

General Session

Dr. L. Mac Cropsey, Chairman



The Future of Bovine Practice

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Introduction

A point at which I know we will find agreement is an intense interest in, even affection for, bovine practice. And, I am very much concerned right now with the need to deal adequately with its future.

You have all come to this meeting at some inconvenience and at some cost. I have come a very great distance, at no little inconvenience it is true, but particularly at a considerable expense to your Association.

These are material matters perhaps, but they do require a dividend in return for the investment.

There are emotive aspects too. Some of you, especially the younger ones, are concerned as to what form bovine practice will take in the future; whether or not major changes will occur. And at least one of you must be thinking that or we would not be here discussing the subject today.

Someone is nervous about the future. I admit I have been. But not any more.

And that, I suppose, is why I accepted your invitation to talk to you.

And to justify my confidence in the future I have to explain two things.

The first is that I am a "future watcher" on behalf of the students I teach. I take the matter very seriously and for the 30 years during which I have been a teacher I have been most concerned with teaching my students what they needed to know about cattle and the cattle industry, and

what the cattle industry needed to have them know.

And the only way to do that was to work almost full-time as a clinician in the cattle industry and to continuously predict the future.

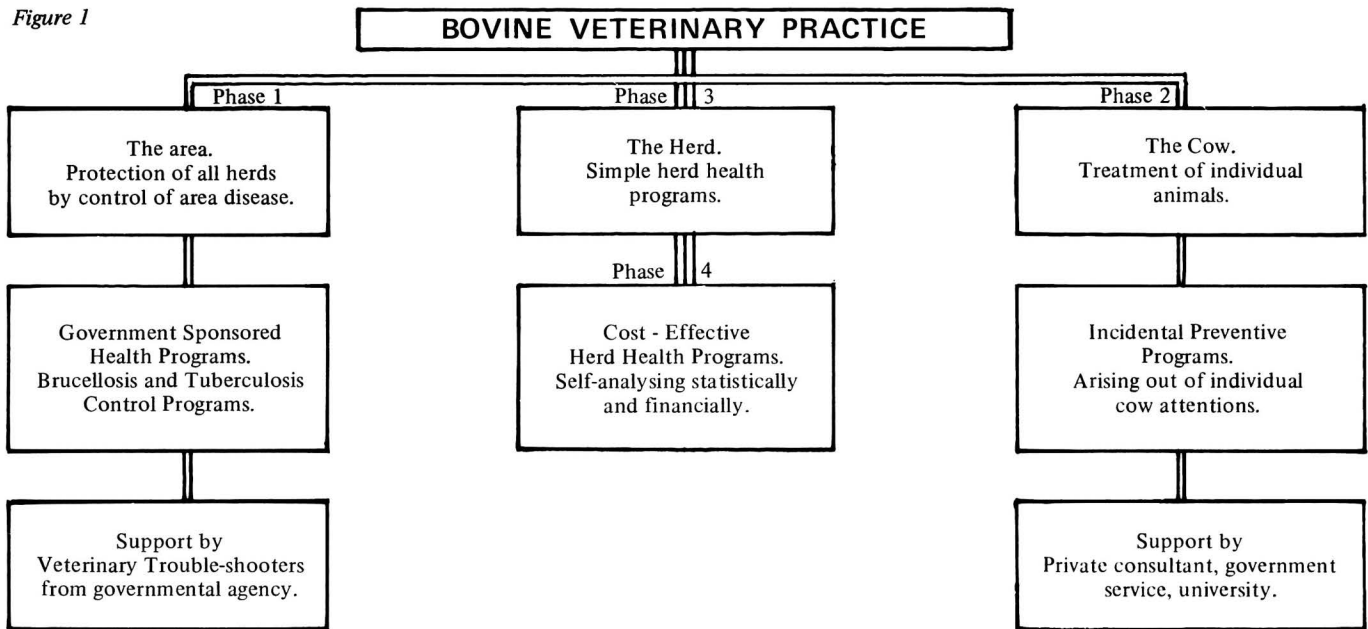
The second explanation is historical and I refer to the developments in the cattle industry and in bovine practice in our lifetimes. I identify four stages and these may have occurred at different times in our respective countries but I think they occurred.

Stage 1 began long before my time. It was the era of the horse, and cattle work was pretty much restricted to controlling infectious diseases by quarantine and test and slaughter. The significant part of this activity, participation by practitioners in government supported disease control programmes, as they apply to individual herds, of course still persists, but has declined.

Stage 2 began for me about 1945, after the second war. The value of individual cattle began to rise and individual cattle medicine began. It has continued until today, with some changes; principally a decline in volume as farmers do more of their own work, and greater difficulty and sophistication, for the same reason.

Sporadic preventive medicine was practiced during this period. This was in addition to the government-supported tuberculosis and brucellosis control programs. It was the kind of preventive medicine that grew out of individual incidents. One

Figure 1



steer dies of blackleg—we vaccinate the rest. We have always done this. We always will.

