

Improvement of Hygienic Conditions of Teat Liners of Automatic Milking System using Slightly Acidic Electrolyzed Water



Safety and quality of dairy products start at the dairy farm. Dairy producers aim to ensure that the safety and quality of their raw milk will satisfy the expectations of the food industry and consumers (Codex 1996). The hygienic status of the automatic milking system (AMS) appears to be dependent on the environmental conditions of dairy housing and cannot ignore the spread of contagious pathogens via teat cup liners of AMS. The inner surface of teat cups of AMS after milking is basically treated by a cleaning system with a compressed air and clean water mixture without disinfectants. This process may involve not only the risk of transferring mastitis-causing pathogens via teat liners but also of an increase in bacterial counts in milk due to the lowering the hygienic condition of teat liners of AMS. The results from AMS farms indicate that milk quality, particularly in increase in bacterial counts, is negatively influenced after the introduction of AMS (Klungel et al. 2000; De Koning et al. 2004). Effective management strategies to minimize contamination of raw milk will help dairy producers achieve high quality milk on dairy farms. Slightly acidic electrolyzed (SAE) water, hypochlorous acid (HOCl), is an effective medium for killing bacteria and has been utilized for sanitization of the systems in food industries. This study was conducted to evaluate the effectiveness of SAE water for improvement of hygienic conditions of teat liners of AMS.

SAE-water (HOCl, pH6) produced by the system (PuresterR, Morinaga Milk Industry Co., Tokyo) was used for washing the teat brushes and rinsing the inner of the teat cup

liners of AMS. This study was performed in 2 dairy farms that use two types of AMS (Lely Astronaut, The Netherlands, and Delaval, Sweden). The modes of cleaning the teat cup liners and milking system are that the milking unit was rinsed after each milking with water without detergent and disinfectant as a unit flush. Samples were collected from inner surface of AMS immediately after rinsing with water or SAE water supply at each pre-milking event from cows for microbiologic evaluation. The cleanliness of inner surface of teat liners of AMS was also evaluated.

The OD values, parameter for cleanliness of inner surface of teat cup liners of AMS after rinsing with SAE water, were significantly lower than those of water supply. The values were clearly decreased after whole system cleaning. The number of viable bacteria in samples from the inner surface of teat cup liners of AMS was significantly decreased after rinsing with SAE water, compared to those with water supply. The viable bacteria counts in the inner surface of teat cup liners were clearly decreased after whole system cleaning. The ratio of viable to non-viable bacteria was markedly decreased by SAE water, compared with that of water supply.

It is obvious that reducing the number of pathogenic bacteria causing mastitis and bacteria on teats and in the teat cup liners contributes to the decrease of the risk for infections and to improvement in the milk quality (Codex 1996). The number of SCC and bacterial counts in bulk milk had increased gradually after the introduction of AMS in dairy farms (Klungel et al. 2000;

De Koning et al. 2004). To avoid chemical residues in raw milk, the use of disinfectants is not allowed, mains water supply is used for flushing and cleaning the teat cup liners of AMS before and after milking.

The properties of the SAE water such as bactericidal activity, safety, stability, influence on metals, and costs have been well characterized (Tomita et al. 1998). The effective speed of SAE water against microorganisms is 10 times faster in comparison with that of sodium hypochlorite solution. It contains no salts and its pH is neutral range. It barely causes any rusting in metals.

The number of bacterial counts in swab samples taken from the inner surface of teat cup liners of AMS was significantly decreased by using SAE water compared to that of water supply. This finding demonstrated that SAE water reduces the total bacterial count and proved to kill bacteria effectively. Not all bacteria were killed, however, though a significantly reduced number of bacteria was found in swab samples from teat cup liners after both unit flush and system cleaning. The use of SAE water for rinsing the teat liners after milking in AMS proved to be effective to reduce bacterial counts.

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