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Voluntary Waiting Period and Adoption of Synchronized Breeding in Dairy Herd Improvement Herds

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ABSTRACT

Voluntary waiting period and adoption of synchronized breeding (ovulation synchronization followed by timed artificial insemination) were characterized from 33 million services of Holsteins and Jerseys in Dairy Herd Improvement herds. Calving month, calving year, and parity had large effects on days to first service for both breeds. Holstein cows that calved during March and April were bred later than those that calved during other months (February and March for Jerseys), whereas cows that calved during September and October were bred earlier. First-parity cows had longer days to first service than did second-parity cows. Herd-year voluntary waiting period was measured as the days postpartum by which 10% of cows had received a first insemination. Median days to reach 10% of cows bred were 55.5 d. Over 65% of herds had 10% of cows inseminated by 60 d postpartum, the voluntary waiting period assumed for national evaluations for daughter pregnancy rate. Herd-years with synchronized breeding at first insemination were identified through χ^2 analysis based on deviation of observed frequency of first inseminations by day of the week from an expected equal frequency and by the maximum percentage of cows inseminated on a particular day of the week. Herds that were identified as having synchronized breeding had fewer days to first service (17.0), more services (0.16/cow), and fewer days open (9.1) than did herds that were classified as having traditional estrus detection. Synchronized herds also had a standard deviation for days to first service that was only 38% as large as that for herds that bred on observed estrus. Adoption of synchronized breeding for first services steadily increased from 1.9% of herd-years (2% of cows) for 1996 to 19.9% of herd-years (34.9% of cows) for 2005. Procedures for genetic evaluation of daughter pregnancy rate should be examined to determine if herd regimen for reproductive management affects results.

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INTRODUCTION

Voluntary waiting period (**VWP**) is a key management decision in which the herd manager designates a target number of days postpartum after which cows will be inseminated. The interval from calving to first insemination provides time for uterine involution. Within a herd, the VWP may be flexible (e.g., cows that were observed in estrus a few days before a fixed VWP might be inseminated before the target date). Also, some herds may have variable VWP (e.g., longer for high producers or for first-parity cows). A VWP of 60 d is assumed for calculating national genetic evaluations for daughter pregnancy rate (VanRaden et al., 2004).

One factor in choosing a VWP for lactating cows is that conception rate is expected to increase as days postpartum increase (Britt, 1975; Tenhagen et al., 2003), which may be partly related to milk yield. Washburn et al. (2002) reported that days to first service (**DFS**) after calving have increased over time in southeastern US herds. Faust et al. (1988) found that milk yield negatively affects conception rate. Some researchers have hypothesized that this antagonism is related to negative energy balance or body condition during early lactation (Britt, 1975; Moreira et al., 2000) or to impaired expression of estrus (Harrison et al., 1990). Tenhagen et al. (2001, 2003), however, found no effect of level of milk yield on conception rate after timed AI (**TAI**).

Reducing VWP is tempting because of associated reductions in calving interval. Williamson et al. (1980) reported that a 1-d reduction in DFS decreased calving interval by 0.86 d. Linderoth (2005), however, recommended a VWP of >60 d because 20 to 30% of cows were anovulatory at 60 d. Cows that conceive too early during lactation may need to be dried off when milk yield is still relatively high (Britt, 1975; Plunkett et al., 1984; Linderoth, 2005). Olson (2004) discussed choosing a VWP relative to parity and noted a trend for greater lactation persistency for first-parity cows and a need for longer dry periods. Weller and Folman (1990) suggested that an economically optimum VWP is at least 2 wk longer for first parity than for second. Tenhagen et al. (2003) advocated a VWP of >73 d for TAI regimens.