This stage of individual medicine, the 1945 to 1960 period, was one of tremendous advances in medical and surgical knowledge. The principal excitement of the era was the identification of new diseases, acetonaemia, vagal indigestion, displaced abomasum and mucosal disease.

For me it terminated in 1960 with the first publication of Blood and Henderson. The period began to sag at about that time—10 to 15 years ago.

Stage 3 began for me as early as 1950 after two years at Cornell, but became significant only about 1960 and is still with us. It is the era of programmed herd health with packaged health deals for individual herds. Essentially it has consisted of putting individual techniques for controlling each disease into a packaged program.

It has been an unsatisfactory period because of the fairly general lack of acceptance of the principle of preventive veterinary services by farmers and veterinarians. This deficiency has been due largely to a failure to take into account the new direction, and pressure to advance, in the cattle industry.

Stage 4 is the one we are just entering. It is based on herd health programs as in stage 3 but now they will be self-analyzing in terms of numerical results, and more importantly, in terms of financial costs and returns. In brief, cost-effective herd health programs.

The pressures in the cattle industries have, of course, been economic ones and the direction the industries have followed has been towards becoming

a business rather than remaining as a subsistence occupation.

This has been aided in my country by a tendency to withdraw the financial supports provided by the public purse, the subsidies in fact, and insisting that farmers stand on their own financial feet.

The veterinary profession has not responded because we did not know the financial implications of much of what we did.

We were fine when it was obvious that a cow's life was more valuable than a veterinarian's fee.

But the decisions were not so obvious when we began to tangle with the really important diseases such as herd infertility and mastitis, where the input of veterinary work and control measures could be much more expensive than the output in financial gain.

I think we have, in many cases, been guilty of including individual techniques in herd health programs, simply because they were effective in controlling a disease.

My philosophy now is that I work for farmers whose total financial welfare is my interest. And whether his cattle have a particular disease, or have it at a particular level of prevalence, is largely immaterial unless it is economically profitable to do something about it, and the choice between the techniques available depends on their economic efficiency, not their biological efficiency.

This has meant a very significant change of objective for me. Most simply stated it has been the assumption of the farmer's objective of total farm profitability. Individual diseases have significance only if they affect that.


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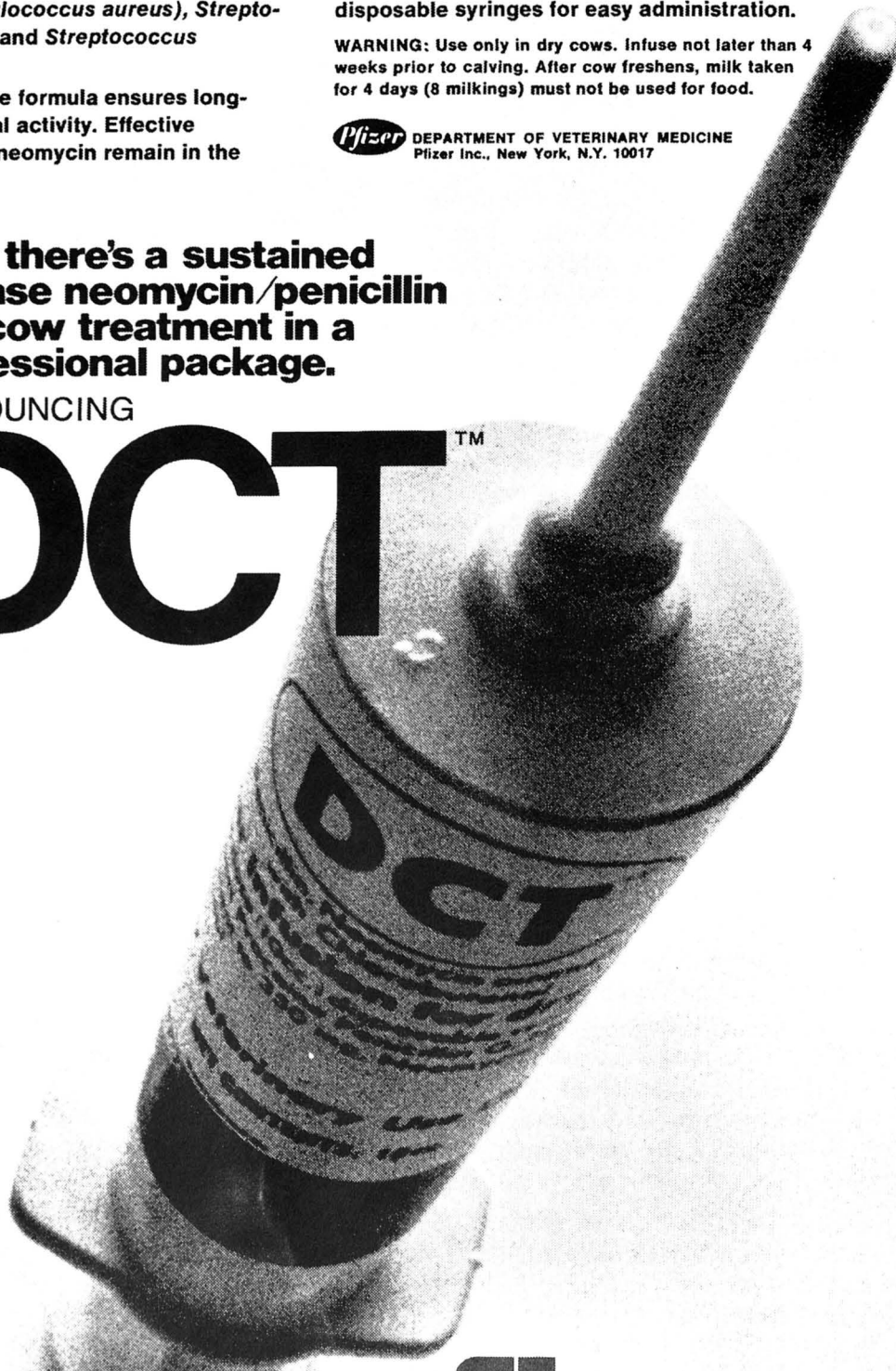
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It is easy as a veterinarian to look upon disease as the enemy. It is, but not the final one. Diseases are only the instruments of financial ill health.

