Synchronizing Heats in Beef Cows and Heifers

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Objectives

- Provide a summary of some of the most popular estrous synchronization methods.
- Discuss answers to key producer questions.

Artificial insemination (AI) of beef cattle is a technology that allows producers to bring genetic improvement to their herds. Estrous synchronization is the technology that allows artificial insemination to occur more effectively and efficiently. Recent research has brought many new estrous synchronization systems and products. This fact sheet is a just a summary of some of the more popular estrous synchronization methods used at the time of this writing. More research will continue to provide additional synchronization methods and products. Producers should keep up-to-date with the latest research developments.

Products Used to Synchronize Estrus in Beef Cattle

There are three primary groups of products used to synchronize estrus or ovulation in beef cattle: prostaglandins, progestins, and gonadotropins. Prostaglandin products have the trade names of Lutalyse®, Estrumate®, and IN-SYNCH® and each contain prostaglandin $F_2\alpha$ ($PGF_2\alpha$) or an analogue of $PGF_2\alpha$. The progestin products include the intravaginal implant in the EAZI-Breed® CIDR and Melengestrol Acetate (MGA®), that is consumed orally. The GnRH products are Cystorelin®, Factrel®, and Fertagyl®.

Table 1. Products to synchronize estrus in beef cattle.

Product	Dose[a]	Approved Label Use
Prostaglandins:		
Lutalyse ®	5 mL, im	beef heifers and cows
Estrumate ®	2 mL, im	beef heifers and cows
IN-SYNC ®	5 mL, im	beef heifers and cows
Progestins:		
EAZI-Breed®[b]		
CIDR	Intravaginal device[c]	beef and dairy heifers and beef cows
MGA ®[d]	0.5 mg/hd/day, oral	beef heifers (estrus control or suppression[e])
GnRH:		
Cystorelin ®[f]	2 mL, im or iv	bovine females
Factrel ®[f]	2 mL, im	dairy females
Fertagyl ®[f]	2 mL, im or iv	bovine females

[a] Strict adherence to label warnings and precautions should be observed. **Follow Beef Quality Assurance (BQA) injection site procedures.**
[b] Progestin (progesterone-like compound)
[c] Controlled internal releasing device
[d] Melengestrol acetate.
[e] MGA is approved for estrus control of heifers or estrus suppression in feedlot heifers
[f] Products used to treat cystic follicles in beef and dairy cattle.

Estrous Synchronization Protocols

Prostaglandin Protocols to Synchronize Estrus

There are four prostaglandin protocols being used to synchronize estrus in cattle. Two of these programs require two injections of prostaglandin and two require just one injection. Prostaglandins are effective only on cows and heifers that are currently cycling. They do not induce anestrus or non-cycling females to begin to cycle.

One injection of Prostaglandin with five days of breeding protocol

Inject all females with prostaglandin on day zero and check for estrus and breed 12 hours after standing estrus (Figure 1). With a single injection of prostaglandin about 75% of the

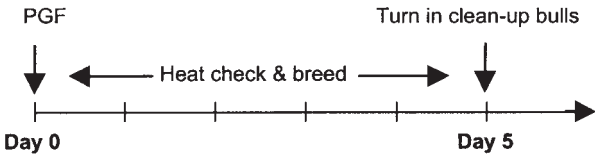

Figure 1 – Timeline for one injection of Prostaglandin (PGF) with five days breeding protocol.

cycling females would be expected to display estrus during the next two to five days.

One injection of Prostaglandin with ten days of breeding protocol

Check for estrus and breed all females in standing estrus for the first five days of the breeding season (Figure 2). Inject all females with prostaglandin not previously bred at the end of day five and breed these females 12 hours after standing heat. By breeding for five days, none of the cows that receive the prostaglandin injection will be between day one to five of their estrous cycle. Cows that are cycling should display estrus within two to five days after the prostaglandin injection. This protocol can result in greater than 90% of cyclic females being inseminated during the first 10 days of the breeding season.

