Split-time artificial insemination programs for beef cows

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Estrous Synchronization

• Enhance the use of artificial insemination
• Decrease / eliminate the time required for heat detection
• Maximize the number of cows conceiving to artificial insemination
Resources for estrous synchronization

• Many estrous synchronization protocols to choose from
• Many different company brand name hormones available for estrous synchronization
• Beef Reproduction Task Force – Applied Reproductive Strategies in Beef Cattle
  – [https://beefrepro.unl.edu/](https://beefrepro.unl.edu/)
Applied Reproductive Strategies in Beef Cattle

Applied Reproductive Strategies in Beef Cattle (ARSBC)

brought to you by the

Beef Reproduction Task Force

Visit our RESOURCES page for
2018 synchronization protocols, AI Cowculator, past proceedings and more.
Applied Reproductive Strategies in Beef Cattle

RESOURCES

- Download FREE Estrus Synchronization Planner
- AI Cowculator
- NEW! 2018 Estrus Synchronization Protocols for HEIFERS and COWS (Chart)
- 2017 Protocols for Synchronization of Estrus and Ovulation
- The Bovine Estrous Cycle
- Detection of Standing Estrus in Cattle
- Estrus Synchronization—Planning for Success
- Tips for a Successful Synchronization Program
**HEAT DETECTION**

Select Synch

- GnRH: treatment day 0
- PG: treatment day 6
- Heat detect & AI: treatment day 7

Select Synch + CIDR®

- GnRH: treatment day 0
- PG: treatment day 7
- Heat detect & AI: treatment day 13

PG 6-day CIDR®

- PG: treatment day 0
- Heat detect & AI: treatment day 3
- Heat detect & AI: treatment day 9
- Heat detect & AI: treatment day 12

**HEAT DETECT & TIME AI (TAI)**

Select Synch & TAI

- GnRH: treatment day 0
- PG: treatment day 72 - 84 hr after PG with GnRH at TAI
- Heat detect & AI

Select Synch + CIDR® & TAI

- GnRH: treatment day 0
- PG: treatment day 72 - 84 hr after PG with GnRH at TAI
- Heat detect & AI

PG 6-day CIDR® & TAI

- PG: treatment day 0
- Heat detect & AI: treatment day 72 - 84 hr after PG

**FIXED-TIME AI (TAI)***

7-day CO-Synch + CIDR®

- PG: treatment day 0
- Heat detect & AI: treatment day 60 - 66 hr

5-day CO-Synch + CIDR®

- PG: treatment day 0
- Heat detect & AI: treatment day 72 ± 2 hr

**FIXED-TIME AI (TAI)**

- PG: treatment day 0
- Heat detect & AI: treatment day 66 ± 2 hr

*The time listed for “Fixed-time AI” should be considered as the approximate average time of insemination. This should be based on the number of cows to inseminate, labor, and facilities.*

Approved 8-28-2017

Beef Reproduction Task Force
**BEEF COW PROTOCOLS - 2018**

**FIXED-TIME AI (TAI)**

7-day CO-Synch + CIDR®
Perform TAI at 60 to 66 hr after PG with GnRH at TAI.

![Diagram of 7-day protocol](image)

5-day CO-Synch + CIDR®
Perform TAI at 72 ± 2 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.

![Diagram of 5-day protocol](image)
Estrus Synchronization Hormones

CIDR®

Controlled internal drug release impregnated with progesterone

GnRH
Cystorelin®, Factrel®, Fertagyl®, OvaCyst®, GONABreed®

PG
estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, Lutalyse® HighCon, ProstaMate®, SYNCHSURE™
Why add split-time breeding to a fixed-time protocol?

Impact of estrus at FTAI

First Service Conception Rate, %

- Estrus: n = 103
- No Estrus: n = 146

Hill et al., 2016
Why add split-time breeding to a fixed-time protocol?

• Numerous studies have shown that ~30% of cows do not show estrus by 66 h post-CIDR.
  – First service conception rate is ↓

• Delaying fixed-time insemination for those cows not displaying estrus by 66 h may improve conception rate among those cows.
Treatment protocol to establish the importance of injecting GnRH

- Estrous detection patches
  - CIDR
  - PGF
  - TAI + GnRH-2
  - PGF
  - TAI
  - PGF
  - GnRH-2
  - TAI
  - 0
  - 65 h
  - 84 h

- Treatment:
  - GnRH-1
  - BS -17 d
  - BS -7 d

- Active patch at 66 h
  - E + G

- Non-active patch at 66 h
  - E – G
  - L + G
  - L – G

- Don’t Breed
- Breed
Treatment protocol to establish the importance of injecting GnRH

- **E + G**: Cows displayed estrus by 65 h, received GnRH and AI
- **E – G**: Cows displayed estrus by 65 h, received **no** GnRH and AI
- **L + G**: Cows did not display estrus by 65 h, received GnRH and inseminated at 84 h
- **L – G**: Cows did not display estrus by 65 h, received **no** GnRH and inseminated at 84 h
First service conception rate to fixed-time AI at 65 or 84 h after CIDR removal

**Early (65 h)**
- GnRH: 61.9%
- No GnRH: 60.4%
- n = 385

**Late (84 h)**
- GnRH: 41.7%
- No GnRH: 30.8%
- n = 226

Legend:
- **a**
- **b**
- **c**
Effect of estrus and GnRH on FSCR to fixed-time AI at 84 h after CIDR removal

First service conception rate (%)

Estrus
Cows bred at 84 hours after CIDR

- GnRH: 65.3 (n = 103)
- No GnRH: 61.7 (n = 97)

No Estrus
Cows bred at 84 hours after CIDR

- GnRH: 33.4 (n = 146)
- No GnRH: 15.0 (n = 128)

*Significance levels: a, b, c*
Discussion

• GnRH is not essential to achieve acceptable FSCR (>60%) when cows express estrus before AI at 65 h.

