

## **RECOMMENDED ESTROUS SYNCHRONIZATION SYSTEMS FOR HEIFERS**

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Information already discussed in these proceedings has reviewed the biology, history and research behind numerous estrous synchronization systems. The previous authors/speakers indicated which systems relating to the synchronization products they discussed (PG, GnRH, MGA®, CIDR®) were the most effective. However, this still leaves an amazing number of systems and combination of systems that producers can use to synchronizes cows and heifers.

In 2004, a group of representatives from AI companies, the animal health pharmaceutical industry, academia, and veterinarians met in to discuss which synchronization systems should be recommended based on performance in research and field trials. In addition, the group considered the practicality of applying the systems. The recommended systems for heifers and cows appear on pages 125-126. These systems are currently included in most of the major AI company catalogues.

The purpose of this section is to briefly review:

- 1) The recommended systems
- 2) Results with these systems
- 3) Advantages and limitations of the systems
- 4) Relative cost of the systems

### **Systems Requiring Estrous Detection**

Three estrous synchronizations requiring detection of estrus are recommended - Modified one-shot PG (aka. AILE), MGA-PG, and CIDR-PG (see diagrams and Table 1 for descriptions). In general, these systems require the most labor, but have the lowest pharmaceutical cost. Labor is high due to twice daily estrus detection and AI. Conception rates are high because only animals observed in estrus are inseminated at the optimum time. Pregnancy rates depend on percentage of animals expressing estrus and estrus detection efficiency (Table 1). Estrus detection efficiency has been reported to range from 35% to 85%; therefore, depending on the skill and dedication of the estrus detection crew a portion of animals in heat will not be presented for insemination.

#### *Pregnancy rates with estrous detection systems*

Literature values for pregnancy rates among the three systems are varied and few studies compared the recommended systems to one another. The most appropriate method is to

consider pregnancy rate range and average over a large number of studies. Synchronized pregnancy rate to the 1-shot PG systems averaged 45% (see Lauderdale in these proceedings).

Kesler (2003) reviewed 22 studies using the MGA-PG system in heifers the average pregnancy rate for MGA-PG with PG 17 d after last MGA feeding was 48% (range 31% to 57 %) compared to 56% (range 49% to 62%) for MGA-PG with PG 19 d after last MGA feeding. Although, MGA-PG with PG given any day between 17 and 19 after last MGA feeding is effective, the results are more consistent.

Recently, our laboratory (Dorsey, 2005) compared CIDR-PG to MGA-PG. Pregnancy rates were similar ( $P > 0.5$ ) between the two systems with pregnancy rates of 54.9% (95/173) and 52.8% (93/176) for CIDR-PG and MGA-PG, respectively. Kesler (2003) reported no difference between the CIDR-PG and MGA-PG systems with average heifer pregnancy rate at 50%. Clearly, these systems utilizing detection of estrus are effective and producers can generally expect AI pregnancy rates of 50% to 60% in groups of well managed heifers with adequate estrous detection.

### **Systems Combining Estrus Detection and Timed-AI (TAI)**

In general, these systems require a moderate to high amount of labor, and have a moderate to high pharmaceutical cost. Labor is higher than total TAI system due to twice daily estrus detection and AI in addition to more “trips down the chute”. Conception rates are high because most animals are observed in estrus and inseminated at the appropriate time. Pregnancy rates may be increased over estrus detection systems as all animals are presented for AI. Estrus detection efficiency is still critical to maximizing pregnancy rates.

The two recommended systems Select-Synch + CIDR & TAI and MGA-PG & TAI (see diagrams and Table 2 for description). These systems are often described as estrous detection with “clean-up AI” systems. Most research reports indicate little, if any, decrease in pregnancy rates and in some cases increases in pregnancy rates for the addition of TAI to these protocols. For MGA-PG & TAI, three separate studies indicated a range from 54 % to 63.5% (Dorsey, 2005; Johnson and Day, 2004; and Kesler, 2003). Reports on Select-Synch + CIDR & TAI are less numerous; however, pregnancy rates are in the 50% to 56% range. In a large scale multi-state study (Larson et al., 2004) reported pregnancy rate of 57.3%. In our experience, pregnancy rate to the TAI in heifers not in estrus by insemination is between 25% and 35% with approximately 20% to 25% of heifers not in estrus; thereby, potentially increasing overall AI pregnancy rates by 4% to 7%.

