57th Annual Meeting of the European Association for Animal Production

Antalya (Turkey), September 17-20, 2006

Session: M19

Free communications animal management and health

Effect of omitting post-milking teat disinfection on the mastitis infection rate of dairy cows over a full lactation

D.E. Gleeson, W.J. Meaney, E.J. O'Callaghan and B. O'Brien
Teagasc, Moorepark Dairy Production Research Centre, Fermoy, Co. Cork, Ireland

David.gleeson@teagasc.ie

KEY WORDS: Dairy cows, somatic cell count, teat disinfectant

Abstract
Fifty-six autumn calving Holstein-Friesian dairy cows were milked as one herd over a complete lactation. Right-sided teats were disinfected post-milking by submersing teats in a chlorohexadine solution, while teat disinfectant was omitted on left-sided teats. Milk samples were taken from individual quarters to measure SCC on thirteen occasions during the lactation. Mean somatic cell count was lower ($P<0.01$) in milk from disinfected compared to non-disinfected quarters over the full lactation. The number of clinical infections was also significantly lower ($P<0.001$) in disinfected compared to non-disinfected quarters. Omitting teat disinfection also resulted in a higher ($P<0.01$) number of non-haemolytic staphylococci and *Staphylococcus aureus* pathogens in those quarters compared to disinfected quarters.

Introduction

High somatic cell counts (SCC) are associated with lower cow milk yields and reduced shelf life of liquid milk (Ma *et al.*, 2000). Therefore, high herd bulk milk SCC has implications for both processor and farmer in terms of potential loss in income. One of the key factors that determine the infection risk of cows is the level of exposure of teats to pathogens. The teat orifice is an important first line of defence in protecting a cow from the invasion of mastitis pathogens into udder quarters. Colonization of the teat orifice with bacteria may be facilitated in the absence of post-milking disinfectant (Fox, 1991). Increased colonization may increase the risk of mastitis (Roberson *et al.*, 1994). Post milking teat disinfectant with iodophor teat dips has been shown to be affective against the contagious pathogens *Staphylococcus aureus* (Pankey *et al*., 1983b) and *Streptococcus agalactiae* (Boddie and Nickerson, 1990). Similarly the use of chlorohexidine digluconate

has been shown to have a significant efficacy against *Staphylococcus aureus* (Hicks *et al.*, 1981) and *Streptococcus agalactiae* (Pankey *et al.*, 1983a) under experimental challenge conditions.
The objective of this study was to establish the effect of omitting post milking teat disinfectant with natural bacterial exposure over a full lactation on SCC and intramammary infection.

Materials and Methods
Fifty-six autumn calving Holstein-Friesian dairy cows including forty-six primiparous cows were milked for a complete lactation in a 14-unit, 80-degree side-by-side milking parlour, using id-13.5mm long milk tubes, with a milk lift of 1.5m above the cow standing to a single milk-line (id-72mm). Right-sided teats were disinfected after milking by submerging teats in a chlorohexidine solution containing 4250 ppm chlorohexidine gluconate (solution 20% Ph Eur) which contained a fly repellent and emollients (Deosan). Left-sided teats were not disinfected. Cows were milked at intervals of 17h (overnight) and 7h (daytime). Pre-milking teat preparation consisted of washing with warm running water and drying with individual paper towels. Individual quarter milk samples were taken on thirteen occasions. These samples were analysed for SCC on each occasion and for microbiological analysis on nine of the thirteen occasions. Bacterial pathogens were identified as 0= no pathogens present, 1= *Staphylococcus aureus*, 2= non-haemolytic staphylococci, 3= *Streptococcus dysgalactiae*, 4= *Streptococcus uberis.*
Udder quarters with an SCC >300x10^3/ml and/or quarters treated for clinical mastitis at calving were excluded from the data set. When SCC of an individual quarter milk was >300x10^3/ml on three consecutive samplings and pathogens were isolated, the quarter was considered to have a new sub-clinical infection. When milk SCC was >300x10^3/ml on three consecutive samplings with no pathogens present, the quarter was considered to have non-specific (NS) sub-clinical mastitis. Subsequent sub-clinical occurrences in that quarter were not included in the dataset, but the first clinical infection was included. Additionally recurrent clinical cases in the same quarter were not included in the dataset. A sub-clinical infection was considered transient when the SCC was >300x10^3/ml with pathogens present on one sampling date. A sub-clinical infection was considered transient and NS when the SCC was >300x10^3/ml without pathogens present on one sampling date. Quarters were considered clinical if the milk was visibly abnormal or if quarters had obvious signs of inflammation. Comparisons were made between right-sided and left-sided quarters based on milk SCC, number of new clinical and sub-clinical infections and causative pathogen type.
Statistical analysis
Mean somatic cell count was averaged for right-sided teats, for each cow, at each measurement day and likewise for left-sided teats. Log transformed SCC was compared by analysis of variance using Genstat (Genstat 5 Release 3.2, Lawes Agricultural Trust (Rothamsted Experimental Station, 1995). Chi-square analysis was used to measure differences in new infection rate and causative pathogen type between disinfected and non disinfected teats at each sampling date and over the lactation.

