

Implementation, impacts and economic aspects of selective dry cow therapy and selective treatment of clinical mastitis in Canadian dairy herds

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Project objectives are: 1) assess prevalence of antimicrobial resistance (AMR) in mastitis pathogens in Canadian dairy herds; 2) identify herd- and cow-level criteria for implementing selective dry cow therapy (SDCT) and treatment of clinical mastitis (CM); 3) evaluate impacts of selective DCT and selective treatment of CM on farm-level parameters; 4) determine whether selective DCT or selective CM treatment reduces AMR prevalence in mastitis pathogens; 5) estimate economic impacts of selective practices (DCT and CM treatment) considering Canadian settings; and 6) develop practical standard operating procedures (SOPs) for selective DCT and CM treatment. In order to achieve a representative sample enrollment criterion will include 60 dairy farms with different management practices across Alberta, Quebec, Ontario, and Atlantic Canada. The proposed study will contribute to producer knowledge of their resistance levels, as well as the overall AMR prevalence in the Canadian dairy industry, and assessment of adopted AMU reduction practices. Re-evaluating the AMR prevalence on dairy farms with enacted management changes will greatly contribute to the understanding of effectiveness in AMR mitigation efforts through selective treatment practices. This project will have a major emphasis on knowledge transfer with written reports and producer meetings, as well as provide practical performance-based standard operating protocols that could be adapted to the industry as a whole. Overall, this project will identify best practices related to AMR, improving dairy farm profitability, animal welfare, public health, and consumer confidence.

Take home message: We expect that by using social sciences to facilitate peer-to-peer learning as well as developing standard operating protocols will motivate producers and veterinarians to use antibiotics more prudently. As more countries regulate specific antimicrobial classes, we ultimately hope this self-regulation of AMU will strengthen industry resilience.

Determinants of antimicrobial resistance patterns in bovine mastitis *Streptococcus* isolates from Canadian dairy herds

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The emergence and spread of antimicrobial resistance (AMR) is a global burden that threatens animal, human, and environmental health. The development of AMR in livestock production industries produces a serious risk towards our food security. In Canadian dairy herds, intramammary infections causing clinical and subclinical mastitis are the most common reason for antimicrobial use (AMU). *Streptococcus* spp. are among the most important groups of bacteria causing clinical mastitis worldwide, and unnecessary use of critically important antimicrobial drug classes against these pathogens may further the risk of a high AMR prevalence. Therefore, we aim to investigate the molecular epidemiology of *Streptococcus* spp. in Canada, including determining the prevalence and risk factors of AMR. Whole-genome sequencing (WGS) of approximately 1000 bovine mastitis *Streptococcus* isolates from the Mastitis Pathogen Culture Collection of the Canadian Bovine Mastitis and Milk Quality Research Network will provide deep insight into determinant genes and mechanisms of AMR, and allow for phylogenetic analysis for species- and strain-level comparisons. Phenotypic AMR will also be explored by broth microdilution against 20 antimicrobials commonly administered in livestock and human medicine. Risk factors for phenotypic AMR prevalence and multidrug resistance will be explored against AMU rates, route of antimicrobial administration, *Streptococcus* WGS information, and herd-level farm and production parameters. Phenotypic and genotypic analyses are currently being performed.

Take home message: As the dairy industry is pushed towards more stringent antimicrobial stewardship practices, changes to policy regulations and herd management practices must be based on quality research. Correspondingly, the data to be presented from this comprehensive surveillance of *Streptococcus* mastitis isolates will uncover the magnitude of AMR levels across Canada and will provide intense understanding of AMR determinants and risk factors for researchers and dairy industry professionals alike.