Abstract

Livestock production contributes to global human-induced greenhouse gases (GHG) emissions in the form of CH_4, N_2O and CO_2. Beyond climate change, direct CH_4 emissions are also linked with efficiency in dairy cows. The aim of this study was to estimate genetic correlations between methane emissions and nitrogen use efficiency (NUE) in Walloon dairy cows. Milk mid-infrared (MIR) spectra were used to predict CH_4 emissions (PME, g/d) using existing equations. The trait log-transformed CH_4 intensity (LMI) was defined as the log-transformed ratio of PME divided by the daily milk yield (MY, kg/d) recorded on the same test-day achieving a more normal distribution. The values of predicted NUE (PNUE) and N losses (PNL) as proxies of the NUE and N loss were obtained using the combined MIR spectra, parity, and milk yield-based prediction equations on test-day MIR records with days in milk (DIM) between 5 and 50 d. The used data were restricted to the first-parity cows. Random regression test-day models were used to estimate genetic parameters with the Bayesian Gibbs sampling method using a single chain of 100,000 iterates with a burn-in period of 20,000 iterates. Mean (SD) daily h^2 estimated for PME and LMI were 0.14 (0.05) and 0.24 (0.05), respectively. Mean (SD) daily genetic correlation estimated between PME and LMI was 0.55 (0.03). At a level of reliability of more than 0.30 for all examined traits, breeding values of 420 bulls born after 1995 were used to estimate the approximate genetic correlations (AGC) between PME and LMI and PUNE and PNL. The AGC estimated between PME and PUNE was -0.33 (0.07) and that found between LMI and PUNE was -0.60 (0.07). The AGC estimated between PME and PNL was 0.43 (0.08) and that found between LMI and PNL was 0.32 (0.08). The results showed that CH_4 emission, as an indicator of energy lose, is positively correlated with predicted nitrogen lose and negatively correlated with N use efficiency. It can be concluded that genetic selection for decreasing CH_4 emission will also decrease N loss and increase N use efficiency in dairy cows.