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Estrus Synchronization of Beef Cattle

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Good heat detection requires that cows be closely observed several times a day if a large percentage of actual standing heats are to be detected. Estrus synchronization is a management technique which makes use of hormones to control, or reschedule, the estrus cycle. Before discussing the products that can be used for this task, the limitations as well as the benefits of an estrus synchronization program are outlined.

Estrus synchronization is not a substitute for poor reproductive management. To be effective, certain areas must not be neglected. First of all, a solid nutrition program is essential. If the nutritional demands of lactation and growth are not met, a cow will not cycle, much less conceive and maintain a pregnancy. Second, estrus synchronization requires intensive, carefully coordinated labor for limited periods of time. Although it does narrow the window of time required for close cow herd observation, it does not necessarily eliminate the need for heat detection. Third, estrus synchronization does just that - it synchronizes estrus, not ovulation. For that reason, timed insemination often produces unacceptable results. Using the a.m.-p.m. rule for insemination along with accurate heat detection increases the potential for a successful estrus synchronization program.

There are additional factors which can help improve heat detection during estrus synchronization. The facilities should provide adequate shade, access to water and feed, and solid footing. These precautions help reduce stress to the cows, which is apt to be increased when a large percent of the cow herd is in heat at the same time. Furthermore, some cows will appear to be in estrus for abnormally long periods due to sympathetic behavioral responses to other members of the herd. Carefully monitoring beginning and ending heat times helps determine the duration of standing estrus.

In spite of seemingly myriad limitations, estrus synchronization can improve a reproductive management program. In an agricultural enterprise where labor demands are at a premium, estrus synchronization can efficiently consolidate labor inputs. Furthermore, a successful synchronization program can accommodate more services to superior A.I. sires over a limited breeding season. Three inseminations are possible in a

45-day breeding season versus only two when cows are cycling randomly. Finally, with more cows bred to superior sires, culling on the basis of economically important traits such as milk production and calf performance becomes more feasible. Therefore, estrus synchronization conducted under carefully managed systems can provide both short range and long range benefits to a cow-calf enterprise.

Prostaglandins

One of the most widely accepted forms of estrus synchronization relies on the action of $PGF_{2\alpha}$ on the corpus luteum (CL) of the ovary of regularly cycling cows and heifers. $PGF_{2\alpha}$, when administered via an intramuscular injection, will cause regression of the CL and a decline in the hormone progesterone, resulting in a return to estrus in 48 to 96 hours. This variable response time is probably a result of the stage of development of ovarian follicles in individual cows. Therefore, even though the negative feedback effects of progesterone have been eliminated, the time to estrus may vary depending upon the maturity of the follicles present upon the ovary.

There are several commercial prostaglandins available. Those containing naturally occurring hormone are most often recommended for breeding programs. However, there are long acting synthetic products available which can provide effective regulation in a variety of conditions when used under the direction of a veterinarian. Lutalyse, Estrumate and Bovilene, are safe, effective products available to producers for estrus regulation.

There are a number of possible regimes for using

Table 1

Schedule A: 1-Shot Prostaglandin Regime	
Days 1-6	Check heat and breed according to a.m.-p.m. rule
Day 7	Give PGF_2 injection to all non-serviced females
Days 8-14	Check heat and breed according to a.m.-p.m. rule

Table 2

Schedule B: 2-Shot Prostaglandin Regime	
Day 1	Inject all females with 1st $PGF_{2\alpha}$ shot
Day 11	Inject all females with 2nd $PGF_{2\alpha}$ shot
Days 12-16	Check heat and breed according to a.m.-p.m. rule

Table 3

Schedule C: Variation of 2-shot Prostaglandin Regime	
Day 1	Inject all females with 1st $PGF_{2\alpha}$ shot
Days 2-10	Check heat and breed according to a.m.-p.m. rule
Day 11	Give non-serviced females 2nd $PGF_{2\alpha}$ shot
Days 12-16	Check heat and breed according to a.m.-p.m. rule

