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REVIEW OF ESTROUS SYNCRHONIZATION SYSTEMS: CIDR INSERTS

Darrel J. Kesler, Ph.D.[1]
Professor of Animal Sciences, Campus Honors Program, and Academic Outreach
and Extension Reproductive Biologist
University of Illinois

Introduction

Although estrous synchronization has been cited over the past several decades to have significant impact on reproductive performance of beef cattle (Schafer et al., 1990), only a limited percent of beef cattle operations in the U.S. synchronize estrus. In a summary by the National Animal Health Monitoring Systems (NAHMS) only 3.3% of beef cattle in the U.S. were being synchronized (NAHMS, 1994) even though estrous synchronization and AI have been documented to increase production and profitability in beef operations (Lesmeister et al., 1973; Bellows and Short, 1990; Wiltbank, 1990).

Estrous synchronization is a valuable reproductive tool for beef producers. A survey was conducted in Illinois in 2000 in attempt to understand why producers were not using estrous synchronization (Kesler, 2000). In completing the survey, producers were asked to indicate the reasons (listed in Table 1) they did not synchronize estrus in their heifers and cows. Although there was support for all provided reasons, one factor emerged as the primary reason: lack of time/labor. The second ranked reason was poor results. These are the two most important factors that must be considered in new product development and education. Products that were made available up until the 1990's were limited in efficacy and consistency and may have caused producers to lose interest in or question new developments.

Table 1. Reasons why producers don't synchronize estrus.

Reason	**Frequency**[a]
Too difficult to use	11%
Don't see the value	11%
Lack of time/labor	43%
High cost	11%
Poor results	17%
Requires heat detection	8%

[a]Producers were asked "If applicable, check which of the following explain why you do not routinely use estrous synchronization." The number of checks in each category were divided by the total number of checks to determine frequency.

[1]Darrel J. Kesler, Ph.D., University of Illinois (1207 W. Gregory Dr., Urbana, IL 61801; 217.333.2902; djkesler@uiuc.edu).

Synchronization of Estrus with the CIDR/$PGF_{2\alpha}$ Protocol

A new reproductive tool–the CIDR–was approved by FDA in 2002 for the synchronization of estrus (Food and Drug Administration, 2002). The CIDR, an intravaginal progesterone insert, used in conjunction with $PGF_{2\alpha}$ advances the first pubertal estrus in beef heifers, advances the first postpartum estrus in suckled beef cows, and synchronizes estrus in replacement beef and dairy heifers and suckled beef cows. The CIDR was developed in New Zealand and has been used there for several years.

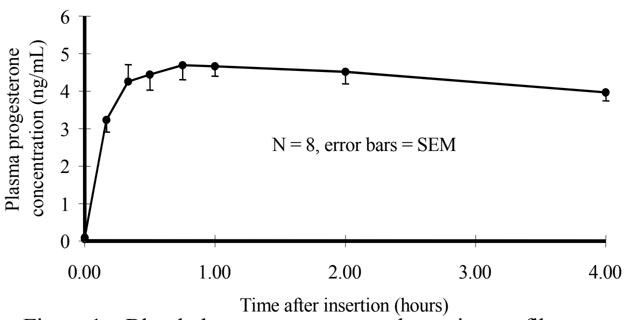

Figure 1. Blood plasma progesterone absorption profile following administration of EAZI-BREED CIDR® Cattle Insert

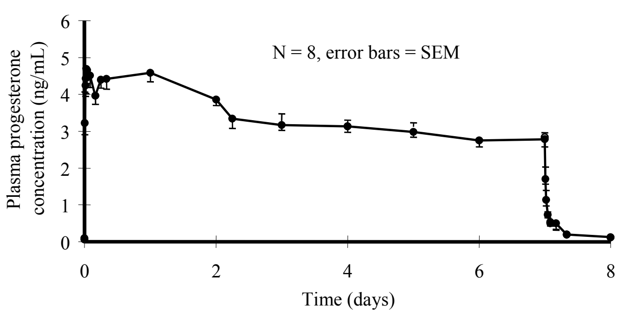

Figure 2. Entire blood plasma progesterone profile for EAZI-BREED CIDR® Cattle Insert

