Protocols for Synchronization of Estrus and Ovulation

Beef Reproduction Task Force

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, estrous 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/estrussynchplannermain.htm

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 $F_2\alpha$ (**PG**), gonadotropin releasing hormone (**GnRH**) and progestins. They are available in the following commercial products. Follow label directions for dose and route of administration.

Type	Commercial Names
GnRH	Cystorelin®, Factrel®, Fertagyl®, OvaCyst®
PG	estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, ProstaMate®
Progestin	MGA® (melengesterol acetate) CIDR® (progesterone)

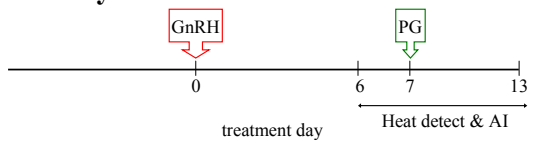
PROTOCOLS

Heat Detection Protocols

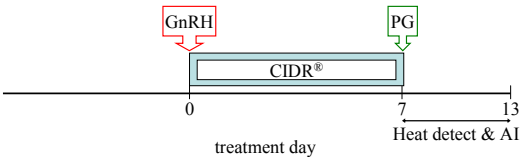
Animals in these protocols should be inseminated 6 to 12 hours after the first observation of standing heat. During peak activity (48 to 72 hours after PG for most systems), heat detection for a total of three hours per day at three or more times would be a minimum and a total of 5 to 6 hours better.

Select Synch and **Select Synch + CIDR®** 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 CIDR®s selectively placed in young, thin, or late calving cows.

Select Synch

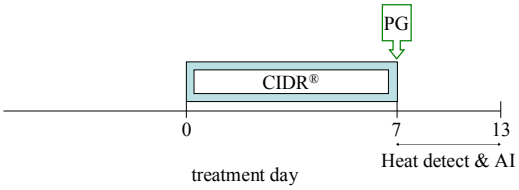


Select Synch + CIDR®



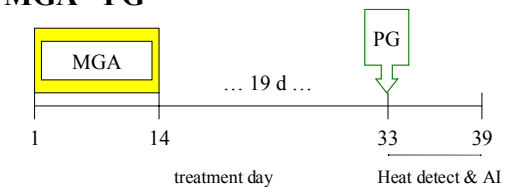
The **CIDR®-PG** protocol is recommended in heifers in contrast to the Select Synch + CIDR® protocol in cows. The difference is that heifers do not require the GnRH injection at the beginning of the treatment. Research has shown pregnancy rates from the CIDR®-PG protocol similar to those from the Select 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.

CIDR®-PG



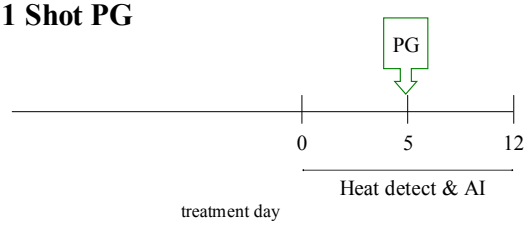
Feeding of MGA® is specifically approved for estrus suppression in heifers only. The MGA®-based protocol recommended for heifers is **MGA®-PG**. More advance planning is needed as this protocol begins with feeding MGA® for 14 days starting 33 days before PG injection. If MGA® can be delivered accurately 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.

MGA®-PG



A single injection of PG 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.

1 Shot PG



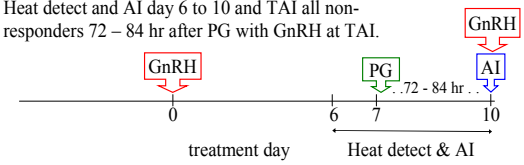
Heat Detection & Timed AI (TAI) Protocols

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. The success of these protocols is still dependent on good heat detection, particularly for early heats in the Select Synch protocol.

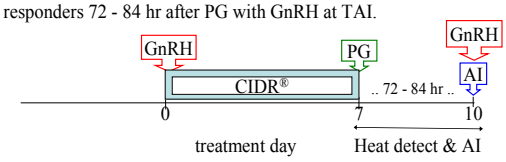
Select Synch & TAI

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



Select Synch + CIDR® & TAI

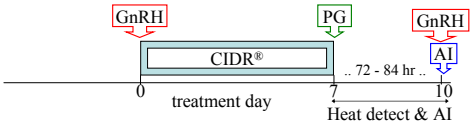
Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



In heifers, the MGA®-PG protocol can be used combining heat detection and timed AI. A second protocol recommended for use in heifers is Select Synch + CIDR®. 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.

