Reproductive Performance and Recording Systems

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Introduction

Veterinarians receive considerable training in the diagnosis and treatment of diseases, along with nutrition, genetics, husbandry and environment. Because of our doctor image we tend to look first for diseases to explain inadequate performance in individual animals and herds and generally expect to have some means of therapy available to cure these "diseases" which limit production efficiency. In today's cattle enterprises, clinical disease is frequently of minor importance when compared with other aspects limiting production such as sub-clinical disease, feeding, animal husbandry, record keeping and general herd management. In many situations the farmer's inability to manage his herd limits productivity the most, especially in the area of reproduction. The animals are just one component, in a total farm system so veterinarians must be aware of the strengths and weaknesses of the *total* system which affect the animal enterprise. In most instances the farmer and his level of management limit the efficiency of animal reproduction, more than limitations due to disease. If the veterinarian is to make a real contribution to improving farm performance then he should use all of his training to provide means of dealing with all the factors limiting production efficiency. The proper use of records is the key to improving the level of management in dairy and beef herds.

Records are important for the evaluation of herd reproductive performance. Therefore veterinarians should know how to examine and analyse records to help diagnose the causes of inadequate reproductive performance in cattle enterprises whether due to disease or management. It is more likely that a diagnosis of the cause of inadequate reproductive performance in a herd can be made by thorough examination and analysis of herd records than by serological testing or microbiological culture. However, most veterinarians start to investigate the inadequate reproductive performance by examining cows and obtaining samples for serology or biochemistry. Many veterinarians argue that this must be done, because this is what farmers expect. It can also be argued that farmers expect this approach because this is the approach they have grown accustomed to.

The analysis of a complete set of herd records by hand can be a very time consuming task. Most veterinarians would be reluctant to charge farmers the actual cost of their time to do an analysis of the records of even a relatively small herd. Therefore, veterinarians rarely conduct analyses of herd records and generally have limited experience in using records to diagnose herd fertility problems or monitor herd reproductive performance. Even when veterinarians are conducting reproductive health programs in herds, in most cases the record systems are only used to select cows for examination of individual animals, then the animals are examined, treated and the findings recorded. Frequently farmers select the cows which require examination and the veterinarian only records his diagnoses and treatments. Records are important for these purposes, but they can also be used to *analyse* and *monitor* a herd's ongoing performance.

Since the practicing veterinarian is the only well trained independent professional who regularly visits most farms, he is the obvious person to monitor and analyse a herd's performance, determine the reasons for inadequate performance (especially in reproduction) and recommend methods for dealing with the problems or improving the performance. Even if a veterinarian doesn't have the skills to overcome particular problems himself, he should be aware of the sources of help and be able to act as a source of referral to other consultants who can help.

Access to conputing power is becoming available to everyone including veterinary practitioners and this will make it easier for us to monitor reproductive performance in dairy herds on herd health programs and help diagnose problems as they arise.

The Use of Records in Reproductive Control

Records can be used in a number of ways to aid herd reproductive performance.

Individual Cow Records:

The primary reason for farmers to keep records at all is to document the history of each individual cow in their herds. Most farmers periodically evaluate the performance of each cow by reviewing the cow's record and they may call their veterinarian to examine the cow if they believe that there is an abnormality in performance or that the cows require examination, say for pregnancy diagnosis. This is how the reproductive aspect of traditional clinical practice operates.

When a veterinarian offers a reproductive health program, the evaluation of each cow's performance can be

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formalized. The veterinarian can then define levels of performance for cows which he considers acceptable. In health programs, cows are selected for examination for a number of reasons:

For Example
- They are at risk
- They fail to meet performance targets
- They require routine examination - eg. for pregnancy
- They show excessive variation in normal function

In the operation of reproductive health programs a number of examination categories are defined and are generally similar to those of Blood et. al. (1978).

