

## **Surfactant-Facilitated Transport of *Cryptosporidium parvum* in Soil**

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Grant Number: 2008-35102-19159

### **Justification:**

Agricultural land, feedlot runoff, and land application of manure are suspected sources of *Cryptosporidium parvum*, a parasitic protozoan responsible of Cryptosporidiosis outbreaks. To better understand the mechanisms by which the pathogen moves through soils and contaminates water resources, they must be studied under conditions representative of real-world scenarios, where both *C. parvum* and chemicals that affect their fate are present in soils. Surfactants occur widely in soils due to practices such as waste-water irrigation and the application of pesticides in surfactant solution sprays. They affect water tension and, consequently, the air-water interfaces in soil pores where *C. parvum* are retained. Thus we are conducting research on the surfactant-facilitated transport of *C. parvum* in soil.

### **Objectives:**

The ultimate objective of our research is to investigate how and to what extent surfactants may facilitate the transport of *C. parvum* in soil, thereby furthering our understanding of mechanisms of *C. parvum* movement through subsurface environments. Our specific research objectives are to evaluate the sorption and desorption of *C. parvum* oocysts onto soil particles in the presence of natural and industrial surfactant solutions, to investigate the mobility of oocysts in the presence of surfactants in structured and non-structured soil columns, to explore the effects of surfactants on fluid movement through uncontaminated, model, porous media by capillary rise and infiltration, and to develop recommendations for best management practices related to land application of surfactants for the protection of agricultural watersheds and public health from *C. parvum* outbreaks.

### **Progress to date:**

A PhD Student – Shooka Karimpour - has been recruited in Fall 2008 at the University of Illinois at Chicago for this research. Another PhD Student - Sina Arjmand – is scheduled to start on this research in Spring 2009 (pending US visa clearance) at the University of Illinois at Chicago. A recent MS graduate (Dec. 2008) – Mical Woldeselassie – has been recruited for a research internship at Utah State University (pending US visa clearance, due Jan. 2009). A comprehensive literature review on the fate and transport of *C. parvum* in the environment is being performed. We are reviewing protocols for the detection of *C. parvum* and preparing required safety protocols for conducting the batch and transport studies and analyses with *C. parvum*. We are concurrently developing the experimental apparatus for testing effects of surfactants on soil hydraulic properties. Four Utah agricultural soils have been characterized. We will select two with contrasting properties to use in the experiments.

### **Impacts:**

N/A