BUL 1096

Estrus Synchronization for Natural Service in Western Cow Herds

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Introduction

THE PERCENTAGE OF COWS CALVING in the first thirty days of the calving season is critical to profitability of a cow-calf operation. Research from North Dakota State (Hughes 2005) determined that the most profitable cow-calf operations have 60%–70% of the calves born in the first thirty days and over 85% born in the first forty-two days of the calving season. In commercial operations, for every twenty-one days later a calf is born in the calving season, calf weaning weight reduces by 28–50 lb for steers and 18–35 lb for heifers.

Moving cows from a ninety-day calving season to a sixty-day calving season increases weaning weights and improves net returns per cow. Models indicate that the advantage of moving to a sixty-day calving season is magnified if reproductive management such as estrus synchronization is used. An additional benefit of a sixty-day season is that all cows have calved before the beginning of the breeding season, which improves the percentage of cows conceiving in the first thirty days.

One challenge in herds employing only natural service mating is how to maximize the percentage of cows bred early in the breeding season. Estrus synchronization can be used with natural service to help accomplish this. Several simple synchronization systems have been developed.

Some ranches in the West utilize public lands grazing allotments, which occasionally are used by multiple leaseholders or a grazing association. In these specific cases, the bulls that service one ranch's cows may belong to another ranch. Often ranches using this grazing arrangement prefer to breed their cows for one cycle to their own bulls. Estrus synchronization systems for natural service may increase the number of cows conceiving to the desired bulls.

A Brief Overview of the Estrous Cycle of the Cow

Cows and heifers come into estrus (heat) every twenty-one days (range 18–24 days). When cows are in estrus, they are receptive to bulls and will stand to be mounted. Estrogen from a large ovarian follicle, which holds the ovum (egg), causes estrus behavior. Approximately thirty hours after the beginning of estrus, the follicle ovulates and releases the ovum for fertilization. Ovulation initiates the formation of the corpus luteum (CL) that produces progesterone, which prepares the uterus for pregnancy and keeps cows from expressing estrus. If a cow does not become pregnant, the uterus produces prostaglandin, a hormone that kills (lyses) the CL, reducing progesterone and allowing the cow to develop a new follicle and come into heat. In estrus synchronization systems for natural service, either progesterone or prostaglandin is used.

Preparing for Estrus Synchronization and Natural Service

Proper Management

Cattle need to be properly managed before considering an estrus synchronization protocol. Females that are undernourished, too early postpartum, or prepuberal will not respond to estrus synchronization. Cows or heifers need to be well nourished and in body condition score 5 or 6 (1 = emaciated to 9 = obese). Heifers need to be at least thirteen months of age and weigh approximately 60%–65% of their mature weight. Cows should be at least thirty days postcalving before starting an estrus synchronization protocol. Under no circumstances should cows less than twenty-five days postcalving be exposed to estrus synchronization drugs. The early postpartum cows have not had sufficient time to repair their reproductive tracts. Estrus synchronization systems are not a substitute for good management.

Synchrony

One of the important factors in synchronizing cows for natural service is to ensure that the synchrony of estrus is not so tight as to overwhelm the bull power. Research on bull serving capacity (Boyd et al. 1988) indicates that pregnancy rates are higher for bulls that serviced three cows per day compared to bulls servicing nine cows per day. For cows exhibiting natural estrous cycles, approximately 5% of the cows will be in heat on any given day. For a normal cow to bull ratio of 30:1, bulls breeding nonsynchronized cows would have one or two cows to breed on most days. The goal of synchronization for natural service is to have most cows in heat within **7–10 days**; therefore, bulls will be servicing 2–3 cows per day.

Bull Power

When using synchronization with natural service, bulls should be required to service fewer cows per bull. For synchronized natural service, the cow to bull ratio should be 25:1 for mature bulls. Reducing the ratio of cows to bulls below 25:1 does not improve pregnancy rates in synchronized females. Experienced older mature bulls are preferred over yearling bulls for synchronized natural service due to older bulls' greater serving capacity and mating behavior. Bulls that are two years old or older with at least one season of breeding experience are recommended.

All bulls need to pass a breeding soundness exam every year. A complete breeding soundness exam includes a physical evaluation, examination of sexual organs, scrotal circumference measurement, and a semen evaluation. These examinations should be conducted by a veterinarian using the guidelines prescribed by the Society for Theriogenology. Bulls that pass the examination still need to be observed at the beginning of the breeding season to ensure they have sufficient libido and mating capability.

Bulls need to be in top physical condition with a body condition score of 5–6 (1 = emaciated to 9 = obese) and accustomed to exercise. During the synchronized period and throughout the breeding season, observe bulls daily for signs of fatigue, injury, or failure to service cows. Immediately replace bulls exhibiting any issues hindering breeding ability.

