Preventive Medicine and Infertility in Herd Health Programs

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In a previous paper I dealt with what appear to be the important areas of change in what the cattle farmer wants from his veterinary adviser, and what the implications are likely to be for the future of the bovine practitioner. The principal areas of change which I foreshadowed, and which I now propose to dissect in terms of infertility, were:

(I) In commercial herds a decrease in single treatments of sick cows, at least by practicing veterinarians.

(II) Much greater activity in providing analyses of the farm's production performance. It will then be possible to diagnose that a farm is producing inefficiently, and to locate the area in which it is occurring. Is it nutrition, a labor problem, or is it disease? And having determined that it is disease, to identify it.

(III) When the problem falls into our area of competence, disease, the objective will be to restrain the prevalence of the disease to a predetermined level.

(a) In determining which is the most appropriate level of restraint it will be necessary to relate the cost of such restraint to its effectiveness and to choose from among the options which are available the most financially effective method—a profitability analysis.

(b) Above all, it will be necessary to relate the effects of the disease limitation maneuvers on the management and financial welfare of the farm as a whole.

Predictably, I suppose, I propose to carry out this dissection in terms of what we do in our own service. It is as close to our needs as we know how to make it.

Locating the cause of reproductive inefficiency. We are not, or at least we are not yet, in a position to diagnose inefficiency in production for a farm, but if such a diagnosis is made and the fertility status needs to be checked out, or if a farmer thinks he has a problem of specifically reproductive inefficiency, or if a farmer wants his herd's reproductive efficiency continuously monitored, we are in a position to do these things.

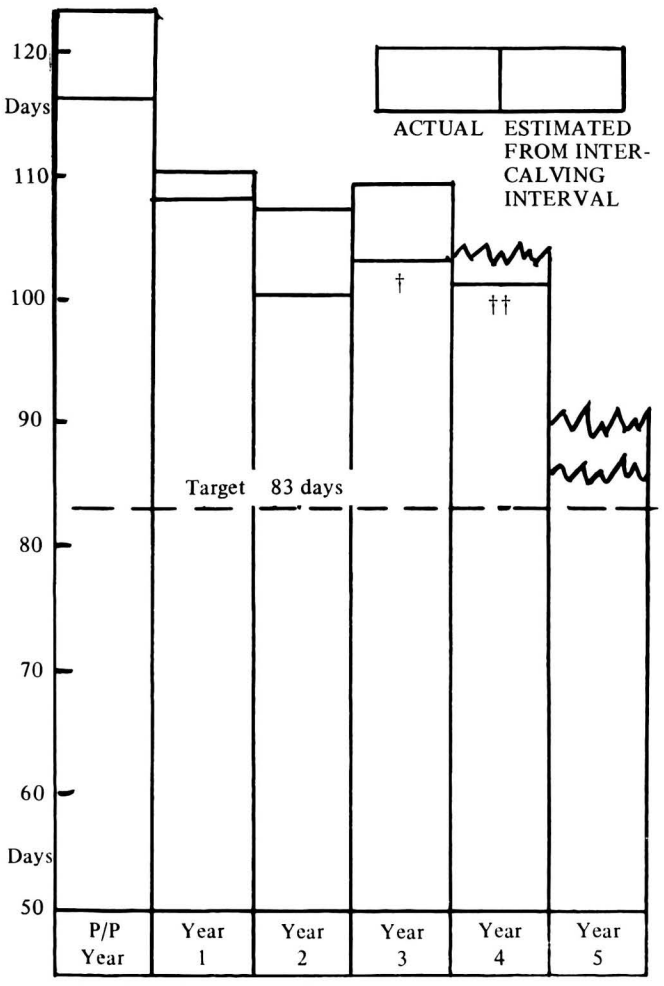
After a great deal of argument we have selected the intercalving interval as the single critical index on which to base a diagnosis of reproductive inefficiency. At 365 days, average intercalving period, the farm is achieving optimum reproduction, and every day more than that in the herd average means a net loss in terms of our costs and returns of about $.50 per cow. (The relationship is actually much more complicated than that. It is definitely not a straight-line relationship, but it will serve to indicate the levels of financial loss).

We had eight herds, comprising 1750 cows, in our program. The average figure in the preprogram years showed a shortfall of 40 days from the target of 365 days. In terms of the 1750 cows in the population, this meant an estimated net loss of $37,500. We have gradually reduced the interval and are approaching the target figure of 365 days.

It is pointed out that the final figures for the fourth or fifth years still need some amendment as a few very long intercalving periods are completed. You will appreciate that farmers are reluctant to cull some relatively infertile cows. As I said in the first paper, the intercalving interval is a retrospective index, and we need a guideline which is available much earlier in the breeding cycle. Like most other people who work in this area, we use the "calving-to-conception-interval," based on pregnancy diagnosis.

We show a gradual progress towards the target of 83 days. However, the progress in this calving to conception interval is less than in the intercalving interval. (In the fourth year 15 days as against 27 days).

