

MEASURING CLIENT COMPLIANCE FOR REPRODUCTIVE SUCCESS

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The Reproduction Scenario Today

Almost all dairymen today would like to have more pregnant cows. They would also like better control of when cows become pregnant in order to accomplish two things. First, to optimize the value of those pregnancies; and second, to have enough animals to maintain herd size or expand if they so choose. To do this, cows must become pregnant as soon after the voluntary waiting period as practical. But as simple as that sounds, it is less than simple in practice.

The goal of having more pregnant cows is a worldwide opportunity. In the United States, dairy reproductive performance is unusually poor, with average pregnancy rates of 13–15 percent. Most dairymen believe these rates are “normal” and acceptable without realizing the tremendous advantages afforded by improving on these rates.

The data trend paints an interesting picture. Reproductive performance from DHI herds processed at Provo, Utah, for example, shows a dramatic decrease from 1990 to 2002.

- Average days open have increased from 129.5 in 1990 to 156.5 in 2002.
- Days in milk at first service have increased from 81.6 to 83.8.
- Services per conception have increased from 2.02 to 2.45.
- And of the 27 additional days open, 2.2 were lost due to later days at first service; 9.0 days due to increased services per conception; and 15.8 days due to poor heat detection efficiency.

This decrease in reproductive efficiency means that there would be five fewer calves produced per year for each 100 cows in the dairy. In addition, the next peak lactation would be delayed by more than three weeks.

A similar evaluation in the UK found that conception rates in British Holstein-Friesian cattle have declined by one percentage point per year for the last 20 years. This decline in fertility has occurred in a country that doesn't use BST and has not had large annual increases in milk production as in the U.S.¹

Additionally, estrus expression in Holstein cows has changed dramatically from 1975 to 1997. In 1975, estrus lasted 8-14 hours and there was an average of 20 mounts per estrus.² In 1997, estrus lasted 7.3 hours and there were 7.2 mounts per estrus.³

One other factor affecting current Holstein reproductive performance is liver function and the liver's ability to metabolize the reproductive hormones. The liver represents 1-2 percent of the cow's body weight and 25 percent of her oxygen demand, and increased milk production has been associated with increased blood flow through the liver. With this increased blood flow to the liver, there is a more rapid metabolism of the steroid hormones, including estrogen and progesterone.

This is important because lower levels of progesterone have been linked to decreased fertility, and lower estrogen levels have been associated with more double ovulations and an increased rate of twinning. The increase in twins is due to a lack of estrogen-suppressing FSH release from the pituitary, resulting in a subsequent increase in double ovulations.

In one study, the rate of double ovulations was three times higher in cows with production greater than 40 kg/day or 20.2 compared to 6.9 for cows producing less than 40 kg/day.⁴ The same researchers also found that non-lactating cows had liver blood flows of 746 L/hr with progesterone values of 4.1 ng/ml, while lactating cows had liver blood flows of 1587 L/hr and progesterone at 2.58 ng/ml. Liver blood flows increase linearly with increased milk production. A conclusion is that, due to increased liver metabolism, today's high-producing Holstein cow may be failing to maintain adequate levels of progesterone or estrogen at critical times in her reproductive cycle. It is hoped that supplementation of both progesterone and estrogen at appropriate times in the breeding cycle might reduce or eliminate this problem, but further study is needed in this area.

In order to improve pregnancy results, many dairies are using controlled breeding programs that service 100 percent of the cows in the first 10 days after the voluntary waiting period. These programs include Ovsynch, Presynch, Heatsynch and Modified Targeted Breeding. With these programs using Lutalyse® Sterile Solution (prostaglandin F2 α) and gonadatropin releasing hormone (GnRH), U.S. dairies are at least doubling first cycle pregnancy results. Theoretically, current breeding technologies such as the 100 percent service programs and proper reproductive management should produce first cycle pregnancy rates approaching 50 percent and three-cycle, cumulative percent pregnant in the 70-80 percent range. However, few herds today approach these levels.

Measurement Is Critical

In 1999, Pharmacia Animal Health launched the 100-Day ContractSM to the dairy industry. The 100-Day Contract fine-tunes management of the dairy cow during the critical period 30 days prior to calving through the breeding process. The program identifies cow needs during the dry cow period, fresh period and breeding period and provides standard operating procedures that will result in more pregnant cows. Any time management procedures are involved, there is an automatic requirement to keep and evaluate records related to these events. If the producer is unable to define success, then too often he/she is flying blind and unaware of the impact management decisions have, either good or bad.

