Temperament, adaptation and maternal abilities of Meishan and Large White sows kept in a loose-housing system during lactation

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Outline

• Introduction
• Experimental design: performance in lactation
• Objectives
• Behavioural study: measures and results
• Discussion - Conclusion

Introduction

• Genetic variation in pig behaviour
  Breeds known for having contrasted maternal abilities and temperament:
  Meishan: old Chinese unselected breed, very good performance, calm animals
  Large White: selected for lean growth rate and prolificacy, active animals

• Towards loose-housing in lactation…
  ⇒ sows suitable for this environment

Experimental design

Test of maternal component only

Meishan × Large White
↓↓
F1 MS × LW piglets

Lactation: individual pen 2.8 x 2.5 m²

Objectives

Relevance of behavioural traits recorded early in life, as criteria of selection to improve sow maternal abilities?

1. Estimate behavioural differences between Meishan and Large White gilts
   In two stressful situations - change of environment
   - Reactivity during a novelty test
   - Adaptation to individual pen in lactation

2. Relations of behaviour with performance in lactation
   ⇒ within-breed level

Performance in lactation

Meishan vs. Large White

- No difference in stillbirth and later mortality, remarkably low
  - Larger litters
  - Heavier piglets
  - Higher litter growth
  - Better nursing behaviour
  - Piglets more eager to suckle

⇒ Large maternal component involved in success of reproduction

Canario et al., EAAP 2007; Knowing Animals WQ2009
SAS software p<0.05

Experimental unit: Le Magneraud
Novelty test

**BEHAVIOUR** 11 wk of age – post-weaning

**ENDOCRINOLOGY**

Test 15 min

3 challenges
- Novel environment
- Novel object voluntary approach
- Human voluntary approach

Traits
- Vocalizations, locomotion, exploration, immobility (standing), investigation of novel object and human

**Lactation unit**

- Thursday before week of farrowing

Day 2: after cleaning the pen

**Human approach test**

- behaviour video recorded for 1 hour

**Activity**: % time spent in different positions

Statistical analyses

**Behaviour + endocrinology**:

1. **Breed comparison**:
   \[ y = \mu + \text{date} + \text{order} + \text{breed} + e \]

   - Behavoiur: Normal, Binomial or Poisson distribution
   - Endocrinology: \( \log(CORTI1) \)

   SAS Proc GLM
   Proc Genmod
   Proc LSmEANS (SE)

2. **Within-breed comparison**:
   \[ y = \mu + \text{date} + \text{order} + e \]  

   Performance:
   \[ y = \mu + \text{batch} + e \]  

   % of stillbirth and % of mortality to 21d

   Early (4~7 d of lactation) and late (7~21 d) litter growth

**Results 2. Novelty test – breed comparison**

<table>
<thead>
<tr>
<th>Behaviour Challenge</th>
<th>Vocalizations (n)</th>
<th>Locomotion (n) sections</th>
<th>Exploration (mm)</th>
<th>Immobility (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meishan</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Large White</td>
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<tr>
<td>Diff P-value</td>
<td></td>
<td></td>
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<tr>
<td>Basal cortisol (log)</td>
<td>3.84</td>
<td>2.84</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>DIFFCORTI1 (ng/ml)</td>
<td>18.1</td>
<td>21.5</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>

**Endocrine status**

- Basal cortisol (log): similar response to stress
- DIFFCORTI1 (ng/ml): no significant relation with performance

**Results 3. Within-breed comparison**

reactivity in novelty test → litter mortality and growth

**Challenge 1**
- Meishan: \( r \) (immobility – later litter growth) = + 0.61
- Large White: \( r \) (exploration - % stillbirth) = + 0.57
  \( r \) (exploration - % mortality) = + 0.60

**Challenge 2**
- Meishan: no significant correlation
- Large White: no significant correlation

**Challenge 3**
- Meishan: \( r \) (stay standing - later litter growth) = + 0.52
- Large White: \( r \) (immobility - % mortality) = - 0.59

**Results 2. Novelty test – breed comparison**

**Lactation unit**

- Thursday before week of farrowing

Day 2: after cleaning the pen

**Human approach test**

- behaviour video recorded for 1 hour

**Activity**: % time spent in different positions
**Results 4 – Adaptation to individual pen**

**Between breed**
- No difference in postural activity

<table>
<thead>
<tr>
<th>Breed</th>
<th>Stand</th>
<th>Sit</th>
<th>Lye laterally</th>
<th>Lye ventrally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meishan</td>
<td></td>
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<tr>
<td>Large White</td>
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</tbody>
</table>

**Within breed**
- Meishan
  - $r$ (standing – early litter growth) = + 0.64
  - $r$ (standing – % stillbirth) = + 0.64
  - $r$ (standing - early litter growth) = - 0.77
- Large White

**Discussion - Conclusion**

- **Breed comparison**
  - Low discrimination according to behavioural reactivity in stressful situation (vocalizations and locomotion in Large White)

- **Predictors of good maternal abilities**
  - Standing position: favourable to maternal abilities in Meishan vs unfavourable in Large White
  - Exploration: sign of anxiety in Large White
  - Immobility leads to growth in Meishan vs survival in Large White

Reactivity in prepubertal period affects lactation performance, late gestation affects farrowing performance.

**Discussion - Conclusion**

- Preliminary study to investigate early behavioural indicators of good maternal abilities – small data set
- Environment at farrowing promotes good performance in both breeds. In farrowing crate?
- Perspectives: Relationship of aggressiveness during gestation with performance

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