PROTOCOLS FOR SYNCHRONIZATION OF ESTRUS AND OVULATION

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Introduction

The potential for genetic improvement in beef herds in the US through advances in biotechnology has never been greater. Recent improvements in our understanding of methods of inducing and synchronizing estrus and ovulation in postpartum beef cows and replacement beef heifers creates the opportunity to significantly expand the use of artificial insemination in both purebred and commercial herds. Technology now exists to successfully inseminate beef cows at predetermined fixed times with pregnancy rates comparable to those achieved with heat detection.

While many options exist for synchronization of estrus and ovulation, this short list of protocols was developed based on available research data and field use by the Beef Cattle Reproduction Leadership Team. This group is composed of representatives from the AI and pharmaceutical industries, veterinarians, and reproductive physiologists from the Beef Reproduction Task Force with active research programs in this area.

Selecting a synchronization protocol

Each producer should evaluate available resources and assess the cows or heifers intended for synchronization before selecting a protocol. Key considerations should include time and skill available for heat detection, body condition of the cows or heifers, days postpartum in cows, facilities, experience, and cost.

Amount of Heat Detection

The first step in selecting a synchronization protocol is to determine how much, if any, heat detection is feasible or desired. Some management systems make heat detection and the sorting of animals very simple and effective. In other cases, heat detection can be very difficult. Poor detection efficiency can result in a low AI pregnancy rate. The recommended protocols are divided into three groups based on amount of heat detection required; 1) heat detection for 7 to 8 days, 2) heat detection for 3 days followed by fixed-time AI of all remaining animals not previously detected in heat (clean-up timed AI) or 3) strict fixed-time AI.

Cow factors

Any of the synchronization protocols are recommended for mature cows with a body condition score of 5 or greater that are 50 days or more since calving at the time of AI. Young, thin, and late calving cows are all less likely to have resumed their estrous cycles at the beginning of the breeding season. If a high percentage of cattle are in these categories, consideration should be given to protocols that include a progestin such as a CIDR. The progestin will induce some non-cycling cows to cycle and improve their chance of conceiving to
AI. If cows are too thin or have calved too recently, the investment in synchronization of estrus may not be cost effective.

Heifer factors

Age and weight are key factors that influence time of puberty in heifers. Heifers should attain 60% of their mature weight prior to breeding. Because selection pressure on growth has increased mature cow size, producers may tend to underestimate future mature size. Producers that score heifer reproductive tracts at 50 to 60 days prior to breeding have a true measure of physiological maturity and time to adjust rations prior to breeding. If 50% of heifers have a tract score of 3 or greater 50 to 60 days prior to breeding, estrus synchronization programs tend to be more successful. Protocols including a progestin such as MGA or CIDR will induce some prepubertal heifers to cycle.

Other

Length of the protocol, number of times handled, and the ability to successfully deliver treatments such as MGA are other factors that must be considered when choosing a synchronization protocol. Management system, feed resource flexibility, and facilities will play a role in which protocol works best in each particular environment. Success of any protocol is dependent on the proper administration and timing of treatments. For help see the Estrus Synchronization Planner at http://www.iowabeefcenter.org/content/software_estrus%20planner.html

Cost

If labor is available or can be hired, protocols using heat detection are generally lower cost than fixed-timed AI. Treatments, semen and number of handlings will contribute to cash costs of synchronization. Estimated savings from fewer bulls needed for natural service and increased returns from age and weight of AI sired calves should be considered. Producers that find AI most cost effective are those that capture additional returns from AI sired calves.

Which animals should I synchronize?

When starting an AI program for the first time, replacement heifers probably are the easiest group of animals to work with and first calf heifers the most difficult group to achieve success. Start simple and add more animals as you gain experience.

PRODUCTS USED

Hormones common to many protocols are prostaglandin F₂α (PG), gonadotropin releasing hormone (GnRH) and progestins. They are available in the following commercial products. Follow label directions for dose and route of administration.

<table>
<thead>
<tr>
<th>Type</th>
<th>Commercial Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>GnRH</td>
<td>Cystorelin®, Factrel®, Fertagyl®, OvaCyst®</td>
</tr>
<tr>
<td>PG</td>
<td>estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, ProstaMate®</td>
</tr>
<tr>
<td>Progestin</td>
<td>MGA® (melengesterol acetate) CIDR® (progesterone)</td>
</tr>
</tbody>
</table>
PROTOCOLS

Heat Detection Protocols

Animals in these protocols should be inseminated 6 to 12 hours after the first observation of standing heat. During peak activity (48 to 72 hours after PG for most systems), heat detection for a total of three hours per day at three or more times would be a minimum and a total of 5 to 6 hours better.

