

EFFECT OF LINER AGE ON MILKING CHARACTERISTICS OF THE LINER

M.A. Davis and D.J. Reinemann

University of Wisconsin-Madison Madison, Wisconsin, USA

Proceedings, AABP-NMC International Symposium on Mastitis and Milk Quality,
Vancouver, BC, Canada. September 2001.

Introduction and Objective

Changes in milking performance of aging liners have been documented previously (2,3,5). However, these studies were not done on liners typical of those used in the US. Liners manufactured for use outside of the USA may contain more carbon black in the rubber mixture responsible for improved hardness, tear strength and abrasion characteristics (4). Carbon content is also known to influence the rate of change of the physical properties of liners. The objectives of this study were to measure changes in the following milking characteristics of US liners as they aged: milk yield, milking duration, average milk flow rate, peak milk flow rate, mouthpiece chamber vacuum and Irregular Vacuum Fluctuations (IVF).

Materials and Methods

Two milking time tests were conducted to measure the change in milking characteristics of new liners compared to artificially or naturally aged liners. Liners were either artificially aged three days by soaking in clarified butter held at 100°C or naturally aged by use in the University of Wisconsin-Madison milking parlor to 1680 cow milkings. The tests were a paired switchback design; statistical significance was identified through paired Student's t tests at the $\alpha=0.05$ level. Cows were milked one evening with new liners, the successive evening with aged liners; treatment schedule was random. The liners used in all tests were Bou-Matic R-2CV of the same lot. Measurement of milking characteristics have been described previously (1).

Results and Discussion

The results of these tests are shown in Table 1. The average effect is the average of each measurement for the aged liners minus measurement for the new liners. Statistical significance ($p<0.05$) is denoted by an asterisk.

Artificial aging of the liners for 3 days produced significant changes in both peak flow and average flow. Liners aged naturally for 1680 cow milkings, or approximately two lifetimes, yielded significant changes in milking duration, peak milk flow rate and both classes of IVF.

Milking duration was increased when milking with naturally aged liners, a result also reported in several past studies, (1,2,3,7). The difference in milk yield between new and aged liners was mixed depending on the method of aging, but was insignificant for both. Inconclusive results on milk yield have also been reported in previous studies (2,3,5). Peak milk flow rate was the most sensitive indicator of liner age as it experienced significant decreases for both aging treatments. Average milk flow rate was also decreased when milking with aged liners, although the measurement is not as sensitive to liner age as

peak milk flow rate since it is an average over the whole milking. Aged liners did not significantly change mouthpiece vacuum but did produce a significant increase in number of IVF observed.

Table 1. Effect of liner age on milking characteristics.

Milking characteristic	Liner aged: 3 days artificial			Liner aged: 1680 cow milkings		
	n (paired)	Average effect	Standard deviation of effect	n (paired)	Average effect	Standard deviation of effect
Milking duration (s)	8	+26 s	73 s	16	+ 47 s *	65 s
Milk yield (kg)	8	-0.4 kg	7.4 kg	16	1.1 kg	6.0 kg
Peak milk flow rate (kg/min)	4	-0.4 kg/min *	0.5 kg/min	16	-0.5 kg / min *	0.5 kg/min
Average milk flow rate (kg/min)	8	-0.3 kg/min *	0.3 kg/min	16	-0.2 kg/min	0.5 kg/min
Average mouthpiece chamber vacuum (kPa)	4	+ 3.8 kPa	2.8 kPa	16	-0.5 kPa	6.4 kPa
IVF class 1 (no. of)	4	-5.0	8.7	16	0.4*	0.8
IVF class 2 (no. of)	4	1.5	9.4	16	0.8*	1.1

Conclusions

Liners aged artificially for 3 days produced significant decreases in both peak flow and average flow. Liners aged naturally for 1680 cow milkings, or approximately two lifetimes, yielded a significant decrease in peak milk flow rate and significant increases in milking duration and both classes of IVF. Peak milk flow rate was the most sensitive indicator of liner age.

References

1. Davis, M.A., D.J. Reinemann and G.A. Mein. 2000. Relationships between physical characteristics and milking characteristics of the aging liner. ASAE Paper No. 00-3014.
2. Gibb, I. McD. and G.A. Mein. 1976. A comparison of the milking characteristics of teatcup liners. *The Australian Journal of Dairy Technology* 31: (4) 148-153.
3. Gleeson, D.E. and E.J. O'Callaghan. 1998. A note on the effect of aging on teatcup liner performance. *Irish Journal of Agricultural and Food Research* 37: 93-95.
4. Kelly, T.G., J. O'Shea, E. O'Callaghan and B. McKenna. 1983. Comparisons of milking characteristics of new and used liners. *Milking Machine Research at Moorepark 1978-82*, pp. 44-55.
5. Kelly, T.G., B. McKenna, and J. O'Shea. 1983. Milking machine liners- a review of their chemical and physical characteristics and factors affecting their deterioration. *Milking Machine Research at Moorepark 1978-82*, pp. 14-23.
6. O'Shea, J. and E. O'Callaghan. 1980. Milking performance of full udder clusters with standard pulsation: effect of cluster weight and cluster weight distribution; and comparisons of 'original' and 'imitation' liners and new and used liners. *Experiments on Milking Machine Components at Moorepark 1976-79*, pp. 104-114.
7. Schwiderski, H. 1965. Life of milking stockings. *Tierzucht* 19: 637-638.