Litter weight three weeks after farrowing and genetic correlation to others nursing ability traits

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Videncenter for Svineproduktion

Landbrug Fødevarer

Breeding for litter size and weight at 3 weeks are useful indicators of nursing ability

Motivation

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- **Number of weaned piglets - key for productivity**
  - Increase fertility
  - Decrease piglet mortality
- **Increasing litter size demand for better nursing ability**
- **How to measure ?**

Nursing ability complex

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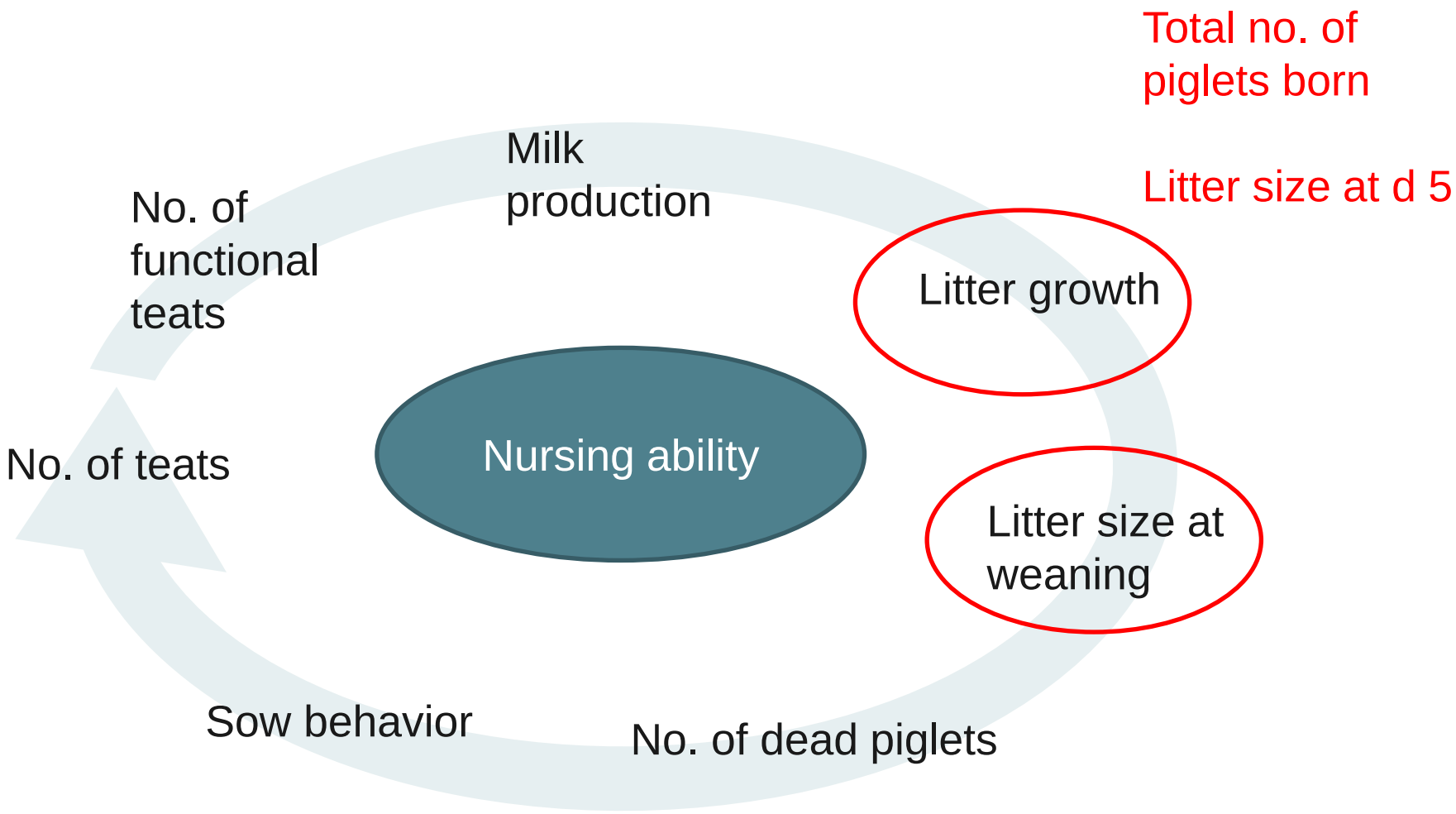