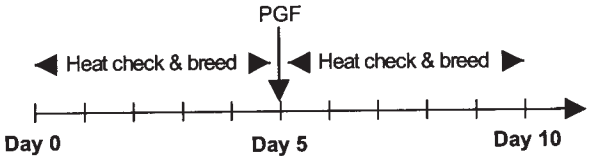

Figure 2. Timeline for one injection of Prostaglandin (PGF) with ten days of breeding protocol.

Two Injections with Prostaglandin Protocol with Ten Days of Breeding

The two injection programs for synchronization with prostaglandin allow for females to be inseminated after each prostaglandin injection or for insemination only after the second injection. In this protocol, an injection of prostaglandin is given to all cows (Figure 3). After one injection, about 75% of the cycling females should be in heat during the next five days. Females that are detected in estrus should be inseminated 12 hours later. The females that are not detected in heat and bred after the first injection should receive a second prostaglandin injection 11 or 14 days later and be bred 12 hours after they display standing estrus. **When breeding females after each injection, be sure not to inject prostaglandin into females that were inseminated after the first injection.**

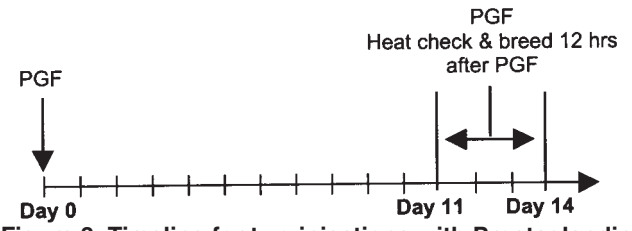

Figure 3. Timeline for two injections with Prostaglandin (PGF) protocol with ten days of breeding.

Two Injections with Prostaglandin Protocol with Five Days of Breeding

Traditionally, the injections of prostaglandin are administered 11 days apart with breeding after the second injection (Figure 4). However, recent data suggests that administering the second injection 14 days after the first injection has resulted in more females exhibiting estrus. The two injection protocol should theoretically synchronize estrus in cyclic females within two to five days after the second injection. Synchronization responses of 70 to 80% of females within a herd are common with this protocol, but can be highly variable depending on the number of anestrous females in the herd. Timed insemination with this protocol is not recommended.

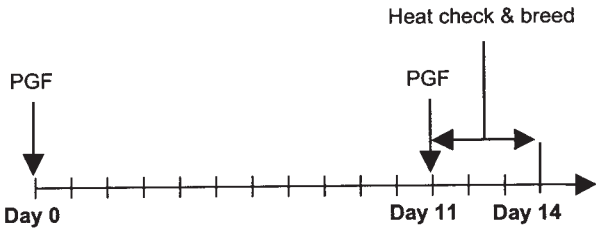

Figure 4 – Timeline for two injections with Prostaglandin (PGF) protocol with five days of breeding.

Using MGA and Prostaglandin Protocol to Synchronize estrus

A low cost system for estrous synchronization uses Melengestrol Acetate (MGA®) and prostaglandin (Figure 5). MGA is a "progesterone-like" feed additive that suppresses estrus in feedlot heifers and was not originally designed to synchronize estrus. However, it is approved to suppress estrus in heifers in a feedlot, and because heifers are usually confined in a dry-lot during development and breeding, especially if artificial insemination is used, MGA can be used in this protocol. MGA is fed at .5 mg/head/day for 14 days. Females will exhibit estrus two to five days after withdrawal of the MGA. The estrus that occurs immediately after MGA feeding is sub-fertile and females should not be bred on this estrus. A single injection of prostaglandin is administered 19 days days after the MGA has been removed from the feeding program. Most females will exhibit estrus 48 to 72 hours after the prostaglandin injection. Inseminate females 12 hours after standing estrus.

This protocol is capable of inducing estrous cycles in some females that are not yet cycling. Timed mating all females or those that have not yet displayed heat at 72 hours (heifers) or 80 hours (cows) after the prostaglandin injection results in additional pregnancies. This synchronization method is becoming very popular for synchronizing groups of replacement heifers.

