

Cattle Producer's Handbook

Reproduction Section

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Estrus Synchronization for Natural Service

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Cow-calf operations are more profitable when cows calve in the first 30 days of the calving season. Therefore, there is a major opportunity for enhancing profitability by shifting late-calving cows so they calve earlier in the calving season (Hughes 2005).

In an analysis of high production/high profitability herds, Dr. Hughes observed that cows in these herds delivered over 60 percent of the calves by day 21 of the calving season and 85 percent of calves by day 42. In addition, most of these herds maintained a 60- to 70-day breeding season.

One challenge in cow-calf operations employing natural service mating is how to reduce the length of the calving season and have more calves born early in the calving season. Estrus synchronization has been used along with natural service to increase the number of females available for insemination in a specific period of time.

Research from Missouri (Patterson et al. 2006) demonstrated that use of estrus synchronization and artificial insemination (A.I.) resulted in 70 percent of calves being born in the first 21 days of the calving season (Fig. 1). Over the past 20 years, scientists and industry have developed breeding systems that use estrus synchronization with natural service.

These systems can increase the percentage of cows calving early in the calving season. In addition, systems that incorporate progestins can induce cycles in late calving cows.

Challenges with Estrus Synchronization and Natural Service

Synchrony—One of the important factors in synchronizing cows for natural service is to ensure that the synchrony of estrus is not so tight as to overwhelm the bull power. Bulls exposed to nine estrus females per bull in a 24-hour period impregnated 20 to 25 percent fewer cows than bulls exposed to two or three estrus females per day per bull (Boyd et al. 1988).

Further results from this research indicated that the maximum number of cows a bull can service in a day is five to six. For cows exhibiting natural estrous cycles,

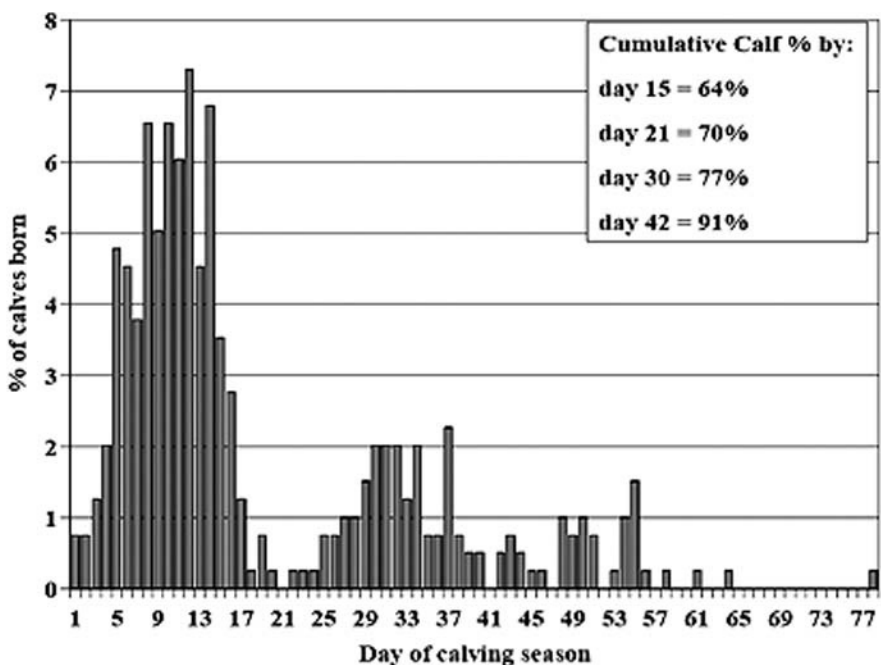


Fig. 1. Effect of combination of estrus synchronization and A.I. on calving distribution compared to cows bred natural service with no synchronization (Patterson et al. 2006).

