PROJECT SNAPSHOT

9A: Wastewater treatment-adapted organisms as a model to understand environmental AMR

Pillar: Surveillance

Theme: Policy Economics and Sustainability

Keywords: Wastewater Effluents; Pathogens; Treatment; Resistance

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CO-INVESTIGATOR(S): Paul Stothard, PhD

AIM

To investigate a wastewater sample bank from Alberta to identify ESKAPE pathogens, with an initial focus on the coliforms Klebsiella spp., Enterobacter spp., and Citrobacter spp., to identify wastewater treatment resistance and AMR through whole genome sequencing.

WHY IS THIS IMPORTANT?

Drinking water treatment and waste sanitation are the most important public health intervention strategies for control of infectious diseases. Water treatment is recognized as the most cost-effective intervention for infectious disease control, but our research has demonstrated that there are strains of E. coli highly adapted to resist waste-water treatment and that these strains possess a variety of diverse and concerning AMR genes.

OUTCOME

Scientific information and data to inform the development and revision of current wastewater treatment guidelines at the provincial, national, and international levels.

RESEARCH QUESTIONS

1. Do treated wastewater effluents in Alberta contain strains of ESKAPE pathogens that are resistant to typical wastewater treatment mechanisms, such as chlorination, heat, and ozonation?
2. Do these strains possess AMR genes and phenotypic resistance?

OUR APPROACH

1. Develop an expanded library of Klebsiella spp., Enterobacter spp., and Citrobacter spp. from treated wastewater effluents.
2. Validate chlorine-, heat-, and antibiotic resistant phenotypes of isolates.
3. Comprehensive evaluation of whole genome sequencing (WGS) and comparative genomic and phenotypic analysis of chlorine-, heat-, and antibiotic resistance in clinically relevant strains of Klebsiella spp., Enterobacter spp., and Citrobacter spp. surviving water treatment.

ALIGNMENT WITH THE AMR - ONE HEALTH CONSORTIUM

LEVERAGED SOURCES OF SUPPORT

Alberta Innovates grant • CIHR (Environments and Health Programmatic Grant in Intersectoral Prevention Research)

KNOWLEDGE & TECHNOLOGY EXCHANGE AND EXPLOITATION

- Scientific publications and conference abstract presentations.
- Future interactions with municipal, provincial, and federal governments on wastewater reuse frameworks and guidelines.

TRAINING OF HIGHLY QUALIFIED PERSONNEL

- 2 PhD
- 1 MSc
- 2 Research Assistants

AFFILIATIONS: UNIVERSITY OF ALBERTA CENTRE FOR HEALTHY COMMUNITIES, A CENTRE OF THE SCHOOL OF PUBLIC HEALTH; UNIVERSITY OF ALBERTA

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Alberta Government