But to feel that one knows the answer is one thing. To convert others, specifically you, to the same point of view is the challenge that haunts all evangelists. In this case this specific evangelist, me.

There is, of course, a very significant prize for effecting such a conversion. It is that bovine practice will not only come out of its cessation of growth phase, or decline, whichever is your personal experience, but it will progress into a very substantial future in which considerable expansion is the order of the day.

On the other hand, my impression is that there are two principal obstacles in the way of your conversion if a conversion is necessary.

Firstly, as I have said, I am in someone else's country and I am in danger of using values and defining objectives which are valid in my own country but not necessarily here.

However, I am sure that the principles of the argument apply everywhere. The details should only modify the conclusion, not change it.

Secondly, there is the obstacle created by different views of the future of the cattle industries.

I have been involved in two recent assessments of the future of all the animal industries in Australia and the conclusions are that growth will continue in the cattle industries and that economic efficiency will be the principal criterion on which management decisions will be based; and that the implication for the veterinary profession is that preventive medicine will become by far the biggest weapon in that crusade.

Now, this view *rejects* the possibility that synthetic materials will dominate the market over the head of natural foods and fibres.

It is accepted that natural materials and synthetic products will accommodate each other and cohabit the market but that is all.

Our impartial scientific people in the food industries have this view. Certainly the veterinary profession does too but we're rather more involved and perhaps not so impartial.

It also seems that our culture is increasingly insisting on a more natural environment. And it certainly has the affluence to pay the additional cost where this is necessary.

The point I want to make here is that we do not have time to argue this point today. We must assume it; either as the way of development ahead or, if you are a doomsday type, the least you can

do is to regard this view as the core argument in a long rearguard action.

If I assume that we all accept that view about the industries' futures, I can proceed to being prophetic about our future activities in them.

Being prophetic in this matter is relatively simple for me because we are already running a successful cost/effective herd health program. It is based on the following assumptions:

1. Animal production can be greatly increased, or its economic efficiency greatly improved, by the positive maintenance of animal health in individual herds.
2. The scientific information about individual diseases is already approximately equal to that task.
3. What is required now, and is achievable in the near future, is the selection of the most economically gainful maneuvers to reduce disease wastage, and their incorporation into a health program which is totally the most financially advantageous for that herd.

I propose to identify herd health programs by describing our own but the following principles are, I think, worthwhile setting down first.

1. *Firstly, the future of emergency or salvage work.* There will always be the need to salvage sick and injured animals and preventive medicine is not going to even greatly reduce this kind of work.

What is going to reduce it and has in fact done so is the performance of many of the simpler tasks by the owner or manager.

This has been due to the conversion of a seasonal subsistence type of farming to a commercial enterprise which requires a financial return on an investment.

The farmer is more cost-benefit conscious, is financially constrained and educationally better fitted to do more himself.

So, emergency work is less in quantity but tougher in quality. More downer cows, more caesareans, more call for other surgery, often of a sophisticated nature. But, in addition, a much greater disinclination to invest money in doubtful issues.

Beef prices are so high and the risk aversion of farmers is also so high that cases of traumatic reticulitis, repeat breeders and cystic ovaries often go for slaughter without our seeing them.

The general decline in volume of work has, of course, raised the question, "If you want to keep going to cattle farms, what do you do to replace salvage work?" An acceptable, practicable herd health program provides an attractive answer.

2. *The classical type of salvage practice was*

essentially a piece-work system. Payment-for-a-task. The emphasis was on physically doing a task for a farmer which was aimed at saving his money by salvaging one of his assets.

In terms of what it cost the farmer, the return was usually many times greater and was very, very obvious. It was unfortunately most obvious when it failed.

Of course, advice was often provided too, especially about what to do with the remainder of the herd. And this advice may have been more financially significant than the physical work performed, but it was often not charged for.

In a herd health service the main commodity sold to the farmer is advice. And the physical work performed is done principally to derive the information on which the advice is based.

