Milk biomarkers to evaluate health status of mammary gland in high producing dairy cattle

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For several decades, in many countries, the focus of the dairy industry has been on maximizing milk yield, leading to the deterioration of many functional traits. In the transition period high producing dairy cows may be affected by several infectious diseases. A new approach is to utilize predictive milk biomarkers for health traits and intervene in a preventative manner. The aim was to discover potential biomarkers in milk to evaluate mammary gland health status. A total of 241 dairy cows from 6 experimental herds in Denmark, Ireland, UK, Italy, Belgium and Germany were enrolled. Milk samples were collected at 7, 14, 21 and 35 days in milk (DIM). Lactose, fat, protein content, SCC, β-hydroxybutyrate, isocitrate, urea, uric acid, glucose, glucose-6-phosphate, lactate dehydrogenase (LHD) and N-acetyl-β-d-glucosaminidase (NAGase) were determined. Furthermore, individual milk MIR spectra were collected at the same DIM, and prediction equations were used to predict mineral and fatty acid contents. Cows were assigned to one of three groups on the basis of milk SCC values ('000 cells/mL): LOW (≤ 100), INTERMEDIATE (101≤SCC≤400), and HIGH (≥ 401). Mammary gland status was monitored during the trial period by veterinarian control. Milk parameters were analysed by MIXED GLM model in SAS to determine and compare means among different lactation day and between the three groups. A canonical discriminant analysis was performed by CANDISC procedure in SAS to obtain linear combinations of the quantitative variables that best summarize the differences among the three SCC health states. Mineral and lactose contents, NAGase, and LDH activity, and some fatty acid contents were significantly different between 7, 14, 21 and 35 DIM and in HIGH vs LOW cows. Two new canonical functions that grouped some of the milk parameters distinguished LOW, INTERMEDIATE and HIGH SCC cows. These identified milk biomarkers will be tested and validated using larger numbers of cows. These new milk biomarkers may be used by farmers for early detection of diseases. This research was supported by the GplusE project (EU FP7 613689). http://www.gpluse.eu/

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