TINE Rådgiving

CLASSIFICATION OF MOUTHPIECE CHAMBER VACUUM RECORDS IN MILKING-TIME TESTS

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Vacuum in the milking unit in milking-time tests gives information about the milking and the function of the milking machine. Traditionally, the vacuum at the teat end has been regarded as the key, but at present the vacuum in the mouthpiece chamber (MPC) of the liner has got more focus.
Basic research on the dynamics of MPC vacuum (Borkhus & Rønningen, 2003), the need for MPC vacuum (Mein et al., 1973) and the impact of MPC vacuum on the udder (Rasmussen, 1998) has been reported earlier.
Modern technology gives the possibility to acquire detailed records of vacuum in the milking unit. However, the knowledge on how to interpret these records limits the utilisation in advisory services. One step ahead was taken by the working group of the International Dairy Federation, "Milking-time tests, methods and interpretation" which worked on guidelines for measuring and interpreting vacuum in the milking unit during milking. Results from this work has earlier been reported by e.g. Rasmussen et al (2007) and Rønningen & Rasmussen (2008). Additional results on assessment of mouthpiece chamber (MPC) vacuum of the teatcup liner are reported here.

MATERIALS AND METHODS

The study was based on data collected by technicians in practical advisory work on Norwegian farms in 2002 – 2006. Vacuum records from one milking of 2077 cows on 265 dairy farms were analysed. The records included vacuum records for the MPC and the short milk tube. Data on milk quality and udder health were taken from the animal recording and herd health databases. Teat sizes were recorded by the technicians. The classification was subjective with three classes for length (Short/Medium/Long) and diameter (Thin/Medium/Thick). SAS Genmod procedures were used for statistical analysis. An identity model for normally distributed data on herd level was run for mastitis index, and logistic regression on cow level was used for analysing factors associated with high or low MPC vacuum.

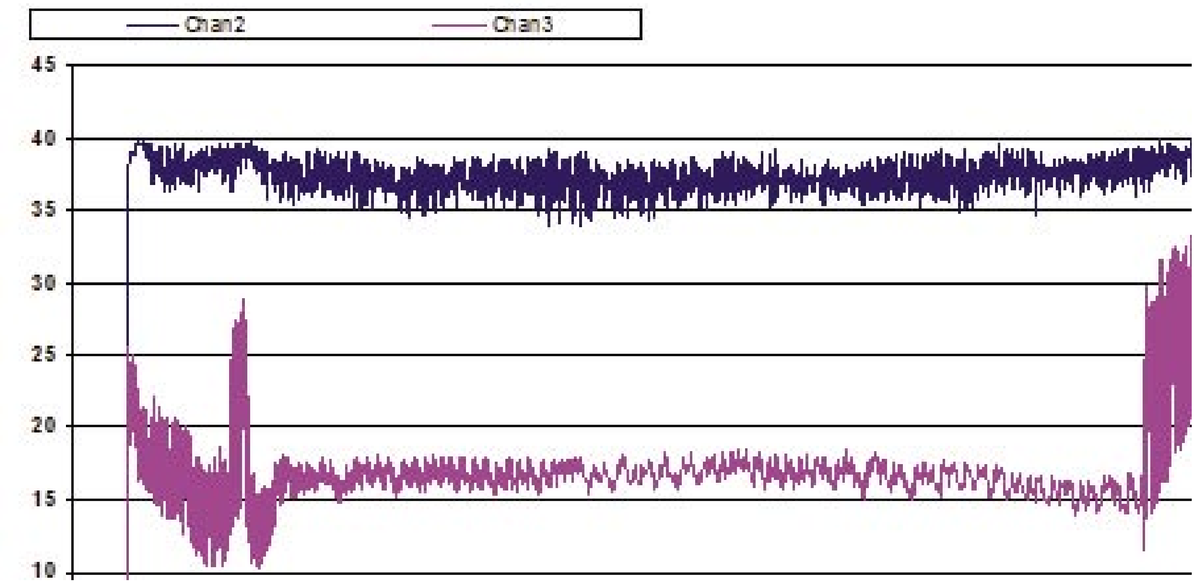

***Figure 1**. Vacuum in short milk tube and mouthpiece chamber of one teatcup during milking of one cow.*

RESULTS AND DISCUSSION

1. Association between MPC vacuum and udder health

Herd level data were analysed with mastitis index as dependent variable. Mastitis index is an indicator on the economic loss per litre of milk caused by mastitis, based on information from animal recording and herd health databases. The statistical model yielding the highest statistical significance is presented in table 1.

***Table 1**. Associations between mastitis index and factors listed. 212 herds remained after exclusion of herds with missing data.*

Independent variables	Coefficients
Proportion of cows with MPC medium vacuum (range 10 – 30 kPa) in the peak flow period [0 – 1]	-9,6352 **
Time from attachment to detachment of cluster [sec-	-0,023 *
Teat end vacuum in the peak flow period [kPa]	0,6555 (*)
Irregular vacuum drops at teat end per cow milking	0,2504 n.s.

*Significance: **=p<0.01; *= p<0.05; (*)=<0.1; n.s.=p>0.1*

Proportion of cows with medium MPC vacuum is in this study a very strong indicator on the effect on udder health on herd level. This is consistent with Rasmussen (1999), who found that low variation in MPC vacuum within herds was associated with poor udder health, and suggested that the explanation was that poorly adapted liners caused either a majority of high MPC vacuum or a majority of low MPC vacuum in a herd.
The remaining factors improved the statistical model, but are of minor importance compared with the MPC vacuum.

2. Factors affecting MPC vacuum

Summary statistics for factors associated with high or low MPC vacuum is shown in table 2. The proportion of milkings with high MPC vacuum is increasing with decreasing teat length, and with decreasing teat diameter, and the proportion of milkings with low MPC vacuum is increasing with increasing teat length and teat diameter. This is consistent with the findings of Borkhus & Rønningen (2003). The highest probability of medium MPC vacuum was with medium long and thick teats.

***Table 2**. Summary statistics of factors affecting the proportion of milkings with high or low MPC vacuum during peak flow period. 113 herds remained after exclusion of herds with unknown liner types.*

Independent variables	High (>30 kPa) MPC vacuum	Low (<10 kPa) MPC vacuum
Teat length class [Short, Medium, Long]	***	***
Teat diameter class [Thin, Medium, Thick]	***	***
Teatcup liner type [12 types]	***	*
SMT vacuum in peak flow period [kPa]	***	n.s.

*Significance: ***=p<0.001; *=p<0.05; n.s.=p>0.1*

CONCLUSION

The results show that MPC vacuum is a strong indicator on the aptness of the milking unit for the milked cows. Further, the significance of teat sizes and liner types are shown to be of major importance in controlling MPC vacuum.
These results can be utilized in practical advisory work in milking-time tests. The proportion of cows milked with a medium high mouthpiece chamber vacuum in the milking unit a key value on herd level that can be obtained in milking-time tests with MPC vacuum recording. Further, in case of unfavourable results, there is sufficient knowledge about MPC vacuum to prescribe measures to improve the performance. For example, one advice could be to select a liner more suitable for the teats in the herd.
The possibility of using MPC vacuum in evaluation of the milking process is implemented in the new vacuum diagnostics (VaDia) instrument.

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