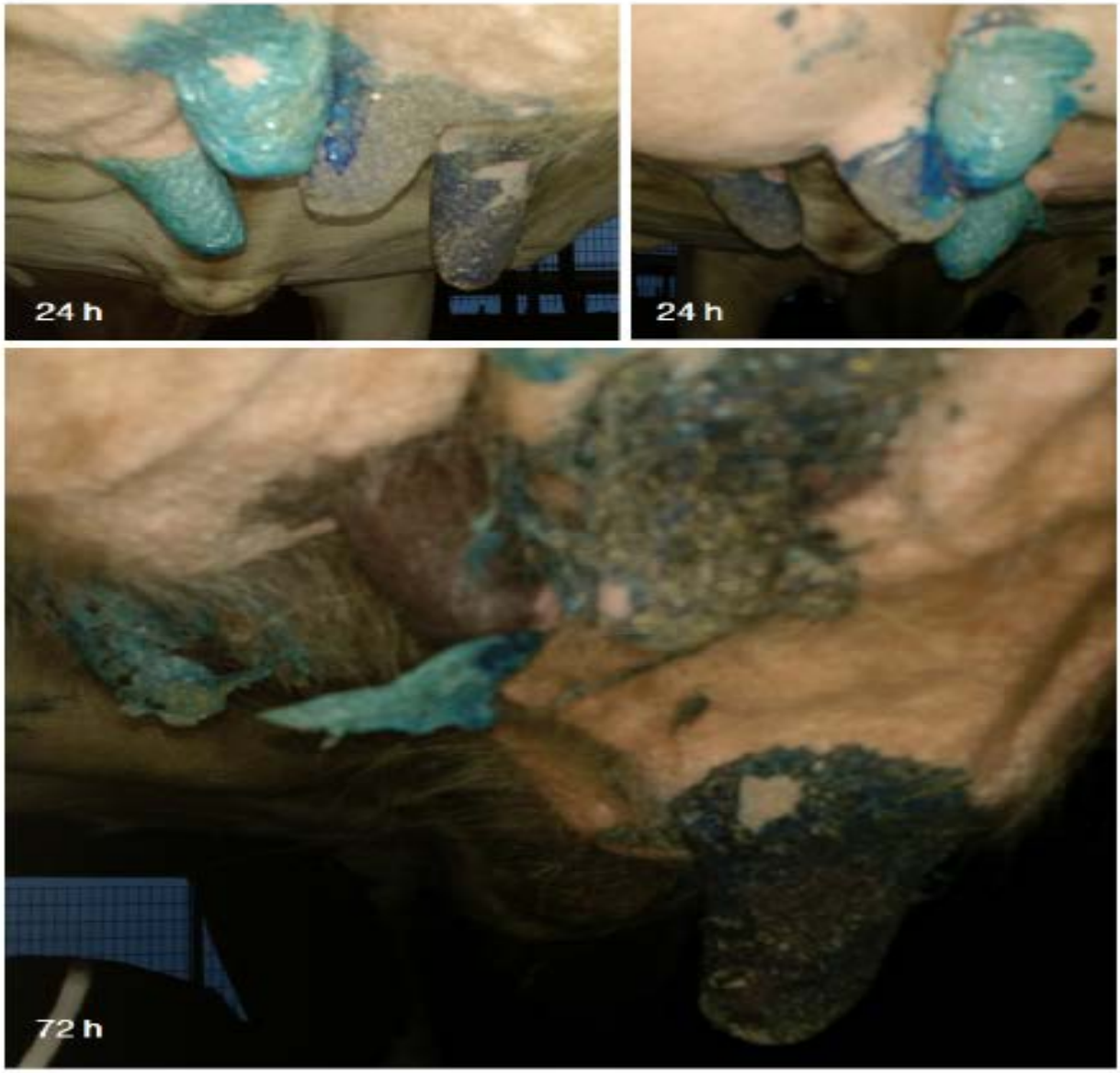


Figure 2. Adherence of products on teats after 24 and 72 hours of application (dark blue = T-Hexx Dry, light blue = 588-88-2). Some shredding is observed at 24 and 72 in the 588-88-2 group.

