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Evaluation of Teat Coverage Persistency and Teat Health for Four Dry Period Persistent Barrier Teat Sealant Dips

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Summary and Implications

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. 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 and compare 4 persistent barrier dry cow teat sealant dips with particular interest and comparisons of dip persistency in providing teat end protection, and overall teat end and skin health.

Cows dipped with all dips had significantly greater persistency and protection compared to previous 4 trials (last 2 years). All dips were easy to apply and showed excellent teat health. Films were very consistent and very flexible over time (limited ripping, shredding or flaking). Overall, Dip B showed the greatest persistency in the first 4 days post dipping which is a very critical time period.

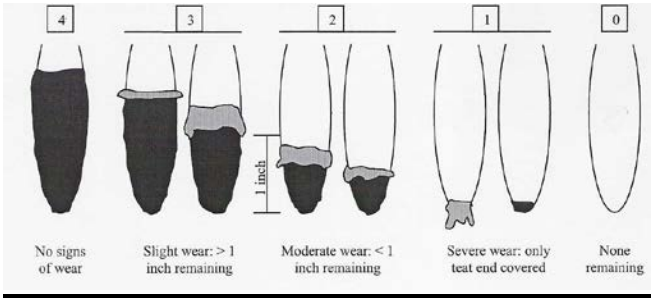
Introduction

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 and compare 4 persistent barrier dry cow teat sealant dips with particular interest and comparisons of dip persistency in providing teat end protection, and overall teat end and skin health.

Materials and Methods

1. **Dips used**: 4 dips were used in this trial. The four dips were named T-Hexx Dry A (Dip A), T-Hexx Dry – B (Dip B), T-Hexx Dry C (Dip C), and T-Hexx Dry D (Dip D).
2. **Cows**: All protocols were approved by the ISU Committee on Animal Care. 24 dry cows and pregnant heifers (~ 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 Thursday, June 5, 2014..
3. **Animal ID and teat health evaluation** (initial and final): 24 animals 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 400 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 total cows were dipped in a half udder design. 6 blocks of 4 animals were used for each dip combination comparison (A v B, A v C, A v D, B v C, B v D, C v D). Respective dips were applied to the right teats of 2 animals and left teats of the other 2 within a block, with the comparative dip used in reverse fashion. Observations of film or dip thickness, color, dip dripping and/or stringing of dip, and dip wastage via animal leg movement, etc. were recorded. Some cows were photographed on day 0 (dip day- see report end).
5. **Teat dip persistency evaluation**: Teat dip persistency or coverage of teats (especially teat ends) was conducted every 24 hours. Teat dip coverage was score 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 was last seen) and means and medians for each dip and block of cows are in the database spreadsheet (T-Hexx Dry Study June 2014). Summary data on each dip (A, B, C, and D) but on different cow blocks and combinations were evaluated and compared. Data from each dip was

then combined and summarized (12 cows, 24 quarters/dip) and graphed. **Graphs in this report will reflect summarized data for dips due to small numbers of cows and teats within each block comparison but interpretation of results within individual blocks and overall will be presented.**



Results and Discussion

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

2. **Teat dip film coverage:**
   - Dip films on Day 0: Dips A, C, and D went on very fluently with some dripping but all gave very uniform films. Dip B seemed to drip more than others and a few cows ended up with dip stringing from the teat after drying (see pictures at end).
   - Dip films on Days 2 and later: All dips were reasonably flexible with good films. There was limited or no ripping, shearing, or flaking. Outside of the slight stringing of Dip B upon application, these dips were very good in terms of both thickness and flexibility (limited drying out or flaking).
   - Dip thickness, stickiness, and reasonable drying times are very important. We dip not dip any different than we have in previous experiments and all cows had dip dried before being released to lie down. All dips looked and did very well from a film standpoint (except a little stringing when dip B dried on some cows)!

3. **Teat dip persistency and coverage:** Results are shown in Figures 1 and 2. Figure 1 represents % of teat ends protected relative to dips used and days post dipping for each dip combined across all combinations and blocks. Figure 2 represents days post dipping that an individual cow (both teats) were still completely protected for each dip combined across all combinations and blocks.

