UNIVERSITY of GUELPH

ONTARIO AGRICULTURAL COLLEGE

DEPARTMENT OF ANIMAL BIOSCIENCES

PhD Defence

The development of a Canadian resiliency index for dairy calf disease traits

Colin Lynch

Date: August 29th 2024 at 9:00am

The PhD Defence for Colin Lynch has been scheduled for August 29th, 2024 at 9:00am. The defence will be held in room 141 and online via Teams: https://teams.microsoft.com/l/meetup-join/19%3ameeting_OTVmZWZhMGQtODdjYi00YWU4LWJiNGItNWZjNWQ1OGZlMzk2%40thread.v2/0?context=%7b%22Tid%22%3a%22be62a12b-2cad-49a1-a5fa-85f4f3156a7d%22%2c%22Oid%22%3a%22fbd28915-dda5-478f-8ecb-a3682dcf0c3a%22%7d

Examining Chair: Dr. Eduardo Ribeiro

Advisor: Dr. Christine Baes

Advisory Committee Member: Dr. David Kelton

Additional Committee Member: Dr. Andy Robinson

External: Dr. Troy Rowan

Abstract:

Dairy calf health and welfare is crucial for production efficiency and aligns with the increasing consumer interest in animal welfare. The primary health challenges for calves are diarrhea (DIAR) and respiratory problems (RESP). This thesis aimed to assess the impact of these diseases by estimating incidence rates, genetic parameters, genetic correlations with economically significant traits, and recording practices on Canadian dairy farms. Additionally, a genome-wide association study (GWAS) was conducted to identify genomic regions linked to calf disease traits, and the potential of incorporating indirect genetic effects (IGEs) into current quantitative approaches was explored. Heritability estimates ranged from 0.02 to 0.07 on the observed scale, with the highest values obtained from multiple trait analyses, reflecting a moderate to strong genetic correlation (0.62) between traits. Genetic correlations between calf disease and production, fertility, and health-related traits were generally close to zero, except for notable favorable correlations between RESP and both ketosis (0.66), and displaced abomasum (0.26). The GWAS identified 17 SNPs significantly associated with DIAR and 20 SNPs with RESP. Enrichment analysis highlighted seven candidate genes for DIAR (ACER3, CAPN5, ILK, LIPT2, PGM2L1, and PPME1) and four for RESP (SYNPO, DCTN4, ANXA6, and MYOZ3). The feasibility of IGEs was suggested, though further research is necessary for accurately estimating initial environmental pathogen levels and proper grouping of calves. The major limitation across studies is inconsistent data recording. Thus, it is vital for industry stakeholders to implement the findings to enhance the recording of phenotypes. Collaboration between industry, academia, veterinarians, and producers is essential to establish standardized recording practices and an efficient data pipeline for genetic evaluation centers, which is critical to successfully reducing calf disease on Canadian dairy herds.