Figure 1 attempts to reconcile the discrepancy. The lower figures represent the calving to conception interval as determined by pregnancy diagnosis. The larger figures are calving-to-conception intervals as determined retrospectively by subtracting 282 days from the intercalving intervals (282 days is the average duration of pregnancy over many thousands of cows in our practice). The average discrepancy of five days between the two measurements is due to a few very long intercalving intervals in cows which were



†Significant Management Errors in 3 Herds
††Drought badly affected one farm

Figure 1: Changes in Reproductive Efficiency Calving to Conception Interval. Averages (8 herds-1750 cows)

not presented for pregnancy diagnosis, because they were not pregnant when they were drief off and turned out. In the fourth year the final intercalving interval average needs the final figures for those very long intercalving intervals and is therefore incomplete. In the fifth year both averages are shown as incomplete, the intercalving interval for the same reason as before. The calving conception figures are shown as incomplete because we have only two herds which have completed five years at the end of 1972. Late figures this year suggest that the average figures will be about five days more than suggested (the predictive figure will be 92 days and the corrected final figure will be 97 days)—a total gain of 27 days over a period of five years.

It is a relatively simple matter now to multiply the days gained by $.50 per day and come up with the average savings. Of a possible net saving of 30 days and $15 per cow the average farmer has saved 15 days for a gain of $7.50. They are half-way and, by the look of the graph, leveling off.

From our experience with these herds we know that there are significant differences between farms so that I have set out those differences in Figure 2 which looks a bit like an entry in a competition to see who can get the most information on one slide.

It is the performance of each herd, the herds being arranged in the order of their performance efficiency, almost in order of their profitability but not quite. Each farm is listed separately for each year it has been in the program and for a preprogram period of at least one year to serve as a base line.

For each year the calving-conception interval as determined at pregnancy diagnosis is shown in relation to the target of 83 days. The first farm has made a tremendous gain because his performance was very bad to begin with, but he responded well. An excellent farmer biologically—just a poor businessman who badly needs our analyses.

The second farm is in the same category but not as bad. His story was that he was president of the Artificial Breeders and deferred breeding cows to achieve a high conception rate.

The third farm has a very good performance from not too bad a start. Its characteristic is a bad performance in the third year. He got into an awful mess by changing into a new parlour and consolidating two large herds.

The fourth changed into a new parlour and increased the size of the herd and had the same result.

The fifth farm was the only herd that did not improve in the first year but did well in subsequent years. It was a herd that had been put together very quickly and had a large number of problem cows which took time to identify and remove.

The sixth farm did something of the same thing, but being in pretty good shape to begin with he has achieved the biological target without making much financial gain. Actually, it was enough to encourage him to retain our services, but he has terminated our association.

The seventh farm did very well to begin with, but the son was drafted for army service for two years and the father could not maintain the level of efficiency. The herd size increased by 50% over this period. And then when the boy finished his army stint they had a crippling drought.

The eighth farm was a failure for the first four years because the manager, relatively inefficient when he was making intuitive decisions in a 250 cow herd, became confused and more inefficient as a result of trying to improve the poor performance.

