Thank you for participating in SowBridge 2012-13.
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Commercial application of reducing semen concentration per dose and single sire evaluation

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**Agenda**

- Reason for pooling
- Trial results
- Fertility comparison
- Genetic value
- Conclusion

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**Definitions**

- Selection index
  \[
  \text{index} = (EBV_{T1} \times $) + (EBV_{T2} \times $) + \ldots
  \]

- Simplistically, the higher the index the better.

- Population has a floating base index of 100

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**Reasons for pooling commercial boars**

**Boar stud**

- More efficient
- Fewer disposables
- Reduced cost
  - pooled doses cost $0.10 less than single sire (ss) doses

**Sow farm**

- Less recording/semen management
- Reduces the risk of breeding sows to incorrect boars during 2nd service
- Protection from subfertile boars

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**Byproduct of pooling?**

- Using boars of unknown fertility
- Underutilization of sires with greater genetic merit
  \[= $/\text{pig}\]
Subfertile boars in the population

- Estimates from limited data suggest 13-17% of commercial boars are subfertile (T. Gall, personal comm)
- Use of pools and high # sperm per dose (3 billion viable) limits the identification of these boars
- Semen quality ≠ fertility

Holden Farms Trial

- Objective: To identify subfertile boars and improve the use of genetically superior commercial boars by a combination of decreased semen concentration and single sire matings.

Materials & Methods

- Subsequent groups of boars
  - Ejaculates processed 2 billion viable
  - Fifty ss matings
  - SQ criteria met in order to use for matings
- Sows
  - Multiparous
  - Conventional AI
- Data
  - Pregnancy rate, farrowing rate and litter size

Trial

- Phases of the trial:
  1) Reduce semen concentration from 3.2 to 2 billion (B) viable cells using ss matings
  2) Further reduce concentration to 1.5B viable using ss matings and IUI
  3) Single fixed-time AI with 1.5B viable IUI
Results

<table>
<thead>
<tr>
<th>Trait</th>
<th>Min</th>
<th>Max</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy rate, %</td>
<td>37</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>Total born</td>
<td>6.9</td>
<td>15.1</td>
<td>13.2</td>
</tr>
</tbody>
</table>

By decreasing semen concentration and using ss matings...

- Identify subfertile boars and potentially improve performance
- Need fewer boars for semen production needs
- Ideally use boars more effectively that have greater genetic merit or index

Fertility of pools

- How does pooled fertility compare to ss mating fertility?

Pool composition

- Studs use 4-6 boars per pool on average (Knox et al., 2008)
- Semen quality standards must be met but are not a guarantee of fertility
- Variation in index range
  - Dependent on collection schedules, introduction of young boars, etc.

Example 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Boar A (n=31 breedings)</th>
<th>Boar B (n=27 breedings)</th>
<th>Average Total Born (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farrowing Rate (%)</td>
<td>45</td>
<td>100</td>
<td>11.56</td>
</tr>
<tr>
<td>Av. Total Born</td>
<td>9.22</td>
<td>12.34</td>
<td>11.56</td>
</tr>
</tbody>
</table>

(Adapted from Foxcroft et al., 2010, IPVS)
### Example 2

<table>
<thead>
<tr>
<th>#Matings</th>
<th>Pool TB</th>
<th>Ave SS TB Difference (Pool - SS)</th>
<th>SS1</th>
<th>SS2</th>
<th>SS3</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>12.8</td>
<td>13.0</td>
<td>-0.2</td>
<td>12.5</td>
<td>12.7</td>
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<tr>
<td>6</td>
<td>13.2</td>
<td>13.8</td>
<td>-0.6</td>
<td>14.0</td>
<td>13.5</td>
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<tr>
<td>7</td>
<td>11.7</td>
<td>13.6</td>
<td>-1.8</td>
<td>14.0</td>
<td>13.1</td>
</tr>
<tr>
<td>7</td>
<td>12.9</td>
<td>12.9</td>
<td>0.0</td>
<td>12.3</td>
<td>13.5</td>
</tr>
<tr>
<td>8</td>
<td>13.5</td>
<td>13.5</td>
<td>0.0</td>
<td>13.8</td>
<td>13.1</td>
</tr>
<tr>
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<td>13.3</td>
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<td>13.3</td>
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<td>13.5</td>
<td>12.7</td>
</tr>
</tbody>
</table>

(Holden Farms, unpublished, 2011)

### Fertility of pools

- No conclusive evidence to suggest fertility of pools is better or worse than ss
- Know that variation exists in fertility of boars and some boars in studs may not sire many pigs
- What about optimizing genetics in pools?

### Equal number of pigs sired cannot be assumed

- $230
  - A (115)
  - B (101)
  - C (107)
  - D (112)
  - E (120)
- Total = $1,110

### Multiple outcomes are possible

- $606
  - A (115)
  - B (101)
  - C (107)
  - D (112)
  - E (120)
- Total = $825

Each boar will not sire same # pigs

### By using pools...

- We have no way of knowing if the highest indexing boars are being used effectively.

### By decreasing semen concentration and using ss matings...

- Identify subfertile boars and potentially improve performance
- Need fewer boars for semen production needs
- Ideally use boars more effectively that have the highest genetic merit or index
- However, fertility is NOT related to index of commercial boars
- Balance must exist between fertility and index
Why is an index important?

A high indexing commercial boar passes these traits on to his progeny.
1. Improved feed conversion
2. Fewer days to market
3. Decreased mortality

Increase $$ per pig marketed

*The optimum environment must be provided for a pig to reach it’s genetic potential.

Costs and benefits

Pooling
Cons
- Boars in stud may not sire many pigs
  - Cost to feed, house, etc
  - Dependent on system
- May not be utilizing boars effectively with greatest genetic merit

Pros
- Stud more efficient
- Easier at the sow farm

Single sire
Cons
- Cost to produce ss instead of pooled dose
  - $0.10/dose
- Time to produce doses

Pros
- Identify and remove subfertile boars
- Potential for increased performance
- Improved use of boars

Conclusion

- Large variation in boar fertility
- Boars can be identified and removed through ss matings
- Potential to improve performance and more efficient use of genetically superior boars
- Balance must be maintained between fertility and genetic index

Questions?