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Genetic response in piglet survival in a selection experiment carried out under outdoor conditions

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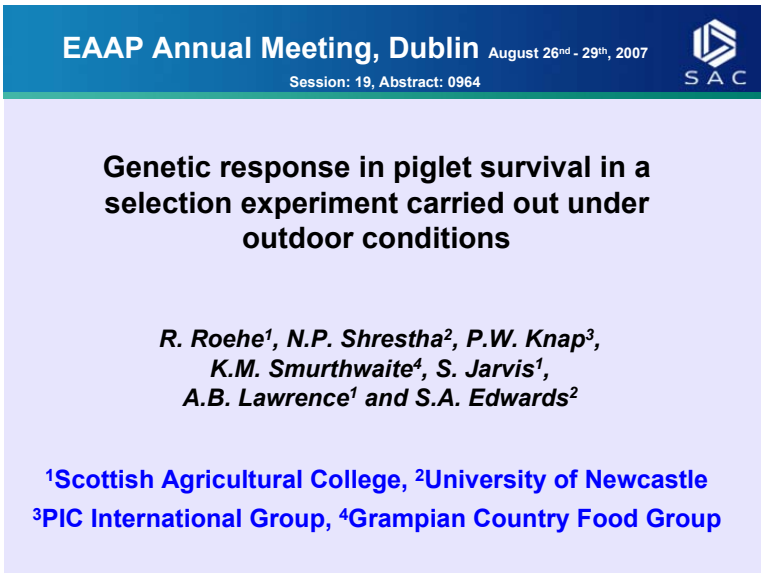
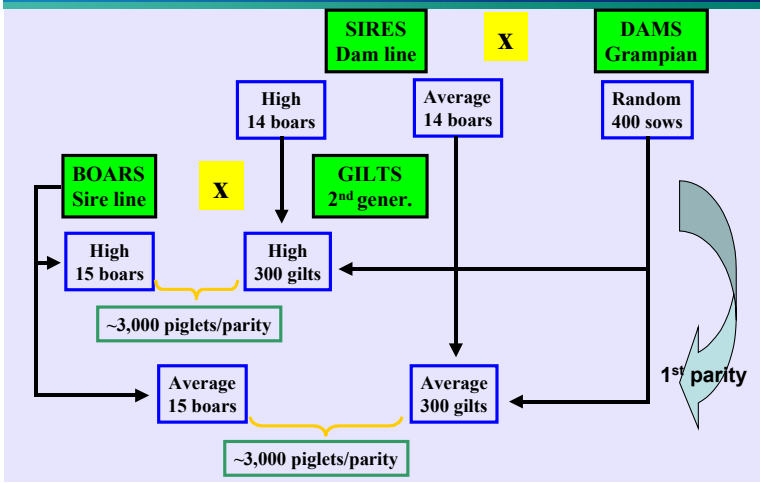


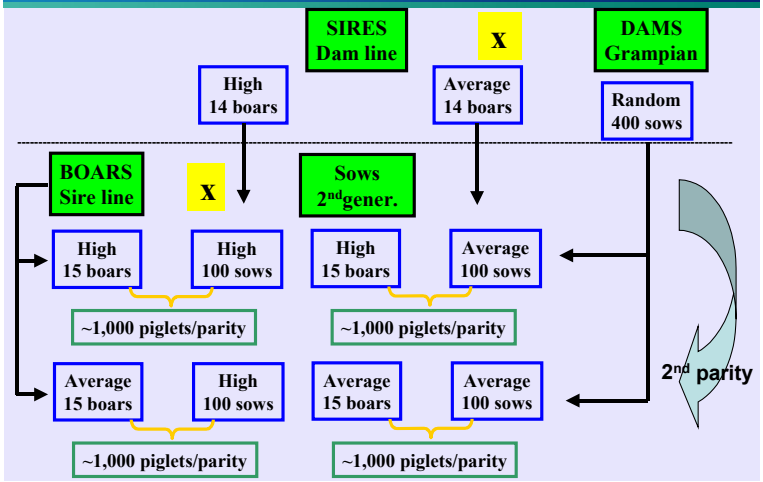
Background and Objectives of the Research

