A Timeline Approach from Calving to the end of the Voluntary Waiting Period to Increase Pregnancy Rate

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Take Home Messages

- A common cause for reproductive inefficiency in dairy herds is poor management of the transition period (3 weeks before and after calving).
- From an animal health well-being and performance perspective, the transition period is comprised of an early window in the production cycle of the dairy cow to improve health and maximize reproductive efficiency.
- The crux of a reproductive program is good management during the transition period to ensure a normal state of cow health at the herd level to optimize reproductive performance.
- Implementation of a health monitoring program allows for early diagnosis and treatment of common fresh cow problems that can improve health.

Introduction

Has the reproductive performance in your dairy herd improved, remained the same or declined over time? If your herd is typical, reproductive performance probably has declined over time or remained the same. Research has shown that reproductive efficiency has decreased in lactating dairy cows world-wide as evidenced by a reduction in conception rates (Macmillan et al., 1996; Royal et al., 2000; Lucy et al., 2001; de Vries & Risco, 2006). Although, causes for this decline are multifactorial, attenuation of estrus expression in high producing cows (Wiltbank et al,. 2006), embryonic mortality (Santos et al., 2007), and energy metabolism during the early postpartum period and its interactions with immune function play a major role (Hammon et al., 2006). Further, the trend for larger herds coupled with labor shortage has resulted in new challenges with compliance of health and reproductive programs. Thus,

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opportunities abound for dairy producers to work with veterinarians and nutritionists to implement a sound reproductive management program to alleviate the effect of these factors on reproductive efficiency.

Pregnancy rate (PR) determines the calving to conception interval (CCI) at the end of the voluntary waiting period (VWP). As PR increases, the CCI is reduced; thereby increasing the amount of milk produced per day of herd lifetime and reduces the number of cows culled for reproductive failure which collectively increases herd income (Risco et al., 1998; de Vries., 2006). Thus, it is clear that the challenge for producers is to employ a reproductive program that attains and maintains a herd PR commensurate with a profitable production of milk.

Typically, reproductive programs on dairy herds are established with the goal of increasing PR at the end of the VWP by employing estrous synchronization protocols to increase insemination rates. However, events that occur during parturition have a profound effect on fertility at the end of the VWP by predisposing cows to calving-related disorders that affect uterine health and resumption of cyclicity. That is, cows that do not "transition" well from parturition to lactation have a lower risk to become pregnant from the application of these synchronization protocols at the end of the VWP. Therefore, reproductive management of dairy cows must integrate management strategies that optimize cow health from the time prior to parturition until the end of the VWP as shown below in Figure 1.

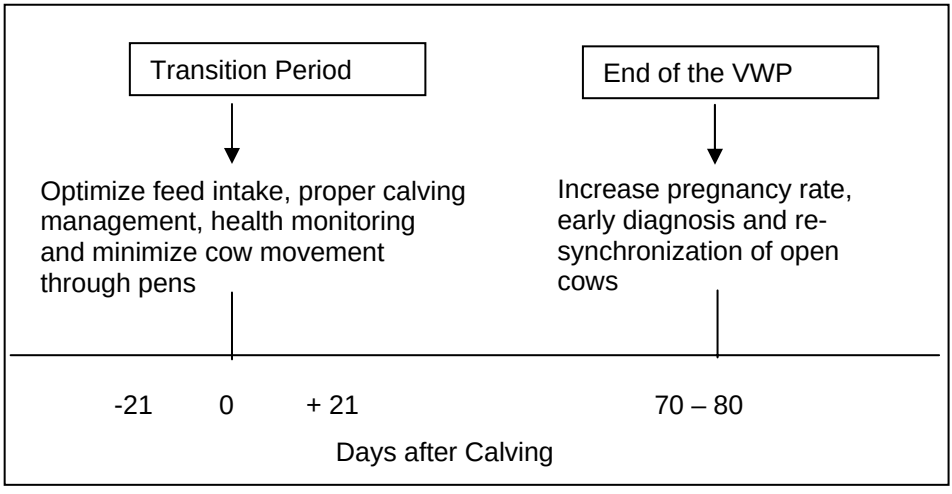

Figure 1. Management considerations from calving to the end of the voluntary waiting period (VWP) to increase health and fertility.

