Consequences of selection for indirect genetic effects on growth for production traits in pigs

Irene Camerlink, N. Duijvesteijn, J.E. Bolhuis, J.A.M van Arendonk and P. Bijma
Long term challenges
Indirect Genetic Effects (IGE)

Indirect Genetic Effect (IGE)\(^1\) = heritable effect of an individual on its social partners

Pigs: heritable effect on the growth of pen mates

\[ P = A + E \]

\(^1\) Social genetic effect, associative effect, competitive effect, Social Breeding Value
Indirect Genetic Effects and Housing Conditions in Relation to Aggressive Behaviour in Pigs

Irene Camerlink1,2,*, Simon P. Turner3, Piter Bijma3, J. Elizabeth Bolhuis1

1 Animal Physiology Group, Department of Animal Sciences, Wageningen University, Wageningen, The Netherlands. 2 Animal Breeding and Genomics Centre, Department of Animal Sciences, Wageningen University, Wageningen, The Netherlands. 3 SITC, Edinburgh, United Kingdom

Applied Animal Behaviour Science
journal homepage: www.elsevier.com/locate/applan

Relationship between growth rate and oral manipulation, and aggression in finishing pigs

Irene Camerlink a,4,*, Piter Bijma4, Bas Kemp4, J. Elizabeth Bolhuis4

a Animal Physiology Group, Department of Animal Sciences, Wageningen University, P.O. Box 370, 6700 AE Wageningen, The Netherlands. 4 Animal Breeding and Genetics Centre, Department of Animal Sciences, Wageningen University, P.O. Box 370, 6700 AE Wageningen, The Netherlands.
One-generation selection experiment

- IGE for ADG finishing
- based on pedigree
- high / low selection
- A priori estimated IGE contrast \[ 3.6 \text{ g ADG} \] (DBV contr. 3.1)
- Re-estimated (excl. trial) contrast \[ 2.8 \text{ g ADG} \] (DBV contr. 0.1)
G×E set-up

High IGE
Low IGE
Straw
Barren

x 80
Results – no difference in ADG w10-23
Results – BW in opposite direction

- High IGE lower body weight after weaning

<table>
<thead>
<tr>
<th>Age (wk)</th>
<th>High IGE</th>
<th>Low IGE</th>
<th>SE</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>8.9</td>
<td>9.2</td>
<td>0.1</td>
<td>0.004</td>
</tr>
<tr>
<td>10</td>
<td>33.1</td>
<td>34.1</td>
<td>0.3</td>
<td>0.01</td>
</tr>
<tr>
<td>17</td>
<td>84</td>
<td>86</td>
<td>0.6</td>
<td>0.08</td>
</tr>
<tr>
<td>23</td>
<td>118</td>
<td>121</td>
<td>0.9</td>
<td>0.07</td>
</tr>
</tbody>
</table>

- No difference feed intake
- No difference feed conversion ratio (FCR)
# Results slaughter

<table>
<thead>
<tr>
<th>Measurement</th>
<th>High IGE</th>
<th>Low IGE</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass weight (kg)</td>
<td>92.0 ± 0.8</td>
<td>94.6 ± 0.8</td>
<td>0.02</td>
</tr>
<tr>
<td>Back fat thickness (mm)</td>
<td>18.1 ± 0.3</td>
<td>18.5 ± 0.3</td>
<td>0.35</td>
</tr>
<tr>
<td>Meat (%)</td>
<td>55.1 ± 0.2</td>
<td>55.1 ± 0.2</td>
<td>0.93</td>
</tr>
<tr>
<td>Muscle depth (mm)</td>
<td>58.5 ± 0.5</td>
<td>60.7 ± 0.5</td>
<td>0.0013</td>
</tr>
<tr>
<td>Stomach wall damage (1–5)</td>
<td>2.7 ± 0.1</td>
<td>2.5 ± 0.1</td>
<td>0.08</td>
</tr>
</tbody>
</table>
Discussion

Novelty selection method

- Difficulty of selection for IGE on growth in pigs
- Contrast smaller at re-estimation
- One generation of selection

![Graph showing growth in g ADG for Barren pen and Straw-enriched pen across different batches.](image-url)
Discussion

Differences found in aggression and tail biting behaviour

⇒ Low IGE more biting behaviour

Differences to commercial practice

⇒ Ad lib feeding – less competition
⇒ Strict measures against tail biting

Avoiding ‘damaging’ behaviour in trial limits effect on growth
Long term perspective

Selection on IGE for growth is a long term, but promising challenge to simultaneously improve pig welfare, production, and breeding value estimations.

Contact: irene.camerlink@wur.nl
Indirect genetic effects

Indirect Genetic Effects for growth: heritable effect a pig has on the growth of its pen mates

\[ P_i = A_{D_i} + E_{D_i} + \sum_{i \neq j} (A_{S_j} + E_{S_j}) \]

- Own genetics
- Genetics of others

\[ TBV_i = A_{D_i} + (n - 1)A_{S_i} \]

- DBV
- SBV: effect on others