

Assessing Water Quality, Microbial Risks and Waterborne Pathogens in Rural Areas Using a One Health Framework

This research project, led by Dr. Sylvia Checkley, aims to identify and characterize risk factors relating to groundwater contamination in Alberta through use of geographic information system (GIS) mapping and spatial analysis, to assess microbial risks associated with shiga-toxin producing *E. coli* (STEC), antimicrobial resistance (AMR), and viruses. The results will be compared with work previously and concurrently carried out using the current drinking water quality identification standards (total coliforms and *E. coli*) in Canada. The project also aims to better understand livestock producers' perceptions of the source of and importance of well-water contamination to determine how this affects their management decisions.



Wellhead on rural property. Photo S. Checkley



RECIPIENT:

University of
Calgary



PARTNERS:

Alberta Agriculture
and Forestry



TOTAL BUDGET:

\$1,206,430



AI FUNDING:

\$466,430



PROJECT DATES:

SEPT 2014 -
MAY 2020



PROJECT TRL:

N/A

APPLICATION

The findings of this project will inform decision-makers at all levels. For livestock producers this will relate to providing information about risk factors and management decisions that can influence water well contamination. For government decision-makers this will relate to providing information regarding uptake of provincial programs such as free water testing, barriers to water testing and how to address these issues, and the methods used to identify bacterial contamination in well water.



ALBERTA INNOVATES CLEAN RESOURCES

ENVIRONMENTAL INNOVATION

WATER INNOVATION

PROJECT GOALS

The key objectives of the project are:

- To perform a retrospective survey of archived *E. coli* positive samples isolated from well water samples submitted to ProvLab (Alberta Precision Laboratories), to detect whether these *E.coli* are resistant to antimicrobials and whether they are shiga-toxin producers (STEC).
- To prospectively sample well water within a sentinel area for the presence of bacteria and viruses.
- To describe patterns of STEC and antimicrobial resistant organisms in well water.
- To perform source tracking of fecal contamination in *E. coli* positive wells.
- To examine well owners' perceptions of water quality and contamination and the influence of their perceptions on their management practices.
- To provide information to decision-makers on implications for human, animal and environmental health.

BENEFITS TO ALBERTA

The knowledge generated by this project will result in:

- Better understanding of the potential risks related to well water confirmed to contain fecal contamination.
- Identification of wells that are consistently compromised when current water testing standards fail to detect that contamination, leading to improvements to standard methods used to identify well water contamination.
- Refinement of a well vulnerability risk assessment tool used by the health authorities to make assessments based on the physical characteristics of the well.
- Development of new policy guidelines to promote uptake of free well water testing in the province.
- Partnership between researchers and the Alberta Health Services to encourage best practices for water well management.



6 Publications



7 Students
Trained



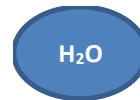
6 Project Jobs



5 Future Jobs



1 New
Products/Services



Water Quality
Protection

CURRENT STATUS

JUNE 2020: COMPLETE

Objectives 1-5 have been successfully completed. Five years of archived *E. coli* positive water samples were examined to identify if these bacteria were resistant to antimicrobials or were shiga-toxin producing *E. coli*. Some results have been published in the *Canadian Journal of Microbiology* *Canadian Water Resources Journal*, and the *Journal of Undergraduate Research*.