Welcome to 2009 Swine Day!
Outline for the Day

• Sow Research
  - Creep Feeding
  - Late Gestation Feeding
  - Importance of Birth Weight

• Nursery Research
  - Starter Diet Ingredients
  - Feed Additives
  - Lysine Requirements

• PCV2 Vaccination

• H₁N₁ Panel
Outline for the Day

• Grow-Finish Research
  - Feeder design and adjustment
  - Amino acid research
  - DDGS and other alternatives
  - Mycotoxins
  - Marketing
    – Mixing and topping pigs and Paylean use

• Kent Bang – Bank of the West

• Ice Cream Reception
Creep Feeding
# K-State Creep Feeding Research

<table>
<thead>
<tr>
<th>Study #</th>
<th>No. of Litters</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>84</td>
<td>Creep feeding x lactation feed intake</td>
</tr>
<tr>
<td>2</td>
<td>54</td>
<td>Creep feeding duration</td>
</tr>
<tr>
<td>3</td>
<td>54</td>
<td>Creep feeder design</td>
</tr>
<tr>
<td>4</td>
<td>50</td>
<td>Feed flavors in creep feed</td>
</tr>
<tr>
<td>5</td>
<td>96</td>
<td>Creep diet complexity</td>
</tr>
</tbody>
</table>

Sulabo PhD Dissertation, 2009
Creep Feed Impact on Post-weaning Growth

Eaters: 24.3a
Non-eaters: 23.1b
No creep pigs: 23.4b

Overall ADG, lb
Total Gain, lb

Sulabo et al., 2009

a,bP<0.05
Creep Feeder Design

Rotary feeder with a hopper

Rotary feeder without a hopper

Stainless pan feeder

Sulabo et al., 2009
Materials and Methods (Exp. 5)

- 96 sows (PIC) and their litters
- Conducted in a commercial facility
- Dietary treatments:
  - Treatment 1 – No Creep (n = 26)
  - Treatment 2 – Simple creep diet (n = 26)
  - Treatment 3 – Complex creep diet (n = 44)
- Creep fed from d 18 to 21 (weaning) using the rotary feeder with a hopper

Sulabo et al., 2009
Exp 5 Simple (Sow Feed) vs Complex Creep (Pelleted Diet with Milk Products and Animal Proteins)

<table>
<thead>
<tr>
<th>Creep diet complexity</th>
<th>Simple</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter creep feed intake (lb)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.37a</td>
<td>2.73b</td>
</tr>
<tr>
<td></td>
<td>0.452a</td>
<td>0.908b</td>
</tr>
</tbody>
</table>

a,bP<0.01

Sulabo et al., 2009
Effect of creep diet complexity on the proportion of piglets consuming creep feed (Eaters)

![Bar chart showing the proportion of piglets consuming creep feed for simple and complex diets.](chart)

- Simple Diet: 28a
- Complex Diet: 68b

Sulabo et al., 2009

a,bP<0.0001
Proportion of Eaters According to Weight Category

Proportion of Eaters (%)

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Bottom</th>
<th>Middle</th>
<th>Top</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>47&lt;sup&gt;a&lt;/sup&gt;</td>
<td>25&lt;sup&gt;b&lt;/sup&gt;</td>
<td>23&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Complex</td>
<td>83&lt;sup&gt;a&lt;/sup&gt;</td>
<td>65&lt;sup&gt;b&lt;/sup&gt;</td>
<td>62&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

P = .0001

Sulabo et al., 2009
Percentage of pigs failing to gain weight during the initial 3 d after weaning

- No creep: 28\textsuperscript{a}
- Non-eater: 29\textsuperscript{a}
- Eater: 17\textsuperscript{b}

\textsuperscript{a,b}P<0.0001

Sulabo et al., 2009
Influence of creep feed consumption on performance after weaning

Sulabo et al., 2009
Creep Feeding Practical Recommendations:

- Start 3 to 5 days before weaning
- Use appropriate creep feeder design and a complex creep feed
- Target 1.1 to 2.2 lb creep feed consumption per litter
Effect of Increased Late Gestation Feed Intake

+2.0 lb from d 90 to 112
PIC 1050 Sows

Shelton et al., 2010
The majority of fetal growth occurs during the last 1/3 of gestation. As a result, many producers increase feed intake in late gestation.
Gestation Weight Change
d 90 to 112