- Peri- and postnatal mortality of piglet 16 to 36%
- Genetic improvement of piglet survival has great benefit:
  - animal welfare
  - economics
  - environment
- Genetic parameters of different survival traits:
  - survival at birth (complement of stillbirth)
  - survival during the entire nursing period
- Associations of piglet survival and individual birth weight
- Response to selection of piglet survival:
  - Selection experiment

Two generation selection experiment (high and average genetic groups for piglet survival)



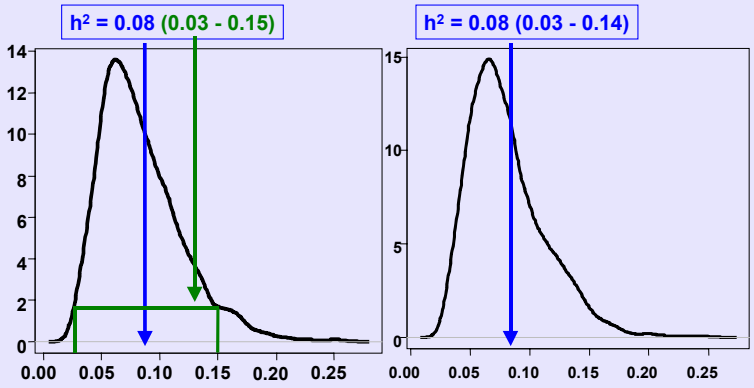
Two generation selection experiment (high and average genetic lines for piglet survival)



Multiple trait linear and threshold model

- **Threshold model:**
  - considering the categorical, i.e. binary expression of the survival traits
- **Linear model:**
  - birth weight
- **Bayesian analysis using Gibbs Sampling**
- **Animal model:**
  - direct genetic effects
  - litter effect
    (maternal genetic and environmental effects)

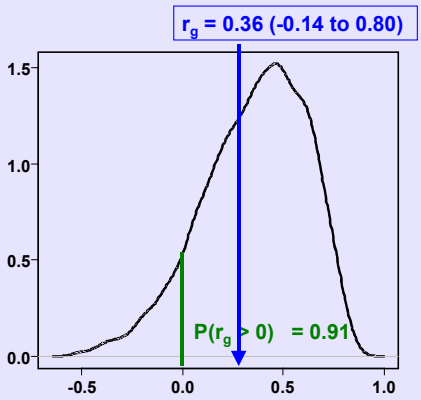
Posterior distributions of the direct heritability of piglet survival traits



Heritability of survival at birth (complement to stillbirth)

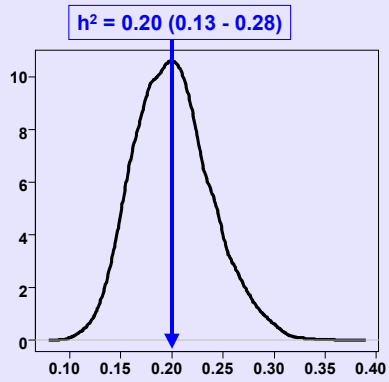
Heritability of survival during the nursing period

Posterior distribution of the correlation between direct genetic effects of survival at birth & survival during the nursing period



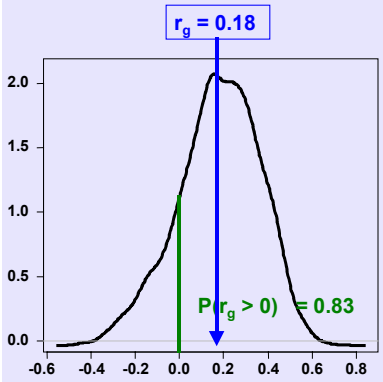
Genetic correlation of survival at birth & survival during the nursing period