Select Synch and Select Synch + CIDR® (Figure 1) are protocols for use in cows. Including the CIDR is recommended when more cows are likely to be anestrus and/or when heat detection prior to PG is not feasible. With Select Synch, 5 to 20% of the animals may show heat 1.5 to 2 days before PG. Both protocols could be applied to the same group of cows, with CIDRs selectively placed in young, thin, and/or late calving cows.

The 7-day CIDR®-PG protocol (Figure 2) is recommended in heifers in contrast to the Select Synch + CIDR® protocol in cows. The difference is that heifers do not require the GnRH injection at the beginning of the treatment. Research has shown pregnancy rates from the 7-day CIDR®-PG protocol similar to those from the Select Synch + CIDR® protocol in heifers. Select Synch is not preferred for heifers because a wider range in responses to Select Synch has been reported in heifers perhaps due to inconsistent response to GnRH.

Feeding of MGA is specifically approved for estrus suppression in heifers only. The MGA-based protocol recommended for heifers is MGA®-PG (Figure 3). More advance planning is needed as this protocol begins with feeding MGA for 14 days starting 33 days before injection of PG. If MGA can be delivered accurately on a daily basis; this is a very effective protocol in beef heifers. The original recommendation for the interval between the last feeding of MGA and PG injection was 17 days. Delaying this interval to 19 days improves synchrony of estrus.
A single injection of PG (Figure 4) can be used on heifers. This protocol does not provide the degree of synchrony of others and the heat detection period is twice as long. Nevertheless, it is a low cost method that often works well for those just starting to use AI. It could be used on cows but because sorting and heat detection are more complex when the calf is present, other options should be strongly considered. Heifers that have not reached puberty or cows that have not initiated estrous cycles do not have a corpus luteum (CL) and will not respond to this treatment. Heifers observed in heat and inseminated before the time of PG injection do not require PG.

Heat Detection & Timed AI (TAI) Protocols

Heat detection and timed AI protocols involve AI 6 to 12 hours after observed estrus for 3 days then timed AI of all non-responders 72 to 84 hours after PG with GnRH given at TAI. The amount of time spent on heat detection is reduced and early responders have a better chance of conceiving compared to a single fixed-timed AI.

The same protocols recommended for heat detection are also recommended for the combination of heat detection and timed AI in cows (Figure 5). The success of these protocols is still dependent on good heat detection, particularly for early heats in the Select Synch protocol.

In heifers, the MGA®-PG (Figure 6) protocol can be used combining heat detection and timed AI. A second protocol recommended for use in heifers is Select Synch + CIDR® (Figure 6). GnRH is recommended in this protocol as it adds little additional cost and heifers that do respond with a new follicular wave are more likely to conceive at the clean-up timed AI.
The third option for combination heat detection and TAI in heifers is 14-day CIDR® PG (Figure 7). This protocol appears similar to MGA-PG but the interval between CIDR removal and PG is reduced to 16 days. This is because the progesterone in CIDR treated animals is cleared from the body much faster than melengesterol acetate in MGA-treated animals.

**Fixed-Time AI protocols**

In fixed-time AI protocols, all animals are inseminated at a predetermined time. For cows, fixed-timed AI can produce similar pregnancy rates as protocols that require 5 to 7 days of heat detection. For heifers, pregnancy rates from current TAI protocols tend to be 5 to 10% lower than using heat detection alone. The times listed for fixed-time AI should be considered as the approximate average time of insemination. This should be based on the number of females to inseminate, labor and facilities.

**7-day CO-Synch + CIDR® - Cows**

Perform TAI at 60 - 66 hr after PG with GnRH at TAI.

**5-day CO-Synch + CIDR® - Cows**

Two injections of PG 8 ± 2 hr apart are required for this protocol. Perform TAI at 72 ± 2 hr after 1st PG with GnRH at TAI.

between 60 and 66 hours after CIDR removal. Insemination time for heifers is recommended at 52 to 56 hours after CIDR removal. A shortened 5-day CO-Synch + CIDR® protocol (Figure 8) is another option for cows. Two full doses of PG given 8 hours apart are critical for success in the shortened protocol.

