Addressing lameness in group housed sows

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The problem of lameness in sows

- Lameness is a major production disease
- 2nd most important reason for culling (Anil et al., 2005)
- 32% of animals culled for lameness have only produced one litter (Boyle et al., 1998)
- Replacement rate = 50% (Irish PigSys data)
- Welfare problem
  - Pain/discomfort
  - Reduced mobility
  - Difficulty competing for resources
Claw lesions

- Highly prevalent: 100% of sows affected
- Account for 5 to 20% of sow lameness

Score 0 = normal to 3 = severe injury (FeetFirst™ – Zinpro Corp.)
Osteochondrosis

- Main contributor to leg weakness/lameness in pigs
- **Non-infectious** disease of the **joint surface**; resulting in **deterioration** of quality of **cartilage** & underlying **bone**
- Increased pressure on the joint surface
- Risk factors:
  - High growth rate
  - Joint stress
Locomotion/lameness scoring

Scored as *per Main et al., 2000*

0 = Normal
1 = Pig appears stiff
2 = Shortened stride
3 = No weight bearing on affected limb
4 = Affected limb elevated off floor
5 = Pig does not move

Non-lame

Categorised as lame as *per KilBride et al. (2009)*

Lame
Objectives
To evaluate risk factors for lameness in sows and to establish nutritional and environmental means of addressing lameness

• Improve nutrition of replacement gilts to reduce lameness/increase longevity
• Improve flooring to reduce injury and improve comfort
Lameness in stall vs. group housed sows

Compared lameness scores at transfer to the farrowing house (d110)

<table>
<thead>
<tr>
<th>Lameness score</th>
<th>Group housing</th>
<th>Gestation stalls</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>≥3</td>
<td>13</td>
<td>3</td>
</tr>
</tbody>
</table>

74% 33%

Lameness is likely to become a bigger problem now that sows are group housed

Calderon Diaz et al. submitted to JAS
Claw lesions recorded in sows on slatted steel or cast iron floors in the farrowing crate

Slatted steel (Tribar type) flooring detrimental to claw health irrespective of way sows housed during gestation

Calderon Diaz et al. submitted to JAS
Lameness survey: Risk factors for lameness

- Visits and questionnaires to 68 pig farms
- +10,000 pigs inspected (including 525 replacement gilts)

The earlier replacement gilts were housed/fed differently to the finisher pigs the less likely they were to be lame
Management of replacement gilts

- Strategies practised on Irish farms
  1. House and feed gilts as finisher stock up to service
  2. House/feed as finishers up to 100kg; then gestating sow diet
- Replacement gilt: Bone development & fat deposition NB

“Developer” diets

- Gradual weight gain: energy:lysine (OCD)
- Bone development: Ca:P (BMD)
- Claw strength: Zn, Cu & Mn
Materials and methods

- 36 Large White X Landrace gilts at ~65kg
- Housed individually
- 3 dietary treatments:
  1. Developer
  2. Finisher
  3. Gestating sow
- Carried out over 12 weeks until c. 140kg
# Diets fed to replacement gilts from 65 to 140kg

<table>
<thead>
<tr>
<th>Chemical composition</th>
<th>Developer</th>
<th>Finisher</th>
<th>Gestating sow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestible energy (MJ of DE/kg)</td>
<td>14.0</td>
<td>13.5</td>
<td>13.0</td>
</tr>
<tr>
<td>Lysine (g/kg)</td>
<td>7.0</td>
<td>9.8</td>
<td>6.4</td>
</tr>
<tr>
<td>Calcium (g/kg)</td>
<td>7.6</td>
<td>6.1</td>
<td>7.0</td>
</tr>
<tr>
<td>Phosphorous (g/kg)</td>
<td>5.0</td>
<td>3.7</td>
<td>4.6</td>
</tr>
<tr>
<td>Digestible phosphorus (g/kg)</td>
<td>3.3</td>
<td>2.4</td>
<td>3.2</td>
</tr>
</tbody>
</table>

- Developer diet Avalia sow ® inclusion @ 850g/tonne
Experimental schedule

- Flushing
- Slaughter (service weight)

- 65kg: Day 0
- 100kg: Wk 4
- 130kg: Wk 10
- 140kg: Wk 12
# Lameness

<table>
<thead>
<tr>
<th></th>
<th>Developer&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Finisher</th>
<th>Pregnant sow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>Wk 1-4</td>
<td>1</td>
<td>2.68</td>
<td>0.01, 7.11</td>
</tr>
<tr>
<td>Wk 5-8</td>
<td>1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.25&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.40, 5.95</td>
</tr>
<tr>
<td>Wk 9-12</td>
<td>1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.65&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.15, 5.44</td>
</tr>
</tbody>
</table>

<sup>1</sup>Developer is reference category, OR = Odds ratio CI = Confidence interval
Body weight

The graph shows the body weight changes over different periods for different groups:

- **Day 0**
- **Wk 4**
- **Wk 10**
- **Wk 12**

The lines represent:

- **Blue line**: Developer
- **Red line**: Finisher
- **Green line**: Gestating sow

