
Effect of old and new rubber liners on teats evaluated by thermographic method

I. Knížková¹, P. Kunc², M. Koubková⁴, J. Fluser³ & O. Dolezal¹

¹Research Institute of Animal Production Uhřetěves,
104 00 Prague 10, Czech Republic
E-mail:knizkova@vuzv.cz

²Czech Agricultural University, 165 21 Prague 6, Czech Republic

³Institute of Information Theory and Automation,
182 08 Prague 8, Czech Republic

The objective of this study was to compare the effect of old (before exchange) and new (after exchange) rubber liners by means of the changes of teat surface temperature. Thermographic measurements were conducted in milking parlour 2 x 10 (rapid exit herringbone, vacuum 42.6 kPa) in 64 dairy cows. Scheme of measurement was following: 1st day: evening milking - old liners, 2nd day: morning milking - old liners & exchange of liners, 2nd day: evening milking - new liners, 3rd day: morning evening - new liners. Thermal responses of teats were recorded: before milking, after milking immediately, 1st minute postmilking, 2nd minute milking postmilking and 3rd minute postmilking. The results showed that milking increased the temperature of teats. The highest values were obtained after milking immediately. New liners increased temperature of teats more than old liners, but the differences were not significant. The highest decline in teat surface temperature was obtained to 1 minute after milking then the decline was gradual (2nd and 3rd minute). But surface teat temperature was not recovery to starting value before milking. The recovery time to initial temperature of teats will be longer than 3 minutes after milking. The significant injuring of the teats evoked by tested liners was not recorded. Thermography can produce important information where conventional diagnostic techniques have exhausted their possibilities.

Summary

Key words: *Liners, machine milking, teat surface temperature, thermography.*

Introduction

The most stressed part of the udder are the teats, because milking changes their condition. Repeated teat compressions may cause mechanical and circulatory changes in teat tissues and hyperaemia in teat wall (Hamann 1992, Isaksson and Lind 1992, Burmeister *et al.* 1998). Such changes may even lead to pathological traumatization manifested by, e.g., congestion, oedema, cracks of mucous membrane, induration, etc. (Králičková 1984, Ryšánek and Babák 1986). Machine milking, however, will often produce specific traumatized zones even when all technical parameters of the milking machine used meet to relevant standards and the producer's recommendations (Kejík and Mašková 1989, Kunc *et al.* 2000a). These zones, which cannot be detected visually, are manifested by elevated temperatures and slow recovery (Kunc *et al.* 2000 b). They cannot be accurately localised even by contact thermometers. For all these reasons it seems that the most suitable method of detection is thermography. The changes of teat temperature are then used to evaluate the effects on clinically undetected teat traumatization.

There are a number of factors in machine milking that may influence the condition of teats. Literary sources emphasise the importance of the milking vacuum, and also pulsation rate, pulsation ratio and the quality of teat cups. The liners are in direct contact with very sensitive organ, i.e. mammary gland. Using the thermographic method, Kejík and Mašková (1989) and Malík *et al.* (1989) took udder thermograms and evaluated relationship between its traumatised zones and the quality of teat rubber. Thermography was used by Mašková (1991) in her evaluation of a prototype of a milking machine. Basing her evaluation on an assessment of teat surface temperature during milking. The author concluded that the shape of teat rubber used in the new type of milking machine does not significantly stress the teat. Kunc *et al.* (1999) studied the influence of the liners with circular section and the liners of triangular section on teats. Thermographic measurements showed that the liners with triangular section affected the teats negatively.

The objective of this study was to compare the effect of old (before exchange) and new (after exchange) rubber liners on the teats by means of the changes of teat surface temperature.

Material and methods

Thermographic measurements (thermographic system AGA 570 DEMO) were conducted in milking parlour 2 x 10 (rapid exit herringbone, vacuum 42.6 kPa) in 64 healthy dairy cows (Holstein, milk yield 8 200 l).

Set of measurements was following:

- 1st day: evening milking – old (worn-out) rubber liners;
 - 2nd day: morning milking - old (worn-out) rubber liners;
- ⇒ exchange of rubber liners;
- 2nd day: evening milking – new rubber liners;
 - 3rd day morning milking – new rubber liners.

Thermograms of the teats were obtained in following intervals:

- premilking immediately;
- postmilking immediately;
- 1st minute postmilking;
- 2nd minute postmilking;
- 3rd minute postmilking.

The special computer program IRwin 5.3.1 was used for evaluation of thermograms and data analyses.

Table 1. Temperature status of teats in dependence on used rubber liners.

Liners	Premilking	Postmilking	1min	2min	3min
Old	31.20±1.46	33.04±0.78	32.51±0.62	32.41±0.62	32.33±0.73
New	30.74±1.55	32.87±0.85	32.19±0.78	32.03±0.76	31.91±0.82

