

Estrus Synchronization Programs For Beef Herds

Introduction

The use of artificial insemination (AI) allows beef producers to use superior sires. This can markedly change calf performance in traits such as birth weight, weaning weight, muscling, and frame size. However, the successful use of AI in beef herds is dependent on attention to detail in areas such as estrus (heat) detection, records, nutrition, health, breeding season management, cattle-handling facilities, semen handling and storage, and insemination technique. For AI programs to succeed, producers must be willing to invest sufficient time and money and set realistic goals.

Definitions

estrus—cow in standing heat, or standing to be mounted.

estrous—the 21-day cycle from estrus to next estrus.

Pregnancy can only result if cows are inseminated after they are in true estrus, or “standing heat,” which lasts only about a day. Since the estrous cycle, the period between heats, is 21 days long, on average about 5% ($1/21 = 4.7\%$) of a group of cows would be expected to be in estrus on any given day. On that day, the cow may show signs of standing behavior for only a few hours. Therefore, twice-a-day, everyday estrus detection is necessary to find cows in heat to breed. This is time consuming, sometimes frustrating, and, if not done vigilantly, the cause of poor conception rates.

Synchronizing estrus so that it occurs during a concentrated period optimizes the use of time and resources, and makes AI more practical in beef cow herds. The following programs can aid you in managing groups of cows and heifers so that they come into estrus and within a 4 to 5 day period.

The Normal Estrous Cycle

Products used for estrus synchronization programs mimic or duplicate what occurs during the cow's natural cycle. Therefore, the biology of the normal estrous cycle must be understood in order to understand synchronization programs.

The average estrous cycle, from one standing estrus to the next, is 21 days in the cow (Figure 1). The cycle begins on day 1 when the egg is ovulated from a follicle of the ovary. The egg moves into the uterine tube where, if viable sperm from the bull are present, it is fertilized and moves into the uterus.

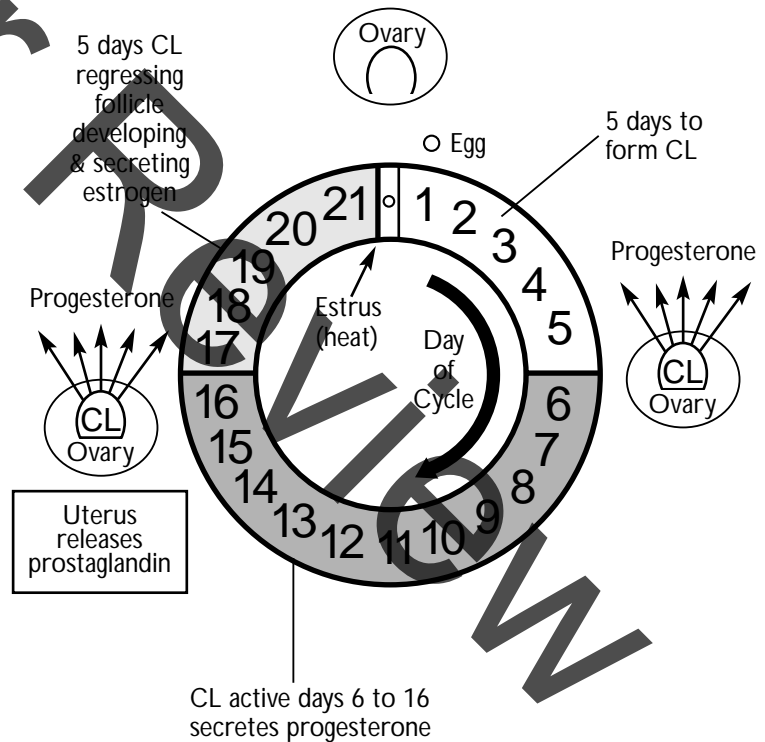


Figure 1. Normal Estrous Cycle Of The Cow With Events On Ovary.

Whether the egg is fertilized or not, by day 5 the site of ovulation on the ovary develops into a *corpus luteum* (CL), a gland secreting the hormone *progesterone* into the cow's blood. While the CL is secreting progesterone, sometimes called the “hormone of pregnancy,” the animal does not come into estrus.

Around day 17, if the animal did not become pregnant, the uterus secretes the hormone *prostaglandin F₂α* (*PGF₂α*) which causes the CL to regress in about 5 days.

On the ovary, a new egg-containing follicle has developed which secretes the hormone *estrogen*, causing the cow to come into standing estrus on about day 20 or 21 of the old cycle. At this point, the cow is ready to be inseminated. The cow ovulates 1 to 2 days after standing estrus.