At the introduction of the 100-Day Contract, Pharmacia Animal Health sponsored discussions on the use of record keeping systems and quickly realized there was very little standardization across records platforms in measuring reproductive success. It also became clear that the metric of pregnancy rate was a critical feature in the standardization discussion.

Working with Dr. Mark Kinsel of Agricultural Information Management, Pharmacia created a software program (100-Day Contract Manager) capable of reading a report from major record keeping systems and returning pregnancy rate feedback in both an "annualized" longitudinal format as well as broken out by calving date cohort groups. Cohort monitoring allows for more rapid identification of real change.

Pharmacia also developed a protected web site (100-Day Contract Network) that would obtain 14-day calving cohort pregnancy rates, as well as the “annualized” longitudinal analysis results from the 100-Day Contract Manager uploads. These uploads are compiled on a “real-time” basis and immediately presented back to the participating producer in the form of a table that assigns a percentile rank to their reproductive performance against national, regional and size of dairy average values.

The 100-Day Contract Manager and Network standardize reproductive measures across all herd software and allow for benchmarking. Due to its ability to summarize data, the 100-Day Contract Network has become an important tool in providing knowledge about current reproductive management in the U.S. dairy industry. At the start of this project, Pharmacia Animal Health obtained through participating dairy records management centers a random selection of the reproductive records of 285 anonymous herds evenly split between greater than and less than 500 cows to estimate the national average. The 100-Day Contract Network has been in operation for a period of a year and has drawn conclusions and comparisons from these results.

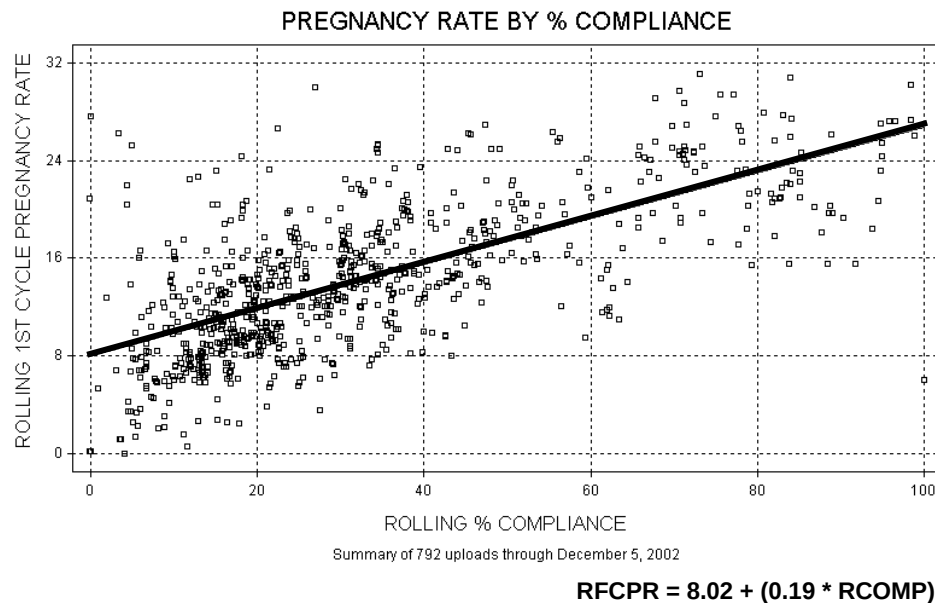
Compliance Metrics

One of the most successful interventions in reproductive management has been the adoption of controlled breeding programs. These entail a series of setup steps that result in the cow being ready to ovulate at a specific time. The result is that a week’s worth of cows (the cohort or group) will be ready for insemination on a specified day of the week.

With a timed procedure it becomes critical that no one misses the specified procedures. If some cows are missed from any of the steps, success of the procedure will degrade. Realizing this, Pharmacia Animal Health and Dr. Mark Kinsel created a metric called “Compliance.” This answers the question, “what percentage of cows that were available in the cohort were actually serviced by the end of the first breeding following the voluntary wait period?”

This metric is built on seven days for each day of the week in the cohort, plus an additional three days for biological variation. This results in a total of a ten days-in-milk window. To be considered compliant the cow must have an insemination on record during the first ten days-in-milk after the voluntary waiting period. Compliance values of less than 80 percent would be an indication to either the producer or practitioner to review reproductive procedures to identify holes in the program.

