Milking variables in relation to teats preparation and unit attachment delay in cows

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Summary

Milking routines observations were carried out on 84 black and white dairy cows randomly chosen. The effect of the time taken to manually stimulate the teats (cleaning and drying) before the unit is attached "prep-time" divided into two classes (to 30 and >30 seconds) and the time delay from the beginning of the cow preparation process until unit attachment "prep-lag time" also divided into two classes (to 60 and >60 seconds) on milk flow time, total milking time, first minute milk flow rate, average milk flow rate, milk yield and somatic cell counts in milk was investigated. The longest milk flow time was observed in rear teats, for all classes of prep-time and prep-lag time. The greatest difference ($P \leq 0.05$) between front and rear teats was observed for a prep-time and a prep-lag time respectively of 30 and 60 sec.

Prep-time had a significant effect on milk flow time ($P \leq 0.01$), total milking time ($P \leq 0.01$) and first minute milk flow rate ($P \leq 0.01$), this effect was also observed on average milk flow rate ($P \leq 0.05$). However no significant effects were observed on milk yield and somatic cell counts. Total milking time, first minute milk flow rate, average milk flow rate and milk yield decreased as prep-lag time increased. Milk yield was influenced by prep-lag time ($P \leq 0.05$). No significant effects of neither prep-time nor prep-lag time was observed on somatic cell count in milk.

Key words: *Prep-time, prep-lag time, dairy cow, milk flow rate, milking time.*

Introduction

To withdraw milk efficiently from the bovine mammary gland, the cow must be included as an active partner in the milking process by evoking the milk ejection reflex (Hamann, 1991). Studies have shown that milk ejection is not entirely dependant on the action of oxytocin and that there are also many other factors that control the effectiveness of oxytocin

response (Mayer et al., 1984; Svennersten and Claesson, 1990). According to Lefcourt (1982), the effect of teat stimulation on sympathetic tone in the mammary gland is a second milk letdown mechanism. In addition to oxytocin causing milk letdown, the nervous system also plays a role in rate of milk flow through the teat canal (Bruckmaier and Blum, 1998). A minimum of 12-15 seconds of teat contact time is required for sufficient nerve stimulation to ensure adequate oxytocin release and a good milk ejection response (Mein and Reid, 1996). Premilking cow preparation is proven to be an important step in achieving maximum milk yield, quality and udder health. Units should be attached within a window of 60 to 90 seconds from beginning of udder preparation process to take advantage of oxytocin stimulated by good teat manipulation (Rasmussen *et al*., 1992).

The purpose of this experiment was to investigate the effect of the time taken to manually clean and dry the teats before the unit is attached and the time from the beginning of the cow preparation process until unit attachment on milk flow time, first minute milk flow rate, average milk flow rate, milk yield and somatic cell count in milk.

Material and methods

A field study was carried out on 84 black and white dairy cows randomly chosen. Cows were held in a two tie-stall barn and milked to a pipeline by a set of four milking units MilkMaster with automatic teatcups detachers. All cows were milked using the same milking routine consisting of fore stripping of three to five squirts from each teat followed by teat cleaning with a different total duration.

The machine was attached in a different time for each cow after preparation. The time taken to manually clean and dry the teats before the unit is attached is referred to as “Prep time” and the time from the beginning of the cow preparation process until unit attachment is referred to as “Prep lag time” (Reneau and Chastain, 1995).

Time studies were conducted for three consecutive days at evening milking. Prep time, Prep lag time, milk flow time from individual quarters, first minute milk flow rate, average milk flow rate, total milking time and milk yield were recorded. On the fourth day milk samples were taken during evening milking in order to determinate somatic cell counts using Fossomatic 4000.

The effect of prep time divided into two classes (to 30 sec., >30 sec.) and prep lag time into two classes (to 60 sec., > 60 sec.) on first minute milk flow rate, average milk flow rate, total milk yield and total milking time was investigated.

Results are presented tables as means ± SD. For statistical evaluations STATISTICA 97 software was used. Mean differences of different classes were tested for significant differences using the Duncan’s Test.

Table1. Milk flow time from in individual quarters in relation to prep-time and prep-lag time.

Seconds			Front teats		Rear teats		
Prep-time ranges	Prep-lag time ranges	Number of cows	Left	Right	Left	Right	Quarter effect
	0-60	31	230±34^{AB}	249±48^{AB}	290±74^{Aa}	303±78^{A}	X
0-30	> 60	29	244±44^{CD}	234±52^{CD}	269±77^{BC}	272±92^{Ba}	X
	0-60	11	307±72^{AC}	310±56^{AC}	362±76^{AB}	389±123^{AB}	X
> 30	> 60	13	284±40^{BD}	308±82^{BD}	343±62^{Ca}	350±76^{a}	X
Prep-time effect			XX	XX	XX	XX	-
Prep-lag time effect			NS	NS	NS	NS	-
Lactation effect			XX	XX	XX	XX	-

Means in columns designated by the same capital letter are significantly different at P≤0,01.
Means in columns designated by the same small letter are significantly different at P≤0,05.
NS- means not significant.