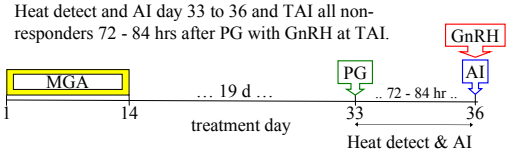
Select Synch + CIDR® & TAI

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



MGA®-PG & TAI

Heat detect and AI day 33 to 36 and TAI all non-responders 72 - 84 hrs after PG with GnRH at TAI.



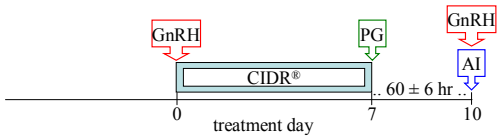
Fixed-Time AI protocols

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.

The **CO-Synch + CIDR®** protocol is recommended for both cows and heifers. Cows should be inseminated between 54 and 66 hours after CIDR® removal. Insemination time for heifers is recommended at 52 to 56 hours after CIDR® removal.

CO-Synch + CIDR® - Cows

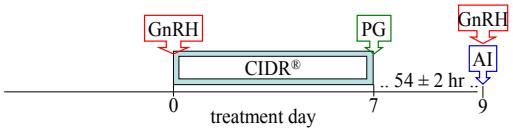
Perform TAI at 60 ± 6 hr after PG with GnRH at TAI.



MGA®-PG can be used with fixed-timed AI in heifers; however, pregnancy rate will likely be lower than with the CO-Synch + CIDR® protocol. For most producers CO-Synch + CIDR® would be a lower risk protocol for fixed-timed AI than MGA®-PG as it is not reliant on accurate, daily MGA® consumption and control of follicular growth should be better.

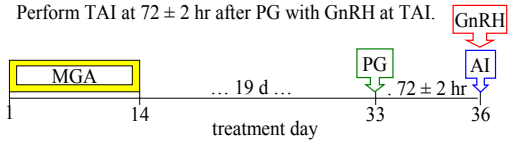
CO-Synch + CIDR® - Heifers

Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.



MGA®-PG

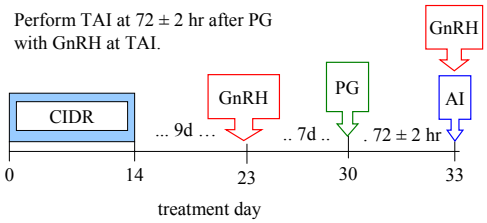
Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.



The CIDR®–Select program is another fixed-time AI option for heifers. Results are promising in the data available to date, however, more information is needed to compare this protocol with CO-Synch+ CIDR.

CIDR® Select

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



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

Heat Detection	Cost	Labor	Reports[a]	No. of cows	Pregnancy Rate[b]	
					Range	Avg.
Select Synch	Low	Medium/High	4	678	38-70	46
Select Synch + CIDR®	High	Medium	3	514	42-85	50
Heat Detect & TAI						
Select Synch	Low	Medium/High	5	1887	31-89	50
Select Synch + CIDR®	High	Medium	4	787	36-74	59
Fixed-time AI						
CO-Synch + CIDR®	High	Medium	10	3314	43-74	56

[a]Number of reports in published literature
[b]Number pregnant to AI / total number treated

Table 2. Beef Heifers

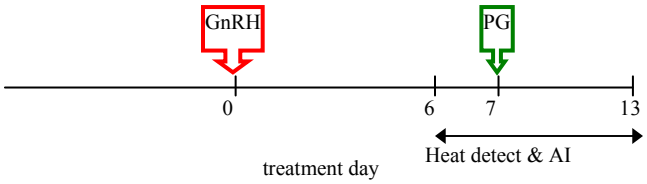
Heat Detection	Cost	Labor	Reports[a]	No. of heifers	Pregnancy Rate[b]	
					Range	Avg.
1 Shot PG	Low	High	1(18 herds)	2700		45
CIDR® - PG	Medium	Medium	1	147	41-59	51
CIDR® - PG (3 days of heat detection)			2	745	33-61	46
MGA® - PG	Low	Low/Medium	6	2746	40-71	60
Heat Detect & TAI						
Select Synch + CIDR®	High	Medium	2	748	31-67	56
MGA® - PG	Medium	Medium	4	1826	48-64	56
Fixed-time AI						
CO-Synch + CIDR®	High	Medium	4	735	24-68	53
MGA® - PG	Medium	Medium	2	246	47-49	48
CIDR®- Select	High	Medium/High	-	853[c]	26-78	61