**MGA®-PG** (Figure 9) can be used with fixed-timed AI in heifers; however, pregnancy rate will likely be lower than with the CO-Synch + CIDR® protocol or 14-day CIDR®-PG.

The 7-day CO-Synch + CIDR® protocol is recommended for both cows (Figure 8) and heifers (Figure 9). Cows should be inseminated...
For many producers a CIDR-based protocol would be lower risk for fixed-timed AI than MGA®-PG as they are not reliant on accurate, daily MGA consumption and control of follicular growth should be better. The 14-day CIDR-PG is the most recent fixed-timed AI protocol for heifers. It is 3 days shorter than MGA-PG and requires one more handling than CO-Synch +CIDR.

**Concluding Comments**

Considerable research and field data support the use of these protocols as described. General comparisons of the protocols are found in Tables 1 and 2. Other protocols should only be considered in unique situations and with the advice of someone with extensive experience with synchronization protocols. Alterations of any protocol should be supported with sound research data.

**COMPARISON OF PROTOCOLS**

**Table 1. Beef Cows**

<table>
<thead>
<tr>
<th>Heat Detection</th>
<th>Cost</th>
<th>Labor</th>
<th>Reportsa</th>
<th>No. of cows</th>
<th>Pregnancy Rateb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Synch</td>
<td>Low</td>
<td>Medium/High</td>
<td>4</td>
<td>678</td>
<td>38-70 46</td>
</tr>
<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
<td>8</td>
<td>595</td>
<td>42-85 51</td>
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<tr>
<td><strong>Heat Detect &amp; TAI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select Synch</td>
<td>Low</td>
<td>Medium/High</td>
<td>6</td>
<td>2048</td>
<td>31-89 51</td>
</tr>
<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
<td>8</td>
<td>1596</td>
<td>36-77 56</td>
</tr>
<tr>
<td><strong>Fixed-time AI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-day CO-Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
<td>23</td>
<td>10,701a</td>
<td>32-79 58</td>
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<tr>
<td>5-day CO-Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
<td>8</td>
<td>2189</td>
<td>49-80 62</td>
</tr>
</tbody>
</table>

*aNumber of reports in published literature

*bNumber pregnant to AI / total number treated

*cIncludes field data from 35 herds (3015 head) in Missouri

**Table 2. Beef Heifers**

<table>
<thead>
<tr>
<th>Heat Detection</th>
<th>Cost</th>
<th>Labor</th>
<th>Reportsa</th>
<th>No. of heifers</th>
<th>Pregnancy Rateb</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Shot PG</td>
<td>Low</td>
<td>High</td>
<td>1(18 herds)</td>
<td>2700</td>
<td>45</td>
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<tr>
<td>7-day CIDR® - PG</td>
<td>Medium</td>
<td>Medium</td>
<td>1</td>
<td>147</td>
<td>41-59 51</td>
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<tr>
<td>CIDR® - PG (3 days of heat detection)</td>
<td>2</td>
<td>745</td>
<td>33-61</td>
<td>46</td>
<td></td>
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<tr>
<td>MGA® - PG</td>
<td>Low</td>
<td>Low/Medium</td>
<td>6</td>
<td>2746</td>
<td>40-71 60</td>
</tr>
<tr>
<td><strong>Heat Detect &amp; TAI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
<td>2</td>
<td>748</td>
<td>31-67 56</td>
</tr>
<tr>
<td>MGA® - PG</td>
<td>Medium</td>
<td>Medium</td>
<td>5</td>
<td>1905</td>
<td>48-64 56</td>
</tr>
<tr>
<td>14-day CIDR®-PG</td>
<td>Medium</td>
<td>Medium</td>
<td>2</td>
<td>159</td>
<td>50-62 56</td>
</tr>
<tr>
<td><strong>Fixed-time AI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO-Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
<td>11</td>
<td>1495</td>
<td>24-68 50</td>
</tr>
<tr>
<td>MGA® - PG</td>
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<td>Medium</td>
<td>5</td>
<td>831</td>
<td>36-62 46</td>
</tr>
<tr>
<td>14-day CIDR®-PG</td>
<td>Medium</td>
<td>Medium</td>
<td>1</td>
<td>934c</td>
<td>58-69 63</td>
</tr>
</tbody>
</table>

*aNumber of reports in published literature

*bNumber pregnant to AI / total number treated

*cIncludes field data from 5 herds (734 head) in Missouri
**HEAT DETECTION**

**Select Synch**

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

**Select Synch + CIDR®**

GnRH 0 7 13
PG
CIDR®

Heat detect & AI
treatment day

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

**Select Synch & TAI**

Heat detect and AI day 6 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

**Select Synch + CIDR® & TAI**

Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.

