# Milking characteristics of two liners

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## Summary

The Research Institute for Animal Husbandry in Lelystad and the IMAG institute in Wageningen have combined their milking machine research in the Dutch Expertise Group Machine Milking. The Expertise Group focuses on generating knowledge on the milking process. Improvement and fine-tuning of the milking process are key-issues. One of the research topics is liner research. On request of a milking machine manufacturer, two liners with the same type and dimensions, but different compounds, were compared with regard to milking time, average and maximum milk flow and teat end deformation.

***Key words***: *Milking characteristics, liners, milking, teat condition, teat end deformation*

## Materials and method

The tests were carried out at the experimental station "De Vijf Roeden" of IMAG-DLO at Duiven in 1998. The milking parlour is equipped with a quarter milking installation for each stall including facilities for accurate recording of the milk evacuation process per quarter. Machine milking parameters are adjustable per stall (milking and pulsation vacuum) or per quarter (pulsation rate and ratio). Switch off levels are adjustable per stall (udder) as well as per quarter. Teat end deformation is measured with a 200 VET scanner with a linear Array 7.5 MHz probe ultrasound scanner 200 VET, Pie Medical (Neijenhuis, submitted). For best probe application, the presence of air between probe and tissue examined must be avoided. Therefore the teat was immersed into water in a plastic bag and the probe with sufficient contact jelly was held against the bag. The water used had a temperature of approximately 35 ºC. The scanning device was connected to a computer. The real time scanning was shown on the terminal of the scanning device. When the picture of the teat was satisfying, the picture was frozen and exported to the PC. The measurements on the image of

the teat were done with special software of Pie Medical - Eview - Echo Image Viewer. Teat dimensions were determined at four different points: teat canal length, teat end diameter, teat wall thickness and teat cistern width as shown in figure 1.

The experiment was carried out with 12 HF cows. The liners were placed on the Babson RX-milk claw (internal diameters short milk tubes connection 10mm). Pulsation settings were in according with the guide lines of the manufacturer, e.g. 60 P / min and a 60 / 40-ratio at 42 kPa nominal vacuum.

The trial started with an adaptation period (standard liner), followed by two test periods. As far as milking characteristics were concerned, all data were collected on quarter level. The trial was set up as a split udder design with a cross-over. The milking characteristics were collected automatically by the milking parlour data recording system. Data were analysed by ANOVA (Genstat). Teat scans were carried out at one evening and one morning milking both in period 1 and period 2. The teat scans were carried out directly after pre-treatment, so before attachment of the milking cluster, and directly after cluster removal. Changes in teat diameters were analysed using a generalised linear model (REML-Genstat).

## Results

Milking intervals and quarter position showed significant effects on milking characteristics, so they were included in the statistical model. The results of the model are shown in table 1. Milking machine parameters like average and maximum milk flow rate, milk yield 3 minutes after attachment and machine on time did not differ between both liners.

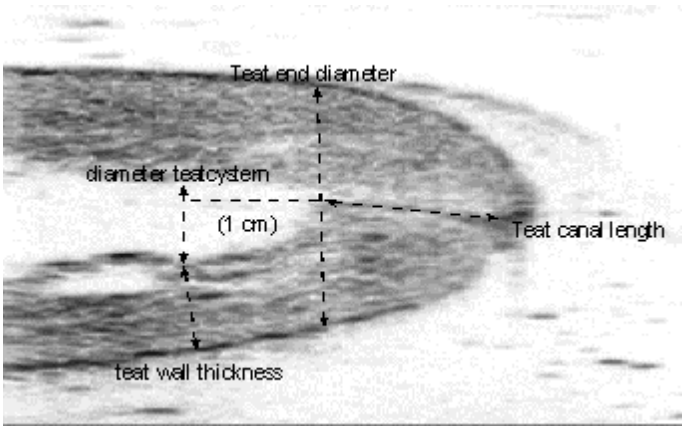


*Figure 1. Teat scan: explanation of parameters.*

*Table 1. Statistical results on milking parameters for two types of liners.*

| Parameter | Liner A | Liner B | s.e.d. | F-prob. |
|---|---|---|---|---|
| Milk yield (g) | 3 522 | 3 519 | 26.6 | 0.931 |
| Milk yield 3 min after attachment (g) | 2 296 | 2 295 | 30.5 | 0.976 |
| Mean milk flow (g/min) | 598 | 598 | 6.3 | 0.983 |
| Max milk flow (g/min) | 1 127 | 1 109 | 13.0 | 0.160 |
| Milking duration per quarter till flow < 50 g (s) | 329 | 334 | 4.0 | 0.189 |
| Mean milk flow till flow < 50 g (g/min) | 674 | 666 | 7.9 | 0.309 |

*Table 2. Change of teat parameters after milking (in %).*

| Parameters | Liner A | Liner B | s.e.d. | F.prob. |
|---|---|---|---|---|
| Teat canal length | 29.01 | 29.69 | 4.23 | 0.874 |
| Teat end diameter | 6.81 | 7.46 | 0.45 | 0.645 |
| Teat cistern width | -34.08 | -49.98 | 1.41 | 0.008 |
| Teat wall thickness | 50.73 | 62.48 | 6.30 | 0.062 |
| Surface area teat cistern | -48.66 | -67.40 | 6.90 | 0.015 |
| Surface area teat wall | 25.43 | 31.47 | 3.78 | 0.196 |
| Surface area teat end | 0.19 | 0.48 | 2.76 | 0.932 |

However there were some changes in the teat parameters after milking (Table 2.) Liner A showed a smaller increase ($P<0.1$) in teat wall thickness after milking than with liner B. There was a difference ($P<0.01$) between the two liners with respect to teat cistern diameter after milking. Teat cistern diameter after milking was bigger with liner B ($P<0.05$) than with liner A. So it was concluded that liner A exerted less pressure on the teat but with the same milking characteristics of liner B.

## References

**Neijenhuis F., G. H. Klungel, and H. Hogeveen**, Recovery of Cow Teats after Milking as Determined by Ultrasonographic Scanning, Journal of Dairy Science, submitted.