Pregnancy Diagnosis (P.D.) is conducted on cows at a minimum interval from breeding at which the veterinarian feels confident in his ability to make a positive diagnosis. This minimum varies from 4 to 7 weeks after a breeding which is not followed by a return estrus. Some cows may be palpated for the presence of a corpus luteum at about 21 days after a breeding if this coincides with the time of the visit.

Post-Partum Examination is conducted on all cows at 2 or more weeks after calving by some veterinarians conducting health programs while others (Morrow, 1963, Hartigan, 1972) restrict examinations to cows which have some clinically obvious abnormality near the time of calving (Blood et. al., 1978). It is generally accepted however, that examination before two weeks post-partum is unrewarding.

No Visible Estrus or Estrus Not Observed categories are included for examination in most reproductive health programs and all cows with no heat recorded for a prolonged period either after calving or after a heat at which they were not served are examined to check if cycling is occurring or if some clinically detectable abnormality is preventing cycling. The interval chosen before a cow is selected may depend on the level of detection efficiency and should be similar to the interval at which first pregnancy diagnosis is attempted. Any abnormalities are dealt with at the visits by appropriate treatments or recommendations. Where clinical abnormalities occur in individuals, appropriate actions are generally easy to decide, but herd problems may be more difficult to resolve.

Cows which *Fail To Conceive* after two or three breedings are included for examination in many reproductive health programs, although the appropriate means of treating the majority, which have no clinically detectable abnormality are still not well documented. Blood et. al. 1978, examine all cows which reach six months after calving without a positive pregnancy diagnosis, with one of the primary reasons being to draw these animals to the farmer's attention so that he makes a decision regarding their future in the herd.

Nymphomaniac cows generally are selected for examination and cows having 3 or more heats within a period of 35 days should be checked for ovarian follicular cysts (Blood et. al., 1978).

If *endometritis* or *pyometra* have been diagnosed or if an abnormal vaginal discharge is noted by the farmer, cows should be examined and treated as necessary until no further abnormality is detected, or a decision is made to cull the cow.

Pregnancy Rechecks can be requested if the findings are uncertain at an initial examination or if cows are recorded in oestrus after a previously daignosed pregnancy. Cows should also be checked if they fail to calve fifteen days beyond the anticipated date.

"No Activity Cows" is a group described by Blood et. al., 1978, which includes animals which don't have events recorded in their histories for more than six months. The purpose of requesting these cows is to check their status rather than to examine them for abnormality. If this type of check procedure isn't conducted, farmers dispose of cows without recording the fact and an accumulation of records of nonexistent cows occurs. This tends to confuse the veterinarian and confound analyses of performance.

Herd Records:

Epidemiologists have long recognized that the information which can be derived from the accumulated data of many individuals may give insights into disease which aren't obvious from the individual cases.

This concept can be carried over to the interpretation of herd reproductive records. The interpretation of herd (rather than individual cow) records is neglected by most practicing veterinarians, but modern technology is making it easier to calculate herd performance indices. Blood et. al., (1978) describe the concept of performance targets for herds and set certain performance targets for reproduction including the following:

i. All heifers should calve by 28 months of age.
ii. The mean herd calving interval should be at or below 375 days, with a standard deviation of under 45 days.
iii. The average open or calving to conception interval should be less than 90 days with a standard deviation of under 40 days.
iv. The mean lactation length for the herd should exceed 285 days and the mean dry period should be less than 65 days.
v. Less than 5% of the adult herd should be sold each year because of infertility or failure to become pregnant within an acceptable period.

These performance targets, if achieved, will be related to efficient biological performance. If they aren't achieved, then the herd requires closer analysis and monitoring to determine the specific areas of inadequacy which will aid in the diagnosis of the cause of the problem by identifying areas requiring further investigation.

The reproductive performance of herds can be broken down into a number of areas and various performance indexes relate to these areas. The calving interval and proportion of the herd culled for infertility are closely

related to productivity, but give no indication of the causes of problems. Diagnostic information is provided by other indexes, some of which are easy to derive, and others which are difficult.