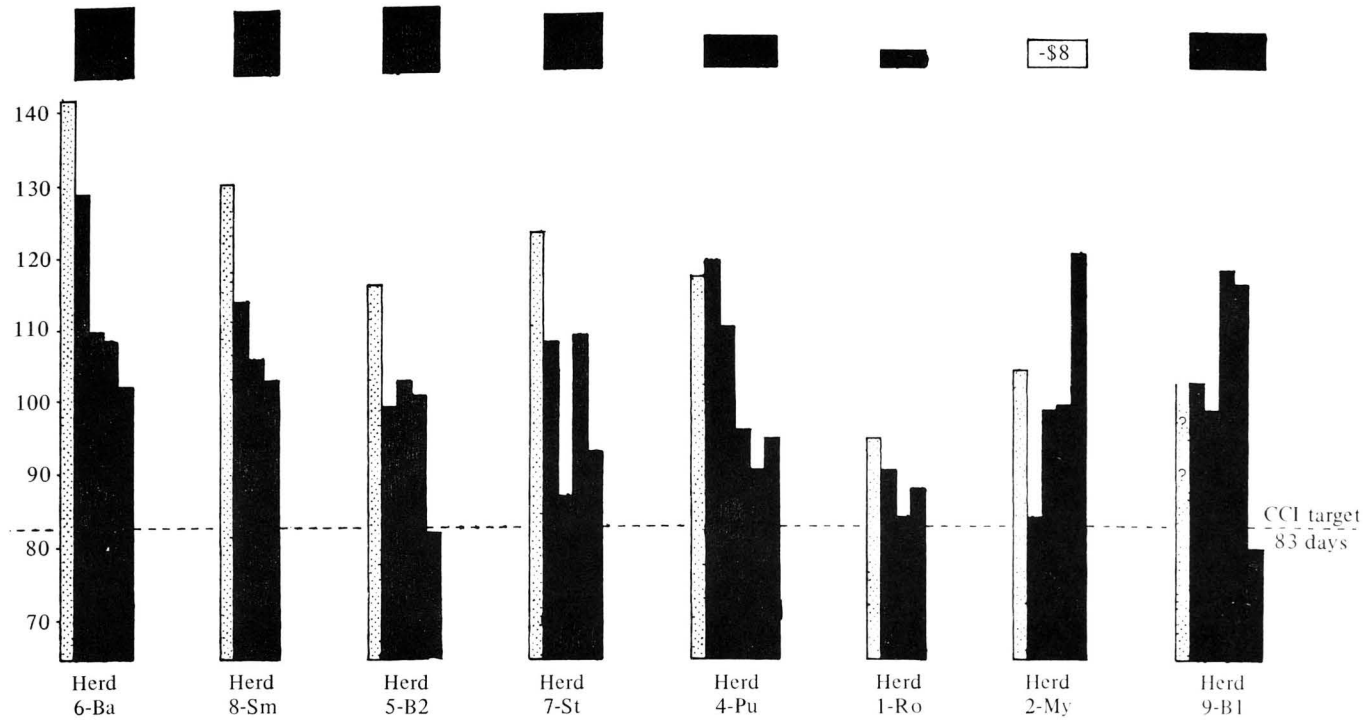


Figure 2: Changes in Reproductive Performance Calving to Conception Interval in Days.

A change in manager produced the desired result.

In terms of profitability there is the obvious variation from plus $20 to minus $8, and a difference between a gain of $18 and target achieved in one herd and $20 achieved and $15 to go to the target in another. There is the obvious point that a good herd starts off with little to gain but can still achieve a worthwhile return.

My purpose in showing you these details is to highlight my concluding comments in the first paper. Principally, the comment that it is impossible to run a completely controlled scientific experiment in an uncontrollable commercial environment, but a carefully controlled experiment would not be able to take into account all the management variables that are so important to productive efficiency. Like a two-year stint in the army.

There are other variables of course. Like the difference in accuracy of the calving-to-conception interval in the various farms. This is entirely a matter of what proportion of cows finish a lactation and are still not diagnosed as pregnant (Figure 3). The background figures are in Table I.

It seems to us to be a choice between doing nothing or doing what we have done. Decide on what information is critical and collect it and measure the effect of natural variables. Then make some preventive health changes in management and measure the effects they produce.

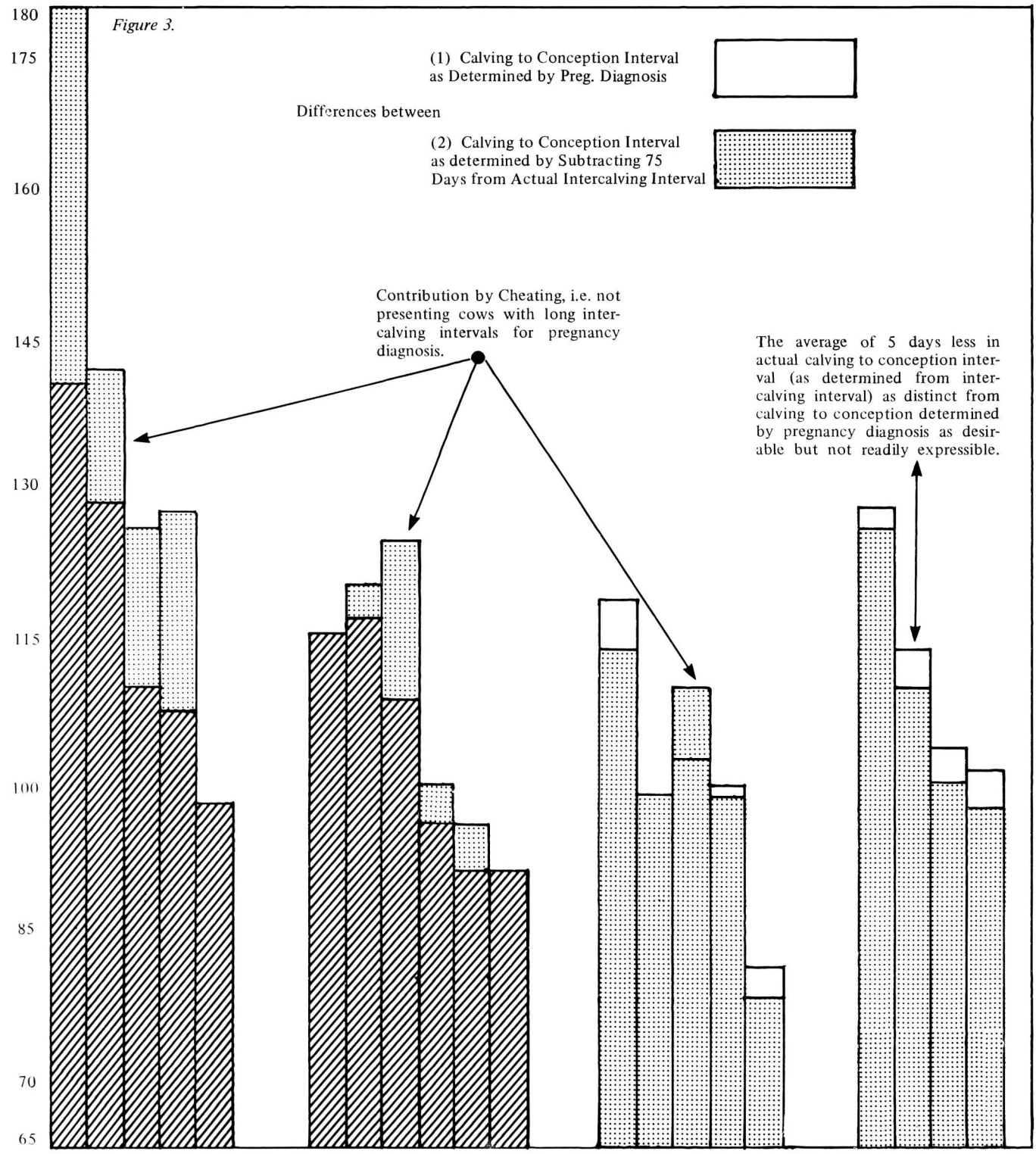
At present we can see trends, but we don't have enough information for enough separate sets of circumstances to enable us to predict confidently what is going to happen on the basis of current data. We have already produced a mathematical model of reasonable accuracy for use in our own environment.