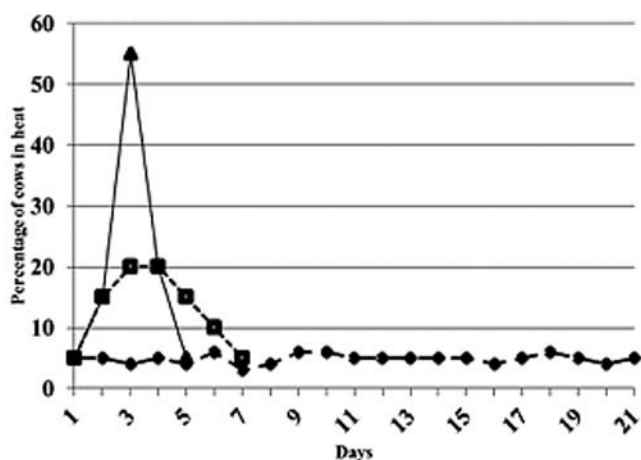


Fig. 2. Typical estrus distribution for unsynchronized cows (◆), cows synchronized for natural service (■), and cows synchronized for artificial insemination (▲).

the percentage of cows in heat on any given day will be few and it will take 20 to 22 days for all cows to come in heat once (Fig. 2).

The goal for estrus synchronization with A.I. is to have a majority of cows in heat in 1 or 2 days. In contrast, synchronization for natural service is designed to have a majority of cows in heat from 7 to 10 days. A synchronized period of 7 to 10 days will allow bulls to only have to service three to five cows per day.

Bull Power—When using synchronization with natural service, bulls should be required to service fewer cows per bull. Recommended cow-to-bull ratios for natural service are 30:1. However, for synchronized natural service the cow-to-bull ratio should be 15:1 to 25:1—depending on the age of the bull.

Older, mature bulls are preferred over yearling bulls for synchronized natural service because they have a greater serving capacity and can handle more cows per bull. In addition, older bulls are more experienced and are less likely to miss cows in heat or continue servicing a cow multiple times.

Bulls need to be reproductively sound and in good physical condition before placing them with the cows. To determine if bulls are reproductively sound, they need to pass a breeding soundness exam before each breeding season (see fact sheet 425). Bulls also need to be in top physical condition and used to exercise. A simple method to ensure bulls exercise during the “off season” is to place feed or salt at the opposite end of the field or pen from water.

Bulls in body condition score 5 or 6 are more fertile and pass the BSE at a greater rate than bulls that

are below BCS 5 or above BCS 6 (Barth and Waldner 2002). During the synchronized period, bulls should be observed daily for signs of fatigue, injury, or failure to service cows.

Systems for Synchronizing Estrus for Natural Service

The system used for synchronization will depend on cow age (heifer vs. cow), cycling status, and amount of labor needed. Three primary systems for synchronizing estrus for natural service have been developed. Each system uses a different synchronization drug and has a different protocol.

1-Shot Prostaglandin (PG)-Natural Service (NS)

This protocol only works on cycling cows or heifers. It involves a single shot of $\text{PGF}_{2\alpha}$ (Lutalyse®, In-synch®, ProstMate®) or its analog (Estrumate®, estroPLAN®) to all animals 5 days after introduction of bulls (Fig. 3). Only cycling cows with a functional corpus luteum (CL) will be synchronized by this treatment. The injection of PG will lyse the CL and bring females into heat.

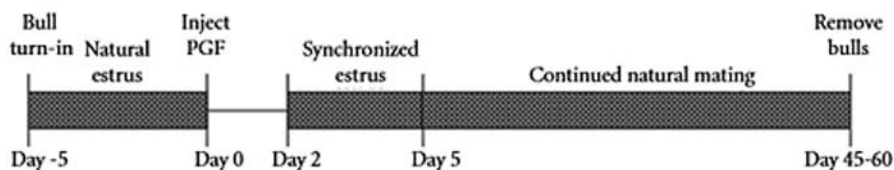


Fig. 3. 1-shot Prostaglandin (PGF)-NS protocol. Cows are given prostaglandin $\text{F}_{2\alpha}$ or its analog 5 days after introduction of bulls (Larson et al. 2009).

