Nutrition of the Developing Gilt for Optimal Lifetime Productivity

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Goals of Gilt Development Program

- 55 - 60 pigs weaned per sow lifetime
- 40 - 45% annual sow replacement rate
- 0% sow death loss
- 0% gilt wastage
The Current Situation

- Primary causes of premature sow losses are reproductive failure and lameness.
- Sow losses are too high and premature.
- Sows leave the herd before they become profitable.
Factors to Consider in Gilt Development Programs

- Growth rate of gilts
- Body composition at first mating
- Skeletal integrity
- Structural correctness (Fitness)
Growth Rate
Effect of ADG and Mating Age on Sow Performance over 3 Parities

Kummer et al., 2006

*Total pigs born/litter
Effect of BW at 22 weeks on Lifetime Productive Days

Johnston et al., 2007

Mean wt. (kg)     85.3  91.1  95.3  99.3  103.8  112.3

Lifetime Prod. Days

285\textsuperscript{ab}
298\textsuperscript{a}
288\textsuperscript{a}
301\textsuperscript{a}
284\textsuperscript{ab}
269\textsuperscript{b}

\textsuperscript{ab}(P < 0.05)
Effect of BW at 22 weeks on Lifetime Pigs Born Live

Johnston et al., 2007

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\( r = \) 1958, 1959

\( ab(P < 0.05) \)
Effect of Gilt Development Diet on Stayability through 4 Parities

Stalder et al., 2000
Long et al., 1998

ab(P < 0.05) within parity
Effect of BW at First Mating on Pigs Born over 3 Parities

Williams et al., 2005
Growth Rate Summary

- Extremes (slow and rapid) in growth rate seem detrimental.
- Gilts should gain at least 550 g/d from birth to selection at 160 days of age.
- Growth rate should not exceed 800 g/d from birth to selection to optimize sow longevity.
Body Composition
Body Fat and Reproduction

Johnston et al., 1989

Postweaning interval to estrus (d)

Maternal body fat at weaning (%)

Y = 52.51 - 1.59X

r² = 0.24
(p < .05)
Body Composition Effects on Sow Retention to Parity 4

Rozeboom et al., 1996
### Effect of Backfat Depth at 22 wks on Lifetime Productive Days

<table>
<thead>
<tr>
<th>Mean P2 fat (mm)</th>
<th>Lifetime Prod. Days</th>
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<tr>
<td>8.1 1958</td>
<td>260&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>9.4 1959</td>
<td>277&lt;sup&gt;ac&lt;/sup&gt;</td>
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<tr>
<td>10.1 1958</td>
<td>286&lt;sup&gt;b&lt;/sup&gt;c</td>
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<tr>
<td>11.0 1959</td>
<td>302&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>12.1 1958</td>
<td>295&lt;sup&gt;bc&lt;/sup&gt;</td>
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<td>14.2 1959</td>
<td>304&lt;sup&gt;b&lt;/sup&gt;</td>
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Johnston et al., 2007

abc (P < 0.05)
Effect of Backfat Depth at 22 wks on Lifetime Pigs Born Live

Johnston et al., 2007 abc (P < 0.05)
Effect of Backfat Depth on Lifetime NBA and Longevity

Stalder et al., 2005

Backfat depth (mm) at 113 kg

<table>
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<th>Backfat Depth (mm)</th>
<th>Pigs Born Live</th>
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<td>24.1&lt;sup&gt;bc&lt;/sup&gt;</td>
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<td>17-21</td>
<td>23.2&lt;sup&gt;ab&lt;/sup&gt;</td>
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<td>21-25</td>
<td>22.6&lt;sup&gt;ab&lt;/sup&gt;</td>
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<tr>
<td>&gt; 25</td>
<td>27.6&lt;sup&gt;c&lt;/sup&gt;</td>
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<sup>abc</sup>(P < 0.05) for maximum parity
<sup>wxyz</sup>(P < 0.05) for maximum parity
Body Fatness and Structural Correctness

- Pigs selected over 5 generations for correct front leg structure were fatter than pigs with poorer structure (Rothschild et al., 1988)

- Fatter gilts at selection = more correct structure?

- More correct structure = greater longevity
Body Composition Summary

- Seems body fat is not terribly important
- Other factors play a larger role
  - Body weight
  - Body protein mass
  - Sexual age
- Keep body fat within “reasonable” levels
Skeletal Integrity
Historical

- Ca, P, and Vit. D receive most attention related to skeletal growth
- Nimmo et al. (1981) very influential
- Many factors influence bone integrity
  (Davidson, 2006)
- Exercise is an important factor
  (Marchant and Broom, 1996)
Adjusted Tibiotarsus Stiffness of Broiler Strains at 15 Days

Williams et al. 2004

(ab(P < 0.01)
Adj. Maximum Tibiotarsus Load of Broiler Strains at 15 Days

Williams et al. 2004

ab(P < 0.01)
Growth Rate and Bone Strength in Pigs

- Crenshaw (2003) restricted feed intake of pigs from 100 to 72% of ad libitum
- Collected metatarsal bones when BW ranged from 25 to 120 kg
- Diet restriction increased size of bones
- Mechanical properties of bones not influenced by diet restriction
- OCD lesions seemed to decline with diet restriction
Skeletal Integrity Summary

- Rapid growth seems to compromise skeletal quality.
- Maintaining growth from birth to selection at about 600 – 700 g/d seems prudent in the absence of controlled studies to the contrary.
Structural Correctness (Fitness)
Areas of evaluation

- Skeleton (feet/legs, topline, rib, locomotion)
- Mammary soundness
- External genitalia
Structurally Correct
Structurally Incorrect
Front Leg Soundness Score

PIC as cited by Tiranti and Morrison, 2006
Conformation Score Effects on Herd Survival – Front Legs

Tiranti and Morrison, 2006

Conformation score effect (P < 0.02)
Hind Leg Structure Score

PIC as cited by Tiranti and Morrison, 2006
Conformation Score Effects on Herd Survival – Hind Legs

Tiranti and Morrison, 2006

Conformation score effect (P < 0.01)
Effects of a Gilt Selection Program on Sow Losses

A rigorous gilt selection program was implemented in a 20,000-sow commercial system in late 2005.
Mammary soundness
Reproductive soundness
Final Recommendations

- First mating at 2\textsuperscript{nd} estrus
- Mate gilts at 135 to 155 kg BW
  - Considers growth rate of gilts to mating
  - Considers body composition of gilts
  - Requires the use of a livestock scale
- Evaluate “fitness” of gilts at 115 to 125 kg BW
- Protect investment in gilt program by careful management of females after entering the breeding herd.
Questions for the Future

- Effects of early life on longevity?
  - In utero
  - During suckling and nursery
- Dam effects on longevity?
- How will changes in sow housing and management systems influence longevity?
- Can keener stockmanship increase longevity?
- Are there genetic markers for longevity?