THE IMPACT OF AUTOMATIC MILKING ON UDDER HEALTH

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Introduction

A rapidly increasing number of farms world-wide are milking automatically. The first commercial farm started in Holland in 1992 and Holland is still the leading country in number of farms with automatic milking systems (AMS). Many countries have followed since and AMS are being put in at a very rapid pace. Several farms in Canada milk automatically and the first commercial farm in USA started in year 2000. We foresee that AMS will not be for small farms with 60-120 cows only but will influence milking on bigger farms as well. The influence of automatic milking has been evaluated in Holland (Van der Voorst and Hogeveen, 2000) and Denmark (Justesen and Rasmussen, 2000) showing an increase in bulk milk total bacterial count, freezing point, and cell count. There may be technical as well as management reasons for these increases. An increase in bulk milk cell count may originate from an increase in the number of subclinically infected cows, an increase in clinical mastitis and lack of sorting of milk, or in a general increase in cow cell counts.

Automatic milking offers the possibility of more frequent and voluntary milking with respect to the needs of the cows and pre-set management decisions. The more frequent milking may have positive as well as negative effects on the udder health. Frequent milking flushes the teat canal more often during removal of the milk and leaves shorter time for bacteria to grow within the udder between milkings. However, the time between milkings may not be evenly distributed within and between cows where short (5 h) as well as very long milking intervals (> 18 h) can be observed. Short milking intervals leave shorter time for the teat tissue to recover whereas long intervals offer longer time for invading bacteria to multiply in the tissue. The milking technique used for automatic milking should benefit udder health and teat condition since it is mainly based on milking of the individual quarter. Many unknown factors contribute to the battle between the host and the bacteria and the influence of automatic milking on the udder health is so far speculative. The purpose of the present paper is to evaluate udder health from monthly cow cell counts in the year before and after installation of AMS on Danish farms.

Material and Methods

The Danish AMS sales companies reported dates of installation of automatic milking systems and individual cow cell count data were extracted from the National Cattle Database. Cow cell counts from 69 farms were recorded monthly and analysed from one year before the introduction of AMS to one year after. NewSCC200 was defined as the percentage of cows at each recording that for their first time had an individual cell count > 200.000 cells/ml and that is an indicator of the new infection rate (Dohoo and Leslie, 1991). NewSCC200 was counted in percentage of cows at risk i.e. cows not previously having had SCC > 200.000 cells/ml. The percentage of cows with elevated SCC (SCC200) was counted as cows with SCC > 200.000 cells/ml of all cows at each recording. Data were analysed by a mixed procedure including fixed effects of treatment (Conventional or AMS), Month (-12 to 12), Lactation number, and Month*Year. The effect of herd was included as random effect. Results are presented as Least Square Means.

Results and Discussion

The geometric mean cow SCC decreased over the year before installation of AMS but increased suddenly at the start of automatic milking (Figure 1). After a couple of months, the SCC settled again at a lower level. SCC of all milking cows at the record day is included in Figure 1 and consequently, this average is a mixture of uninfected, subclinically and clinically infected cows. The data were divided into cows that in general had SCC > 200.000 cells/ml and cows that exceeded this threshold for the first time (Figure 2). There was a sudden increase in New SCC200 when the farms started milking automatically. The frequency was higher throughout the first year with AMS than the previous year with conventional milking. Overall NewSCC200 increased from 9.7 to 15.4% and all lactation groups showed similar patterns (Table 1). Sixty-six out of the 69 farms experienced an increase in NewSCC200, indicating that farms with AMS experienced more new infections during the first year of automatic milking than in the previous year with conventional milking. The number of cows with elevated SCC decreased slowly after 3 months. SCC200 increased as well at the start of automatic milking but is a mixture of newly and chronically infected cows. The frequency of SCC200 was back to the levels of conventional milking after 4-5 months with AMS.

