

# Genetic parameters of average milk flow recorded electronically from milking parlours and automatic milking systems in Estonian Holstein dairy cows

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## Objective

- To investigate the feasibility of recording electronically average milk flow rate (AFR) from milking parlours (MP) and automatic milking systems (AMS).
- To estimate **heritability** of AFR and **genetic correlations** with other traits in Estonian Holstein.

## Material and methods

- AFR data of 11,001 Estonian Holstein cows
  - 57 farms (23 with AMS and 34 with MP),
  - from July 2010 to December 2013,
  - single AFR record during an official phenotypic (või performance) recording between 60 and 90 days in milk (DIM) for primiparous cows.
- Records of milk yield and milk quality traits
  - on the day of AFR recording (all cows);
  - from 270–330 DIM in the first lactation (6,669 cows),
  - from 5–60 DIM in the second lactation (4,752 cows).
- Udder conformation traits (5,736 cows) were scored on a 9 point scale at 8–305 DIM in the first lactation.
- Multivariate animal models evaluated with VCE-6 (44,689 animals in pedigree).



## Results

Milking system <sup>1</sup>	No. of farms	No. of cows	Average milk flow, kg/min			
			Mean	SD	Min	Max
AMS	23	2,626	2.12	0.78	0.30	5.40
MP	34	8,375	2.14	0.75	0.08	5.50

<sup>1</sup>AMS = Automatic milking system; MP = Milking parlour

- The genetic correlation between AFR measured by AMS and MP was **0.918** (s.e. 0.054).

Trait <sup>1</sup>	h <sup>2</sup>	r <sub>gen</sub> with AFR
Udder conformation traits		
OUS	0.315	0.093
FUA	0.197	0.007
Udder depth	0.390	0.003
Rear udder height	0.273	<b>0.327</b>
Udder cleft	0.188	0.039
Teat placement	0.303	0.086
Teat length	0.354	<b>-0.202</b>
	s.e.=	0.034–0.046    0.081–0.104

<sup>1</sup>OUS = Overall udder score; FUA = Fore udder attachment



Trait <sup>1</sup>	h <sup>2</sup>	r <sub>gen</sub> with AFR
First parity cows recorded at 60-90 days in milk		
AFR, kg/min	<b>0.495<sup>2</sup></b>	-
Milk, kg/d	0.251	<b>0.408</b>
Fat, %	0.213	-0.248
Protein, %	0.364	-0.166
SCS	0.062	<b>0.271</b>
First parity cows recorded at 270-330 days in milk		
Milk, kg/d	0.394	0.165
Fat, %	0.396	-0.121
Protein, %	0.550	-0.045
SCS	0.076	<b>0.147</b>
Second parity cows recorded at 5-60 days in milk		
Milk, kg/d	0.103	0.164
Fat, %	0.158	-0.041
Protein, %	0.147	0.053
SCS	0.067	<b>0.233</b>
	s.e.=	0.015–0.049    0.039–0.152

<sup>1</sup>AFR = Average milk flow rate; SCS = Somatic cell score

<sup>2</sup> mean value from bivariate models

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## Conclusions

- The genetic correlation between AFR, measured by AMS and MP treated as two different traits, was 0.918.
- Average flow rate recorded at the beginning of the first lactation had moderately high heritability (0.495) and it seems to be a good method for routine recording of AFR for genetic evaluation.
- There was a positive genetic correlation with milk yield and a negative correlation with both fat and protein contents.
- The genetic correlation of AFR with SCS was the most stable over studied time periods and was around 0.2.
- The genetic relationships between AFR and udder conformation were low, slightly stronger and positive was relationship with rear udder height and negative with teat length.
- However, in our opinion a potential genetic index for milkability should include, in addition to AFR, also SCS and some udder conformation traits, but further genetic response simulation is needed in order to be more convincing.

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## Background

Estonia (01.01.2014):

- 1.3 million citizens (68.8% Estonians);



- 97,100 dairy cows (79.1% Estonian Holstein);
- **94.9%** dairy cows under milk recording;
- average milk yield **8,416 kg** (Estonian Holsteins 8,611 kg) and increasing;
- average herd size **120.6 cows** and increasing;
- 174 automatic milking system devices (milking about 12% of cows) + at least 35% of cows milked in modern milking parlours (automatic identification, milking speed etc).

