# PROJECT SNAPSHOT 3C: Molecular Epidemiology of Antimicrobial Resistance in Enterococcus From Poultry, Cattle, Humans, and the Environment

Pillar: Surveillance

Theme: Innovation and Commercialization

Keywords: Enterococci; Comparative Genomics; Virulence;

Antimicrobial Resistance



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#### AIM

1 Characterization and comparison of antimicrobial resistance phenotypes and genotypes in Enterococcus spp. isolated from cattle feces, poultry feces, and beef and poultry retail meats in Alberta, Canada as it relates to surveillance.

# **RESEARCH QUESTIONS**

1 What is the role of the environment in transmission or maintenance of bacteria and genes that convey antimicrobial resistance?

2 Antimicrobial resistance in Escherichia coli isolated from food animals, retail meat, and water samples in Alberta: Comparative genomics and molecular epidemiology

3 Modelling Antimicrobial Resistant Enterococcus Spp. in the Canadian Beef Industry: A One-Health Approach

#### WHY IS THIS IMPORTANT?

Enterococcus and E. coli are bacteria that are part of the normal flora of intestines and feces of humans and animals. They can cause difficult-totreat infections in people due to resistance to antibiotics. They may carry genes that convey resistance to antimicrobials, which are of high importance in human medicine. They can be used as an indicator of fecal contamination in water samples. Z How have genomics been used to contribute to surveillance for AMR in Enterococcus spp?

3 How related are E. faecium and E. faecalis isolated from different sources?

- 4 What is the distribution of specific mobile genetic elements and AMR genes in E. faecium and E. faecalis across different sources?
- **b** How are AMR phenotypes and genotypes associated?

# **OUR APPROACH**

We use a One Health approach to investigate this issue. We will complete a scoping review as well as use comparative genomics, molecular epidemiology, and sophisticated bioinformatics tools with an extensive "One Health" collection of enterococci from humans, livestock, poultry, sewage, surface water, lagoons, and meat processing plants. In addition, use of an integrated assessment model and other epidemiologic techniques will be used to look at specific associations between outcomes and risk factors.

#### ALIGNMENT WITH THE AMR - ONE HEALTH CONSORTIUM

## LEVERAGED SOURCES OF SUPPORT

Agriculture and Agri-Food Canada • Alberta Agriculture and Forestry • Alberta Graduate Excellence Scholarships • Genomics Research and Development Initiative • Natural Sciences and Engineering Research Council of Canada • Public Health Agency of Canada • University of Calgary, Faculty of Veterinary Medicine: One Health Training Award; VMS Recruitment Award

## OUTCOMES

Inform surveillance and policy through better understanding of the relatedness of enterococci isolated from different sources, modelling Enterococcus and E. coli and antimicrobial resistance gene transmission dynamics, comparison of resistant phenotypes and genotypes.

2 Information that supports the mitigation of AMR.

# KNOWLEDGE & TECHNOLOGY EXCHANGE AND EXPLOITATION

- Identification of new tools for the management AMR throughout the One Health environment
- Validate tools and develop operating procedures for adoption by industry

# **HIGHLY QUALIFIED PERSONNEL**

- 1 Postdoc Fellow
- 2 PhD
- 1MSc
- 1 Summer Student



Aberta Government

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