Aggressive Management Strategies for Improving Reproductive Efficiency in Lactating Dairy Cows

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Take Home Messages
- ➢ Reproductive efficiency and dairy farm profitability are maximized when the average calving interval for a herd is around 13 months.
- ➢ Current indices of reproductive performance based on average service and conception rates for lactating dairy cows result in calving intervals that fail to meet and often greatly exceed the goal of a 13-month calving interval.
- ➢ New reproductive tools, which include hormonal protocols for conducting timed AI and use of transrectal ultrasound, can improve reproductive efficiency and profitability for a dairy operation.

❑ The Economics of Calving Intervals

Timely rebreeding of postpartum lactating cows is essential for reducing average days open and the corresponding calving interval. A successful breeding program enhances profitability by maximizing the time cows spend in the most productive portion of lactation.

Table 1. Predicted annual returns from a dairy cow with varying calving intervals (Jones, unpublished data)*

Calving Interval Weeks (Months)	Annual Return ($)	Difference from 56 Weeks ($)
56 (13)	959.18	-
60 (14)	936.78	-23.04
64 (15)	909.65	-50.17
68 (16)	879.49	-80.33
72 (17)	847.13	-112.69
76 (18)	813.19	-128.63

*Assumptions of the model: peak milk production at week 8 = 101 lbs; milk production over 305 days = 26,719 lbs; daily decline in production from peak to end of lactation = 0.1844%; initiation of rbST treatment = 63 DIM; initial rbST response = 8 lbs; dry period = 56 days; lactations per cow before culling = 3; replacement cost = $1,400; cull cow value = $450; value of calf = $100; milk price = $13/cwt.

For each cow in the herd, the calving interval can be subdivided into the following four intervals: 1) the voluntary waiting period (VWP), or the interval from calving until a cow is eligible to receive her first AI service; 2) the interval from the end of the VWP to first AI service; 3) the interval from first AI service until conception; and 4) the gestation period. Because each cow in the herd must progress consecutively through these four periods, each interval represents a management opportunity to optimize the average calving interval of the herd. Understanding the factors that regulate the duration of each of these intervals and the management opportunities these intervals present will provide insight into aggressive strategies for managing reproductive efficiency in a dairy herd.

Voluntary Waiting Period (VWP)

The interval that must elapse from calving until a cow is eligible to receive her first AI service is termed the Voluntary Waiting Period (VWP). As the name implies, the duration of this interval is voluntary (i.e., a management decision) and traditionally varies from 40 to 70 days on most dairies. The VWP constitutes part of the transition period immediately after calving and represents a significant risk to the future health and productivity of the cow. Cows often experience physiologic disorders including, retained placenta, metritis, ketosis, displaced abomasum, and cystic ovarian disease during the VWP. Recent advances in transition cow management such as feeding transition rations and monitoring rumen motility and body temperature can minimize many of these complications. Major reproductive events that occur during the VWP include initiation of lactation, uterine involution, and the first postpartum ovulation and resumption of reproductive cyclicity.

because the VWP may vary among individual cows within the herd, the decision to AI a cow for the first time postpartum is often determined based on when (or if) a cow is detected in estrus rather than on a predetermined management decision. In such instances, the cow is managing the decision to breed rather than the dairy manager. I believe the decision to inseminate a cow before the VWP elapses is motivated by one factor, and that factor is fear. Most producers fear the decision to not breed a cow detected in estrus because she may not be detected in estrus again

For dairies relying on visual estrus detection to breed cows, the duration of this period is primarily determined by estrus detection efficiency and, to a lesser extent, the physiologic status of individual cows within the herd. Based on the utopian assumptions that 1) all cows within the herd are cycling by the end of the VWP, 2) estrous cycle duration is 21 days, and 3) estrus detection efficiency is 100%, the average duration of this period for all cows in the herd would be 10.5 days. Under field conditions, the duration of this period is much longer for several

until much later in lactation. Unfortunately, this risk is often realized on dairies that rely on visual estrus detection for AI because of poor estrus detection by dairy personnel and poor estrus expression by lactating dairy cows.

Interval from the VWP to First AI Service

Once a cow has passed the VWP, she becomes eligible to receive her first postpartum AI service. The interval from the VWP to first AI service varies dramatically among individual cows within the herd. A few cows may receive their first AI at or near the end of the VWP, whereas other cows often experience extended intervals to first AI service for a variety of reasons. Thus, this interval is calculated as an average for all cows within the herd.

Interval from First AI Service to Conception

The interval from first AI service to conception represents the rate at which cows become pregnant in the herd and varies dramatically among individual cows within the herd. The rate at which cows become pregnant in a dairy herd, commonly called the pregnancy rate, is defined as the number of eligible cows in a herd that conceive every 21 days. Two factors that determine pregnancy rate are: 1) services per conception or conception rate, and 2) estrus detection rate or service rate. Thus, a few cows may conceive to first AI, whereas other cows require several services to establish pregnancy. On many dairies, the mathematical inverse of the conception rate or the number of services per conception is calculated. Thus, this interval is calculated as an average for all cows within the herd.

The key to decreasing the interval from first AI service to conception lies not with improving conception rate beyond that which is "normal" for lactating cows, but with improving the AI service rate. Service rate is defined as the percentage of eligible cows bred during a 21-day period. In herds using AI, the service rate directly reflects estrus detection efficiency because a cow must first be detected in estrus before she can be bred. Unfortunately, less than 50% of all estrus periods are accurately detected on an average dairy farm in the United States (Senger, 1994). Economic cost analysis of improving the estrus detection rate (i.e., service rate) by 20 to 30%, and assuming a 50% AI conception rate, resulted in an estimated annual benefit of $83 per cow (Pecsok et al., 1994).

Table 2. Predicted average calving interval for a dairy herd based on average or poor reproductive management.

Interval (days)	Average Reproductive Management	Poor Reproductive Management
Voluntary Waiting Period (VWP)	50	40
End of VWP to first AI service[a]	21	62
First AI service to conception[b]	105	165
Gestation	282	282
Average Herd Calving Interval	458 days (>15 months)	549 days (>18 months)

[a]Based on a service rate of 50% for average reproductive performance, 30% for poor reproductive performance.
[b]Based on a 50% service rate and a 40% conception rate for average reproductive performance; 30% service rate and 40% conception rate for poor reproductive performance.

Aggressive Reproductive Management Strategies

- ➤ **Eliminate the Interval from the VWP to First AI Service**
  Timed AI programs such as Ovsynch are powerful tools for improving reproductive efficiency in a dairy operation.

- ➤ **Improve AI Service Rate and Pregnancy Rate**
  Use of timed AI programs such as Ovsynch improves pregnancy rate by improving AI service rate.

- ➤ **Identify Nonpregnant Cows Early and Return them to AI Service**