I started off this talk with the intention of making three principle points. That was the first one. We need to collect a lot of data on the degree to which many factors affect reproductive efficiency. This requires a lot of people doing approximately the same thing in a lot of places and in different circumstances.

The second point I wanted to make is that it should be possible to collect data in such a way that if reproductive inefficiency is evident because the calving-conception interval, and therefore the intercalving period, is longer than the permissible limit, it should be possible to define from the data what the nature of the reproductive abnormality is.

The discussion of this subject falls naturally into two parts. Firstly, the examinations and treatments we carry out. These will differ very little from what many of you already do. Secondly, we must consider the indexes we use to express the analysis of the observations made, and to recount how these help in locating the type of cause of infertility.

We use approximately the same system regardless of whether it is a once-only examination of a problem which is known to exist in a herd, or a routine periodic examination for the purpose of monitoring reproductive efficiency. We make



periodic visitations, once monthly, and examine cows nominated previously by us on the basis of the records that we keep on each one. The system, the examinations and the treatments are as near to the desirable as we know how for our circumstances.

Examinations and Treatments

1. **Pregnancy diagnosis** in cows mated 7 to 11 weeks previously, without subsequent return to oestrus. Nonpregnant cows go into the N.V.O. group.

2. **Examination of N.V.O.'s** (No visible oestrus

Table 1

Accuracy of Calving-Conception Interval as Indicator of Reproductive Efficiency in Individual Herds

Herd No.	Calving-Conception Interval Measured by	Pre Programme Year	Prog. Year 1	Prog. Year 2	Prog. Year 3	Prog. Year 4	Prog. Year 5
Herd-1 Ba	By Diff. from Calving Interval	185	144	128	129	87	
	Pregnancy Diagnosis	142	129	110	108	102	
	Difference	43	15	18	21	–	
Herd-9 B1	Inter-calving figure	–	101	105	119	117	68
	Pregnancy Diagnosis	–	102	99	118	116	77
	Difference	–	-1	6	-1	+1	-9
Herd-1 Ro	1/C/1	98	101	91	–	–	–
	Pregnancy Diagnosis	95	91	84	87	–	–
	Difference	3	10	7	–	–	–
Herd-2 My	I/C/I	98	87	98	101	98	–
	Pregnancy Diagnosis	104	84	99	100	120	–
Herd-7 St.	I/C/I	123	116	94	113	–	
	Pregnancy Diagnosis	123	108	87	109	93	
	Difference	Nil	8	7	4	–	–
Herd-4 Pu	I/C/I	117	122	126	101	100	85
	Pregnancy Diagnosis	117	110	96	96	90	95
	Difference	–	3	16	5	10	–
Herd 5 B2	I/C/I	115	99	111	101	78	–
	Pregnancy Diagnosis	118	99	103	100	82	–
	Difference	-3	Nil	8	1	-4	–
Herd-8 Sn	I/C/I	128	111	101	98	–	–
	Pregnancy Diagnosis	130	114	105	103	–	–
	Difference	-2	-3	-4	-5	–	–

cows.) This includes the supposed pregnant cows which have shown no oestrus for 49 days after service but are in fact pregnant. By far, the bigger group is those cows which have not shown oestrus for more than 49 days after calving. The basic decision is whether the problem is faulty oestrus detection or anoestrus. In our circumstances it has been principally faulty heat detection. Ovarian palpation, in association with the use of a heat detection device, should indicate whether anoestrus, suboestrus or faulty heat detection is the cause. If anoestrus is obviously occurring, it is necessary to look for evidence of malnutrition. This examination consists of a consideration of the diet, of milk production, and either assessment of the cow's metabolic profile, including estimation of blood glucose levels, or alternatively a response to dietary supplementation on a trial basis with total energy or appropriate minerals.

3. **Examination of F.T.C.** (Failure to Conceive) cows. The classical "repeat breeder" category. Just as we select from the farms' records the identities of the cows now showing oestrus, we also identify cows that have been bred twice and come on heat a third time. We have no more answer to this problem than anyone else has, and in diagnosis and treatment we can do no better than, nor in fact any differently from, what I have done all my working life.

We examine normally per rectum for signs of endometritis, thickened uterine walls, salpingitis; per vaginam with vaginascope for cervicitis and uterine discharge; by swab for microbiological pathogens; by vaginal mucus for vibrio antibody and serologically for *Brucella abortus* antibodies. However, these represent at most a small proportion of the problem. Any cow with evidence of cervicitis-metritis is treated by intrauterine infusion with penicillin-streptomycin, with the same results that Moore and Roberts achieved 30 years ago with less sophisticated remedies, including normal saline.