Various protocols to synchronize estrus or ovulation among cows have been investigated. Pursley et al. (1995) developed a method of synchronized ovulation by administering GnRH at a random stage of the estrous cycle, $PGF_{2\alpha}$ 7 d later, and GnRH again 48 h after $PGF_{2\alpha}$. A TAI was given to all cows 20 to 24 h after the second GnRH injection. Subsequently, Pursley et al. (1997a,b) compared the effectiveness of this protocol (Ovsynch) with traditional reproductive management (daily detection of estrus, a.m.-p.m. breeding rule, and occasional use of $PGF_{2\alpha}$ or GnRH); a VWP of 50 d was chosen. Median days open and DFS were fewer for treated than for control cows; pregnancy rate for first AI service was similar for treated and control cows. Rabiee et al. (2005) presented a meta-analysis review of results from 53 published reports on the Ovsynch protocol as well as other synchrony programs such as $PGF_{2\alpha}$ injections, Heat Synch, Select Synch, and modified Ovsynch. They concluded that conception and pregnancy rates from first inseminations with the various modified synchronization protocols were comparable with those from Ovsynch. Because all cows received first inseminations at a predetermined time, however, the Ovsynch-treated cows had much greater pregnancy rates at first insemination than did cows inseminated after observed estrus.

Tenhagen et al. (2003) evaluated the effects of lactation stage and level of milk yield on conception rates and pregnancy rates of 1,288 German Holsteins in which ovulation was synchronized with the Ovsynch protocol. For cows with similar yield, first-service conception rates were less for cows synchronized earlier during lactation than for those synchronized later. Level of milk yield had no effect on conception rates after TAI in cows synchronized at similar DIM. At 200 DIM, fewer high-yielding cows were pregnant than cows with mean or low production, regardless of DIM when ovulation was synchronized. Subsequently, Tenhagen et al. (2004) compared a synchronized breeding protocol with traditional AI administered after detected estrus in 2 German commercial dairy herds. Ovsynch reduced interval to first service after calving and days open in both herds and reduced culling for infertility in the herd with poorer rates of detected estrus. Conception rate at first service, however, was greater for those cows inseminated after detected estrus than for those receiving TAI in both herds. Tenhagen et al. (2004) concluded that synchronized breeding is more beneficial for herds with poor detection of estrus. Goodling et al. (2005) found that days open for herds with timed insemination were 17 d fewer than for herds with insemination after observed estrus.

Various strategies can be used to synchronize breeding (Stevenson and Phatak, 2005). Stevenson (2004, 2005) suggested that first service after calving could be based on customary AI after detected estrus and then an Ovsynch protocol could be applied to cows diagnosed open for subsequent AI services and also restated the importance of detection of estrus.

Research is needed to determine whether genetic evaluation procedures for daughter pregnancy rate need to be modified to account for reproductive-management regimen. Goodling et al. (2005) studied 64 progeny-test herds that were using a variety of reproductive-management regimens. Synchronized breeding did not affect heritability of DFS, days open, or pregnancy rate at 120 d. Goodling et al. (2005) recommended investigating a possible interaction between sire and management regimen and adjusting genetic evaluations for heterogeneous variance. Data submitted to USDA to calculate national evaluations for daughter pregnancy rate have no designation for the type of herd reproductive-management regimen (VanRaden et al., 2004). Identification of herds that definitely practice synchronization and those that definitely use traditional estrus-detection programs would be useful.

Objectives of this study were to 1) document variation in DFS, 2) determine consistency of herd VWP over time, 3) investigate possible criteria for identifying herds with synchronized breeding regimens (ovulation synchronization followed by TAI) for first inseminations, 4) characterize use of synchronized breeding over time, and 5) determine differences in DFS and days open between herds with traditional estrus-detection programs and those with synchronized breeding.

MATERIALS AND METHODS

Data

Data were records for 33 million Holstein and Jersey inseminations in DHI herds from 1995 through 2005 that included calving date, service date, and service sire. Data were primarily from Dairy Records Management Systems (Raleigh, NC, and Ames, IA) and AgSource (Verona, WI). Herd-years with <30 first services were excluded; 136,691 herd-years remained for analysis of first inseminations.

Variation in DFS and VWP

Least squares analyses of DFS were conducted separately for Holsteins and Jerseys. The model included