It is true that farmers have been reluctant to pay for advice and veterinarians are generally disinclined to press something that farmers resist. So, that herd health work has not developed as it should have done.

Or, alternatively, there has been some rhetorical sleight of hand and the farmer has paid for advice but thought he was paying for something else. Special feed additives and the like.

I think it is very apparent that the service is advisory, and that payment should be made on the basis of the advice received, and that there should not be any misunderstanding or misrepresentation about it.

What *we* are adding to the *conventional* herd-health program is a numerical and financial analysis of what we do in preventive medicine.

And one of the important outcomes of the system as far as I am concerned is that a great deal more thought goes into that advice, and it is likely to be much better advice when its value will be examined and can be proven.

3. *The third basic principle in any herd health service is the optional nature of the advice given. The advice is offered, the farmer may accept it or reject it.*

It is distinctly different from the compulsory advice provided by regulatory veterinarians about specific disease governed by statutes.

It is very important that the two kinds of advice be kept separate in the minds of veterinarians and in the eyes of farmers.

The justification for existence of the cost/effective herd health programs is that they are directed at the specific financial advantage of an individual farmer.

Not the communal welfare of all the farmers in

the district. That welfare is already provided for by the state.

Our service is complementary to that service in that having satisfied community interests, we now begin to foster the profitability of those farmers in that community who are anxious and prepared to go that extra distance beyond the base-line of community productivity.

But in addition to conventional herd health services, we either provide proof of profitability or opt out.

A corollary to what I have just said is the need for the optional advice to come from an independent advisor. Someone who is not obliged to press an institutional policy.

There is, of course, every reason for the private veterinary advisor to look amongst government and industry policies and choose from among them. But his success will depend on the profitability of his advice, not its source.

Before I leave the subject of regulatory disease advice to farmers I must say that I do not want to leave any flavor of dissatisfaction with it. It has been very satisfactorily practiced in your country and in mine and it has been what has made animal agriculture at an economic level practicable. Without it the world's protein supply situation would have been disastrous before now.

But the satisfactory prosecution of preventive medicine on a national or area scale has also made it possible now to turn to the neglected field of herd health.

4. *The fourth characteristic of cost/effective herd health programs is the inclusion of a group of statistical/economic support workers.*

Figure 1A is the same as Figure 1 except that I have added the new support group to the Herd Health Program sector. And it is this addition which marks the transition into phase 4.

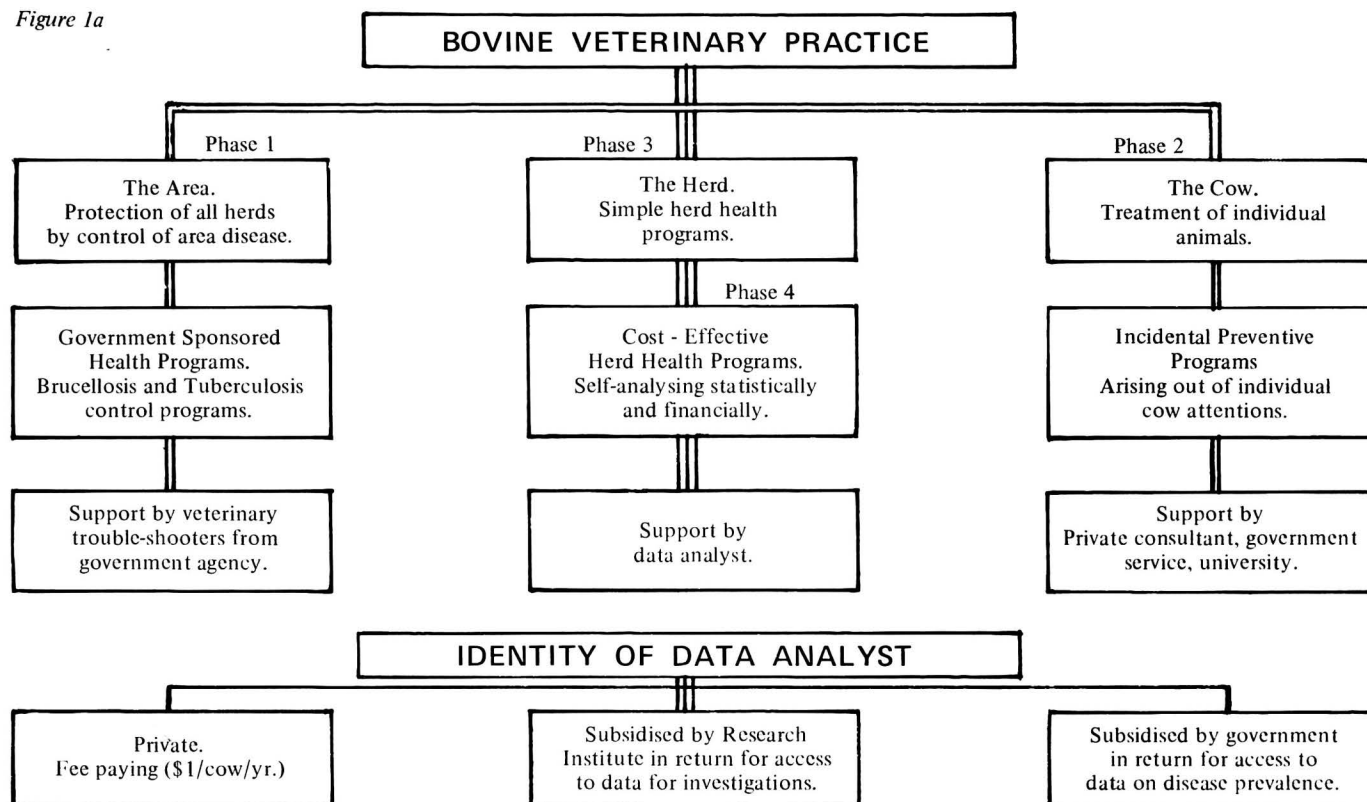
The data analysis service provides the numerical and financial assessments which are the crux of the health recommendations which are then made by the veterinarian.

