Development and use of the controlled intravaginal drug releasing device (CIDR) and gonadotropin releasing hormone (GnRH) has allowed producers to manipulate the estrous cycle and ovarian activity of the beef cow and heifer. This has allowed us to develop heat synchronization protocols that reach pregnancy success rates of 50 percent or better with timed or scheduled artificial breeding (figure 1).

Nevada and Oregon field studies show that incorporating the use of bulls into synchronization and timed artificial insemination can increase first-service pregnancy rates to as high as 70 percent.

From 2004 to 2006, over 1200 well developed and cycling yearling heifers were synchronized and bred on four cooperating commercial ranches. Two protocols for yearling replacement heifers were examined, one utilizing CO-Synch + CIDR (Figure 1) with exposure to fertile bulls (1 bull to 15 heifers) from time of CIDR removal to 48 hours and again at 84 hours (Figure 2). Timed AI breeding occurred at 65 to 70 hours instead of the standard 54 ± 2 hours recommended for the CO-Synch + CIDR protocol. The goals with this protocol included getting as many heifers bred in the first cycle as possible (with the majority bred to AI) while keeping costs to a minimum.

Figure 1. Beef heifer synchronization CO-Synch + CIDR® Protocol

Perform TAI at 54 hr after PG with GnRH at TAI.

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Figure 2. Proportion and timing of well-developed, yearling heifers expected in estrus following CIDR removal and prostaglandin injection (hour 0) on the CO-Synch + CIDR protocol.

The second protocol evaluated was the CO-Synch protocol without a CIDR (Figure 1 minus the CIDR). The same bull to cow ratio of 1:15 was utilized and heifers were exposed to fertile bulls on day 5 following the initial GnRH injection (48 hours before the prostaglandin injection) to 48 hours post prostaglandin injection (Figure 3). Timed AI occurred at 68 to 72 hours post-prostaglandin injection. Bulls were re-introduced at 84 hours post-prostaglandin injection.

Figure 3. Proportion and timing of well-developed, yearling heifers expected in estrus following the CO-Synch protocol.
Calving results suggest that 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. Observations showed the CO-Synch + CIDR groups had tighter synchrony at scheduled timed breeding. Also, it was noted that bulls were more active prior to removal at 48-hours post prostaglandin with the CO-Synch only versus the CO-Synch + CIDR protocol. Because some heifers receiving the CO-Synch only treatment will exhibit estrus before the PG injection, bulls could be introduced at the time of the 1st GnRH injection.

Recommended time of timed AI for heifers receiving the CO-Synch + CIDR protocol is 54 +/- 2 hours. This recommendation is primarily based on semen delivery at the most optimum time for the majority of heifers within a group. This recommendation balances the heifers in estrus early (within 48 hours after prostaglandin) with the heifers in estrus later (those after 84 hours) as well as selecting a time when most heifers would be expected to ovulate in response to an injection of GnRH. When incorporating bulls into the process, the heifers in estrus early and late are covered. This allows timed AI at a slightly later hour, inseminating at a more optimum time for the majority of the heifers. In the Nevada and Oregon studies, GnRH was administered at timed AI as per the protocol outlined in Figure 1. Researchers question if this second shot of GnRH is necessary when incorporating natural service into the timed breeding program. It is theorized that heifers cycling after 84 hours would be covered by natural service thus making the second shot of GnRH at timed AI unnecessary, but it does provide an opportunity for more heifers to conceive to AI.

Two of the cooperating ranches removed heifers in standing heat at 48 hours when they removed bulls. These heifers were not artificially inseminated as they were assumed already bred by bulls. This saved semen cost on approximately 8 percent of the heifers. It might also be feasible to add a cheap heat detection aid (such as latex paint) to the tail head of heifers at the time of PG to identify heifers already bred by natural service. A concern of one cooperator was being able to distinguish between AI sired and natural service calves. In this case AI sires used were Hereford while clean up bulls were Angus. All heifers were Angus. Other cooperators did not make an effort to identify AI sired from natural service calves because the primary goal was to economically get as many heifers bred in the first cycle as possible without heat detection.

In summary, incorporating natural service into a timed breeding AI program can boost conception rates as much as 20 percent. This will increase the number of calves born early in the calving season, thereby yielding more pounds of calves to sell at weaning. In many cases AI sired calves cannot be identified from natural service sired calves. Semen cost can be reduced if cycling heifers are removed with the bulls at 48 hours. Optimum timing of bull removal and time of insemination for each protocol is yet to be established and needs to be researched further before recommending protocols for use with mature cows.

Literature Review


