Field investigation of *E. coli* contamination of a shallow vulnerable aquifer, Abbotsford, British Columbia

Andrea Mellor*
University of Calgary, Calgary, Alberta
afpmello@ucalgary.ca

and

Edwin Cey
University of Calgary, Calgary, Alberta

Previous studies have shown the Abbotsford aquifer has elevated nitrate concentrations as a result of widespread agricultural land use on the aquifer, and some of these same studies have implicated poultry manure as a major source of the nitrate. However, few studies have examined the potential for pathogen loading to this shallow, vulnerable aquifer despite the continued application of manure. The main goal of this field study was to investigate temporal and spatial patterns of bacterial loading to the Abbotsford aquifer. The field program included sampling of regional groundwater monitoring wells and installation of lysimeters for monitoring soil water. The monitoring program was targeted during the fall and winter months, when rainfall is greatest and leaching of contaminants through the soil is considered to be most likely. Twenty-five shallow monitoring wells were selected for sampling and analysis of fecal indicators (total coliforms and *E. coli*) as well as selected chemical parameters. A vadose zone test site was established with pan lysimeters at four 1 m by 1 m meter plots treated with poultry manure, potassium bromide, and fluorescent microspheres. The lysimeters will collect soil water leachate and monitor breakthrough of bacteria and the applied tracers. Initial groundwater monitoring results indicate *E. coli* was absent from all the monitoring wells and was detected only in a nearby creek. Likewise, lysimeter samples have only shown *E. coli* breakthrough at 30 cm depths on the order of 1 MPN unit in the 3 months after manure application. *E. coli* has not been found in either of the 50 cm depth lysimeters. As high levels of *E. coli* were initially measured in the manure, the relatively structureless soil appears to be effectively retaining bacteria in the upper portion of the soil profile and preventing mobilization to groundwater. Total coliforms (TC) have been detected repeatedly in several wells and lysimeters, although the source is not clear since TC can be present naturally in the environment. Preliminary conclusions suggest the consistent trend of high nitrate (above the drinking water guidelines) in many monitoring wells is not reflected in our results for *E. coli* detection. This suggests that *E. coli* is subject to different transport and attenuation processes than nutrients from the same manure source. In the end, the findings from this study will help provide a clearer picture of potential impact of pathogens on the Abbotsford aquifer and improve our understanding of microbial transport and attenuation processes.

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