Association of milking practices with DHI somatic cell counts in large Brandenburg dairy herds

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Summary

The association of milking practices with DHI somatic cell counts (DHI-SCC) was studied on 80 large dairy farms in Brandenburg, Germany, in 2002 and 2003. All farms were visited by the same veterinarian and milking practices were recorded using a standardized record sheet. To reduce the number of individual items in the analysis compound variables were extracted using factor analysis. The association of the milking practices with DHI-SCC was analysed for the current month and the average DHI-SCC of the last year.

Factor analysis for variables associated with milking management and routines derived three compound factors that combined two or three variables each. The first component was "use of water in the milking parlor" for udder and teat cleaning and cleaning of the parlor between cows. The second was "attention of the milkers" (detection of mastitis, reliability of teat dipping, use of cluster disinfection) and the third was "udder preparation" (material used for teat cleaning, forestripping). The range of values derived from the factor analysis was categorized into three classes, representing one third of the range each with low values being good and high values being bad.

Good values for use of water in the parlor were associated with lower DHI-SCC both for the current month and the last year than bad values (P=0.019 and 0.003, respectively). Attentive, keen milkers were associated with lower DHI-SCC than milkers that were less attentive (P=0.014 and 0.012 for the current month and the last year, respectively). In contrast, the component including material used for teat cleaning and method of forestripping was not significantly associated with SCC.

Results of the study indicate that it is crucial to sensitize milkers for the importance of proper milking routines and to remind them of their vital role for the udder health of a dairy herd.

***Key words**: Mastitis, milking practices, hygiene*

Introduction

Average bulk tank somatic cell counts (BMSCC) in Brandenburg were 241,000 per ml milk in 2003 (LKV Brandenburg, 2003) and did not differ much from recent years and other east German states. This is much higher than what is estimated as a healthy herd. However, BMSCC are not the whole story. There relationship to udder health is fairly week and a true estimate of the udder health in large herds is not possible. Average SCC from DHI data (DHI-SCC) varied between 297,000 and 341.000 in 2003 with an average of 308,000 cells / ml (LKV Brandenburg 2003).

The association of milking practices with udder health has been extensively studied in various countries. However, most of the studies are based on BMSCC data and a lot of the research was carried out on small or medium scale dairy farms in western Europe, or the north eastern states of the US. Hence it was doubtful if their results could be transferred to the situation of large scale east German dairy herds.

In a cross sectional study we therefore tried to estimate udder health and to identify factors that contribute to the high somatic cell counts of dairy cows in Brandenburg.

Material and methods

We included 80 of the approximately 850 dairy farms registered by the Brandenburg DHI service (Landeskontrollverband Brandenburg, Waldsieversdorf, Germany) in the study. Farms were chosen by convenience from the respondents of a questionnaire survey that we had carried out to collect preliminary data. Herd sizes were between 100 and 1100 cows per herd. Farms were visited once between July 2001 and October 2002. Information on housing conditions and management was collected using standardized recording sheets and entered into an MS Access database. DHI data on all cows on the farms were obtained from the LKV Brandenburg for the month when the visit took place and the year before the visit.

The multitude of single management items was reduced using factor analysis (Varimax – method) as provided by the SPSS package. Factor analysis aims at identifying the relationship between factors and at reducing the complexity of models by combining factors to compound variables. In the part of the study that is described here we included 8 variables that were combined to 3 compound variables. The association of the compound variables with the geometric mean of the DHI-SCC was analysed using univariate analysis of variance (UNIANOVA, SPSS Inc. Chicago).

Results

Average herd size was 300 cows with 56 % of the herds between 100 and 299 cows and 2 herds with more than 900 cows. Most herds were kept in loose housing systems with cubicles (80 %). A loose housing system with straw bedding was used in 6 herds and a combination of cubicle

and non cubicle loose housing systems was used by another 6 herds. 2 herds were kept in tie stall barns. Most of the cubicle systems (53 %) used straw as bedding material. Herringbone parlors were the predominant type of parlor used (65%), followed by rotary parlors (18%) and parallel parlors (9 %). Forestripping was common with most milkers using a strip cup (74%) or milking on the floor of the parlor (18%). Automatic cluster removal was common (97.5%). Automatic stimulation (41.3%) and automatic machine stripping (38.8%) were widespread. Most machines worked with a vacuum of 41 to 43 kPa (47.5%) or below (38.8%).

Postmilking teat disinfection was common (97.5%) and mostly applied with a dip cup (58/80, 72.5%) or a hand held sprayer (18/80, 22.5%). An automatic spraying system was used by 2 herds (2.5%). Cluster disinfection was also widespread. Two thirds of the herds (65.1%) used it consistently, another 3 herds used it after mastitis cows. An automatic disinfection system was used by 5 herds. However, in 4 of the 5 herds the system did not work properly.

