Is *Helicobacter pylori* present in surface and treated water samples in Aklavik, NWT?

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**Abstract**

**Background:** The community of Aklavik, NWT has a high prevalence of *Helicobacter pylori* infection which is associated with stomach inflammation, peptic ulcer disease and stomach cancer. Since 2007, this community has participated in the Aklavik *H. pylori* Project carried out by the Canadian North Helicobacter (CANHelp) Working Group. Community members expressed concern that drinking water may be a source of *H. pylori*. Scientific evidence has shown that in remote Arctic communities, filters were cultured in brain heart infusion-yeast extract broth or on agar containing 5% horse serum and antibiotics under microaerobic conditions.

**Objective:** To test Aklavik water sources for the presence of *H. pylori* organisms.

**Methods:** Environmental surface water samples and domestic treated water samples were collected around Aklavik in summer 2013. Aklavik residents and members of the *H. pylori* project planning committee guided researchers on locations for water sampling. Water samples (200 mL) were collected in replicate in sterile polyethylene bottles containing sodium thiosulfate. 10 mL from treated water from indoor taps and 10 mL from untreated surface water (by the hand-dip method) were collected around the community. Samples were stored at 4°C overnight before air shipment to the laboratory for analysis. Each set of triplicate treated water samples were filtered through one 0.4 μm membrane. Each of the triplicate untreated water samples were divided into two 100 mL aliquots and individually filtered to perform the vacuum filter setup. From each water filter, filter organisms were cultured in brain heart infusion-yeast extract broth or on agar containing 5% horse serum and antibiotics under microaerobic conditions at 37°C. To detect *H. pylori* genetic material, they were first extracted from the filter by the phenol-chloroform method for DNA, and by the TRIzol method for RNA. Extracted DNA was tested for the presence of *vaca* mRNAs by reverse transcriptase PCR to detect living *H. pylori* organisms. The protocol for detecting live *H. pylori* was confirmed by using serial dilutions of 24-96 pg DNA.

**Results:** The DNA test using *H. pylori* 26695 was able to detect 90 ng of *vaca* mRNA which represented 10,000 colonies. For a 100 mL water sample, this corresponds to 100 colonies per ml water. DNA and RNA tests of *H. pylori* vacA and cagA genes were positive in respective samples. The DNA and RNA results were also confirmed by gel extraction from treated water filters and no *H. pylori* DNA or RNA was found on the filters.

**Conclusion:** The test results do not provide evidence that filtered water sources contain *H. pylori*. It is possible that the limitations of the methods used in this investigation prevented its detection. In particular, these methods require a sufficient number of organisms in the tested sample volume. Larger volumes of samples may be required to detect the bacteria. It is not known what concentration of *H. pylori* organisms is required for water to be an important source of infection in the community.

**Acknowledgements**

Test results do not provide evidence that Aklavik water sources contain *H. pylori*. It is possible that the limitations of the methods used prevented its detection.

- Continue to evaluate environment samples for the presence of *H. pylori*
- Collect and test water samples at different times of year
- Continue to improve methods to detect viable *H. pylori*