SUPPLEMENTARY MATERIAL

Table S1. Number of phenotypic records throughout the data editing processes for the Dataset 1.

Editing steps	No. of records	No. of cows
Initial dataset	1,958,926	5,645
Removed records with missing information	1,929,178	4,452
Removed records for DIM[1] > 350	1,830,186	4,413
Removed records for cows with parity 0	1,830,186	4,413
Removed records for cows with parity > 6	1,826,610	4,410
Removed records for cows with AFC[2] <= 650	1,753,777	4,257

[1] DIM = Days in milk

[2] AFC = Age at first calving

Table S2. Number of phenotypic records throughout the data editing processes for the Dataset 2.

Editing steps	No. of records	No. of cows
Initial dataset	5,177,190	4,451
Removed records with no successful milkings	5,075,975	4,446
Removed records with milk yield <= 0.44 lbs	5,051,898	4,446
Removed records with missing information	4,727,674	4,445
Removed records for DIM[1] > 350	4,292,066	4,426
Removed records for cows with parity 0	4,292,066	4,405
Removed records for cows with parity > 6	4,273,196	4,405
Removed records for cows with AFC[2] <= 650	3,648,676	4,402
Removed records with more than one pen in a single day	3,636,915	4,249

[1] DIM = Days in milk

[2] AFC = Age at first calving

Table S3: Additive genetic variance (σ_a^2), permanent environment variance between parities $\left(\sigma_{pe}^2\right)$, residual variance ($\sigma_e^2$), heritability ($h^2 \pm$ SE), repeatability ($t \pm SE$) and Akaike information criterion (AIC) of the traits derived from data obtained by the automated milking system for North American Holstein cattle.

Traits*	Parity	σ_a^2	σ_{pe}^2	σ_e^2	h^2	t	AIC
AMT	1 – 6	1.71	0.91	1.08	0.46 ± 0.02	0.71 ± 0.01	44,236,296.37
TMT	1 - 6	11.82	8.60	21.31	0.28 ± 0.02	0.49 ± 0.01	89,412,767.76
INT	1 - 6	0.0023	0.0041	0.017	0.10 ± 0.01	0.27 ± 0.01	-18,221,796.75
NoV	1 - 6	0.33	0.52	2.58	0.10 ± 0.01	0.25 ± 0.01	6,605,915.91
NSE	1 - 6	0.077	0.14	0.50	0.11 ± 0.01	0.30 ± 0.01	32,447,466.74
PSM	1 - 6	30.7	62.1	413.4	0.06 ± 0.01	0.18 ± 0.01	134,417,608.40
PCS	1 - 6	0.012	0.014	0.023	0.24 ± 0.02	0.53 ± 0.01	-13,850,699.37
PCS	1	0.00067	0.014	0.023	0.018 ± 0.01	0.39 ± 0.01	-5,541,308.47
PCS	2	0.0011	0.022	0.020	0.025 ± 0.01	0.53 ± 0.01	-5,281,099.60
PCS	3	0.0019	0.028	0.021	0.037 ± 0.02	0.58 ± 0.01	-2,699,531.10
PCS	4+	0.00035	0.036	0.022	0.006 ± 0.03	0.62 ± 0.01	-1,459,997.96

*AMT: Average time of milking; TMT: Total time of milking; INT: Time interval between milkings; NoV: Number of visits; NSE: Number of successful entries into the AMS units; PSM: Percentage of milking success; PCS: Preference consistency score.

Table S4: Genetic correlations (± SE) table for derived traits from data obtained by the automated milking system for North American Holstein cattle with the permanent environment effect between parities

Traits	TMT	INT	NoV	NSE	PSM	PCS
AMT	0.82 ± 0.02	0.26 ± 0.05	-0.36 ± 0.04	-0.34 ± 0.05	0.35 ± 0.05	-0.022 ± 0.05
TMT	-	-0.30 ± 0.05	0.14 ± 0.05	0.24 ± 0.05	0.0014 ± 0.06	-0.13 ± 0.05
INT	-	-	-0.87 ± 0.02	-0.98 ± 0.05	0.64 ± 0.04	0. 40 ± 0.05
NoV	-	-	-	0.89 ± 0.02	-0.93 ± 0.01	-0.41 ± 0.05
NSE	-	-	-	-	-0.64 ± 0.04	-0.25 ± 0.05
PSM	-	-	-	-	-	0.37 ± 0.06

*AMT: Average time of milking; TMT: Total time of milking; INT: Time interval between milkings; NoV: Number of visits; NSE: Number of successful entries into the AMS units; PSM: Percentage of milking success; PCS: Preference consistency score.