Feed Level, \( P < 0.01 \)

None +2.0 lb

Gilts

Fat Depth, mm: 19.0
19.9

Sows

14.9
15.3

Shelton et al., 2010
Piglet Birth Weight

Shelton et al., 2010
Lactation Feed Intake

Feed Level x Parity P < 0.01

11.7

9.9

12.8

13.4

ADF, lb

None +2.0 lb None +2.0 lb

Gilts Sows

Shelton et al., 2010
Farrowing to Weaning Weight Change

Feed Level x Parity P < 0.12

<table>
<thead>
<tr>
<th>Weight Change, lb</th>
<th>Gilts</th>
<th>Sows</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>-30.1</td>
<td>-16.7</td>
</tr>
<tr>
<td>+2.0 lb</td>
<td>-41.2</td>
<td>-15.3</td>
</tr>
</tbody>
</table>

Shelton et al., 2010
Summary – Increased Feed in Late Gestation

- Offered no benefit in sows
- Decreased lactation feed intake and increased weight loss in gilts with adequate or marginally excessive back fat
- Increased sow feed cost by $3.50 to $5.00 per sow
- **Bottom line**
  - Bump thin sows no more than 2 lb and no sooner than d 90 of gestation
Effect of Piglet Birth Weight and Litter Size on Subsequent Growth Rate

Bergstrom et al., 2009
Procedures

• 2,204 pigs (PIC sired) from a commercial sow farm were weighed then weaned at 25 days of age
• 4 birth weight categories, lb
  - ≤ 2.3
  - 2.4 to 3.3
  - 3.4 to 4.3
  - ≥ 4.4
• 3 total born categories
  - ≤ 11
  - 12 to 14
  - ≥ 15
Influence of total born category on weight of pigs born alive

Bergstrom et al., 2009
Influence of total born and weight category on number of pigs weaned

Bergstrom et al., 2009
Influence of total born category on pig weaning weight

- **≤ 11**: 16.3 lb
- **12 to 14**: 15.9 lb
- **≥ 15**: 15.8 lb

Bergstrom et al., 2009
Influence of total born category on preweaning mortality

Bergstrom et al., 2009
Influence of birth weight category on pig market weight (d 156 after weaning)

Bergstrom et al., 2009
Influence of birth weight category on percentage of culls and pigs < 215 lb

Bergstrom et al., 2009
Influence of Birth-weight on Live-weight at 180 d of age, lb

\[ y = -3.6688x^2 + 45.558x + 152.79 \]

\[ R^2 = 0.2031 \]
Summary

- Larger litters will have more lightweight pigs than small litters but...
- Large litters still have more heavy pigs.
- Low birth weight pigs, < 1.5 to 2 lb are very unlikely to reach an acceptable market weight.
Lactation Feeding - Key Points

- Feed intake drives subsequent reproduction
- High producing maternal line sows with lower feed intake will continue to drive milk production at the expense of body stores
- Many US swine producers are installing ad lib lactation feeders
Nursery pig research
Influence of PEP2 on nursery pig performance (D 0 to 11)

Myers et al., 2009
Influence of PEP2 on nursery pig performance (D 11 to 25)

Myers et al., 2009
Influence of PEP2 on nursery pig performance (D 0 to 25)

SBM vs Pos control P< 0.01
PEP quadratic P < 0.02
SEM 0.02

ADG, lb

0.65 0.71 0.71 0.71 0.70

SBM Plasma/fish 4% 8% 12%

PEP²

Myers et al., 2009
PEP² Summary

- Pigs fed PEP² had greater ADG and improved F/G compared to pigs fed 4% select menhaden fish meal
Nursery Growth Promoting Copper and Zinc

Post weaning Day

<table>
<thead>
<tr>
<th>Post weaning Day</th>
<th>Control</th>
<th>Cu</th>
<th>Zn</th>
<th>Cu+Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>d 0 to 14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d 14 to 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Zn = 3,000 ppm d 0 to 14 and 2,000 ppm d 14 to 42
Cu = 125 ppm
Nursery Growth Promoting Copper and Zinc

