Actionable output developed from milk fatty acids to assess rumen health, negative energy balance and production loss in dairy cows

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Metabolic health is crucial for production performance, good fertility and longevity in dairy cows. Early detection of excessive fat mobilization and poor rumen function enables farmers to suitably intervene both at group and individual cow level to prevent milk losses and optimize fertility. Current tools often lack sensitivity and do not offer farmers and advisors direct guidance on how to act. Milk fatty acids (MFA) vary across lactation stage, parity, breed and season, and are therefore not actionable as such. The goal of this study was to develop actionable output based on the MFA profile, incorporating variations with the aforementioned covariates.

The MFA profile, predicted from mid-infrared spectra, was acquired from 181,794 milk samples collected through the national herd milk recording (MR) program at 52 farms over a time period of 4 years (2021-2024). These data, originating from 14,261 unique lactations, were combined with cow auxiliary data, daily milk yield records, and herd MR information (fat and protein yield). We developed 3 metrics to predict the risk on poor rumen functioning (days in milk, DIM 0-450), negative energy balance (DIM0-100), and early lactation milk losses (DIM0-42). The latter was assessed on production losses in the first 150 days of lactation. Each risk metric was classified as 'low', 'medium' or 'high' risk. Odds ratios were calculated to assess the difference in milk losses between these classes, and risks were compared with the current ketosis alerts based on ketones. Milk losses and farmer experiences were evaluated during a second validation study on 27 farms in '25-'26.

On average, cows with a high risk MFA profile were up to 3 times more frequently in the worst 20% quantile for milk losses than cows with a low risk. Contrarily, cows with a low risk MFA profile were up to 3.5 times more likely to experience low (lowest 20%) milk losses as compared to cows with a high risk profile. The MFA based risk metrics were more sensitive than the current ketosis alerts. The second validation study showed that cows with high risk for both energy balance and rumen function had on average 0.6kg/d, corresponding to 74% more milk loss than cows with low risk. MFA risks helps farmers to optimize their ration at group level and to identify cows that need extra attention to prevent milk losses.