The "Open Interval" and "Calving Interval" depend on when cows are bred, and what the success rate is at breeding. The proportion of cows culled for infertility is influenced by the same two factors and it should be evaluated when the reproductive performance of a herd is being assessed. It is easy to achieve a desirable herd intercalving interval if all cows with potentially long intercalving intervals are culled, but this excessive use of strategy is unlikely to improve farm profitability if a herd has breeding problems!

The time of breeding after calving is measured by the calving to first breeding (or service) interval which can be influenced by the occurrence and observation of estrus. An assessment of the herd's performance also depends on the farmer recording the observed heats and breedings.

Since anestrus and inadequate estrus detection have been the major factors limiting herd reproductive performance in both Victoria and Minnesota, I will concentrate on the use of records and recording systems in monitoring the occurrence and detection of estrus.

A number of indexes reflect the occurrence and observation of estrus, including the proportion of cows recorded in heat by 60 days after calving. A range from 45% to 85% is generally reported. In a study of records from 59 herds involved in a herd health program which emphasized the importance of detecting and recording estrus, the percentage of cows recorded in estrus ranged from 67.6% to 82.% in different years. However, some herds could consistently maintain a proportion of about 90%, so perhaps this is what should be aimed for. Another index which may be used to measure the occurrence and observation of estrus after calving is the mean interval to first observed estrus after calving. The interval observed for 59 Victorian herds ranged from 40.5 to 52.1 days over a 4 year period, although well nourished, well managed herds consistently achieved a mean interval of about 35 days. If either of these indexes is unsatisfactory, the cause could be a failure of estrus to occur, or a failure to observe or record estrus.

The assessment of whether or not estrus is occurring must depend on the findings when cows are examined. If a half have corpora lutea, others have follicles or corpora haemorrhagica and few have inactive ovaries or any detectable pathology then it is likely that the herd is cycling normally, which indicates that estrus detection or recording, not anestrus, is likely to be the problem. The failure to note estrus can generally be established by asking the farmer. The documentation of a failure to observe estrus is best accomplished by analysing the herd records further. "The estrus detection rate" has been defined by Wood (1976) as the $\frac{21}{\textit{mean interestrus interval}} \times 100$. In Victorian herds on a health program, this index averaged 75% to 80% but in 2618 British Friesian cows inseminated twice by A. I. the estrus detection rate was 58.5%. The index does give some impression of estrus detection efficiency but it could be influenced by the real extension of interestral intervals due to embryonic death, post-breeding infection, cystic ovaries or anestrus due to other causes.

Another means of evaluating the efficiency of estrus detection of herds participating in a herd health program is to determine the proportion of cows presented for pregnancy diagnosis which are actually pregnant. To be selected for examination normal non-pregnant cows must have had one or two heats which weren't observed or noted by the farmer. When pregnancy diagnosis is conducted seven or more weeks after breeding, then at least 95% of cows should be pregnant at pregnancy diagnosis and when pregnancy diagnosis is at four to six weeks at least 85% of cows selected for diagnosis should be pregnant. If the proportions are lower and most cows are clinically normal, this is good evidence that heat detection can be improved. When a low proportion of cows is detected pregnant at pregnancy diagnosis, this is an indication of poor estrus detection efficiency and is not related to the success of breeding, if cows are bred and return to service, they should be detected in estrus. It is the failure of estrus detection, not the failure to conceive which results in a high proportion of cows being non-pregnant at pregnancy diagnosis.

Another index of the estrus detection performance of the farmer, which is best used in large herds recording all observed heats, is the ratio of single (18-24 day) to double (39 to 45 day) interestral intervals. If there are six or more times as many single than double cycles, estrus detection is satisfactory, but if less than 5 times as many, then estrus detection *can* be improved. This index is specifically one of estrus detection efficiency which is not confounded by nutritional or pathological factors causing delayed returns to estrus.