Zn from d 0 to 14 and Cu from 14 to 42 resulted in the heaviest pig with $0.56 less cost per pig compared to Cu+Zn

Shelton et al., 2009
Influence of dietary antibiotics on ADG (d 0 to 21)

Antibiotics $P < 0.01$

<table>
<thead>
<tr>
<th>ADG, lb</th>
<th>d 0 to 21</th>
<th>d 21 to 42</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.34</td>
<td>No med</td>
<td>Den/CTC</td>
</tr>
<tr>
<td>0.53</td>
<td>Den/CTC</td>
<td>Pulmotil</td>
</tr>
<tr>
<td>0.51</td>
<td>Den/CTC</td>
<td>Pulmotil</td>
</tr>
<tr>
<td>0.54</td>
<td>Den/CTC</td>
<td>Pulmotil</td>
</tr>
<tr>
<td>0.51</td>
<td>No med</td>
<td>Mec/OTC</td>
</tr>
<tr>
<td>0.55</td>
<td>Den/CTC</td>
<td>Mec/OTC</td>
</tr>
<tr>
<td>0.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Steidinger et al., 2009
Influence of dietary antibiotics on ADG (d 21 to 42)

Antibiotics $P < 0.01$

<table>
<thead>
<tr>
<th>ADG, lb</th>
<th>d 0 to 21 No med</th>
<th>d 21 to 42 No med</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Den/CTC Pulmotil</td>
<td>Den/CTC No med</td>
</tr>
<tr>
<td></td>
<td>0.93</td>
<td>1.11</td>
</tr>
</tbody>
</table>

Steidinger et al., 2009
Influence of dietary antibiotics on final pig weight (d 42)

Antibiotics d 0 to 21; \( P = 0.05 \)

Antibiotics d 21 to 42; \( P = 0.02 \)

<table>
<thead>
<tr>
<th>Duration</th>
<th>Treatment</th>
<th>Weight, lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>d 0 to 21</td>
<td>No med Den/CTC Pulmotil Den/CTC Pulmotil Den/CTC Pulmotil</td>
<td>39.4 44.9 44.8 42.7 42.4 45.4 45.8</td>
</tr>
<tr>
<td>d 21 to 42</td>
<td>No med Den/CTC Den/CTC No med No med Mec/OTC Mec/OTC</td>
<td></td>
</tr>
</tbody>
</table>

Steidinger et al., 2009
Antibiotic summary

- Adding antibiotics to the nursery diet improved pig performance and economic return
Available P released by phytase source and level

\[ y = -0.000000125x^2 + 0.000236245x + 0.015482000 \]

\[ R^2 = 0.73 \]

Jones et al., 2009
Phytase stability trial

- 3 sources (Ronozyme P, Optiphos, Phyzyme)
- 2 coatings (Coated and uncoated)
- 3 forms (pure, vitamin premix VTM premix)
- 4 temperatures (-18, 5, 23, 37 C)
- 6 periods (0, 30, 60, 90, 120, 180 d)
- All analysis by DSM
- Source x coating x form x temperature x day interaction (P < 0.001)

Jones et al., 2010
Phytase shelf life at different storage temperatures

![Graph showing phytase remaining at different temperatures over time. Temperatures: -18°C (0°F), 5°C (41°F), 23°C (73°F), 37°C (99°F). The graph illustrates the decrease in phytase activity over 120 days of analysis.]

Jones et al., 2010
Phytase activity remaining in pure form at 23 C (73 F) at 180 days

- Ronozyme P: 61%
- Optiphos: 93%
- Phyzyme: 86%

Uncoated: 80%
Coated: 40%

Jones et al., 2010
Phytase activity remaining in vitamin premix at 23 C (73 F) at 180 days

Jones et al., 2010
Phytase activity remaining in VTM premix at 23°C (73°F) at 180 days

Jones et al., 2010
Phytase activity remaining in pure form at 37 C (99 F) at 180 days

Jones et al., 2010
Phytase stability trial

- Source x coating x form x temperature x day interaction (P < 0.001)
- Pure products held at 23°C or less were the most stable.
- In premixes, longer storage time and higher temperature reduced phytase activity.
- Coating mitigated some of the negative effects of storage time and temperature for premixes.