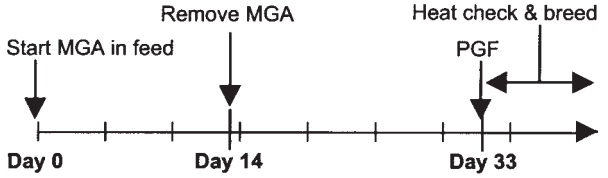

Figure 5. Timeline for using MGA and Prostaglandin (PGF) protocol to synchronize estrus.

Protocols Using GnRH and Prostaglandin

"Select Synch"

A method for synchronizing estrus in mature beef cows (not for heifers) is to administer a GnRH injection followed one week later by an injection of prostaglandin (Figure 6). Females are observed for signs of estrus beginning 36 hours before and up to six days following the prostaglandin injection. Cows are inseminated 12 hours after standing estrus is observed. Most cows will exhibit estrus by day four after prostaglandin injection although some may exhibit estrus up to six days after prostaglandin. This protocol has been referred to as the Select Synch protocol.

The estrus following GnRH is fertile and cows can be inseminated. The prostaglandin injection is not necessary in cows that have already exhibited estrus and not yet bred, but will not cause any harm, either. Do not inject prostaglandin in females that have been bred after the GnRH injection. Timed insemination is not recommended when using this protocol.

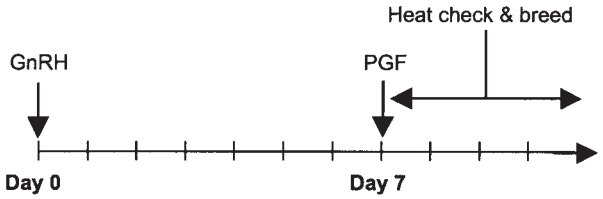

Figure 6 – Timeline for protocols using GnRH and Prostaglandin (PGF).

"Co-Synch" protocols using GnRH and Prostaglandin

There appears to be two possible ways to implement the Co-Synch protocol to synchronize ovulation in beef cows. Whatever the method implemented, they all involve timed insemination on day nine of the protocol.

"Co-Synch" with Timed Insemination

A slight variation to the Select Synch protocol involves administering the GnRH injection on day zero, prostaglandin on day seven, and a second GnRH injection on day nine (48 hours after the prostaglandin injection) at the same time that the cows are time inseminated (Co-Synch; Figure 7). This second GnRH injection initiates a fertile ovulation in cows that have not yet exhibited estrus. The Co-Synch protocol makes heat detection unnecessary and can yield pregnancy rates similar to breeding after detecting estrus.

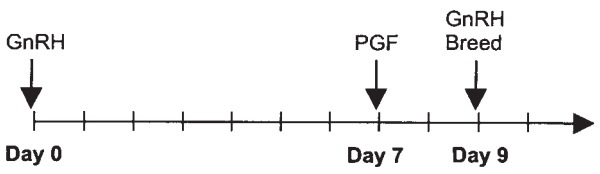

Figure 7 – Timeline for "Co-Synch" protocols using GnRH and Prostaglandin (PGF) with timed insemination.

"Co-Synch" with 48 Hour Calf Separation and Timed Insemination on Day Nine

Higher pregnancy rates might be obtained by separating the calf from the cow on day 7 at the same time that the prostaglandin injection is given (Figure 8). Calves and cows can be separated for 48 hours until the second GnRH injection and insemination is done. About an 8% increase in pregnancy rate has been obtained.

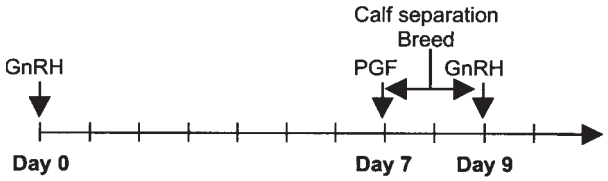

Figure 8 – Timeline for "Co-Synch" protocols using GnRH and Prostaglandin (PGF) with 48 hour calf separation and timed insemination on day nine.

CIDR's

A controlled internal drug-releasing device (CIDR) has recently been approved by the Food and Drug Administration for use in beef cows and heifers and dairy heifers in the United States. The CIDR is inserted into the vagina of the female and releases into the blood stream a product with progesterone-like activity. The device is removed seven days later and the resulting decline in blood progesterone allows cycling cows and heifers to have estrous together. A prostaglandin injection is given at day six or day seven to regress any currently active corpora lutea that may still exist. Researchers have reported that CIDRs could help stimulate estrous activity in prepubertal heifers and in some anestrous cows.

