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Subject	Abstract presented manuscript as ORAL presentation	Dynamic nature of genetic parameters for feed efficiency estimated using random regression models

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Session: Recording and selection tools for feed efficiency and environmental impact

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ABSTRACT

Historically, traits related to feed efficiency have not been included in selection programs due to the high cost of phenotyping. However, international collaborations and advancements in technologies, make it possible to include feed efficiency traits into breeding programs. Through these collaborations, accurate measurements on traits related to feed efficiency, such as dry matter intake, body weight, body condition score, and milk components have become more readily available. Optimal selection strategies will depend on our understanding of the genetic nature of feed efficiency. Therefore, it is imperative to assess how genetic parameters of feed efficiency and sustainability traits vary throughout the lactation. In this study, we estimated genetic parameters for three traits; dry matter intake (DMI; kg/day), energy corrected milk (ECM; $0.25 \times \text{milk yield} + 12.2 \times \text{fat yield} + 7.7 \times \text{protein yield}$, kg/day) and metabolic body weight (MBW; $\text{body weight}^{0.75}$, kg/day), expressed as weekly averages. The data consisted of 121,226 (DMI), 120,500 (ECM) and 98,957 (MBW) weekly records on 7,440 (DMI), 6,868 (ECM) and 6,384 (MBW) first parity Holstein cows from six countries (Canada, Denmark, Germany, Spain, Switzerland and United States of America). Genetic parameters were estimated using restricted maximum likelihood methodology in bivariate random regression models with fourth order Legendre polynomials. Subsequently, weekly phenotypes of DMI were linearly adjusted for genetic effects of ECM and MBW. This created a measure of feed efficiency (FE), equivalent to residual feed intake that was genetically independent of ECM and MBW. Heritability of FE ranged from 0.09 (SE: 0.03) to 0.23 (SE: 0.07) across weeks of lactation. Genetic correlations for FE were high (0.99 (SE: 0.01)) between weeks of lactation that were close to each other, and were moderate (0.43 (SE: 0.22)) to low (0.10 (SE: 0.18)) between early and late lactation. The results of this study contribute to the understanding of the dynamic nature of feed efficiency over the lactation and provide insight on potential considerations needed when including feed efficiency into breeding programs. :



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