Genetic parameters of milk coagulation traits in the first three lactations using random regression model

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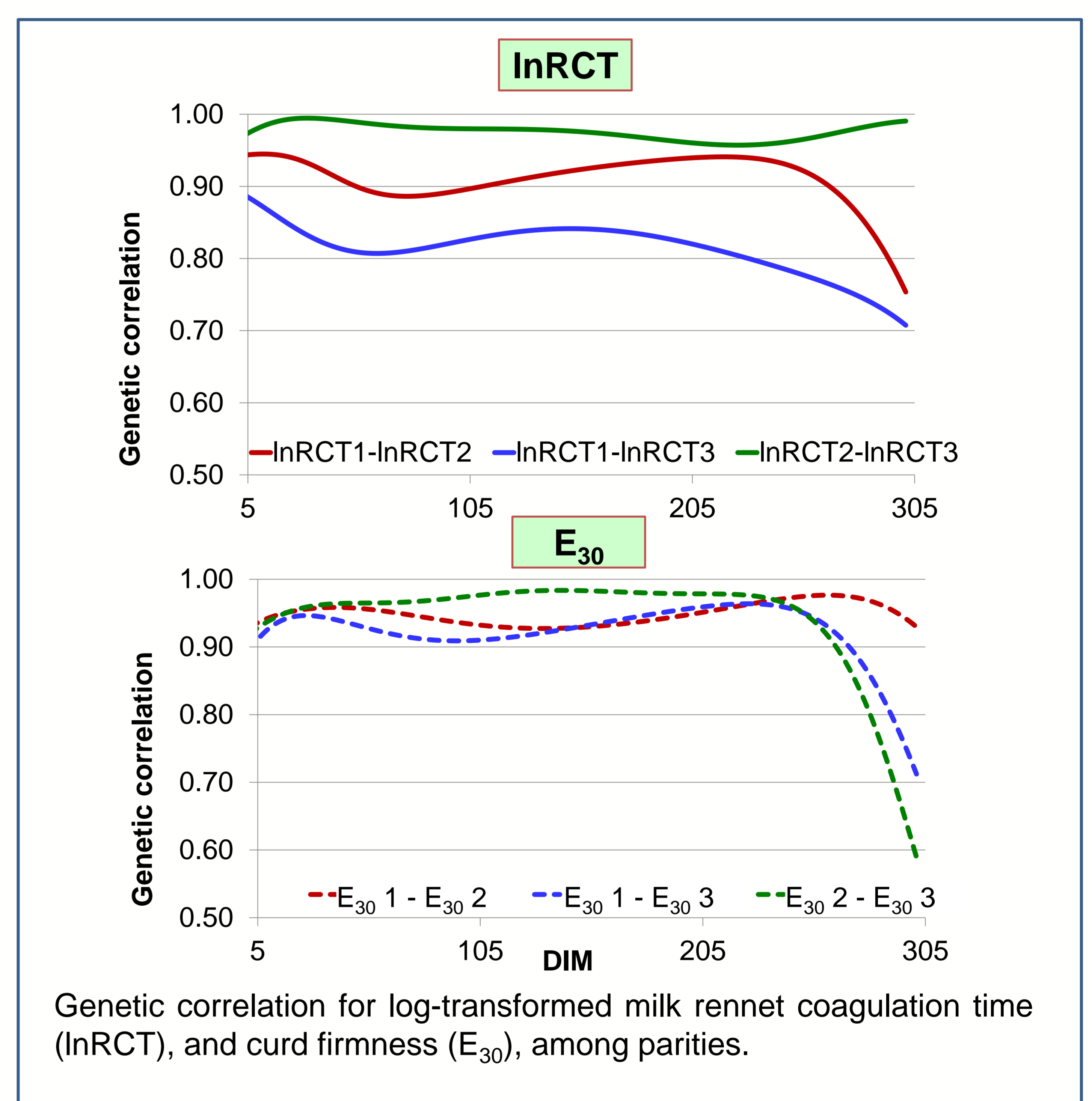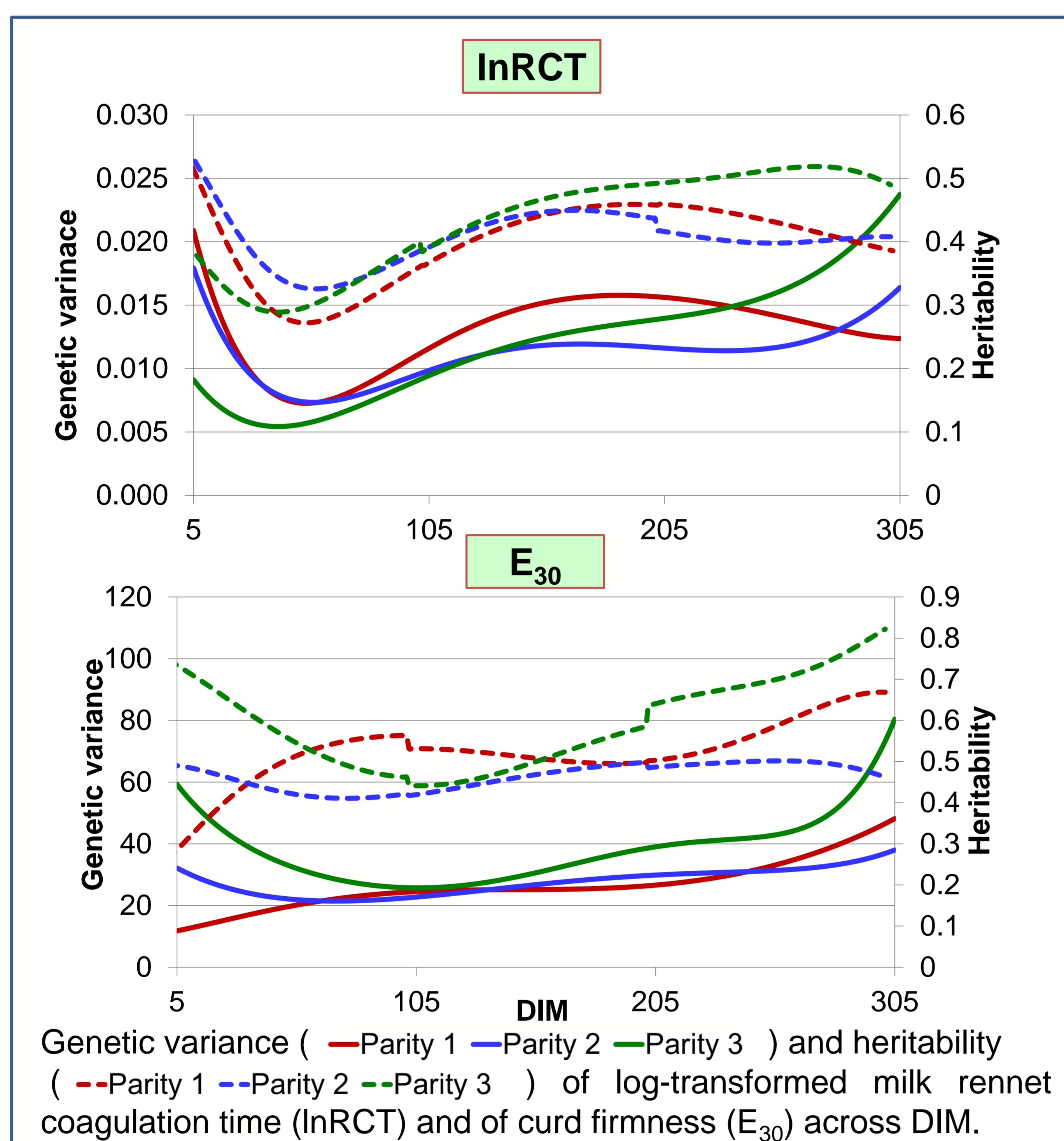
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Objective

