

# PROJECT SNAPSHOT

## 4A: Does Antibiotic Use and Wastewater Treatment Encourage the Development of Antimicrobial Resistance?

Pillar: Prevention of Transmission

Theme: Innovation and Commercialization

Keywords: Wastewater; Treatment; Disinfection; Horizontal Gene Transmission; AMR Evolution



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### AIM

The goal of this project is to understand if current wastewater treatment and disinfection processes are encouraging the development of antimicrobial resistance within wastewater treatment facilities and whether receiving environments act as reservoirs for antimicrobial elements.

### WHY IS THIS IMPORTANT?

If treatment processes encourage or facilitate antimicrobial resistance development, changes to those processes or the addition of new disinfection strategies will be required to protect environmental and human health. This is particularly relevant to the development of water reuse strategies and options.

### OUTCOMES

- 1 An understanding of the risk of current treatment and disinfection processes to facilitate AMR development
- 2 An understanding of the role of receiving environments as reservoirs for AMR elements (genes, bacteria)

### RESEARCH QUESTIONS

- 1 What ozone (O<sub>3</sub>) dose and contact times lead to complete wastewater disinfection?
- 2 What bacteria survive current O<sub>3</sub> dosing regimes?
- 3 What variation of AMR is present in municipal wastewater treatment plants and their receiving environments?
- 4 What are the rates of horizontal gene transmission in environmental reservoirs?

### OUR APPROACH

- 1 We will manipulate the O<sub>3</sub> dose and contact times, followed by the measurement of wastewater disinfection endpoints. We will then identify treatment survivors (species or functional groups).
- 2 We will survey wastewater treatment plants and agricultural (dairy and beef) operation's wastewater isolates for antimicrobial resistance.
- 3 We will grow periphyton communities on unglazed tiles in replicated, naturalized research streams to evaluate the changes in antimicrobial elements over time.

### ALIGNMENT WITH THE AMR - ONE HEALTH CONSORTIUM

#### LEVERAGED SOURCES OF SUPPORT

Department of Biological Sciences, Department of Civil Engineering and Faculty of Veterinary Medicine, University of Calgary • Alberta Innovates

#### KNOWLEDGE & TECHNOLOGY EXCHANGE AND EXPLOITATION

- Recommendations regarding ozone dose and contact times plus quantification of the nature and amount of antimicrobial resistance, including antibiotic resistance, will be translated to utilities and regulators.

#### TRAINING OF HIGHLY QUALIFIED PERSONNEL

- 4 PhD
- 4 Summer BSc Research Associates

**AFFILIATIONS:** ACWA Advancing Canadian Wastewater Assets An Urban Alliance initiative



Lakeland COLLEGE

