# The effect of two milking systems on bovine teat condition

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## Summary

The objective of the study was to measure the effect of wide-bore and narrow-bore milking principles on bovine teat condition and milking performance over a complete lactation. Teat-end hyperkeratosis (T.H), teat colour and teat textures are indicators of teat condition and were used to evaluate the effectiveness of the milking principles. Cows (n = 56) were milked as one herd with all milking units removed at a milk flow-rate of 0.2 kg / min. There was no significant difference shown in teat condition between the two milking principles. TH scores increased with stage of lactation, for front teats as compared to rear teats and where post-milking teat-disinfectant was applied. Differences in machine yield were recorded between the two milking principles at the AM milking. Where teat condition is used to evaluate different milking systems, the time of cluster removal should be controlled before accurate comparison can be made.

***Key words***: *Teat hyperkeratosis, machine milking, liner type.*

## Introduction

Maximum milk yield and reduced liner slip levels can be achieved using heavy clusters and wide-bore tapered liners (O'Callaghan,1989). An alternate milking principle incorporates a light cluster weight and narrow-bore liners. A survey of milking machines by Hillerton *et al*., 1998 showed poor teat condition where machines used the wide-bore liner milking system. Teat-end hyperkeratosis (TH) is a commonly observed condition in dairy cows and can result from mechanical damage from machine milking (Sieber, 1980). Wide-bore tapered liners with simultaneous pulsation give higher levels of milking vacuum than narrow bore liners with alternate pulsation (O'Callaghan and Gleeson, 1999). The objective of this study was to measure the effect of these vacuum conditions on teat condition and milking performance over a full lactation using two cluster types.

## Materials and methods

Autumn calving Friesian type dairy cows (n = 56), were assigned post calving to two milking treatments. Treatment 1 consisted of a heavy cluster weight (3.20 -kg) with a claw volume of 150 ml, wide bore tapered liners (31.6 mm –21.0 mm) and used simultaneous pulsation. Treatment 2 consisted of a light cluster weight (1.65 -kg) with a claw volume of 275 ml, narrow–bore liners (25.0 mm – 20.0 mm) and alternate pulsation. Cows were milked in a 14-unit swing-over side by side milking parlour, with the milk elevated into a 60 mm milk-line 1.4 m above the cow standing. The clusters were removed automatically when the milk-flow rate dropped to 0.2 -kg / min. The AM and PM milking interval was 18 and 6 hrs respectively. Teats were washed with running water and dried with paper towels before cluster application. Milk production (kg), milking time kg / min and peak milk flow-rate was recorded daily. A Chlorohexidine teat disinfectant was applied post milking to right-sided teats and left-sided teats were left untreated.

### Teat hyperkeratosis, teat texture and colour

Teats were scored for hyperkeratosis (TH) using five classifications scores (0=normal, 1=slightly raised smooth or broken ring, 2=moderate raised smooth or broken ring, 3=large smooth or broken ring, 4=extreme broken ring). Teat classification was carried out monthly after PM milking by the author using a miner's headlamp and a personal organiser to store data.

Machine milking can cause short-term changes in teat hardness and colour. Teats generally have a pink colour after milking, but some teats become reddened or blue. One operator unfamiliar with the milking treatments, classified teat barrels for teat texture by manual palpation and teat colour by visual assessment. The teats were scored for texture as soft, firm or rough. All cows teats were examined twice on consecutive days during mid lactation, and teats were classified within one minute of cluster removal. Statistical analyses were done using a Kruskal-Wallis one way analysis of variance test to compare teat scores between treatments. Teat score comparisons were also made for front and hind teats using the Wilcoxon matched pairs test.