[a]Number of reports in published literature
[b]Number pregnant to AI / total number treated
[c]Field data from 13 herds in Missouri

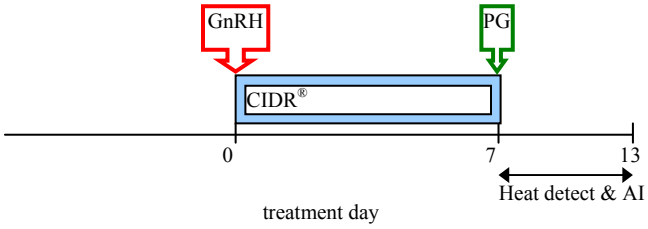
Beef Cow Protocols

Heat Detection

Select Synch



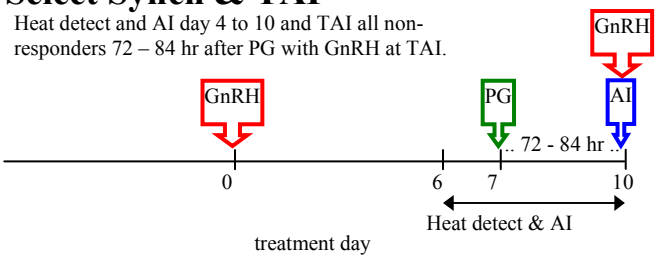
Select Synch + CIDR®



Heat Detect & Time AI (TAI)

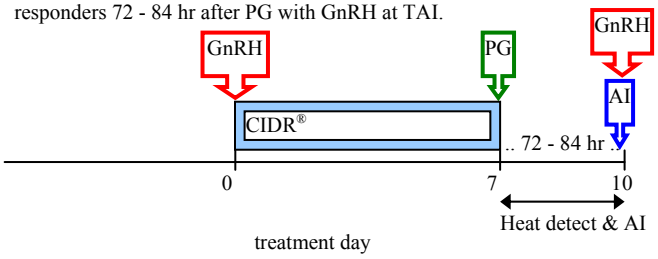
Select Synch & TAI

Heat detect and AI day 4 to 10 and TAI all non-responders 72 – 84 hr after PG with GnRH at TAI.



Select Synch + CIDR® & TAI

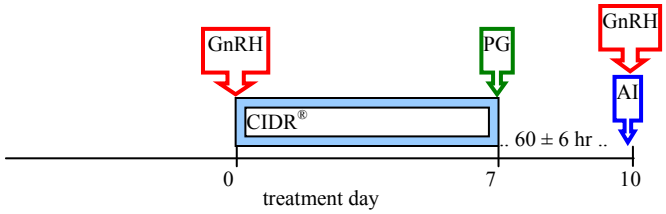
Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



Fixed-Time AI (TAI)*

CO-Synch + CIDR®

Perform TAI at 60 ± 6 hr after PG with GnRH at TAI.



Comparison Of Protocols For Beef Cows

Heat Detection	Cost	Labor
Select Synch	Low	Medium/High
Select Synch + CIDR®	High	Medium
Heat Detect & TAI		
Select Synch (TAI non-responders 72-84 hr after PG)	Low	Medium/High
Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)	High	Medium
Fixed-Time AI (TAI)		
CO-Synch + CIDR® (TAI 60 ± 6 hr after PG with GnRH at TAI)	High	Medium

• 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.

GnRH — Cystorelin®, Factrel®, Fertagyl®, OvaCyst®

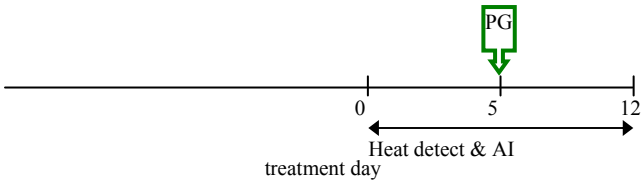
PG — Estrumate®, In-Synch®, Lutalyse®, ProstaMate®, estroPLAN®