The CIDR is a "T" shaped device–referred to as an insert by FDA. The wings of the device collapse to form a rod that can be inserted into the vagina with an applicator. The CIDR is left in the vagina for seven days. An injection of $PGF_{2\alpha}$ is administered on day 6 and the insert is removed on day 7; however, many academic researchers are suggesting that the $PGF_{2\alpha}$ be administered at the same time the insert is removed. On the end opposite the wings of the insert a tail is attached that facilitates removal of the insert seven days after administration. The backbone of the CIDR is a nylon spine covered by a progesterone (1.38 g) impregnated silicone skin. Upon insertion blood progesterone concentrations rise rapidly. Maximal concentrations are reached within an hour (Figure 1). Progesterone concentrations are maintained at a relatively constant level during the seven days the insert is in the vagina (Figure 2). Upon removal of the insert, progesterone concentrations are quickly eliminated (Figures 3).

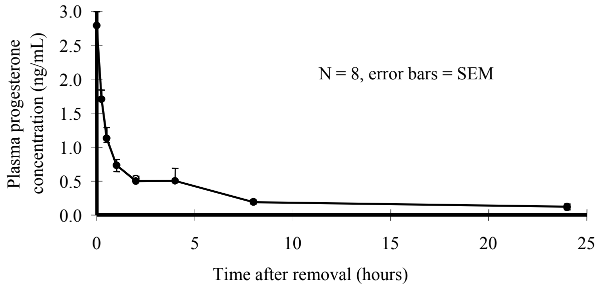

Figure 3. Blood plasma progesterone clearance profile following removal of EAZI-BREED CIDR® Cattle Insert

Retention rate of the insert during the seven-day period is exceptionally high: generally 97-98%. In recent research on dairy cows, vaginal irritation was monitored. This study with 863 lactating dairy cows demonstrated that most cows had a clear, cloudy, or yellow mucus associated with the insert upon removal; however, only 2% of the cows had a score suggestive of potential vaginitis. Caution is advised when working with the CIDRs, individuals handling the CIDRs should wear latex or nitrile gloves to prevent exposure to progesterone on the surface of the insert and to prevent the introduction of contaminants from the hands into the vagina of the treated females. The inserts are developed for a one-time use and multiple use–which is not approved by FDA–may cause vaginal infections.

Results from the studies that support the claims were published (Lucy et al., 2001). That study included 724 beef heifers, 851 beef cows, and 260 dairy heifers from seven sites across the United States demonstrating that the protocol is efficacious (Table 2).

Table 2. Synchrony, conception rates, and pregnancy rates of beef cows and heifers administered the CIDR + $PGF_{2\alpha}$ procedure.[a]

Item	Control	$PGF_{2\alpha}$	CIDR + $PGF_{2\alpha}$
Beef Cows:			
Estrus 1st 3 Days	15%	33%	59%
Synchronization Rate:			
Anestrous Cows	11%	19%	45%**
Cyclic Cows	19%	49%	72%**
Conception Rate:			
Anestrous Cows	38%	57%	57%
Cyclic Cows	58%	70%	63%
Pregnancy Rate:			
Anestrous Cows	4%	11%	26%**
Cyclic Cows	11%	34%	46%**
Beef Heifers:			
Estrus 1st 3 Days	13%	27%	65%
Synchronization Rate:			
Prepubertal Heifers	7%	11%	48%**
Cyclic Heifers	17%	37%	80%**
Conception Rate:			
Prepubertal Heifers	75%	55%	58%
Cyclic Heifers	52%	52%	61%
Pregnancy Rate:			
Prepubertal Heifers	6%	6%	28%**
Cyclic Heifers	9%	19%	49%**

[a]Modified from Lucy et al. (2001).
**Denotes a significant (P<.01) treatment effect.

CIDR/$PGF_{2\alpha}$ Protocol: Mechanism of Action

During the seven days of CIDR insertion, progesterone diffusion from the CIDR does not affect spontaneous luteolysis. Assuming all beef heifers and cows have 21 day estrous cycles, there will be two populations of females after six days of CIDR treatment: females without corpora lutea and females with corpora lutea more than six days after ovulation. All females, therefore, have corpora lutea that are potentially responsive to an injection of $PGF_{2\alpha}$. Although most research data suggests that only about 90% of corpora lutea in heifers and cows more than six days after ovulation regress promptly to an injection $PGF_{2\alpha}$, only about 60% of the females will have corpora lutea at the time of $PGF_{2\alpha}$ treatment (assuming that spontaneous corpora lutea regression begins about 18 days after ovulation). Therefore, about 95% of the females treated with the FDA approved CIDR/$PGF_{2\alpha}$ protocol are synchronized to exhibit estrus within a few days of CIDR insert removal. However, more than 95% of the treated females will be synchronized to exhibit estrus if estrous behavior is monitored for five days after removal of the CIDR insert.

