Estimation of genetic parameters for young stock survival in Danish beef x dairy crossbred calves

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Aim

- Uncover the extent of calf mortality in beef x dairy crossbred calves and which risk factors influence the trait
- Define a young stock survival trait and estimate the genetic parameters
- Investigate if it is feasible to implement young stock survival in the Danish X-index for beef sires used on dairy dams

Background

- Beef x dairy crossbreeding
  - Improvement of slaughtered dairy offspring
- Use of beef semen on dairy has increased greatly
  - 67,740 in 2014 → 120,656 in 2015 (No. of inseminations)
- Calf mortality is important
  - Economic loss
  - Animal welfare

The Danish X-index

- **X-veal producer**
  - Daily gain
  - EUROP form score
- **X-dairy producer**
  - Daily gain
  - EUROP form score
  - Calf vitality
  - Calving ease

NO CALF SURVIVAL

Danish Blue Cattle sire - Sdr. Skovens Tornado

Genetic background

- In Denmark and the Netherlands young stock survival has been implemented in the breeding goal for dairy cattle
- Low heritability trait
  - Higher for Jersey
- Moderate correlations between early and late life survival
- High correlation between sex

Materials and methods

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Data editing

- Data provided by SEGES, edited in SAS
  - Calves born from 2000-2016
- Milk delivering herds
- Multiple births, unknown sex or unknown parents were deleted

Data editing - continued

- Only dam breeds HOL, RDC and JER
- Only sire breeds SIM, BAQ, CHA, LIM and BLK
- Deleted calves
  - Stillborn calves
  - Herds with <5 calves
  - Slaughtered within the first 200 days
  - Exported animals

Traits of interest

- 2 traits
  - Survival from 1-30 days after birth
  - Survival from 31-200 days after birth
  - (Survival from 1-200 days after birth)

Statistical analysis

$$Y_{ijklmn} = YM_i + H_j + S_k + BC_l + P_m + T_n + a_c + a_h + e_{ijklmn}$$

- Y_{ijklmn} = Binary variable dead or alive
- YM_i = Fixed effect of year $*$ month of birth
- H_j = Fixed effect of birth/slaughter herd
- S_k = Fixed effect of sex
- BC_l = Fixed effect of breed combination
- P_m = Fixed effect of parity of the dam
- T_n = Fixed effect of transfer
- a_c = Random effect of calf
- a_h = Random effect of birth/slaughter herd $*$ year
- e_{ijklmn} = Random residual

Results and discussion

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Heritablities

Young stock survival	h^2 - underlying	σ_A	σ_E	σ_P
1-30 days	0.045	0.022	0.211	0.212
31-200 days	0.075	0.028	0.209	0.210
1-200 days	0.035	0.028	0.250	0.252