GnRH 0 6 7 13
PG
CIDR®

Heat detect & AI
treatment day

**COMPARISON OF PROTOCOLS FOR BEEF COWS**

<table>
<thead>
<tr>
<th>HEAT DETECTION</th>
<th>COST</th>
<th>LABOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Synch</td>
<td>Low</td>
<td>Medium/High</td>
</tr>
<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>

**HEAT DETECT & TAI**

Select Synch (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG
CIDR®

Heat detect & AI
treatment day

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

**7-day CO-Synch + CIDR®**

Perform TAI at 60 to 66 hr after PG with GnRH at TAI.

GnRH 0 7 13
PG
CIDR®

60-66 hr

Heat detect & AI
treatment day

**5-day CO-Synch + CIDR®**

Perform TAI at 72 ± 2 hr after 1st PG with GnRH at TAI.

Two injections of PG 8 ± 2 hr apart are required for this protocol.

GnRH 0 5 8 ± 2 hr
PG
CIDR®

Heat detect & AI
treatment day

• The times 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.

**COMPARISON OF PROTOCOLS FOR BEEF COWS**

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<tr>
<th>HEAT DETECTION</th>
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<tr>
<td>Select Synch</td>
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<td>Medium/High</td>
</tr>
<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>

**HEAT DETECT & TAI**

Select Synch (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG
CIDR®

Heat detect & AI
treatment day

**FIXED-TIME AI (TAI)**

7-day CO-Synch + CIDR®

(70 to 66 hr after PG with GnRH at TAI)

GnRH 0 7 13
PG
CIDR®

Heat detect & AI
treatment day

5-day CO-Synch + CIDR®

(72 ± 2 hr after 1st PG with GnRH at TAI)

GnRH 0 5 8 ± 2 hr
PG
CIDR®

Heat detect & AI
treatment day

• The times 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.

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<td>Select Synch + CIDR®</td>
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<td>Medium</td>
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**HEAT DETECT & TAI**

Select Synch (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG
CIDR®

Heat detect & AI
treatment day

**FIXED-TIME AI (TAI)**

7-day CO-Synch + CIDR®

(70 to 66 hr after PG with GnRH at TAI)

GnRH 0 7 13
PG
CIDR®

Heat detect & AI
treatment day

5-day CO-Synch + CIDR®

(72 ± 2 hr after 1st PG with GnRH at TAI)

GnRH 0 5 8 ± 2 hr
PG
CIDR®

Heat detect & AI
treatment day

• The times 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.

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<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
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</table>

**HEAT DETECT & TAI**

Select Synch (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG
CIDR®

Heat detect & AI
treatment day

**FIXED-TIME AI (TAI)**

7-day CO-Synch + CIDR®

(70 to 66 hr after PG with GnRH at TAI)

GnRH 0 7 13
PG
CIDR®

Heat detect & AI
treatment day

5-day CO-Synch + CIDR®

(72 ± 2 hr after 1st PG with GnRH at TAI)

GnRH 0 5 8 ± 2 hr
PG
CIDR®

Heat detect & AI
treatment day

• The times 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.

**COMPARISON OF PROTOCOLS FOR BEEF COWS**

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<td>Medium/High</td>
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<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
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</tbody>
</table>

**HEAT DETECT & TAI**

Select Synch (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG
CIDR®

Heat detect & AI
treatment day

**FIXED-TIME AI (TAI)**

7-day CO-Synch + CIDR®

(70 to 66 hr after PG with GnRH at TAI)

GnRH 0 7 13
PG
CIDR®

Heat detect & AI
treatment day

5-day CO-Synch + CIDR®

(72 ± 2 hr after 1st PG with GnRH at TAI)

GnRH 0 5 8 ± 2 hr
PG
CIDR®

Heat detect & AI
treatment day

• The times 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.

