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Model evaluation and genetic parameters for milk urea content in Holstein dairy heifers

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Data

589 heifers, 8th - 180th day of lactation, fed by a total mixed ration ad libitum twice daily and a fixed amount of concentrates, milk samples were taken once per week from two consecutive milkings, afterwards milk urea content was analysed by infrared spectroscopy (Mean 261.2 mg/kg, SD 51.6 mg/kg)

Model evaluation

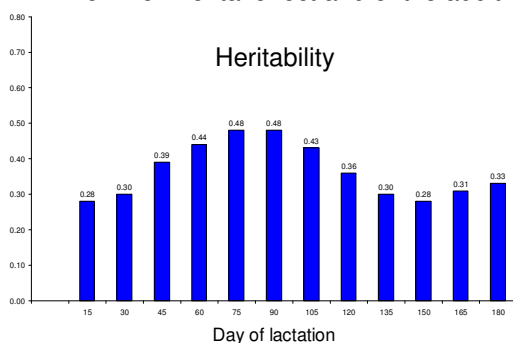
Modelling of fixed and afterwards of random regression coefficients (with the function of Ali and Schaeffer as fixed regression) by five parametric functions of days in milk

Function	Fixed effect model (method ML)			Mixed model (method REML)		
	-2 logL	Δ AICC	Δ BIC	-2 logL	Δ AICC	Δ BIC
Wilink	121036	77.9	63.3	111409	164.1	124.8
Guo and Swalve	121010	52.0	37.4	111404	158.6	119.2
Legendre polynomial of third degree	120960	4.4	-2.9	111326	89.0	67.1
Legendre polynomial of fourth degree	120954	0.1	0.1	111267	39.5	39.5
Ali and Schaeffer	120954	0	0	111227	0	0

AICC = corrected Akaike's information criterion, BIC = Schwarz's Bayesian information criterion

Genetic parameters

Estimation with ASREML 2.0a, statistical model includes the fixed effects herd test day, class of age of first calving, function of day of lactation (Ali and Schaeffer) and the random regressions of the permanent environmental effect and of the additive genetic effect of the heifer (Legendre polynomial of third degree)



Genetic correlations between six stages of lactation

Day of lactation	60	90	120	150	180
30	0.91	0.86	0.79	0.70	0.81
60		0.98	0.88	0.73	0.86
90			0.95	0.82	0.92
120				0.96	0.98
150					0.97

Conclusions

Suitable functions for modelling both the fixed and the random regression part of the mixed model (Ali and Schaeffer, alternatively Legendre polynomials) and promising resulting heritabilities were found. So, basic preconditions for using milk urea content as a selection trait e.g. to prevent higher nitrogen excretion are fulfilled.

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