In herds in which a compact seasonal calving is desired, a simple index of the occurrence and detection of estrus (and also service) is the submission rate or the percentage of the herd bred during the first 4 weeks of mating. Submission rates of over 90% can be achieved in well managed well fed herds.

Intervals from calving to breeding can be prolonged by a farmer's decision to withhold breeding from cows, even though they have been detected in heat at a time which would be suitable to breed them. This voluntary deferral of service can prolong open intervals and calving intervals and should be documented in an analysis of herd reproductive performance, especially in herds on a reproductive program. The interval between any estrus seen after 50 days post-partum at which the cows are not bred and the next breeding can be referred to as "deferral days".

Another index of fertility which influences open intervals is the conception rate, which measures the success of breeding. Most farmers believe that this index is the most important index of herd fertility since this is the index that A.I. organizations have emphasized as a measure of performance of bulls and inseminators. However,

conception rate is not the only critical index influencing open or calving intervals, (Olds, 1969: Williamson, et. al., 1980) and it is these which influence milk production efficiency and profitability the most in commercial herds (Louca and Legates, 1968).

However, conception rate does measure an important aspect of herd reproductive performance and it should be monitored, especially in view of the widespread practice of owner insemination which is becoming more prevalent. The first-service conception rate is the least biased estimate of fertility because it is not unduly influenced by one cow having a large number of services.

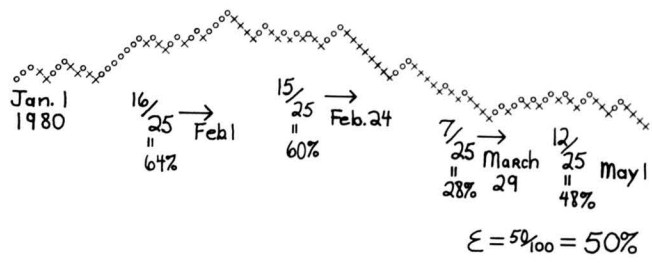
conception rate is influenced by many factors which can be subdivided into bull, cow and management factors. Low conception rates frequently are associated with poor semen quality of individual bulls or batches of semen, poor insemination technique and poor timing of insemination in relation to both calving and estrus. In some cases, nutritional problems or infections cause low conception rates, but these are usually associated with other signs such as anesturs or vaginal discharges.

Conception rates can be easily calculated from D.H.I.A. records and a veterinarian operating a health program can calculate conception rates readily by noting all services which occur between herd health visits on a chronological list and checking them as successful or unsuccessful when cows return to estrus or undergo pregnancy diagnosis. A running conception rate chart can be kept as a Q-sum graph (Meek et. al., 1975). This can readily be kept by hand, with each service being represented by a unit on the X-axis of a graph and with a graph starting half way up on the left hand side of a page and successful service moving the line one square to the right and up the page and each unsuccessful service moving it one square to the right and down the page, with the services being entered in chronological order. This technique gives a useful pictorial representation of any index having a yes-no result, and can be done relatively easily by hand as well as by computer, (Figure 1). It can also be used to graph the proportion of cows detected on heat by 60 days after calving.

Conclusion

Records can be used in reproduction to enable management decisions to be made about cows and herds. They can also be used to monitor the performance of cows and herds. Some types of records, especially relating to the performance of individual cows can readily be maintained by hand and monitored to allow selection of cows requiring attention. The monitoring by hand of population information about a herd is demanding on time and labor but some useful analyses can be done with a relatively small effort. An increasing number of veterinarians are purchasing computers to aid in practice management. The advent of computers in practices means that many useful analyses and indexes can be produced with minimal clerical effort by veterinarians who own computers and have them properly programmed. Therefore, we should address the problem of how to best analyse and present reproductive information to farmers. We should also become very familiar with how to use reproductive indexes and analyses to help in the monitoring and management of farms.

Figure 1. Graph of conception performance of consecutive matings.



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