Systems for Synchronizing Estrus for Natural Service

All estrus synchronization systems discussed in this publication are approved by the Beef Reproduction Task Force (BRTF). The BRTF is a group of researchers in cattle reproduction and Extension beef specialists that have identified effective estrus synchronization systems through ranch-level research across multiple locations. The protocol recommended for synchronization depends on cow age (heifer versus cow), cycling status, and the amount of labor needed. Each protocol uses a different synchronization drug and different timing. Producers employing these estrus synchronization protocols need to carefully follow them exactly as written for best success.

1 Shot Prostaglandin (PG) - Natural Service (NS) - Heifers and Cows

This protocol only works on cycling cows or heifers. It involves a single shot of prostaglandin (PG), either prostaglandin F2α (Lutalyse, Lutalyse HighCon, ProstaMate) or its analog (Estrumate, estroPLAN, Synchsure), to all animals five days after the introduction of bulls (Figure 1). Alternatively, bulls can be introduced on the same day as females are given PG. Only cycling cows with a functional CL will be synchronized by this treatment. The injection of PG lyses the CL and brings females into heat.

Bulls will breed cows that are in heat during the first five days. Any cow bred during this period will not respond to the prostaglandin treatment because the CL is too immature, so these cows remain pregnant. After the shot of prostaglandin, unbred cycling cows come into estrus over a five-to-ten-day period and bulls will service those cows. Cows that are not cycling do not respond to the injection of prostaglandin; there is no difference in pregnancy rates in noncycling cows injected with PG compared to noncycling cows that did not receive an injection.

With this protocol, ranchers can expect 3.0%–12.0% more synchronized cows calving early in the calving season than nonsynchronized cows (Table 1). Some studies (Whittier et al. 1991) indicate an improvement in overall pregnancy rates. The one study in Table 1 that shows a decrease in the percentage of synchronized heifers pregnant in the first twenty-five days (Larson et al. 2010) notes that more of the synchronized heifers calved in the first ten days compared to the nonsynchronized heifers.

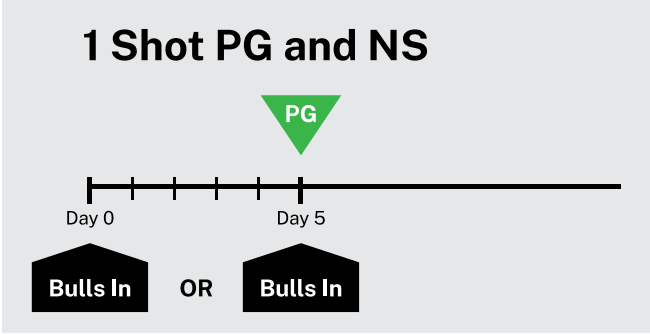

Figure 1. 1 Shot Prostaglandin (PG) – NS Protocol (Beef Reproduction Task Force 2024).

Table 1. Pregnancy rates to natural service in cows or heifers estrus synchronized with 1 shot PG protocol compared to nonsynchronized females. 1 shot PG = either prostaglandin F2α (Lutalyse, Lutalyse HighCon, ProstaMate) or its analog (Estrumate, estroPLAN, Synchsure) administered at the dosage indicated on the label either at bull introduction or five days after bull introduction. Suggested cow to bull ratio is 25:1 when using mature bulls.

Cows or Heifers (No. of Animals)	Period for Pregnancy Analysis	Treatment		Change Due to Synchronization	Statistically Different	Reference
		1 Shot PG	Control			
Cows (360) Heifers (45)	21 days	63.4%	60.3%	3.1%	No	Whittier et al. 1991
	45 days	82.6%	74.9%	7.7%	Yes	
	Overall	85.3%	78.8%	6.5%	Yes	
Cows (2590)	21 days	75.0 %	63.0%	12%	Yes	Larson et al. 2009
	Overall	94.0%	95.0%	-1.0%	No	
Heifers (2390)	25 days	73.7%	78.3%	-4.6%	Yes	Larson et al. 2010

14-Day MGA - NS (Heifers Only)

This system is only for use in heifers. Melengestrol acetate (MGA [produced by Zoetis] or HeifermaX [Elanco]) is a synthetic oral progestin that acts like the naturally occurring hormone progesterone in heifers. Progesterone prevents ovarian follicles from ovulating and suppresses estrus. Treatment with MGA keeps heifers from expressing estrus. In addition, it will initiate cycles in noncycling animals. Melengestrol acetate is **only** labeled for use in heifers.

The MGA is fed at 0.5 mg/heifer/day of MGA mixed in 3–5 lb of grain. Some feed mills provide MGA in a range cube. Heifers need to be fed at the same time every day with sufficient bunk space, so all heifers get their share of the product. Heifers that fail to eat their portion of the MGA containing feed will "breakthrough" and not synchronize.