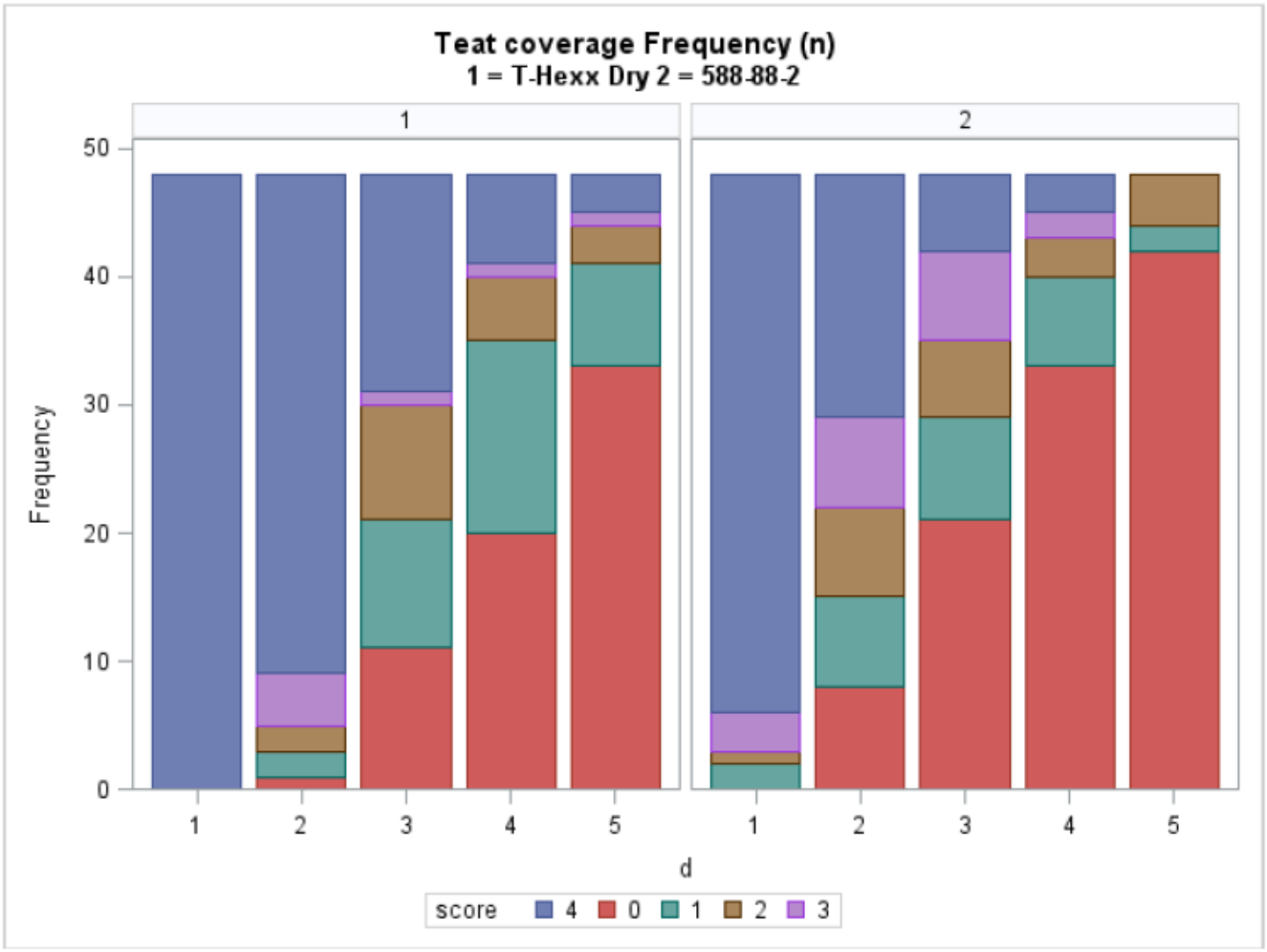


Figure 3. Teat coverage by external teat sealants over a period of five days