

Project title: Surface Water Quality in Iqaluit, Nunavut

RESEARCHER NAMES AND AFFILIATIONS:

- **Sherilee Harper**, University of Guelph
- **Jamal Shirley**, Nunavut Research Institute
- **Jean Allen**, Nunavut Research Institute
- **Stephanie Masina**, University of Guelph
- **Anna Manore**, University of Guelph

PROJECT LOCATION

After consultation with various Iqaluit stakeholders, three water sampling locations were identified:

- 1) Sylvia Grinnell River, Iqaluit 2) Apex River, Iqaluit 3) Stream near airport, Iqaluit

TIMEFRAME

Water Sampling: June 15, 2016 to October 31, 2016

PROJECT DESCRIPTION

REASONS FOR THE WORK

- 1) **Waterborne Disease:** Rates of diarrhea and vomiting are generally high in Northern Canada. Diarrhoea and vomiting can be caused by contaminated water, food, or person-to-person contact. There are three types of contaminants that can cause diarrhea and vomiting: bacteria (e.g. pathogenic *E. coli*), parasites (e.g. *Giardia* and *Cryptosporidium*), and viruses.
- 2) **Community-based Water Quality Monitoring in Iqaluit:** The Nunavut Research Institute (NRI) runs a very successful community-based water quality monitoring program. NRI's program monitors the quality of surface water that many Iqaluit resident collect and drink. NRI's program is establishing important temporal baseline data to better understand how different environmental and meteorological conditions impact surface water in Iqaluit. NRI's program also contributes to important training for Northerners.
- 3) **Waterborne Pathogens:** NRI's program currently monitors physical parameters of water (e.g. water temperature, etc), and also monitors two types of bacteria in the water (total coliforms, and *E. coli*). While the program does monitor bacteria, the program does **not** currently monitor parasites in water.

GOAL & OBJECTIVES

The goal of this proposed project is to enhance NRI's community-based water monitoring program to include testing for parasites. The objectives are to:

- 1) Estimate the estimate the prevalence of *Giardia* and *Cryptosporidium* parasites in surface water;
- 2) Identify the association between parasite and bacteria prevalence in water;
- 3) Identify environmental and meteorological conditions that increase the risk or *Giardia* and *Cryptosporidium* in surface water;
- 4) Examine molecular source attribution of *Giardia* and *Cryptosporidium* parasites in water to explore where the pathogens are originating from;
- 5) Share the study results with local partners, community members, and the scientific community; and
- 6) Co-develop a parasite testing training module for use in educational programs in Northern Canada.

METHODOLOGY

COLLECTION PROTOCOL

Approach: The protocol was developed over 18 months of consultation with Iqaluit partners. Partners identified what water sources will be tested, by whom, and for what pathogens. Indeed, partners identified the three sampling locations, identified the NRI personnel to conduct the water collection and testing, and selected *Giardia* and *Cryptosporidium* parasites as the focus of this study.

Bacteria Testing: Local personnel will be hired and trained to collect raw water samples (120 mL) in sterile bottles for testing using IDEXX Colilert® Quanti-Tray®/2000 following the manufacturer's instructions (IDEXX Laboratories, 2007) to detect the most probable number (MPN) of total coliforms and *E. coli* per 100 mL. All testing will be done onsite by local personnel, in accordance with NRI's existing protocol for total coliform and *E. coli* testing.

Parasite Testing: Local personnel will be hired and trained to collect raw water samples (25-50 L) for testing. Water will be pumped through IDEXX Filtamax® cartridges following the manufacturer's instructions (IDEXX Laboratories, 2002). The IDEXX cartridges will be stored in plastic bags, kept cool, and shipped to a lab in Guelph, Ontario for analysis.

Sampling Timelines: Up to 3 samples/week at 3 locations will be collected from June to August, 2016.

POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

The environmental impacts of this project are predicted to be minimal. Surface water samples will be collected from three sources that are easily accessible by public roads in Iqaluit (e.g. existing roadways). A small team of 3 trained field researchers will visit the collection sites 3 times/week to collect water using sterile sampling vessels, and to record water chemistry parameters using a portable field probe. Each sampling event will require no more than 1 hour on site. Water samples will be immediately transported to the NRI laboratory in Iqaluit for filtration and testing. No fuel, chemicals or other hazardous materials will be utilized for sample collection; and the research team will not camp overnight at any field site. We do not anticipate that water sampling will impact water quality or quantity.

OTHER INFORMATION

- **Location Justification:** This project takes place in the city of Iqaluit because this is where NRI's community-based water monitoring program is established.
- **Structures erected:** None.
- **Waste management and spill contingency plans:** N/A

DATA USES & OWNERSHIP

The data will be used to:

1) Meet the study objectives: Estimate the prevalence, identify environmental and meteorological risk factors, and examine molecular source attribution of *Giardia* and *Cryptosporidium* parasites.

2) Share the results: A MSc thesis dissertation and peer-reviewed publications will be written to share the study results with the scientific community. Results will also be shared through public presentations, engagement with local media, and in person meetings in Iqaluit.

3) Create a training module: Based on the procedures developed for use in the North and the data that are gathered, a training module for testing water for pathogens will be developed for use in educational programs in Northern Canada.

Data Ownership: While the data will be used in a University of Guelph MSc thesis dissertation (Stephanie Masina), the data will belong to the NRI. As such, the NRI owns the data that will be produced through this project, and will control data access and use.

NORTHERN ENGAGEMENT AND CONSULTATION

Iqaluit Community: Effective and ongoing knowledge translation, extension, and communication is a key aspect of this research and is one of the five main objectives of this project. We spent over 18 months developing the study protocol to reflect and respect local priorities, interests, and priorities. We are still doing ongoing consultation to ensure the results dissemination methods used will be both useful and widely accessible. We plan to host annual meetings and stakeholder workshops. For government and community stakeholders, we plan to keep them up-to-date with regular email updates and upon completion of the project we will create a results dissemination booklet and policy-focused report. At a community level we aim to have community events to discuss methods, results, and project outcomes. We will also be conducting annual reports, policy briefs, and press releases to share project results throughout the project.

Scientific Community: We anticipate one MSc thesis dissertation and at least two academic peer-reviewed papers will be published as a result of this research. These publications will be made available to all stakeholders, government workers, and community members. Local partners will be co-authors on all publications. NRI will approve all reports before they become publicly available.

Summary of Past Consultation: The following list outlines the individuals present at the February 10, 2016 consultation meeting held at the Nunavut Research Institute, to determine which pathogens should be investigated, and what water should be tested.

Individual	Organization
Taha Tabish	Quajigiartiit Health Research Centre
Wanda Joy	Department of Health
Amanda Winegardner	INAC Water Resources
Kristine Hutchinson	Government of Nunavut Public Health
Greg Thibault	Government of Nunavut Environmental Health
Naudia Lewis	Government of Nunavut Public Health
Mary Ellen Thomas	Nunavut Research Institute