Northern NY Agricultural Development Program
2016 Project Report

Evaluation of Powdered Teat Dip Post Milking Under Cold Weather Conditions in Northern New York

Project Leader(s):

- Kimberley Morrill, PhD, Regional Dairy Specialist, CCE Northern New York Regional Ag Team, 2043B State HWY 68, Canton, NY 13617, 315-379-9192, cell: 603-568-1404, kmm434@cornell.edu
- Jessica C. Scillieri Smith, DVM, Senior Extension Associate, Quality Milk Production Services, 34 Cornell Drive, Canton, NY 13617, 315-379-3930, cell: 626-484-0794, jcs385@cornell.edu

Collaborators:

- William H. Miner Agricultural Research Institute, Chazy, NY: Heather Dann, PhD; Katie Ballard, MS
- Quality Milk Production Services: Frank Welcome, DVM, PhD; Brad Rauch, MS; Daryl Nydam, DVM, PhD

- **Cooperating Producers:**
  William H. Miner Agricultural Research Institute, Chazy, NY

Abstract:

The objective of this trial was to compare a powdered chlorhexidine acetate (0.5%)-based teat dip to a foamed 1% iodine based teat dip during a Northern New York winter on mastitis, linear score (LS), teat skin condition (TSC) and teat end score (TES).

Holstein cows (n=331) housed in both a freestall and tiestall barn were blocked by pen, parity, lactation stage, and lactation performance and assigned randomly to either a powdered post-dip (PD; Derma Soft n'Dry; IBA Inc., Millbury, MA) or a foamed iodine based post-dip (ID; FS-103; IBA Inc., Millbury, MA). Treatments were applied for 6 weeks starting January 4, 2016.

Cows were milked 3x/d. Quarter samples were collected at the beginning and end of the study and analyzed for aerobic culture by standard microbiological methods (NMC, 1999) and somatic

cell count (SCC) by flow cytometry. Cows that had a clinical mastitis event during the trial were quarter sampled at the time of clinical event.

Teat skin condition and TES were evaluated at the beginning, middle and end of the study based on a 3 and 5 point scale, respectively. No difference was observed between PD and ID groups for LS (4.72 and 4.70, SE = 0.004), TSC (1.33 and 1.29, SE = 0.03), or TES (2.81 and 2.79, SE = 0.05). Linear score increased ($P < 0.01$) from week 1 to week 6 (4.43 vs 4.71) for both treatment groups. At the beginning of trial 869 quarters had a negative culture, while 459 had a positive culture, these numbers were 1,097 and 231 at the conclusion of the trial.

There was no difference between treatment groups for cows to remain pathogen free throughout the trial duration or for cows that tested positive at the beginning of the trial and negative at the end of the trial.

There was a trend for PD to have a greater number of cows that were positive for an organism at the start and finish of the trial.

There was greater risk of new infection (odds ratio = 1.59) for PD cows as compared to ID cows. Quarters were then grouped to evaluate risk of new infection. There was a greater risk for ID cows to have a negative culture result at the conclusion of the trial (odds ratio = 0.6213).

There was a greater risk for PD cows to have a positive culture result for a minor mastitis organism (odds ratio = 1.63) or for Staph. aureus (odds ration = 2.3223).

There was no difference in number or odds ratio for coliform or Streptococcus spp. While cases of clinical and subclinical mastitis were low, PD did appear to increase the risk of Staph. aureus infections, which may be a concern in some herds with a higher level of infection or if used over a longer period of time.

Background:

Teat dipping is a widely used management practice in the dairy industry to prevent and control mastitis pathogens at the time of milking. Pre dipping is essential to disinfection of the teat before milking and reduces the risk of exposing the open teat end to environmental pathogens during milking. Post dipping is a tool which is helpful at disinfecting the teat from any contagious pathogens that the cow was exposed to during milking, as well as helping to protect the teat end from environmental pathogens before the teat end closes after milking.