Jones et al., 2010
Influence of lysine level on nursery pig performance (d 0 to 35)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Lysine, %</th>
<th>ADG, lb</th>
<th>Phase 3 lysine P</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 0 to 7</td>
<td>1.35</td>
<td>0.89</td>
<td>0.90</td>
</tr>
<tr>
<td>D 7 to 21</td>
<td>1.15</td>
<td>0.93</td>
<td>0.94</td>
</tr>
<tr>
<td>D 21 to 35</td>
<td>1.05</td>
<td>0.90</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Nemechek et al., 2010
Influence of lysine level on nursery pig performance (d 0 to 35)

<table>
<thead>
<tr>
<th>Group</th>
<th>Phase 2 lysine</th>
<th>Phase 3 lysine</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 0 to 7</td>
<td>1.35</td>
<td>1.54</td>
<td>P = 0.005</td>
</tr>
<tr>
<td>D 7 to 21</td>
<td>1.15</td>
<td>1.45</td>
<td>P = 0.003</td>
</tr>
<tr>
<td>D 21 to 35</td>
<td>1.05</td>
<td>1.49</td>
<td>P &gt; 0.20</td>
</tr>
</tbody>
</table>

SID Lysine, %

Nemechek et al., 2010
Lysine study summary

- Marginally deficient diets can be fed for the first 21 days after weaning provided that the late nursery diet is not deficient in lysine
- May provide more flexibility in diet formulation
Effect of Vaccination on Production Responses
Effect of PCV2 and *M. hyo* vaccination on nursery pig weight (d 35)

PCV2 × *M. hyo*: $P = 0.68$  
PCV2: $P < 0.01$  
*M. hyo*: $P = 0.06$

SE = 1.3

Potter et al., 2009
Effect of PCV2/M. hyo vaccine strategy on Fainting Pigs and Post Weaning Losses

Bergstrom et al., 2009
Effect of PCV2/M. hyo vaccine strategy on ADG

**d 0 to 73**

- **Bi**: 1.27
- **Intervet**: 1.24

*P < 0.0001*

**d 73 to 156**

- **Bi**: 1.89
- **Intervet**: 1.92

*P < 0.05*

Bergstrom et al., 2009
Effect of PCV2/M. hyo vaccine strategy on wean-to-finisher ADG (d 0 to 155)

$P = 0.98$

ADG, lb

- BI: 1.60
- Intervet: 1.60

Bergstrom et al., 2009
Effect of PCV2 vaccine strategy on ADG under a PRRS Challenge

d 0 and 15 = PCV2 Vaccination

No Difference

Shelton et al., 2009
Effect of PCV2 vaccine strategy on ADG under a PRRS Challenge

d 29= PRRS Challenge

Shelton et al., 2009
Effect of PCV2 vaccine on Survival under a PRRS Challenge

Shelton et al., 2009
Sirrah PRRSV-RS Vaccine Trial

Potter et al., 2009
Effect of Sirrah PRRSV-RS Vaccine on Mortality

Potter et al., 2009
Effect of Sirrah PRRSV-RS Vaccine on Finisher ADG and Feed Efficiency

Potter et al., 2009
Key Take Home Messages for Vaccination Strategies:

- Some vaccines negatively impact nursery performance
  - The impact needs to be evaluated against effectiveness in the finisher
- Although overall growth rate was similar – pattern of growth rate was different between the two PCV2/M. hyo vaccination strategies
- We failed to find an impact on production parameters for the PRRS vaccine
Thank You!
Grow-Finish Research Update

- Feeder design and adjustment
- Amino acid levels
- DDGS and other alternatives
- Mycotoxins
- Marketing
  - Mixing and topping pigs and Paylean use
Effects of feeder type and adjustment on finishing pig growth

Bergstrom et al. 2008
Target feed pan coverage is 40 to 50% without feed accumulating in the corners.
Effects of feeder type on final weight

Exp. 1

- Dry: 216.4
- Wet/Dry: 227.3

P < .01

Exp. 2

- Dry: 261
- Wet/Dry: 273

P < .01

Bergstrom et al. 2008
Effects of feeder type on F/G

Exp. 1

Dry: 2.44  
Wet/Dry: 2.47

Exp. 2

Dry: 2.62  
Wet/Dry: 2.68

P < .01

Bergstrom et al. 2008
Influence of feeder type and DDGS level (20 or 60%) on pig performance