The data points are significant at **P <0.05** for all periods.
## Joint lesions

<table>
<thead>
<tr>
<th></th>
<th>Developer</th>
<th>Finisher</th>
<th>Pregnant sow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>Humeral Condyle</td>
<td>$1^a$</td>
<td>$11.6^b$</td>
<td>0.60, 18.30</td>
</tr>
<tr>
<td>Anconeal Process</td>
<td>1</td>
<td>3.2</td>
<td>-0.62, 2.94</td>
</tr>
</tbody>
</table>

- No effect of dietary regime on claw lesions \( (P>0.05) \)
Claw lesions in group housed gilts fed a developer diet ad libitum

<table>
<thead>
<tr>
<th>Developer</th>
<th>Finisher</th>
<th>Gestating sow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wk OR OR 95% CI</td>
<td>OR 95% CI</td>
<td>OR 95% CI</td>
</tr>
<tr>
<td>Claw lesions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 1 1.12 0.41, 3.12</td>
<td>1.38 0.52, 3.64</td>
<td></td>
</tr>
<tr>
<td>12 1 a 3.15 b 2.27, 6.80</td>
<td>3.91 c 1.51, 10.14</td>
<td></td>
</tr>
</tbody>
</table>

- No effect of dietary regime on joint lesions but developer diet not associated with slower growth rate (P>0.05)
Conclusions

- Restricted feeding of a developer diet reduced joint lesions - slower growth rate?
- Claw lesions reduced – mineral supplementation?
- Feeding a developer diet from 65kg reduced lameness in replacement gilts
- Need to study individual components of developer diet & long term impact on reprod. performance/longevity
Concrete slatted flooring in group housing

• Major risk factor for lameness (*KilBride et al., 2009*)
• Labour/cost, availability, hygiene issues with straw
• Growing interest in rubber flooring for pigs
• More yielding/compressible and lower thermal conductivity than concrete (*Boe et al., 2007; Platz et al., 2008*)
• Greater area of contact between claw and floor (*Flower et al., 2007*) and protective → fewer claw lesions
Longitudinal study of the effect of rubber slat mats on indicators of sow welfare and lameness

- 2000 sow commercial herd
- 160 replacement gilts → 2 parities
- Oct. ‘10 – Mar. ‘12

Rubber; n=80 gilts  Concrete; n=80 gilts

Calderon-Diaz et al., 2013. JAS 19: 1-15
Risk associated with lameness and claw lesions in sows on rubber vs. concrete slats during two parities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parity 1</th>
<th>Parity 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR$^1$</td>
<td>CI$^2$</td>
</tr>
<tr>
<td>Lameness</td>
<td>0.32$^a$</td>
<td>0.21-0.50</td>
</tr>
<tr>
<td>Toe overgrowth</td>
<td>3.81$^a$</td>
<td>1.17-9.28</td>
</tr>
<tr>
<td>Dew claw overgrowth</td>
<td>1.05</td>
<td>0.34-3.26</td>
</tr>
<tr>
<td>Heel overgrowth/erosion</td>
<td>1.21</td>
<td>0.58-2.54</td>
</tr>
<tr>
<td>Heel sole crack</td>
<td>6.77$^a$</td>
<td>1.95-23.49</td>
</tr>
<tr>
<td>White line damage</td>
<td>3.01</td>
<td>0.72-12.52</td>
</tr>
<tr>
<td>Cracs in the wall</td>
<td>3.18$^a$</td>
<td>1.52-6.64</td>
</tr>
<tr>
<td>Dew claw injuries</td>
<td>1.48</td>
<td>0.43-5.02</td>
</tr>
</tbody>
</table>

Reference category: concrete flooring

Protective benefit of rubber on limb lesions (calluses ↓wounds and swellings $P<0.05$)
Dirtiness of sows

No effect of floor (P>0.05)

Dirtiness of pen: Rubber floors were more soiled (P<0.05)
Effect of rubber flooring on the time (%) spent in different pen locations

- Group area: $P < 0.01$
- Feeding stalls: $P < 0.05$

Bar chart showing the time spent (%) in group area and feeding stalls with concrete and rubber flooring. The chart indicates a statistically significant difference between the two materials in both locations.
Effect of rubber flooring on postural behaviour in the group area

- Standing: $P < 0.05$
- Lateral lying: $P = 0.08$
- Ventral lying: $P > 0.05$
- Lying: $P < 0.05$

Concrete: □
Rubber: ▲
Conclusions

- Rubber flooring reduces lameness in group housed sows
- Mediated by better comfort while lying/posture changing rather than by protection of the foot from the floor
- Caution re. lack of abrasion of claws, potential for dirtiness and heat stress with rubber flooring!
Overall conclusions

- Lameness is a major threat to the sustainability of group housing systems operated in the absence of bedding.
- Lameness can be addressed by:
  - Improving sow comfort and offering protection to the feet/skin from the floor (e.g. rubber slat mats).
  - Improving the nutritional management and housing of replacement gilts during rearing.
Acknowledgements
Thank you!