Evaluation of Dripping and Drying Characteristics, Teat Coverage Persistency, and Teat Health for Two New Prototype and One Commercial Dry Period Persistent Barrier Teat 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 specific aim of this study was to evaluate teat dip characteristics (drip amounts and times, drying times, effects on teat health) and adherence times of two novel fast drying prototype dry cow barrier teat dip products compared to a commercial product.

Dipping with the new fast drying dips (FG and FP) compared to T-Hexx Blue (commercial dip Hydromer, Inc.) resulted in similar excellent teat end and skin health, reduced drip amounts, dripping times, and drying times (~ 50%) (FG slightly better than FP); but both fast drying dips showed decreased persistency in teat coverage with FG being lowest persistency and FP intermediate between FG and Blue.

Some other important observations to consider is that drying times were significant less when dip was applied to teats compared to test tubes with Blue being ~ 2-4 min. Also, when animals bumped or kicked while dipping, significantly more dip is wasted than what drips off teats. These 2 points, in conjunction with the above points on persistency, should be highly considered when deciding to alter or put new dips into the marketplace.

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 specific aim of this study was to evaluate teat dip characteristics (drip amounts and times, drying times, effects on teat health) and adherence times of two novel fast drying prototype dry cow barrier teat dip products compared to a commercial product.

Materials and Methods

Dips used: 3 dips were used in this trial. Two new fast drying prototype dry cow barrier dips (fast drying purple (Purple: FP) and fast drying lime green (green: FP) were compared to a commercially available dry cow barrier dip (T- Hexx Dry, Hydromer, Inc. (Blue)).

Cows: All protocols were approved by the ISU Committee on Animal Care. 43 dry cows and pregnant heifers (~ 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 10 am Sunday morning, Aug. 30.

Animal ID and teat health evaluation (initial and final): 43 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 .25% iodine 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 (Tables 1 and 2) 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.

Teat dipping and dripping / drying evaluations: Dip was dispensed into dixie cups for dipping and refilled as needed. 15 cows were dipped in a half udder design with left teats dipped in Blue dip (control) and right teats with Fast Green. The amount of time dripping occurred and the amount of dip dripped off (collected in conical test tube) were quantified on 5 individual teats of 5 individual cows for each dip (2 teats compared within cow). Dip drying time was measured by touching the teat with a cotton swab starting at 1 minute post dipping and then every 30 second. Dip was considered dry when no color or dip showed on the cotton swab. The second 15 cows were dipped with left teats dipped in Blue dip (control) and right teats with Fast Purple and similar dripping/dry measurements taken. Finally, 13

cows were dipped with left teats dipped in Fast Purple and right teats with fast green and drip/dry measurements taken. Observations of film or dip thickness, stringing of dip, and dip wastage via animal leg movement, etc. were recorded.

Teat dip persistency evaluation: Teat dip persistency or coverage of teats (especially teat ends) was conducted every 12 hrs. Teat dip coverage was score using a 1-5 scale: (5= complete teat adherence similar to originally dipped; 4 = dip starting to peel but on ¾ of teat; 3 = 50% of teat covered; 2 = teat end only covered; and 1 = dip completely off. Observations on dip shearing, flaking, or tearing were also recorded.

Results and Discussion

Teat end and teat skin health: Prior to dipping, most teats had excellent teat skin and ends since these were mid dry cows and heifers (no milking machine pressures) and season was summer (minimal temperature issues). Some cows showed some dryness of teat skin (score 2) with some of these cows returning to excellent teat skin following dipping. Some teat ends showed minor rough hyperkeratosis (score 3.5) prior to dipping and had returned to normal following dipping.

- There were no differences among dips with regards to teat skin and teat end health. Some teats showed improvements in teat skin and teat end health (similar across dips) and no adverse effects of dips were seen**.**

Teat dip dripping, drying, and film coverage:

a. Data on test tubes (plastic and glass):

- Showed a 50% reduction in drip amount (1 vs 2 ml) with FP and FG vs Blue dip,
- 50% (FP) to 50-75% (FG) reduction in drip time compared to Blue.
- Drying times were significantly decreased with both fast drying dips on both plastic test tubes (3-4, 7-8, and 11 min for FG, FP, and B, respectively) and glass tubes (3-4, 4, and 8 min FG,FP,B). FG dried faster than both other dips (less difference between purple on glass) and FP and B dips dried faster on glass vs. plastic.

b. Data on cows:

- Drip time was significantly reduced with FG (55%; ~15 sec avg.) and FP(40%;~ 20 sec avg) compared to B (33.5 sec avg). FG dripped slightly less time than FP where compared on cows.
- Drip amounts were reduced with FG and FP compared to B (~50%, ~ 1 vs 2 ml)) with FG slightly less than FP. Although this may seem significant, the quantity that drips off (1-2 ml/teat) may be small compared to what gets wasted when a cow bumps or knocks dip from the dip cup when being dipped (10-20 ml). Also, drip times and amounts were similar to test tube data.
- Drying times were significantly reduced with FG (1.6 min avg: ~ 50%) and FP (1.85 min avg: ~40%) compared to Blue (3.3 min avg). Drying times on teats were significantly less than when dip was applied to test tubes (~ 50%) probably due to warmer skin temperatures.
- Dip films: FP and B had excellent consistent dip films; FG was thin and uneven!!

Teat dip persistency and coverage:

- There is a tremendous amount of cow to cow variability (short-long persistency). This is due to age (younger cows with shorter teats, thus less dip and adherence surface area); teat size and shape, and heritable differences in skin turnover time on teats.
- Although different dips stayed on some cows and teats similarly across dips, T-Hexx Blue showed longer persistency across teats and cows with higher % of teats covered > 72 hrs compared to FG and FP.
- Overall, FG has the shortest persistency with a high % of teats protected ≤ 72 hrs (3 days) (66-80%).
- FP was intermediate with 54-66% of teats protected ≤ 72 hrs (3 days).
- Blue showed 33-53% of teats protected ≤ 72 hrs
- Greatest difference across dips was the % of teats where dip only persisted up to 48 hrs. (FG and FP higher % than Blue).
- There may be some differences due to dip chemistry (fast drying vs not fast drying).
- There was also a difference in dip film as FG had poorest film upon application (thin and uneven) and also the poorest persistency. We have shown this to be critical in all our past dip work.

Overall Summary

Dipping with the new fast drying dips (FG and FP) compared to T-Hexx Blue (commercial dip) resulted in similar excellent teat end and skin health, reduced drip amounts, dripping times, and drying times (~ 50%) (FG slightly better than FP); but both fast drying dips showed decreased persistency in teat coverage with FG being lowest persistency and FP intermediate between FG and Blue.

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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