**COMPARISON OF PROTOCOLS FOR BEEF COWS**

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</thead>
<tbody>
<tr>
<td>Select Synch</td>
<td>Low</td>
<td>Medium/High</td>
</tr>
<tr>
<td>Select Synch + CIDR®</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>

**HEAT DETECT & TAI**

Select Synch (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG

Heat detect & AI
treatment day

Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)

GnRH 0 6 7 13
PG
CIDR®

Heat detect & AI
treatment day

**FIXED-TIME AI (TAI)**

7-day CO-Synch + CIDR®

(70 to 66 hr after PG with GnRH at TAI)

GnRH 0 7 13
PG
CIDR®

Heat detect & AI
treatment day

5-day CO-Synch + CIDR®

(72 ± 2 hr after 1st PG with GnRH at TAI)

GnRH 0 5 8 ± 2 hr
PG
CIDR®

Heat detect & AI
treatment day

• The times 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.
**HEAT DETECTION**

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Heat Detect &amp; AI</th>
<th>Treatment Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Shot PG</td>
<td>PG</td>
<td>0-12</td>
</tr>
<tr>
<td>7-day CIDR®-PG</td>
<td>PG</td>
<td>0-9</td>
</tr>
<tr>
<td>MGA®-PG</td>
<td>PG</td>
<td>0-13, 19±2 hr</td>
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</table>

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

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Heat Detect &amp; AI</th>
<th>Treatment Days</th>
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</thead>
<tbody>
<tr>
<td>Select Synch + CIDR® &amp; TAI</td>
<td>CIDR®</td>
<td>0-10, 72-84 hr</td>
</tr>
<tr>
<td>MGA®-PG &amp; TAI</td>
<td>PG, GnRH</td>
<td>14, 72-84 hr</td>
</tr>
<tr>
<td>14-day CIDR®-PG &amp; TAI</td>
<td>PG, GnRH</td>
<td>0-14, 30-33, 70-74 hr</td>
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**COMPARISON OF PROTOCOLS FOR BEEF HEIFERS**

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Cost</th>
<th>Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Shot PG</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>7-day CIDR®-PG</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>MGA®-PG</td>
<td>Low</td>
<td>Low/Medium</td>
</tr>
</tbody>
</table>

**HEAT DETECT & TAI**

- **Select Synch + CIDR®** (TAI non-responders 72-84 hr after PG)
- **MGA®-PG** (TAI non-responders 72-84 hr after PG)
- **14-day CIDR®-PG** (TAI non-responders 70-74 hr after PG)

**FIXED-TIME AI (TAI)**

- **CO-Synch + CIDR®**
  - Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.
- **MGA®-PG**
  - Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.
- **14-day CIDR®-PG**
  - Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.

**Cystorelin®, Factrel®, Fertagyl®, OvaCyst®**

**estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, ProstaMate®**

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

Beef Reproduction Task Force
### Estrus Synchronization Planner

**Inputs**

<table>
<thead>
<tr>
<th>Date to start breeding:</th>
<th>5/26/2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of day you want to breed:</td>
<td>7:30 AM</td>
</tr>
<tr>
<td>Detection-Insemination type:</td>
<td>1</td>
</tr>
<tr>
<td>Estrus synchronization system:</td>
<td>6</td>
</tr>
<tr>
<td>Days from last AI to bull turn in:</td>
<td>1</td>
</tr>
<tr>
<td>Trips through the working facility:</td>
<td>2</td>
</tr>
<tr>
<td>Cost Comparison - Alternative 1:</td>
<td>16</td>
</tr>
<tr>
<td>Optional</td>
<td>Alternative 2:</td>
</tr>
</tbody>
</table>

**Tips**

- **Inputs Tips**
  - 0.00 0.3125
  - 84

- **Date to start breeding:** 5/26/2010 (Example: 6/1/2010)
- **Time of day you want to breed:** 7:30 AM
- **Detection-Insemination type:** 1
  - 1 = Estrus AI
  - 2 = Estrus AI & Clean-up AI
  - 3 = Fixed-Time AI
- **Estrus synchronization system:** 6
  - Select number from list of systems below.
- **Days from last AI to bull turn in:** 1
- **Trips through the working facility:** 2
- **Cost Comparison - Alternative 1:** 16
  - Optional
- **alternative 2:** 32
  - Select number from list of systems below.