Bulls will breed cows in heat during the first 5 days. Any cow bred during the first 5 days will not respond to the prostaglandin treatment as the CL is too immature to respond to the injection at this phase. After the shot of prostaglandin, unbred cycling cows will come into estrus over a 5- to 7-day period. Research previously conducted in Nebraska demonstrated that cows synchronized with the 1-shot PG-NS system had a 12 percent increase in calves born in the first 21 days of the calving season compared to unsynchronized cows (75 vs. 63 percent, respectively; Larson et al. 2009).

14- or 7-Day MGA-NS (heifers only)

Melengestrol acetate (MGA; Zoetis, Florham Park, NJ) is a synthetic oral progestin that acts like the naturally occurring hormone progesterone in heifers. Treatment with MGA keeps heifers from expressing estrus. In addition, it will initiate cycles in non-cycling animals. It is important to note that MGA is only labeled for use in heifers.

There are two methods for using MGA for natural service. Both methods involve feeding 0.5 mg/heifer/day of MGA mixed in 3 to 5 pounds of grain. Some feed mills provide MGA in a range cube. Heifers need

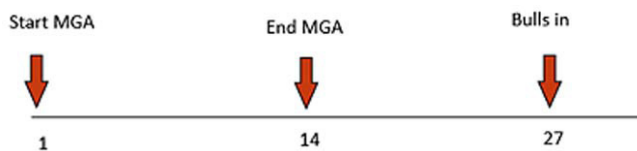


Fig. 4. The 14-day MGA system. Melengestrol acetate (MGA) is fed at 0.5 mg/heifer/day mixed in 3 to 5 pounds of grain (Patterson et al. 1991).

to be fed at the same time every day, and there needs to be enough bunk space so all heifers get their share of the product.

In the 14-day method (Fig. 4), heifers are fed MGA for 14 days. After feeding is stopped, heifers will come into heat over a 3- to 5-day period. This heat is an **infertile** heat and bulls should not be introduced at this time. In addition, synchrony may be too tight. Bulls are introduced to heifers 13 days after the last feeding of MGA.

The advantage to this system is response is good and it is effective in initiating cycles in non-cycling heifers. The disadvantage is that the system takes almost a month to complete before breeding can begin.

Researchers from Kentucky worked with 601 heifers in 12 herds. Using the 14-day MGA-NS method resulted in 69 percent of the heifers pregnant to the synchronized estrus and 83 percent of heifers were pregnant within the first 30 days of the breeding season (Patterson et al. 1991).

Another MGA option is the 7-day MGA-NS protocol (Fig. 5). In this program, heifers are fed MGA for 7 days and then bulls turned in 1 day after the last feeding of MGA. With only 7 days of feeding, synchrony of estrus is not going to be as tight. Heifers will be in estrus over a 7- to 10-day period. There is limited information on this method in heifers.

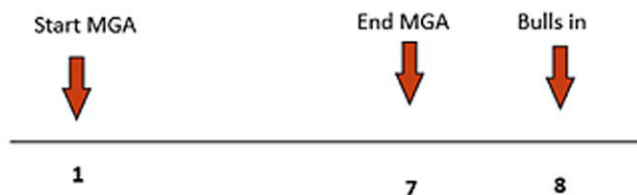


Fig. 5. The 7-day MGA-NS system. Melengestrol acetate (MGA) is fed at 0.5 mg/heifer/day mixed in 3 to 5 pounds of grain (Anderson 2007).

One study using cows found that cows synchronized in this method had a 78 percent pregnancy rate during the first 30 days of the breeding season (Anderson 2007). This was an experiment so MGA was used on cows even though it is not legal for cow-calf operators to use on cows. While the results may not be as good as with the 14-day MGA-NS method, this option does provide a shorter alternative method.