An advantage of a progestin-based estrous synchronization protocol is that administration of progestins to prepubertal heifers and postpartum anestrous cows have been demonstrated to hasten puberty and cyclicity. Table 3 reports that efficacy of the CIDR in the study conducted by Lucy et al. (2001). In fact, in addition to synchronizing estrus in replacement beef and dairy heifers and suckled beef cows, FDA approved the claim that the CIDR advances the first pubertal estrus in beef heifers and advances the first postpartum estrus in suckled beef cows.

Table 3. Efficacy of the CIDR + $PGF_{2\alpha}$ procedure in hastening puberty and cyclicity.[a]

Target Animal	Control	Treated
Prepubertal Beef Heifers	7%	48%**
Anestrous Beef Cows	11%	45%**

[a]Adapted from Lucy et al. (2001).
**Differs from the control group (P<.01).

Synchronization of Estrus with Alternative Protocols Using the CIDR

Several alterations of the basic protocol are being evaluated, however, much work is yet to be done since field trials with CIDRs were limited during the FDA approval process. Some of the published data will be reviewed, although it should be noted that these results are preliminary and it is unlikely that the best way to utilize CIDRs has yet to be established. The following are alternative protocols; however, caution is advised on the implementation of these protocols until thorough multi-site studies are conducted.

- Inclusion of the CIDR in the CO-Synch procedure.
- Inclusion of an estradiol at the time of CIDR insertion.
- Inclusion of an estradiol about 24 hours after CIDR removal.
- Administration of the CIDR 14±1 days after insemination and removal 21±1 days later for resynchronization; however, this application will be discussed elsewhere in this proceedings.

Inclusion of the CIDR in the CO-Synch Procedure: Lamb et al. (2001) published data in which the CIDR was included in the CO-Synch estrous synchronization procedure. The CIDR was inserted at the time of the first injection of GnRH and removed at the time of the injection of $PGF_{2\alpha}$. Overall, there was a positive effect of including the CIDR in the CO-Synch protocol; however, this positive effect was not consistent across all locations. Second, the positive effect of including the CIDR was absent in the cows that were cycling and had high progesterone concentrations at the time of $PGF_{2\alpha}$ treatment, which may explain why there was not a positive effect at each location (Table 4).

Table 4. Effect of including a CIDR in the CO-Synch protocol for beef cows. [a]

Item	**CO-Synch**	**CO-Synch + CIDR**
Total Number	287	273
Station:		
Illinois	52%	43%
Kansas	54%	66%
Minnesota	38%	51%
Missouri	53%	71%
Combined	48%	59%
Reproductive Status:		
Cycling + high P4 at $PGF_{2\alpha}$	58%	58%
Noncycling + high P4 at $PGF_{2\alpha}$	40%	53%
Cycling + low P4 at $PGF_{2\alpha}$	43%	79%
Noncycling	38%	66%

[a]Adapted from Lamb et al. (2001).

Martinez et al. (2002a) included the CIDR in the CO-Synch protocol for heifers and the data are summarized in the following table (Table 5). Ovsynch and CO-Synch have not been reported to be as effective in heifers as cows. However, Martinez's data would suggest that the CO-Synch protocol is effective in heifers if the CIDR is included as was done for cows—administered at the time of the first injection of GnRH and removed at the time of the $PGF_{2\alpha}$.

Table 5. Effect of CO-Synch alone or along with CIDR treatment in beef heifers.[a]

Item	**n**	**Pregnancy Rate**
CO-Synch	23	39%
CO-Synch + CIDR	25	68%*

[a]Adapted from Martinez et al. (Theriogenology 57:1049; 2002a).

Estrada et al. (2002) administered the CO-Synch + CIDR protocol to both cows and heifers. Pregnancy rates in their study were 61% for cows and 60% for heifers. Although Estrada et al. (2002) did not have a similar treatment group without the CIDR; these positive results would support the studies by Lamb et al. (2001) and Martinez et al. (2002a).

