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Genetic analysis of dystocia and stillbirth in Holsteins based on data including calf weights

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Introduction

- The calving complex is of importance for aspects of animal welfare and economics
- Calving ease and stillbirth: low heritability and unfavourable correlation between direct and maternal component

➔ Improvements for the recording of the trait are necessary to really capture the underlying biological mechanisms
(Swalve and König, 2007)

Introduction

- Implementation of a cooperator test herd scheme by RMV, LfA-MV und MLU Halle
- For calving traits: proper recording of birth weight and sex of alive and stillborn calves

➔ Do these auxilliary traits lead to improved genetic evaluations for dystocia and stillbirth?

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Material and Methods

- Data from 22 herds
- October 2005 to January 2009
- Constraints:
  - Holstein
  - Single births
  - >30 kg birth weight

➔ 53,144 observations

- Stillbirth: death at birth or died between first 48 h (5,5%)
- Dystocia: at least one assistant necessary (32,8%)

Material and Methods

- Threshold model with probit-link function
- Estimation of variance components for sire of calf and maternal grandsire
- For each trait 4 models

M1: $Pr(y_{ijkno} = 1) = \Theta(m + H_i + YS_j + PA_k + sire_n + mgs_o)$

M2: $Pr(y_{ijklno} = 1) = \Theta(m + H_i + YS_j + PA_k + SEX_l + sire_n + mgs_o)$

M3: $Pr(y_{ijkmno} = 1) = \Theta(m + H_i + YS_j + PA_k + BW_m + sire_n + mgs_o)$

M4: $Pr(y_{ijklmno} = 1) = \Theta(m + H_i + YS_j + PA_k + SEX_l + BW_m + sire_n + mgs_o)$

- with:

Pr	Probability for stillbirth or dystocia		
Θ	probit link function		
H	herd	YS	year-season of birth
PA	Parity of dam	SEX	sex of calf
BW	birth weight of calf		

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Results

Back-transformed probabilities for stillbirth and dystocia by parity and sex

	Parity of dam		Sex of calf	
	heifer	cow	male	female
n	19,944	33,200	27,433	25,711
Stillbirth (%)	9.32	3.18	5.85	3.62
Dystocia (%)	49.27	22.96	37.68	24.8

Results

Back-transformed probabilities for stillbirth and dystocia by birth weight

	Birth weight (kg)				
	31-35	36-40	41-45	46-50	>50
n	3,027	12,362	19,699	12,726	5,330
Stillbirth (%)	6.00	4.82	4.41	4.17	5.40
Dystocia (%)	16.45	21.32	29.95	38.49	52.66

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Results

Direct und maternal heritabilities and correlations of stillbirth and dystocia

model[1)]	stillbirth			dystocia		
H+YS+PA	h^2_{dir}	h^2_{mat}	$r_{g\ dir-mat}$	h^2_{dir}	h^2_{mat}	$r_{g\ dir-mat}$
M1	0.049	0.129	-0.363	0.112	0.097	-0.306
M2 +SEX	0.051	0.136	-0.409	0.116	0.102	-0.307
M3 +BW	0.048	0.133	-0.383	0.066	0.107	-0.372
M4 +SEX+BW	0.055	0.140	-0.424	0.072	0.108	-0.366

1) H=herd, YS=year-season of birth, PA=Parity of dam, BW=birth weight of calf

Conclusions

- Sex and birth weight of calf do influence dystocia and stillbirth
- The traits analyzed do have the potential to be used as corrections in models for genetic evaluation
- Further traits (e.g. conformation, gestation length) also should be considered

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