# Evaluating Herd Reproductive Status Using the DairyCHAMP Program

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## Introduction

As veterinarians we have many skills which can help improve the performance of our clients' herds. We should fully use our skills and training to increase the efficiency and profitability of dairy herds and not limit ourselves to only those gains which can be made from controlling disease. Our value to clients is improved by using our skills in an organized way, and encouraging and using available technologies. Computer use to monitor performance and aid in diagnosis is essential to efficient and timely veterinary herd health services. Herd reproductive performance limits herd production and profits. Recognition of this by dairy farmers has made reproductive herd health programs increasingly popular with them for 25 years. We must ensure that reproductive health programs continue to contribute to farm profits. To do this we must continually measure and monitor herd reproductive performance.

It is not good enough to continue to visit farms for regular reproductive examinations and treatments at so-called herd health visits if the examination and treatment of cows is all that occurs. This is nothing more than individual cow reproductive medicine being practiced on a number of cows at each visit. Although this is convenient and spreads call overheads among a number of cows, it does not realize the potential gains possible from true **herd** health care delivery programs.

We must use reproductive records to select the cows which should be examined by veterinarians. They may be at risk or fail to meet targets. The DairyCHAMP program allows this to be done for predetermined categories of cows, but we set the intervals used in their selection. Thus, expert palpators may select for pregnancy diagnosis at 30 days and occasional palpators may set the selection for 49 days.

We need to monitor herd performance by comparing reproductive indices to herd targets to identify opportunities to improve herd production efficiency. Many indices of reproductive performance have been described, so it may be difficult and confusing to decide which indices to use and how to use them. The DairyCHAMP program provides calculated indices which are derived in an epidemiologically correct and consistent manner to allow herd performance to be reliably monitored and evaluated.

This paper highlights some features of the DairyCHAMP program in the evaluation of reproductive performance in dairy herds. It considers reproductive indices and their use to monitor herd reproductive performance to keep herds profitable.

## Reproductive Evaluation

The calving to calving interval and culling rate (especially reproductive culling rate) are critical production related indices of reproductive performance. They should always be considered together when evaluating herd reproductive performance since indices of calving interval which appear acceptable can result from culling all cows with long intervals. Information to evaluate the calving interval and culling rate are available in the Periodic Report of the DairyCHAMP program.

Bias to reproductive indices may be introduced if some cows are retained in herds for prolonged periods without a calving occurring. For example, a cow may calve in November of 1987 and not again until June of 1989. In an analysis of cows calving in 1988, the performance of this cow will not be included. The impact of such cows on herd performance indices and economics needs investigation. The demographics section of the DairyCHAMP report makes it obvious how many such cows are present in a herd so that their possible impact can be evaluated.

## Indices of Herd Reproductive Performance

It is important to clearly define the population to be analyzed in producing indices of performance so that consistency and comparability can be achieved. Popula-

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tions included in analyses may vary depending on whether the analysis is a monitor of recent performance or a long term evaluation of progress. The DairyCHAMP program analyzes performance in two ways, one for each of these purposes. The periodic report is designed as a monitoring report to allow recent trends to be assessed. Different populations are used for different indices in this report. The evaluation report is used for purposes of within herd or between herd comparative analyses and is based on a single population which is defined as having calved or having been born in a specific time period.

In monitoring, it is important to get a picture of what has been happening recently in a herd. Thus an index may relate only to the events occurring in the last month (e.g., pregnancy diagnoses in the last month) rather than all events for a year. This makes the measure current and reflective of recent performance, where an annual rolling average can, for example, mask a seasonal trend in an index and be much less sensitive in showing adverse changes in performance.

The periodic report of the DairyCHAMP program allows recent performance to be displayed, but also allows the user to define base periods (days, weeks, months or years) and displays up to 12 of these individual periods as well as the rolling average of these and the latest period. Thus time trends can be evaluated. The DairyCHAMP program also allows this analysis to be conducted based on the lactation number, location, breed or a combination of these factors so that associations of performance can be made with these epidemiological determinants.