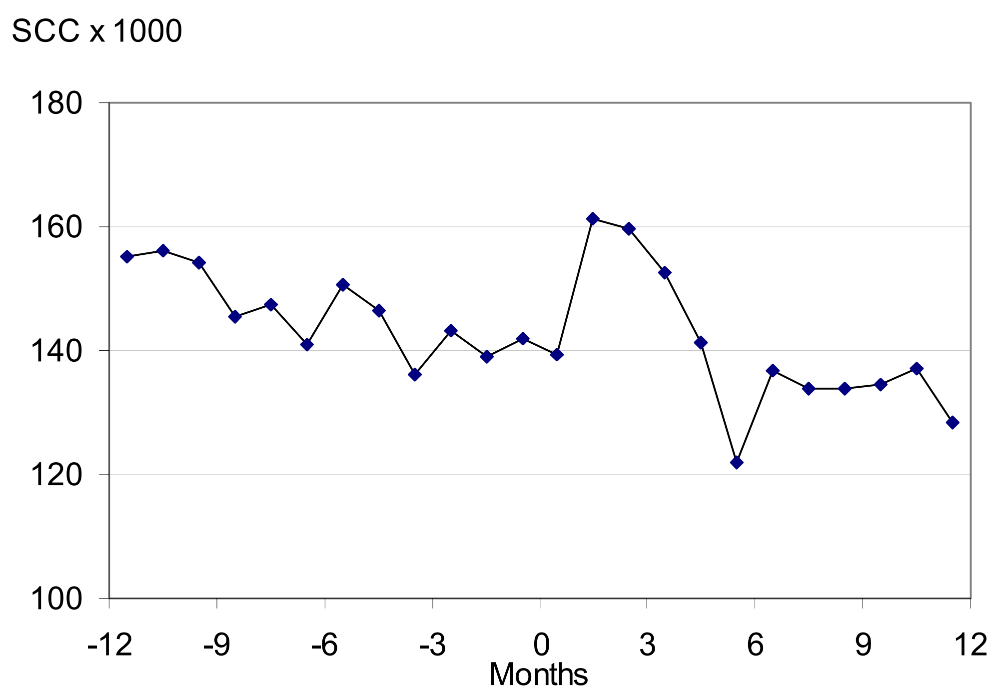

Figure 1. Geometric mean cow SCC from 12 months before to 12 months after installation of automatic milking on 69 Danish farms.

The increase in NewSCC200 was synchronised with the introduction of AMS on the Danish farms. An AMS is a quite different management system to operate than conventional milking and farming. The contact between herdsmen and cows is obviously lacking during milking and the control of diseases, such as mastitis, has to rely on either in-line measurements during milking, analysis of measurements during milking, or observations in the barn between milkings. The AMS alarm systems for detecting mastitis are mainly based on the measurement of conductivity during milking and designed to detect new infections at an early stage. Consequently, cows with new infections could have been treated before clinical outbreaks and SCC settled before the next milk yield recording. It seems as if this early warning system was either not used or was unreliable. However, the lack of detection of mastitis in general would mainly affect bulk milk SCC and not necessarily new infection rates.

