Thank you for participating in SowBridge 2012-13.

To start this presentation, advance one slide by pressing enter/return or the down or right arrow key.

The following documents in pdf format also are on this CD.

1 AllTimingSuggestion.pdf “A review of AI timing in swine and factors influencing fertility”
2 TechProceduresImproveFertility.pdf “Technical procedures during AI and their impact on fertility”
3 LowDoseAI.pdf “Methodology for Lower Numbers of Sperm for Swine AI”

Why is this technology valued?

• Potential for:
  – High indexing sires used efficiently for incorporating economically valued traits
  – Reduced costs, labor
  – Use of Frozen or Sexed sperm
  – Breeding at optimal time

Value of sire index in progeny performance

<table>
<thead>
<tr>
<th>Trait</th>
<th>10% change</th>
<th>5 value</th>
<th>1 SD</th>
<th>5 value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days to 113 kg</td>
<td>-1.8 d</td>
<td>$520,544</td>
<td>13 d</td>
<td>$36,504</td>
</tr>
<tr>
<td>Backfat (mm)</td>
<td>-2 mm</td>
<td>$28,080</td>
<td>3.8 mm</td>
<td>$52,650</td>
</tr>
</tbody>
</table>

Example of Value of Sire Index in Market Pigs Low Dose AI Models

<table>
<thead>
<tr>
<th>Trait</th>
<th>2.5 billion</th>
<th>1.5 billion</th>
</tr>
</thead>
<tbody>
<tr>
<td># sires</td>
<td>10000</td>
<td>10000</td>
</tr>
<tr>
<td>Cells/dose</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td># boars needed</td>
<td>41</td>
<td>28</td>
</tr>
<tr>
<td>Avg. boar index value</td>
<td>100</td>
<td>106</td>
</tr>
<tr>
<td>Value of index point/pig</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Finishers/sow/year</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Value of index point/pig</td>
<td>$162,000</td>
<td>$270,000</td>
</tr>
</tbody>
</table>

Breeding Technology Changes

Conventional
• Heat check 1-2 X/day
• AI with 2.5-3 billion sperm/80 cc extender
• Conventional AI twice (0 and 24 h)
• Use of liquid semen 3-4 days

Single Service
• Controlled ovulation with no heat check
• AI with 1.5 billion sperm in 40-60 cc
• PCAI once at 24 h
• Liquid, Frozen, sexed
What will the Expectations Be?
2011 PigCHAMP Benchmarking summary

<table>
<thead>
<tr>
<th></th>
<th>USA</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg sow inventory</td>
<td>1533</td>
<td>1187</td>
</tr>
<tr>
<td>Farrowing rate</td>
<td>82.7</td>
<td>83.9</td>
</tr>
<tr>
<td>Total Born</td>
<td>13.2</td>
<td>13.7</td>
</tr>
<tr>
<td>Lactation</td>
<td>11.8</td>
<td>12.1</td>
</tr>
<tr>
<td>Farms</td>
<td>312</td>
<td>16</td>
</tr>
</tbody>
</table>

PigCHAMP, 2011 USA Benchmarking summary
312 farms with 1533 sows avg. (inventory ~478,000 sows)

The Risk:Reward

Risk
- Lost -$$$
- Insurance policies removed
  - Sperm numbers
  - Multiple AI
  - Estrus
- Breed infertile animals
- Farrowing rate
- Litter size

Reward
- GAIN +$$$
- Rate of Genetic progress for Target Traits

Primary Limitation to single service AI

- FERTILIZATION and EMBRYO SURVIVAL
  - Sperm survive to fertilize eggs for ~24 hours after AI
  - Eggs fertilized only for ~8-12 hours after ovulation

Estrus and Ovulation

- Estrus is the primary determinant for fertility and AI timing
- The PROBLEM:
  - Estrus and interval from onset to ovulation variable
- To compensate
  - multiple inseminations used to ensure 1 AI occurs within 12-24 h before ovulation

Duration of estrus is related to wean to estrus interval

Implications for wean to estrus and estrus to ovulation interval
For 95% of sows, weaning to ovulation varies 2.5 to 3 days.

