Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 1511-1519

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 1511-1519**
Journal homepage: http://www.ijcmas.com

Review Article

Synchronization of Estrus: A Reproductive Management Tool in Veterinary Practice

Ashvinkumar Chaudhari, Nilufar Haque*, Natvarbhai Jamnesha, Nikita Bhalakiya, Gaurangkumar Patel, Mahesh Madhavatar, Dhavalkumar Patel and Pankaj Patel

Sardarkrushinagar Dantiwada Agricultural University, SKNagar, Gujarat, India
**Corresponding author*

Keywords

Ashwagandha, *Alternaria alternata*, management, fungicides, organic manure, biofertilizer

A B S T R A C T

Estrus synchronization is a manipulation of the reproductive process which offers several benefits. It reduces and in some cases eliminates the need to detect estrus and allows the herd manager to schedule breeding activities in a predetermined period. It also creates a more uniform calf crop, enables more cows to be bred to a superior sire and shortens the breeding and calving seasons. Estrous synchronization gives many beef cattle producers the opportunity to capture the economic benefits of artificial insemination (AI). Producers can use this technique as more precise tool for genetic selection. Now a day, research has led to a better understanding of methods to induce and synchronize estrus and ovulation in postpartum cows and replacement heifers. Therefore, advantages and disadvantages of each system as well as the management capabilities and expectations of the producer should be considered when determining the most appropriate estrous synchronization product or protocol.

Introduction

Synchronization of estrus implies the manipulation of the estrous cycle or induction of estrus to bring a large percentage of a group of females into estrus at a short, predetermined time (Odde, 1990). Synchronization of estrus is one of the advanced management process through which the humane errors and management costs could be minimized.

The success of the dairy cattle and buffalo economy lies in proper and optimal reproductive rhythm of each individual cow and buffalo in the herd within normal physiological range (Dhaliwal, 2005). Any deviation or prolongation in the breeding rhythm result in progressive economic loss due to widening of dry period and reduced lactation during the life span of animal (Singh *et al.*, 2006).

Basic approach for estrous synchronization

Basic approach is to control the timing of the onset of estrus by controlling the length of the estrous cycle. The various approaches for controlling cycle length are

Administration of Prostaglandin to regress the corpus luteum (CL) of the animal before the time of natural luteolysis.

Administration of Progesterone or more

commonly synthetic progestins to temporarily suppress the ovarian activity.

A newer way of creating estrous synchrony is by using gonadotropin-releasing hormone (GnRH) or analogue, which causes ovulation of a large follicle. This help in synchronizing estrous cycle in anoestrous female.

Protocol selection

Before selecting a protocol, animals should be assessed intended for synchronization. Body condition of cows and heifers and days postpartum for cows should be considered. Resources, including facilities, labor, experience, and budget should be evaluated.

Heat detection

The first step is to determine how much heat detection is feasible or desired. Poor heat detection will result in a lower AI pregnancy rate.

Cow factors

Synchronization protocols are recommended for mature cows with a body condition score of 5 or greater that is at least 50 days post-calving at the time of AI. Young, thin, and late-calving cows are less likely to have resumed their estrous cycles at the beginning of the breeding season. If a high percentage of cattle fall into these categories, protocols that include a progestin (a compound that acts like progesterone) that mimics the first cycle after calving should be considered. An intravaginal progesterone-containing insert, such as a CIDR (controlled internal drug release), will induce some noncycling cows to cycle and improve their chances of conceiving to AI. If cows are too thin or have calved too recently, synchronization of estrus may not be cost effective.

Heifer factors

Synchronization programs are more successful when 50 percent of heifers have a tract score of 4 or better 4 to 6 weeks before breeding. Protocols that include a progestin — delivered orally, such as MGA (melengesterol acetate), or intravaginally as a CIDR — may induce some prepubertal heifers to cycle.

Other factors

Duration of the protocol, number of times handled, and the ability to successfully administer treatments are other factors to consider in protocol selection. Management system, feed resource flexibility, and facilities help determine which protocol works best in a particular environment. Protocol success depends on proper administration and timing of treatments.

Cost

Heat-detection protocols generally cost less than fixed-timed AI, provided that labor is available or can be hired. Treatments, semen, and number of handlings contribute to cost of synchronization. Savings from fewer bulls needed for natural service and higher returns based on age and weight of AI-sired calves should also be considered.

