Patterns of Fourier-transform infrared estimated milk constituents in early lactation Holstein cows

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Cows undergo immense physiological stress to produce milk during early lactation. Monitoring early lactation milk through Fourier-transform infrared (**FTIR**) spectroscopy might offer an understanding of which cows transition successfully. Daily patterns of milk constituents in early lactation cows have yet to be reported continuously thus our objective was to describe these patterns for cows of varying parity groups from 3 to 10 d postpartum. We enrolled 1,024 Holstein cows from a commercial dairy farm in Cayuga County, NY with a total of 306 parity 1, 274 parity 2, and 444 parity ≥3 cows. Cows were sampled once daily, Monday through Friday, via proportional milk samplers and stored at 4°C until analysis using FTIR. Estimated constituents included % lactose, protein, and fat; relative % (**rel %**) and yield of de novo, mixed, and preformed fatty acids (**FA**); the individual fatty acids C16:0, C18:0, and C18:1 cis:9; milk urea nitrogen (**MUN**), milk acetone (**mACE**), milk beta-hydroxybutyrate (**mBHB**), and milk predicted blood non-esterified fatty acids (**mpbNEFA**). Differences between parity groups were assessed using repeated-measures ANOVA. Milk yield per milking differed over time between 3 and 10 DIM ($P < 0.001$) and averaged 8.7, 13.3, and 13.3 kg for parity 1, 2, and ≥3 cows, respectively. Parity differences were found for % lactose ($P = 0.008$), % fat ($P < 0.001$), and preformed FA g/100 g milk ($P < 0.001$). Parity differed across DIM for % protein ($P < 0.001$), de novo FA rel % ($P < 0.001$) and g/100 g milk ($P = 0.004$), mixed FA rel % ($P < 0.001$) and g/100 g milk ($P < 0.001$), preformed FA rel % ($P = 0.001$), C16:0 ($P < 0.001$), C18:0 ($P < 0.001$), C18:1 cis:9 ($P < 0.001$), MUN ($P < 0.001$), mACE ($P < 0.001$), mBHB ($P < 0.001$), and mpbNEFA ($P = 0.003$). It is important to acknowledge the limitations of this study as it was conducted on a single farm. If FTIR technology is to be used as a method of identifying cows maladapted to lactation, understanding variations in early lactation milk constituents is a crucial first step in the practical adoption of this technology.

Keywords: milk constituents, parity, Fourier-transform infrared spectroscopy