During winter months, some farms modify teat dipping practices to proactively reduce the risk of frostbite in the herd. This practice is more common for farms where cows are less protected from environmental conditions in the barn or along pathways to and from the parlor. Different management changes for post dip management include blotting the teat end after post dipping to reduce excess moisture, switching to a different formulation of dip intended for winter, switching to a powder based dip, or discontinuing dipping completely.

While frostbite is the main concern because it can have major implication to the cow's health, there may be a longer but more subtle effect to the udder and teat health on the farm secondary to extreme temperature fluctuations in winter. In addition, some of these management strategies leave cows at a potentially higher risk for mastitis pathogens. Teat skin chapping and increased hyperkeratosis (thickening of the outer layer of skin) of the teat ends can reduce the ability to

achieve clean teat ends, increase bacterial colonization of teat ends, and put cows at higher risk for mastitis and higher somatic cell counts.

Some management strategies for protecting teat ends from harsh weather may not be as protective as others; finding the best strategy will help farms where changes in facilities are not feasible. Changes in teat dip products can result in a reduction in mastitis prevention, especially for contagious pathogens (specifically Staph. aureus) if post dip products are not as effective. Research from 1994 in Idaho indicated that powdered teat dip is as effective as a 1% iodine post dip at controlling environmental infections (Goldberg et al., 1994). However, the powdered teat dip was found to increase the risk of contagious mastitis due to Staph. aureus resulting in clinical mastitis. Staph. aureus is still a common mastitis pathogen that is present in many herds in Northern New York. Another study using the same powdered teat dip in Iowa (Knutson et al., 2011) reported that use of a powdered teat dip did not result in any difference in teat end scoring (TES) or teat skin condition (TSC).

Objective:

The objective of this Northern New York Agricultural Development Program-funded trial was to compare a powdered chlorhexidine acetate (0.5%)-based teat dip to a a traditional iodine based teat dip, i.e., a foamed 1% iodine based teat dip, during a Northern New York winter on clinical mastitis (CM), subclinical mastitis (SCM), somatic cell count (SCC), linear score (LS), teat skin condition (TSC) and teat end score (TES).

Materials & Methods:

All research was conducted at Miner Institute, Chazy, NY. Cows were housed in free stall barns bedded with sand or sawdust and in a tie stall barn with foam mattresses bedded with sawdust. Milking occurred three times a day and was performed in a double twelve Boumatic parallel parlor. Cows were milked following National Mastitis Council recommendations, including the routine use of pre and post dip.

Research was conducted between January 4, 2016 and February 16, 2016 for a trial duration of 44 days. Cows were randomly assigned to one of two treatments: a powdered chlorhexidine acetate (0.5%) based teat dip (PD) or a traditional 1% iodine based teat dip (ID). Treatment assignment was identified with leg bands to allow for identification of appropriate post dip treatment by the person milking. All other management practices on the farm remained unchanged. The milking equipment was checked and serviced before and after the study to ensure proper function.

Aseptic quarter samples were taken on day 1 and 44 to assess SCM, additionally quarter samples were taken when a cow had a CM event (all 4 quarters). Samples were cultured for aerobic organisms using standard microbiological methods (NMC, 1999). Quarter level SCC was evaluated using flow cytometry (SomaScope, Delta Instruments, Drachten, Netherlands). Teat end score (5 point scale) and TSC (3 point scale) were assessed on days 1, 24 and 44.

Data were analyzed using SAS 9.4 (SAS Institute, Cary, NC) using the Means, Mixed and Freq procedures. Significance was declared at $P < 0.05$.

Results:

Three hundred and thirty one cows (1,324 quarters) were included in the final dataset (Table 1).

Temperature was moderate for Northern New York in January, 2016 (Figure 1). Temperature ranged from -4.99 to 17.13 ^{o}C, with a mean value of 5.58 ^{o}C (Table 2).

