Pooling data on energy balance in dairy cows for genetic and genomic analyses

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Genetic (and genomic) studies for difficult to record traits (e.g., feed intake, energy balance) have been hampered by limited data availability. This study merged data from dairy experimental resources and used statistical models to derive harmonised energy balance profiles for further genetic analyses. Data from four experimental herds located in three countries (Scotland, Ireland and the Netherlands) were used. Two datasets (DS) were created – DS1 contained records on 4,708 first lactation Holstein-Friesian cows and DS2 included records on the first 4 lactations of 4,927 cows (12,497 lactations). Weekly records were extracted from the herd databases and included 7 traits: milk, fat and protein yield, milk somatic cell count, live weight, dry matter intake and energy intake. Missing records were predicted with random regression models, so that at the end there were 44 weekly records (per lactation for DS2), corresponding to 305-day lactation, for each cow. Different lactation traits related to milk production, somatic cells, feed intake, and energy balance were derived. Data were merged and analysed with mixed linear models. Genetic variance and heritability estimates were greater ($P<0.05$) than zero. When estimable, the genetic correlation between herds was high suggesting that data from these experimental herds could be merged into a single dataset for genetic and genomic analyses, despite potential differences in management and recording in the four herds. Genomic analysis on the data is currently underway for energy balance traits. Merging experimental data will increase power of genetic analysis and genomic studies, especially of difficult-to-record traits.