## Results and discussion

There was no significant difference in TH scores for the two treatments at each month of classification or over the complete lactation (Figure1). TH increased with stage of lactation and was higher for front teats as compared to rear teats. TH was significantly higher for right-sided teats as compared to left-sided teats. An increased prevalence of TH has been reported to occur in dairy cattle during winter months particularly during cold weather (Timms, *et al*., 1997). Weather changes during the autumn / winter-milking period and wet teats due to teat-dip application, may explain the higher TH scores recorded with right-sided teats. The percentage of teats classified as soft, firm or rough and with pink or red colour are presented in table 1. The number of pink and reddened teats is presented as a percentage of light coloured teats. There was no difference

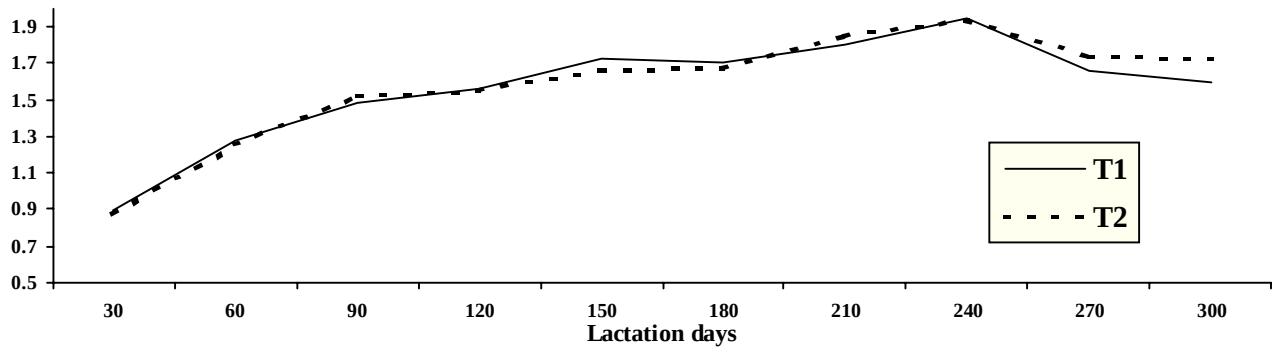


*Figure 1. Monthly teat-end scores for two milking systems.*

shown in teat texture or colour between milking treatments. Teat colour changes shown in previous studies were probably more related to over-milking rather than the teat-cup liner type used. The percentage of teats classified as soft was 19% and 47 % and rough was 34 % and 11 % for front and rear teats respectively. The poor teat texture found with front teats is probably due to some level of over-milking with front teats as compared to rear teats. Right-sided teats showed had higher percentage soft teats (43% v 24%) as compared to left-sided teats. The post milking disinfectant used on right-sided teats contained high levels of emollients and this may explain the better teat texture shown with these teats. The mean total lactation milk yields recorded were 5 465 kg and 5 267 kg for Treatments 1 and 2, respectively. Treatment 1 gave 5.2% and 0.5% higher milk yields at the AM and PM milking respectively, as compared to Treatment 2. The peak milk flow-rate was 3.6 and 3.2 kg / min at AM and PM respectively for both milking treatments. Peak milk flow-rate was higher for T1 during the 1st twelve weeks of lactation and for T2 during the last 12 weeks of lactation.

*Table 1. Effect of milking treatment and teat position on teat texture and teat.*

| | Teat texture | | | Teat colour | |
|---|---|---|---|---|---|
| | Soft % | Firm % | Rough % | pink % | Red % |
| T1 | 34 | 45 | 20 | 78 | 22 |
| T2 | 32 | 44 | 24 | 73 | 27 |
| Front Teats | 19 | 47 | 34 | 78 | 22 |
| Rear Teats | 47 | 42 | 11 | 82 | 18 |
| Right sided Teats | 43 | 38 | 18 | 83 | 17 |
| Left sided Teats | 24 | 51 | 26 | 76 | 24 |

## Conclusions

Milking systems with different levels of milking vacuum gave the same level of TH, colour and texture. This study unlike other studies compared milking systems under the same milking and herd management over a complete lactation. Differences in teat condition were shown where post-milking disinfecting was omitted, with front teats as compared to rear teats and stage of lactation. When teat condition is used to evaluate milking systems, stage of cluster removal, lactation days and post-milking disinfection should be considered. Machine yield and peak milk flow-rate obtained with specific types of milking units is effected by the magnitude of the milk yield per cow per milking.

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