■ Management of the Transition Period

The majority of problems that affect cow's health occur during the transition period (three weeks before and after parturition) as a consequence of parturition and initiation of lactation. These problems include dystocia, hypocalcemia, ketosis, retained fetal membranes (RFM), uterine infections, displaced abomasum and mastitis. Alone or together, these problems are known to affect fresh cow health lowering subsequent milk production and reproductive performance (Gröhn et al., 1990)

The challenge in transition cow nutrition and management is to implement feeding strategies before calving to optimize immune function at calving by allowing fresh cows to recover quickly from hypocalcemia and negative energy balance. In many dairy herds, attention to transition cow management occurs after health problems have occurred. Therefore, periodic evaluation of the management given to both pre and post fresh cows is recommended to control the prevalence of calving-related problems. The checklist below provides a guide to determine whether or not management of transition cows is appropriate.

- Is the ration balanced for energy, fiber content (including effective fiber), protein, minerals and vitamins?
- What is the dietary cationic anionic difference of the ration including the potassium percentage of the roughage source?
- Is there enough feed bunk space for prepartum cows (at least 0.60 meters per cow)?
- Is there adequate shade for heat stress abatement (4.65 meters^2 per cow)?
- Are employees trained and supervised for proper calving assistance and treatment of postpartum diseases?
- Are urine pH's evaluated to ascertain compliance of appropriate anionic diet feeding?
- Are pre and postpartum energy status evaluated in selected groups to determine prevalence of subclinical ketosis?
- Are body condition scores evaluated?

Calving Management

Dairy farm employees play a major role in carrying out reproductive and health programs. They do more than just inseminate and milk cows. A case in point is health monitoring to diagnose and treat diseases. In reality, to the dairy practitioner they are "health technicians", similar to those employed by

companion animal veterinarians. Consequently, training programs that define the role of the employee, the “how to” and the “why” should be an integral component of dairy cattle production medicine.

On many dairy farms, there are inadequately trained employees that perform obstetrical procedures which results in calving trauma. Who treats, what training have they received, when and how they treat calving related problems are important questions that veterinarians should ask herd managers. Therefore, veterinarians should work closely with producers to design a herd health protocol that emphasizes first – aid calving assistance to get employees away from using improper techniques for delivering calves.

Moving Fresh Cows through Pens Before and After Calving

Cow behavior and social factors can be primary risks for the development of ketosis, fatty liver and displaced abomasum. Where poorly formulated rations and inaccurate delivery systems are considered primary risk factors for these conditions, poorly staged pen moves and overstocking are major risk factors (Nordlund et al., 2008). The mechanism appears to be a disruption of dry matter intake for vulnerable cows, leading to ketosis followed by the cascade of diseases related to ketosis.

To simplify labor, dairy farms commonly use a grouping system of cows for specialized management which includes:

- Far off dry cows : -60 to -21 day from calving
- Close up dry cows: -20 to -3 days from calving
- Maternity pen
- Fresh pen: 3 to 14 days after calving
- Sick pen: variable days after calving
- Various lactation and pregnant groups

In the above scenario, cows are often moved multiple times during the transition period, a time when cows are most vulnerable to develop subclinical ketosis. In general, cows resident in a pen tend to maintain their rank compared to new arrivals (Scheim & Forhman, 1955). With each movement to a new pen or group, cows experience stress and must establish their rank within the social order of the pen and feed intake is reduced. It has been reported that cows form dominance hierarchies, strongly associated with age, body size and seniority in herd (Dickson, 1970). Early lactation cows are more affected by regrouping than mid lactation cows and cows that are losing weight lose social rank within a group, while those gaining weight gain dominance. These observations suggest that too many cow movements early

post-partum impacts on fresh cow health as the early post-partum period is a period of significant weight loss.

The sick pen in dairy farms is dynamic in nature because of daily cow entries that can be described as a state of constant social turmoil as each new cow attempts to establish her rank within the social order of the pen (Cook et al., 2004). Sick dairy cow pens have been reported to be contaminated with bacterial pathogens that include Salmonella (Peek et al., 2004). Thus they represent a substantial risk to cows that are stressed and immunosupressed. In some dairies fresh cows are moved through the sick pen until colostrum is cleared to group "non–saleable" milk, which is a high risk practice. Another group of cows that often are moved to the sick pen are cows with uterine infections that require antibiotic treatment. With the commercial availability of antibiotics labeled for treatment of metritis that do not require milk withdrawal, cows can be treated and remain in the milk herd and avoid social turmoil that reduces feed intake.

Postpartum Health Monitoring

A major goal for transition cow management is to maintain a dairy cow healthy during early postpartum (first 3 weeks after calving). In doing so, we must recognize that the earlier a sick animal is found and treated, the quicker her chances for returning to a normal state of health improves.

