

University of Prince Edward Island

Faculty of Veterinary Medicine
Summary of Dissertation

Submitted in Partial Fulfilment
of the Requirements for the

DEGREE OF DOCTOR OF PHILOSOPHY

Dr. Thitiwich Changtes
Department of Health Management

Supervisory Committee

Dr. Kathryn Proudfoot, Chair
Dr. Javier Sanchez, Co-supervisor
Dr. Luke Heider, Co-supervisor
Dr. Henrik Stryhn
Dr. Russell Fraser
Dr. Shawn McKenna
Dr. David Hall

Examination Committee

Dr. Bronwyn Crane, Chair
Dr. Emily John
Dr. Luke Heider
Dr. David Hall
Dr. Greg Habing, External Examiner

Dairy-beef production in Atlantic Canada and a methodological approach to assess temporal changes in minimum inhibitory concentration for monitoring antimicrobial resistance

Dairy-beef production is an important component of the beef supply in Atlantic Canada. Bull calves and non-replacement heifers (hereafter referred to as "surplus calves") are a key component of dairy-beef production. Due to suboptimal management practices, surplus calves are more likely to be susceptible to infections, which may lead to frequent antimicrobial use and the development of antimicrobial resistance (AMR) in pathogenic and foodborne enteric bacteria, posing challenges to dairy-beef production and public health. The overall objectives of this thesis were to 1) describe current dairy-beef production systems and antimicrobial use practices that may contribute to AMR development in Atlantic Canada, and 2) to demonstrate the application of generalized logistic regression models for detecting temporal changes in AMR levels in foodborne enteric or cattle pathogenic bacteria in dairy-beef production. To achieve the first objective, an online survey was completed by dairy producers who reared surplus calves for dairy beef (dairy-beef producers) and those who did not (non-dairy-beef producers) in Atlantic Canada. Additionally, a phone survey was conducted among dairy-beef producers, calf-rearing operators, and feedlot operators. The study revealed that most dairy producers marketed surplus calves within 1–2 weeks after birth via third-party agents or directly to purchasers; however, some raised these calves until 18–24 months of age using existing resources on dairy farms before marketing them directly to slaughterhouses or local markets as dairy-beef products. Various antimicrobial classes were used for disease prevention and treatment, and respiratory diseases were the most common reason for antimicrobial treatment among surplus calves destined for dairy-beef production. Additionally, MIC metadata from *Campylobacter* spp. isolates recovered from fecal samples collected on dairy farms across six Canadian provinces (2019–2023) were used to address the second objective. The generalized logistic regression models revealed that *Campylobacter* spp. showed fluctuations in MIC values within the susceptible range and in the proportions of resistant isolates over time across different antimicrobials, with province-specific patterns, showing that generalized logistic regression models can explain temporal changes in AMR levels. Overall, this thesis provides insights into current management, antimicrobial use, and the application of generalized logistic regression models for describing the changes in AMR levels. These results can inform future interventions for AMR monitoring and promote sustainable husbandry practices in dairy-beef production.

Publications

- Changtes, T., L.C. Heider, K.L. Proudfoot, S. McKenna, R.S. Fraser, D.C. Hall, and J. Sanchez. 2026. Factors affecting breeding practices and surplus calf management: Producer perspectives from Atlantic Canada. *Journal of Dairy Science*, 109(4), pp.4139–4151. <https://doi.org/10.3168/jds.2025-27250>
- Changtes, T., L.C. Heider, K.L. Proudfoot, S. McKenna, R.S. Fraser, D.C. Hall, and J. Sanchez. Marketing routes, health management practices, and challenges in dairy-beef production: producer perspectives from Atlantic Canada. In preparation for submission to *Journal of Dairy Science*.
- Changtes, T., S. Henrik, L.C. Heider, and J. Sanchez. Generalized logistic regression modeling to detect temporal changes in antimicrobial resistance level in *Campylobacter* spp. recovered from dairy farms in Canada, 2019–2023. In preparation for submission to *Preventive Veterinary Medicine*.

Presentations

- Changtes, T., L.C. Heider, K.L. Proudfoot, S. McKenna, and J. Sanchez. 2024. A survey of management practices and motivations related to dairy-beef production on dairy farms in Atlantic Canada. *International Symposia on Veterinary Epidemiology and Economics, ISVEE 17: Proceedings of the 17th Symposium, Sydney, Australia, Poster Presentations*.

Biographical Data

Born in Nakhon Pathom, Thailand

Awards

2024 – James E. Bateman Memorial Scholarship in Dairy or Bovine Health Research, Canada