University of Prince Edward Island

Faculty of Veterinary Medicine
Summary of Dissertation

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DEGREE OF MASTER OF SCIENCE

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Antimicrobial resistance of *Campylobacter* spp. in Canadian dairy cattle: Phenotypic comparisons across livestock commodities and genotypic characterization of dairy isolates

Campylobacter spp. are leading bacterial causes of foodborne illness and commonly carried asymptomatically by livestock. Antimicrobial resistance (AMR) is a major public health concern. AMR in *Campylobacter* spp. has been studied extensively in poultry but remains less well characterized in dairy cattle despite their roles as reservoirs for human infection.

The objectives of this thesis were to characterize the occurrence and AMR of *Campylobacter* spp. in Canadian dairy cattle, place these findings in comparative context using data from four other livestock commodities, and evaluate agreement between phenotypic resistance and selected genotypic AMR determinants in dairy-derived isolates. This retrospective cross-sectional study used pooled fecal samples collected through national surveillance in 2019 and 2020 from dairy cattle, feedlot cattle, grower-finisher swine, turkeys, and broiler chickens. *Campylobacter* isolates were identified to species level and assessed using phenotypic antimicrobial susceptibility testing (AST).

Generalized estimating equations evaluated predictors of *Campylobacter* recovery and AMR outcomes. Dairy cattle isolates were further characterized using whole genome sequencing, and Fisher's exact tests were used to assess associations between phenotypic resistance and genotypic determinants. *Campylobacter* recovery differed by livestock commodity, sampling year, and quarter of the year, with a significant interaction between commodity and quarter. *C. jejuni* predominated in dairy cattle, turkey, and broiler chicken samples; *C. coli* was more frequently recovered from swine and feedlot cattle. Phenotypic AMR was more common in *C. coli*

than *C. jejuni* across commodities. Multidrug resistance (MDR; resistance to 3 antimicrobial classes), was uncommon and occurred more frequently among *C. coli,* within dairy cattle, MDR was limited to a small number of *C. jejuni* isolates.

Phenotypic resistance showed strong agreement with *tet*(O) and resistance-associated *gyr*A mutations for tetracycline and fluoroquinolones, respectively. These findings support integrating phenotypic AST and genomic approaches for AMR surveillance in food animal populations, including dairy systems.

Presentations

MacNeil L, Fonseca M, Heider L, Sanchez J. *Phenotypic antimicrobial resistance comparisons of* Campylobacter *spp. isolated from Canadian dairy farms.* American Society for Microbiology Microbe, Houston, TX; June 2023. *(Poster presentation).*

MacNeil L, Deckert AE, Fonseca M, Sanchez J, Heider L. *Antimicrobial resistance profiles of* Campylobacter *isolated from Canadian dairy, beef, swine, turkey, and broiler farms in 2019-2020.* Canadian Association of Veterinary Epidemiology and Preventive Medicine (CAVEPM) Conference; Guelph, ON; May 2023. *(Oral presentation)*.

MacNeil L, Fonseca M, Heider L, Sanchez J. *Phenotypic comparisons of* Campylobacter *species Isolated from Canadian dairy farms*. UPEI Graduate Studies Research Days; Charlottetown, PE; October 2022. *(Oral presentation)*.

Biographical Data

Born in Kitchener, Ontario