Results and discussion

Average milk flow time (MFT) increased significantly in all quarters (P≤0.01) as prep time increased (Table 1), however no significant effect of prep-lag time was observed even though as cow prep lag time increased, (MFT) decreased. According to Eicker *et al*., (2000), a well-prepped cow will letdown her milk rapidly and completely and her average flow rate will be higher. The longest (MFT) was observed in rear teats, for all classes of prep-time and prep-lag time. The greatest difference (P≤0.05) in (MFT) between front and rear teats was observed for a prep-time and a prep-lag time ranging respectively from 0 to 30 and from 0 to 60 sec. The quarter effect was significant (P≤0.05). Rear teats normally have higher milk yield and take longer to milk than the front ones (Rassmusen, 1993).

First minute milk flow rate (FMMFR) (P≤0.01) and average milk flow rate (AMFR) (P≤0.05) were influenced by prep-time and prep-lag time (Table 2). (FMMFR) and (AMFR) were the highest for a prep-time from 0 to 30 sec. and a prep-lag time from 0-60 sec. As prep-time and prep-lag time increased, (FMMFR) and (AMFR) decreased. According to Gorewit and Gassman (1985) a stimulation for 60 or 120 sec. did not achieve higher peak milk flow rates than 15 or 30 sec., and the average milk flow rate increased and machine-on time decreased with duration of stimulation. Milk yield was not affected by prep-time, however it was influenced significantly (P≤0.05) by prep-lag time. According to Bruckmaeir and Blum, (1996) milk yield was not significantly lower in milking without than with stimulation, whereas machine-on time was prolonged and peak milk flow rate was reduced during milking without stimulation.

Total milking time (TMT) increased (P≤0.01) as prep-time increased and decreased as prep-lag time increased. The longest (TMT) was observed for a prep-time and a prep lag-time respectively over 30 sec. and ranging from 0 to 60 sec. This is probably due to an inadequate stimulus of the udder. According to Rasmussen *et al*., (1992) the ideal prep-lag times are 1.3 minutes, or 1.18 minutes. They found that a range of 1 to 1.5 minutes is accepted as the optimal prep-lag time for all stages of lactation. Gorewit and Gassman (1985) concluded that it takes longer to milk out the last kg of milk if premilking teat preparation is conducted inefficiently or even omitted. On the other hand the shortest (TMT) was observed when prep-time ranged from 0 to 30 sec. and prep-lag time was over 60 sec. Better milking preparation causes faster let-down and better milk-out and allows shorter unit-on times (Stewart, 1993). Merill *et al*., (1987) tested the effects of premilking preparation (full stimulation and minimum stimulation) on milk flow rates and machine-on time. They found that cows receiving full stimulation had significantly higher average milk flow rates and shorter machine on-times starting at week 32. Milk flow rate and yield determine the unit-on time and can have a significant effect on throughput (Reneau and Chastain, 1995). According to Pfeilsticker *et al*. (1995), the time from the start of teat stimulation until maximal pressure (ejection pressure) is 115 seconds. However, milkers, compelled by the speed of premilking cow prep rather than thoroughness, often fail to

Table 2. First minute milk flow, average milk flow, milk yield and total milking time in relation to Prep-time and prep-lag time.

Seconds			(kg / min)				
Prep-time ranges	Prep-lag time ranges	Number of cows	First minute milk flow	Average milk flow	Milk yield (kg)	Total milking time (sec.)	Ln SCC
0-30	0-60	31	2.905±0.800[AB]	2.476±0.823[a]	8.263±2.182	313±78[A]	10.504±1.256
	> 60	29	2.429±0.735[CD]	2.122±0.514	7.240±2.290	282±92[BC]	10.655±1.207
> 30	0-60	11	1.903±0.967[AC]	2.024±0.685	8.042±2.314	399±73[AB]	11.654±0.752
	> 60	13	1.507±0.384[BD]	1.789±0.691[a]	6.641±1.926	360±80[C]	10.772±1.248
Prep-time effect			XX	X	NS	XX	NS
Prep-lag time effect			XX	X	X	NS	NS
Lactation effect			X	NS	XX	XX	NS

Marks as in table 1.

achieve either adequate teat sanitation or consistent milk letdown stimulus. No significant effects of neither prep-time nor prep-lag time was observed on somatic cell count in milk.

Conclusion

Average milk flow time increased significantly in all quarters ($P \leq 0.01$) as prep time increased, on the other hand no significant effect of prep-lag time was observed on milk flow time. The longest milk flow time was observed in rear teats, for all classes of prep-time and prep-lag time.

First minute milk flow rate and average milk flow rate were influenced by prep-time and prep-lag time. As prep-time and prep-lag time increased, first minute milk flow rate and average milk flow rate decreased.

Milk yield was not affected by prep-time, however it was influenced significantly by prep-lag time.

Total milking time increased as prep-time increased and decreased as prep-lag time increased. The longest total milking time was observed for a prep-time and a prep lag-time respectively over 30 sec. and ranging from 0 to 60 sec.

No significant effects of neither prep-time nor prep-lag time was observed on somatic cell count in milk.

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