**Cow Systems**

- **Cow Systems**
  - 7 = Select Synch
  - 14 = Select Synch + CIDR

**Less Preferred Systems**

- **Less Preferred Systems**
  - 1 = 1 Injection Prostaglandin (prior estrus detection)
  - 2 = 1 Injection Prostaglandin (no prior estrus detection)
  - 3 = 2 Injection Prostaglandin (no prior estrus detection)
  - 15 = 7-Day CIDR+PG

**Heifer Systems**

- **Heifer Systems**
  - 1 = 1 Injection Prostaglandin (prior estrus detection)
  - 6 = MGA + Prostaglandin
  - 15 = 7-Day CIDR+PG

**Heat detect & Breed**

- **Heat detect & Breed**
- 3 = 2 Injection Prostaglandin (no prior estrus detection)
- 12 = 7-11 Synch
- 14 = Select Synch + CIDR
- 30=14 - Day CIDR+PG with E-AI

**Daily Lbs./Hd. Cost / Lb**

<table>
<thead>
<tr>
<th>Head in group:</th>
<th>100</th>
<th>Forage:</th>
<th>20</th>
<th>$0.040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Estimate:</td>
<td>62.0</td>
<td>Grain:</td>
<td>4</td>
<td>$0.063</td>
</tr>
<tr>
<td>Labor Charge:</td>
<td>$10.00</td>
<td>MGA:</td>
<td>1</td>
<td>$0.200</td>
</tr>
<tr>
<td>Yardage:</td>
<td>$0.25</td>
<td>Supplement:</td>
<td>0.25</td>
<td>$0.150</td>
</tr>
<tr>
<td>PG ($/dose):</td>
<td>$2.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GnRH ($/dose):</td>
<td>$2.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIDR ($/insert):</td>
<td>$10.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semen ($/unit):</td>
<td>$20.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**User Defined Charges**

- **Name of Item:** Estrotect
  - No.Units: 100
  - Cost - $ per Unit: $0.95
- **Name of Item:** No.Units
  - Cost - $ per Unit: 
- **Name of Item:** No.Units
  - Cost - $ per Unit: 

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**Beef Reproduction Task Force / Iowa Beef Center - Synch - 10**

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**12/7/2009**
**Estrus Synchronization Planner**

- **Date to start breeding:** 5/26/10
- **Clean-up bull turn in date:** 6/2/10
- **Start of calving season:** 3/3/11
- **Producer Name:** Calvin Cowman
- **Address:** Rural Route
- **Town:** USA
- **Phone Number:** 785-462-6281
- **Prepared by:** Sandy Johnson

### Comments
- This system is highly recommended for heifers and works effectively in postpartum cows.
- Estrus detection should begin at the time of PG administration.
- Majority will exhibit estrus between 48 and 96 hours after PG.
- Daily intake during MGA feeding is critical, may require drylot feeding.
- Deliver MGA in either a well mixed ration or a supplement with not less than 3-5 lbs fed per head per day.
- For either MGA feeding methodology provide adequate bunk space (12 in. for TMR, 18 in. for MGA + grain only).
- Immediate addition of clean-up bulls could lead to questions about parentage.

### Date of Activity

<table>
<thead>
<tr>
<th>Date of Activity</th>
<th>Day of the Week</th>
<th>Description of Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/24/10</td>
<td>Saturday</td>
<td>Start feeding Melengestrol Acetate (MGA) at .5 mg/hd/day. Continue feeding until 5/7/2010.</td>
</tr>
<tr>
<td>05/07/10</td>
<td>Friday</td>
<td>Last day to feed MGA at .5 mg/hd/day.</td>
</tr>
<tr>
<td>05/09/10</td>
<td>Sunday</td>
<td>Large numbers of females will show heat the next 4 days - DO NOT BREED!</td>
</tr>
<tr>
<td>05/26/10</td>
<td>Wednesday</td>
<td>Inject Prostaglandin (PG) to all females. Start heat detection. Breed females AI 10-14 hours after standing heat.</td>
</tr>
<tr>
<td>05/27/10</td>
<td>Thursday</td>
<td>Continue heat detection. Breed females AI 10-14 hours after standing heat.</td>
</tr>
<tr>
<td>05/28/10</td>
<td>Friday</td>
<td>Peak heat at 60 - 72 hours after PG. Continue heat detection. Breed females AI 10-14 hours after standing heat.</td>
</tr>
<tr>
<td>06/01/10</td>
<td>Tuesday</td>
<td>Last day of heat detection. Breed females AI 10-14 hours later if showing standing heat.</td>
</tr>
<tr>
<td>06/02/10</td>
<td>Wednesday</td>
<td>Turn clean up bulls in with females. Immediate addition of clean-up bulls could lead to questions about parentage.</td>
</tr>
</tbody>
</table>
Date to start breeding: 5/26/10  
Clean-up bull turn in date: 6/2/10  
Start of calving season: 3/3/11