One cause of "Failure-to-Conceive" which has ranked high in our experience, especially when the fertility situation is bad, and no effort is being spared to improve it, is the inclination of farm workers to have cows bred which are not in heat. It is a common response when heat detection is poor. The farm worker realizes that he should be averaging six services a week, and when he is down to three he is likely to breed anything that looks sideways. Any cow which shows an abnormal vaginal discharge is, of course, kept in for examination. (N.B. This brings me to another signpost of things I must say. We don't engage in any biological investigational work which is being well conducted elsewhere. We read the literature, go to conferences and include any technique with merit in our program. We may run a trial at first to modify the technique to our circumstances. Heat

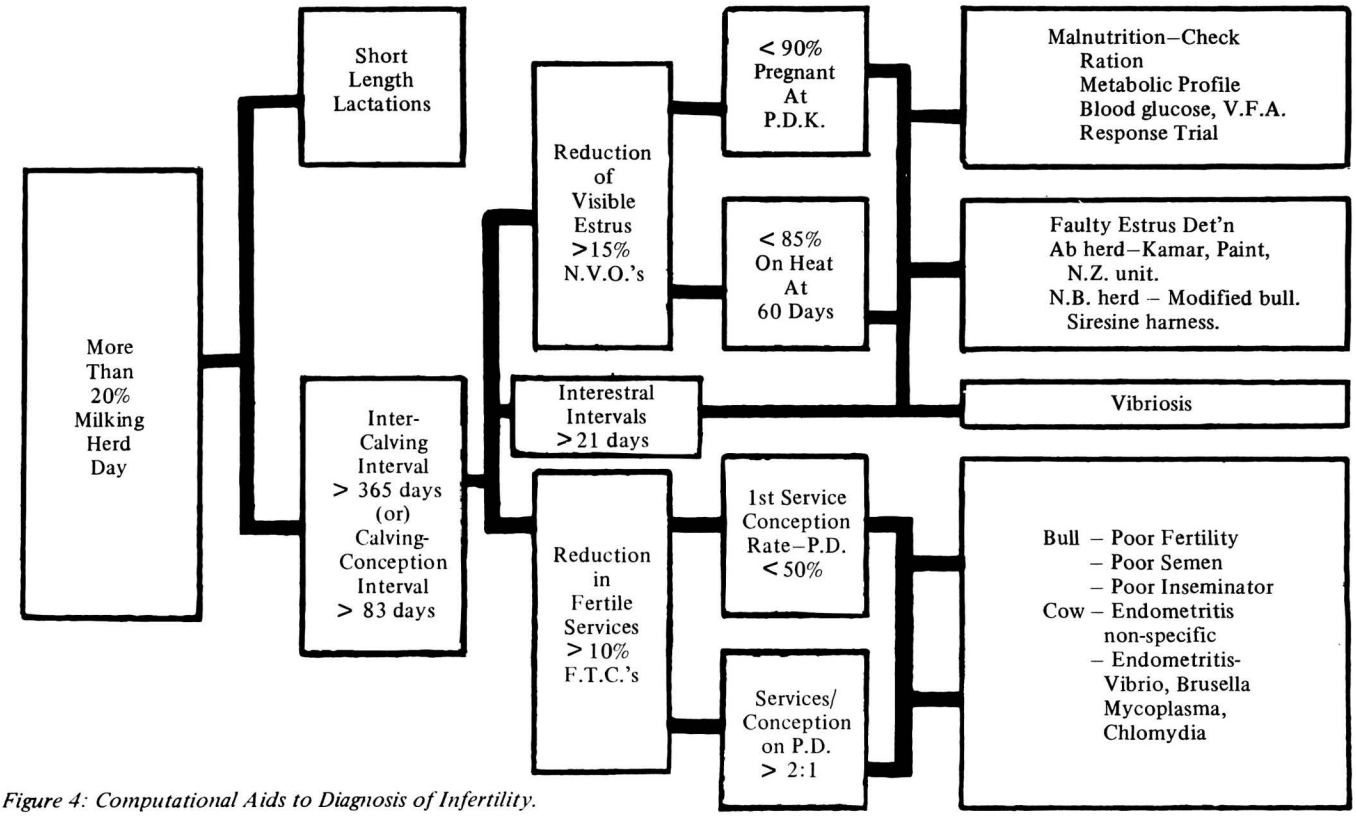


Figure 4: Computational Aids to Diagnosis of Infertility.

detection is one such area in which we became very interested, but that is another matter.)

To avoid missing cows which experience long interservice periods there is a final selection criterion for F.T.C.'s. Any cow which has not been diagnosed pregnant six months after calving is brought in for examination as an F.T.C.

Analysis of Results

Having done those examinations and done the necessary treatments, we pass all the data to the data analyst, as I described in the first paper, and we get back his analyses on which we base our judgements. The indexes we use, and these are also headings used in monthly and annual reports, are as follows:

(a) *Distribution of Herd:* If more than 17% of the cows in the herd are dry, the herd is carrying too many followers. We allow a tolerance up to 25%. After that a warning signal is raised—the fault may be in any of the areas outlined in Fig. 4. The only reservation is that the criterion relates to herds which are milking all the year round and calve equal numbers every month, otherwise targets must be provided for each month.