Bergstrom et al. 2009
Influence of feeder type and DDGS level (20 or 60%) on pig performance

Bergstrom et al. 2009
Effects of feeder design and changing water source at 4 and 8 weeks before market on pig performance

Bergstrom et al., 2010
Effects of feeder design and changing water source at 4 and 8 weeks before market on pig performance

Bergstrom et al., 2010
Effects of feeder design and adjustment on average daily gain from 42 to 85 lb

Bergstrom et al., 2010
Effects of feeder design and adjustment on percentage pan coverage

Setting of 10 with a 0.75 inch opening and ~53% coverage

Setting of 14 with a 1 inch opening and ~73% coverage

Bergstrom et al., 2010
Effects of feeder design and adjustment on feed efficiency from 42 to 85 lb

Bergstrom et al., 2010
Effects of feeder design and adjustment on feed efficiency through 270 lb

Bergstrom et al., 2010
Percentage difference in ADG and F/G with more open adjustment (18 vs 10) for wet/dry feeder

<table>
<thead>
<tr>
<th>Setting</th>
<th>inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1/2</td>
</tr>
<tr>
<td>10</td>
<td>3/4</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>1 1/4</td>
</tr>
</tbody>
</table>

Bergstrom et al., 2010
Current Feeder Recommendations

- **Dry feeders**
  - 50% of pan should be covered with feed
    - 1 to 1.25 inch below adjustment gate
  - Minimum of 2 inch of feeder space/pig

- **Wet/dry feeders**
  - Increased weight gain and intake compared to dry feeders
  - Still determining optimal feeder settings
    - 1.25 inch opening from placement to 200 lb
    - 0.75 inch opening after 200 lb
• First pigs placed in early December 2008
• Eight research projects completed or in progress:
  1) DDGS x dietary enzyme
  2) Four separate lysine requirement experiments
  3) Feeding blended diets or corn-supplement blend
  4) DDGS x wheat midds
  5) Feeder space x feeder adjustment
SID lysine requirements in the new KSU finishing barn (no added fat diets)

Bergstrom et al., 2009
Feed blending using the FEEDPro system on growth performance

<table>
<thead>
<tr>
<th>Diet Phase Feeding</th>
<th>4 Diet Phase Feeding</th>
<th>2 Diet Curve</th>
<th>Corn-Supplement Phase Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADG, lb</td>
<td>2.10</td>
<td>2.07</td>
<td>2.06</td>
</tr>
<tr>
<td>F/G</td>
<td>2.93&lt;sup&gt;ax&lt;/sup&gt;</td>
<td>2.90&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.98&lt;sup&gt;by&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a,b P < 0.05; x,y P < 0.09</sup>

Sulabo et al., 2010
Feed blending using the FEEDPro system on feed cost/pig

No effects, P > 0.10
SEM = 0.62

Sulabo et al., 2010
Feed blending using the FEEDPro system on income over feed cost

No effects, P > 0.10
SEM = 1.03

<table>
<thead>
<tr>
<th>Diet Phase Feeding</th>
<th>2 Diet Curve</th>
<th>Corn-Supplement Phase Feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/pig</td>
<td>55.29</td>
<td>56.86</td>
</tr>
<tr>
<td></td>
<td>54.91</td>
<td></td>
</tr>
</tbody>
</table>

Sulabo et al., 2010
Use synthetic amino acids continue to be used economically in finishing diets.
When supplementing Lysine, Threonine, and Methionine – Tryptophan is typically the limiting amino acid in growing pig diets.
Effect of TID Try:Lys on finishing ADG
(d 0 – 42; initial BW 80 lb)

<table>
<thead>
<tr>
<th>SID Try:Lys</th>
<th>lb/d</th>
<th>SEM = 0.035</th>
</tr>
</thead>
<tbody>
<tr>
<td>18%</td>
<td>1.93 ab</td>
<td></td>
</tr>
<tr>
<td>16.5%</td>
<td>1.94 a</td>
<td></td>
</tr>
<tr>
<td>15%</td>
<td>1.84 b</td>
<td></td>
</tr>
<tr>
<td>14%</td>
<td>1.72 c</td>
<td></td>
</tr>
<tr>
<td>to 16.5%</td>
<td>1.87 ab</td>
<td></td>
</tr>
</tbody>
</table>

abc Superscripts differ, P < 0.05

Barnes et al., 2010
Effect of TID Try:Lys on finishing ADFI (d 0 – 42; initial BW 80 lb)

\[ \text{SEM} = 0.107 \]