If the cow became pregnant, the embryo in the uterus prevents the prostaglandin signal from being sent, progesterone secretion by the CL continues, cycling ceases, and the pregnancy is maintained. If no problems occur during pregnancy, the embryo develops into a fetus which is born as a calf about 283 days after the egg was fertilized.

Estrus Synchronization Programs

Estrus synchronization programs use one or a combination of two basic methods which work with the biology of the cow's normal estrous cycle.

- Prostaglandin injections cause CL regression and standing estrus in 2 to 3 days.
- Progestin hormones, released from implants or ingested in feed, mimic progesterone by preventing cycles from occurring as long as they are present in the body. Once removed, the cow comes into estrus in 2 to 3 days.

See Table 1 for the products currently available for estrus synchronization using either of these two basic methods. To obtain prostaglandin products, you must get a prescription from a licensed veterinarian.

Table 1. Products Approved For Estrus Synchronization Programs^a.

Product	Dose	Approved Label Use
<i>Prostaglandins</i>		
Lutalyse	5cc intramuscular	beef cattle, dairy heifers, milked cows
Estrumate	2cc intramuscular	beef cattle, dairy heifers, milked cows
<i>Progestins</i>		
Syncro-Mate-B	implant 6 mg N ^b inject 3 mg N ^b and 5 mg. EV ^c im	beef cattle, dairy heifers
MGA	0.5 mg/day, oral	beef heifers

^aStrict adherence to label warnings and precautions should be observed.

^bNorgestomet

^cEstradiol valerate

^dMelengestrol acetate

Prostaglandin Programs

Cows and heifers must be cycling in order for prostaglandin injections to cause the CL to regress. Prostaglandins will not regress the CL of females that have been in estrus within 5 days prior to the injection. The CL of females on days 6 to 17 of their estrous cycle will be regressed by a prostaglandin injection.

The response in cycling heifers or cows is excellent, with estrus occurring within 2½ to 3 days. Fertility is similar to that of a natural estrus. It is recommended to inseminate on an observed estrus, not at a fixed time after prostaglandin injection.

Words Of Caution

Many beef producers report that prostaglandin products "have not worked" in their herds. There are two main reasons for these failures:

1. The animals were not cycling.

Cows must be in sufficient body condition at calving and must have sufficient available nutrition to return to cyclicity. Heifers should be at approximately 65% of their mature body weights to initiate cycling.

2. The animals were cycling, but heat was not detected after injection. Cows are usually in estrus for only a day, and may only show signs of standing estrus a few times. *Estrus detection should be conducted at least 30 minutes, twice daily.*

Single Injection Prostaglandin Program

Method

Check for estrus the first 5 days of the program. AI any cow detected in heat (Figure 2). If 20 to 25% of the cows have been detected in estrus during this period, the group is cycling and the remaining cows can be injected with prostaglandin on day 6. Watch these cows for estrus and AI for the next 4 to 5 days.

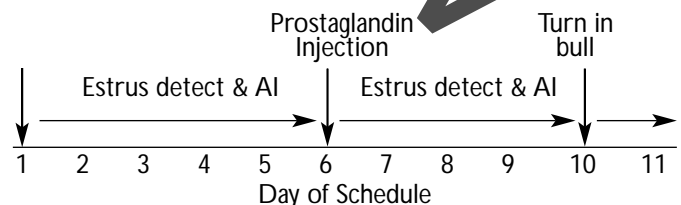


Figure 2. Single Prostaglandin Injection Program.

Advantage

This program has the advantage of allowing cows on days 17 to 21 of their estrous cycles to be artificially inseminated at the start of the program. Those females are coming into heat naturally.

Another advantage is the ability to determine that the cattle are cycling during the first 5 days of the program, and therefore, be more sure of the response after the injection on day 6.

Cattle are handled twice in this program—prostaglandin injection and AI.

Double Injection Prostaglandin Program

Method

Give two prostaglandin injections 11 days apart (Figure 3). After the second injection, detect estrus and AI for the next 4 to 5 days. Then turn in the “clean-up” bull.