CIDR/Prostaglandin: Insert the CIDR intravaginally on day zero. Give a shot of prostaglandin on day six and remove the CIDR on day seven. Heat check and breed from day seven to day 12.

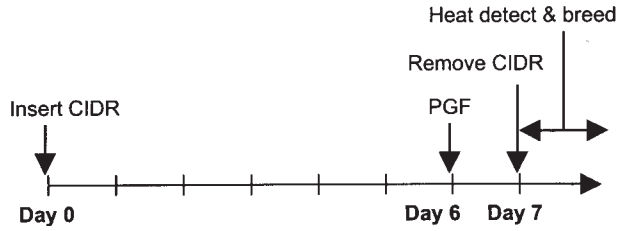

Figure 9 – Timeline using CIDR and injecting Prostaglandin (PDF) on day six.

For the sake of convenience and less cattle handling, many producers choose to give the prostaglandin injection at the same time as the CIDR removal. (Figure 10.) Research data has shown very little difference in AI success rates to these two schedules.

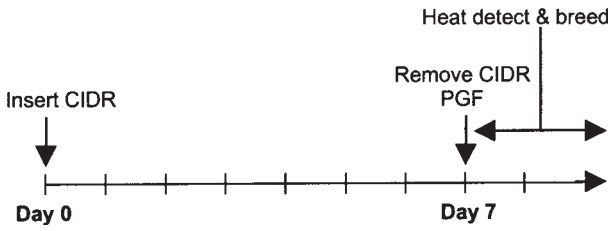

Figure 10 – Timeline using CIDR and injecting Prostaglandin (PDF) on day seven.

More recently, research has evaluated the combination of synchronization methods. One example is the combining of the Co-Synch method with a CIDR. The number of trips through the working chute is no different than was already planned for the Co-Synch method (Figure 11.) The CIDR is in place during the seven days between the first GnRH injection and the prostaglandin injection. Timed AI can be performed with this protocol.

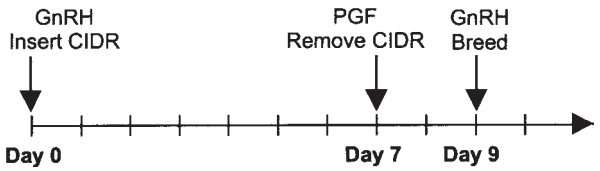

Figure 11 – Timeline which combines the Co-Synch method with CIDR.

Another synchronization system that is a combination of two other protocols is called the "7 – 11 Synch" program. This is a combination of feeding MGA® and injecting GnRH and prostaglandin. The MGA is fed for seven days, prostaglandin injected on the last day of MGA feeding, and the "Select Synch" protocol is initiated four days later. (Figure 12.)

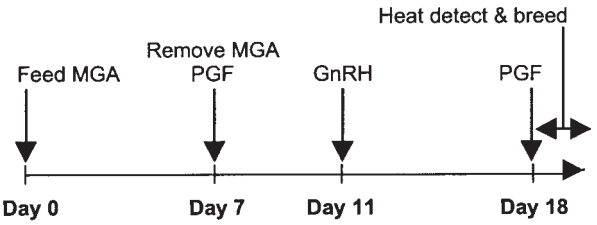

Figure 12 – Timeline for the "7–11 Co-Synch" program.

According to University of Missouri researchers, synchrony of estrous has been quite good when the "7 –11 Synch" has been used. Therefore they have suggested that timed AI could be employed at about 60 hours after the prostaglandin injection. The insemination could also be accompanied by another injection of GnRH. (Figure 13.)

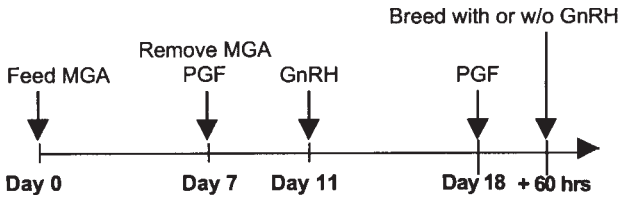

Figure 13 – Timeline for "7 –11 Synch" with AI employed 60 hours after Prostaglandin (PGF) injection.