Postpartum health monitoring programs have become popular on dairy farms. Monitoring postpartum health involves the examination of all cows during early post-partum (first 12 days) by trained farm personnel. Parameters that can be used to evaluate health status of cows include rectal temperature, attitude, milk production, uterine discharge and urine ketones. Veterinarians have an opportunity to expand their services to dairy producers by implementing training programs for farm employees to "look" for sick cows using time effective techniques to identify animals in the early stages of disease and allow for effective treatment.

▪ Strategies to Maximize Pregnancy Rate at the End of the Voluntary Waiting Period

The VWP is the time during early lactation that producers choose not to breed cows despite being detected in estrus. In a survey conducted in dairy herds participating in a progeny test program, the VWP range varied from 30 to 90 days postpartum with a mean of 56 ± 0.6 days (De Jarnette et al., 2007). In that survey, reasons for selectively altering the VWP were post-partum health issues, parity, milk production and season.

During the VWP cows are in a negative energy balance, are not cycling and have some degree of uterine infection which is detrimental to fertility. Recovery from these conditions can be viewed as physiological requirements for an optimal time to pregnancy at the end of the VWP. In the author's opinion, first insemination postpartum between 70 to 90 days is a sufficient time to allow cows to recover from these conditions and experience multiple estrous cycles prior to first insemination.

On many dairy farms, failure to detect cows in estrus results in the calving to first insemination interval to extend well beyond the established VWP. The development and application of ovulation synchronization protocols that allow for fixed time insemination results in acceptable pregnancy rates and dramatically lowers the interval from calving to first insemination. The economic value of the use of these ovulation synchronization protocols such as Ovsynch depends on the estrus detection rate of the herd. In those herds with high estrus detection rates the value of Ovsynch is lower. This concept was illustrated in a study that reported the value of a pregnancy based on insemination at detected estrus or Ovsynch in two herds (Tenhagen et al., 2004). One half of each herd was inseminated at detected estrus; the other half was inseminated with OvSynch. In one herd with poor estrus detection, the cost of a pregnancy was reduced significantly with the use of OvSynch compared to insemination at detected estrus. In the second herd, which had higher estrus detection rates, the cost of a pregnancy was slightly more for OvSynch, despite improved reproductive performance. The greatest costs attributed to lower pregnancy rates from insemination at detected estrus were higher culling rates and excessive days non-pregnant.

Potential net returns per cow were modeled by comparing use of Ovsynch in winter and summer compared to insemination at detected estrus (Risco et al., 1998). The greatest impact on net returns was obtained when Ovsynch was used during summer compared to winter. This finding was attributed to lower estrus detection rates observed during the summer months. Results from these studies indicate that the use of an ovulation synchronization protocol such as OvSynch is an economical alternative in reproductive management of dairy herds with poor estrus detection.

■ Early Diagnosis of Non-Pregnant Cows

The value of early pregnancy diagnostics is finding a non-pregnant cow earlier followed by a successful re-breeding to reduce days not pregnant. Palpation per rectum is effective after day 33 to 35 and ultrasonography by day 28. Pregnancy–specific protein B (PSPB) is present in cells of the developing trophoblast as early as day 21 of pregnancy in cows (Humblot et al., 1988). Detection of this protein in blood is a very good indicator of pregnancy as early as 30 days of gestation. Because of its long half-life, it

remains in circulation for several months after parturition. Therefore, in cows diagnosed pregnant that lose their pregnancy, residual PSPB can cause a false positive result. Currently, blood samples for cows that are greater than 90 days post-partum and 30 days post breeding are shipped to the laboratory for analysis (BioPRYN®; Ag Health, Sunnyside, Wa, www.aghealth.com). A study that compared pregnancy diagnosis in dairy cattle by use of a commercial (BioPRYN®) PSPB ELISA and palpation per rectum showed good agreement between the two tests (Breed et al., 2009). Discrepant results were attributable to a nonviable fetus, embryonic loss, or fetal loss. The authors concluded that the pregnancy diagnostic error and the delayed return of results for the PSPB ELISA results, compared with the diagnostic accuracy and immediacy of obtaining results for palpation per rectum are drawbacks for the PSPB ELISA.

None of these pregnancy tests is faultless, and unacceptable test sensitivity and specificity can occur. The decision as to which “test” to use for early diagnosis of non-pregnant cows should be based on practicality, cost and practitioner comfort level. Regardless of which test is used, it is critical that veterinarians engaged in reproductive management institute a program that allows for the identification of bred cows that are not pregnant early followed by re-breeding. Further, due to embryonic mortality, cows diagnosed pregnant should be reconfirmed at a later date to identify those cows that have aborted and are non-pregnant so that they can be re-bred in a timely manner.

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