Inclusion of an Estradiol at the Time of CIDR Insertion: The injection of estradiol at the time of CIDR insertion is to synchronize the follicular wave. Alternatively, GnRH may be used to synchronize the follicular wave as used in the previously described CO-Synch procedure. Lane et al. (2001a) demonstrated that 0.75 mg of estradiol benzoate given at the time of PRID—an alternative progesterone-releasing intravaginal device—insertion, with $PGF_{2\alpha}$ given one day before PRID removal, was more effective at synchronizing estrus during the first 72 hours after insert removal than was GnRH at PRID insertion. In Table 6 are results from two studies in which various doses of estradiol benzoate were administered at the time of CIDR insertion to both heifers and cows (Lammoglia et al., 1998 and Steckler et al., 2001). These results suggest that inclusion of an estradiol injection at the time of CIDR insertion may improve synchronized pregnancy rates in cows, but not in heifers. As these studies have not been repeated at multiple sites, optimal dosage for cows is uncertain.

Table 6. Effect of administration of estradiol benzoate at the time of CIDR insertion. [a]

Estradiol Benzoate	**Synchronized Pregnancy Rates**	**Synchronized Pregnancy Rates**
Dose	**Lammoglia et al. (1998)**	**Steckler et al. (2001)**
Heifers:		
0.00 mg	35%	40%
0.20 mg	33%	---
0.38 mg	35%	---
0.75 mg	29%	---
1.00 mg	---	30%
2.00 mg	---	37%
4.00 mg	---	27%
Cows:		
0.00 mg	8%	46%
0.25 mg	23%	---
0.50 mg	21%	---
1.00 mg	58%	53%
2.00 mg	---	55%
4.00 mg	---	63%

[a]Adapted from Lammoglia et al. (1998) and Steckler et al. (2001).

Inclusion of an Estradiol at the Time of CIDR Removal: The idea behind giving estradiol about 24 hours after the CIDR removal is to hasten the onset of estrus and tighten synchrony. Fike et al. (1997) demonstrated that the administration of 1.0 mg of estradiol benzoate about 24 hours after the removal of the CIDR increased estrus response from 40% for control heifers to 60% for estradiol benzoate treated cows. Results of a study reported by Rasby et al. (1998) supported the Fike et al. study. They administered 1.0 mg of estradiol benzoate 24 to 30 hours after CIDR removal and observed more heifers in estrus within three days of CIDR removal than in the non-estradiol benzoate treated heifers. Lane et al. (2001b) demonstrated that 0.5 mg estradiol benzoate given 24 hours after PRID removal decreased the interval to the onset of estrus and decreased the variation in onset of estrus; however, it decreased pregnancy rates when given at emergence of a follicle wave. Martinez et al. (2002b) administered estradiol benzoate about 24 hours after CIDR removal in heifers synchronized with the CIDR along with injections of estradiol benzoate and progesterone at the time of CIDR insertion and results are summarized in Table 7. Note that a higher percentage of heifers exhibited estrus even though the heifers were inseminated at a predetermined time. Pregnancy rates were not different from heifers administered the CO-Synch protocol so the additional animal handling would not seem warranted. Furthermore, this protocol included an injection of progesterone at CIDR insertion, which may have circumvented the decrease in pregnancy rates observed by Lane et al. (2001b) by removing heifers with emerging follicular waves at estradiol benzoate treatment after CIDR removal. Meyer et al. (2002), however, reported that an injection of progesterone at the time of CIDR insertion did not influence pregnancy rates to timed AI (TAI).

Table 7. Effect of using GnRH or estradiol benzoate with CIDRs for estrus synchronization in beef heifers.[a]

Item	**GnRH** [b]	**Estradiol Benzoate** [c]
No. of heifers	103	52
Estrus (%)	65%	92%*
PG to estrus:	47 h	47 h
Hours	47 h	47 h
SD	8.2	3.8*
Pregnancy Rate to AI	65%	62%

[a]Adapted from Martinez et al. (J. Anim. Sci. 80:1746; 2002b).
[b]The GnRH treated heifers received GnRH at the time of CIDR insertion. CIDRs were left in for 7 days and $PGF_{2\alpha}$ was administered at CIDR removal. Forty-eight hours after $PGF_{2\alpha}$ /CIDR removal they were administered a second injection of GnRH. Heifers were fixed-time inseminated (about 48 hours after CIDR removal).
[c] The estradiol benzoate treated heifers received 2 mg of estradiol benzoate and 50 mg of progesterone at CIDR insertion. CIDRs were left in for 7 days and $PGF_{2\alpha}$ was administered at CIDR removal. Twenty-four hours after CIDR removal heifers were administered a 1 mg injection of estradiol benzoate. Heifers were fixed-time inseminated (about 48 hours after CIDR removal).