Perhaps I should color the data analyst more solidly. He is a statistician, preferably one experienced in biometry, preferably experienced in agriculture, especially agricultural economics. Or, having these areas of expertise at call.

In our organization, the veterinarians, including myself, visit farms and carry out examinations and record data of findings and treatments, the same as you do perhaps but with emphasis on recording and in a pre-arranged pattern.

The farmer provides history, again in accurate detail and in a pre-arranged pattern.

Figure 1a



And just as we are accustomed to collect biological specimens and send them to a path lab, we now send our numerical detail to a computer lab.

Perhaps the veterinarian could do the analysis work himself but we have yet to find one who wants to. And I doubt that many would be capable of doing it.

Both of the previous illustrations have related to the veterinary profession. Figure 3 includes the farmer and his veterinary advisor, in this case the bovine practitioner, and his technical supports. Including the data analyst.

5. *But the fifth characteristic of the cost/benefit herd health system is the possibility that it provides for collaboration with other production regulating areas such as nutrition and genetics.*

The data analyst could also be the same one as in Figure 4, who handles not only health data, but also production data. And with some planning and good fortune, coordinates the two.

In our organization we have our own computer laboratory, but our data analyst also services, in a pilot program, eight outside veterinarians and their herd health programs. The objective is to service a whole lot more.

If our analyst were also part of an organization which evaluated production efficiency as well as disease management, the combined results would be of tremendous value.

6. *Another characteristic of our system is the opportunity it presents to place some clients on a "surveillance" standby basis.*

At present, we act as the veterinary advisor. We collect data from the farmer, forward it to the analyst, receive his report, interpret the results and pass the evaluation back to the farmer.

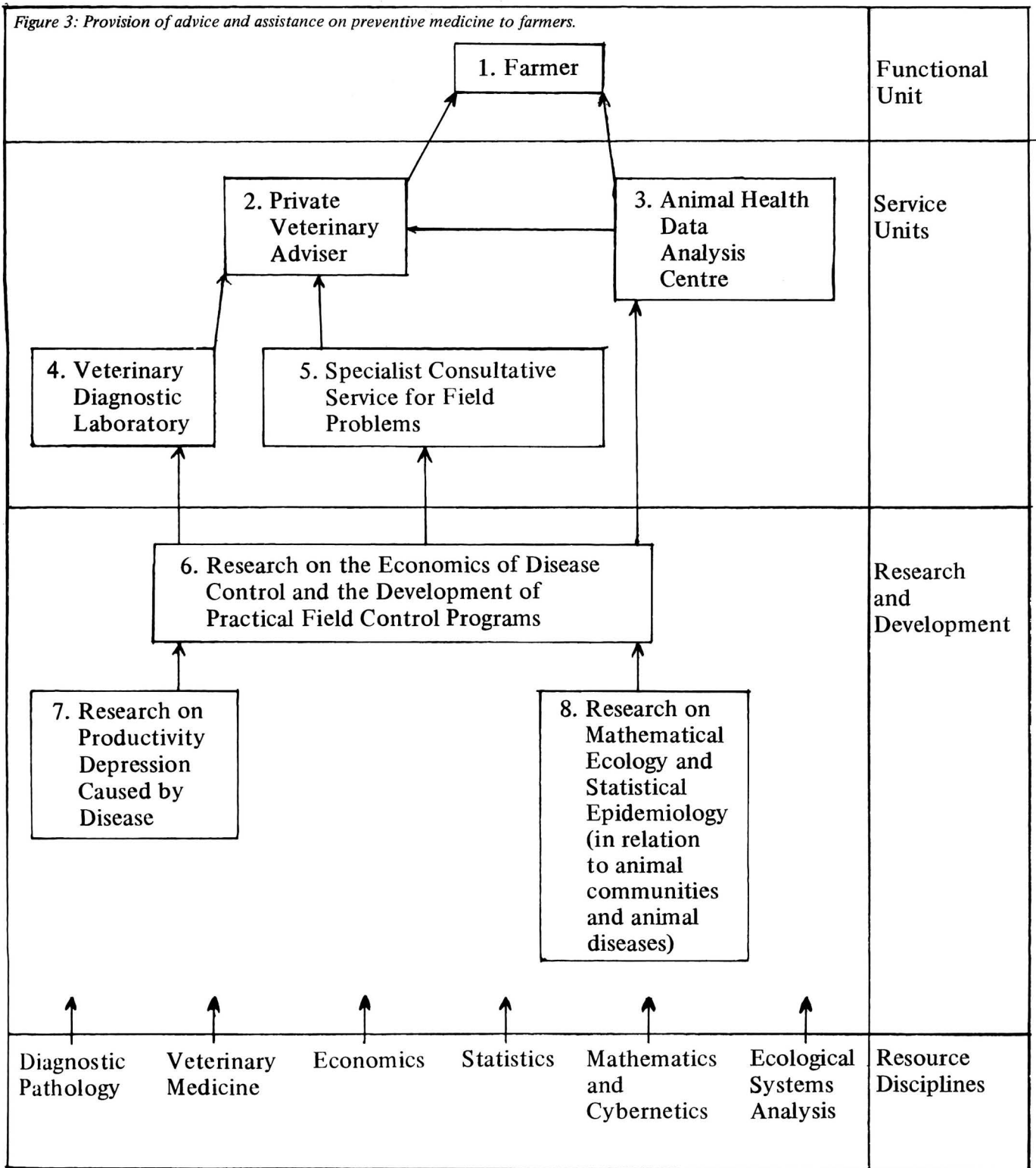
As you can see from the diagram it would be possible for the farmer to communicate directly with the data analyst and eliminate the veterinarian.