The animals which should be synchronized

When starting an AI program, replacement heifers are the easiest group of animals to work with, and first-calf heifers are the most difficult. Hence, synchronization is advised to start simply and more animals should be added as experience is gained.

Comparison of Beef Cow Estrous Synchronization Protocols

Protocol	Labor	Cost
Heat Detection		
Select Synch	Medium/High	Low
Select Synch + CIDR®	Medium	High
PG 6-day CIDR®	Medium/High	Medium
Heat Detection and Timed Artificial Insemination		
Select Synch	Medium/High	Low
Select Synch + CIDR®	Medium	High
PG 6-day CIDR®	Medium/High	Medium
Fixed-time Artificial Insemination		
7-day CO-Synch + CIDR®	Medium	High
5-day CO-Synch + CIDR®	High	High

Source: Adapted from Beef Reproduction Task Force, Beef Cow Protocols – 2010

Comparison of Beef Heifer Estrous Synchronization Protocols

Protocol	Labor	Cost
Heat Detection		
1 Shot PG	High	Low
7-day CIDR®-PG	Medium	Medium
MGA®-PG	Low/Medium	Low
Heat Detection and Timed Artificial Insemination		
Select Synch + CIDR®	Medium	High
MGA®-PG	Medium	Medium
14-day CIDR®-PG	Medium	Medium
Fixed-time Artificial Insemination		
CO-Synch + CIDR®	Medium	High
MGA®-PG	Medium	Medium
14-day CIDR®-PG	Medium	Medium

Source: Adapted from Beef Reproduction Task Force, Beef Cow Protocols – 2010.

Choosing a synchrony method

The various approaches to estrous synchronization require different amounts of time to implement. Managers who have limited time and available labor should consider the methods that allow for "time mating" (TAI). Before selecting any treatment, however, the number of females that can potentially respond to treatment should be determined. If the number is low, treatment may not be justified. Well-managed beef herds that calve in 80 days or less usually respond well, so the cost of treatment is justified. In longer calving periods, the cowls can be sorted into groups and treated according to their calves' ages. Any cow whose calf is at least 40 days old can be treated. Beef cows with calves less than 40 days old may be anestrous and respond poorly to estrus synchronization. Cows in poor to marginal body condition will likely be anestrous because of

inadequate nutrition. Thus they will respond poorly to treatments. The response in replacement heifers depends on the proportion that has reached puberty.

Commercial Names for Common Bovine Estrous Synchronization Hormones

Hormone	Commercial Names
GnRH	Cystorelin®, Factrel®, Fertagyl®, OvaCyst®
PG	estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, ProstaMate®
Progestin	MGA® (melangestrol acetate), CIDR® (progesterone)

Ovulation Synchronization Protocol

Synchrony of estrus and fertility with a combination of GnRH and Prostaglandin F2α are good for cyclic females and this combination may induce cyclicity in cows experiencing postpartum anoestrus (Pursley *et al.*, 1995).The new methods synchronize oestrus more precisely and control the time of ovulation more exactly in order to allow a single timed insemination without the need of detection of behavioural oestrus. The most common methods for altering follicular turnover in conjunction with oestrus synchronization have been the administration of GnRH (Bo *et al*., 1995). Altering the endogenous release of LH and FSH or administration of exogenous steroids or gonadotropins can cause regression of a dominant follicle and emergence of a new follicular wave. There are several synchrony programs that could be used to optimize reproductive management on the dairy farm by eliminating the need to detect estrus before breeding. Those methods have been developed in recent years based on timed insemination including Ovsynch, Select Synch, Heat Synch, CoSynch, CIDR-Ovsynch, and others Modified Ovsynch.

A. Ovsynch protocols

A novel synchronization protocol named Ovsynch was developed (Pursley *et al.*, 1995) in cows, which requires a three injection schedule (GnRH-PGF2α-GnRH) for synchronization of ovulation.

