

University of Prince Edward Island

Faculty of Veterinary Medicine
Summary of Dissertation

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DEGREE OF DOCTOR OF PHILOSOPHY

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From Calf to Cow: Assessing the Long-Term Effects of Early-Life Management and Genetic Potential on Dairy Production and Longevity

Management practices significantly impact the health, production, longevity and welfare of dairy cattle, yet early-life management practices are often overlooked in the long term. This thesis aimed to estimate the impacts of preweaning calf management on adult cow production and longevity, while accounting for genetic potential (GP) at both the calf and herd level. Incorporating GP, which integrates the quantitative genetic concept of phenotype = heritable additive genetics + environment, improved model fit and estimates for milk production outcomes. However, GP was not significant for longevity outcomes, likely due to low heritability and environmental influences.

Calf-level analyses, conducted on calves from eight New Brunswick farms, used regression and discrete survival models to assess the effects of management practices on production and longevity, respectively. Feeding colostrum from 1-2 h after birth displayed improved milk and protein yields in first lactation compared to earlier or later feeding; while fat yield was negatively impacted by disease and antibiotic treatment. Higher milk yields in later lactations were associated with feeding colostrum >1h after birth and increased weaning weights. Survival in the herd was at increased risk when calves were fed pooled colostrum, compared to one dam; while decreased risk was associated with feeding >2L of colostrum and being born in the winter.

Herd-level associations were assessed through surveys and production data from Quebec and New Brunswick herds, linking overall calf management practices with herd milk production. Data collected across the 69 herds was extensive; therefore, data was analyzed in a confirmatory manner to examine causal relationships, followed by an in-depth exploratory approach for to identify possible associations for future investigation. Notably in the confirmatory analysis, herds feeding calves more than 10 L/day of milk experienced reduced production, while herds evaluating colostrum IgG and implementing pneumonia treatment protocols saw improved yields. Exploratory analyses supported these findings and identified potential confounders, such as milk feeding methods, for further investigation. Some limitations, such as sample size, could impact the external validity of our results.

The findings in this thesis highlight the preliminary insights into incorporating quantitative genetic concepts in epidemiological studies, particularly for production outcomes, and serve as a baseline for future work to optimize calf management practices.

Publications

McFarland, E.D., I. Elsohaby, C.F. Baes, H. Stryhn, G. Keefe, and J.T. McClure. 2024. Impacts of preweaning colostrum feeding practices and health measures on dairy cow production, while accounting for genetic potential. *J Anim Sci* 102:skae061. doi:10.1093/jas/skae061.

Presentations

McFarland, E.D., Elsohaby, I., Baes, C.F., Stryhn, H., Fraser, R.S., Keefe, G., McClure J.T. 2023. Short and long term effects of pre-weaning colostrum management practices on dairy cattle longevity. In: Canadian Association of Veterinary Epidemiology and Preventative Medicine Conference (CAVEPM), Guelph, ON, Canada, 30 May - 1 Jun 2023 [Oral Presentation]

McFarland, E. D., McClure, J.T. 2023. Extending Cow Longevity by Improving Calf Management Practices. In: Atlantic Canada Research Showcase/Dairy Research Workshop for Producers: The Latest Research & Best Practices. Moncton, NB. 31 January 2023. [Oral presentation]

McFarland, E. D., Keefe, G., McClure, J. T. 2023. Extending Cow Longevity by Improving Calf Management Practices. In: Dairy Farmers of Canada Showcasing dairy research excellence in Canada. Online. 18 January 2023. [Webinar]

McFarland, E. D., Keefe, G., Elsohaby, I., Baes, C.F., Stryhn, H., Fraser, R.S., McClure, J.T. 2022. Impact of calf management practices on 2nd & 3rd lactation while accounting for genetic potential. In: UPEI Graduate Studies and Research Conference, Charlottetown, PE, Canada 13-14 October 2022. p.12. [Oral Presentation]

McFarland, E. D., Elsohaby, I., Stryhn, H., Baes, C.F., Keefe, G., McClure, J.T. 2022. The effects of calf management practices on first lactation adult cow production while accounting for genetic potential. In: 16th International Symposium of Veterinary Epidemiology and Economics (ISVEE 16), Halifax, NS, Canada 7-12 August 2022. p.428 [Oral Presentation]

McFarland E. Calf Management and genetics on cow longevity. In: Atlantic Veterinary College (AVC) Producer Luncheon, Charlottetown, PE, Canada, 02 December 2021 [Oral Presentation]

McFarland E., Keefe G., Elsohaby I., Oliveira Jr G.A., Baes C.F., Stryhn H., Fraser R.S., McClure J.T. Potential Impacts of Calf Management Practices on Cow Productivity and Longevity. In: Dairy Cattle Breeding & Genetics Committee (DCBGC) technical meeting, Guelph, ON, Canada, 20 October 2021 [Oral presentation]

McFarland, E. D., Elsohaby, I., G.A. Oliveira Jr., Stryhn, H., Baes, C.F., Fraser, R.S., Keefe, G., McClure, J.T. 2021. Identifying calf management practices and health events that impact cow longevity. In: UPEI Graduate Studies and Research Conference, Online, 13-14 October 2021. [Oral Presentation]

McFarland, E. D., Elsohaby, I., G.A. Oliveira Jr., Stryhn, H., Baes, C.F., Fraser, R.S., Keefe, G., McClure, J.T. 2021. Identifying calf management practices and health events that impact cow longevity. In: The ADSA 2021 Virtual Annual Meeting, Online, 11-14 July 2021. Peer-Reviewed. [Oral Presentation]

McFarland E., Keefe G., Elsohaby I., Baes C.F., Stryhn H., Fraser R.S., McClure J.T. Extending Cow Longevity on Dairy Farms by Improving Calf Management Practices in the First Year of Life. In: Dairy Cattle Breeding & Genetics Committee (DCBGC) technical meeting, Guelph, ON, Canada, 20 February 2021 [Oral presentation]

McFarland, E. D., Elsohaby, I., Stryhn, H., Baes, C.F., Fraser, R.S., Keefe, G., McClure, J.T. 2020. PSI-6 Development of an epidemiological and genomic strategy to evaluate the impact of calf management practices on cow productivity and longevity in Canadian dairy herds. In: The 2020 ASAS-CSAS-WSASAS Virtual Annual Meeting and Trade Show, Online, 19-23 July 2020. *Journal of Animal Science*. <https://doi.org/10.1093/jas/skaa278.490> [Poster Presentation]

Awards

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Biographical Data - Born in Brampton, Ontario.