



Relationship between udder health and hygiene on farms with an automatic milking system

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ABSTRACT

Poor hygiene is an important risk factor for reduced udder health. Because the teat cleaning process is done automatically on farms with an automatic milking system (AMS), hygiene management might differ. The aim of this study was to determine the relationship between hygiene and udder health on farms with an AMS at the farm level as well as at the cow level. Information on hygiene and udder health was collected on 151 Dutch dairy farms with an AMS. Teams of 2 veterinary students collected data with the use of a partially open-ended questionnaire and scoring protocols for hygiene of the cows, cleanliness of the AMS, and functioning of the AMS. Milk production records from the Dutch dairy herd information association were also collected. Stepwise general linear models were used to analyze the relation between hygiene and udder health at farm level. Dependent variables were average herd somatic cell count (SCC), the average percentage of new cows with a high SCC, and the incidence rate of clinical mastitis, all in the year preceding the farm visit. The annual average herd SCC was positively related to the proportion of cows with dirty teats before milking and the proportion of cows with dirty thighs. The annual average percentage of new cows with a high SCC was positively related to the proportion of cows with dirty teats before milking and the proportion of milkings where teats were not covered with teat disinfecting spray by the AMS. The annual incidence rate of clinical mastitis was positively related to the frequency of replacing the milking filters. At the cow level, hygiene scores of the udder, thighs, and legs (range 1 to 4, where 1 is clean and 4 is very dirty) were related with cow SCC from the milk production test day closest to the farm visit using a general linear mixed model. The relationship between cow SCC and the hygiene score of the udder was positive.

Key words: udder health, hygiene, automatic milking system

INTRODUCTION

The first automatic milking system (AMS) on a commercial farm was introduced in the Netherlands in 1992 (De Koning and Rodenburg, 2004). At the end of 2009, more than 8,000 commercial farms worldwide were milking with an AMS. In the Netherlands, almost 2,000 farmers are milking automatically (De Koning, 2010). Mastitis is a frequent and costly problem in many dairy herds (e.g., Halasa et al., 2007). In a recent study on conventional farms in the Netherlands, the average incidence rate of clinical mastitis (CM) was 30.3 cases/100 cows at risk per farm per year and the average bulk milk SCC (BMSCC) was 192,000 cells/mL (Jansen et al., 2009).

Udder health is at risk on farms with an AMS. Several studies have been published regarding the increase in BMSCC after the transition from conventional milking to automatic milking (AM; e.g., Van der Vorst and Hogeveen, 2000; Rasmussen et al., 2002). However, De Koning et al. (2004) found that BMSCC is increased only during the first 6 mo after transition. According to Klungel et al. (2000), BMSCC did not increase after introducing AM but was already higher before the change of system compared with other conventional herds. Contrary to BMSCC, quarter SCC decreased in an experimental study where AM was compared with conventional milking (Berglund et al., 2002). Any conclusions about the factors that cause these results and explain the differences found are hard to draw. Moreover, many more aspects than just milking technique change in the transition of the herd from conventional milking to AM (Poelarends et al., 2004).

On farms with a conventional milking system, BMSCC was lower when more attention was paid to hygiene management (Barkema et al., 1999). Schreiner and Ruegg (2003) found that udder hygiene scores and leg hygiene scores were significantly associated with cow SCC on 1,250 lactating dairy cows from 8 farms. An-

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other observational study on 1,093 lactating dairy cows from 8 farms showed significant relationships between cow SCC and hygiene scores of the udder and lower legs and the udder-lower leg composite score (Reneau et al., 2005). According to these results, hygiene aspects are also expected to be of importance in relation to SCC on farms with an AMS. Hygiene and hygiene management might even be more important because the automatic cleaning of the udder is a standardized process, so the cleaning of the udder cannot be adjusted to the dirtiness of individual cows. Some research had been done on the influence of poor hygiene on udder health on farms with an AMS, but knowledge on this subject is still poor. An observational study on 28 farms with an AMS in the Netherlands, designed to identify risk factors affecting milk quality, showed an increased BMSCC on farms with a poor overall hygiene (De Koning et al., 2003). Knapstein et al. (2004) determined significant differences in teat cleaning efficiency of different brands of AMS by measuring total bacterial count. Also, the initial contamination of teats had a significant influence on teat cleaning efficiency, independent of AMS brand. Several management factors associated with high teat contamination were found. However, no relationship was made with SCC and only 18 farms were included. The aim of the present study was to identify the relationship between hygiene and udder health on farms with an AMS.

MATERIALS AND METHODS

Data Collection

The Dutch dairy cooperative FrieslandCampina (Amersfoort, the Netherlands) approached 400 farms with an AMS in the Netherlands with the request to participate in the survey. From these 400 farms, 161 farms were willing to participate. From these 161 farms, 10 farms were excluded because they did not meet all the selection criteria for inclusion. Selection criteria were milking with an AMS for more than 1 yr, participation in the Dutch dairy herd information association, and no additional conventional milking. Finally, 151 farms were visited between May 2008 and November 2008. Data was collected during a 3-h farm visit using a partially open-ended questionnaire and scoring protocols for hygiene of the cows, cleanliness of the AMS, and functioning of the AMS. These 4 tools for collection are described in the next section. Each farm was visited by a team of 2 students from the Faculty of Veterinary Medicine (Utrecht University, Utrecht, the Netherlands). The questionnaire was explained to the students by experts who helped develop the survey. The students were trained by other experts in scoring

the hygiene of the cows, the cleanliness of the AMS, and the functioning of the AMS with the use of the 3 scoring protocols.

The Dutch dairy herd information association (Coöperatie Rundvee Verbetering, Arnhem, the Netherlands) collects milk production information on farms every 4 or 6 wk. They provided the milk production data, including cow identification, date of milk recording, test-day milk yields, and SCC for all cows. For each farm the milk production records in the year preceding the farm visit and the available milk production records after the farm visit were selected.

Survey Design

The questionnaire consisted of 45 questions divided in 5 parts: general information, AMS, housing, cow hygiene, and udder health. Definitions of variables (e.g., the definition of CM) as we used them were discussed while conducting the questionnaire. The contents of the 5 parts of the questionnaire are summarized in Table 1.

The 3 scoring protocols were used to gain information about the cleanliness of the AMS parts, the functioning of the AMS, and cow hygiene by visual inspection. The cleanliness of 8 AMS parts was scored for each robot present on the farm (range 1 to 4, where 1 = clean and 4 = very dirty). The functioning of the AMS was scored for 10 milkings at every farm. The functioning was measured by scoring the cleanliness of the teats before and after milking and by scoring 6 different procedures of the AMS, all with different scoring systems. Cow hygiene was scored for at least 10 lactating cows at every farm. Hygiene of the udder, thighs (upper portion of the hind limbs), and legs (lower portion of the hind limbs), was compared with model animals depicted in photographs on the hygiene scoring protocol and scored (range 1 to 4, where 1 = completely free of or has very little dirt, 2 = slightly dirty, 3 = mostly covered in dirt, and 4 = completely covered, caked-on dirt; Schreiner and Ruegg, 2003). The contents and scoring systems of the 3 scoring protocols are listed in Table 2.

Data Preparation

From the total of 151 visited farms, data from 7 farms were excluded from further analysis. From these farms, 4 farms were excluded because they had been milking with an AMS for less than 1 yr, 1 farm was excluded because no milk production information was available, 1 farm was excluded because cows were also milked conventionally, and 1 farm was left out because of a too-high proportion of missing values and some unlikely values (e.g., 0% of CM cases in the past year).

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