Superscripts differ, \( P < 0.05 \)

Barnes et al., 2010
Effect of TID Try:Lys on finishing F/G (d 0 – 42; initial BW 80 lb)

No effect, $P > 0.05$
SEM = 0.050

Barnes et al., 2010
Effect of TID Try:Lys on finishing ADG (d 0 – 42; initial BW 80 lb)

161.6\textsuperscript{ab} 161.7\textsuperscript{a}

\textsuperscript{abc}Superscripts differ, P < 0.05 SEM = 0.035

157.4\textsuperscript{b}

152.2\textsuperscript{c}

159.3\textsuperscript{ab}

18% 16.5% 15% 14% to 16.5% SID Try:Lys Added Try

Barnes et al., 2010
Grow-Finish Research Update

- Feeder design and adjustment
- Amino acid levels
- DDGS and other alternatives
- Mycotoxins
- Marketing
  - Mixing and topping pigs and Paylean use
## DDGS Value Calculator with no performance change

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Price, $/unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn, $/bu</td>
<td>$3.80</td>
</tr>
<tr>
<td>SBM, $/ton</td>
<td>$300</td>
</tr>
<tr>
<td>Monocal, $/ton</td>
<td>$510</td>
</tr>
<tr>
<td>Limestone, $/ton</td>
<td>$45</td>
</tr>
<tr>
<td>Lysine HCl, $/lb</td>
<td>$0.85</td>
</tr>
<tr>
<td>DDGS, $/ton</td>
<td>$135</td>
</tr>
</tbody>
</table>

### DDGS, %

<table>
<thead>
<tr>
<th>Change in diet cost, $/ton</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>-$6.22</td>
<td>-$10.77</td>
<td>-$14.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approximate savings, $/pig</th>
<th>$1.87</th>
<th>$3.23</th>
<th>$4.20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakeven price, $/ton</td>
<td>$197.23</td>
<td>$188.83</td>
<td>$181.68</td>
</tr>
</tbody>
</table>

www.KSUswine.org
DDGS step-down or withdrawal regimen on ADG

No effect, P > 0.10
SEM = 0.031

Jacela et al., 2009
DDGS step-down or withdrawal regimen on final BW

Jacela et al., 2009
DDGS step-down or withdrawal regimen on F/G

No effect, P > 0.10
SEM = 0.037

Jacela et al., 2009
DDGS step-down or withdrawal regimen on carcass yield

No effect, $P = 0.59$
SEM = 0.422

| DDGS, % | 0 to 48: 0 30 30 30 30 30 | 48 to 69: 0 0 30 15 30 30 | 69 to 89: 0 0 0 15 15 30 |

Jacela et al., 2009
DDGS step-down or withdrawal regimen on FFLI

Jacela et al., 2009
DDGS step-down or withdrawal regimen on jowl fat iodine value

Linear effect of duration (trts 1, 2, 3, & 6), P < 0.01
SEM = 0.852

<table>
<thead>
<tr>
<th>Iodine Value, g/100 g</th>
<th>66</th>
<th>68.6</th>
<th>72.6</th>
<th>73.3</th>
<th>74.2</th>
<th>74.6</th>
<th>74.7</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DDGS, %</th>
<th>0</th>
<th>30</th>
<th>30</th>
<th>30</th>
<th>30</th>
<th>30</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>d 0 to 48:</td>
<td>0</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>d 48 to 69:</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>15</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>d 69 to 89:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

Jacela et al., 2009
DDGS step-down or withdrawal regimen on jowl fat iodine value by gender