(b) *Intercalving Interval:* An error in distribution of the herd could be due to short lactations or long intercalving intervals. The former are easily checked in our records because lactation lengths of all cows are automatically computed. So are intercalving intervals and these are an admirable criterion if one is concerned with something which is already past. When confronted with something in the present, it is better to devote consideration to the calving to conception interval. Prolongation of either can be caused by a reduction in observed oestrus, or a reduction in the proportion of matings which are fertile as shown in the diagram. Reductions in observed oestrus (which can result from anoestrus, reduced oestrus or poor oestrus detection) can be indicated by:

(c) *The Proportion of Cows presented for Pregnancy Diagnosis which are not Pregnant*: The objective is to have 100% of cows pregnant at pregnancy diagnosis. Good farmers can maintain a level of 95% over long periods. A level below 90% requires a vigorous tightening up of heat detection methods. (Williamson's papers in the Veterinary Record arose out of our experience in this field.) In artificially bred herds the answer is often one of using one of the available aids to heat detection. We depend largely on palpable ovarian findings, of which we keep a record, to decide whether there has been ovarian activity. If a corpus luteum is present this will eliminate the other possibility—anoestrus—from consideration as a cause of the apparent failure to return to oestrus. There is also a small segment of pregnancy diagnosis which is of interest, but unknown significance—cows which are

pregnant but demonstrate oestrus. Most cows which show this phenomenon have uncomplicated pregnancies. There is a very small proportion of them which have suffered apparent foetal death.

(d) *More than 15% of cows presenting as N.V.O. subjects:* The objective is to have over 85% on heat 60 days after calving, and more than 15% of cows in this group spells a problem. Remember that because we visit only once each month some cows will be 76 days (i.e. 48 + 28) calved before we examine them. In my present situation where herds are big and milk 200 to 500 head and nutrition is good, such problems are usually due to faulty oestrus detection. At least improvement in heat detection methods in our herds has had the effect of reducing the number of N.V.O.'s in all herds by 67% (Table 2). In another area where herds are small, nutrition poor, and the dairy farm a subsistence operation, ovarian inactivity is a more likely cause.

Table 2

Effect of Improved Oestrus Detection on Number of Cows Presented as Showing No Visible Oestrus

	% N.V.O.'s all herds
1968	54.1%
1969	37.8%
1970	33.0%
1971	25.5%
1972	18.5%

(e) *More than 10% of Cows Presented as F.T.C.'s:* One cow that is a repeat breeder represents a problem, but when does one have a herd problem? I don't know from experience because F.T.C.'s have not bulked large in our herds. In 1972, 4.7% of all cows in our herds were presented as F.T.C.'s. We are inclined to think that over 10% F.T.C.'s means that a herd problem exists. When we reach that point we may re-introduce the routine use of an examination technique which we used to use but eliminated because it showed no advantage and cost a good deal. This was the postnatal examination of the uterus by rectal palpation, and of the cervix and uterine discharges by visual and bacterial examination per vaginum. An examination which is probably routine for those of you who do this kind of work.

A herd problem with F.T.C.'s could mean (1) poor fertility semen—which could be determined by examination of the semen, the bull, and by comparison with performance in other herds; (2) breeding at the wrong time in the oestrus period. Not an uncommon event when inseminators are trying for high conception rates—detectable from history; (3) faulty insemination techniques of any other sort; (4) infectious disease such as vibriosis or brucellosis, detectable by laboratory test; (5) malnutrition. Perhaps detectable by assessment of metabolic profile including blood glucose, volatile fatty acids, etc.; (6) perhaps an extreme varient of (2) is the tendency of a farmer who is in difficulty with heat detection to breed many cows that are not in heat.

(f) *Services per Conception and First Service Conception Rate.* When these are based on pregnancy diagnosis and not on failure to return to oestrus these indexes make a meaningful contribution to our assessment of the herd's performance. They can be dissected for an individual month or season, for an individual bull, an individual inseminator or even a particular batch of semen. They are particularly valuable for the above purposes when they are available from other herds and areas permitting interfarm comparisons. If it is apparent that it is an individual farm problem, it is of very little more value than considering the prevalence of F.T.C.'s. All other things being equal, we would like less than two services per conception, and a first-service conception rate of at least 65%. But provided the calving to conception interval is O.K., we must accept more than three services per conception and a first-service conception rate of 40%. This is an environment where insemination is very cheap. Where A.I. is expensive conception rates become more important.

(g) *Inter-oestral Intervals.* Significant differences from the standard of 21 days attracts attention because of the possible occurrence of vibriosis or, if the intervals are in error by multiples of 21, heat detection is probably at fault.

One of the things that I have to stress about the system I have just described is that we have to depend a very great deal on accurate recording of events by the farmer. We encourage this by specifying exactly what we want recorded, and we keep these items to an absolute minimum. We record it in a strict *pro forma*, and we collect the same information regularly, in this instance every month.