Heifers are fed MGA for fourteen days (Figure 2). After feeding is stopped, heifers come into heat over a 3–5-day period. This heat is an **infertile** heat and bulls should not be introduced at this time. In addition, synchrony may be too tight. Bulls are introduced to heifers fourteen days after the last feeding of MGA. The advantage to this system is the estrus response is good and it is effective in initiating cycles in noncycling heifers. The disadvantage is that the system takes a month to complete before breeding can begin.

The percentage of heifers becoming pregnant during the synchronized estrus (7–10 days after bull introduction) was 66.0%–68.7% in large-scale field trials (Table 2, Patterson et al. 1991 and 2001). In another study using Zebu-influenced heifers (Locke et al. 2020), 4% more synchronized heifers were pregnant compared to nonsynchronized heifers.

14-Day CIDR - NS (Heifers and Cows)

The Eazi-Breed CIDR (controlled internal drug release; Zoetis) is a plastic device impregnated with progesterone that is inserted into the vagina of a cow or heifer for fourteen days and provides a constant dose of progesterone. Bulls are introduced to females fourteen days after CIDR removal. Since CIDRs are approved for both cows and heifers, they can be used in either class of animal. The 14-day CIDR protocol (Figure 3) is just a modification of the previous 14-day MGA protocol. Just like the 14-day MGA protocol, the heat immediately after CIDR removal is subfertile. The advantage of the 14-day CIDR protocol over the 14-day MGA system is that animals receive their full daily dose of progesterone. Loss of the CIDR is rare. The disadvantage is that cows or heifers need to be worked twice through the chute.

Although this protocol can be used for both heifers and cows, most of the research information comes from experiments with heifers (Table 2). Synchronization with the 14-day CIDR protocol resulted in a 6% increase in heifers pregnant during the first twenty-one days. Although this estrus synchronization protocol works in cows, actual use is limited due to the long duration from the beginning of synchronization to breeding.

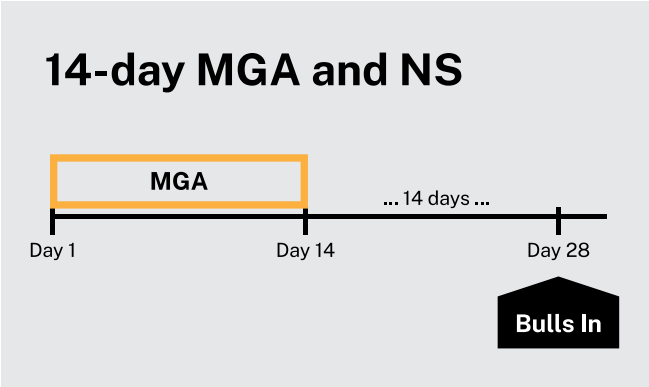

Figure 2. The 14-Day MGA system (Beef Reproduction Task Force 2024).

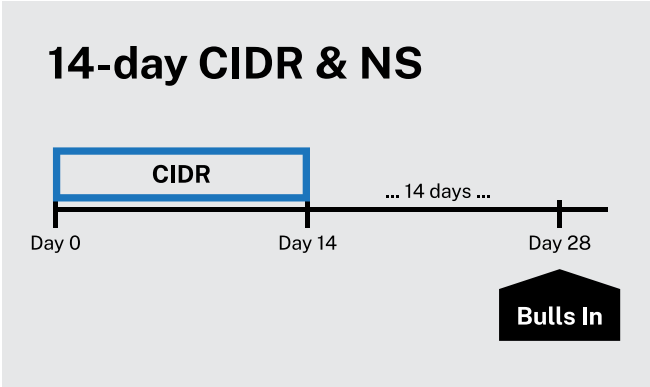

Figure 3. The 14-Day CIDR protocol (Beef Reproduction Task Force 2024).

Table 2. Pregnancy rates to natural service in heifers estrus-synchronized with a long-term progestin protocol (14-day MGA or 14-day CIDR) compared to nonsynchronized heifers. 14-day MGA = daily feeding of Melengestrol acetate (0.5 mg/animal/day) in a grain carrier for fourteen days with bull introduction fourteen days after cessation of feeding. 14-day CIDR = vaginal insertion of a controlled internal drug release (CIDR) device with removal fourteen days after insertion with bull introduction fourteen days after CIDR removal. Suggested cow to bull ratio is 25:1 when using mature bulls.