Gender effect, $P < 0.05$
SEM = 0.852

71.8
Barrow

74.2
Gilt

Jacela et al., 2009
DDGS step-down or withdrawal regimen on feed cost/pig

Linear effect of duration (trts 1, 2, 3, & 6), $P < 0.01$
SEM = 0.755

<table>
<thead>
<tr>
<th>DDGS, %</th>
<th>d 0 to 48:</th>
<th>d 48 to 69:</th>
<th>d 69 to 89:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDGS, %</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>d 0 to 48:</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>d 48 to 69:</td>
<td>30</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>d 69 to 89:</td>
<td>30</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>d 69 to 89:</td>
<td>30</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

Jacela et al., 2009
DDGS step-down or withdrawal regimen on income over feed cost

No effect, P > 0.10
SEM = 1.969

<table>
<thead>
<tr>
<th>DDGS, %</th>
<th>0</th>
<th>30</th>
<th>30</th>
<th>30</th>
<th>30</th>
<th>30</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>d 0 to 48:</td>
<td>0</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>d 48 to 69:</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>15</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>d 69 to 89:</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

Jacela et al., 2009
Meta analysis of dietary enzymes on growth of finishing pigs

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Duration, d</th>
<th>Start weight, lb</th>
<th>DDGS, %</th>
<th>Enzyme activity of product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>92</td>
<td>65.3</td>
<td>15</td>
<td>β-mannanase</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>75.8</td>
<td>15</td>
<td>β-glucanase, cellulase, and protease</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>101.5</td>
<td>45 and 60</td>
<td>Proprietary blend of enzymes</td>
</tr>
<tr>
<td>4</td>
<td>66</td>
<td>87.4</td>
<td>30</td>
<td>Bacterial endo-1,4-beta-xylanase</td>
</tr>
</tbody>
</table>

Jacela et al., 2009
Meta analysis of dietary enzymes on ADG

No effects, P > 0.33

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Enzyme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp 1</td>
<td>2.21</td>
<td>2.22</td>
</tr>
<tr>
<td>Exp 2</td>
<td>2.08</td>
<td>2.07</td>
</tr>
<tr>
<td>Exp 3</td>
<td>1.89</td>
<td>1.88</td>
</tr>
<tr>
<td>Exp 4</td>
<td>1.82</td>
<td>1.81</td>
</tr>
<tr>
<td>Combined</td>
<td>2.00</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Jacela et al., 2009
Meta analysis of dietary enzymes on F/G

No effects, $P > 0.33$

Jacela et al., 2009
Effect of corn hominy feed on average daily gain from 80 to 270 lb

ADG, lb

2.20
2.07
2.09
2.05

0.0% 12.5% 25.0% 37.5%
Corn hominy feed, %

ADFI, lb

6.32
5.90
5.91
5.72

0.0% 12.5% 25.0% 37.5%
Corn hominy feed, %

Linear P < 0.01

Potter et al., 2009
Effect of corn hominy feed on feed efficiency from 80 to 270 lb

Potter et al., 2009
Effect of DDGS and wheat midds on pig performance

Wheat midds linear $P < 0.01$

**ADG, lb**

<table>
<thead>
<tr>
<th>Wheat Midds (%) in 30% DDGS diets</th>
<th>0.0%</th>
<th>10.0%</th>
<th>20.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn-soy</td>
<td>2.36</td>
<td>2.33</td>
<td>2.23</td>
</tr>
<tr>
<td>10.0%</td>
<td></td>
<td></td>
<td>2.21</td>
</tr>
<tr>
<td>20.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Barnes et al., 2010
Effect of DDGS and wheat midds on pig performance

Wheat midds linear $P < 0.01$

F/G

2.75 2.71 2.77 2.82

Corn-soy 0.0% 10.0% 20.0%

Wheat Midds (%) in 30% DDGS diets

Barnes et al., 2010
Mycotoxins and New Crop Corn

- Observations of black mold on corn in Kansas and surrounding states
  - Most test results have shown limited mycotoxin contamination
  - Deoxynivalenol (DON), also commonly known as vomitoxin, has been the most common this year
    - > 1 ppm may reduce feed intake and rate of gain
    - > 5 ppm may result in feed refusal
    - > 10 ppm may result in vomiting

- DDGS – 3 times the level of original corn level
Mycotoxins – What can we do?