It is obvious from the above discussion that there are numerous choices now available for estrous synchronization. Producers should visit with their local veterinarians about these protocols as a current veterinary-client relationship will be necessary before some of the products can be purchased. A great deal of information that would compare the costs of these and other systems is available from Iowa State University at their popular "Synchronization System Planner" website: http://www.iowabeefcenter.org/synchplanner/synchplanner.asp

Some producers may use synchronization with natural breeding. The purpose would be to more closely time the calving of a group of females to better utilize labor at calving time and to produce more uniform groups of calves to market. Choosing a low cost synchronization that does not produce tight synchrony of heats should be a choice in this situation. Extremely tight synchrony of large groups of females may overwhelm the bull power available to breed the herd.

Key questions

As producers wade through the myriad of choices now available, there are five key questions that need to be answered about estrous synchronization and artificial insemination for their ranch.

Question 1. Handling facilities are a critical factor in successful synchronization programs, what equipment details make efforts successful?

Answer 1. Handling facilities must be adequate to gather and move cattle without causing undue excitement to the cattle or the cattle handlers. Always remember that excited and stressed cattle (especially in warm or hot weather) will not conceive as readily as cattle that are calm**.**
If the construction of the working facility is being considered, find some corral plans that have been successfully used at other operations. Some of the most efficient plans include a circular crowding area that leads to a solid-sided alley. Certainly the facility needs a palpation/AI cage where the technician can move easily and safely behind the cow. A chute that allows the cow to be confined without catching her head can be helpful in some synchronization systems, such as those that use the vaginal inserts. A source of information about such corral plans is a book called Modern Corral Design E-938. A very simple plan included in this publication is OK-724-26. This plan includes the circular crowding area, curved, solid-sided alley and palpation/AI cage. Write to: Plans and Building Information Service, Biosystems and Agricultural Engineering Department, 214 Agricultural

Hall, Oklahoma State University, Stillwater, Oklahoma 74078-0469. Include $5.00 for the book plus $1.00 for postage and handling.

Question 2. What are the considerations between synchronizing yearling heifers versus post-calving cows?

Answer 2. Yearling heifers and post-calving cows have similarities and some important differences. Each yearling should be developed to be at a minimum of 65% (shrunk weight) of their eventual mature weight by about 13 months of age so that more than 90% or more of them are cycling as the synchronization program begins. Using one of the synchronization systems that contains a synthetic progesterone, such as feeding MGA™ or the new CIDR vaginal insert, will induce a few of the pre-puberty, non-cycling heifers to begin to cycle.

Heifers are usually more excitable if worked through the chute several times, just due to their lack of experience. Therefore a system of feeding the MGA™ additive and using just two trips through the chute makes sense while they are "learning the ropes". Heifers are often receiving a prepared feed mix as part of their growing ration. Therefore it is feasible to include the MGA™ additive at the mill while the feed is mixed. Remember to schedule with feed supplier the mixing of the feed, as it must be started about 35 days prior to breeding.

Mature cows, very near the return to cycling, will often respond to a system that includes calf separation for the two days just prior to breeding. Many experiments have shown good response to utilization of the "Ov-Synch" or "Co-Synch" systems with calf separation between the prostaglandin injection and the second injection of gonadotropin releasing hormone (GnRH). Properly used vaginal inserts have been meeting much success with producers. Current label directions require the addition of only injection in addition to the insertion and removal of the (CIDR) progestin-containing device.

Question 3. What is the recommendation to achieve best heat detection?

Answer 3. Estrus (or heat) detection is often a weak link in artificial insemination programs. Estrus detection is labor-intensive, time-consuming, tedious and quite frankly, not everyone can do it well. Therefore, there is a constant barrage of new and changing synchronization protocols aimed at improving AI success without heat detection. There is no question that improvements are being made and timed AI is more possible today than in years past. Nonetheless, producers who can identify a high percentage of the heats that take place (heat detection efficiency of around 90%) should achieve an increase in conception rates over timed AI systems.