7-Day CIDR-NS

A controlled internal drug release device (CIDR; Zoetis, Florham Park, NJ) is a rubberized vaginal insert that contains progesterone. Physiologically, the CIDR works much like MGA. It keeps animals from expressing estrus and can induce estrus in non-cycling females. In this protocol, the CIDR is inserted on day 1 and left in place for 7 days (Fig. 6). One day after CIDR removal, bulls are introduced.

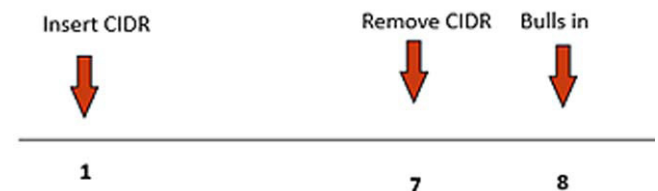


Fig. 6. The 7-day CIDR-NS protocol. Controlled internal drug release device (CIDR) inserted for 7 days.

In a large scale on-ranch study, 80 percent of postpartum cows synchronized using a 7-day CIDR-NS protocol were pregnant in the first 30 days compared to 46 percent of the control cows that were not synchronized (Anderson 2007). Also, there was an 8 percent improvement in overall pregnancy rate.

The advantage to this system is that all animals get a full dose and duration of progesterone. In addition, because progesterone levels decline rapidly after removal, synchrony is tighter than with MGA. However, females will still be in heat over at least 7 days.

Which System to Use?

When beginning to use estrus synchronization with natural service, cow-calf operators need to consider several questions in order to decide on a system for their operation. What animals are being synchronized? While all systems can be used in heifers, MGA systems cannot be used in cows. Is there likely to be a significant number of non-cyclic animals? If so, a system using MGA or CIDR will produce better results. If MGA is used on heifers, can adequate consumption be ensured? How many times will cattle go through the chute?

The 14-day MGA-NS system for heifers and the 7-day CIDR-NS for cows are probably the most reliable protocols. Both systems will produce good synchrony without being too tight while also inducing non-cycling animals to initiate cycles. A relative comparison between systems is given in Table 1.

The 1-shot PG-NS and the 7-day MGA-NS systems have the highest risk for lower pregnancy rates early in the breeding season compared to the other two systems. However, the PG protocol and the short duration MGA protocol are the least expensive and require the least labor.

Table 1. Comparison of protocols for estrus synchronization of cows to be bred by natural service.*

Protocol	Jump start non-cycling females?	Advantage	Limitations	Cost (\$/hd)
PG	NO	One trip down chute	Only works on cycling cows or heifers	<\$5
MGA	YES	No chute work	Heifers only Feed daily Consumption may be a problem	<\$5
CIDR	YES	Every animal treated	Two trips down chute Must be 20 days post calving	\$15

*PG = prostaglandin-natural service. Bulls are introduced to females for 5 days before females receive a single injection of prostaglandin (PGF_{2α} or analog); MGA = melengestrol acetate-natural service. Heifers are fed 0.5 mg MGA for 14 d and bulls introduced 13 d after last MGA feeding OR heifers fed MGA for 7 d and bulls introduced 1 d after MGA feeding; CIDR = Controlled internal drug release device-natural service. CIDR inserted for 7 d with bulls introduced 1 d after CIDR removal.

Conclusions

Employing estrus synchronization in a natural service breeding program will increase the number of calves born in the first 21 to 30 days of the calving season. In a commercial cow-calf operation, increasing the number of calves born early in the calving season will increase income.

Protocols for estrus synchronization with natural service are relatively simple and low cost. When progestins (MGA or CIDR) are used in the protocol, anestrous cows will be induced to initiate estrous cycles. When combined with proper bull evaluation and management, these synchronization systems can improve calving distribution and increase pregnancy rates.

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