### Cost Comparison of Three Selected Systems

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>100</td>
<td>1400</td>
<td></td>
<td>62.0</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Cost/Unit</td>
<td>$2.60</td>
<td>$0.20</td>
<td></td>
<td>$10.00</td>
<td>$10.00</td>
<td>$0.95</td>
<td>$1.00</td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>$260.00</td>
<td>$280.00</td>
<td></td>
<td>$1,020.00</td>
<td>$619.72</td>
<td>$95.00</td>
<td>$95.00</td>
<td></td>
</tr>
<tr>
<td>vs. Total cost</td>
<td>$260.00</td>
<td>$270.00</td>
<td></td>
<td>$1,020.00</td>
<td>$565.73</td>
<td>$95.00</td>
<td>$95.00</td>
<td></td>
</tr>
<tr>
<td>vs. Total cost</td>
<td>$260.00</td>
<td>$200.00</td>
<td></td>
<td>$1,020.00</td>
<td>$506.00</td>
<td>$95.00</td>
<td>$95.00</td>
<td></td>
</tr>
</tbody>
</table>

**Synchronization Cost Subtotal** $540.00 vs. $1,550.00 vs. $1,480.00

| Days in Drylot       | 39      |
| Roughage             | 78000   | $3,120.00 |
| Grain                | 15600   | $982.80   |
| Yardage              | 3900    | $975.00   |
| Supplement           | 975     | $146.25   |

**Feed & Yardage Cost Subtotal** $5,224.05

**Total Cost (not including feed & yardage)** $3,254.72 vs. $4,210.73 vs. $4,081.00

**Cost / Female Synchronized** $32.55 vs. $42.11 vs. $40.81

**Total Cost** $3,254.72 vs. $4,210.73 vs. $4,081.00

---

**Cost - Response Analysis:**

<table>
<thead>
<tr>
<th>Estrous Response Rate</th>
<th>% AI Pregnant</th>
<th>$/Synch AI preg.</th>
<th>Conception Rate of those Responding to Synchronization</th>
</tr>
</thead>
<tbody>
<tr>
<td>75%</td>
<td>33.8%</td>
<td>$81.62</td>
<td>45%: 33.8%</td>
</tr>
<tr>
<td>80%</td>
<td>36.0%</td>
<td>$79.30</td>
<td>55.3%: 36.0%</td>
</tr>
<tr>
<td>85%</td>
<td>40.5%</td>
<td>$75.43</td>
<td>58.5%: 40.5%</td>
</tr>
<tr>
<td>90%</td>
<td>42.8%</td>
<td>$73.79</td>
<td>61.8%: 42.8%</td>
</tr>
<tr>
<td>95%</td>
<td>45.0%</td>
<td>$72.22</td>
<td>67.5%: 45.0%</td>
</tr>
</tbody>
</table>

**This cost analysis does not include the feed & yardage cost subtotal which would be $52.24.**
### Estrus Synchronization Planner

- **Date to start breeding:** 5/26/10
- **Clean-up bull turn in date:** 5/30/10
- **Start of calving season:** 3/3/11

#### Comments
- Estrus detection should begin at the time of PG administration.
- Majority will exhibit estrus between 48 - 96 hours after PG.
- Cleanup AI performed from 72 - 84 hours after PG if more than 50% of heifers have been detected after 72 hours.
- Daily intake during MGA feeding is critical, may require drylot feeding.
- Deliver MGA in either a well mixed ration or a supplement with not less than 3-5 lbs fed per head per day.
- For either MGA feeding methodology provide adequate bunk space (12 in. for TMR, 18 in. for MGA + grain only).
- Immediate addition of clean-up bulls could lead to questions about parentage.