Results

A significantly higher milk SCC was observed from quarters where that were not disinfected compared to those that were disinfected, on seven of the sampling occasions during the lactation (Table 1). Milk SCC was higher ($P<0.01$)(s.e.d=0.04) for non-disinfected teats (261k) compared to non-disinfected teats (153k) over the lactation. The number of cases of clinical mastitis was significantly higher ($P<0.001$) for non disinfected teats compared to disinfected teats. There were no differences between treatments for sub-clinical, NS sub-clinical, transient sub-clinical or NS transient sub-clinical infections (Table 2). Teats on the non disinfection treatment had a higher ($P<0.05$) number of non-haemolytic staphylococci present on day 230 of the lactation and tended to have more *Staphylococcus aureus* pathogens present at day 100 compared to disinfected teats (Table 3). When data from all sampling dates were pooled for analysis, non-disinfected teats had a higher ($P<0.01$) number of n*on*-haemolytic staphylococci and *Staphylococcus aureus* and fewer quarters ($P<0.001$) with no pathogens present than disinfected teats. There were no differences between non-disinfection or disinfection in the number of teats with *Streptococcus dysgalactiae* or *Streptococcus uberis*.

Discussion

Omitting post-milking teat disinfection resulted in a higher milk somatic cell count, a higher incidence of clinical mastitis and a higher number of pathogens in milk samples. This finding was in agreement with earlier work by Kingwell *et al.* (1979) which demonstrated the benefits of post milking teat disinfection in reducing mastitis. In previous studies by Fox (1991) and Fox and Norell, (1994) the concentration of *Staphylococcus aureus* recovered from teat skin swabbing was lower when teats were dipped with a disinfectant solution compared to untreated teats. Teat skin colonized by *Staphylococcus aureus* has been reported to be more than three times as likely to result in mastitis (Roberson *et al.*, 1994). The chlorohexidine disinfectant used in this study was effective in reducing the number of non-haemolytic staphylococci and tended to be effective against *Staphylococcus aureus.* Hogan *et al*. (1995) showed chlorohexidine disinfectant to be effective against non-haemolytic staphylococci and Pankey *et al*. (1983a) showed it to be effective against *Staphylococcus aureus* under an experimental challenge.

In conclusion, this trial confirms the benefits of post-milking teat disinfection in reducing the bacterial challenge, somatic cell count and new intramammary infection.

References

Boddie, R.L, and Nickerson, S.C. 1990. Efficacy of two iodophor postmilking teat germicides against *Streptococcus aureus*. *Journal of Dairy Science* **74**: 2790-2793.

Fox, L.K. 1991. Colonization by Staphylococcus aureus on chapped teat skin: Effect of iodine and chlorhexidine postmilking disinfectants. *Journal of Dairy Science* **75**: 66-71.

Fox, L.K. and Norell, R.J. 1994. *Staphylococcus aureus* colonization of teat skin as affected by postmilking teat treatment when exposed to cold and windy conditions. *Journal of Dairy Science* **77**: 2281-2288.

