

**SYSTEM AND BIOLOGICAL EFFECTS ON QUANTITATIVE MILKING SPEED PHENOTYPES FROM INLINE MILK METERS**

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Milking speed (MS) is actively used by herds with both conventional and automatic milking systems (AMS) in the USA. A genetic evaluation for MS could be of significant economic value, and dairy producers surveyed express enthusiasm for the development of this new trait. The classification system successfully implemented in other countries that evaluate MS is unlikely to be practical in the USA due to larger average herd sizes, and so the use of quantitative measurements of milking speed is being explored. Many farms now have in-line milk meters that can supply the information required to calculate MS, but there is not a strong consensus on the milking system effects and other biological influences on quantitative milking speed phenotypes. A large dataset was assembled comprising ~300 U.S. herds, >230,000 cows, >300,000 lactations, and >40 million observations of individual milkings from January 2022 to February 2023, and representing 6 dairy breeds, 11 different meter manufacturers, and 2X, 3X, and AMS herds. Milking speed was defined as lbs per minute and calculated for every milking in a day for each individual cow. Data quality control involved only using records with durations between 1 and 15 minutes, weights between 1 and 60 lbs, speeds between 1 and 15 lbs per minute, and cows with at least 10 observations. Milking speed varied by breed, lactation number, and milking frequency. Among 2X and 3X herds, MS mirrored the milking curve over the course of a lactation for Holstein and Jersey, which was to be expected given the favorable correlations between MS and milk yield observed in the literature and this dataset ( $R^2 = 0.4-0.6$ ). Trends were less clear for Ayrshire, Brown Swiss, Guernsey, and Milking Shorthorn due to the sparsity of data available for those breeds. The highest variation in MS was observed during early and late lactation, suggesting MS for genetic selection should be measured during a certain windows of DIM only. Among Holstein, the speed of those milked by AMS also mirrored the milk production curve, but with substantial differences observed between meter manufacturers. This is likely an artifact of how the data is collected by each manufacturer, such as differing definitions of when milk flow begins, and the total duration of a milking (box time, or amount of time the milking unit is attached), suggesting that meter manufacturer is a major effect that will need to be accounted for in the harmonization of data collected from different systems. The work to characterize other system and biological effects like udder health parameters and milking interval is ongoing, and will be integral to our efforts to standardize quantitative MS phenotypes and determine their suitability for selection.