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## Synchronized Breeding Programs in Canadian Dairy Herds: Attitudes and Opportunities

By Jeffrey Wichtel, BVSc, PhD, Dipl ACT; Stephen LeBlanc, DVM, DVSc; and Luc DesCôteaux, DMV, MSc, Dipl ABVP (Dairy)

A synchronized breeding program (SBP) is any protocol that uses exogenous hormones to synchronize the estrous cycle and is routinely applied to groups of cows. SBPs are designed to assist producers in obtaining pregnancies in cohorts of cows, primarily by restricting the periods during which producers need to detect estrus, or by eliminating the need to detect estrus. Recent survey results suggest that SBPs are underutilized in Canadian dairy herds. There is a continuing reliance on traditional approaches to solving reproductive problems, with an emphasis on treating individual or problem cows after veterinary examination. This approach does not take advantage of the potential economic benefits that systematic SBPs can offer in many herds. The decline in reproductive efficiency in North American dairy herds is well-documented and economic modeling suggests that most herds would benefit from some form of systematic SBP. Veterinarians should encourage wider use of SBPs as a means to enhance herd profitability. This issue of *Large Animal Veterinary Rounds* examines the background and the results of the *First Canadian Consensus on Synchronized Breeding Programs in Dairy Herds*, 2003.

### Introduction

Reproductive performance is an important determinant of dairy herd profitability. Evidence continues to accumulate that the national dairy herds of the United States (US) and Canada are experiencing a sustained and significant decline in reproductive performance. Both the Ontario Dairy Herd Improvement (DHI) Corporation and the Programme d'Analyse de Troupeaux Laitiers du Quebec (PATLQ) reported an increase in calving interval of about 2 days per year between 1993 and 2002.<sup>1</sup> The number of days open (days from parturition to conception) for 532 Holstein herds in the southeastern US increased from 126 days for the period 1976-78 to 172 days for the period 1997-99.<sup>2</sup> These changes may, in part, be the result of competition between reproductive performance and increasing milk yield; however, many other factors such as herd size, personnel management, housing, use of bovine somatotropin (bST), genetic selection, and decisions related to time of breeding likely play important roles.<sup>3</sup>

The increase in average days open in artificially inseminated dairy herds is likely mediated, in part, through a reduced ability to identify behavioural estrus. Washburn and co-workers found that heat detection rates declined from 51% in the period 1985-1987, to 42% for the period 1997-1999 for Holstein herds in the southeastern US, and this trend is probably mirrored in Canadian herds.<sup>2</sup> Increasing use of confinement housing on concrete may be an important factor affecting this trend.<sup>3</sup>

A declining ability to detect behavioural estrus may explain the increased interest in the use of synchronized breeding programs that are designed to assist producers in obtaining pregnancies in cohorts of early lactation cows, either by eliminating the need to detect estrus, or by restricting the periods during which producers need to detect estrus. The definitions of common terms used when discussing reproductive performance in cattle are shown in Table 1.



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**Table 1: Definitions of common reproductive terms**

- **Synchronized breeding program (SBP):** Any protocol that uses exogenous hormones to synchronize the reproductive cycle of a cow and is routinely applied to groups of cows.
- **Systematic SBP:** This refers to the enrolment of groups or cohorts of cows in a planned and systematic fashion, generally without the requirement for veterinary examination prior to enrolment.
- **Heat detection rate (HDR):** The probability that an open cow, beyond the voluntary waiting period, will be detected in heat and/or inseminated in a 21-day period. HDR is a measure of estrous detection intensity, but often, as only breedings are recorded, it is estimated using the insemination rate.
- **Conception rate (CR):** The probability that an insemination will result in a diagnosis of pregnancy.
- **Pregnancy rate (PR):** The probability that an open cow will become pregnant in a 21-day period. PR is a reflection of the rate at which cows become pregnant and is approximately equal to  $HDR \times CR$ .

## Synchronized breeding programs

### *Synchronized breeding program protocols currently in use*

An effective SBP can be defined as a practical and cost-effective program that facilitates artificial insemination (AI) by causing cohorts of cows to display estrus and/or ovulate at a predicted time, and achieves an acceptable conception rate following insemination at that ovulation. Presently, there are a great number of SBP protocols in use in dairy herds; however, it should be noted that not all of the drugs mentioned below are currently approved for lactating dairy cattle. The most commonly used protocols can be grouped as follows:

- **Prostaglandin (PG)** protocols: single- and double-prostaglandin  $F_2\alpha$  (PG) protocols (eg, targeted breeding). Treatment with PG following *per rectum* identification of a corpus luteum, while not strictly speaking an SBP, is still the most commonly used PG protocol.

