Proactive Dairy Reproductive Programs Pay

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Timely pregnancies have a positive impact on the performance and profitability of dairy cows, not only during this lactation, but as importantly, their next lactation. Cows that do not become pregnant in a timely manner spend more time in later lactation as revealed by longer days in milk and longer calving intervals. During later lactation, milk production is lower than in early lactation, especially in second lactation and greater cows. Dairy cows with long days in milk also are more likely to be culled, or if retained, go dry and calve over-conditioned. These over-conditioned cows often times have a higher incidence of health issues after calving, lower fertility and higher early pregnancy losses the next lactation. Thus, continuing this unproductive and vicious cycle.

To maximize the number of cows that become pregnant in a timely manner, proactive reproductive management practices, i.e. getting viable semen into cows at the correct time relative to ovulation, must be practiced daily. Evaluating the on-going successes or shortcomings in achieving ones goals relies on maintaining and reviewing breeding and pregnancy information related to cows currently in the breeding herd, not just retrospective measures which include previously pregnant cows. Reviewing these records at least weekly allows one to target and follow individual cows needing to be bred, determine their pregnancy status within 30 to 45 days post breeding (if she does not return in heat), and rebreeding cows until diagnosed pregnant or denoted as “do not breed”. These records should be used to generate “to-do” lists for the week used in the day-to-day management of the reproductive program. In addition, reviewing the overall progress of the current breeding program allows one to evaluate the progress and corrections needed to keep the program on target. This check list and the discussion which follows looks at some key areas to evaluate to see if you are achieving a proactive, not reactive, reproductive management system.

Voluntary Waiting Period (VWP)

Definition: The number of days after calving when cows will start to be bred. This value determines the date after calving when cows should start to be detected in heat and then bred. This value also determines the number of cows in the breeding herd.

Value/Goal: The number of days post-calving is decided upon by the manager of the reproductive program and then is entered into a program, i.e. DHI system or dairy management software. Generally, most farms start breeding cows 60 days post calving. First-calf heifers might benefit from a slightly longer VWP since their milk production is more persistent (stays higher for longer) than mature cows. As the VWP increases, reproductive management programs need to be even more tightly managed to allow for the majority of cows to become pregnant by 130 to 150 days in milk. By getting cows pregnant by 130 to 150 days in milk, generally cows do not become overconditioned which can minimize health and reproductive issues in the next lactation.

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Impact of Longer VWP: Fertility (Pregnancies/1st AI) is slightly higher with a slightly later VWP, especially with first-calf heifers. However, the magnitude and whether these differences are real depends on lactation number (1st calf heifers vs mature cows), method of insemination (timed AI vs heat detection), season, milk production, and VWP used. Again, when utilizing a planned longer VWP, the reproductive management program needs to be even more tightly managed to achieve a goal of having the majority of cows pregnant by 130 to 150 days in milk. (Giordano. 2021. Western Canadian Dairy Seminar Proceedings.)

Insemination Rate (Heat detection rate)

Definition: Generally known as the heat detection rate, the insemination rate (some call it service rate) refers to the number of cows that have been detected in heat and bred versus the number that are eligible to be bred within a 21-day period or other defined period (DHI usually reflects 1 month). The difference between heat detection rate and insemination rate is that heat detection rate also includes cows which are detected in heat, but are not bred.

$$\text{Insemination rate} = \frac{\text{\# cows bred in 21 or 30 day period}}{\text{\# cows past VWP and eligible to be bred in 21 or 30 day period}}$$

Goal: Greater than 60 to 65% of cows eligible to be bred are inseminated within a 21-day interval or other defined interval.

Areas to evaluate if goal is not reached:

- Are you reporting all services for cows bred during this reporting period?
- Are you detecting cows in heat? The real question is "how many cows needing to be bred are detected in heat and then bred?". When using visual heat detection, cows should be observed for signs of standing heat 3 times daily for 20 to 30 minutes each time. Cows display standing heat better on dirt surfaces versus concrete. If using heat detection aids, such as tail paint or a commercially-available individual cow heat detection aid, are they replaced or refreshed as needed to allow for easy and definitive detection of cows in heat? Are cows reviewed for heat signs on a routine, on-going basis? Manual heat detection can take a back seat when other tasks on the farm are a priority as seen during the cropping season. Activity monitoring systems can also be used to detect cows in standing heat and can be effectively used to replace visual heat detection, but one must understand how to use the data, i.e. do the action lists reflect data collected at milking times or reported throughout the day.
- Are cows cycling, i.e. coming into heat? Are cows at the optimum energy balance and body condition? Management of cows pre- and post-freshening plays a critical role in getting cows rebred in a timely manner. Cows which lose body condition in the first 21 days in milk after calving have lower pregnancy rates compared to cows that either maintained or gained body condition during this time frame.

