MANAGING REPRODUCTION WITH TECHNOLOGIES AND HORMONES

WHAT IS THE SWEET SPOT?

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Reproductive management on dairy farms has evolved dramatically over the past decades. Much of this progress stems from improvements in two critical components of any reproductive program: AI service rate (how quickly eligible cows are inseminated or re-inseminated) and fertility following insemination (Pregnancy/AI). In a previous article, we noted that around 2001, conception rates had reached historic lows, approximately 30% for first-lactation cows and 27% for cows in second or greater lactations.

A major turning point occurred soon after the development of hormonal synchronization programs, beginning with the original Ovsynch publication in 1995. Originally, Ovsynch did not improve conception rates but overcame the limitations associated with visual detection of estrus, thereby increasing the AI service rates. Subsequently, the development of presynchronization and resynchronization programs brought meaningful gains in fertility, to the point where these programs began to be referred to as fertility programs rather than simply timed-AI protocols. Since then, conception rates in lactating herds have steadily increased, surpassing 40% by 2024.

Additionally, the widespread adoption of activity monitors over the past decade has further enhanced AI service rates. The combined use of synchronization/fertility programs and activity-monitor technology has contributed substantially to the improvements in conception rates observed today.

Interestingly, reproductive hormones themselves, prostaglandin and GnRH, were commercially available long before synchronization programs became mainstream, with both products entering the market in the early 1980s. Activity monitors are not new either; the first pedometer was patented in the U.S. during that same decade. But only in the recent decade have activity systems surged in popularity, driven by major advances in 3-D accelerometer technology, improved accuracy, and the integration of additional physiological indicators such as rumination, temperature, and respiration. These added metrics have strengthened the value of activity systems not only for estrus detection but also for transition-cow health monitoring and nutritional management. Today, many farms are adopting activity-monitoring tools, and a common question is how to best leverage these systems to enhance reproductive performance.

From a reproductive standpoint, this article focuses on getting cows pregnant in a timely and efficient manner.

THE IMPORTANCE OF FIRST SERVICE

First service is the cornerstone of efficient reproductive performance. Conception rates vary depending on several factors including health status, season, geography, management strategy, and compliance. While it is absolutely possible to achieve first-service conception rates above 50%, benchmark data from the mySYNCH community including over 1 million of lactating cows across the U.S. show averages of 47% for first-lactation animals and 44% for cows in second and greater lactations.

Today, producers generally rely on one of two well-established strategies for first service:

1. Prioritize heat detection, or
2. Breed all cows via timed-AI (TAI).

More recently, universities have developed hybrid models using heat-detection data from activity monitors to identify cows likely to benefit more from one strategy versus the other. These newer approaches fall under the umbrella of *Targeted Reproduction Management* (TRM).

STRATEGY 1: PRIORITIZING HEAT DETECTION

This remains a very common strategy, especially among farms wishing to reduce hormone use or those limited in specialized labor. The typical model uses a Presynch-Ovsynch program: cows showing estrus after the first or second prostaglandin injection are bred, and all remaining cows receive a "back-door" Ovsynch to ensure they eventually get their first breeding.

A few important considerations:

Anovular cows matter. Not all cows will express estrus, simply because not all of them resume normal ovarian cycles as early as expected. Research consistently shows that 7% to 42% of cows may be anovular at 65 DIM, with most herds falling around 19–25%. Therefore, skipping the back-door Ovsynch could delay or completely miss breeding these cows.

Practically, farms should expect to breed 70–80% of eligible cows when prioritizing estrus detection. If actual results are far below that, the herd likely has:

▶ A higher-than-normal anovular rate,

▶ Poor estrus detection due to compliance issues, or

▶ Poor estrus expression due to environmental constraints such as heat stress, overcrowding, and other management factors.

Higher twinning risk: Farms that breed most cows in estrus, especially high-producing herds, frequently observe twinning rates around 4%. While not an immediate "problem," twinning increases the risk of dystocia, retained placenta, and metritis. In other words, prioritizing heat detection requires extremely sharp transition-period management.

