

## Assessing differences in early lactation milk constituent estimates between Holstein cows of varying health outcomes

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Cows have an increased risk of disease shortly after parturition due to the energy and macromineral demands that occur secondary to the initiation of lactation. Our objective was to assess the feasibility of identifying a healthy or maladaptive transition using Fourier-transform infrared (FTIR) spectroscopy of milk. We collected proportional milk samples once daily on all cows in the early lactation pen of a commercial dairy farm in Cayuga County, NY. Milk was stored at 4°C until analysis via FTIR; estimated constituents included % lactose, protein, and fat; relative % and yield of de novo, mixed, and preformed fatty acids; the individual fatty acids C16:0, C18:0, and C18:1 cis:9; milk urea nitrogen, milk acetone, milk beta-hydroxybutyrate, and milk predicted blood non-esterified fatty acids. Cows (n = 1,024) were followed through 14 DIM and classified as healthy (n = 881; no adverse health events) or sick (n = 143; diagnosis of clinical ketosis, metritis, and/or displaced abomasum). We used partial least squares regression to model the response variable (healthy vs. sick) separately for each DIM from 3 to 10 as a function of the 16 predictor estimated milk constituents and parity group (parity 1, parity ≥2). All models included 3 components and were cross validated using a 100-repetition bootstrap method. Predicted response probabilities were used in receiver operating characteristic curves; areas under the curve ranged from 0.80 at 3 DIM to 0.61 at 10 DIM. Sensitivity, specificity, positive predictive value, and negative predictive value ranged from 18 to 69%, 77 to 85%, 2 to 44%, and 91 to 98%, respectively, with sensitivity and positive predictive value decreasing from 3 to 10 DIM and specificity and negative predictive value increasing from 3 to 10 DIM. Although conducted in only one herd, our results suggest that FTIR estimates from a single proportional milk sample collected between 3 and 10 DIM can identify healthy cows with good accuracy. This finding could have beneficial implications for management of cows in early lactation.

**Key words:** milk constituents, early lactation, Fourier-transform infrared spectroscopy, health prediction