ACWA

Advancing Canadian Wastewater Assets

An Urban Alliance initiative

There is growing appreciation that wastewater treatment plants (particularly disinfection processes) and receiving environments play important roles in the development, transmission, evolution and persistence of antimicrobial resistance. ACWA provides unique infrastructure to evaluate treatment process options at bench to pilot scale, plus controlled, replicated receiving environments in which to evaluate the presence, type and effectiveness of antimicrobial resistance, including antibiotic resistance.

ACWA is a research facility focused on research and development, piloting, and demonstrations of leading-edge wastewater treatment technologies, plus evaluation of associated receiving environment effects. ACWA contains a leading-edge analytical lab, four experimental tertiary treatment modules that treat over 500,000 L/day of wastewater, and 12 fully-contained (clay-lined) experimental, naturalized, replicate streams that total over 3.8 km, in which assessments of receiving environment effects can be conducted. ACWA has three additional laboratories (aquatic toxicology; microbiology and gene sequencing; and stable isotope) on the University of Calgary campus and maintains an active network of researchers in disciplines ranging from wastewater engineering, chemistry, ecology, microbiology and public health. Students can draw on these researchers to contribute their expertise to projects as needed.

We seek graduate students (PhD preferred but exceptional MSc candidates will be considered) to work in a collaborative environment to address the following general research objectives:

1. Determination of water treatment ($Cl^-$, UV and $O_3$) resistance of isolates from wastewater treatment plants in Alberta by examining dose and contact times and associated disinfection kinetics at bench and pilot scales
2. Expand current collections of *E. coli* pathotypes from wastewater treatment plants to determine genomic stress-resistance features contributing to water treatment resistance, including antibiotic resistance.
3. Determine environmental transmission and persistence of isolates in receiving environments by evaluating the environmentally-persistent nature of these isolates, whether they act as a reservoir for horizontal gene transmission with other environmental microbes to enhance their own environmental persistence.
4. Develop a bioinformatic database on the 'stressome' of selected isolates, such as *E. coli*, to understand the genetic characteristics that contribute to their evolved resistance phenotype and gene targets that are candidate markers to track the emergence of water treatment resistance.
5. Contrast the degree of antibiotic resistance in municipal wastewater and agricultural (dairy and beef production) operations to add agriculture, companion animals and environmental waters to existing surveillance systems that have been established.
6. Determine whether the presence of antimicrobial resistance elements actually confers resistance to those elements in environmental samples.

Students with strong engineering/science/toxicology backgrounds wishing to pursue a PhD degree in the above areas are particularly encouraged to apply. Candidates will be selected based on their documented knowledge in one or more of the 6 areas above, written and oral proficiency in English, the capacity for analytical thinking, the ability to collaborate, and their creativity, initiative, and independence. Assessments will be based on previous experience and grades, references, relevant experience and understanding of engineered systems and processes, microbiology or aquatic ecology and the candidate's written motivation for seeking the position. Experience studying genomics or transcriptomics and an understanding of bioinformatics pipelines is highly desirable. Interviews may occur in person or via electronic means.

More information regarding ACWA can be found here: ucalgary.ca/acwa. Inquiries can be directed to Dr. Lee Jackson, Scientific Director, ACWA.