**What are the options for single service success?**
- Predict time of ovulation
- Reduce variation in estrus to ovulation
- Extend sperm survival after insemination
- Control time of ovulation

**Technologies that will be matched with single service**
- Ovulation induction
- PCAI
- Low sperm dose and volume

**SINGLE SERVICE ALONE**

**Inseminating Times for Gilts** (2 Day Estrus)

<table>
<thead>
<tr>
<th>Insemination Relative to Ovulation (h)</th>
<th>Fertilization (%)</th>
<th>Farrow rate</th>
<th>Litter size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, 12, 24, 36, 48</td>
<td>&gt;90% normal</td>
<td>89</td>
<td>8.9</td>
</tr>
<tr>
<td>0, 12, 24</td>
<td>88</td>
<td>8.7</td>
<td>8.9</td>
</tr>
<tr>
<td>12, 24, 36</td>
<td>86</td>
<td>8.6</td>
<td>8.9</td>
</tr>
<tr>
<td>0, 24</td>
<td>86</td>
<td>8.6</td>
<td>8.6</td>
</tr>
<tr>
<td>24</td>
<td>74</td>
<td>8.6</td>
<td>8.6</td>
</tr>
<tr>
<td>12</td>
<td>72</td>
<td>8.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>

*Flowers & Esbenshade, 1995*
Farrowing Rates In Response to Once Versus Twice Daily Estrus Detection and AI Schedule

The physiology of Follicle development, Estrus and Ovulation

Model for Variation in Estrus & Ovulation (48-72 h) in weaned sows from differences in follicle development

Ovulation induction Advances & Synchronizes Ovulation Within 24-36 h

A simplified Overview of the Process for Follicle and Ovulation Induction
**OvuGel™ (an intravaginal GnRH Gel)**
Synchronizes and advances Ovulation in weaned sows

- **Control**: Ovulate by 48 h, P<0.001
  - Vehicle: 37%
  - Treatment: 80%

- **Vehicle**: 60% success

- **Ovugel**: 80% success

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**What Does Fertility Look Like with Fixed Time AI?**

<table>
<thead>
<tr>
<th>Animals</th>
<th>n</th>
<th>Follicle induction</th>
<th>TIT</th>
<th>PR</th>
<th>Estrus</th>
<th>24 h</th>
<th>48 h</th>
<th>Vehicle</th>
<th>PMSG</th>
<th>2x Fixed</th>
<th>Control</th>
<th>Vehicle</th>
<th>PMSG</th>
<th>2x Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaned sow</td>
<td>128</td>
<td>Triptorelin</td>
<td>2x Fixed</td>
<td>87%</td>
<td>66%</td>
<td>11.1</td>
<td>5.9</td>
<td>6.6</td>
<td>6.6</td>
<td>6.6</td>
<td>6.6</td>
<td>6.6</td>
<td>6.6</td>
<td></td>
</tr>
</tbody>
</table>

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**POST-CERVICAL AI (PCAI) AND LOW SPERM NUMBERS**

- **Control**: PR 66.2
  - IUI: 91.1
  - TB: 10.3
  - FR: 65.8
  - NFA: 9.0

- **Vehicle**: PR 91.2
  - IUI: 93.1
  - TB: 13.0
  - FR: 93.3
  - NFA: 10.9

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**Importance of Sperm in the AI Dose Using Conventional or IUI for Weaned Sows**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>IUI</th>
<th>PR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PR</td>
<td></td>
<td>91.1</td>
<td>91.3</td>
<td>88.7</td>
<td>92.6</td>
<td>91.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IUI</td>
<td></td>
<td>93.1</td>
<td>93.1</td>
<td>86.9</td>
<td>92.5</td>
<td>90.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TB</td>
<td></td>
<td>12.6</td>
<td>12.5</td>
<td>12.1</td>
<td>12.3</td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NFA</td>
<td></td>
<td>10.9</td>
<td>10.9</td>
<td>10.9</td>
<td>10.8</td>
<td>11.0</td>
<td></td>
</tr>
</tbody>
</table>

Watson and Behan, Theriogenology 2003; 57:1685-1693, n = 1,250
A Possible Future for US Producers

- Ovulation induction
  - Fixed-Time AI + No heat check
- Single Sire and AI
- Low Dose AI
  - PCA/DUI
  - Liquid
  - Frozen or Sexed sperm

Thank you for your attention!