

# Estrus Synchronization for Natural-service Breeding in Beef Cattle

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## Introduction

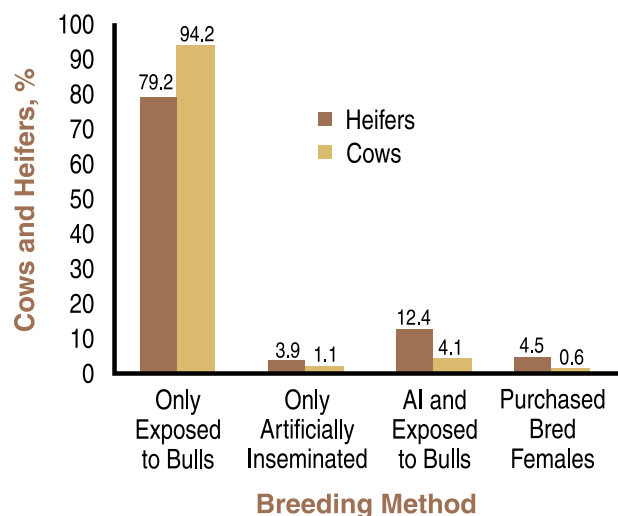
The U.S. beef industry is dominated by herds that rely solely on bull breeding. The percentage of cows bred only by bull breeding was 94.2 percent, whereas the percentage of heifers was 79.2 percent (Figure 1). Breeding systems that utilize natural-service bulls to breed estrus-synchronized females may offer opportunities to get females pregnant earlier in the breeding season, have calves born earlier in the calving season and possibly increase weaning weight of calves born to synchronized females.

In circumstances in which synchronization products have been administered to cattle and a planned artificial insemination date is no longer a possibility (semen not delivered, semen tank ran dry, injured technician, etc.), breeding synchronized cows with bulls may be the only way to capitalize on the labor and financial resources already invested to achieve a synchronized estrus. In these instances, protocols used for synchronizing females for natural service breeding can be quite different than those used to synchronize females for artificial insemination (AI).

Characteristics of bulls used for breeding and characteristics of the females being synchronized contribute to the success or failure of synchronized natural-service breeding. Also, knowing specific synchronization protocols will give producers flexibility as they plan to implement a synchronized natural-service breeding system.



**Figure 1.** Percentage of heifers and cows bred by breeding method for calving in 2007. Adapted from *National Animal Health Monitoring System, 2009.*



## Bull Factors That Influence Success

Not all bulls are suitable for breeding groups of synchronized females. Age, breeding soundness and libido need to be evaluated to determine whether individual bulls are suitable candidates for natural-service synchronization protocols.

**Age:** Breeding is a learned behavior. As bulls get older, they have fewer false mounts, compared with younger bulls (Table 1). However, no differences are present in the number of successful services among bulls of different ages. More important is the fact that the 2-year-old bulls had greater overall pregnancy rates, compared with yearling bulls, and bulls age 3 and older had greater pregnancy rates than the 2-year-old bulls. Taken together, these results highlight the fact that experienced breeding bulls (2-plus years of age) are the best candidates to use for synchronization with natural service.

**Breeding Soundness:** Breeding soundness examinations (BSE) include a physical evaluation, measurement of scrotal circumference and an evaluation of semen quality. A BSE can identify potential breeding issues that a simple semen test could not. Using bulls that passed a BSE will result in greater pregnancy rates in synchronized females, compared with using bulls that failed or had classification “deferred” (need to be retested).

**Libido:** High libido, or sex drive, is something that certainly is required of bulls that will be stocked with synchronized females. To identify bulls with high libido, watch for yearling (and mature) bulls that aggressively seek and breed females, and keep notes for potential use in natural-service systems in upcoming years. Not having the opportunity to observe yearling bulls carefully for previous breeding activity is another reason to avoid their use for breeding synchronized females.