Heifers (No. of Animals)	Period for Pregnancy Analysis	Treatment			Change Due to Synchronization	Statistically Different	Reference
		14-Day MGA	14-Day CIDR	Control			
Heifers (883)	21 days	53.0%	55.0%	49.0%	4.0%/6.0%	No	Locke et al. 2020
	Overall	83.0%	83.0%	82.0%	1.0%/1.0%	No	
Heifers (601)	7–10 days	68.7%	N/A	N/A	N/A	N/A	Patterson et al. 1991[a]
	30 days	83.0%					
Heifers (1749)	7–10 days	66.0%	N/A	N/A	N/A	N/A	Patterson et al. 2001[a]

[a] *Extension demonstration or data from the Missouri Show-Me Select heifer development program; therefore, no unsynchronized heifers as controls.*

7-day CIDR - NS (Heifers or Cows)

This protocol can be used in cows or heifers and induces cycles in noncycling females. The CIDR is inserted on Day 0 and removed seven days later, with the bulls turned in immediately after CIDR removal (Figure 4). For example, CIDRs are inserted on Monday, they are removed the following Monday, and then the bulls are placed with cows.

Since the CIDR is only in for seven days, heats after CIDR removal occur over 7–10 days and heats are fertile. In two studies with multiple herds (Lamb et al. 2008 and Anderson and Crites 2021), herds that used the 7-day CIDR protocol had more cows pregnant in the first 20–30 days and a higher pregnancy rate overall (5.3%–35.0%; Table 3).

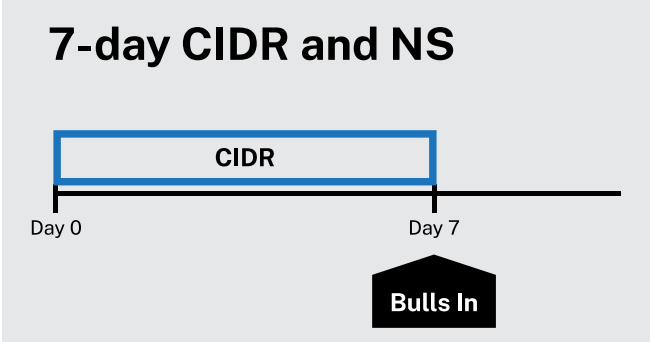

Figure 4. The 7-day CIDR natural service protocol (Beef Reproduction Task Force 2024).

Table 3. Pregnancy rates to natural service in cow estrus synchronized with 7-day CIDR protocol compared to nonsynchronized cows. 7-day CIDR = vaginal insertion of a CIDR device with removal seven days after insertion with bull introduction immediately after CIDR removal. Suggested cow to bull ratio is 25:1 when using mature bulls.

Cows (No. of Animals)	Period for Pregnancy Analysis	Treatment		Change Due to Synchronization	Statistically Different	Reference
		7-Day CIDR	Control			
Cows (1461)	30 days	80.0%	45.0%	35.0%	Yes	Anderson and Crites 2021
	Overall	91.0%	83.0%	8.0%	Yes	
Cows (2033)	20 days	55.6%	50.3%	5.3%	Yes	Lamb et al. 2008
	30 days	68.2%	66.7%	1.5%	No	
	Overall	88.9%	88.6%	0.3%	No	

Which Protocol to Use

Compare protocols on the class of animal to be synchronized, the advantages and disadvantages, and the cost. Table 4 compares different aspects of the protocols discussed in this bulletin. The MGA protocol can only be used in heifers and MGA must be fed daily. The PG protocol will not induce cycles while the MGA and CIDR protocols may cause anestrous cattle to cycle. Synchronization costs vary from $4.00–$21.00 per animal. Labor costs are the most variable cost. Labor costs in Table 4 do not include the cost of gathering the cattle.

Taking into account the genetic and financial investment in bulls, estrus synchronization is worth considering for natural service. Ensuring that more cows are bred to desired bulls and increasing the weaning weights of calves by getting more animals bred early in the breeding season may improve profitability and herd quality. For more assistance with synchronizing estrus for natural service, contact an Extension beef specialist or a veterinarian.

Further Reading

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Table 4. Comparison of systems for synchronization of estrus for natural service.

System[1]	Animal Type	Induces Cycles	Number of Trips through Chute	Cost Per Head[2]
PG + NS	Cows and Heifers	No	1	$3.50–$4.50
14 d MGA + NS	Heifers Only	Yes	0	$12.88
14 d CIDR + NS	Cows and Heifers	Yes	2	$17.00–$21.00
7 d CIDR + NS	Cows and Heifers	Yes	2	$17.00–$21.00

[1] NS = natural service, PG = prostaglandin, MGA = melengestrol acetate; CIDR = controlled internal drug release device.

[2] Cost included.

- PG = $2.50–$3.00 per animal
- MGA = $ 0.67/animal/day ($0.30/animal/day drug cost plus $0.37 feed cost/animal/day)
- CIDR = $ 15.00–$19.00/animal
- Labor = $1.00/animal/trip through chute; $0.25/animal/day for feeding

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