### **Systems Using Complete Timed-AI (TAI)**

In general, these systems require a moderate amount of labor, and have the highest pharmaceutical cost. Labor is lower than other systems as twice daily estrus detection and AI are eliminated without adding “trips down the chute”. Conception rates may be lower

than other system categories as some heifers are inseminated at a less than optimum time relative to ovulation or are induced to ovulate. However, pregnancy rates may be increased over estrus detection systems because all animals are presented for AI.

The two recommended TAI systems are CO-Synch + CIDR TAI and MGA-PG TAI (see diagram and Table 3 for descriptions). Information on the performance of complete timed-AI protocols is limited, but initial results are encouraging. Pregnancy rates for CO-Synch + CIDR TAI were 53.1% (Larson et al., 2004) and 52.4% (Walker et al., 2005). Comparison of MGA-PG TAI to MGA-PG demonstrated a 17% reduction in the percentage of heifers pregnant to 1<sup>st</sup> service AI (Johnson and Day, 2004) with TAI pregnancy rates of 46.6%. Particular attention needs to be paid to the time of AI relative to PG. The time of 54 hours after PG for CO-Synch + CIDR TAI and 72 hours after PG for MGA-PG TAI are critical to success of these TAI protocols. Producers and advisors need to pay attention to the time of day of PG administration so TAI does not occur at an inconvenient time of day (or night). Timed-AI protocols for heifers will continue to improve as additional research is completed. At this time, these protocols will result in an acceptable percentage of AI pregnancies with reduced labor.

## **Summary**

The recommended synchronization systems for heifers are all effective in synchronizing heifers and producing acceptable 1<sup>st</sup> service AI pregnancy rates. Producers and their advisors need to understand the limitations and advantages of each system. Systems selection should emphasize the best fit for developmental status of heifers, labor available, and expectations for pregnancy rates. Actual cash cost of the system should be a secondary decision. In most, cases costs of systems are similar.

Currently, the combination systems that incorporate estrous detection and TAI (clean-up AI) are my most commonly recommended systems. These systems, CIDR-PG & TAI and MGA-PG & TAI, provide the best combination of 1) effectiveness in mixed populations of cycling and non-cycling heifers, 2) consistent and acceptable pregnancy rates, and 3) reduction in labor associated with AI. For producers with a limited number of replacement heifers or those with labor constraints the CO-Synch CIDR TAI system appears to be the appropriate choice for a TAI system.

Table 1. Comparison of estrous synchronization systems requiring detection of estrus for heifers

	System		
	Modified One-shot PG	CIDR-PG	MGA-PG
System description (see diagrams)	5 d heat check, PG to unbred animals, 6 d heat check	7 d CIDR w/PG at CIDR removal, 5-7 d heat check and breed	14 d MGA w/PG 19 d after last MGA, 5-7 d heat check and breed
Length of system (d)	11	12 to 14	37 to 39
Number of days of estrous detection	11	5 to 7	5 to 10
Induces cyclicity/ovulation	No	Yes	Yes
Advantages	<ul style="list-style-type: none"> <li>- high conception rate</li> <li>- 2 trips through the chute</li> <li>- allows go-no decision</li> </ul>	<ul style="list-style-type: none"> <li>- high conception rate</li> <li>- 3 trips through the chute</li> <li>- induces cyclicity</li> </ul>	<ul style="list-style-type: none"> <li>- high conception rate</li> <li>- 2 trips through the chute</li> <li>- induces cyclicity</li> <li>- induced heifers bred on subsequent estrus</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>- May require up to 22 sorting and breeding events</li> <li>- Only works in cycling heifers</li> <li>- dependent on estrous detection efficiency</li> </ul>	<ul style="list-style-type: none"> <li>- May require up to 14 sorting and breeding events</li> <li>- additional trip through the chute</li> <li>- dependent on estrous detection efficiency</li> </ul>	<ul style="list-style-type: none"> <li>- May require up to 14 sorting and breeding events</li> <li>- Requires daily feeding of MGA</li> <li>- Heifers may “break thru”</li> <li>- dependent on estrous detection efficiency</li> <li>- a low % of heifers may be in estrus before PG</li> </ul>
Degree of synchrony	Low	Moderately high	Moderate
Reported range in pregnancy percentage	35% to 55%	50% to 63%	49 % to 65%
Pharmaceutical cost	Very low	Moderately low	Low
Labor cost	High	Moderately high	High