### Summary of minimum bull recommendations

- ✓ **Age of 2-plus years with previous breeding experience**
- ✓ **Passed complete breeding soundness exam**
- ✓ **High libido**

**Table 1.** Breeding behavior and fertility of bulls of different ages.

	Age of Bull		
	Yearling	2	3+
Number of mounts	207 <sup>a</sup>	120 <sup>b</sup>	85.8 <sup>b</sup>
Number of services	54.5	37.6	40.5
Estrus females serviced, %	69.4	73.8	72.0
Pregnancy rates of serviced females, %	39.6 <sup>a</sup>	59.4 <sup>b</sup>	62.2 <sup>b</sup>
Overall pregnancy rate, * %	30.9 <sup>a</sup>	41.5 <sup>b</sup>	49.9 <sup>c</sup>

<sup>a,b,c</sup> Means within row lacking common superscript differ ( $P < 0.05$ ).

\* Pregnancy rate after a five-day breeding period.

Adapted from Pexton et al., 1990

**Table 2.** Effect of bull-to-heifer ratio on pregnancy status.

	Bull: Heifer Ratio*			
	1:50	1:50	1:25	1:16
	Nonsynchronized		Synchronized	
Number of bulls in pasture*	2	2	4	6
Pregnancy rate, %	82	77 <sup>a</sup>	83	84 <sup>b</sup>

\* Each pasture had 100 heifers with different number of bulls present to reach each respective stocking rate.

<sup>a,b</sup> Means within row lacking common superscript differ ( $P < 0.05$ ).

Adapted from Healy et al., 1993

**Stocking Rate:** Once bulls that meet the minimum requirements are identified, producers must make a final decision on stocking rates.

As the number of synchronized females a bull is expected to breed increased (from seven to 51 cows), pregnancy rates decreased slightly. In addition, overall pregnancy rates were lower for heifers stocked at one bull per 50 heifers, compared with heifers stocked at one bull per 16 heifers (Table 2).

An economic analysis of the stocking rates tested concluded that the stocking rate of 1-to-25 resulted in the greatest economic return. Therefore, the number of synchronized females a bull can be expected to breed is not that different from the national average stocking rate of about 25 females per bull.

However, keep in mind that the risk associated with injury or other breeding issues is concentrated when breeding synchronized females. Close observation of bulls during the synchronized period and early intervention when problems are observed are very important to achieve desired results.

## Cow Factors That Influence Success

Estrus synchronization systems for artificial insemination have concentrated on the ability of a protocol to synchronize females that are cycling and not cycling. However, in natural-service synchronization systems, having a high proportion of females in standing heat during the synchronized period is essential to the success of the system.

Cows need time to recover after calving to start having estrous cycles again. As days after calving (days postpartum) increase, the proportion of cows cycling increases as well. Thin cows take longer to start cycling after calving and thin heifers take longer to reach puberty, compared with females with adequate body condition. Therefore, evaluating the days postpartum and/or body condition score can help determine whether females are good candidates for synchronization.

An easy way to evaluate the proportion of females cycling in a group is to perform heat checking and close analysis of the results. If all of the females in a group are cycling, we would expect to see just a little less than 5 percent of the group in heat every day (1 day ÷ 21 days in an average estrous cycle = 4.8 percent).