- **Gonadotropin-releasing hormone (GnRH)-PG-GnRH** protocols: for instance, an injection of GnRH is followed in 7 days with an injection of PG and a GnRH injection is given 48 hours (h) after PG, with AI 12–16 h later (Ovsynch) or at the same time as the second GnRH injection (Cosynch). Presynch requires that 2 injections of PG are given 14 days apart with the first injection of the Ovsynch protocol given 12–14 days after the second PG injection. Another variation is Heatsynch, where GnRH is followed by PG 7 days later and an injection of estradiol cypionate (ECP) 24 h after PG, followed by AI 24 h after ECP for cows detected in heat, with AI of all remaining cows 48 h after ECP.

- **Intra-vaginal progesterone (IVP)** protocols: a range of protocols that utilize an IVP device administered for  $\geq 7$  days, with an injection of PG on the last or second-to-last day, with or without the use of GnRH or estradiol at the time of IVP device insertion and/or after removal.

The degree to which heat detection is required with these protocols varies. Whereas most PG-only protocols do not provide sufficient synchrony of ovulation to allow for timed artificial insemination, many of the GnRH- and controlled intravaginal drug release (CIDR)-based protocols provide sufficient synchronization to allow for acceptable conception rates to a single-timed artificial insemination.

### *SBP use in Canadian dairy herds: myth or reality?*

Profitability in US herds, measured by gross margins per cow, is maximized when the pregnancy rate is  $>30\%$ .<sup>4</sup> Economic models show that US herds consistently achieving a pregnancy rate  $<28\%$  can benefit from the use of an SBP.<sup>5</sup> For example, a herd Ovsynch program was modeled against above-average heat detection (16% pregnancy rate) using cost and performance assumptions typical of Canadian herds. Despite increased costs for hormones and semen, more cows were pregnant sooner and there were fewer reproductive culls, resulting in a benefit of \$195 per cow (ie, more than a 6:1 return on investment).<sup>6</sup>

Typical pregnancy rates in North American herds range from 12% to 18%, largely because the heat detection rate is  $<50\%$  in these herds, suggesting that adoption of SBPs should be widespread. Until recently, there have been no objective data on the degree to which these protocols are being used in Canadian herds; however, it would appear from the above figures that the use of SBPs in a systematic fashion has been less than might be expected.

## The First Canadian Consensus on SBPs in Dairy Herds

The First Canadian Consensus on Synchronized Breeding Programs in Dairy Herds was undertaken in 2003 to address the shortfall in information concerning the use of SBPs in Canada and to approve guidelines for the management of SBPs. The consensus panel consisted of 6 veterinarians with expertise in SBPs. The panelists were chosen to represent the full range of SBP users, from practitioners to researchers and from all regions of Canada. The panel met in June 2003 to analyze survey data generated by the North American Veterinary Research Group (NAVRG) to evaluate the current use of SBPs in Canadian herds and to assess the attitudes toward these programs by the users and potential users of SBPs.

### *Methods*

Between January and May 2003, a written survey on SBPs was sent to a random sample of 2000 dairy producers across Canada; 235 producers responded (12% response rate). At the same time, a companion survey was sent to 200 dairy veterinarians and 57 responded (29% response rate). The survey results were interpreted through a structured discussion by the members of the panel. A less structured discussion followed; this discussion concerned the potential for an expanded or more systematic use of these programs to improve reproductive performance in Canadian dairy herds.

**Table 2: Protocol options considered in the survey****Prostaglandin**

- Biweekly PG injections, with or without a PG injection before the end of the voluntary waiting period (eg, 50 days of lactation). PG injections are continued at 14-day intervals until estrus is detected
- Targeted breeding, with or without a PG injection before the end of the voluntary waiting period
- Selected use of PG following rectal palpation by the veterinarian, with AI upon heat detection (Palpation-PG program)

**Gonadotropin-releasing hormone**

- Synchronization of ovulation using Ovsynch
- Presynch (2 PG injections 14 days apart, 12 to 14 days prior to the Ovsynch protocol)

**Other**

- Ovsynch + IVP device, etc. (off-label in lactating cows)
- Heat Synch

PG = prostaglandin; AI = artificial insemination

**Survey results and discussion****SBP use by producers**

No difference in the proportion of SBP users (75%) and non-users was observed between provinces. Reasons given by non-users for their avoidance of SBPs included:

- an aversion to the use of hormones and/or overuse of injections (due to a perception of hormone use being unnatural or otherwise undesirable)
- a perception that their herd was too small to justify the use of SBPs (80% of dairy producers responding had <80 lactating cows)
- a perception that there was no problem with reproduction in their herd
- cost.

