

Lauren Hoyt, PharmD Candidate  
Catherine Santanello, PhD

## Background

- Nearly 800 million people worldwide do not have access to clean water.<sup>1</sup> Pathogens contracted from contaminated water can cause a plethora of severe symptoms, including diarrhea, dehydration, malnutrition and death.<sup>1</sup> Diarrhea is the 2<sup>nd</sup> leading cause of death in children under the age of 5.<sup>1</sup>
- FDA estimates that contaminated agricultural water is responsible for 48 million cases of food-borne illness, 128,000 hospitalizations and 3,000 deaths annually.
- Two of the most prevalent pathogens are Enterococci *E. coli* and *Giardia lamblia*.<sup>2</sup>
- Hands Helping Haiti currently uses biosand filtration systems to provide clean drinking water for Haitian citizens.<sup>3</sup> Portable water filters may provide a more economical and convenient adjunct. Longevity of portable water filters stored in suboptimal conditions has not been studied.

## Objectives

- Bring awareness to water contamination by identifying contaminated drinking/agricultural water sources and the pathogens that reside within.
- Provide a recommendation to Hands Helping Haiti for the adjunctive use of portable water filters

## Methods

- Water samples collected from agricultural irrigation sites, municipal water sources and wells in Guatemala, Costa Rica, Madison, Greene and Jackson counties in IL and MO River in STL
- Local samples tested for *E. coli* using Aquagenx® detection kits.
- DNA extracted using Qiagen DNeasy® Blood & Tissue Kit
- PCR and gel electrophoresis carried out to determine presence of EAEC and *Giardia lamblia* target genes
- Sawyer portable water filters tested using Aquagenx® detection kits, 8 months after initial use



