

Escherichia coli and Cryptosporidium occurrence, transport, fate and reduction from dairy farm point and non point pollution sources

Aleksandra Drizo

University of Vermont and State Agricultural College

Grant Number: 2008-35102-19222

NON-TECHNICAL SUMMARY: Dairy farm point and non-point pollution sources can contain water borne pathogens (fecal bacteria and zoonotic pathogens) and therefore represent a growing public health risk. The purpose of this research is to quantify dairy farm pathogens *Escherichia coli* (*E. coli*) and *Cryptosporidium parvum* (*C. parvum*) in barnyard and milking operations wastewater and in feed bunk and farm ditch runoff generated during precipitation events, and to assess a novel steel slag filter technology for reducing these organisms from point and non-point dairy farm effluents in a cold northern climate. In addition, the effects of water quality parameters, such as phosphorus, suspended solids, and organic matter concentrations, on *E. coli* and *C. parvum* occurrence, transport and survival rates in dairy farm effluents and runoff will be evaluated. The objectives will be achieved by long-term monitoring (24 months) of *E. coli* and *C. parvum* occurrence in pollution sources and pathways, and after steel slag filter treatment, on two dairy farms in Vermont. Knowledge of the *E.coli* and *C. parvum* occurrence and transport, and in particular, the effects of water quality parameters on their fate and quantity in dairy farm point and non-point pollution sources, will significantly contribute to efforts aimed at controlling and eliminating these pathogens. The project will also test the efficacy of EAF steel slag filters as a practical and cost effective technology for pathogen reduction with potential for implementation in water quality policy practices.

OBJECTIVES: The long term goals of this project are to identify and quantify dairy farm pathogens (*Escherichia coli* and *Cryptosporidium parvum*) in barnyard and milking operations wastewater, feed bunks and farm ditch runoff generated during summer and winter precipitation, and to assess a novel steel slag filter technology for reducing these organisms from dairy farm effluents in cold northern climates. We aim to i) identify *Escherichia coli* (*E. coli*) and *Cryptosporidium parvum* (*C. parvum*) occurrence in point and non-point pollution sources at the University of Vermont (UVM) dairy farm; ii) to evaluate the effectiveness of the electric arc furnace (EAF) steel slag filter technology in reducing these pathogens from point (barnyard and milk house operations effluent) and non-point (Cross Winds dairy farm ditch, Grand Isles, VT) pollution sources; iii) to determine the fate of *E. coli* and *C. parvum* in EAF steel slag filters; iv) to assess the impact of water quality parameters, in particular phosphorus (P), total suspended solids (TSS), and organic matter (BOD5) concentrations, on *E. coli* and *C. parvum* occurrence, transport and survival rates in dairy farm effluents and runoff.