• For cows not in estrus by 65 h – GnRH was only effective in improving FSCR for cows not displaying estrus by 84 h.
  – GnRH treatment of non-estrus cows increased FSCR of those cows by 2×
Conclusions

• GnRH injection at AI improved FSCR only in those cows that were not detected in estrus before AI.

• Cows that displayed estrus, regardless of GnRH treatment, had better FSCR than cows that did not display estrus.

• The split-time AI program serves as a compromise between conventional AI after detecting estrus and a standard one fixed-time AI program.
Two split-time artificial insemination programs

• Two split-time treatment groups

  1. Cows in estrus bred at 55 h, non-estrus cows received GnRH and bred at 75 h. (55 – 75 h)

  2. Cows in estrus bred at 65 h, non-estrus cows received GnRH and bred at 85 h. (65 – 85 h)
Two split-time artificial insemination programs

• Four treatment response groups

55 – 75 h

1a. Cows in estrus at 55 h & AI (no GnRH)
1b. Cows not in estrus at 55 h, received GnRH & AI at 75 h.

65 – 85 h

2a. Cows in estrus at 65 h & AI (no GnRH)
2b. Cows not in estrus at 65 h, received GnRH & AI at 85 h.
Two split-time artificial insemination programs

CIDR

GnRH

‒7 d

PGF

0 d

55 h

65 h

75 h

85 h

Estrous detection patches
Proportion of cows in estrus by 55, 65, 75 or 85 h after removal of CIDR and injection of PGF$_{2\alpha}$

- **Estrus (%)**

- **Primiparous**
  - 55: 28.5%
  - 65: 65.3%
  - 75: 53.5%
  - 85: 74.8%

- **Multiparous**
  - 55: 45.5%
  - 65: 61.4%
  - 75: 68.3%
  - 85: 77.2%

- **Trt P < 0.001**
  - **Parity P = 0.125**
  - **T x P P = 0.006**

- **Trt P < 0.001**
  - **Parity P = 0.045**
  - **T x P P = 0.137**
First service conception rate

Pregnancy rate at 36 d (%)

- Trt $P < 0.002$
- Parity $P = 0.067$
- $T \times P \quad P = 0.192$

<table>
<thead>
<tr>
<th>Hours after PGF$_{2\alpha}$</th>
<th>Primiparous</th>
<th>Multiparous</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>46.0</td>
<td>223</td>
</tr>
<tr>
<td>65</td>
<td>70.5</td>
<td>326</td>
</tr>
<tr>
<td>75</td>
<td>64.5</td>
<td>302</td>
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<tr>
<td>85</td>
<td>53.5</td>
<td>198</td>
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</tbody>
</table>

K-STATE Research and Extension
Knowledge for Life
Final (end of breeding) pregnancy rate

Final pregnancy rate (%)

<table>
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<tr>
<th>Hours after PGF$_{2\alpha}$</th>
<th>Primiparous</th>
<th>Multiparous</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>88.4</td>
<td>95.0</td>
</tr>
<tr>
<td>65</td>
<td>88.1</td>
<td>97.0</td>
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<tr>
<td>75</td>
<td>73.8</td>
<td>93.9</td>
</tr>
<tr>
<td>85</td>
<td>80.8</td>
<td>92.7</td>
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</table>

Trt  $P < 0.058$
Parity  $P = 0.001$
T $\times$ P  $P = 0.708$
First service conception and final pregnancy rate by treatment (55 + 75 vs. 65 + 85 h)

- **FSCR**: Conceived, %
  - 55 + 75: 57.7
  - 65 + 85: 62.8
  - Total: 525

- **PR**: Conceived, %
  - 55 + 75: 90.0
  - 65 + 85: 92.0
  - Total: 530
Summary

• **For cows in estrus by 55 or 65 h**, pregnancy rate was greater compared to cows not in estrus and bred at 75 or 85 h.

• **For cows not in estrus by 55 or 65 h**, but showed estrus by 75 or 85 h, pregnancy rate was greater for cows displaying estrus than for cows not showing estrus.

• **Overall**, (regardless of when estrus occurred) FSCR rate was greater for cows displaying estrus than for those not showing estrus (67.3 vs. 42.7%).
Summary

• FSCR was greater for cows assigned to the 65 + 85 h treatment compared to cows assigned to the 55 + 75 h treatment (62.8 vs. 57.7%, respectively).

• Final pregnancy rate was not different between the 55 + 75 h and 65 + 85 h treatments (90.0 vs. 92.0 %, respectively).
Summary – “Cowboy math” (100 cows)

FSCR: At 65/85 h Estrus – 67%; No estrus – 43%

FTAI at 65 h

- 63 % in estrus at 65 h
- 37 % not in estrus at 65 h
- 63 estrus cows × 67% FSCR = 42 cows
- 37 no estrus cows × 43% FSCR = 16 cows

FSCR = 58 cows

Split time AI at 65 + 85 h

- 63 % in estrus at 65 h
- 37 % not in estrus at 65 h
- 63 estrus cows × 67% FSCR = 42 cows
- 37 cows × 76% estrus at 85 h = 28 cows
- 28 cows × 67% FSCR = 19 cows
- 9 no estrus cows × 43% FSCR at 85 h = 4 cows

FSCR = 65 cows

7% increase for FSCR
Implications

• It is more economical to use estrus detection patches and reduce the number of GnRH injections required.

• Allows for choice of semen and sire selection (cost) for cows detected in estrus (greater PR)
  — Cows not detected in estrus are placed in a split-time program and less expensive semen is utilized.

• Split-time insemination programs should result in a greater number of bred cows and recapture costs associated with estrus synchronization.
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