Bulk Tank Raw Milk Quality: Effects on Consumers and Survey-based Risk Assessments

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Introduction

Raw bulk tank milk (BTM) quality (SCC and bacteria burden) is used to quantify the health and safety of milk. Laboratory-based studies have demonstrated that milk with lower bacteria and somatic cell count produces milk products with superior quality attributes and shelf-life. Raw BTM is subjected to a number of tests to indicate udder health, milk harvest hygiene and storage conditions on the farm. These tests include, total bacterial count (TBC) (or standard plate count (SPC)), preliminary incubation count (PIC), laboratory pasteurization count (LPC) and coliform count (CC), as well as SCC. The objective of this study was to examine the relationship between raw BTM quality and consumer experience with fluid milk products and to survey on-farm risk factors for bacterial milk quality.

Materials and Methods

Bulk tank raw milk quality was evaluated on all Prince Edward Island (PEI) dairy herds (n = 235) over a two year period (March 2005 - March 2007). Biweekly TBC, PIC, LPC and CC, were conducted using Petrifilm (3M Canada, London Ontario). Weekly BTM SCC was conducted using a FOSS 4000 or FOSS 6000 (FOSS Electric, Hillrød Denmark). Data on individual farm milk quality was transferred on a weekly basis to the dairy co-op and were used to assign truck pickup routes. Milk from farms with superior quality, meeting four of five of the following criteria; TBC < 15,000 cfu/ml, LPC < 100 cfu/ml, PIC < 25,000 cfu/ml, CC < 25 cfu/ml and SCC < 200,000, was assigned to fluid processing. Using logs of consumer complaint data from the dairy co-op, an incidence rate ratio (IRR) comparing historic consumer complaint pattern to those after the truck route alteration was conducted. A mail out survey containing questions on farm management and hygiene was conducted. Association between management practices and BTM bacterial quality was examined using a linear multilevel model after log transformation of bacteria counts (TBC, PIC) and logistic multilevel model (LPC, CC)(STATA 9.0).

Results

There was a 58% reduction in the relative number of consumer complaints related to all aspects of fluid milk quality ($P < 0.05$) in the first 19 months of the study compared to the previous 26 months. Additionally, there was an apparent 48% reduction in the relative number of consumer complaints related to shelf-life, however, this was only marginally significant ($P = 0.06$). Of 235 producers, 153 (65%) completed the mail out survey. Season was a significant predictor for all bacterial counts. The models of TBC and PIC were very similar. Four additional variable groups were retained in the final model and were significant ($P < 0.05$). Udder cleanliness, udder preparation, acid wash frequency, and use of certain detergents were all associated with TBC and PIC. For LPC, having a water purification system decreased risk, while having a plate cooler and inadequate acid wash frequency increased risk. Finally, for CC, udder hair removal and automated bulk tank washing reduced risk, whereas herd size and inadequate acid wash frequency increased risk.

Significance

Regarding consumers, the results of this field trial validate the experimental data that suggest that milk of lower bacteria count and SCC results in a superior fluid milk product, with greater shelf life. From this study, it can be concluded that seasonal, equipment hygiene and udder preparation criteria are associated with high bacteria count in BTM.