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The Effect of Breed and Crossbreeding on the Incidence of Recorded Lameness in the New Zealand Dairy Cattle

A thesis presented in partial fulfilment of the requirements for the degree of Master of Science in Animal Science

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DEDICATION

To my parents

ABSTRACT

The objective of this study was to estimate genetic parameters and breed and crossbreeding effects on incidence of recorded clinical lameness (RCL) in New Zealand dairy cattle. Herd records from 76,357 cows distributed in 155 herds dedicated to the Livestock Improvement Corporation (LIC) sire-proving scheme during the 2005 to 2009 milking seasons were used to estimate the phenotypic, additive genetic, permanent environmental and residual variances of RCL in Holstein-Friesian (F), Jersey (J) and crossbred (FxJ) dairy cattle. RCL incident was coded "1" for cows that had at least one event of RCL at any day during lactation and a "0" code was used for cows without a RCL incidence. Genetic parameters and crossbreeding effects on RCL were estimated with a repeatability animal model, across breeds using restricted maximum likelihood methodology. The predicted mean incidence of RCL per herd was 7.74% with a range of 2% to 34%. Heritability estimate for the incidence of RCL for all lactations (1st to 10th lactation) was 0.016 ± 0.003 (± SE) and the repeatability was 0.071 ± 0.005. The heritability estimate of RCL using only first lactation records was 0.05 ± 0.01 (± SE). Jersey cows had a lower mean (± SE) incidence of RCL than F cattle (J: 6.67 ± 1.50%; JxF: 6.89 ± 1.50%; F: 8.83 ± 1.50%). The effect of first cross (F1) FxJ crossbred was -1.2 ± 0.3% (± SE), representing a mean 16% reduction in RCL compared to an average of the parental pure breed J and F cattle. There was considerable variation (-5 to 8%) between sire estimated breeding values for RCL, suggesting that sire selection across breed and within breed could result in increased genetic resistance to RCL in New Zealand dairy cattle. A significant (P<0.05) reduction in mean (± SD) milk solid yield per day was found in cows with RCL (1.40± 0.0012 kg) compared to cows without RCL (1.43± 0.0045 kg). Cattle in first lactation had a significantly higher incidence of RCL than cows in subsequent lactations (7.6 ± 0.1%, 4.6 ± 0.1%, 5.2 ± 0.1%, 6.3 ± 0.1% and 7.0 ± 0.2% (± SE) for first, second, third, fourth and fifth lactations, respectively). These results suggest that selection for resistance to lameness will result in a low rate of genetic gain but using Jersey sires can be an alternative to increase genetic resistance to lameness in New Zealand dairy cattle.

Keywords: Recorded clinical lameness, crossbreeding, genetic evaluation, dairy cattle.

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LIST OF ABBREVIATIONS

CHL	Claw horn lesion
F	Holstein Friesian
FREQ	Frequency
h^2	Heritability
J	Jersey
JxF	Jersey Friesian cross breed
LIC	Livestock Improvement Corporation
NZ	New Zealand
r	Repeatability
SAS	Statistical Analysis System
SD	Standard deviation
SE	Standard error
RCL	Recorded clinical lameness
UK	United Kingdom
USA	United States of America
WLD	White line disease