Posterior distributions of the direct heritability of individual birth weights

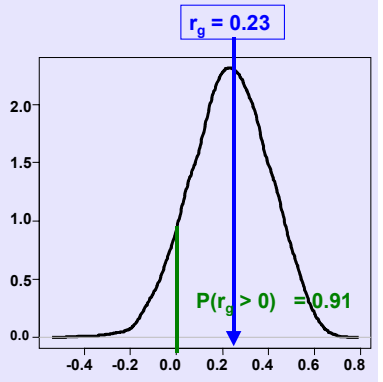


Heritability of birth weight (including weights of dead piglets)

Posterior distribution of the correlations between direct genetic effects of survival traits & birth weight (including weights of dead piglets)



Genetic correlation of survival at birth & birth weight

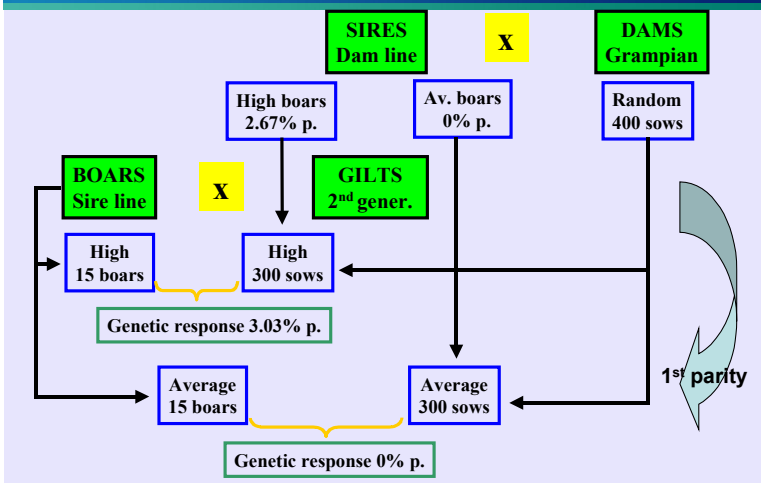


Genetic correlation of survival during nursing period & birth weight

Selection response of the first-parity sows (2nd generation) in piglet survival during the nursing period

	High EBV group	Av. EBV group
Maternal EBV $_{selection}$	2.67%	0.00
Phenotypic mean	91.1%	88.4%
Genetic mean	3.03% ± 1.18	0.00

Two generation selection experiment (high and average genetic groups for piglet survival)



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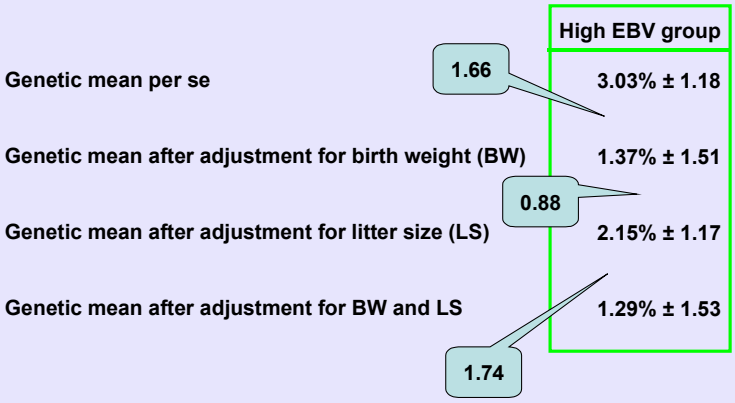

Summary and Conclusions

- **Piglet survival traits are genetically determined (h^2_d = 0.08)**
- **Piglet survival at birth and piglet survival during the nursing period are mainly genetically different traits (r_g = 0.36)**
- **Piglet survival traits and individual birth weight are favourably genetically associated (r_g = 0.18 to 0.23)**
- **The use of the continuously measurable trait birth weight in the multiple trait linear & threshold model enhanced the estimation of genetic effects of piglet survival**

Summary and Conclusions

- Selection for maternal genetic effects of postnatal survival was successful:
  - No genotype by environmental interactions (in-/outdoor)
- Improvement mainly associated with:
  - birth weight
  - litter size

  } Interactions
- Selection for survival on both:
  - piglet survival per se using a threshold model
  - and to an optimal birth weight

Acknowledgements

PARTNERS

- University of Newcastle
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- GCFG
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