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Timing of A.I.

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OUTLINE
- overview of estrous cycle, ovulation
- overview of insemination, capacitation
- theoretical perspective of appropriate timing of AI
- evaluation under field conditions
- the future

When to Inseminate?

- Satisfactory reproductive performance should result if females are inseminated with fresh semen (<72 hours-old) 0 to 24 hours prior to the time of ovulation.
- When using “older” or frozen semen superior performance requires inseminations be closer to the time of ovulation.
- **Goal**: Have an adequate population of fertile, capacitated sperm present in the female just prior to the time of ovulation.

Swine AI

- heat detection 1x or 2x daily
- intracervical semen deposition
- mate twice or more per estrus
- 3 billion cells per dose
- 12-24 hours between matings
- only one mating is needed; which one?
Sperm reside in the female reproductive tract for about 8 hours before they are capable of penetrating the ova (capacitation).

Sperm remain viable in the female’s tract for about 24 hours.

After ovulation viability of the ova is rather limited.

**Estrus and Ovulation After Weaning**

- **Conception Rate (%)**
  - Interval from Ovulation to Insemination (h)

**Using Wean-to-Estrus Intervals as an Aid in Timing of Inseminations**

- **Time of Ovulation and Length of Estrus (Hours)**
  - Life span = 24 hr
  - Life span = 6-8 hr

**A.I. model**

- Schedule of inseminations, h

**Percentage**

- Estrus and Ovulation
  - Day Postweaning

**Using Wean-to-Estrus Intervals**

- **From:** Kemp & Soede, 1996, JAS, 74:944 (adapted from Singleton)

**A.I. model**

- Predicted dollar return
  - Heat detection
  - Intake data

**A.I. model**

- Lamberson and Safranski, 2000
why is on-time delivery important?

**sperm too early**
- sow not standing solid
- dead prior to ovulation
- critical with compromised sperm (old, frozen etc.)

**sperm too late**
- sow not standing solid
- fail be capacitated prior to ovulation
- cause immune system activation

Why Not Multiple Inseminations?

- waste time?
  - could be doing other things
- waste semen?
  - cost
  - use lower quality boars to obtain 2x sperm #
- stress on sow?
- hyperactivate immune system?

Table 1. Distribution of sows according to the interval between inseminations and the number of post-ovulatory follicles

<table>
<thead>
<tr>
<th>Interval between inseminations</th>
<th>24 h</th>
<th>12 h</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of AEC per sow</td>
<td>20.3</td>
<td>26.3</td>
<td>27.7</td>
</tr>
<tr>
<td>% sows without post-ovulatory</td>
<td>28.1</td>
<td>26.3</td>
<td>27.7</td>
</tr>
<tr>
<td>% sows with one post-ovulatory</td>
<td>63.3</td>
<td>42.6</td>
<td>53.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>No post-ovulatory AEC</th>
<th>One post-ovulatory AEC</th>
<th>Two post-ovulatory AEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Alcocestus (24h interval)</td>
<td>187</td>
<td>90.3</td>
<td>90.3</td>
</tr>
<tr>
<td>Three Alcocestus (24h interval)</td>
<td>116</td>
<td>90.4</td>
<td>100.3</td>
</tr>
<tr>
<td>Four Alcocestus (48h interval)</td>
<td>109</td>
<td>90.7</td>
<td>100.3</td>
</tr>
</tbody>
</table>

Adjusted total born (mean ± SE) per 100 sows are: Two Alcocestus 110.3 ± 0.5, Three Alcocestus 100.3 ± 0.5, Four Alcocestus 100.3 ± 0.5.
Figure 1. Relationship between standing ova-to-ovulation interval and duration of standing ova.

Terqui et al., 2000

AIOV = AI to ovulation interval
PR = pregnancy rate
TE = total number of embryos

Table 1. Storage time (h) to AIOV (h) and PR (n/n) and TE.

<table>
<thead>
<tr>
<th>Storage time (h)</th>
<th>AIOV (h)</th>
<th>PR (n/n)</th>
<th>TE (x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-48</td>
<td>0-12</td>
<td>93.4 (37/61)</td>
<td>14.1 ± 3.2</td>
</tr>
<tr>
<td>13-23</td>
<td>13.9 (34/77)</td>
<td>14.2 ± 4.8</td>
<td></td>
</tr>
<tr>
<td>24-30</td>
<td>13.9 (38/31)</td>
<td>13.2 ± 3.9</td>
<td></td>
</tr>
<tr>
<td>96-120</td>
<td>13-23</td>
<td>73.1 (30/38)</td>
<td>14.3 ± 4.7</td>
</tr>
<tr>
<td>24-30</td>
<td>30.8 (41/31)</td>
<td>6.5 ± 3.1</td>
<td></td>
</tr>
</tbody>
</table>

*LS mean ± standard deviation.

AIOV = AI to ovulation interval
PR = pregnancy rate
TE = total number of embryos

Almeida et al., 2000

Steverink et al., 1999

Bennemann et al., 2006

Stevens et al., 1999
Belstra et al., 2004

- DE and Est. to Ov. as in research literature
- WEI \( \uparrow \) on 2 of 3 in summer (~8hr)
- WEI of P1 > P3 and older in spring
- WEI of P1 > P2 and older in summer
- DE and EOI \( \uparrow \) linearly w/ parity in summer
- also varied by genetics and lactation length
- EOI ranged: 18-72hr, 24-60hr, 18-66hr by farm

Belstra et al., 2004

- PG-600®
  - 400 IU PMSG (Pregnant Mares Serum Gonadotropin)
    - (Follicle Stimulating Hormone; FSH)
  - 200 IU HCG (Human Chorionic Gonadotropin)
    - (Luteinizing Hormone; LH)

Cassar et al., 2005

*This project was conducted in Canada as compounds are not currently available for use on U.S. pig farms.

Cassar et al., 2005

| Variable          | Control | PG-600® | PMSG | HCG | PMSG + HCG | PMSG + HCG
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Day after estrus</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Days</td>
<td>4.16</td>
<td>4.16</td>
<td>4.16</td>
<td>4.16</td>
<td>4.16</td>
<td>4.16</td>
</tr>
<tr>
<td>Days (incidence)</td>
<td>8.33</td>
<td>8.33</td>
<td>8.33</td>
<td>8.33</td>
<td>8.33</td>
<td>8.33</td>
</tr>
<tr>
<td>Days (duration)</td>
<td>4.25</td>
<td>4.25</td>
<td>4.25</td>
<td>4.25</td>
<td>4.25</td>
<td>4.25</td>
</tr>
<tr>
<td>Days (percentage)</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Days (percentage)</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

Wayne Singleton
Purdue University

MATRIX™ (altrenogest)
- FDA approved product for estrus synchronization in cycling gilts
- Applied to feed 15 mg/hd/day for 14 days

Heat Detection

Primary Signs
- Stands for boar
- Stands for another female
- Stands for back pressure test

Secondary Signs
- Erect ears
- Seeks boar
- Swollen vulva
- Relaxes tail when touched
- Mucous discharge
- Leaded vulva
Conclusions

- timing of A.I. is critical to success
- best time may be farm dependent (genetics, facilities, health, parity, season, records, etc.)
- knowing best time to A.I. irrelevant without good detection of estrus
- text book answer would be breed at 0 and 24 hours or 12 and 36 hours after first detected heat, as long as she still stands