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VM200

Is It Worth Switching from Natural Service to Artificial Insemination? A Comparison of Reproductive Performance and Profitability in Dairy Herds[1]

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Introduction

Reproductive efficiency is a key determinant of dairy cow profitability (Galvão et al. 2013). Natural service (NS) has been used as an alternative breeding program to avoid problems with detection of estrus. In fact, a considerable portion of dairy producers in the United States still use NS in at least part of their breeding program (De Vries et al. 2005; NAHMS 2009). Approximately 25% of the dairy calves born in the United States are from cows sired by NS (NAHMS 2009). Observational studies comparing NS with artificial insemination (AI) after detected estrus—or a combination of detection of estrus and timed AI (TAI)—demonstrate that, in general, reproductive performance is not altered (De Vries et al. 2005) or is worse for natural service. In many dairy farms using a combination of AI and natural service, cows initially are AI one or more times and are then moved to bull breeding groups (Overton and Sischo 2005); however, it is unclear how many AI cows should receive before being exposed to bulls to maximize pregnancy rate. This is particularly important in herds managing reproduction without the aid of estrous detection, as the interval between inseminations is determined by when a cow can be resynchronized for AI. Another important factor to consider is the profitability of programs that use NS or AI.

Therefore, the objective of this publication is to present the results of papers written by Lima et al. (2009, 2010, and 2012) that compared the reproductive performance and profitability of dairy cows that were submitted to natural service or a combination of time AI and natural service.

Reproductive Performance of Cows Submitted to NS or AI

In a large study conducted by Lima et al. (2009) comparing NS and TAI, 1,055 cows were blocked by parity and enrolled to receive either NS or TAI. Cows in both groups were presynchronized with two injections of $PGF_{2\alpha}$ given at 42 and 56 days postpartum. Fourteen days after the last $PGF_{2\alpha}$ injection, cows in the TAI group were enrolled in an Ovsynch protocol for TAI. Cows were started on the Ovsynch program seven days before pregnancy diagnosis on day 32, and nonpregnant cows finished the program. Nonpregnant cows were resynchronized up to five times. Cows in the NS group were exposed to bulls 14 days after the second $PGF_{2\alpha}$ injection, and ultrasonography was performed 42 days after exposure to bulls to determine pregnancy status. Nonpregnant cows in the NS group were re-examined by transrectal palpation combined with ultrasound every 28 days until diagnosed pregnant or 223 days postpartum, whichever occurred first. The overall 21-day-cycle pregnancy rate was not different between

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groups (25.7% and 25.0% for NS and TAI, respectively). However, the daily pregnancy rate was 15% higher for NS, which resulted in fewer median days open (111 vs. 116 days) and more cows pregnant at the end of the breeding period (223 days postpartum) (84.2% and 74.8% for NS and TAI, respectively). One of the problems with only TAI is the long inter-AI interval. Cows can only be subjected to another insemination once a nonpregnancy diagnosis is performed. Thus, the combination of timed AI and NS could potentially benefit reproductive performance. In a subsequent study, cows were subjected to one timed AI or with three timed AI before exposure to natural service (Lima et al. 2012). Increasing the number of AI improved reproductive performance of dairy cows. Cows receiving three TAI had 17% greater pregnancy rate than one TAI, which resulted in a decrease of nine days in the median days open for the group receiving three TAI compared with the group receiving one TAI. Therefore, in dairy herds that use a combination of AI and NS, allowing cows additional opportunities to AI before onset of breeding with bulls is expected to improve reproductive performance.

Economic Analysis of NS and AI

In a follow-up study, Lima et al. (2010) evaluated the profitability of NS and AI programs based on the data from Lima et al. (2009). A herd budget accounting for all costs and revenues was created. Net cost during the field study for the NS program was $100.49/cow per year, and the TAI program was $67.80/cow per year—unadjusted for differences in voluntary waiting period for first insemination (VWP) and pregnancy rates (PR). After inclusion of the differences in VWP and PR, the economic advantage of the TAI program was $9.73/cow per year (Table 1). Sensitivity analysis revealed that if the marginal feed cost increased from $3.11 (default) to $5.00/hundredweight (cwt; 1 cwt = 45.36 kg), the advantage of TAI increased to $48.32/cow per year. In addition, higher milk prices and greater genetic progress increased the advantage of TAI. When semen price increased from $6 (default) to $22, the NS program had an economic advantage of $33.29/cow per year. If each NS bull was replaced by an additional cow, the advantage of the TAI program was $60.81/cow per year.

Conclusion

In conclusion, reproductive performance may not be significantly affected when switching from NS to TAI, but profitability is usually increased. Nonetheless, any advantage of TAI depends greatly on cost of feeding bulls, semen price, and genetic merit of semen.

Table 1. Economic returns ($/cow per year) for the natural service (NS) and the timed AI (TAI) programs

Item	TAI	NS
Milk sales	4,113.56	4,101.68
Cow sales	109.21	111.99
Calf sales	156.27	153.78
Replacement cost	518.76	531.96
Feed cost	1,205.59	1,203.75
Reproductive cost	100.49	67.80
Other variable cost	730.00	730.00
Net return	1,833.94	1,824.20
Difference between TAI and NS	9.74	—

Source: Adapted from Lima et al. (2012)

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