Table 2. Descriptions and comparison of estrous synchronization systems combining detection of estrus and timed AI (TAI) for beef heifers.

	System	
	Select-Synch + CIDR & Clean-up TAI	MGA-PG & Clean-up TAI
System description (see diagrams)	7 d CIDR w/ GnRH at CIDR insertion and PG at CIDR removal, 3 d heat check and breed followed by TAI & GnRH of non-responding heifers between 72-80 h.	14 d MGA w/PG 19 d after last MGA, 3 d heat check and breed followed by TAI & GnRH of non-responding heifers between 72-80 h.
Length of system (d)	10	36
Number of days of estrous detection	3	3-4
Induces cyclicity/ovulation	Yes	Yes
Advantages	<ul style="list-style-type: none"> <li>- high conception rate</li> <li>- induces cyclicity</li> <li>- inseminates all heifers</li> <li>- partial compensation for estrous detection problems</li> <li>- allows for “go/no-go” decision for TAI</li> </ul>	<ul style="list-style-type: none"> <li>- high conception rate</li> <li>- 2 trips through the chute</li> <li>- induces cyclicity</li> <li>- induced heifers bred on subsequent estrus</li> <li>- inseminates all heifers</li> <li>- partial compensation for estrous detection problems</li> <li>- allows for “go/no-go” decision for TAI</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>- May require up to 6 sorting and breeding events</li> <li>- additional trip through the chute</li> </ul>	<ul style="list-style-type: none"> <li>- May require up to 6 sorting and breeding events</li> <li>- Requires daily feeding of MGA</li> <li>- Heifers may “break thru”</li> </ul>
Degree of synchrony	High	Moderate
Reported range in pregnancy percentage	49% - 58%	48% - 63%
Pharmaceutical cost	Moderately high	Moderate
Labor cost	Moderately high	High

Table 3. Description and comparison of complete TAI estrous synchronization systems for beef heifers.

	System	
	CO-Synch CIDR w/ TAI	MGA-PG w/ TAI
System description (see diagrams)	GnRH at insertion of CIDR. CIDR (7 d) w/PG at CIDR removal followed by TAI & GnRH of all heifers at 56 h	14 d MGA w/PG 19 d after last MGA followed by TAI & GnRH of all heifers at 72 h
Length of system (d)	10	36
Number of days of estrus detection	0	0
Induces cyclicity/ovulation	Yes	Yes
Advantages	<ul style="list-style-type: none"> <li>- all heifers inseminated on same day</li> <li>- induces cyclicity</li> <li>- inseminates all heifers</li> <li>- eliminates estrus detection</li> </ul>	<ul style="list-style-type: none"> <li>- all heifers inseminated on same day</li> <li>- 2 trips through the chute</li> <li>- induces cyclicity</li> <li>- inseminates all heifers</li> <li>- eliminates estrus detection</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>- additional trip through the chute</li> </ul>	<ul style="list-style-type: none"> <li>- Requires daily feeding of MGA</li> <li>- Heifers may “break thru”</li> </ul>
Degree of synchrony	NA	NA
Reported range in pregnancy percentage	50% - 56%	40% - 50%
Pharmaceutical cost	High	Moderately high
Labor cost	Moderate	High

### References

- Johnson, S.K., and M.L. Day. 2004. Methods to reduce or eliminate detection of estrus in a melengestrol acetate-PGF $2\alpha$  protocol for synchronization of estrus in beef heifers. *J. Anim. Sci.* 82:3071–3076.
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