- Collect a good sample to test if suspected
- Screen/clean the grain – molds are in the dust and stressed small kernels
- Blend contaminated grain with clean grain to get below a maximum threshold for feeding
- Separate contaminated grain and feed higher levels to finishing pigs or sell for cattle feed
- Binders – generally do not help with vomitoxin
  - Balance binder cost with other alternatives
Managing Pigs at Close Out
Impact of pen unloading on feed efficiency and average daily gain

Marginal ADG, lb  Marginal F/G

<table>
<thead>
<tr>
<th>Pigs/Pen</th>
<th>24</th>
<th>24</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigs Removed</td>
<td>0</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Pig space, sq ft</td>
<td>7.25</td>
<td>9.67</td>
<td>14.50</td>
</tr>
</tbody>
</table>

Boyd et al., 2008
Impact of pen unloading on feed efficiency and average daily gain

<table>
<thead>
<tr>
<th>Pigs/Pen</th>
<th>Pigs Removed</th>
<th>Pig space, sq ft</th>
<th>Marginal ADG, lb</th>
<th>Marginal F/G</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0</td>
<td>7.2</td>
<td>2.26</td>
<td>2.67</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>7.8</td>
<td>2.52</td>
<td>2.58</td>
</tr>
<tr>
<td>25</td>
<td>4</td>
<td>8.6</td>
<td>2.52</td>
<td>2.52</td>
</tr>
</tbody>
</table>

Jacela et al., 2009
Impact of pen unloading on profit per pig

<table>
<thead>
<tr>
<th>Pigs/Pen</th>
<th>Pigs Removed</th>
<th>Pig space, sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0</td>
<td>7.2</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>7.8</td>
</tr>
<tr>
<td>25</td>
<td>4</td>
<td>8.6</td>
</tr>
</tbody>
</table>

$1.08
$0.84

Jacela et al., 2009
Effect of Paylean on Day 0 to 21 Average Daily Gain and Feed Efficiency

Effect of Paylean on Day 0 to 21 Average Daily Gain and Feed Efficiency

ADG, lb

<table>
<thead>
<tr>
<th>Control</th>
<th>14-Day</th>
<th>21-Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.16</td>
<td>2.31</td>
<td>2.26</td>
</tr>
</tbody>
</table>

F/G

<table>
<thead>
<tr>
<th>Control</th>
<th>14-Day</th>
<th>21-Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.62</td>
<td>3.23</td>
<td>3.17</td>
</tr>
</tbody>
</table>

Potter et al., 2009
Effects of different Paylean feeding programs on average daily gain

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Constant, 21 d</th>
<th>Step Up, 28 d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Gain</td>
<td>1.76\textsuperscript{a}</td>
<td>2.09\textsuperscript{b}</td>
<td>2.05\textsuperscript{b}</td>
</tr>
</tbody>
</table>

\textsuperscript{a,b} (P<.05)
Effects of different Paylean feeding programs on percentage lean

- Control: 55.2\(^a\)
- Constant, 21 d: 56.1\(^a\)
- Step Up, 28 d: 57.0\(^b\)

\(^{a,b}\) (P<0.05)

Jacela et al., 2009
Effects of different Paylean feeding programs on income over feed cost

<table>
<thead>
<tr>
<th>Program</th>
<th>Income per Pig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>$101.18</td>
</tr>
<tr>
<td>Constant, 21 d</td>
<td>$109.03</td>
</tr>
<tr>
<td>Step Up, 28 d</td>
<td>$108.61</td>
</tr>
</tbody>
</table>

Jacela et al., 2009
Effect of Mixing Pigs at 260 lb on ADG

Potter et al., 2010
Effect of Mixing Pigs at 260 lb on F/G

Potter et al., 2010
Key Take Home Messages for Managing Pigs at Close Out:

- Top a minimum of 2 pigs from each pen 15 to 20 d prior to closeout
  - Gate cut pigs into pens so pigs can be marketed uniformly
  - Limit further tops unless pigs will be heavier than top of the grid

- Feed Paylean for 14 to 21 d prior to closeout
  - Shorter durations if achieving optimum market weight
  - Longer durations will continue to improve lean but little benefit in growth rate

- If allowed enough time - mixing pigs at closeout is not detrimental to growth rate
  - Enables more efficient site utilization
  - Feed efficiency is poor in the immediate period after mixing
  - FG Improves over time as growth rate and feed intake increases
Thank You!