

Executive Summary

Prevalence of Potentially Pathogenic Bacteria, Protozoans, and Helminthes in Drinking Water from Sources Located in Jacsonville and Throughout the Matabonite Region of Central Haiti.

Submitted by

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This report provides water quality data for water collected from eleven wells, two rivers, and one spring located in Jacsonville and throughout the Matabonite Region of Central Haiti. Water was tested for the presence of total and fecal coliforms, *Escherichia coli*, and *Vibrio* spp. using the membrane filtration technique and selective media. After incubation, bacterial colonies were counted and isolates chosen for tentative identification using the API 20E Identification System. In addition, water from all sites and soil samples collected from two of the sites were microscopically examined for the presence of potentially pathogenic protozoans and helminthes. Based on drinking water guidelines set by the United States Environmental Protection Agency (USEPA) and the World Health Organization (WHO) all water samples assessed during this study require treatment prior to consumption, particularly for populations most at risk for acquiring the associated diseases. Seven water sources met recreational standards issued by the USEPA and would be suitable without treatment for bathing purposes.

The number of coliforms in water samples ranged from 3.0 (Jacsonville Mission Sites-Back and Front) to 3.1×10^5 (Bouyara and Guape Rivers) colony forming units (CFU) per 100 ml of water filtered. Bacterial strains isolated and identified in water included *Pseudomonas luteola*, *Enterobacter cloacae*, and *Aeromonas hydrophilia*. Up until recently these organisms were not thought to be important water borne pathogens, but new concerns have been raised because of increasing incidences of bacteremias, septicemias, pneumonias, and wound infections caused by these organisms in both immune competent and susceptible individuals (immune compromised, children, and the elderly). *E. coli* was detected in seven of the fourteen water sources sampled suggesting that water from these sources had contact with contaminated waste. *E. coli* pathotypes cause diseases ranging from traveler's diarrhea to hemorrhagic colitis and hemolytic-uremic syndrome. It is strongly encouraged that water from sources contaminated with *E. coli* are treated prior to consumption.

While the majority of acute diarrheal diseases are caused by bacteria, common chronic diarrheal infections are caused by protozoans. The protozoans *Giardia*, *Entamoeba*, *Endolimax*, and *Cryptosporidium* trophozoites and cysts were found in eight of fourteen water sources. Eggs of the helminth, *Ascaris lumbricoides*, were

detected in one of the water and one of the soil samples. While *Ascaris* was the only parasitic helminth detected during this sampling event, it raises concerns about the possible presence of other parasitic worms such as *Wuchereria bancrofti* and *Trichuri trichiura*.

The best way to treat microbially-contaminated water is the use of heat. Unfortunately, fuel for boiling water in Haiti is scarce. The most reliable, accessible, and cost-effective alternatives to boiling are solar water disinfection (SODIS) and chemical disinfection, but specific conditions must be met in order for these technologies to be effective. It must be emphasized that this study provides data for only one sampling event. To better assess the quality of water throughout the Matabonite Region and in Jacsonville, identify trends in water quality as result of seasonal and climatic events, and provide specific details on how to best treat the water, the following actions are suggested:

- 1-Acquire a comprehensive data set that details water quality over time by routinely sampling and enumerating fecal coliforms, *Enterococci* and/or *E. coli*, from water sources in the region at least quarterly and after significant rainfall events;
- 2-Collect turbidity data during water sampling; and
- 3-Analyse water samples for the presence of other contaminants (for example, nitrate, phosphate, metals, and halogens).

The regular sampling and assessment of water quality could be performed by members of the community with minimal training and equipment. Data collected after routine sampling could be used to determine if water treatment is necessary, and if warranted, what pretreatments (filtration and/or flocculation) are needed. It would also be advisable to bring in well drilling expertise to inspect the drinking water wells and make repairs or disinfect the wells, as necessary. With a comprehensive water quality program that integrates data related to disease outbreaks and incorporates health statistics of individuals (particularly with the identification of at-risk members of the community), appropriate drinking water and recreational standards could be developed and implemented by the members of the community of Jacsonville and the Matabonite Region.

To view the full report, please visit *InSight: Rivier Academic Journal*, Volume 9, Number 2, Fall 2013 at <http://www.rivier.edu/journal>.