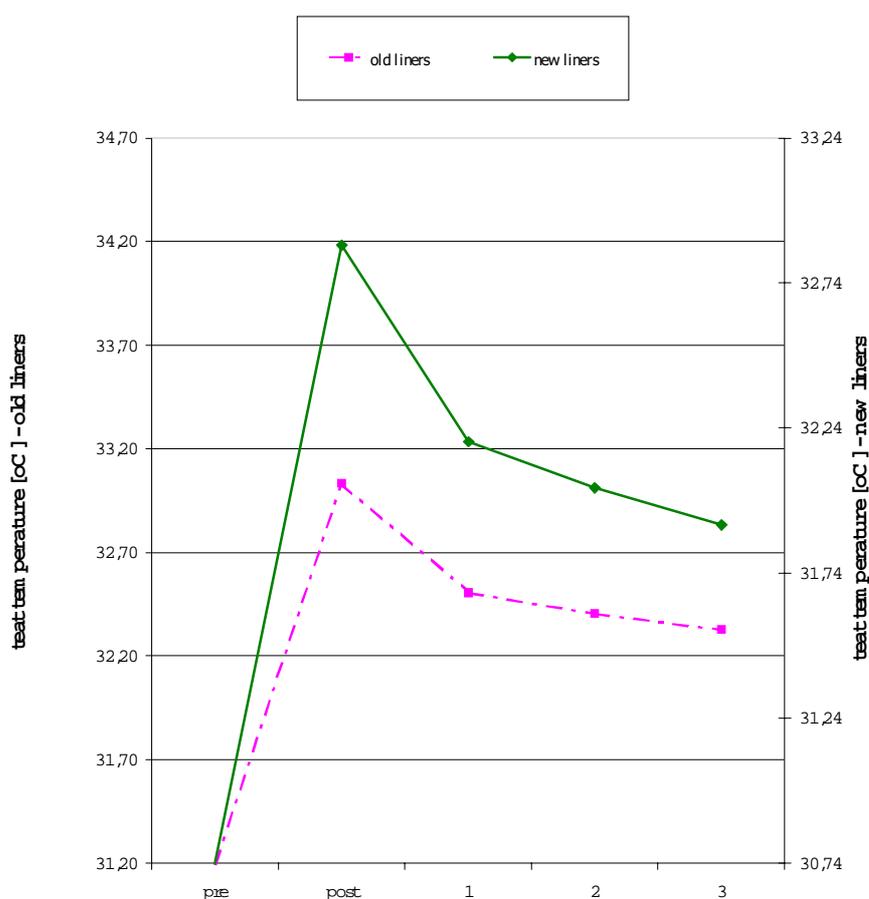


Figure 1. The course of temperature changes of teats

Results and discussion

The results are showed in table 1, the course of temperature changes of teats is illustrated in the figure1. The results showed that milking increased the temperature of teats. The highest values were obtained after milking immediately. That supports the findings of Hamman (1985) and others. New liners increased temperature of teats more then old liners, but the differences were not significant. The highest decline in teat surface temperature was obtained to 1st minute after milking (0.53 °C in old liners and 0.68 °C in new liners) then the decline was gradual (2nd and 3rd minute). But surface teat temperature was not recovered to initial value before milking in both. The difference in old liners was found out 1.13 °C, the difference in new liners was found out 1.17 °C. Kunc *et al.* (1999) found out that teat temperature after milking does not decline to initial value until 2 minutes. Basing this experiment, the recovery time to initial temperature of teats will be longer than 3 minutes after milking. The significant injuring of the teats evoked of tested liners was not recorded. Thermography can produce important information where conventional diagnostic techniques have exhausted their possibilities.

Acknowledgement

This study was supported by the project of the Grant Agency of The Czech Republic 523/99/1489.

References

- Burmeister, J.E., Fox, L.K., Hillers, J.K. & Hancock, D.D.**, 1998; Effect of premilking and postmilking teat disinfectants on teat skin condition. *J. Dairy Sci.*, 81,1910-1916.
- Eichel, H.**,1992; Temperature of teat skin in dairy cows milked in piped milking parlor. *Monatshefte fur Veterinarmedizin*, 47,193-195.
- Hamann, J.**, 1985; Infection rate as affected by teat tissue reactions due to conventional and non-conventional milking systems. *Kiel. Milchwirtsch. Forschungsber*, 37, 426-430.
- Isaksson, A. & Lind, O.**, 1992; Teat reactions in cows associated with machine milking. *J. Vet. Med., Series A.*, 39.
- Kejík, C. & Mašková, A.**, 1989; Termovizní měření povrchových teplot vemene v průběhu strojního dojení. *Ziv. Vyr.*, 35, 225-230.
- Králícková, E.**, 1984; The effect of different milking systems on the health state of udder. *Stud. Inform. ÚVTIZ Praha*, 5:,44.
- Kunc, P., Knížková, I., Koubková, M., Fluser, J. & Dolezal O.**, 2000a; Thermographic observation of the mammary gland responses to machine milking in dairy cows. *Physiol. Res.*, 49, P21.
- Kunc, P., Knížková, I., Koubková, M., Fluser, J. & Dolezal O.**, 2000b; Machine milking and its influence on temperature states of udder. *Czech J. Anim. Sci*, 45,VI.

Kunc, P., Knížková, I., & Koubková, M., 1999; The influence of milking with different vacuum and different design of liner on the change of teat surface temperature. *Czech J. Anim. Sci.*, 44, 131-134.

Malík, K., Mašková, A. & Vévoda, J., 1989; A thermovision study of the rubber teat cup function. *Plastics and Rubber – Special Issue*, 49-51.

Mašková, A., 1991; Termovizní měření povrchových teplot vemene v průběhu dojení. *Technická zpráva, VŠZ Brno*, 50.

Ryšánek, D. & Babák V., 1996; Kontrola funkce dojícího zařízení a zdravotní stav mléčné žlázy. *Proceedings of Current Problems in Production and Technology of Milk, České Budejovice*, 116-119.