#### Estrus Synchronization Planner

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</tr>
<tr>
<td>05/07/10</td>
<td>Friday</td>
<td>Last day to feed MGA at .5 mg/hd/day.</td>
</tr>
<tr>
<td>05/09/10</td>
<td>Sunday</td>
<td>Large numbers of females will show heat the next 4 days - DO NOT BREED!</td>
</tr>
<tr>
<td>05/26/10</td>
<td>Wednesday</td>
<td>Inject Prostaglandin (PG) to all females at: 7:30 AM Start heat detection. Breed females AI 10-14 hours after standing heat.</td>
</tr>
<tr>
<td>05/27/10</td>
<td>Thursday</td>
<td>Continue heat detection. Breed females AI 10-14 hours after standing heat.</td>
</tr>
<tr>
<td>05/28/10</td>
<td>Friday</td>
<td>Continue heat detection. Breed females AI 10-14 hours after standing heat.</td>
</tr>
<tr>
<td>05/29/10</td>
<td>Saturday</td>
<td>Last day of heat detection. For females not detected in heat, inject GnRH &amp; inseminate between the hours: 7:30 AM 7:30 PM</td>
</tr>
<tr>
<td>05/30/10</td>
<td>Sunday</td>
<td>Turn clean up bulls in with females. Immediate addition of clean-up bulls could lead to questions about parentage.</td>
</tr>
</tbody>
</table>
Beef Reproduction Task Force

Estrus Synchronization Planner

| Date to start breeding: | 5/26/10 |
| Clean-up bull turn in date: | 5/30/10 |
| Start of calving season: | 3/3/11 |

<table>
<thead>
<tr>
<th>Cost Comparison of Three Selected Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>26= MGA + PG with E-Al and Cleanup AI</td>
</tr>
<tr>
<td><strong>Cost Analysis Item:</strong></td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>PG Cost</td>
</tr>
<tr>
<td>GnRH Cost</td>
</tr>
<tr>
<td>MGA Supplement</td>
</tr>
<tr>
<td>CIDR Cost</td>
</tr>
<tr>
<td><strong>Synchronization Cost Subtotal</strong></td>
</tr>
<tr>
<td>Detect/Mgt.Labor</td>
</tr>
<tr>
<td>Semen $</td>
</tr>
<tr>
<td>Estrotect</td>
</tr>
<tr>
<td><strong>AI Cost Subtotal</strong></td>
</tr>
<tr>
<td><strong>Total Cost (not including feed &amp; yardage)</strong></td>
</tr>
<tr>
<td>Cost / Female Synchronized</td>
</tr>
<tr>
<td>Days in Drylot</td>
</tr>
<tr>
<td>Roughage</td>
</tr>
<tr>
<td>Grain</td>
</tr>
<tr>
<td>Yardage</td>
</tr>
<tr>
<td>Supplement</td>
</tr>
<tr>
<td><strong>Feed &amp; Yardage Cost Subtotal</strong></td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
</tr>
</tbody>
</table>

This feed & yardage cost does not credit in the cost of maintaining the female on pasture.

$/Synch AI = cost per successful AI pregnancy for the selected system under the given success rate.

**This cost analysis does not include the feed & yardage cost subtotal which would be - $48.22**
**Estrus Synchronization Planner**

**Producer Name:** Calvin Cowman  
**Address:** Rural Route  
**Town:** USA  
**Phone Number:**

**Date to start breeding:** 5/26/2010  
**Clean-up bull turn in date:** 5/30/2010  
**Start of calving season:** 3/3/2011  
**Prepared by:** Sandy Johnson  
**Phone Number:** 785-462-6281

### Clean-up AI between: 5/29/10 7:30 AM - 5/29/10 7:30 PM

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
</table>

- * MGA @ 0.5 mg/ hd/ day
- * Many females in heat next 4 days. DO NOT BREED!
- * Detect Estrus & Breed
- * Detect Estrus & Breed
- * Detect Estrus & Breed
- * Detect Estrus & Breed
- * Detect Estrus & Breed
- * Detect Estrus & Breed
- * Detect Estrus & Breed
- * Detect Estrus & Breed

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Beef Reproduction Task Force / Iowa Beef Center - Synch - 10