$PGF_{2\alpha}$ to synchronize estrus. Tables 1-3 offer three alternatives. Any of these schedules can result in a high percentage of cows being detected in estrus. Which one of these regimes is selected depends upon which is more limited, time or money. While schedule A requires a smaller monetary input (only one injection required), more labor is required for heat detection. Schedule B involves two injections for each cow, so is twice as expensive, but heat detection can be effectively confined to approximately 96 hours, so is much more labor efficient. Schedule C is a compromise of the first two regimes. Since a high percentage of females are inseminated following the first injection, monetary investment is less than that of schedule B. Likewise, heat detection can be concentrated on the noninseminated females following the second injection. Although conception rates tend to be higher for this method, all three schedules can produce acceptable results.

Progestogens

Progestogens are synthetic forms of the naturally occurring hormone, progesterone. Progesterone is produced by the CL. By a process called negative feedback, it reduces pituitary function, thus preventing a female from coming into heat. When administered in conjunction with a luteolytic agent, such as $PGF_{2\alpha}$ or estradiol valerate, progestogens can provide an effective means of resetting the cow's physiological clock. If the progestogen is administered for several days, an artificial CL can in effect be installed, which can be removed at the producer's discretion.

There are two general advantages to using progestogens over prostaglandins: 1) the synchrony of estrus tends to tighter, and 2) some noncycling cows can be induced to come into estrous. Subsequent fertility following the use of progestogens is often somewhat lower than when prostaglandins are used. The reason for this decrease in fertility is possibly due to carryover effects of the synthetic hormone interfering with gamete transport and timing of fertilization. Good management can, however, minimize these fertility decreases and progestogens can offer a viable and, in some cases, a preferable alternative to the use of prostaglandins for estrus synchronization. In addition, the increased number of cows in estrus often offsets the decrease in fertility.

Syncro-Mate-B

Syncro-Mate-B (SMB) is a progestogen product. It is particularly effective when used on well managed postpartum beef cows. SMB use involves two steps. In step 1 (day 0), the cows are administered a 2cc intramuscular injection of norgestomet (the progestogen) and estradiol valerate (the luteolytic agent) and an ear implant containing norgestomet. In step 2, the norgestomet implant is removed on day 9. Cows can be expected to come into heat between 36 and 56 hours later. Table 4 outlines a typical synchronization schedule using SMB.

MGA + $PGF_{2\alpha}$

Another synchronization regime involves combining the effects of melengestrol acetate (MGA), a progestogen-like compound, with $PGF_{2\alpha}$. When administered in the feed at a

Table 4

Syncro-Mate-B Regime	
Day 0	Norgestomet ear implant and 2 cc (I.M.) injection of norgestomet & estradiol valerate
Day 9	Remove norgestomet ear implant
Days 10-14	Check heat & breed (a.m.-p.m. rule)

level of .5 mg. per head per day, MGA is very effective at preventing cows from coming into heat. When $PGF_{2\alpha}$ is administered following MGA removal, cows experience a tightly synchronized estrus. Duration of MGA feeding and subsequent timing of $PGF_{2\alpha}$ administration are critical variables contributing to the fertility achievable with this method.

Colorado State University appears to have designed the most effective schedule (Table 5). In this schedule, MGA is fed for 14 days. $PGF_{2\alpha}$ is given 17 days following MGA removal. Not only does this appear to provide adequate time for the cow to flush the MGA out of her system, but most cows have a functional CL for the $PGF_{2\alpha}$ to act on. Conception rates appear to be at least as high or higher than those achieved by SMB or $PGF_{2\alpha}$ alone.

Which of these systems a producer chooses is dependent upon availability of labor, adequacy of facilities and cost of the system.

Table 5

MGA/Prostaglandin Regime	
Days 1-14	Feed MGA (.5 mg/hd/day)
Day 31	Inject All Females With $PGF_{2\alpha}$ (17 days after MGA removal)
Days 31-36	Check heat & breed (a.m.-p.m. rule)

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