Objective

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To analyse litter weight and litter size at three weeks and estimate genetic correlation to the total number of born and litter size at day 5 in the purebred lines

Data

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- ✓ **Old data: 2002 - 2004**

1) Su et al, 2007 *J Animal Sci*
2) Su et al, 2008 Animal

- ✓ **Purebred litters in 26 nucleus herds**
- ✓ **Female lines, Large white and Landrace**
- ✓ **Cross fostering within the first 3 days**
- ✓ **No removal of piglets from day 3 to day 21**

Definition of traits

1) Litter weight at 3 weeks at the nurse sow
2) Number of piglets at 3 weeks at the nurse sow

Experimental data

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Breed	Trait	Number of litters
Landrace	W3: Litter weight (kg)	7 126
	N3W: No. at 3 week	10 607
	LS5: Litter size at day 5	21 113
	TNB: Total no. born	51 203
Large White	W3	5 147
	N3W	7 710
	LS5	15 264
	TNB	38 250

Four trait animal model

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$$Y_{ij} = \mu_{ij} + \gamma_{ij} + a_i + pe_i + e_{ij}$$

Sow i litter j

$$Y_{ij} = \left(\underbrace{y_{W3,ij}, y_{N3W,ij}}_{\text{Nurse sow}}, \underbrace{y_{LS5,ij}, y_{TNB,ij}}_{\text{Biological mother}}\right)^{T}$$

Fixed effects of μ_{ij}
Herd, year, quarter, parity, crossbred litter

Random effects

- γ_{ij} herd-year-quarter
- a_i animal
- pe_i permanent
- e_{ij} residual

$$\gamma_i \sim N(0, \Sigma_\gamma), \qquad a_i \sim N(0, G \otimes A)$$

$$pe_i \sim N(0, \Sigma_{pe}), \qquad e_{ij} \sim N(0, \Sigma_e)$$

Heritabilities

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Trait	Landrace	Large White
TNB	0.08	0.06
LS5	0.08	0.07
N3W	0.04	0.04
W3	0.10	0.09

Genetic variances and correlations

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Landrace

	TNB	LS5	N3W	W3
TNB	1.07			
LS5	0.48	0.89		
N3W	-0.06	0.77	0.11	
W3	-0.33	0.25	0.58	12.4

Large White

	TNB	LS5	N3W	W3
TNB	0.70			
LS5	0.61	0.73		
N3W	0.44	0.89	0.16	
W3	0.15	0.50	0.78	15.5

Variance in the diagonals, and correlations below

Discussion

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- **Subjective traits - no standardization of litters**
  - At day 3 farmers had decided which and how many piglets for each lactation sow
- **Significance of the traits**
  - N3W increases welfare and production
  - W3 reduces sow welfare, improves production
- **Genetic variances**
  - N3W: 6 times lower than for TNB
  - W3: 4 times lower that growth to 30 kg
  - Maternal and direct effect
- **Breeding goal**
  - N3W economically more important
  - W3 might be an indicator trait

Summary and conclusion

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Summary

- ✓ Litter weight at 3 weeks was heritable (h^2=0.09)
- ✓ Favourable genetic correlation to LS5 and litter size at 3 weeks (r=0.58, r= 0.78)
- ✓ Litter size at 3 weeks had low heritability (h^2=0.04)

Conclusion

- ✓ Litter size and weight at 3 weeks are useful indicators of the nursing ability complex