The figure of 75% for SBP users may be an overestimation. Despite the definition of SBP given in the questionnaire, there was some misunderstanding by producer respondents as to what constitutes an SBP. Some respondents who claimed to be using SBPs may in fact be producers who use hormonal protocols on individual problem breeders rather than using SBPs systematically on groups or cohorts of cows.

**SBP recommendations by veterinarians**

Thirty-three percent of veterinary respondents often recommend SBPs (ie, recommend SBPs to >75% of their clients). Fifty-six percent of veterinarian respondents “seldom” or “never” recommend SBPs. The reasons given by veterinarians for not recommending SBPs fell into 3 categories: perceived lack of interest on the part of the producers; respondents’ desire to make individual animal interventions (following rectal examination) rather than treating groups of cows; and respondent’s belief that dairy producers should be detecting heat in the majority of their cows.

**Programs used and their selection**

Table 2 lists the programs considered in the survey.

**Table 3: Summary of reported SBP recommendations by veterinarians**

Program	% of veterinarians recommending a program to > 50% of their clients
Biweekly PG	9
Targeted breeding	0
Palpation-PG	42
Ovsynch	26
Presynch	4
Other	2

**Discussion: SBP selection by producer**

Producer respondents indicated that the 2 most commonly used protocols were palpation-PG (57% of respondents) and Ovsynch (68% of respondents). “Other” protocols were used by 27% of producers, with many of them using IVP devices for reproductive management of problem cows.

The high use of palpation-PG suggests that SBPs are being used more frequently on individual/problem cows rather than systematically across groups of cows. Conversely, the high use of Ovsynch suggests a degree of comfort on the part of many producers with moderately complex treatment protocols.

Forty-seven percent of producers used SBPs on >50% of cows found open at pregnancy diagnosis; however, only 13% of producer respondents use SBPs on >50% of their cows for a *first insemination*. This latter figure best reflects the proportion of producers currently using SBPs systematically as a management strategy to reduce or eliminate heat detection in their herds.

**Discussion: SBP recommendations by veterinarians**

Table 3 summarizes the SBP recommendations by veterinarians.

The predominance of palpation-PG points to a continuing reliance on the traditional approach to solving reproductive problems. Less than one-third of veterinarians are recommending systematic SBPs to most of their clients.

According to the survey, 78% of veterinarians occasionally use extra-label drugs for reproductive management. Based on comments from the respondents, these protocols are not being used in a systematic fashion and seem to target individual cow problems. There appears to be a low-level, but widespread use of exogenous progesterone (ie, IVP device). Remarkably, 83% of veterinary respondents reported that a majority of their clients follow their recommendations on SBPs.

**Sources of information on SBPs**

Veterinarians were cited as a source of information by 98% of producers who responded to the survey, with agricultural magazines a distant second at 35%. Veterinarians are clearly in a good position to influence producers to make better use of SBPs. Most veterinarians appear to use 3 or 4 sources of information on SBPs. Interestingly, veterinary journals were the most commonly cited source.

## ***Selection of cattle to enrol in SBPs***

### ***Lactating cows***

Approximately 50% of producers use SBPs on >50% of their cows when found open at pregnancy examination. Across the country, 58% were using SBPs on repeat breeders *only*. While 93% of veterinarians do not limit the recommendation of SBPs to repeat breeders, 85% of veterinarians seldom or never recommend (ie, recommend to <50% of their clients) SBPs for first services; however, 75% sometimes or often recommend SBPs for cows past the voluntary waiting period and when a cow is diagnosed open, 85% sometimes or often recommend SBPs. These responses indicate little use of systematic programs.

### ***Replacement heifers***

In 95% of cases, producers were not using SBPs for first service in their heifers. Only 15% of producers surveyed were using SBPs on >50% of their heifers when found open at pregnancy diagnosis.

### ***Attitudes to SBPs***

Veterinarians did not recommend SBPs in many cases because they did not perceive either a need or cost-benefit to the producer. These concerns were shared by many producers. A surprising number of producers stated that they are doing a good enough job with heat detection and they did not need SBPs.

Some veterinarians were concerned that SBPs are “unnatural” and suggested that producers would become less observant in general if they don’t actively work at detecting heat. Many non-user producers also cited the unnatural nature of SBPs, the possibility of milk residues, a reluctance to breed without strong signs of heat, and reluctance to “needle” their cows. Across Canada, 60% to 65% of dairy producers still prefer to inseminate cows after detection of heat. Some were concerned that their cows might become addicted to hormones, that they would be failing to select for fertile cows, and that SBPs may result in higher rates of twinning.