We have made provision for this and we are prepared to take clients on a strictly "data surveillance" basis. The farmer will forward his preselected data and receive an evaluation.

If he falls short of the targets, he calls for assistance from us. I see nothing wrong with this arrangement. It allows us to put good clients "on standby" and to take more clients. Unless we do this I do not see how we can cope with the enormous task of providing all farms with a full service.

7. *I should tell you now that the techniques which we use to detect mastitis say, or treat it, will be very little different from the ones you use. Some of them are the same ones I have used for over 20 years and in fact learned from Dr. Francis Fox and Dr. Steve Roberts and Dr. Mike Fincher at Cornell in 1949.*

The only likely differences are that we select

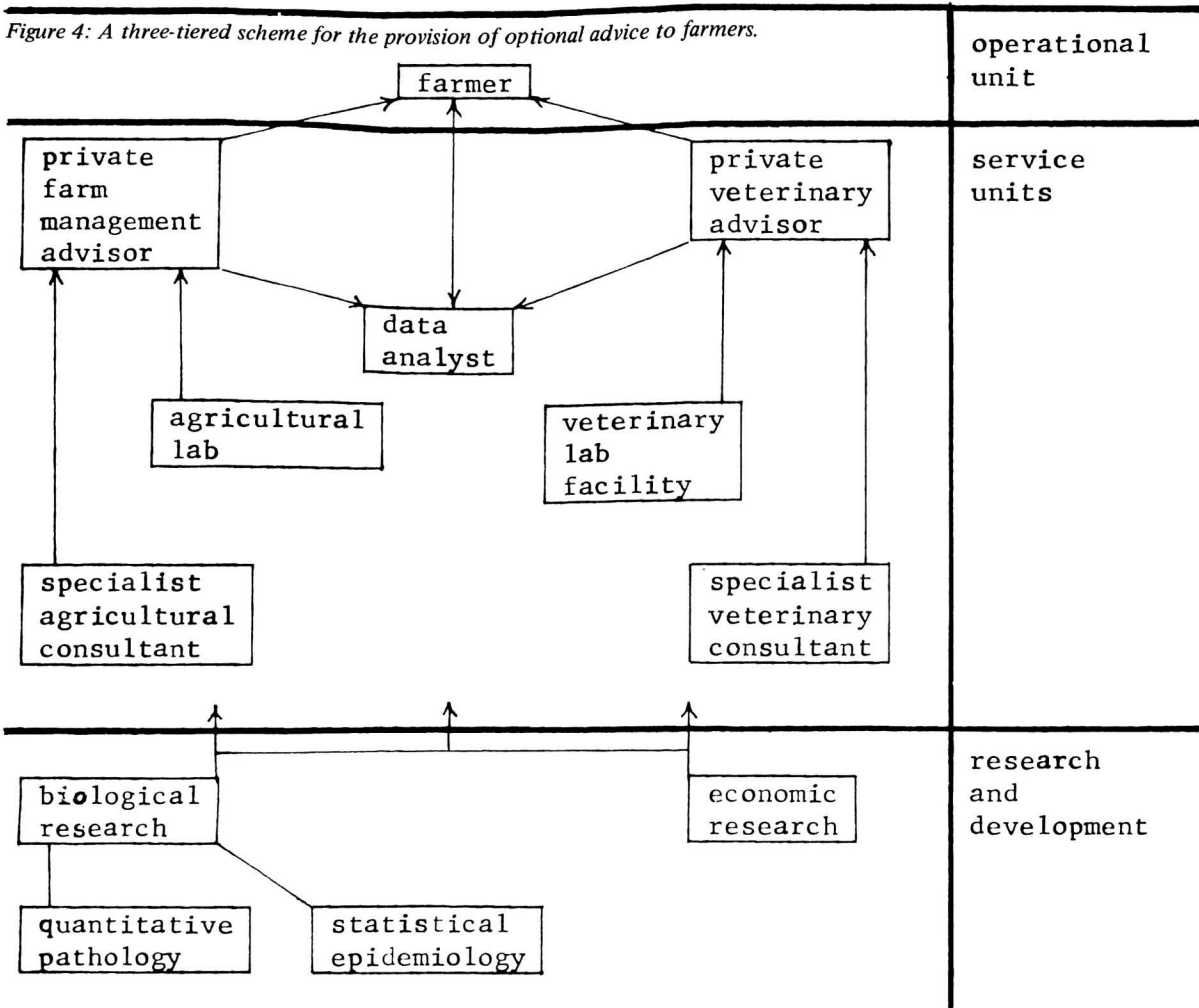


only financially valid techniques and then evaluate the whole herd health program; and the evaluation is done not on some secret experiment farm, but in full public view and under commercial conditions.

8. *Another important characteristic of the system is the nature of the collaborative relationship between the farmer and the veterinarian.*

The program must be carried out on the basis of mutual assistance, not discipline. We can prod but we can not beat him over the head. As soon as the system can be seen to be exploitative of the farmer, as soon as it creates resentment because of discipline, as soon as it is anything other than a

Figure 4: A three-tiered scheme for the provision of optional advice to farmers.



tandem organizational partnership, the farmer becomes uncooperative and the service folds.

I am sure that any herd health programs which you run have this character. But a system which analyzes itself continuously is one which tends to readjust itself frequently and present many opportunities for discussion of what should be done and why.

9. *Even the characteristics have characteristics and there is a very obvious feature of this organizational partnership.* It is that the program may make financial gains; in fact, it may achieve all the gains that were potential in the system, and it may appear that the association is no longer profitable. We have had one farm only secede for this reason. The reasons why it doesn't happen more often are that farmers like us around to keep prodding them up to the barrier, and not many of them achieve the objectives for any length of time.

In the same way as farmers achieve and leave it is possible to assess a potential client's data and find that he is already achieving all the targets and there is no point in taking him on.

We don't lose many clients for this reason. Nor do we reject many potential clients for this reason. Because most of our farmers can profit by a continuous surveillance of what they are attempting to do, what they actually do, and what results they achieve.

It is worthwhile looking at those things I have just suggested we survey. They are the bare bones of the program:

1. Accurate, error-free identification of every animal. No problem there.