Linear score (LS) increased for both treatment groups throughout the duration of the trial. There was a trend for cows on the PD treatment to have a higher LS ($P = 0.07$). However, there was no treatment by time interaction (Table 3).

Teat skin condition increased mid-way through the trial ($P < 0.001$) and then decreased for both treatment groups (Table 2). Treatment did not affect TSC or TES. Teat end score was initially greater for PD cows (2.88 vs 2.81, $P < 0.05$), but was similar for both treatment groups at the conclusion of the trial (2.81 vs 2.79). Additionally, TES improved for PD cows within the first half of the trial and remained low through the remainder of the trial.

There was no difference in CM infection between treatment groups, however, there was a greater risk of new SCM infection (odds ratio = 1.59) for PD cows as compared to ID cows (Figure 2). There was a greater risk for PD cows to have a positive culture result, at the conclusion of the study, for a minor mastitis organism (odds ratio =1.63) or Staph. aureus (odds ration = 2.32; Figure 3). There was no difference in number or odds ratio for infections due to other pathogens.

Conclusions/Outcomes/Impacts:

While cases of CM were low (n = 13 cows), post dip (PD) did increase the risk of a positive culture result at the conclusion of the study for Staph. aureus and minor organisms. This may be a concern in herds with a higher rate of Staph aureus infection or if PD is used over a longer period of time. Treatment did not impact TSC or TES. This research was conducted during a temperate winter and different results may be observed under harsher conditions.

Outreach:

Results from this study have been shared with dairy producers across Northern New York via the Regional Ag Newsletter, and local dairy workshops. Results have been shared nationwide at the 2017 National Mastitis Council meeting in Florida.

Acknowledgments:

Appreciation is given to David Kerr, IBA, for the donation of the powdered teat dip. We thank Miner Institute and its staff for assisting with this trial.

Reports and/or articles in which project results have been published:

- National Mastitis Council proceedings (2017)

For More Information:

Kimberley Morrill, PhD, 603-568-1404, kmm434@cornell.edu

Northern NY Agricultural Development Program
2016 Project Report APPENDIX

Evaluation of Powdered Teat Dip Post Milking Under Cold Weather Conditions in Northern New York

Table 1: Demographics, Teat Dip Post Milking in Cold Weather Project, NNY, 2016

	n	Mean	SD	Min	Max
Cow data					
Lactation #	331	2.15	1.28	1.00	8.00
Days in milk	331	148	95	1	446
Milk, kg/d	331	43.3	10.3	3.6	74.8
Quarter data[1]					
Initial SCC	1324	139,319	599,301	1,538	8,813,936
Initial LS	1324	4.43	0.64	3.19	6.95
Initial TSC	1324	1.26	0.45	1	3
Initial TES	1324	2.80	0.88	2	5

[1]SCC = somatic cell count, LS = linear score; TSC = teat skin condition, TES = teat end hyperkeratosis

Table 2: Mean temperature and humidity in the barn for the duration of the study[1], Teat Dip Post Milking in Cold Weather Project, NNY, 2016.

	n	**Mean**	**SD**	**Min**	**Max**
Item					
Temperature (C)	12624	5.58	2.18	-4.99	17.13
Humidity (%)	12624	46.96	7.82	35.59	100

[1] Temperature and humidity were recorded in each pen every 15 minutes, January 4 through February 16, 2016.

Table 3: LSMeans for LS, TSC and TES by treatment, Teat Dip Post Milking in Cold Weather Project, NNY, 2016.