Conception Rate

Definition: Conception rate reflects the percentage of cows which have been bred that conceive. This measure of fertility does not account for pregnancy losses between 30 to 60 days bred since cows are checked pregnant around 30 days. Some have also referred to this as pregnancies/AI (Preg/AI). Also, some suggest that one calculate a first-service conception rate in addition to the overall conception rate.

(On DHI, cows that do not have breeding dates after 60 days from the last breeding are considered pregnant unless denoted as open.)

$$\text{Conception rate} = \frac{\text{\# cows pregnant}}{\text{\# cows bred within a 21 or 30 day period}}$$

Goal: 45-55% of cows bred are pregnant within a 21 or 30 day period.

Areas to evaluate if goal is not reached:

- Review semen handling procedures including (1) monitor amount of nitrogen in semen tank, (2) quickly remove semen straws using tweezers from the semen tank being careful to keep semen in the lower portion of the neck of the semen tank, (3) thaw semen at 95ºF for 45 seconds and check the accuracy of the thermometer used, (4) keep gun warm (inside shirt) after loaded, and (5) inseminate cows within 15 minutes of thawing semen.
- Review that semen is being deposited into the uterine body (no more than 1 inch beyond the cervix) and not into a uterine horn.
- Cows are being inseminated at the proper time after standing heat (according to the AM/PM rule) or 14 to 18 hours (not 24 hrs) post the last GnRH injection as part of a timed AI program.
- If you are using a Timed AI program, have all the steps been followed using the correct timing so that ovulation has been successfully synchronized.
- Are the cows cycling? This can relate back to a less than optimum transition back into the herd after calving as well as a sub-optimum feeding program pre or post-calving where the cow is losing body condition. Heat stress also decreases estrus expression and duration.
- If natural service is used, is the bull fertile and/or effective at breeding cows, i.e. too small or lame.
- Cows with clinical or subclinical mastitis have lower conception rates than low SCC cows.
- Vaccines to prevent reproductive diseases have been given, administered as directed on the vaccine label, and follow the guidance of your local veterinarian as to particular vaccine, timing of administration (days prior to breeding), and type (killed vs modified live) of vaccine needed. Normally, pregnancy losses are quite small (2%) past 60 days of pregnancy unless reproductive diseases are an issue.
- Heat stress decreases conception rates and early embryo development and survival. Thus, heat abatement practices are very important.

Pregnancy Rate

Definition: Percentage of cows pregnant within a 21-day or month in relation to the total number of cows in the breeding herd. This value reflects the success rate of getting cows pregnant. Pregnancy rate is a function of insemination (heat detection rate) and conception rates. Irrespective of whether herds are bred through AI or naturally, this benchmark should be calculated to help evaluate the reproductive program in the current breeding herd.

$$\text{Pregnancy rate} = \frac{\text{\# cows pregnant}}{\text{\# cows eligible to be bred within a 21 or 30 day period}}$$

or Pregnancy rate = Insemination rate * Conception rate

Goal: Greater than or equal to 26%. As shown in the table, improvements in pregnancy rates increase profit. When pregnancy rates are around 15%, an insufficient number of heifers are born yearly to serve as replacements for the dairy herd. Generally speaking, pregnancy rates need to be around 20% to produce enough replacement heifers.

Improvements in Pregnancy Rate (2% improvements)	Economic value of increased pregnancy "risk" ($/cow/year)
18 to 20%	$ 40.59
22 to 24%	$31.62
26 to 28%	$24.81

Repro cost at $18/cow/month, milk price $18.00 @3.5% BF (Source: V.E. Cabrera, University of WI-Madison https://dairymgt.info/markov/reader.php#fragment-8)

Areas to evaluate if goal is not reached:

- Since pregnancy rate is a function of insemination (or heat detection rate) and conception rates, management practices associated with either of these areas impact this reproductive benchmark.
- Timely "Open Cow" checks – not pregnancy checks-- are done to identify open cows 30+ days post breeding. Be careful to differentiate between assumed pregnancies (cows are not seen in heat after breeding) versus those tested or palpated to confirm pregnancies. Pregnancies should be reconfirmed after 60 days pregnant to account for early pregnancy losses. Pregnancy losses between days 28 to 60 of embryo development can be about 12% (Wiltbank and others. 2016.) Cows should be reconfirmed pregnant before they are dried off.
- Some reproductive physiologists prefer to calculate a 100-day in-calf rate which reflects the number of cows pregnant to a service within 100 days post calving. Others may extend this interval to those cows pregnant within the first 150 days in milk. Both of these benchmarks use a defined number of days in milk and can help assess if the goal to achieve pregnancies in a timely manner has been reached.

Retrospective versus preemptive reproductive measures

To ensure that cows are getting rebred in a timely manner, benchmarks that reflect the current status and outcomes associated with the current breeding herd should be used in this on-going evaluation. Unfortunately, parameters such as calving interval, average days open, and number of cows culled for reproductive reasons are more historical and do not reflect current performance within the current breeding program. These benchmarks are important since they will impact the overall performance and profitability of the herd, but are not as helpful in managing the successes and shortcomings of the current and on-going breeding program.