Hicks, W.G., Kennedy, T.J., Keister, D.M. and Miller, M.L. 1981. Evaluation of a teat dip of chlorhexidine digluconate (0.5%) with glycerine (6%). *Journal of Dairy Science* **64**: 2266-2269.

Hogan, J.S., Smith, K.L., Todhunter, D.A. and Schoenberger, P.S. 1995. Efficacy of a barrier teat dip containing 0.55% chlorhexidine for prevention of bovine mastitis. *Journal of Dairy Science* **78**: 2502- 2506.
Kingwill, R.G., Dodd, F.H. and Neave, F.K. 1979. Machine milking and mastitis. Machine milking, Technical bulletin 1 231-285.
Ma, Y., Ryan, C., Barban, D.M., Galton, D.M., Rudan, M.A. and Boor, K.J. 2000. Effects of somatic cell count on the quality and shelf life of pasteurized fluid milk. *Journal of Dairy Science **83**:*264-274.
Pankey, J.W., Philpot, W.N., Boddie, R.L. and Watts, J.L. 1983a. Evaluation of nine teat dip formulations under experimential challenge to *Staphlococcus aureus* and *Streptococcus agalactiae. Journal of Dairy Science* **66**: 161-167,
Pankey, J.W., Philpot, W.N. and Boddie R.L. 1983b. Efficacy of low concentration iodophor teat dips against *Staphylococcus aureus*. *Journal of Dairy Science* 66:155.
Roberson, J.R., Fox, L.K. Handcock, and Gay, J.M. 1994. Ecology of *Staphylococcus aureus* isolated from various sites on dairy farms. *Journal of Dairy Science***77***:* 3354-3364.

Table 1. Effect of omitting post-milking teat disinfection on milk somatic cell count (SCC) at different stages during lactation

	TD	**NTD**		
Lactation days	SCC/Log_{10}		s.e.d	Sig.
30	4.23	3.90	0.21	NS
60	4.04	4.23	0.17	NS
80	4.00	4.20	0.22	NS
100	4.10	4.58	0.22	*
120	4.21	4.61	0.16	**
150	4.22	4.52	0.18	NS
180	4.44	4.61	0.16	NS
200	4.16	4.60	0.16	***
230	4.54	4.94	0.15	**
250	4.90	5.01	0.12	NS
270	4.80	5.10	0.14	*
285	4.95	5.30	0.15	*
300	5.04	5.37	0.17	*

TD: teats disinfected post milking: NTD: teats not disinfected

Table 2. Effect of omitting post-milking teat disinfection on clinical and sub-clinical new infection rate

	TD (n=27)	**NTD** (n=27)	Sig.
Clinical	6	22	***
Subclinical	5	7	NS
Non Specific subclinical	2	3	NS
Transient subclinical	5	8	NS
Transient Non Specific subclinical	11	13	NS

TD: teats disinfected post milking: NTD: teats not disinfected n=number of cows

Table 3. Comparison of teat disinfection and no teat disinfection post-milking on pathogen type present in individual udder quarters

		Pathogen type					
		No pathogen	Staph. aureus	Non-haem. staph.	Strep. dysgalactiae	Strep. uberis	
Lact. days	Treat	Numbers of quarters					Sig.
100	TD	87	2	6	0	0	
	NTD	79	8	6	2	0	0.13
120	TD	102	1	2	2	1	
	NTD	101	2	2	1	2	0.84
160	TD	97	1	3	1	0	
	NTD	91	3	7	1	0	0.25
200	TD	94	4	3	1	0	
	NTD	94	2	5	0	0	0.56
230	TD	97	1	5	0	1	
	NTD	85	1	16	1	1	*
250	TD	96	1	4	1	0	
	NTD	93	3	4	2	0	0.59
270	TD	74	2	2	1	0	
	NTD	69	2	8	0	0	0.15
285	TD	87	2	3	2	0	
	NTD	84	1	6	2	1	0.50
300	TD	67	0	3	2	0	
	NTD	63	0	4	1	3	0.95
All days	TD	903	16	34	11	2	
	NTD	861	24	62	10	7	**

TD: teats disinfected post milking: NTD: teats not disinfected.