Item[1]	Treatment			Contrasts (*P-value*)				
	PD	ID	SE	TRT	Lact	Time	TRT*Lact	TRT*Time
Linear Score								
Day 1	4.50	4.42	0.04	0.07	<0.01	<0.01	0.02	0.26
Day 44	4.72	4.70	0.04					
Teat skin condition								
Day 1	1.27	1.26	0.03	0.22	<0.01	<0.01	<0.01	0.59
Day 24	1.40	1.39	0.03					
Day 44	1.33	1.29	0.03					
Teat end score								
Day 1	2.88	2.81	0.05	0.47	<0.01	0.07	0.02	0.27
Day 24	2.76	2.79	0.05					
Day 44	2.81	2.79	0.05					

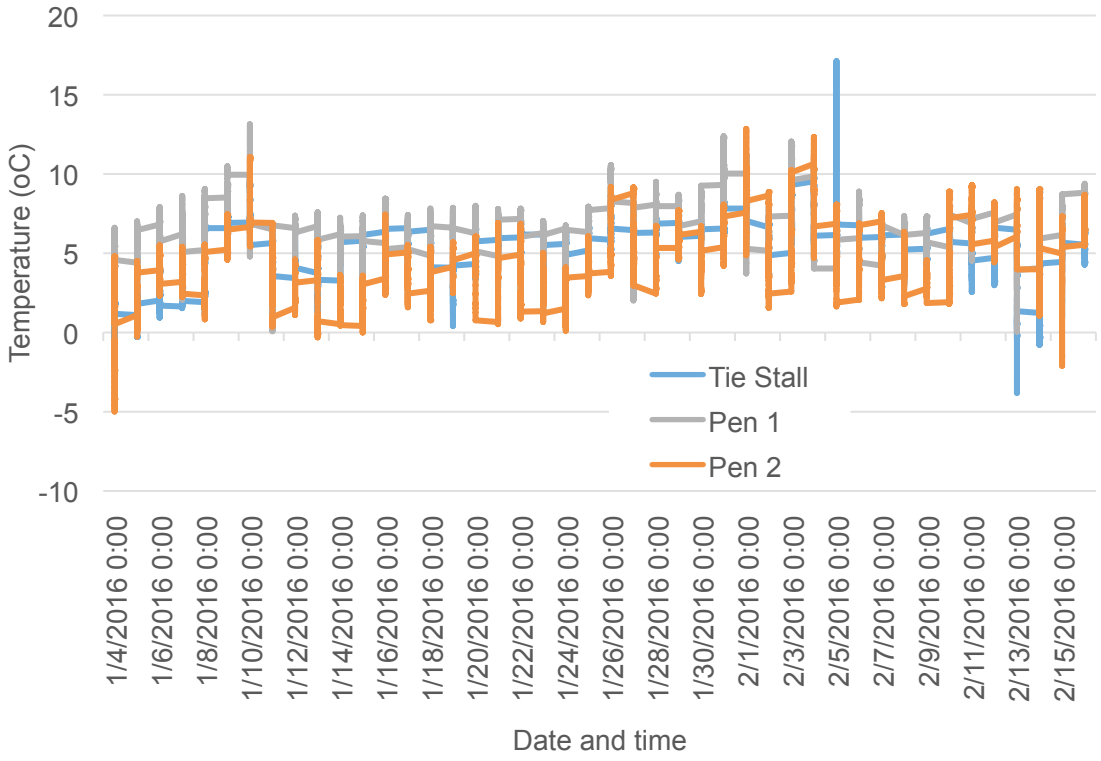

Figure 1. Temperature change throughout the duration of the trial by pen, Teat Dip Post Milking in Cold Weather Project, NNY, 2016.