B. Select-Synch protocol

This combination represents the simplest GnRH –PGF based system. A common name for the GnRH – PGF system is "Select Synch". In Select Synch (Geary and Whittier, 2000; Stevenson *et al.*, 2001) the cows do not receive the second injection of GnRH and are not inseminated at a fixed time. Cows synchronized with this protocol are inseminated 12 h after detected estrus. Single dose of GnRH and Prostaglandin are

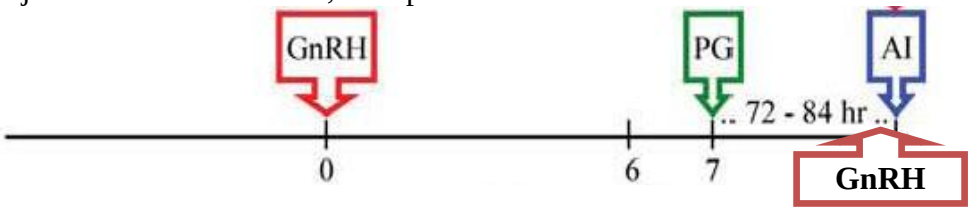
injected on day 1 and day 7, respectively. Some cows (8%) exhibit estrus up to 48 hours before PGF (d 6).The "early" heats are fertile and cows can be inseminated 12 hours after detection. The peak estrus response occurs 2-3 days after PGF with a range of 1-5 days.

C. Heat Synch protocol

Very recently an estrus synchronization protocol called Heatsynch in cattle has been developed which makes use of a combination of GnRH-PGF2α-Estradiol injection. Barros *et al.* (2000) and Fernandes *et al.* (2001) had successfully tested a protocol using estradiol benzoate. Estradiol benzoate is a less expensive hormone in place of second GnRH injection of Ovsynch protocol.

D. CO-Synch protocols

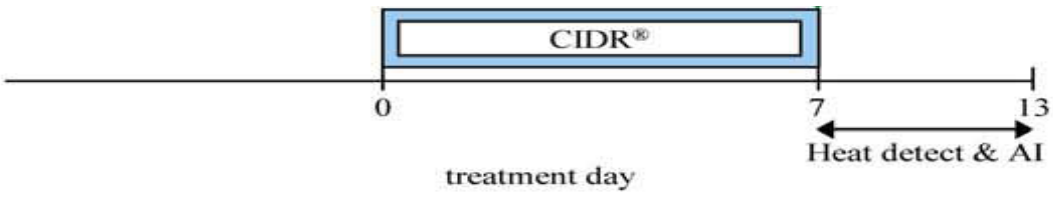
CO-Synch is similar to Ovsynch in that timing and sequence of injections but cows are inseminated when the second GnRH injection is administered, compared to the recommended 16 h after GnRH for Ovsynch treated cows. The CO-Synch program is comprised of an injection of GnRH on day 1, an injection of prosta- glandin on day 7 or 8 and then a second injection of GnRH with breeding on day 9 or 10.



E. Estrus Synchronizaton with CIDR

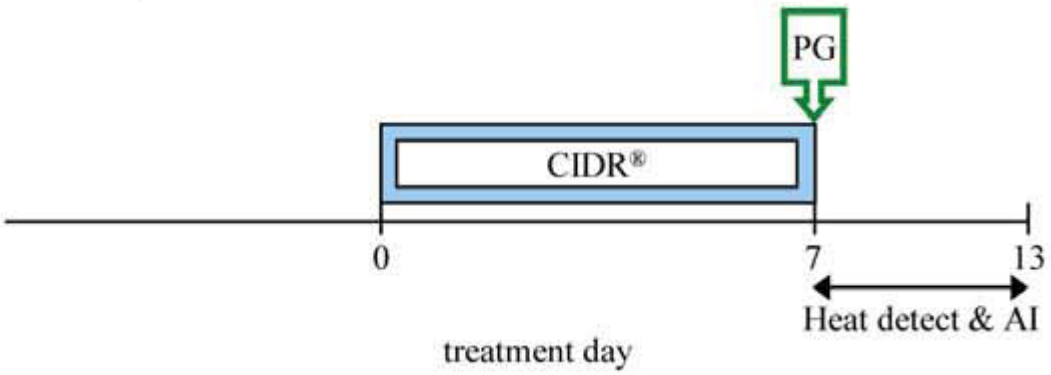
1.CIDR Alone Protocol4:

CIDR device is inserted into the vagina of anestrus animals on day 1 of treatment and removed on day 7. Animals are observed for estrus for 2-6 days post insertion and are inseminated on the observed heat.