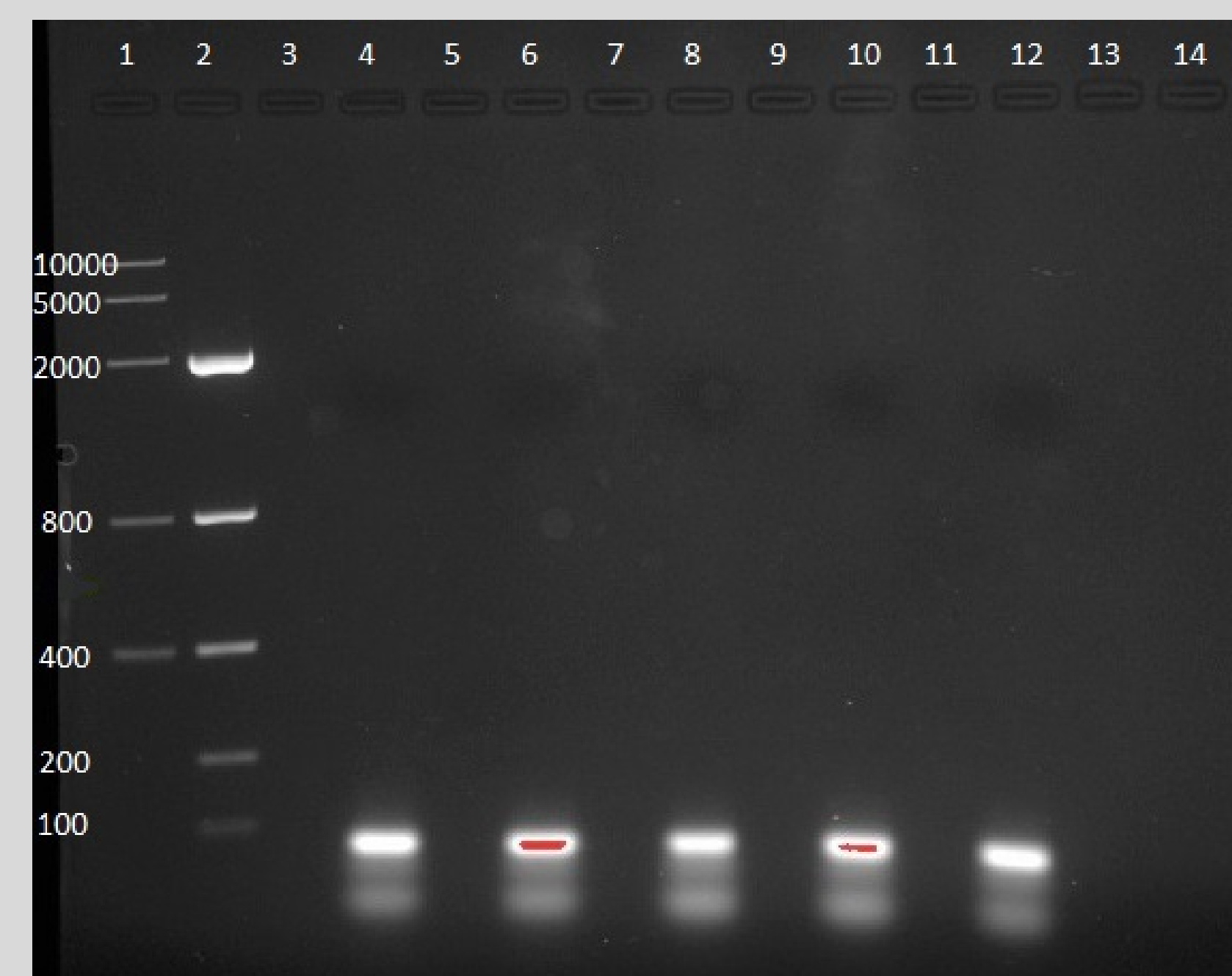
## Results of Initial *E. Coli* Testing

Aquagenx® kits detected the presence of *E. coli* in the surface water source and in one of the ground water sources. Consumption of or irrigation with either of these sources produces a health risk. Presence of *E. coli* in the two agricultural wells were undetectable and deemed safe to consume or use for irrigation.

Samples	Results	WHO Risk Category
Natural Spring	+	Intermediate Risk/Possibly Safe
Man-Made Reservoir	+	High Risk/Very Unsafe
Drilled Well 1	-	Low Risk/Safe
Drilled Well 2	-	Low Risk/Safe

## Results of PCR/Electrophoresis

Depicted is an example of EAEC gel electrophoresis results. Bands were expected at 618 bp for EAEC and 463 bp for *Giardia lamblia*. Primer-dimer artifact was seen throughout all gels in this study. Due to the absence of bands for the positive control, samples can neither be determined as positive or negative.



## Results of Water Filter Testing

Aquagenx® kits showed that filters 1 and 2 eliminated all detectable *E. coli*. Water from these filters was safe for consumption. Though filter number 3 improved water quality, results were still unsatisfactory.

Samples	Results	WHO Risk Category
Pre-Filtered Water	+	High Risk/Very Unsafe
Filter 1	-	Low Risk/Safe
Filter 2	-	Low Risk/Safe
Filter 3	+	Intermediate Risk/Possibly Safe

## Discussion

- Water collected at levels above the bedrock (ie. lakes, some springs, and bored or dug wells) are very susceptible to contamination. Wells that are drilled, collect water below the bedrock and are more resistant to contamination. Depth of the water source is an important factor when supplying drinking water or water for agricultural irrigation.
- Results from electrophoresis and gel imaging were inconclusive. Reevaluation of the protocol is needed to produce more conclusive results.
- From the results, Sawyer portable water filters are not recommended until further studies can be done. Increasing the number of filters being tested and the amount of time from initial use would strengthen the recommendation for Hands Helping Haiti. Future studies should test other portable water filters in hopes to make safe drinking water accessible to all people around the world.

## Limitations

- Due to COVID-19 delays and time constraints, PCR/electrophoresis protocol was not able to be adjusted and reexamined
- Some international water samples were up to 3 years old
- Small number of filters tested

## References

- Global Water, Sanitation, & Hygiene (WASH) [Internet]. Centers for Disease Control and Prevention. CDC; 2016 [cited 2021Jan29]. Available from: [https://www.cdc.gov/healthywater/global/wash\\_statistics.html](https://www.cdc.gov/healthywater/global/wash_statistics.html)
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- Water Project [Internet]. Haiti Water Project. Hands Helping Haiti; 2021 [cited 2021Jan29]. Available from: <https://haitiwaterproject.org/>

