Western Beef Resource Committee

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Cattle Producer's Handbook

Reproduction Section 430

Using Natural Service in Conjunction with Timed Artificial Insemination

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Development and use of the controlled intra-vaginal drug releasing device (CIDR) and gonadotropin releasing hormone (GnRH) have allowed producers to manipulate the estrous cycle and ovarian activity of beef cows and heifers. This has enabled the development of estrous synchronization protocols that can attain pregnancy success rates of 50 percent or better with timed artificial insemination (TAI; Fig. 1).

Over the past 30 years, a variety of estrous synchronization protocols and products have been researched and developed. This paper discusses two commonly used protocols and how natural service can be incorporated in conjunction with A.I. A complete description of proven estrous synchronization protocols is available at: http://westcentral.unl.edu/beefrepro/resources.html.

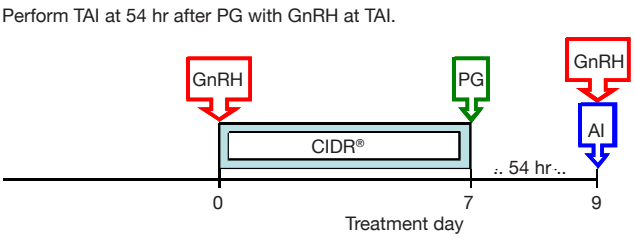

Fig. 1. Timeline for the estrous synchronization of beef heifers via the CO-Synch + CIDR® protocol (TAI = timed artificial insemination; PG = prostaglandin F_2; GnRH = gonadotropin releasing hormone; CIDR = controlled intra-vaginal drug releasing device).

Nevada and Oregon field studies suggest that incorporating the use of bulls into synchronization and TAI protocols can increase first-service pregnancy rates to levels as high as 70 percent. From 2004 to 2006, over 1,200 well-developed and cycling yearling heifers were synchronized and bred on four cooperating commercial ranches. Two protocols for yearling replacement heifers were examined. The goals in using these protocols were to impregnate as many heifers as possible (with the majority being bred to A.I.) while keeping costs to a minimum.

The first protocol involved CO-Synch + CIDR (Fig. 1) with exposure to fertile bulls (1 bull to 15 heifers) during two periods after CIDR removal: (1) for 48 hours immediately after CIDR removal, and (2) beginning 84 hours after CIDR removal (Fig. 2). Insemination via TAI occurred at approximately 65 to 70 hours after CIDR removal instead of the standard 54 ± 2 hours, which is recommend for the CO-Synch + CIDR protocol.

The second estrous synchronization protocol that was evaluated included the CO-Synch protocol without the use of a CIDR (Fig. 1 minus CIDR). The same bull-to-heifer ratio (1:15) was used, but heifers were exposed to fertile bulls for a longer period

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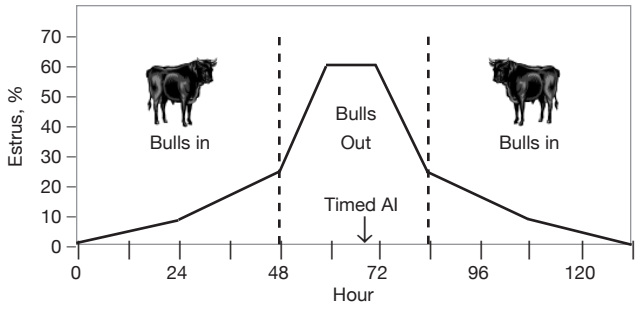

Fig. 2. Estimated proportion of well-developed yearling beef heifers expected to be in estrus after administration of the CO-Synch + CIDR estrous synchronization protocol, and timing for exposure to fertile bulls (CIDR removal and prostaglandin injection occurred at hour 0).