When the object of the reproductive analysis is to document the performance for a herd to be used as a basis of comparison between years or a basis for comparison between herds, the population to be used should include all cows calving in a year which meet the criteria for analysis. This is what is done in the evaluation report of the DairyCHAMP program.

*Production Related Indices*

Calving interval and culling rate are two production-related indices of reproductive performance. Calving interval has limitations for monitoring herd reproductive performance because it is too retrospective. Usually calving interval measures the time from a previous calving to that of a recent calving. This reflects reproductive performance in the breeding period before the cow's most recent gestation. If improvements are occurring in herd reproductive performance, they may not show up in this index for over 12 months. The index may also be biased by the exclusion of cows which do not re-calve due to abortions or sale.[1] These are generally the poorer performing cows. The calving interval is reported in the DairyCHAMP program's evaluation report since it is a performance related rather than diagnostic index.

*Calving to conception interval* can replace calving to calving interval in monitoring because it measures essentially the same processes but is available much sooner.[2] It also is less subject to the bias of excluded data due to cows being culled because of late conception and never having a calving interval occur. The median calving to conception intervals or geometric means are possibly more representative of true herd performance because they are not biased by the non-normal nature of the skewness of the distribution. Cows with very long intervals do not raise the average so much. Ideal calving to conception intervals are 83 to 85 days for individual cows and about 90 days for herds due to the skewness of the distribution. The DairyCHAMP program reports the calving to conception interval in both the periodic report for monitoring and the evaluation reports. In the periodic report the population analyzed is the cows just diagnosed pregnant, while in the evaluation report it is for cows calved in a period.

*The proportion of a herd calving* in a year is influenced by the number of heifers calving into a herd and also the number of cows which calve twice in a year. Some cows in a herd will not calve in the year for which performance is being analyzed. Since this index is not widely used, it should be noted that a target of 110 to 120% of average herd size is attainable. The proportion of the herd not calving in a year may be as low as 0% but probably should not exceed 10%. Since the performance of these cows is not included in the evaluation of annual performance, its absence may represent a major source of bias in the annual reproductive indices of some herds. The proportion of the herd calving in a year can readily be obtained by using the periodic report where the numbers of cows and heifers in the herd and the numbers of those entering and leaving the herd are detailed.

*Culling rate* is readily calculated as the number of cows culled as a proportion of average herd size for any time period. The culling rate for the specified time period is available in the DairyCHAMP program's periodic report culling summary.

Calving (or calving to conception) intervals, the proportion of the herd calving and culling rates reflect the final outcome of all of the factors influencing herd fertility. While they relate to productivity they do not aid in the identification of problems causing inadequate reproductive performance.

*Diagnostic Indices of Herd Reproductive Performance*

To document performance and identify problems beyond the level of excessive calving interval or excessive culling, other indices can be derived from herd records if adequate information is available.

The *calving to first service interval* gives a guide as to the importance of pre-breeding and post-breeding factors

influencing reproductive efficiency. It is a useful starting point in the process of narrowing down causes of low reproductive performance. This interval depends on the occurrence and observation of estrus, the maintenance of records of estrus and breeding and the farmer's policy regarding breeding cows at observed heats.

If calving to service intervals are short (65 day herd average or less), the occurrence, observation and recording of estrus and the breeding management policy are compatible with efficient reproduction. If inadequate reproductive efficiency exists, attention can be directed to factors operating at or after breeding. Long calving to first service intervals result from prolonged post-partum anestrus, inadequate early estrus detection or a failure to record observed heats.

Estrus detection may influence the calving to service interval considerably. An index of the observation of estrus is the *estrus detection rate*, defined as [(21/average inter-estral interval) * 100].[3] The target level of performance for this index is 85%. Another measure of estrus detection is the *ratio of single to double inter-estral cycle lengths*.[4]

A measure of both the occurrence *and* detection of estrus is the *proportion of cows in heat by 60 days after calving*. A failure to cycle due to inadequate nutritional management is frequently observed as a number of cows with poor body condition and inactive ovaries. Where pre-breeding heats are not recorded, many cows are examined unnecessarily at a cost to farmers. Recording of pre-breeding heats helps to establish whether normal cycling is occurring without the expense to the farmer of veterinary palpation.

