Session 3: Breeding for Resilience to Climate Change: Adaptation strategies.

S03.O-02

DEVELOPMENT OF A GLOBAL HEAT STRESS ASSESSMENT FOR GENETIC EVALUATION OF HEAT STRESS IN DAIRY CATTLE

Pauline Lemal[1], Marie-Nguyet Tran[2], Martine Schroyen[1], Nicolas Gengler[1].

[1]Gembloux Agro-Bio Tech / University of Liège, Gembloux, Belgium; [2]Elevéo / Association Wallonne des Eleveurs, Ciney, Belgium.

Heat stress (HS) genetic evaluation is still a challenge. Indeed, the low frequency of milk recording drastically limits the number of records available during hot days. In addition, the different traits evaluated are used separately and are generally related to production. A solution could be to add data from sensors and to combine all this information. The objectives of this study were thus to assess the possible gain of adding sensors data for HS genetic evaluation and to develop a global HS assessment. SenseHub™ collars daily records were obtained from October 2019 to July 2022 in six herds. A total of 453 Holstein cows from the Walloon region of Belgium were followed during this period for activity time. Meteorological data and milk recording data (milk yield and somatic cells score (SCS)) were also obtained from 2015 to 2022 for 1740 cows from the same herds. The thresholds at which the different traits start to be affected by heat stress were estimated at a temperature-humidity index (THI) of 63 and 64 respectively for milk yield and activity time using multi-traits models. For SCS, no clear threshold was observable. In order to use the same model on all traits, it was set at a THI of 60. A three-trait random regression reaction norm model was fitted with these different thresholds. Heritability values were 0.19, 0.14 and 0.08 respectively for milk yield, activity time and SCS at the thresholds and these values were similar at high THI. Regarding reaction norm effects, activity time showed a positive genetic correlation with milk yield (0.42) and a negative genetic correlation with SCS (-0.37) indicating a similar respond to HS. In addition, by performing a PCA on the EBVs for heat tolerance (genetic reaction norm effect), the first eigenvalue represents 75 % of the variability with relevant direction of variation for the three traits (first standardized eigenvector: 0.59, 0.61 and -0.53 for milk yield, activity time and SCS respectively). If confirmed, results seem to validate that daily available sensors data could be of great help to select heat tolerant animals. These results could also be used to generate a global HS assessment by combining EBVs for these three traits, e.g., using weights corresponding to the eigenvector. This global assessment based on the THI reaction of milk yield, activity time and SCS presents a heritability of 0.18. The use of these three traits is relevant for a global assessment because it combines a production, behavioral, and health trait that are relatively easy to measure in routine if sensor data become available on a large scale.