## Options for Synchronization With Natural Service

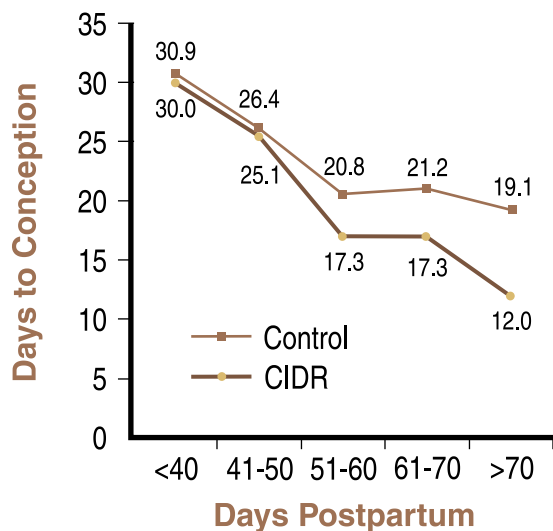
**1 Shot PG:** This protocol simply calls for the administration of a single injection of prostaglandin  $F_{2\alpha}$  (PG) on the day of bull turnout. Females that respond to the PG injection will be in heat during roughly the next five days. The net result would be that 76.2 percent of cyclic females would be in heat within the first five days of the breeding season. In this scenario, the average days to conception would be day 6.8 of the estrous cycle (3.2-day advantage, compared with no synchronization, with, theoretically, calves that are 3.2 days older at weaning and had 3.2 extra days to gain weight after birth).

**Day 4 PG:** To implement this protocol, females are gathered four days after bull turnout and given an injection of PG. The bulls would have bred 19 to 20 percent of cyclic females before the PG injection, and the remaining cyclic females will be in heat during the next five days. Administering PG within the first four days of the breeding season will not sacrifice pregnancies from breedings that took place during the four previous days. However, giving PG after day 4 of the estrous cycle can abort pregnancies. Using this method, 100 percent of cyclic females theoretically would be in heat within the first 10 days of the breeding season, with a majority of breeding activity occurring around day 8 of the breeding season. Interestingly, the average day of conception in females responding to synchronization (day 6.8 of the breeding season) would be the same as for the 1 Shot PG protocol administered just prior to or in concert with bull turnout.

**7-day CIDR:** This protocol is implemented by inserting a CIDR for the seven days prior to the start of the breeding season. Once the CIDR is removed, the bulls are turned in (either immediately or one day later). The CIDR will stop cyclic females from showing estrus during the time it is in place. It also has the potential to initiate estrus in some noncyclic females. Within the first five days after a seven-day CIDR protocol, 57 percent of cyclic females would be expected to show heat, and the average days to conception in this scenario would be day 6 of the breeding season.

When a CIDR was inserted for seven days prior to the breeding season, the average days to conception was three days shorter for cows in the CIDR treatment, compared with cows that did not receive a CIDR. This difference was mainly due to the effects of the CIDR in cows that were likely cycling (calved earlier in the calving season; Figure 2).

**Figure 2.** Interval to conception from initiation of the breeding season at various days postpartum. Days postpartum × treatment ( $P < 0.05$ ). Adapted from Lamb *et al.*, 2008



## Other Considerations

In addition to those protocols listed above, Select Synch, Synchro-Mate B and 14-day MGA/PGF protocols all have been successful methods of synchronizing cows and heifers for natural-service breeding.

Producers wishing to use long-term progestin-based protocols (14-day MGA/PGF, 14-day CIDR, etc.) need to be aware of the fact that long-term exposure to progestins reduces fertility of breeding to the estrus immediately after progestin removal. Based on our current knowledge, if long-term progestin-based protocols are used for synchronizing estrus with natural service, making sure that a window of 16 to 19 days passes prior to the administration of PGF is imperative to ensure adequate fertility.

Much research with modern estrus synchronization protocols has focused on making the window of time during which cows ovulate as small as possible. This small window of ovulation time in a group of cattle is essential for optimization of fixed-time artificial insemination pregnancy rates. Many of these protocols include GnRH administered two to three days after PGF to facilitate fixed-time AI. In the case of bull breeding, **do not administer GnRH** near breeding because cows subsequently may not show estrus and therefore not be bred via natural service.

## Conclusions

Breeding synchronized females with natural-service bulls is a strategy that will work for some producers and not for others. In either case (synchronized or nonsynchronized bull breeding), producers are encouraged to monitor pastures closely for breeding activity and injuries throughout the breeding season. Although not all problems will be seen (such as the case with changes in semen quality after the yearly BSE), identifying issues early in the breeding season will allow time to replace bulls that need to be replaced and salvage the remainder of the breeding season.



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