Estimate heritabilities and genetic correlations for milk coagulation traits (milk coagulation time, RCT; curd firmness, E_{30}) among first three lactations in Estonian Holstein cows using a multiple-lactation random regression animal model.

Results and Conclusions

- Average heritability was 0.40, 0.39, and 0.39 for lnRCT, and 0.48, 0.41 and 0.52 for E_{30}, for parities 1, 2 and 3, respectively.
- Genetic variance was higher in beginning and late of lactation.
- Genetic correlations were 0.91, 0.81 and 0.98 for lnRCT, and 0.95, 0.92 and 0.96 for E_{30}, between parities 1 and 2, 1 and 3, and 2 and 3, respectively.
- Genetic correlation for E_{30} between parities 1-3 and 2-3 dropped rapidly in the end of lactations.
- Regular collection of 1st lactation records should be sufficient for genetic evaluation of milk coagulation traits.

Genetic variance (—Parity 1 —Parity 2 —Parity 3) and heritability (--Parity 1 --Parity 2 --Parity 3) of log-transformed milk rennet coagulation time (lnRCT) and of curd firmness (E_{30}) across DIM.

Genetic correlation for log-transformed milk rennet coagulation time (lnRCT), and curd firmness (E_{30}), among parities.

Material and methods

- **40,154** repeated test-day records of **5,216 Estonian Holstein** cows (progeny of **306 sires**) reared in **98 herds** in Estonia were collected from April 2005 to May 2010.
- Measurements of RCT and E_{30} were determined with the **Optigraph** (Ysebaert, Frepillon, France).
- Statistical analysis was carried out using multiple-lactation random regression animal model where:
- data from parities 1 to 3 was treated as separate traits;
- fixed effects were herd, year-season of calving, year-season of test-day, sample age as days from sample collection to milk coagulation analysis;
- random effects were animal and permanent environment modeled by 3rd order Legendre polynomials.

Trait	Parity 1	Parity 2	Parity 3
	5,200 cows	3,670 cows	2,012 cows
	n = 20,349	n = 13,263	n = 6,542
DIM, d	162.4 ± 84.6	156.5 ± 88.6	149.6 ± 89.5
Milk yield, kg/d	25.92 ± 7.16	29.34 ± 10.05	30.74 ± 10.68
RCT, min	10.39 ± 2.35	9.98 ± 1.98	9.36 ± 1.80
E_{30} , mm	26.72 ± 7.37	26.21 ± 8.01	26.01 ± 8.07

Descriptive statistics for days in milk, milk yield, milk coagulation time (RCT) and curd firmness (E_{30}) per lactation (mean ± SD).

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