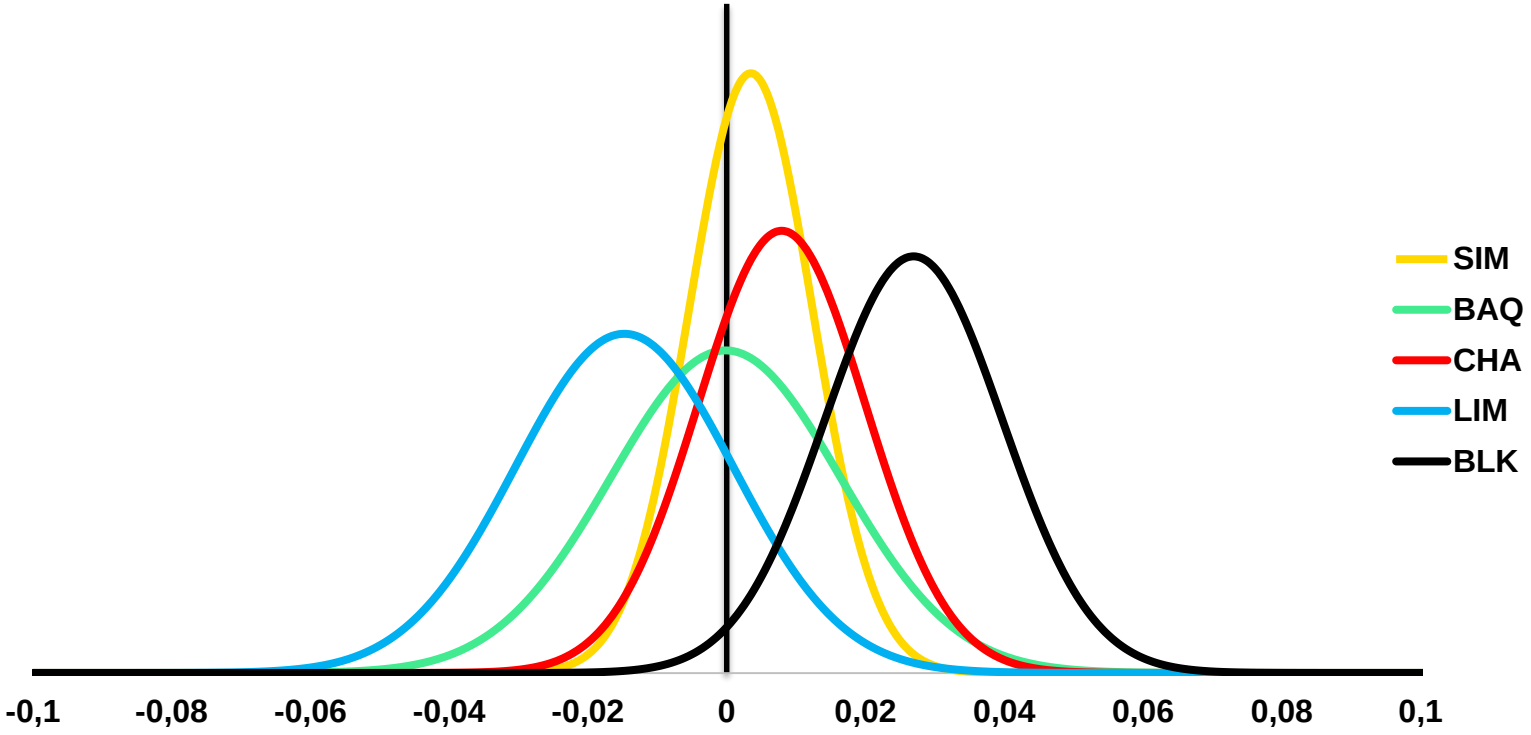
Table 1 –Heritabilities on the underlying scale (h2), the additive genetic (σ_A) , environmental (σ_E) and phenotypic (σ_P) standard deviations for the traits of interest

Average survival rates (%)

	1-30 days	31-200 days	1-200 days
Average	94.8	94.5	89.6
Sire breed			
SIM	95.6	94.7	91.1
BAQ	93.9	91.4	86.7
CHA	95.1	94.0	90.4
LIM	93.5	92.5	87.7
BLK	95.5	95.4	91.8
Dam breed			
RDC	95.8	94.0	90.4
HOL	95.6	94.7	91.0
JER	92.0	94.1	89.3

Table 2 – The average survival rates for all sire breeds, dam breeds and time periods

Absolute breeding values



Young stock survival from 31-200 days after birth

Comparison of the best and worst sires

Young stock survival 1-30 days

The five best sires			The five worst sires		
Sire breed	Number of offspring	EBVab	Sire breed	Number of offspring	EBVab
SIM	137	3.5 %	LIM	718	-2.5 %
BAQ	597	2.5 %	LIM	359	-2.2 %
BLK	887	2.3 %	LIM	481	-1.8 %
BLK	456	2.0 %	BLK	227	-1.6 %
SIM	124	2.0 %	BLK	754	-1.4 %

Young stock survival 31-200 days

The five best sires			The five worst sires		
Sire breed	Number of offspring	EBVab	Sire breed	Number of offspring	EBVab
BLK	955	4.7 %	LIM	1468	-5.4 %
BLK	167	4.6 %	LIM	124	-4.3 %
BLK	440	4.5 %	LIM	205	-4.2 %
BLK	1438	4.5 %	LIM	140	-3.3 %
BLK	596	4.5 %	BAQ	200	-3.2 %

Conclusion

- It seems feasible to breed for an increased young stock survival from day 1-30 and 31-200
  - Both significantly heritable and genetic variation for both traits exists
- This will increase the survival rate of the beef x dairy calves
  - Increase animal welfare and decrease economic loss

Future perspectives

- Implementation into the breeding goal for beef breed sires used for crossbreeding with dairy dams
- Total index with all economically important traits
- More new traits
  - Disease resistance
  - The impact on the dam
  - Drinking temperament

Thanks for listening!
- Any questions?

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