Graph 1. Pregnancy Rate by Percent Compliance:

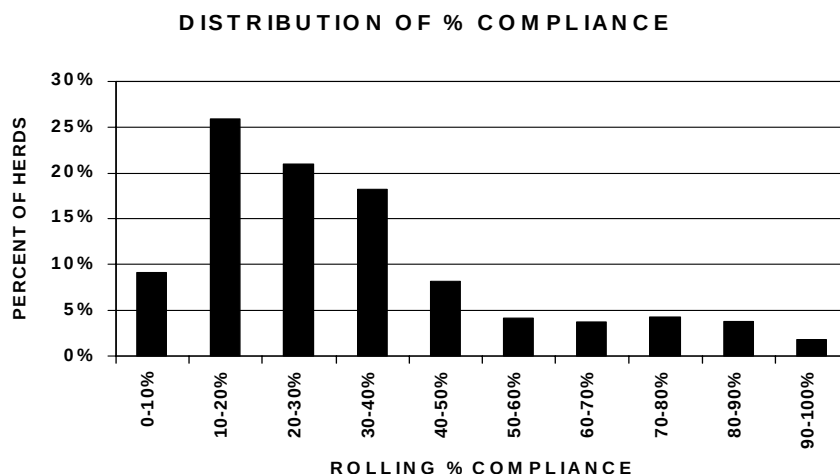


The graphic shown above (Graph 1), is a scatter plot, where every data point represents an upload event and is positioned based on the pregnancy rate and the percent compliance. The pattern of dots demonstrates a linear trend suggesting that pregnancy rate goes up as compliance percent increases. Statistical analysis creates a straight regression line to further emphasize this relationship. Evaluation by Dr. Mark Kinsel indicated the statistical relationship was highly significant and that for every ten percentage points of increased compliance, the pregnancy rate increased 1.9 percent.

Results show that using a controlled breeding program to improve compliance pays dividends in terms of improved pregnancy rates. The Network demonstrates 46 percent of the improved pregnancy rate is due to the effect of compliance, which is very large considering all of the factors that impact reproduction. The take-home message is that in a market of limited resources, a producer should spend money to improve the largest effect, which in this case is in improving the percent compliance.

Graph 2 on the following page, is a histogram of where herds in the 100-Day Contract Network fall in their compliance rates. Currently about 35 percent of the herds on record are demonstrating a 0-20 percent compliance rate. These are herds that are performing estrus detection at the end of the voluntary waiting period and do not have a controlled breeding program. Furthermore, 74 percent of the herds have compliance rates of 0-40 percent, indicating they are heavily centered on an estrus detection program for implementation of their initial reproductive program.

Graph 2. Distribution of Percent Compliance:



Given the high labor requirements of a modern dairy and the variable ability to estrus detect, this may be a procedure that is sacrificing reproductive success. Comparisons with another common procedure on the dairy – milking – create an interesting contrast. Producers are highly compliant about the time of milking, preparatory procedures and not missing a single cow. A low compliance rate in this procedure would be a recipe for disaster. Why should the procedures or compliance of reproduction be any different than milking?

Summary Points

Development of the 100-Day Contract Manager software and Network and the use of compliance as a key measurement are truly unique industry events. The goal has been to assist dairy producers in measuring and understanding their reproductive data as well as discovering the holes in management techniques that contribute to the lack of reproductive success. The 100-Day Contract Manager program has been a real success in helping the dairy industry standardize their measures.

Likewise, the Network features of this program finally start to bring clarification to the question, “How do my pregnancy rates compare with this region or the nation?” Current analysis indicates that 55 percent of the herds using the program have a breeding compliance of 30 percent or less, meaning less than 30 percent of available cows are inseminated within a 10-day window of time from the end of their voluntary waiting period.

The median pregnancy rate in national statistics still remains at 12-15 percent, and pregnancy rates are tied to compliance. Statistical evaluation indicates that 46 percent of the variation in pregnancy rates is due to the effect of compliance, and for every 10 percent increase in compliance, an additional 1.9 percentage points can be added in pregnancy rate. With more use of measures such as compliance and the use of better measurement tools such as the 100-Day Contract Manager, dairy reproduction can start improving instead of decreasing each year.

¹ Royal et al: J An Sci. 70:487, 2000.

² Hurnik, et al: Applied An. Ethology 2:55, 1975.

³ Nebel and Mowrey: Hoard's Dairyman, 145:550, 2000.

⁴ Wiltbank, et al: JDS 84(suppl.):84, 2001.