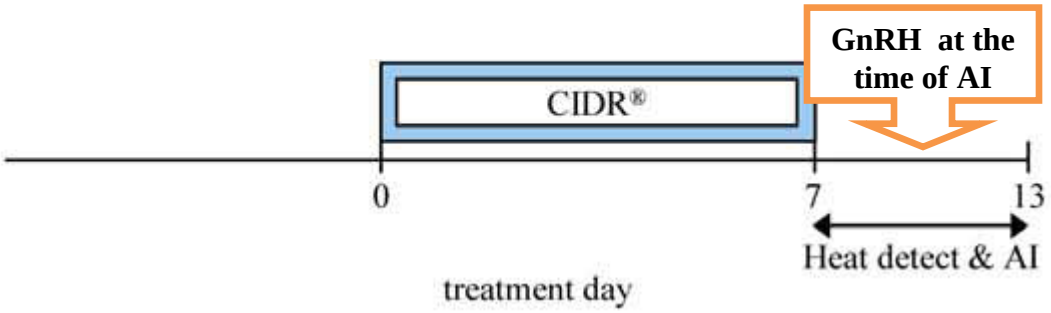
2. CIDR-PG Protocol

CIDR device is inserted into the vagina of animal on day 1 of the treatment and removed on day 7. An injection Clostenol® 2ml (PG) is given intramuscularly (I/m) at day 8 i.e. at the time of removal of CIDR. Heat is observed for 2-6 days and artificial insemination is performed at 12 h after detection of the estrus.



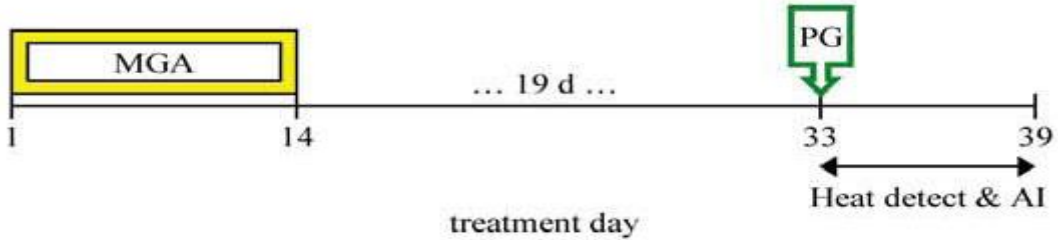
3.CIDR- GnRH Protocol

CIDR device is inserted on day 1 of treatment and is removed on day 7. Heat is observed for 2-6 days post-insertion and AI is done 12 h after observing heat. Inj. Receptal 2.5 ml (GnRH) is injected I/m at the time of AI.



F. Malengesterol acetate +PGF2α

The MGA-based protocol recommended for heifers is MGA-PG. This protocol requires more planning because it begins with feeding MGA for 14 days starting 33 days before PG injection. If MGA can be accurately delivered daily, this is an effective protocol for beef heifers. The original recommendation for the interval between the last feeding of MGA and PG injection is 17 days. Delaying this interval to 19 day s improves synchrony of estrus.



Special consideration

There are special considerations when using MGA in combination with prostaglandins. This method is typically the most cost-effective when a drylot or semi-confinement period is a normal part of management, such as in overwintering cow or heifer development programs. Ranchers should make sure each animal takes in an adequate amount of the MGA feed supplement so that each one gets the proper dosage and has an acceptable estrus response. The dosage rate is designed to overcome some of the variation in intake among individual animals. Nevertheless, animals should be forced to consume the supplement, which can be accomplished in a confined or semi-confined feedlot. Using MGA feed supplements to synchronize females grazing open range or pasture is not recommended because adequate intake cannot be ensured.

Precautions to be taken

1. Herd managers should read and follow product labels or prescribed directions before beginning any treatment. If products are used incorrectly there will be low treatment response and low pregnancy rates. Some products cannot be used in lactating dairy cows.
2. Prostaglandins should be used with extreme caution because they cause abortions in animals and humans. They are readily absorbed through the skin and cause breathing difficulties.
3. Any direct contact of prostaglandin with the skin should be avoided. Accidental spills from the skin should be washed immediately.