Beef Reproduction Task Force

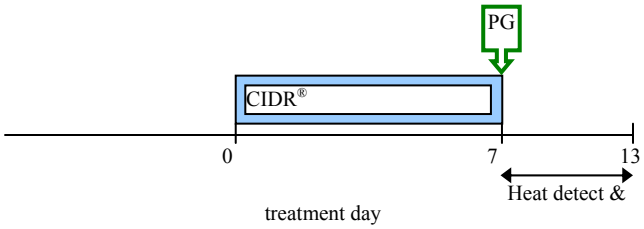
Beef Heifer Protocols

Heat Detection

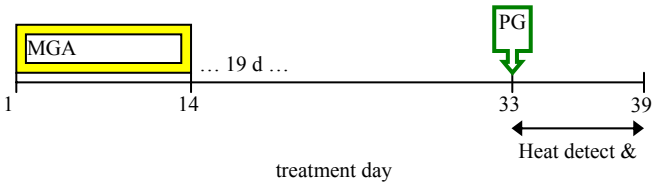
1 Shot PG



CIDR®-PG



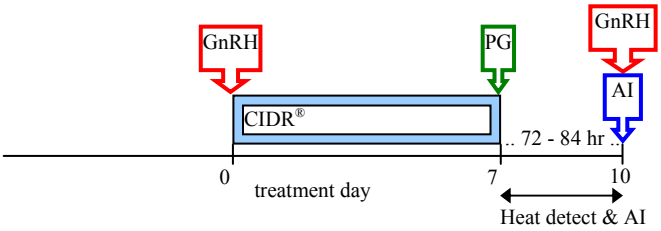
MGA®-



Heat Detect & Time AI (TAI)

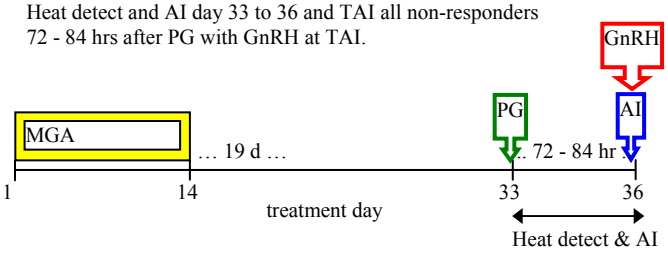
Select Synch + CIDR® & TAI

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



MGA®-PG & TAI

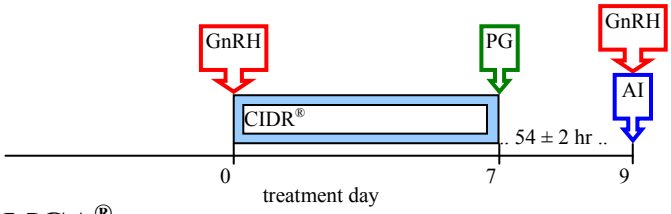
Heat detect and AI day 33 to 36 and TAI all non-responders 72 - 84 hrs after PG with GnRH at TAI.



Fixed-Time AI (TAI)*

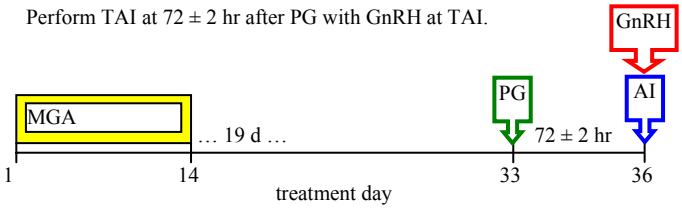
CO-Synch + CIDR®

Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.



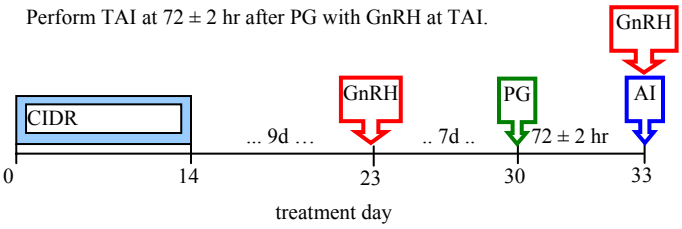
MGA®-

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



CIDR® Select

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



Comparison Of Protocols For Beef Heifers

Heat Detection	Cost	Labor
1 Shot PG	Low	High
CIDR®-PG	Medium	Medium
MGA®-PG	Low	Low/Medium
Heat Detect & TAI		
Select Synch + CIDR® (TAI non-responders 72-84 hr after PG)	High	Medium
MGA®-PG (TAI non-responders 72-84 hr after PG)	Medium	Medium
Fixed-Time AI (TAI)		
CO-Synch + CIDR® (TAI 54 ± 2 hr after PG with GnRH at TAI)	High	Medium
MGA®-PG (TAI 72 ± 2 hr after PG with GnRH at TAI)	Medium	Medium
CIDR® Select (TAI 72 ± 2 hr after PG with GnRH at TAI)	High	Medium/High

• 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.

GnRH — Cystorelin®, Factrel®, Fertagyl®, OvaCyst®

PG — Estrumate®, In-Synch®, Lutalyse®, ProstaMate®, estroPLAN®

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