Protocol and Product Variations: The first variation that should be considered is when to administer the $PGF_{2\alpha}$ in the basic CIDR/$PGF_{2\alpha}$ protocol: day 6 or day 7. The rational for administering the $PGF_{2\alpha}$ on day 6 is to give luteolysis greater time for improved synchrony. Although this strategy seems reasonable, with a five-day estrus observation period for breeding the administration of $PGF_{2\alpha}$ on day 7 will be as effective as on day 6. Day of $PGF_{2\alpha}$ injection may be an issue when TAI protocols are developed; however, these procedures will likely use GnRH or an estradiol and these products may again make this issue irrelevant. Another variation is the difference that exists between CIDRs approved for use in the U.S. and those approved for use outside the U.S. In the U.S. the CIDR contains 1.38 mg of progesterone vs. 1.9 mg progesterone impregnated in the silicone in the CIDRs used outside the U.S. The following figures (Figures 4, 5, and 6) illustrate the different progesterone profiles, which in fact do not differ significantly and certainly will not alter efficacy.

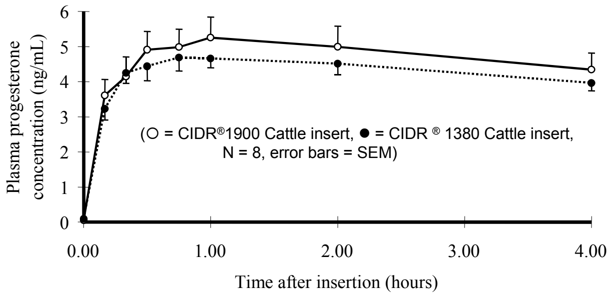

Figure 4. Blood plasma progesterone absorption profile for the CIDR® Cattle Insert with 1.9 g or 1.38 g progesterone.

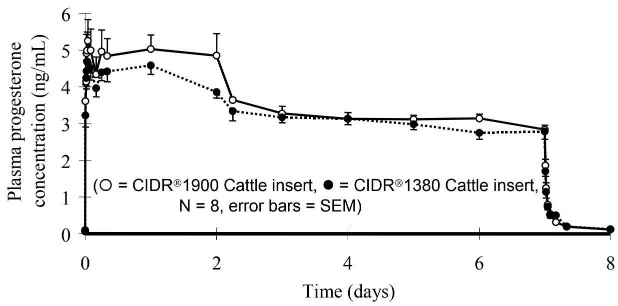

Figure 5. Entire blood plasma progesterone profile for the CIDR® Cattle Insert with 1.9 g or 1.38 g progesterone.

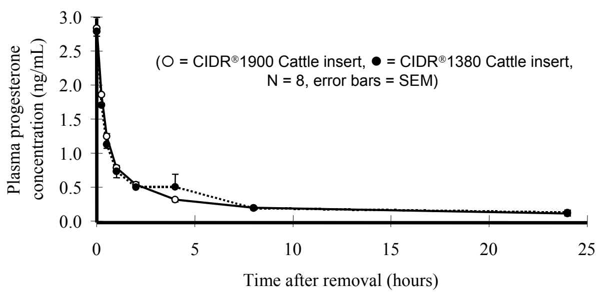

Figure 6. blood plasma progesterone clearance profile for the CIDR® Cattle Insert with 1.9 g or 1.38 g progesterone.

Estradiol benzoate is not commercially available in the U.S. Therefore, there has been interest in estradiol cypionate (ECP), which is commercially available. Colazo et al. (2002) administered ECP (0.5 mg) and 50 mg of progesterone at the time of CIDR insertion. ECP was also administered about 24 hours after insert removal. These researchers reported that inclusion of the ECP and progesterone improved pregnancy rates as compared to CIDR/$PGF_{2\alpha}$ treatment. It is difficult to make too many far-reaching conclusions from these studies since estradiol benzoate is not legal in the U.S. and very little data are available on substituting ECP. Furthermore, Rhinehart et al. (2002) reported that estradiol 17β, estradiol benzoate, and estradiol cypionate are equally effective in stimulating follicular atresia but that recruitment of a new follicle wave after regression may be delayed in beef heifers administered estradiol cypionate.