Management tips to maximize success

1. **Nutrition** – The major factor affecting the success of any estrus synchronization protocol is the percentage of animals cycling at the initiation of treatment. The single most important factor affecting cyclicity is nutrition. Proper feeding of cows is essential to achieve a moderate or better body condition score by the time of calving and increase energy levels in rations to minimize the body condition loss after calving. Body condition score of cows should be done regularly to ensure that r nutrition program is allowing for optimum reproductive performance in herd.
2. **Herd Health** – All vaccinations should be performed at least three weeks ahead of the synchronization and breeding period to provide ample time for the immune system to respond and provide protection from the disease in question.
3. **Bull Exposure** – Exposure of females to bulls in the early postpartum period has been shown to decrease the number of days to the first postpartum ovulation and to increase the percentage of cows cycling at the beginning of the breeding season. Bulls should be surgically altered to prevent insemination and disease transmission. Androgenized females also have a biostimulatory effect equal to that of bulls and are inexpensive to produce.
4. **Calf Removal** – The suckling stimulus of a nursing calf extends the duration of postpartum anestrus in cattle. While not commonly practiced, early weaning of calves provides an excellent means to improve the cycling status of the average beef herd. Temporary calf removal (48 hours) initiated concurrently with the PGF injection of any synchronization protocol is a more common and easily implemented procedure.
5. **Semen -** Semen should be processed at a Certified Semen Service (CSS) certified lab. It has been seen that, considerable sire-to-sire variation in pregnancy rates exists for bulls even when they have

passed a BSE. Hence, accurate records to check individual sire conception rates should be kept. Bull stud which has undergone at least 250 inseminations before should be considered for semen bank.

Advantages of estrous synchronization

- A shortened calving season provides producers a better opportunity to offer improved management and observation of the cow herd, which should result in fewer losses at calving (Larson *et al.*, 2010).
- Shortened calving periods also facilitates improvements in herd health and management such as uniformity in timing of vaccinations and routine management practices resulting in decreased labor requirements.
- Another benefit is that animal nutrition can be improved by grouping animals according to stage of gestation and feeding each group accordingly.
- An additional benefit is that the calf crop will be more uniform in age and size which can lead to an advantage in the market place.

Disadvantage estrous synchronization

- Drug expense and labor
- An existing high level of management is required
- Good handling facilities are required
- Animal must be cycling and in good body condition

In conclusion, estrous synchronization can be a useful tool in the reproductive management of a cow herd. However, if proper levels of nutrition, body condition and health are not maintained, the program is likely to fail. Improvements in facilities and management may be necessary before implementing an estrous synchronization program.

References

Barros, C.M., Moreira, M.B.P., Figueredo, R.A., Teixeira, A.B. and Trinca, L.A. 2000. Synchronization of ovulation in beef cows (Bosindicus) usingGnRH, PGF2α and estradiol benzoate. Theriogenology.53:1121-1134.

Bo, G.A., Adams, G.P., Caccia, M., Martinez, M., Pierson, R.A. and Mapletoft, R.J. 1995.Ovarian follicular wave emergence after treatment with progesterone and estradiol in cattle. Anim. Reprod.Sci.39: 193-204.

Dhaliwal, G.S. 2005. Managing dairy herds for optimal reproductive efficiency.Recent concepts in physio-pathology of animal reproduction. In: Centre of Advanced studies in Veterinary Gynaecology and Reproduction. Punjab Agricultural University, Ludhiana, India.p1-9.

Fernandes, P., Teixeira, A.B., Crocci A.J. and Barros. C.M. 2001. Timed Artificial insemination in beef cattle using GnRH agonist, PGF2α and estradiol benzoate (EB).Theriogenology**.** 55:1521-1532.

Geary, T.W. and Whittier, J.C. 2000. Effects of a Timed Insemination Following Synchronization of Ovulation Using the Ovsynch or CO-Synch Protocol in Beef Cows, The professional animal scientist 14: 217-220.

Pursley J. R, Mee, M.O. and Wiltbank M.C 1995. Synchronization of ovulation in dairy cows using PGF_{2a} and GnRH. Theriogenology.44: 915-923

Singh, A.P., Shah, R.S., Singh, R.B., Akhtar, M.H., Roy, G.P., Singh, C. and Kunj. V. 2006.Response of mineral mixture, Prajana and GnRH on serum biochemical constituents and

conception rate in anoestrus buffaloes. Indian J. Anim. Reprod. 27(1):51-54.

Stevenson, J.S., Thompson, K.E., Forbes, W.L., Lamb, G.C., Grieger, D.M. and Corah L.R. 2000. Synchronizing estrus and (or) ovulation in beef cows after combinations of GnRH, norgestomet, and prostaglandin F with or without timed insemination. J. Anim. Sci. 78:1747-1758.

Larson, D.M., J. A. Musgrave and Funston R.N. 2010. Estrous synchronization increases early calving frequency, which enhances steer progeny value. 2010 Beef Cattle Report. University of Nebraska. Lincoln, NE.

Odde, K.J. 1990. A review of synchronization of estrus in postpartum cattle. J. Anim. Sci. 68:817-830.