

Genetic variance in environmental sensitivity for milk and milk quality in Walloon Holstein cattle

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Animals that are robust to environmental changes are desirable in the current dairy industry. This difference in environmental sensitivity can be studied through the heterogeneity of residual variance while homogeneous residual variance between animals is usually assumed homogeneous in traditional genetic evaluations. The aim of this study was to study genetic heterogeneity of residual variance by the estimation of variance components in residual variance for 5 milk and milk quality traits. 146,027 test-day records from 26,887 Walloon Holstein first-parity cows in 747 herds were available. All cows had at least 3 records and had a known sire. These sires had at least 10 cows with records and each herd × test-day had at least 5 cows. Five traits, milk yield, somatic cell score, and content in milk (g/dl) of oleic acid, monounsaturated and unsaturated fatty acids, were analyzed separately. Estimation of variance components was performed by running iteratively Expectation Maximization-Restricted Maximum Likelihood algorithm by the implementation of double hierarchical generalized linear models. For all traits, the genetic standard deviation in residual variance (i.e. approximately the genetic coefficient of variation of residual variance) was low and ranged between 0.12 and 0.17. The standard deviations due to herd × test day and permanent environment in residual variance ranged between 0.35 and 0.44 for herd × test-day effect and between 0.55 and 0.96 for permanent environmental effect. This study shows the existence of heterogeneity of residual variance and the existence of some genetic variance in environmental sensitivity for all studied traits in the Walloon Holstein cattle.