I come now to the third point which I suggested would need elaboration. It derived from the need to relate the effects of the disease limitation maneuvers to the management and financial welfare of the farm as a whole. I can best do this, I think, by referring to a real-life situation, a situation in which the questions posed nowadays tend to be very different from the ones we used to get, especially in the matter of infertility. For example, all of our herds are pastured outside year round and milk production is subject to variation

depending on the availability of pasture. Supplementary feeding is practiced during the winter months when pasture growth is least, but the costs are considerable and the advent of a drought with the prospect of having to buy feed spells disaster. All farms irrigate, and this brings a measure of stability but there is always *pressure* to keep cow numbers at a minimum for the amount of milk required.

The other management *pressure* is directed at avoiding underproduction of milk for human consumption as liquid milk. To underproduce for even a short period would mean losing part of one's quota or contract. The mechanism used to avoid underproduction, and I'm sure many of you have the same, is to overproduce to provide a safety factor. The excess milk is sold for processing at less than a half of the whole milk price. Most of our farmers have, in the past, carried too many cows and produced too much low-priced milk. The principal objective was to have cows in reserve in case infertility reduced the number available to calve at a particular time.

Now that we have infertility largely under control and have a monitoring system whereby a calving rate problem would be predicted at least six months before it happened, the number of cows carried as a reserve can be greatly reduced, and the overproduction of low priced milk does not have to be absorbed by the greater profitability of the liquid milk.

To get maximum effect from this maneuver it is necessary to select each cow as she comes up to the time of being bred and either specifically nominate her to be inseminated that month, or defer her because the next month needs more cows to breed than it has, or mark her down as redundant and to be culled. So the farmer gets a "breed these cows this month" list, as set out in Figure 5. The system is not particularly sophisticated, but it does require us to know how many cows the farmer wants to calve in a particular month and takes account of the current fertility level in the herd. So, the maximum economy can only be achieved by having the best possible advice about infertility in the particular herd, and the only way to get this is to feed in data to a storage system and gradually accumulate more data about more circumstances and to be able to answer more questions more accurately.

The accuracy and dependability of one's knowledge of the herd determines how far back you can cut the number of reserve cows and still avoid any significant shortfall in production. As an example, I quote figures from a herd which has had a fixed quota for the whole period and has aimed at and achieved the same annual total milk production. In 1971 they had a total of 570 females of breeding age in the herd. In 1972 we reduced this to 530 and in 1973 to 466. The need to reduce was obvious. We had fertility well under control, milk production was increasing and the farmer over a period of two years removed 18% of cows who were just earning their keep, and we anticipate that they will go further yet.

One aspect of the data system and its analysis as we use it is the very high speed of response when decisions need to be made. It is one matter to have collected the data. It is another matter altogether to have collected it and stored it in ways which make it readily analysable, in such a way that answers to urgent questions can be provided, and speed is often so important to us.

Urgent questions such as "Can I safely sell a good-sized group of cows because there is a feed shortage, and the market is good, but without prejudicing my required milk output?" The owner doesn't want a guess. He wants a statistically based answer, and that requires that you know his intercalving period, its variability from month to month or season to season, its dependability—its standard deviation, and considerable information about milk production. So, to repeat, one needs a store of data on the farm's activities collected over several years, collected and analysed in specific, selected indexes, and stored in a computer and analysed by a computer programmer/statistician.

That concludes the three points which I set out as requiring elaboration. It leaves me with a few minutes to take up a matter which I can perhaps call point 3a. It arises out of our recommendation to the farm I used in the last example to sell a significant proportion of its cow strength. The farmer, being a good businessman, immediately did so, but other farmers in similar situations do not necessarily do this. This leads me to a consideration of managemental device used by farmers to provide a reserve of milk supply or to optimize the conception rate. It is the device of mating deferral.

It took us a little time to discover the technique which was sometimes carried out subconsciously. It became apparent when we provided the additional resource by improving reproductive efficiency, but the average intercalving period on a particular farm did not reduce as it should have. I do not have figures accurate enough to illustrate the point well, and the figures I do have were gathered in retrospect, and are susceptible to several explanations. I can say that there was a difference in average deferral times between herds

of up to 14 days. Since we became aware of its size and financial importance, it has been reduced to more reasonable proportions in most herds. This is still too high a level in one herd. The reason is the need of the owner, who is chairman of the local artificial breeders' cooperative, to maintain the highest possible conception rate.

I have brought this point up not only because it does have some effect on the performance of herd health programs—it obviously does do that—but to highlight the importance of farmers' motives in shaping their objectives. On examination we found that the objectives we anticipated as being all-important—achieving maximum return on the investment—was the principal motivation to only *some* farmers.

Risk aversion was a very common motivation. In this instance the fact that we gave them an extra resource meant to some farmers that they could tuck away more potential days of lactation by deferring breeding cows, and drying cows off earlier in lactation. When we convinced them that we were providing, through a service which maintained a predictable level of fertility, the necessary insurance against risk, they were prepared to use the new resource by reducing cow numbers.

Choosing an alternative enterprise. However, this maneuver brought some farmers face to face with the difficulty of selecting another enterprise, rather than following the relatively unproductive path of producing more milk for processing. In most cases the choice was obvious, beef as a sideline. However, to many farmers this meant acquiring a new set of skills, which they were not prepared to do, so much so that one farmer who was producing far too much milk began to show up in the figures as having shorter and shorter lactations. It was too severe and critical to be genetic. The farmer was drying the cows off at 20 lbs. production a day when the herd average was only 30 lbs.