The influence of a farmer's decision to delay breeding can be measured and documented as the mean interval from a heat detected at a time when service is reasonable ( > 50 days postpartum) until service is given. This delay is due to management policy and is called the *deferral interval* by the author. It can contribute significantly to calving interval in some herds. This is the saving that could be made in calving interval by convincing farmers to breed at every heat beyond 50 days which they already detect and note. The number of deferral days is reported in the DairyCHAMP periodic report.

Satisfactory intervals to service with long intervals to conception indicate that there are conception problems or a failure to re-breed previously bred cows. A low *proportion of cows pregnant at pregnancy diagnosis*, where cows are normal and cycling on examination, indicates estrus detection problems after breeding.[5] The 20 CHAMP herds had 75.0% of cows pregnant at pregnancy diagnosis. A suitable target level is over 85%.

*Conception rate* (or really *diagnosed pregnancy rate*) measures the outcome of breeding. It is influenced by cow factors like disease, conformation and nutritional status. Nutritional inadequacies are generally associated with low production and excessive bodyweight changes. Infections may be involved and histories should be checked regarding calving hygiene, diagnosed uterine infections or vaginal discharges and vaccination status. Analysis of conception status by breed, group and age may help to define problems and guide diagnostic efforts. This can of course be done within the DairyCHAMP program. Low conception rates in association with anestrus in early post-partum cows constitute strong evidence of nutritional inadequacy.

Bull factors include the variation in fertility which occurs between different sires and between inseminators. Other bull factors are semen handling variations, artificial breeding technique and semen batch. Low conception rate associated with one or two of these variables indicates a problem due to this factor. First service conception rate provides the least biased estimation of bull factors. Overall conception rates can be biased due to a large number of unsuccessful services being given to a few cows. This may make conception rates look low, but have little impact on overall herd reproductive efficiency. This possible bias is avoided when first service conception rates are used. Conception efficiency can be analyzed by bull or inseminator using the conception rate analysis of the program. The program also provides a conception efficiency cumulative sum graph.

The interval from calving to service[6] and the interval from heat detection to breeding are two management factors which influence conception rate. The DairyCHAMP program has the ability to store the interval from first heat observation to breeding in the breeding event so that fine tuning of breeding policy can be undertaken to improve fertility. The program also allows the identity of the inseminator and that of the person detecting heat to be recorded so that the influence of these factors on herd fertility can be evaluated.

Sometimes farmers complain of conception rate problems in their herds which can be solely explained on the basis of early breeding after calving. Environmental factors also influence fertility. The results of a Minnesota study[3] indicate that fertility is depressed when high or low ambient temperatures occur. The major depression of fertility occurred in August in Minnesota which is the hottest month.

## Conclusion

Dairy herd reproduction is related to production efficiency and farm economic performance in several ways. A few reproductive indices reflect the economically important aspects of reproduction in dairy cows. Performance targets can be set and compared to observed indices. When performance in economically related

indices falls below accepted target levels, diagnostic indices can then be used to determine the management functions and reproductive processes which need to be improved.

The evaluation of herd reproductive performance and status requires that a planned and systematic consideration of indices which reflect key components in the reproductive process occurs. Indices reflecting the occurrence of estrus, its observation, the breeding of cows at estrus, and the outcome of breeding are all defined. A comparison of the value of these indices with expected performance levels can indicate where deficiencies occur and where opportunities for improvement exist.

The new DairyCHAMP program which runs on a personal micro-computer allows the key reproductive performance indices described above to be calculated routinely in a consistent and correct fashion with a minimum of effort on the part of a user of the program. It also provides the flexibility to allow a user to conduct their own directed investigation of the database of stored cow records in unique ways that may help in investigating herd fertility problems or in managing reproduction in a herd.

## References

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