2. A fool-proof system of recording relevant health data. The only one problem there is the decision on what is relevant. It is possible to accumulate enormous volumes of data. Unless you can select a very small amount of data which will accurately measure health performance, the whole thing is likely to become unwieldy and expensive. I freely admit that half of what success we have had has been in the selection of what is relevant data.
3. A very specific knowledge of the farmer's objectives. We do not have time to discuss this

but it is one of the most interesting sidelines of this work. We assumed initially that all farmers wanted to produce more beef or more milk, or the same amount more cheaply. Whereas his real objective may be to live at a rate 10% ahead of his neighbor, or gain 50% more protection against failure, or even to top the steer market.

If there is a misunderstanding here one usually gets a failure of cooperation because our recommendations would not always be relevant to what a farmer really wanted to do.

4. The *economical* way of achieving the analysis is to have as few criteria as possible on which to base judgements, to have a biologically minded computer programmer who can rationally arrange his data inputs, and a financially minded one so that he can use the most economical computer language. The latter can make staggering differences in data processing costs and the *total* costs of the program.
5. The *manual* of preventive medicine techniques aimed at least net cost is a vital factor, e.g., you cannot afford across-the-herd mastitis surveys every three months and it might be too expensive to have a post-natal check of the uterus of every cow.

I must sound one financial warning arising out of that last statement. The profitability of a program that I write for Werribee, Victoria, Australia, might be completely different from its profitability applied in Fort Worth, Texas, U.S.A. It all depends on the costs of the inputs, my fees as against your fees, and the value of the outputs. The value of meat and milk and chopper cows in the two places.

They are certainly different in my practice where Holstein calves are worth \$25 at three days of age, compared to England where they are worth \$100 compared to where I worked in Canada where they were all stud cows and the calves on many farms were worth \$1,000.

So, I do not presume to offer you any advice on business management or animal management in your own country. I offer only principles and not specific recommendations. Our techniques are introduced only as examples.

I have taken far too long to describe the principles of a significant addition to bovine veterinary practice. Now I want to describe the details and I intend to do this by describing our own program. It is limited to dairy herds supplying liquid milk for human consumption on a year-round basis. But we are in the process of adapting it to beef herds and seasonal dairying and see it as highly adaptable.

We have been approached several times to perform the same function for sheep but it is our area of least expertise and we have deferred it until last.

