

Detection of *Escherichia coli* and *Giardia lamblia* in water irrigation systems and the long-term efficacy of portable water filters

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Abstract

Approximately 800 million people do not have access to clean water.^{1,2} Contaminated drinking water and lack of water for adequate hygiene can cause severe diarrheal illness.^{2,3} Diarrhea is the second leading cause of death worldwide in children under the age of 5.^{1,2,3} Over 800,000 child deaths occur every year due to diarrheal illness and 1.7 billion cases of diarrheal disease are reported are yearly.^{1,2,3} Improving the quality of drinking water could reduce diarrheal illness by 45%.² Water sanitation has the power to reduce 9.1% of the world's total disease burden.² In addition to contaminated drinking water, agricultural water sources are a significant cause of diarrheal disease.⁷ The FDA estimates 48 million cases of food-borne illnesses occur every year, which result in 128,000 hospitalizations and 3,000 deaths.⁷ The World Health Organization urges the importance of screening agricultural water sources and agricultural products for contamination to prevent food-borne outbreaks.³ Studies have shown that two of the most prevalent pathogens causing diarrheal illness are Enteroaggregative *Escherichia coli* and *Giardia lamblia*.^{1,9,10,11,12}

This study utilizes polymerase chain reaction and gel electrophoresis to identify the presence of the aforementioned pathogens in water collected from agricultural sites in Guatemala, Costa Rica and the United States. Samples collected in the United States were

evaluated for the presence of *E. coli* and/or other coliform bacteria. Additionally, this study tests the long-term efficacy of portable water filtration systems by determining the presence of *E. coli* pre- and post- filtration.

Results from the PCR protocol used in this study were inconclusive. Reexamination of the protocol is needed to produce more definitive outcomes. Evaluation of the filters 8 months post- initial use revealed that two of the three filters eliminated all *E. coli*. One of the three filters did reduce the number of coliform bacteria, but did not completely eliminate its presence. Further evaluation of the portable water filters is recommended to determine if they are an effective adjunct to the current water filtration systems.