Some veterinarians appear to be concerned that problem cows will not receive sufficient attention when SBPs are implemented systematically. These veterinarians expressed the need to examine each cow before enrolment on an SBP in order to exclude and otherwise treat those with ovarian cysts, endometritis, etc. For some of these veterinarians, there was a concern that producers would no longer need their services if examination was not required before enrolment. Additionally, some veterinarians thought that there would not be good compliance with complex protocols and that clustering of calving might cause logistical problems in some herds.

There were a large number of positive comments regarding SBPs from both producers and veterinarians. They cited improved reproductive performance through increased pregnancy rates and/or decreased time to preg-

nancy, more cows pregnant overall, fewer reproductive culls, and a decreased lag time to re-insemination for open cows. Respondents also referred to the ability to mitigate or bypass problems of low heat detection rates. The planned and predictable nature of SBPs was seen as an advantage by many, providing more time for other management activities on the farm. There were no concerns from current users regarding “overuse” of hormones, frequency of injections, or failure to deal with problem cows. The latter is not surprising, since in many cases, the commonly used SBP protocols are the treatment of choice for a variety of reproductive abnormalities (anestrus, ovarian cysts, and repeat breeding).

Veterinarians making high use of SBPs were clearly aware that veterinary interventions did not decrease following the institution of SBPs; the opinion of this subset of veterinarians was that the increased frequency of early pregnancy diagnosis and the greater control of the reproductive program tended to maintain or enhance veterinary involvement in the herd.

### ***Suggestions to increase the use of SBPs by veterinarians***

Management aids and reminders were seen as useful for clients who have accepted the recommendations from the veterinarian, but need assistance to carry them out. It was suggested that information on the physiology and pharmacology of reproductive hormones might alleviate concerns that these protocols could lead to disruption of normal or natural reproductive function. There is a perceived need among veterinarians to document the economic return on investment in SBPs in Canada.

Veterinarians indicated that they would prefer to see higher conception rates in Ovsynch programs, although in other sections of the survey, they indicated their understanding that pregnancy rate, not conception rate, is the parameter most closely associated with reproductive efficiency and that the increased heat detection rates inherent to systematic SBPs are likely to be the most potent driver of improved pregnancy rates.

### ***Monitoring reproductive performance***

Among SBP users, 82% reported an improvement in the reproductive performance of the herd. For non-users, approximately half stated that they would be willing to try a program that yielded a 40% conception rate without heat detection. There were producers who felt that a 40% conception rate was too low and that it would be too costly to use such a program. Many producers also have a perception that they do not have reproductive problems in their herds; however, most did not appear to use reference values in order to benchmark their performance. These results point to a real need for producer education regarding reproductive goals, monitoring, and determining what constitutes acceptable reproductive performance.

## Conclusions and recommendations

There is surprisingly little systematic use of SBPs at the herd level in Canadian dairy herds. SBPs are mainly used on individual or problem cows based on veterinarian recommendations, often following rectal palpation. Although the national dairy herd is experiencing a significant decline in reproductive performance, many producers appear complacent regarding their current reproductive performance. In the immediate future, the best approach to enhance reproductive efficiency in dairy herds will be to intensively manage the reproductive cycle of the cow.<sup>3</sup> There is now a range of efficacious systematic SBPs that allows producers to restrict or, in some cases, eliminate (through resynchronization) periods during which heats must be detected and yet attain pregnancy rates in excess of traditional breeding programs.