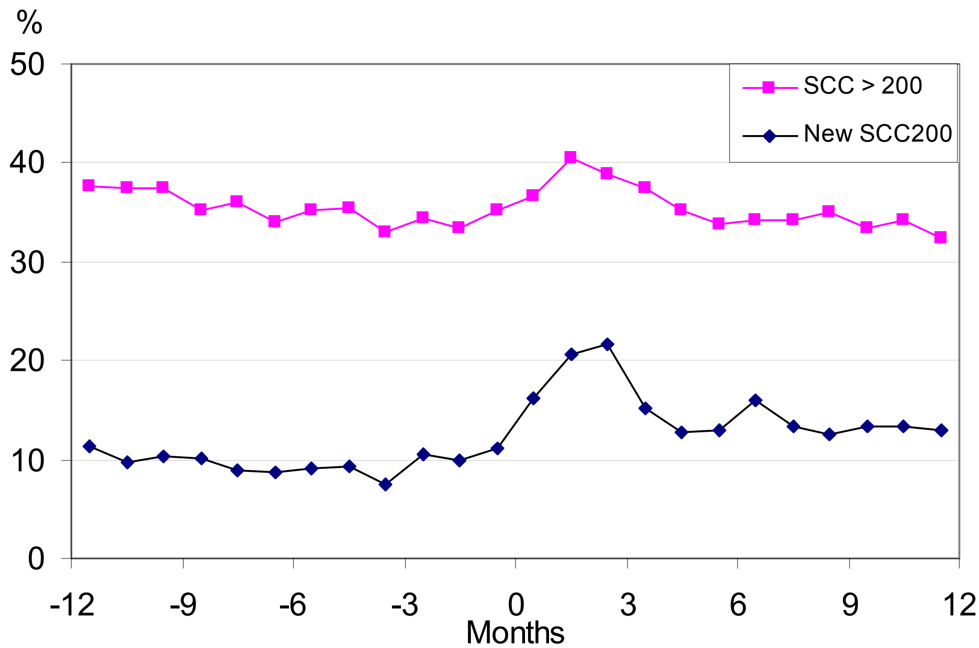

Figure 2. Cows with SCC > 200.000 cells/ml from 12 months before to 12 months after installation of automatic milking. New SCC200 is defined as the first time an SCC is > 200.000 cells/ml of an individual cow in percentage of cows at risk.

Renovation or new building of barns, which may have influenced the udder health, often accompanied the change in management system. New building is often done to improve facilities for the cows and consequently we could expect an improvement of the udder health. Most of our farms experienced a negative effect on the udder health suggesting that there are some general factors of the automatic milking that are not optimised. Cleaning of teats prior to milking is done automatically and if the pre-set time is not sufficient, the teats will enter the liner dirty. We have found an increase in spores of anaerobes of farms milking automatically and this could indicate insufficient teat cleaning (Rasmussen et al., 2001, unpublished results) and could as such increase the frequency of environmental mastitis. Improving the hygiene in the resting area and alleys for the cows could counteract the poor cleaning of teats.

AMS offer the opportunity of more frequent milking thus reducing the time for bacteria to multiply in the udder before they are flushed out again. However, more frequent milking also

Table 1. Cows with SCC > 200.000 cells/ml before and after installation of automatic milking. New SCC200 is defined as the first time an SCC is > 200.000 cells/ml of an individual cow in percentage of cows at risk (not having SCC > 200.000 cells/ml previously).

Variable	1st lactation	2nd lactation	Older cows	All cows
New SCC200 (at risk)				
Before, %	9.0	9.1	11.1	9.7 [a]
After, %	15.1	14.8	14.8	15.4 [b]
SCC > 200 000				
Before, %	20.3	35.0	48.3	34.5 [c]
After, %	27.0	39.3	51.5	39.3 [d]

[ab] Significantly different between, before, and after (P<0.001).
[cd] Significantly different between, before, and after (P<0.01).

leaves the teat canals open for longer time every day. We do not have conclusive material on technical measurements during milking. Milking vacuum is normally set at 42-44 kPa and the high vacuum (limited lifting height) is chosen to speed up the milking. The threshold for detachment at the end of milking is normally set at a low level to ensure complete milk-outs at each visit, but this results in frequent overmilking. These settings may compromise new infection rates but this is only speculation at this stage. Lind et al. (2000) conclude that a review appears to be necessary of how the ISO-standards for milking are fulfilled in AMS.

Conclusion

The Danish farms with AMS experienced a negative influence on the udder health measured by an increase in acutely elevated cell counts during the first year compared with the previous year with conventional milking. The increase came suddenly and was synchronised with the onset of automatic milking. The number of cows with elevated SCC decreased slowly after 3 months. We do not have a conclusive reason for the increase but suggest that more focus is needed on the introductory period.

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