Where activity monitoring shines: Activity monitors remove the need for tail chalking, saving significant labor and supply cost. They also provide a "heat intensity" score indicating estrus quality. A cow in heat should still be bred regardless, but heat-intensity information helps identify cows that might benefit from additional support.

For example, a TRM strategy may involve administering GnRH at insemination for cows with low-quality heat alerts (below the herd median). Research from the University of British Columbia showed a 22% improvement in conception (from 31% to 38%) in low-intensity estrus cows receiving GnRH at AI, whereas cows with strong heat expression did not benefit from the GnRH. High-intensity estrus is strongly associated with larger preovulatory follicles, higher estradiol concentrations, and higher luteal function, which explains their reduced need for GnRH support.

Continued

THE SWEET SPOT

Both TAI and estrus detection work well, but each comes with clear expectations.

STRATEGY 2:
BREEDING ALL COWS VIA TIMED-AI (TAI)

This strategy requires more skilled labor, but its fertility outcomes often justify the investment. In an evaluation through a convenience sample of 49 farms with approximately 145,000 cows across the U.S., farms breeding first service via TAI had higher first-service conception rates relative to the farms prioritizing heat detection (50.8% vs. 42.8%). This aligns with extensive research demonstrating that fertility protocols like Double-Ovsynch improve fertility compared to estrous breedings by establishing a more favorable hormonal profile during follicular development.

Flexibility in voluntary waiting period:
TAI gives producers more control over when first service occurs. For example, if the goal is to breed all cows by 90 DIM, you can begin Double-Ovsynch at 57–63 DIM and achieve TAI between 84–90 DIM. In contrast, Presynch–Ovsynch requires starting earlier (50–54 DIM) and breeding some cows in heat as early as 50 DIM to ensure all cows are bred at least once by 90 DIM.

This means TAI allows:

- A later DIM at the start of the protocols,
- More days for cows to recover from the transition period, and
- More structured and predictable first-service windows.

Of course, compliance is absolutely critical for success.

STRATEGY 3:
TRM – COMBINING BOTH APPROACHES

Targeted strategies generally classify cows based on estrus alerts during the voluntary waiting period.

- Roughly 50% of cows should show at least one estrus alert between 25–50 DIM.
- These cows are more likely to exhibit estrus again and tend to conceive well from first service.
- They may be bred off estrus alone; however, research indicates that these cows respond even better to fertility protocols than if bred in estrus.

Cows without an estrus alert during the VWP are less fertile and less likely to show heat later. These cows strongly benefit from synchronization to ensure timely insemination.

So while TRM refines decision-making, the core question remains the same: Do we breed using TAI or estrus detection?

Where activity systems truly excel: Resynchronization

Activity monitors shine even brighter during resynchronization. Their ability to identify non-pregnant cows weeks before a scheduled pregnancy check allows producers to rebreed cows faster and more efficiently, improving overall reproductive momentum, shortening the interval between breeding events.

So what is the sweet spot?

Research evidence strongly supports the following:

The most consistently successful strategy is breeding all cows via a fertility program for first service, then aggressively rebreeding open cows that express estrus for later services.

This approach:

- Gives more time to cows to recover from the transition period,
- Helps fix anovular cows with the use of multiple GnRH treatments,
- Reduces the number of cows requiring multiple services due to lower number of open cows after the first AI,
- Maximizes the benefit of activity monitoring systems for cows returning in estrus, and
- Maintains structured, predictable reproductive flow.

In summary, both strategies can work well, but each comes with clear expectations. If relying on activity monitors and heat detection for first service, cows must start showing heat early, transition management must support quick recovery, and a back-door Ovsynch is needed to ensure anovular cows and those that don't show estrus still get bred on time. In contrast, breeding all cows via Timed-AI for their first service generally yields higher conception, and offers more flexibility in timing first service without risking delays. ∎

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