

Estrous Synchronization of Cattle

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There are three primary methods of estrous synchronization available for beef producers who breed cattle artificially or who wish to synchronize estrus for natural breeding:

- prostaglandin injections
- “progesterone-like” ear implants and estradiol/progesterone injections
- a combination of an orally active progestogen (MGA) and prostaglandin

Prostaglandins

Developments in the study of cattle physiology have revealed a series of hormone-like substances called prostaglandins that are highly effective in synchronizing estrus (or heats) under certain conditions. They act by causing the corpus luteum (a tissue found on the ovary in mid-estrous cycle or during pregnancy) to regress, thereby allowing the cow to return to heat. For this to be accomplished, cows must be having estrous cycles and have a functional corpus luteum (occurring between five and 18 days of the cycle). Prostaglandins do not cause non-cycling cows to come into heat. Their only effect is to cause regression of a functional corpus luteum (CL).

When management has been good, prostaglandins have greatly reduced the labor and expense of artificial insemination (A.I.) The period of time during which cows must be observed for heat is greatly reduced or eliminated entirely, depending on the management system adapted. The prostaglandin or prostaglandin analog products available at this printing include “Lutalyse” (UpJohn Co.), “Bovilene” (Syntex), and “Estrumate” (Haver).

Three basic schemes have been used with prostaglandins:

1. **Cattle are detected for heat and inseminated for four days. On the morning of the fifth day, cattle previously detected as not in heat are injected with prostaglandin.** Heat detection and breeding continues for another six days. This method is less expensive in drug (prostaglandin) costs, but requires more time detecting heat and performing artificial insemination. This approach allows the producer an opportunity to inseminate all cycling females within a ten to twelve day period.
2. **Two injections of prostaglandin are given 11 days apart.** The first injection interrupts the cycles of those cows with mature (more than five days old) CL's. Any

normally cycling cow that did not have a mature CL at the time of the first injection should have one by the time of the second injection (11 days later). Those cows that responded to the first injection will now have seven to eight day old CL's. Therefore, all cycling cows will be synchronized by the second injection. Cows are either bred upon the detection of heat or within 72 to 80 hours after the second injection, regardless of any signs of heat. Most technicians agree that improved conception rates result when the synchronized females are bred on detected heat rather than by appointment.

3. **Cows are injected with prostaglandin and if detected in estrus during the next six days, inseminated.**

Cows in the first five days of their cycle at the time of the injection **will not** be synchronized. Therefore, 25 percent to 35 percent of cycling cows will not be eligible to respond to prostaglandin treatment and will not be detected in synchronized estrus. Heat detection would have to continue for three more weeks if those cows are to be bred artificially. **The producer can apply a second injection of prostaglandin to those cows not detected in heat.** This injection should be given 11 days after the first one. If the producer wishes to discontinue the heat detection efforts, these cows can be bred by cleanup bulls. If fewer than 50 percent of the cows or heifers are detected in heat after the first insemination, then the second injection will give very disappointing results. The low percentage could be due to many females not cycling or inadequate heat detection. Compared to the previously discussed ways of using prostaglandins, this scheme offers few advantages for most herds. It may offer a method of synchronizing cows and getting some bred artificially when individual cows are not identified, or when your days available for heat detection are limited to one week. This scheme offers a less expensive drug cost than the second scheme, but fewer cows or heifers are artificially bred.

Your choice of system depends on cost, labor, facilities, and the amount of time you want to devote to estrous detection and breeding. Success requires a cow herd with a close calving interval, good nutrition, good facilities, high quality semen, an experienced inseminator, and accurate heat detection (if heat detection is used). Prostaglandin products are sold through licensed veterinarians. The labels should be read carefully and closely followed. These products will cause abortions in pregnant cattle and should not be handled by pregnant women. They must also be handled with extreme caution by anyone who suffers from asthma.

Synthetic Progesterone and Estradiol (Syncro-Mate-B System)

A second synchronization program is available for beef and dairy heifers, and beef cows (but is not approved for lactating dairy cows). This system uses a combination of “Norgestomet,” a potent synthetic progesterone, and estradiol valerate, an estrogen compound. Twelve days before the intended time to inseminate, an ear implant containing Norgestomet is inserted under the skin on the back of one ear. A two milliliter intramuscular injection containing Norgestomet and estradiol valerate is also administered at this time. Nine days later the implant is removed and all cycling females are expected to be in estrus within the next three days. Breeding artificially after **accurate** heat detection should result in higher conception rates compared to breeding by appointment. Some producers, however, choose to breed by appointment. In these cases, they will inseminate all of the treated females between 48 to 54 hours after the implant is removed. The company that sells this product, “Syncro-Mate-B” (Sanofi Animal Health), recommends that starting at the time of implant removal, nursing cows be separated from their calves for 48 hours. This has resulted in a greater percentage of cows exhibiting heat in a tightly synchronized pattern. Because this method causes cattle to come into heat more uniformly than those in the prostaglandin programs, it has become the method of choice by some A.I. technicians who wish to breed by appointment.

The precautions about good nutrition, semen quality, facilities, herd health and insemination skill that were given for the prostaglandin system also apply to the implant program.