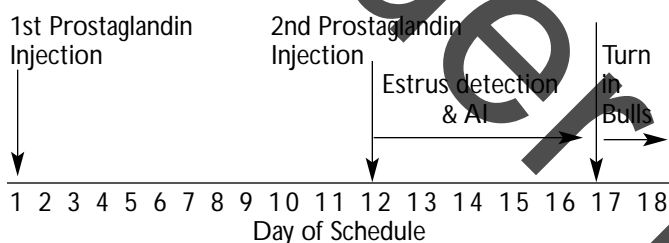


Figure 3. Double Prostaglandin Injection Program.

Timed AI, without detection of heat, can be accomplished at 76 to 80 hours after the second injection. However, AI after observed estrus is more successful.

An alternative within this program is to detect estrus and AI after the first injection. This would reduce the number of cows receiving the second injection.

Advantage

This program theoretically increases the degree of synchronization of the group. However, field studies demonstrate that both degree of synchrony and fertility can vary greatly between herds with all prostaglandin synchronization programs.

Disadvantage

An obvious disadvantage is the expense and time involved in administering and handling cattle for a second prostaglandin injection. Cows must be handled three times—two injections and AI.

“Ovulation Synchronization” Program

A system which has been successfully used in some dairies and beef herds, utilizes an injectable form of gonadotropin releasing hormone, GnRH, in conjunction with a prostaglandin injection. In this program, GnRH is injected on day 1 and a prostaglandin is injected on day 7. (“Day 1” in this program is the day of the first GnRH injection, not the first day of the estrous cycle).

A second GnRH injection is administered on day 9, 32 to 36 hours after the prostaglandin. Fixed-time AI is done 16 to 18 hours after the second GnRH injection.

The goal of this program is to synchronize ovulation, not estrus. This will optimize fixed-time AI. The first GnRH injection causes ovulation in most cows. The prostaglandin injection 7 days later causes regression of the CL formed from the GnRH-induced ovulation. The second GnRH injection causes ovulation of a fresh, new follicle which allows for the fixed-time AI 16 to 18 hours later.

The second GnRH injection has been eliminated in some programs. Insemination on observed estrus instead of at a fixed time will likely increase conception rates.

The success of this program in cows is variable. **It has been less successful in heifers.** It has the advantage of allowing for fixed time AI without estrus detection in post-partum cows. However, the expense of the GnRH and prostaglandin injections must be considered. Cattle must be handled four times in this program—two GnRH injections, one prostaglandin injection, and AI.

Progestin Programs

Syncro-Mate B (SMB) System

An implant containing a progestin (norgestomet) is placed under the skin of the ear, and simultaneously a combination of the hormones norgestomet and estradiol valerate are injected in the muscle (Figure 4). After 9 days, the ear implant is removed. Detect estrus and AI for the next 4 to 5 days.

Fertility in the SMB system depends on the stage of the estrous cycle when the animals are implanted. Results are not as good when this occurs early (days 1 to 8) in the cycle.

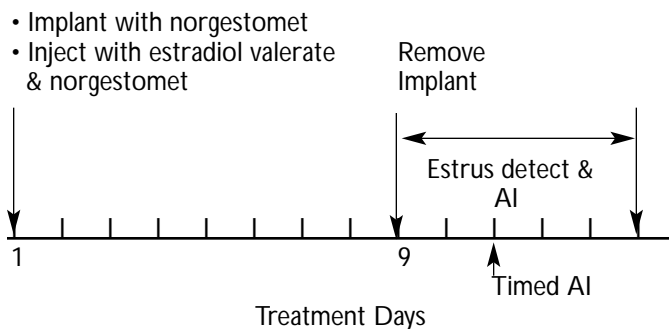


Figure 4. Synchro-mate B System.

Advantage

The SMB system has resulted in some success with fixed-time AI. Timed AI should be done 48 to 54 hours after implant removal. However, as with all programs, AI after observed estrus is still generally the most successful.

The SMB system can “jump start” or induce cycling in some cows and heifers which are not yet cyclic. In cows, this is most successful when their calves are removed and unable to nurse for 48 hours after implant removal.

Disadvantage

Animals must be handled at least three times with the SMB system—implanting and injection, implant removal, and AI.

MGA-Prostaglandin Systems

Melengestrol acetate (MGA, Pharmacia-Upjohn Company) is an orally-active progestin approved by the U.S. Food and Drug Administration for suppression of estrus activity in heifers. If MGA is mixed in feed and consumed by the female at 0.5 mg a day, it will suppress estrus. Most programs recommend 14 days of MGA feeding.

Because feed intake varies between animals, there can be a variable response to MGA programs. The MGA must be thoroughly mixed into a specified amount of supplement that is fed in the amounts of 0.5 to 2.0 pounds per head per day. Commercial feed mills can usually provide this ration.