Those producers who are committed to a long-term artificial insemination program on a large number of cattle could really benefit from the use of the electronic heat detection system now on the market. The sizeable initial investment can be returned (over several years) by the increase in heats detected and increased percentage of cows and heifers bred. Heat detection efficiency is excellent with this system as compared to just human detection.

If visual heat detection is the method of choice, a few "add-ons" will help. Plan to check heats at least four times a day, instead of just two. Some cows/heifers will be in heat less than eight hours and you would miss them with twice-a-day heat detection. Do heat detection when cattle are bored. Heat detection efficiency goes down during times of feeding or changing pastures. Cattle that are distracted will be less likely to be observed in standing heat. Use heat detection aids such as Kamar™ or tail chalk. The Kamar™ devices work best in lots or pens with no trees or brush. Tree or brush limbs can falsely trigger the patch. These "aids" force the person doing the heat checking to concentrate on individual animals and their signs rather than just looking at the whole bunch waiting for something to happen. During hot weather expect most heats to take place late in the day, over night or early mornings. Oklahoma data clearly indicates that more mounts per animal occur during cool weather months.

Question 4. What details should be discussed with an A.I. technician?

Answer 4. Having a thorough "heart-to-heart" discussion with a prospective AI technician long before the breeding season can head-off many potential head-aches. There are several items that need to be discussed besides how the technician will be paid. Ask a prospective AI technician how much experience he/she has with the many synchronization options that are available today. Determine how much experience they have had working with the type of operation and the type of cattle there is on the ranch. For example: are they (AI technicians) just experienced with small herds that have had daily human contact; whereas your cattle are in very large range pastures and are gathered just a few times each year? How many cattle can the technician confidently and comfortably breed in one day? Does there need to be more than one technician to do the job?

Discuss or show the technician the cattle working facilities. The availability of labor to gather cattle in a calm but timely manner may help decide which synchronization protocol is best. Can anyone accurately detect heats? If not, then a program using "timed-AI" may be most appropriate. If heat detection is going to done, who does the detection? What detection aids will be used?

What are realistic expectations of the synchronization and AI system? There are stories where someone got 23 out of 24 bred; very few tell of the groups that had 25% pregnancy rates. Understand that most research trials where most of the factors are controlled still produce about 60% conception rates of cattle bred on detected heat and 40% to 55% on timed AI programs. Expecting unrealistic results may cause disagreements later. Experienced AI technicians should warn of potential problems such as synchronizing heifers or cows that are too thin or scheduling a breeding program for late June, July, and August where weather is very hot.

Question 5. What are suggestions on methods to minimize cattle becoming "chute shy"?

Answer 5. Synchronization systems often require three or four trips through the working facility. The cow that balks often must be "persuaded" to move forward resulting in more excitement, more stress and an elevation in body temperature. Remember that the last trip through the chute is always when semen is placed in the reproductive tract. If the cow or heifer has experienced getting her head trapped each time, she will become more and more reluctant to enter the chute. The vaginal inserts are an improvement over the previously available ear implants because of the reduced need to catch heads. Choosing a system that requires fewer trips through the chute for wilder range cattle makes sense.

Injections still need to be given in the neck (for beef quality assurance purposes). Therefore heads still need to be secured for the safety of the one giving the injection. Moving cattle into the alley without having to use hotshots, whips and a lot of high stress noise will pay off as cows reach the chute at artificial insemination time. This is where having a circular crowding chute becomes helpful. Cows and heifers that are handled frequently or fed on a daily basis prior to synchronization can be put through the chute several times with less stress. Conception is hindered if body temperature is substantially elevated.

Conclusion

There are many ways to perform estrous synchronization. This fact sheet has discussed the most popular synchronization methods. It has also provided answers to some of producers' top questions about synchronization. In order to have a productive AI program, producers need to make informed choices about what products and methods to use.

References

"Synchronization System Planner" website: http://www.iowabeefcenter.org/synchplanner/synchplanner.asp

"Synchronizing Estrus in Beef Cattle" Learning Module at http://beef.unl.edu/learning/estrussynch.shtml

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- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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