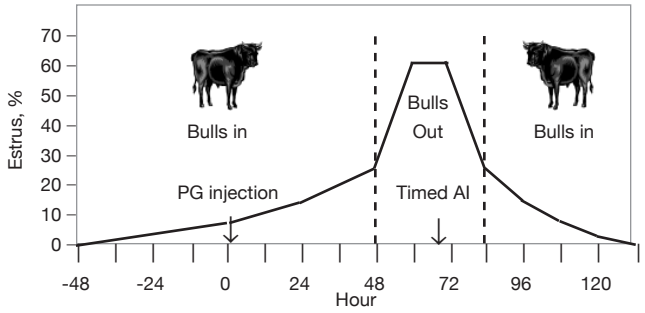

Fig. 3. Estimated proportion of well-developed yearling beef heifers expected to be in estrus after administration of the CO-Synch estrous synchronization protocol, and timing for exposure to fertile bulls (prostaglandin injection occurred at hour 0).

before TAI—from 48 hours before prostaglandin (PG) injection until 48 hours post PG (Fig. 3). Timed A.I. occurred at approximately 68 to 72 hours post-PG injection. Bulls were re-introduced to heifers beginning 84 hours post-PG injection.

Based on calving results, the first-service conception rates for both protocols ranged from 50 to 70 percent. In both years, the CO-Synch + CIDR protocol yielded slightly better results than CO-Synch alone. Also, observations indicate that the CO-Synch + CIDR heifers had tighter synchrony of estrus at TAI. It was noted that bulls exposed to CO-Synch heifers were more active before removal (at 48 hours after PG) vs. the CO-Synch + CIDR heifers. Since some heifers receiving the CO-Synch treatment often exhibit estrus before PG, it's feasible that bulls could have been introduced to heifers at the time of the first GnRH injection.

As stated earlier, the recommended timing for TAI of heifers receiving the CO-Synch + CIDR protocol is 54 ± 2 hours. This recommendation is primarily based on delivery of semen at the optimum time for the majority of heifers within a group. This recommendation balances the heifers that come into estrus right away after PG (within 48 hours) and the heifers that come into estrus later (84 hours or more after PG), as well as the time when most heifers would be expected to ovulate in response to a second injection of GnRH at TAI. When bulls are incorporated into the protocol, heifers that are in estrus early and late can be covered. This allows TAI to occur at a slightly later time, which might be a more appropriate time for the majority of the heifers.

In the Nevada and Oregon studies, GnRH was administered at TAI as per the protocol outlined in Fig. 1. The authors question if this second GnRH injection is necessary when incorporating natural service into a TAI program. Since heifers in estrus after 84 hours post PG would be covered by natural service anyway, it's possible that the second injection of GnRH at TAI is unnecessary to increase the overall pregnancy response to estrous synchronization. However, it could provide an opportunity for more heifers to conceive to A.I.

Two of the cooperating ranches removed heifers that were in standing estrus at 48 hours post PG (when bulls were removed). These heifers were not inseminated since they were assumed to be already bred by the bulls. This eliminated the cost of semen for approximately 8 percent of the heifers. It might also be feasible to add a low cost estrus detection aid (e.g., latex paint) to the tail head of each heifer at the time of PG to identify those already bred by natural service.

A concern of one cooperator was the challenge of distinguishing between calves sired by A.I. or natural service. In this case, the A.I. sires used were Herefords while clean-up bulls were Angus and all of the heifers were Angus. The remaining cooperators did not make efforts to identify if calves were sired by A.I. or natural service since the primary goal was to economically breed as many heifers in the first cycle as possible without estrus detection.

Conclusions

Based on field research, incorporating natural service into a TAI estrous synchronization program can boost overall conception rate by as much as 20 percent. This can help to increase the number of calves born early in the calving season, thereby yielding more pounds of calves to sell at weaning. In many cases, A.I.-sired calves cannot be identified from natural service sired calves. Semen cost can be reduced if cycling heifers are removed along with the bulls at 48 hours after PG and, optimum timing for bull removal and TAI for each protocol has not yet been established. Further research is needed before protocols can be recommended for use with mature cows.

For Further Reading

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