Orally Active Progestogen (MGA) and Prostaglandins

The newest estrous synchronization technique is the combined use of MGA and prostaglandin. Melengestrol acetate (MGA; UpJohn Co.) is a feed additive commonly used in heifer feedlot rations to block the cycling activity of heifers. **At this printing, MGA is FDA approved only for the blocking of estrous activity in feedlot and pasture heifers.** When fed for a short period of time and then removed from the diet, the absence of MGA tends to allow a large percentage of cattle to exhibit estrus together. Compared to normal estrus, fertility at the first heat after MGA removal has been reduced. Subsequent heats have been normal. This program calls for **feeding 0.5 milligrams of MGA per head every day for 14 days.** After 14 days, MGA is removed from the feed. Most of the females will then exhibit heat. **Seventeen days after the MGA feeding has stopped, each female is injected with prostaglandin** to interrupt the next cycle. Two to five days later, females are bred following detected standing heat. Research at several experiment stations has indicated that this method has induced some non-cycling replacement heifers to begin cycling, thereby increasing the percentage of those cattle bred early in the insemination season. Cattle inseminated on

the second heat after MGA removal achieved normal conception rates. Kansas State University researchers have reported that heifers and cows could be inseminated after detected heat for 72 hours following the prostaglandin injection. All remaining females could then be inseminated by appointment within 72 hours after the prostaglandin injection. This would reduce the heat detection time to three days. An important consideration is that the MGA/prostaglandin synchronization program must be started precisely 35 days before the start of the breeding season. This means that prior planning must be done to assure that the feed containing MGA is prepared and ready to feed five weeks before the breeding season begins.

Working Schedules for Synchronization Schemes

Table 1 shows examples of work schedules to illustrate how the various schemes can be planned. All of the schedules use May 1 as the approximate first breeding date. Some producers may wish to heat detect and inseminate for at least two cycles rather than turn in the clean up bulls as early as illustrated.

Terminology Used:

Corpus Luteum: (CL) Corpora Lutea (plural) —structure on the ovary that produces progesterone; will continue producing progesterone if pregnancy occurs; if no pregnancy then CL will be regressed by prostaglandin produced by the cow and cease to produce progesterone.

Estrus (noun) — the time of receptivity of the male by the female; occurs at approximately 21 day (may vary from 18 to 24) intervals in cattle; behavior of female such as standing heat is caused by estrogens in blood and a lack of circulating progesterone.

Estrous (adjective) — descriptive of the cyclic pattern of being in estrus at approximate 3 week intervals. i.e. “estrous activity” or “estrous synchronization”

Hormone — chemical messenger that is produced in one location in the body, travels via the blood stream to another or target tissue and causes changes in the target tissue.

Estrogen — hormone produced by the follicles of the ovary; causes behavioral signs of estrus; prepares the reproductive tract for insemination; causes contractions of the uterus.

MGA (melengestrol acetate)— feed ingredient with “progesterone-like” activity; primarily used to block estrus in feedlot heifers; when removed from the feed, many heifers will exhibit estrous activity together.

Progesterone — hormone released by the corpora lutea (CL); causes the tract to cease contractions; promotes and maintains pregnancy; blocks release of new hormones from the brain; decline in progesterone becomes signal to start new cycle.

Progestogen is any compound that produces progesterone-like response. i.e. norgestomet or MGA.

Prostaglandin — hormone released by the uterine lining; causes regression of the corpus luteum on the ovary; is a signal that the cow is not pregnant; used commercially as a synchronizing drug or for aborting feedlot heifers.

Table 1. Examples of Work Schedules for Synchronization.

Using Prostaglandin only:

Scheme 1.

May 1 Heat detect and breed Purchase prostaglandin from veterinarian	May 5 Inject all others not previously detected in heat.	May 5 - 11 Continue to heat detect breed for 6 days	May 12 Turn in clean up bulls
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Scheme 2.

April 10 Purchase prostaglandin from veterinarian	April 18 Inject all eligible females	April 29 Inject all eligible females	Apr.30 - May 5 Heat detect and breed	May 6 Turn in cleanup bulls
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Scheme 3.

April 25 Purchase prostaglandin	April 28 Inject all eligible	April 29 Heat detect and breed females	May 9 Inject all females not previously detected in heat. Continue to breed on detected heat	May 16 Turn in clean up bulls
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Using "Syncro-Mate-B:"

April 17 Purchase Implants and injections	April 20 Put implants in and give injection	April 29 Remove implants; separate calves from cows begin heat detection and insemination OR:	May 1 Breed by appointment return calves to cows	May 5 Turn in clean- up bulls
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Using MGA and prostaglandins:

Scheme 1.

March 15 Order feed with MGA	March 28 Start feeding MGA to all eligible cows and heifers	April 11 Remove MGA from feed	April 28 Inject all cows and heifers with prostaglandin. Heat detect and breed for 6 days.	May 6 Turn in clean up bulls
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Scheme 2.

March 15 Order feed with MGA	March 28 Start feeding MGA to all eligible cows	April 11 Remove MGA from feed and heifers	April 28 Inject all cows and heifers with prostaglandin. Heat detect and breed for 72 hours.	May 1 Breed all females not previously inseminated	May 6 Turn in clean up bulls
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