A New Tool for the Reproductive Toolbox

A new reproductive tool is now available in the U.S. for synchronization of estrus. Substantial data exists only for the approved protocol—a seven-day treatment along with an injection of $PGF_{2\alpha}$ six days after insertion or one day before removal; however, this may not be the best way to utilize the CIDR for the synchronization of estrus. Protocols that may be used after favorable results emerge from studies conducted at multiple sites follow.

1. Inclusion of the CIDR in the CO-Synch protocol (primary synchronization in heifers and cows).
2. Administration of ECP about 24 hours after removal of the CIDR in the CIDR/$PGF_{2\alpha}$ protocol or in place of the second injection of GnRH in the CO-Synch protocol (primary synchronization in heifers and cows).
3. Administration of ECP at the time of CIDR insertion in the CIDR/$PGF_{2\alpha}$ protocol (primary synchronization in cows).

4. A combination of 2, 3, and 4 (primary synchronization in cows).

These are all primary synchronization protocols: synchronization of the first estrus of the breeding season. It should be noted that dosage of ECP has not been established and will differ from estradiol benzoate as ECP is a longer acting ester of estradiol than estradiol benzoate. These protocols may involve breeding upon the detection of estrus or TAI. The basic CIDR/$PGF_{2\alpha}$ was developed for breeding based upon the detection of estrus. When breeding upon the detection of estrus after any estrus synchronization protocol, a percentage—far greater than desired—of heifers or cows will not exhibit estrus (Table 8) and the timing of estrus will differ from the MGA/$PGF_{2\alpha}$ protocol. Although they may be inseminated at a return estrus or after resynchronization, the number of days to breeding females not exhibiting estrus can be shortened by administering a synchronization protocol the day after the estrous detection period. For example, administering the CO-Synch protocol to heifers or cows on day 6 after a five day estrous detection period will allow them to be inseminated 15 days after the first day of the breeding season. This is a gain of about 8 to 9 days per cow not observed in estrus during the primary synchronization period.

Table 8. Estrus response and pregnancy rates in beef heifers synchronized with the MGA/$PGF_{2\alpha}$ and CIDR/$PGF_{2\alpha}$ protocols.[a]

Time of Estrus	**MGA/$PGF_{2\alpha}$**	**CIDR/$PGF_{2\alpha}$**
0-24	2%	2%
25-48	6%	34%
49-72	31%	31%
73-96	26%	9%
97-120	8%	2%
No Estrus	27%	22%
Conception Rate	69%	65%
Pregnancy Rate	50%	51%

[a]These data were collected from studies conducted by the author over a five-year period. A total of 320 heifers were treated with the MGA/$PGF_{2\alpha}$ protocol and 113 heifers were treated with the CIDR/$PGF_{2\alpha}$ protocol.

The method of breeding heifers and cows after the synchronization with the CIDR is being examined substantially as well. The CO-Synch + CIDR protocol is a TAI protocol. Heifers and cows synchronized with the protocols using estradiol have been bred upon the detection of estrus or at a predetermined time (TAI); however, currently the CO-Synch or CO-Synch + CIDR protocols are the only TAI protocols. Results in Table 7 illustrate why the CIDR/$PGF_{2\alpha}$ protocol does not use TAI; however, a modified TAI procedure has been developed for the MGA/$PGF_{2\alpha}$ protocol, which has similar variability in the interval from $PGF_{2\alpha}$ to estrus (Table 8). If heifers or cows are going to be bred based on the detection of estrus, recommendations are provided in Table 9.

Table 9. Breeding recommendations for synchronized heifers.