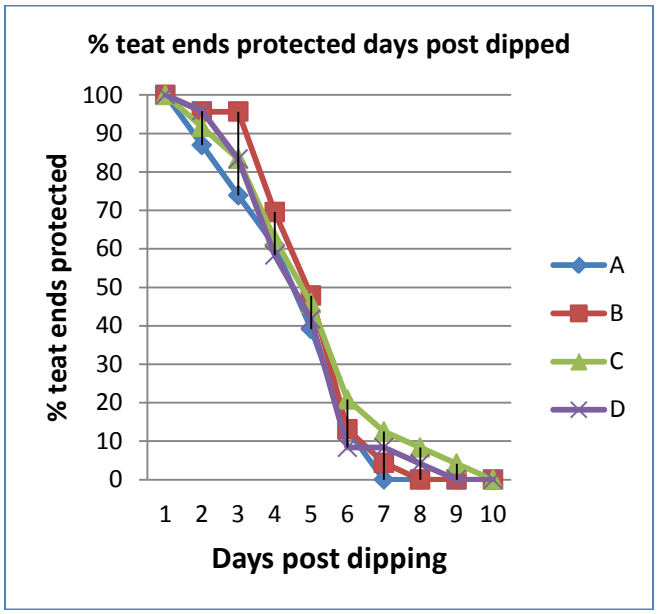


Figure 1. % of teat ends protected by days post dipping and different dips (A, B, C, and D). Remember, this data represents cumulative data of dip (12 cows and 24 quarters) but dipped in 6 blocks of 4 cows each where each block represented 1 of the six dip comparisons (A v B, C, and D; B v C and D; C v D).

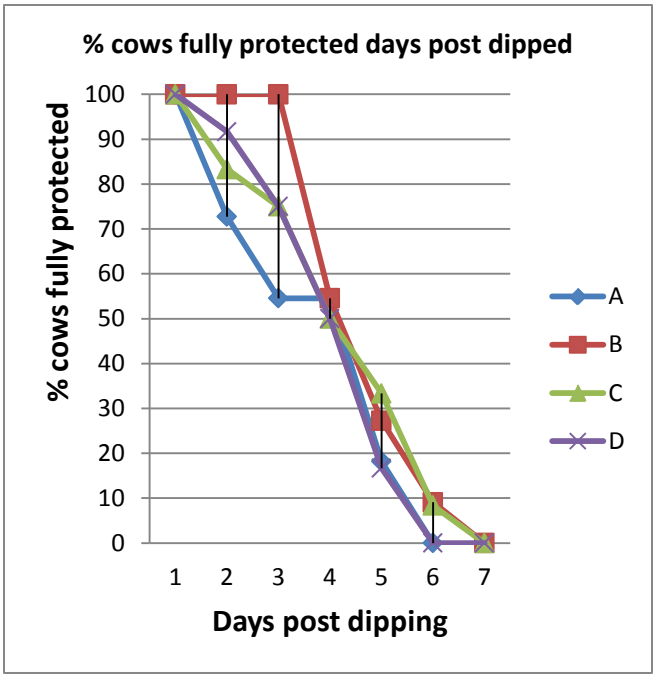


Figure 2. % of cows fully protected (both teat ends covered) by days post dipping and different dips (A, B, C, and D). Remember, this data represents cumulative data of dip (12 cows and 24 quarters) but dipped in 6 blocks of 4 cows each where each block represented 1 of the six dip comparisons (A v B, C, and D; B v C and D; C v D).

a) **Dips A vs. B vs. C vs. D when data combined over teats and times:** Figures 1 and 2 represent data on dips combined across animals, dip combinations, and blocks. This was done to allow more numbers of teats and animals/ dip since only 4 cows were used for each dip combination (6) or block. There are some differences between dips but lots of variability within a cow across blocks so makes for slightly harder interpretations.

- **Dip B was better than Dips A and C, and slightly better than D especially in terms of adherence the first few days (more consistent).** Adherence the first few days is critical. All dips seem to have an individual cow or teat that lingers a long time but it is the first few days (3-4) that are extremely critical. B was the most consistently persistent the 1st 3 days followed closely by D, then C, with A having the poorest performance.
- Over 50% of cows and teats were protected at least 4 days for all dips.
- **Adherence of dips in this study were similar to our March 2014 study but better than previous 2 years of studies. > 60% of teats and 50% cows covered at 4 days post dipping**

b) Individual or dip comparisons within block:

- **Dip A vs. B, C, and D, respectively:** Within a block (A v B, A v C, and A v D individually), A had lower overall retention times compared to dips B and D, but slightly better than C (although when looking at overall combined graphs, C performs better than A).
- **Dip B vs. C and D, respectively:** Dip B performed slightly better than Dip C, and equivocal to dip D in their comparative block.
- **Dip C vs. D:** Dip C and D near equivocal overall, but 2 cows showed C superior and 2 showed D (most variation and difference seen within cows within a block). This drastic difference and variability within the block make Dip C look like a superior dip to A overall, even though Dip C performed better than A in their comparative block.

Overall Summary

- **Ranking the Dips on adherence:** **B > D > C > A**. B and D similar with slight benefit to B over the first few days but a little stringing with B when applied. Overall C > A the first few days but A outperformed C in their head to head comparative block.
- All dips were easy to apply and showed excellent teat health. Films were very consistent and very flexible over time (limited ripping, shredding or flaking). There was a little stringing of dip on 2 cows when drying with the most stringing with Dip B.
- Overall adherence of dips in this study were similar to the March 2014 study but better than previous 2 years of studies with other prototypes.

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

Cow pictures: 6/ 5/ 2014 10 minutes post dipping

Cow 8871: right Dip A, left Dip B June 2014

Cow 21: right Dip D, left A June 2014

Cow 7999: right Dip A, left Dip C June 2014

Cow 8441: right Dip D, left Dip A June 2014