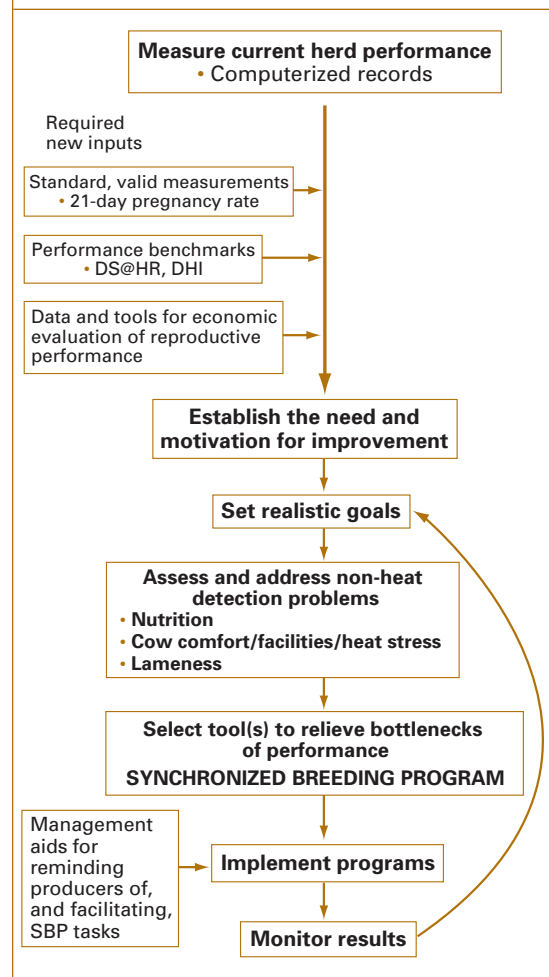
Veterinarians should encourage wider use of SBPs as a means to enhance herd profitability. Economic modeling suggests that the majority of producers would benefit from implementation of some form of SBP and there is also a missed opportunity for use of SBPs in replacement heifers. SBPs should not be seen as a panacea for all reproductive ills, but should be positioned as a tool in a larger reproductive health management plan (Figure 1). Confounding factors that might affect herd reproductive performance (eg, disease, nutrition, and cow comfort) must be addressed before recommending an SBP.<sup>7</sup>

There is a lack of objective and quantitative goals for performance in the Canadian industry and this may, in part, explain the complacency noted among producers and some veterinarians regarding reproductive performance. It is apparent that dairy producers need better access to information on how to monitor reproductive performance, especially the concept of pregnancy rate as compared to traditional measures, such as conception rate. Once these parameters are understood, the veterinarian can help the producer set realistic goals and develop a plan to attain them.

Reproductive health management programs must be customized for each herd. The implementation of an SBP and the choice of program, are decisions that must be made based on a valid analysis of factual herd data and economics. There is a need to provide veterinarians with uncomplicated tools to assess herd reproductive performance and demonstrate to producers the safety and cost-effectiveness of different SBPs.

Producers with a desire and ability to detect heat are often candidates for simpler SBPs.<sup>6,7</sup> These producers have generally paid close attention to cow comfort, provide their cows with the opportunity to demonstrate signs of estrus (off concrete), have excellent transition cow management, and use computerized herd records to the fullest extent. In other herds, it may be more appropriate to try SBPs (eg, Ovsynch or Presynch) that reduce or eliminate heat detection. Producer compliance needs to be monitored when the more complex SBPs are employed.

**Figure 1: Schematic summary of a process for analysis and improvement of dairy herd reproductive performance, including implementation of SBPs where indicated.**



DHI = Canwest dairy herd information  
DS@HR = Dossier de santé animale; Animal health record, formerly ASTLQ (Amélioration de la Santé des Troupeaux Laitiers du Québec)

SBPs have been embraced by a subset of veterinarians and producers. These innovators have likely been motivated by an increased appreciation of the cost of days open, the recent accessibility of cost-effective, efficacious, and well-documented SBPs, and recognition that at present, producers have less time for traditional heat detection. Current users of SBPs tend to be satisfied with the programs and 82% noted an improvement in herd reproductive performance following introduction of an SBP. Veterinarians should make use of these successful innovators to promote SBPs in herds where they would be beneficial.

Copies of the complete final report, *The First Canadian Consensus on Synchronized Breeding Programs in Dairy Herds*, are available from Schering-Plough Veterinary Service Managers Dr. Bernard Vallée (1-887-535-2584) and Dr. Norm Machell (1-888-873-0033).

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## Abstract of Interest

**Future trends in reproductive management. In: Proceedings of the Society for Theriogenology Annual Conference, Colorado Springs, 2002.**

LUCY, MC.

Reproductive efficiency of modern dairy herds is declining. Improved genetics for milk production and changes in housing and management are likely causes for the decline. There are no magical solutions to reproductive decline in high-producing dairy cattle. Cows selected for high milk production partition nutrients toward lactation. The partitioning of nutrients leads to cows with less adipose tissue mass (lower body condition) and greater infertility. Feeding more energy will probably not solve reproductive problems because cows will partition the additional nutrients toward milk production. For the immediate future, the best approach will be to intensively manage the reproductive biology of the cow. This management should include treatment of anestrus, synchronization of first service, and resynchronization of second and third services. In the longer term, a genetic approach that incorporates reproductive and health traits in selection indices will correct some of the reproductive decline. It is also likely, that continued research in the area of postpartum reproduction of dairy cattle will reveal critical control points that can be manipulated to improve reproductive efficiency in dairy cattle.

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