Following its removal from the feed, the females will come into estrus within 2 to 6 days. The degree of synchrony is usually quite high if the animals were cycling when MGA feeding began.

It is not recommended to AI at the estrus following MGA removal because **the fertility after this estrus is poor**. To utilize this program with acceptable fertility, inject a prostaglandin product 17 days after MGA feeding ends. Then observe for estrus and AI as with the prostaglandin programs.

This ensures that a female should be in the late stage of her synchronized but lowly fertile estrous cycle, with a CL which will respond well to the prostaglandin injection.

The MGA program is excellent for heifer development programs, resulting in good conception rates to AI after estrus detection. However, the results in post-partum cows may be more variable. As with the SMB system, the MGA system can induce cyclicity in some post-partum cows, and is most successful when their calves are removed and unable to nurse for 48 hours after MGA feeding ceases.

MGA And Single Prostaglandin Program

This most commonly used MGA program uses one prostaglandin injection (Figure 5). A disadvantage of the program is the length of time required. The prostaglandin injection is given 31 days after MGA feeding begins, with estrus detection and AI occurring out to 36 days. The cattle are handled twice in this program—one prostaglandin injection and AI—compared to three times with the SMB program.

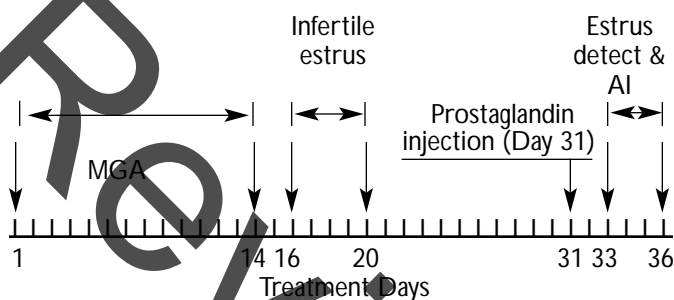


Figure 5. MGA And Single Prostaglandin Program.

MGA And Double Prostaglandin Program

This MGA program has two prostaglandin injections, the first at 17 days after ending MGA feeding, and the second 11 days later (Figure 6). This pro-

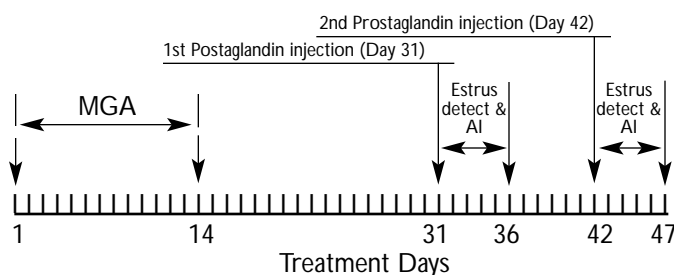


Figure 6. MGA And Double Prostaglandin Program.

gram is designed for the maximum estrus response. Cows detected in estrus after the first prostaglandin injection can be artificially inseminated. Cows that were not detected in estrus after the first injection can be given a second injection. This program provides two chances for AI during the first two weeks of the breeding season. Some cattle will be handled three times—two prostaglandin injections and AI.

MGA And Natural Service Program

This MGA system with a prostaglandin injection is also designed for use with natural service (Figure 7). The MGA is fed to the heifers for 14 days. The heifers are exposed to bulls beginning on day 31. This program has the goal of improving fertility early in the breeding season. Bulls should not be expected to service more than 15 to 20 synchronized females. Bulls should undergo a thorough Breeding Soundness Evaluation before exposure to synchronized females.

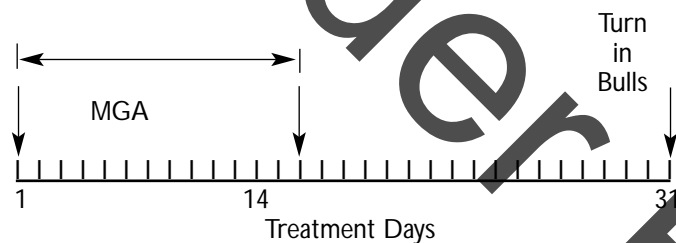
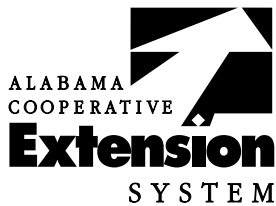


Figure 7. MGA And Natural Service Program

Under Review



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