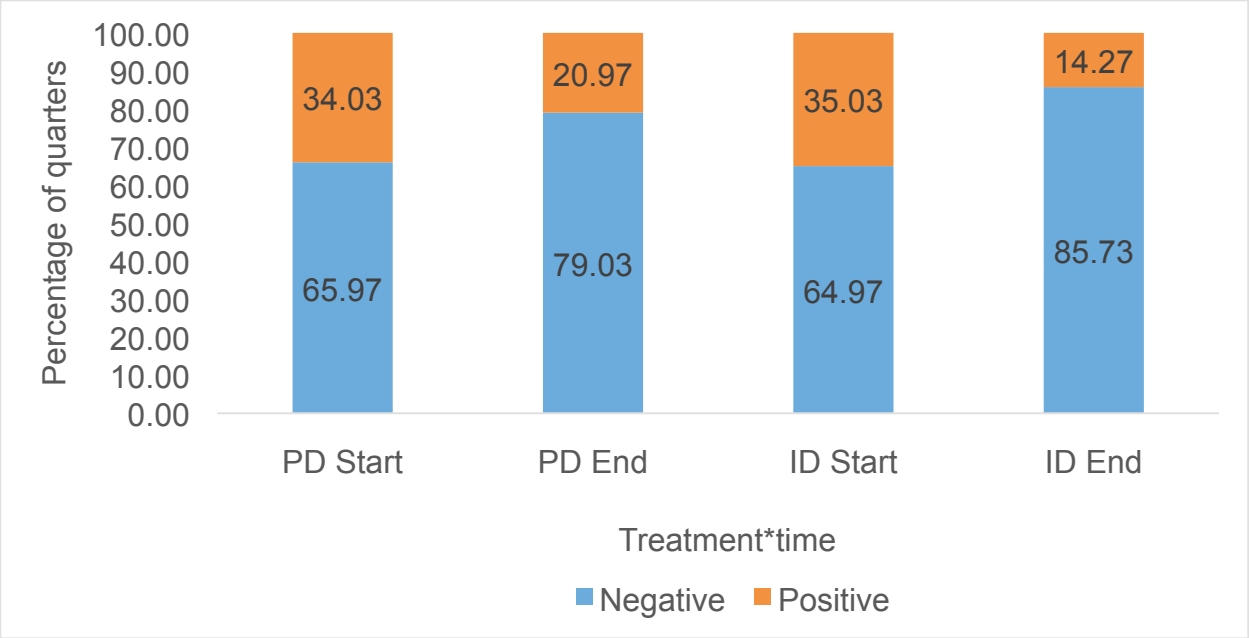

Figure 2. Percentage of samples by treatment and time that had a positive or negative culture result, Teat Dip Post Milking in Cold Weather Project, NNY, 2016.

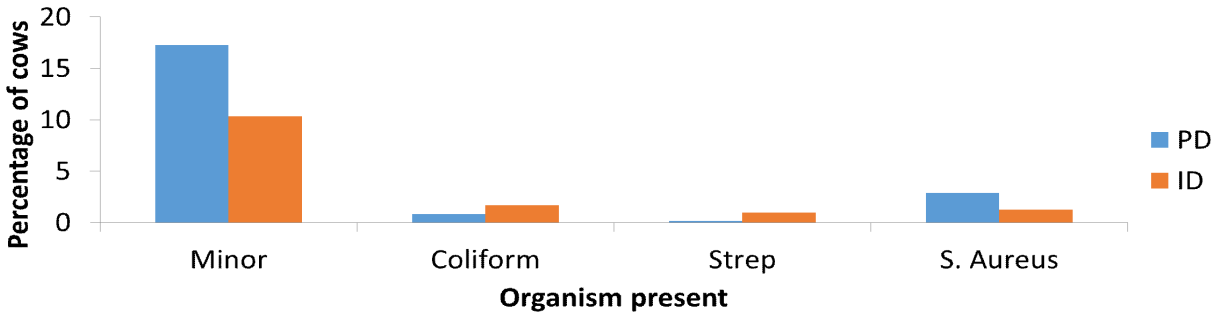

Figure 3. Percentage of samples by treatment that had a positive culture result at the conclusion of the study, Teat Dip Post Milking in Cold Weather Project, NNY, 2016.[1]

[1] *Where minor species = Corynebacterium* species and coagulase negative *Staphylococcus* spp*; Coliform = Escherichia coli, Klebsiella* spp*., Citrobacter* spp*, Enterobacter* spp*. & Serratia* spp*; Strep* spp = *Enterococcus* spp*., Streptococcus* spp*, Strep dysgalactieae, Strep uberis, & Lactococcus* spp*.*