The mean SCC (*1000 cells/ml) of the cows per herd was 372 with a range from 158 to754 in the current month and 366 (203 to 659) for the past year. 42 % of the cows had DHI-SCC of below 10^5, while 7 % had DHI-SCC higher than 10^6.

Good values for use of water in the parlor were associated with lower DHI-SCC both for the current month (P=0.019) and the last year (P=0.003) than bad values. The average category did not differ significantly from the other two categories.

Attentive, keen milkers were associated with lower DHI-SCC than milkers that were less attentive (P=0.014 and 0.012 for the current month and the last year, respectively). The worst category did not differ from the other categories. However, there were only 6 herds in that category, therefore the statistical power was low.

The component including material used for teat cleaning and method of forestripping was not significantly associated with SCC.

Discussion

Overall, udder health was not satisfactory in most of the study farms. Target values are > 60 % of cows below 10^5 cells/ml (Wendt et al. 1998) or less than 15 % of cows with more than $2.5*10^5$ cells/ml (Ruegg, 2003). In the herds studied, only 42 % of cows were below 10^5 cells/ml and about 25 % were above $3*10^5$ cells.

The factors included in the analysis were combined to three major compound variables. These were characterized by use of water in the parlor, attention of milkers and preparation routines.

The compound variable "use of water in the parlor" combined udder cleaning procedures on the one hand and use of water for cleaning the parlor during milking. Use of water to clean the udders before milking has been associated with high somatic cell counts in other studies (Moxley et al. 1978, Bartlett et al. 1992, Spohr 1998). Wet teats have a negative impact on machine milking and water dripping along the udder tends to carry bacteria to the tip of the teat, hence increasing the risk of mastitis.

Table 1. Results of the factor analysis on milking practices.

Compound	Variables	Categories	
Use of water in parlor	Use of a hose to clean udders	1.	never
		2.	rarely
		3.	frequently
		4.	always
	Cleaning of floor during milking	1.	after each cow
		2.	after each group
		3.	from time to time
		4.	never
	Cleaning of teats	1.	dry
		2.	humid
		3.	wet
Attention of milkers	Detection of clinical mastitis by foremilk screening	1.	always
		2.	not always
	Consistency of post milking teat dipping	1.	consistent
		2.	inconsistent
		3.	no teat dipping
	Cluster disinfection	1.	always
		2.	after mastitis cows
		3.	from time to time
		4.	never
Preparation routines	Method of udder cleaning	1.	paper towels
		2.	clothes and paper towels
		3.	more than 1 cow / towel
		4.	no cleaning
	Foremilk stripping	1.	strip cup
		2.	floor of parlor
		3.	plastic shield

Table 2. Geometric mean of SCC (GM SCC) and 95 % CI for month of visit and year before visit for the different compound categories.

			Month of visit		Year before visit	
Compound	Category	N	GM SCC	95% CI	GM SCC	95%CI
Use of water	Good	22	125[a]	110-144	123 [a]	110-139
	Average	41	149	135-164	152	139-164
	Bad	17	168 [b]	144-195	164 [b]	144-187
Attention of milkers	Good	54	135 [a]	124-147	136 [a]	127-147
	Average	20	168 [b]	146-193	166 [b]	147-187
	Bad	6	175	135-224	168	135-209
Routines of preparation	Good	52	143	131-156	143	132-155
	Average	19	156	135-182	153	135-175
	Bad	9	137	110-171	140	116-169

[a] vs [b]: values within compounds and columns differ significantly ($p < 0.05$)

The crucial role of attentive and accurate milkers has been pointed out in recent studies (Barkema et al. 1999, Barnouin et al. 2004). While it was common on the farms to do foremilk stripping and post milking teat disinfection there was a great variation in the consistency of the procedures. Teat dipping as such is rarely associated with good udder health because it is performed on most farms especially if a mastitis problem is recognized by the farmer. Therefore, there is no true control group of farms not using the measure. However, on several farms, teat dipping was officially applied but not consistently performed. The farm management thinks it is using a method to control mastitis but in fact it does not do so.

In line with that the compound variable combining the two procedures of udder preparation had no significant relation to DHI-SCC. About 80 % of the farms used single cow towels and on most other farms single cow towels were combined with wet towels in a bucket to clean the most dirty udders. Forestripping was performed by all farms. However, the differences between farms were in the accuracy of detecting mastitis which was not sufficient in 32 % of the farms.

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