Item	Breeding Recommendation
1	Heifers should be observed for estrus twice a day (early morning and evening) at times when no other activities are occurring. If there is any question don't hesitate to breed. —A heifer has no chance of conceiving if she is not inseminated
2	Heifers may be bred using the A.M./P.M. rule that recommends breeding 8 to 12 hours after the first observation of estrus. —Do not extend this interval beyond 12 hours as intervals greater than 12 hours compromise pregnancy rates (Nebel et al., 1994).
3	If a heifer exhibits estrus at a time that removes the likelihood of using the A.M./P.M. rule correctly (i.e., estrus at 1:00 P.M. and should be bred at 9:00 P.M to 1:00 A.M.) it is better to breed early than late. —Once ovulation has occurred the oocyte has a limited time of viability, whereas the sperm has a far longer time of survival.
4	Although heifers may be bred by the A.M./P.M. rule, there are significant data that suggest that once a day breeding is as efficacious. Continue to check for estrus twice daily and breed only in the A.M. (i.e., heifers in estrus on Monday P.M. and Tuesday A.M. should be bred Tuesday A.M.). —Once daily breeding reduces the number of animal handlings for breeding by one-half (Nebel et al., 1994).
5	If a heifer continues to exhibits estrus 12 hours after breeding, don't hesitate to re-inseminate. —The loss of days to conception is far greater than the cost of the semen.
6	When breeding previously inseminated heifers, be sure that the heifer is in estrus. This can be confirmed by gently examining the uterus for tone <u>per rectum</u>. —Inseminating a pregnant heifer may terminate that pregnancy.

Synchronization Satisfaction Assessment

Producer satisfaction is a most troubling issue as society is consistently reminded of product satisfaction. What is a satisfactory synchronization pregnancy rate? Maximal pregnancy rates—assuming 100% synchrony—is on the average 68% (61% to 73%; mean ± one standard deviation; synchronized conception rates of 14 published studies). Based on this maximal pregnancy rate the following Synchronization Satisfaction Assessment was created (Table 10).

Table 10. Synchronization satisfaction assessment.

Pregnancy Rate	Satisfaction
60%+	Exceptional
50-59%	High
40-49%	Low
30-39%	Not Satisfied
<30%	Bust

Are the synchronization protocols achieving their goal of maximal pregnancy rates? Using this satisfaction assessment the studies using the alternative protocols discussed herein—the most recent data available—are summarized in Table 11. Clearly, near maximal pregnancy rates are being achieved with the alternative protocols. However, multiple site studies are needed to verify the consistency of these protocols. Further, some protocols are more convenient to use than others. Administration of an estradiol requires an additional animal handling which may not be acceptable in some situations.

Table 11. Satisfaction assessment of alternative CIDR protocols.

Study	**Protocol**[a]	**Females**	**Satisfaction**
Lamb et al. (2002)	CO-Synch + CIDR	Beef Cows	High (59%)
Martinez et al. (2002a)	CO-Synch + CIDR	Beef Heifers	Exceptional (68%)
Estrada et al. (2002)	CO-Synch + CIDR	Beef Cows	Exceptional (61%)
Estrada et al. (2002)	CO-Synch + CIDR	Beef Heifers	Exceptional (60%)
Steckler et al. (2001)	CIDR/$PGF_{2\alpha}$ + EB[b]	Beef Cows	Exceptional (63%)
Martinez et al. (2002b)	CIDR/$PGF_{2\alpha}$ + EB[c]	Beef Heifers	Exceptional (62%)
Martinez et al. (2002b)	CO-Synch + CIDR	Beef Heifers	Exceptional (65%)
Colazo et al. (2002)	CIDR/$PGF_{2\alpha}$ + ECP	Beef Heifers	Exceptional (65%)

[a]See the full description of the protocol in the manuscript.
[b]Estradiol benzoate was administered at the time of CIDR insertion.
[c]Estradiol benzoate was administered approximately 24 hours after CIDR removal.

Summary

A new product is now available for the synchronization of estrus. During the next several years expect considerable research with this product. Several alterations of the basic protocol are being evaluated, however, much work is yet to be done, since field trials with CIDRs were limited during the FDA approval process. Caution is advised on the implementation of these protocols until thorough multi-site studies are conducted.

However, this product does effectively synchronize estrus with high pregnancy rates. With this product we may be able to encourage more producers to use estrus synchronization. When considering the reasons why producers don't use AI reported in Table 1, these new protocols using the CIDR have utility (Table 12).

Table 12. Reason why producers don't use AI and MGA/$PGF_{2\alpha}$ and CIDR/$PGF_{2\alpha}$ synchronization

Reason for Not Using Synchronization	**CIDR-Based Protocols**
Difficult to use	No
Valuable	Yes
Requires Extensive Time and Labor	No
High cost	No
Satisfaction	High
Requires estrus detection	Limited

However, we must be careful so that producers don't become confused or use a minimally tested protocol. Given the importance of consumer confidence to help drive beef demand, producers should act responsibly in implementation of synchronization programs

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