The Need to Perform Well. Another motivation appeared. We had, unfortunately, done our earlier propagandizing too well and farmers, many of whom feel the need to perform well as a lead to their friends, believed that they should maintain a very low services-per-conception ratio. Years ago we had convinced the artificial breeding centre not to inseminate cows which had calved less than 60 days ago. It took some time to break the philosophy down, especially as the prize for the best inseminator was based on it, but we did it, tough as it was.

The Absolute Level of Income. Perhaps the most illogical reason for farmers not taking financial opportunities was the one most difficult to combat. To some of them it seems immoral to live at an income which is many times more than their fathers enjoyed. As a result, many of them earn about 2% on the realizable value of their farm. They accept only half of the financial advantage we offer, and this tends to reduce our demonstrable gains and sadly slows down the rate at which our gains are made.

I said earlier that I would return to the matter of speed in advancing herd health projects. This is really all that I want to say about it. It would be a great deal faster if the farmers were all automatons and if it was all a controlled experiment and therefore logical and answerable to the laws of science.

Conclusion

That is our version of how preventive medicine best fits fertility maintenance in dairy cattle. If it sounds as though we take over the reproductive management of the herd, that is about what we do. We more or less assume responsibility for achieving the farmer's objectives and by and large we have only gotten into difficulties when we have wrongly assumed that the farmer's objectives are the same as ours. It can be a fatal mistake, and in our newly developing beef herd health program we are taking very great care to determine what each farmer's objective is, and it is amazing how much they differ. They vary all the way from more beef per acre at least cost to topping the steer market at the fat stock sale.

We try to educate farmers to be aware of optimum production aims, but it isn't easy. One of the most convincing arguments is to put a price on their aims and activities which tend to reduce the profitability.

I have said very little about a number of relevant matters. It did not seem possible to cover the whole field of preventive medicine and its relationship to infertility, so I have limited myself to what appear to be the problem areas that we have with us now and are likely to face in the near future. For example, I have said nothing about the control of brucellosis, trichomoniasis, vibriosis and other specific causes of reproductive inefficiency. In closed herds these diseases are no longer significant in our context, and the sort of program I am discussing presupposes their prior virtual eradication. In fact, it is only when those diseases have been brought under strict control that it is possible to attack the "Residual Infertility Problems" of malnutrition, oestrus detection errors, pasture oestrogens and similar production-type diseases. One of the strong weapons we have and to which I

have not referred is culling. We are aided and abetted in its use by a high beef price and management conditions to keep cows in good fit at all times. We have no specific criteria for culling because the pressures, and the objectives, vary from farm to farm, and from time to time. In general, if a cow is going to exceed 400 days between calves she would have to show significant superiority in some area other than reproduction. Strong culling pressure is more important to us in beef cattle even than in dairy cattle, and I regret that I have not been able to use more examples from that industry. That is largely due to the fact that we have branched out into herd health practice in beef herds only very recently, and I don't have the knowledge or confidence that I have in the dairy industry.

At first glance it seems that infertility is going to present little in the way of problems. A herd conception rate, including heifers, is likely to be as high as 95% and a weaning rate of 92% is not unusual. To attempt to do better might not be cost effective. That, and everything else I have said, probably gives you the impression that I adopt a mechanistic, unbiological approach to the whole matter of animal production, including fertility. I do, but I think it is essential to use mathematical and statistical methods to make the judgements on management procedures.

To me, it is the only way that animal farming can stay alive and in competition with man-made materials that we have the benefit of being detached from sociological whims and fancies, and from environmental independability and biological variability.

Has the Practitioner A Future for Pharmaceutical Sales

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Ladies and gentlemen, I speak to you today as a businessman, pure and simple. As the marketing director for Merck's Professional Veterinary Products, I am responsible for returning a profit to my company for the products that we market to the veterinarian. These products are not selected randomly or by chance. They have a pedigree of research, reliability and quality. They are positioned in the market to return the best possible profit. Since veterinarians are independent businessmen, for the most part, you are fully aware of the need for profits to pay for the overheads in your business just as we are aware of their need in our business. You have also the added responsibility of improving the profitability of your clients' animal production operations.

At the risk of seeming to present the obvious, may I stress that the beef or milk producer looks to you to help him protect his investment. The producer is not a scientist, seeking solutions to the problems of disease and nutrition merely to enrich existing knowledge. The producer is a businessman. Those who serve him must understand, above all, the economic nature of his business. They must demonstrate that the cost of their knowledge and services more than pays for itself in terms of increased earnings for the producer.

My specific assignment today is consideration of the theme, "Has the Practitioner a Future for Pharmaceutical Sales?" This is a pertinent question. In fact, it might even be considered a "hot potato subject" since there is much controversy on what the future holds. Pharmaceuticals have contributed substantially to greater efficiency in the production of both meat and milk products. *The occasional misuse of some of these products has posed a threat to their continuing availability; and the occasional over-reliance on them has sometimes led to relaxation of desirable standards of management.* Such circumstances can rebound to the economic disadvantages of producer and consumer.

The veterinarian who takes a business-like approach to his practice; who, as I have said earlier, recognizes that he can improve his profitability by contributing to that of the producer, will give full