# An Analysis of the Relationship between Wash Water Quality and Bulk Tank Milk Quality on Ontario Dairy Farms

**N. Perkins**[1], *MSc;* **D. Kelton**[1], *DVM, MSc, PhD;* **K. Leslie**[1], *DVM, MSc;* **K. Hand**[2], *MSc, PhD;*
**O. Berke**[1], *Dipl. Stat, Dr. Rer. Nat.*
[1] *Department of Population Medicine, University of Guelph, Guelph, ON*
[2] *CanWest DHI, Guelph, ON*

## Introduction

The Ontario dairy industry takes great pride in providing a high quality food product to the consuming public. Milk and milk products are an important part of the daily diet of most Ontario residents. Bacterial contamination of raw milk has a major negative impact on milk quality (Reed and Grivetti, 2000). Even though most milk is pasteurized prior to consumption, raw milk is consumed by some farming families and is used to manufacture some food products (Hegarty et al, 2002). One potential source of bacterial contamination of raw milk bacteria is the water used to clean the milking and storage equipment (Jayarao and Wang, 1999). The Canadian Quality Milk (CQM) program has established criteria for water quality on dairy farms. Initial testing has suggested that as many as half of Ontario dairy farms do not currently meet these water quality standards. Test results suggest that while some water may be contaminated at its origin, there is also significant contamination that occurs in the "plumbing", and is expressed as an elevation in bacteria counts at the point-of-use. The Dairy Farmers of Ontario (DFO) have begun a water quality-testing program, intended to decrease the risk of bacterial contamination of raw milk. The net benefit to the dairy industry will be to evaluate and document the improvement in raw milk quality attributable to compliance with the CQM program. The objective of the current study was to identify areas of high risk of wash water contamination and to investigate the relationship between bacteria-contaminated wash water and elevated Bactoscan bacteria counts in raw milk.

## Materials and Methods

Water quality analysis was conducted by DFO on an annual basis, during 2003 and 2004. The data obtained from the point-of-use water samples have been used to estimate the extent of bacterial contamination of wash water on Ontario dairy farms. These water quality data, matched with bacteria counts (Bactoscan determinations) in raw bulk milk during the same time period, were evaluated using linear regression to evaluate the relationship between water contamination and bacteria counts in raw milk. After controlling for total monthly milk production, average herd monthly SCC and season, the data was used to determine whether the presence of coliform and/or E. coli bacteria in the water was associated with an elevated Bactoscan level in raw bulk milk. In addition to regression analysis, the first water quality sample was utilized in a spatial analysis to quantify the prevalence of water contamination and to identify any case cluster formations within the data. An *E.coli* case farm was any farm that had >0 *E.coli* bacteria in wash water and similarly, a coliform case was any farm that had >0 coliform bacteria within the water sample.

## Results

The test results from the point-of-use wash water samples on Ontario dairy farms and the milk quality test results from the same time period were used in a linear regression analysis. Several factors were significantly associated with BactoScan levels in raw bulk tank milk. The final linear regression model with only significant (p<0.05) explanatory variables included: the presence of *E.coli* bacteria in wash water and an interaction between average herd monthly SCC and season and also an interaction between total monthly milk production and average herd monthly SCC. The spatial analysis performed separately for coliforms and *E.coli* identified one cluster of coliform cases and three clusters of *E.coli* cases in southern Ontario.

## Significance

The prevalence of bacteria in wash water is a concern within Ontario. Pasteurization does not kill all bacteria within raw milk. Therefore, milking equipment must be properly cleaned in order to ensure the production of a high quality milk product that is safe for the consumer.