Discussion

Our confidence in the future development of this kind of work arises out of our own experience. And we are a most unadventurous lot really. Six years ago we took on our first six farms. Since then we have had fifteen farms totalling about 3,000 cows in the project but not all at the one time. We began with six herds, peaked at ten in 1970 and have reduced now to eight. The fates of the herds have been as follows: two continue with excellent performance; one excellent herd is restrained by a very conservative owner; one herd was sold, dispersed and the farm went to other uses; five herds were eliminated by us for incomplete cooperation and failure to achieve the targets set—we could not justify our continued employment; one farm withdrew because of good performance and achievement of all goals.

So, we have had a mortality rate of about 50% and this is how we think it ought to be. We set out with the aim of getting a cross-section of farms, from bad to good. We did, and the bad ones could not justify retaining us and we pruned them off as being unlikely to survive. We would not recruit such farms in the future.

Six months ago we began two additional dairy programs in two large groups of dairy herds producing milk for processing in addition to our own service to our own clients.

In one we took on the provision of advisory and disease analytical work to 30 farms under the supervision of six private practitioners with whom we communicate only by mail. This is very strictly a try-out on a commercial data-analysis program.

In the other we had undertaken a joint trial program with our government veterinary service in which sixty herds, under the control of three government veterinary officers in widely separated centers, are being handled as program herds, with sixty other herds as controls. We are handling them this way because we want accurate records and a very accurate measurement of the benefits of the herd health program over untreated herds.

At the same time we took our first timid steps into a herd health program in the beef cattle world. I foresee no difficulties in stud beef herds. They can be handled like dairy herds because of high individual values of animals. But the commercial herds consisting of 200-300 breeding cows is the bulk of the beef population in our country and presents the big challenge.

There is no time to discuss it in detail here, and it is too early to say how we will go but I can say that we began with many doubts about whether the low level of disease wastage which we knew to be the rule in these herds would enable us to make the gains which would pay the dividends on the amounts invested in our service.

We tied it in with a performance testing program based on measured weight gain. We had doubts about this because we did not want to be involved in this work. Collaboration yes but doing no.

I think we are going to be okay because we located an unexpected need which we can fill. It is providing a data bank which enables us to offer advice on management decisions. Like "We are facing a drought, I need to cut back about 25%. Which cows do I let go?" or "On the basis of my performance records, could I change from my present practice of keeping bulls in with cows for five months to a much shorter joining period of six weeks and concentrate my problems?"

In both beef herds and processed milk herds it seems that our involvement will be less and will be concentrated into a shorter period of the year. The level of disease prevalence will not be as high as in

liquid milk herds and we doubt that the program could be self-supporting unless we can prepare a data bank capable of answering questions on management logistics which could be influenced by fertility and other production indices likely to be affected by disease.

As I said in the beginning, we think we know what the future can hold for the bovine practitioner. I have attempted to illustrate our version of it; the cost effective herd health program. I have not said, but I have inferred, what are the benefits for the private bovine practitioner. The following are some of the benefits:

I am sure that all of you who do this sort of work will agree that it is an advantage to have a bank of programmed work to relieve the pressure of emergency work, to allow ordered days on at least some days and to provide a more or less guaranteed income.

The income from it depends to an extent on what one is prepared to charge but a 300 to 500% return on an investment, the kind of return inherent in this program, is an inducement to high fees. It seems to me to be so much easier to charge high fees when they can be justified on economic grounds.

I look forward to the time when the financial discrimination against the large animal, particularly the bovine, practitioner will disappear. I admit to having always felt a little envious of the income that my small animal colleagues enjoy and this program suggests a way by which we might join them. Not solely for reasons of income but also because recruitment of young veterinarians to the cause will be that much easier.

A herd health program which measures results and can produce a partial budget will also provide the opportunity of adapting one's service to this era of increasing urban capitalization of farming. And a business association usually deals more efficiently with utilization of time than a semi-social system in which one's reputation is likely to depend as much on conviviality as on financial viability.

It is surprising how the attitude of veterinarians, including my own, towards city farmers has changed. It used to be derisory. City Slickers attempting to greenhorn in to the great outdoors.

Nowadays so much of our agricultural resource is owned by private individuals, private companies and by public companies that collectively they are a force to be reckoned with.

Their objectives are much more business oriented—to our satisfaction. Being absentee owners they require a system which keeps tabs on the work-force. We provide the reassurance that systems are going or that faults are beginning to show.

They also tend to employ managers educated in agricultural business management. Both of these trends of course favor our interests.

The principal end-product of the system—the

production of economic assessments—a partial budget—provides me with the weapon I have been looking for for 30 years. A weapon with which to convince farmers that more of them should practice more prevention.

An additional advantage in the system I have described is that it is possible, provided the farmer has good data accumulated over several years, to determine, before the program commences, whether he is achieving reasonable targets and whether in fact you are going to be able to make him any money.

One of the principal advantages of our service is that we have an excellent recording system. It has to be excellent if we are going to analyse the records. And almost every farmer we have met has needed a disease recording system in the worst possible way. You are probably well ahead of us here because you have such good record systems and services in production and reproduction.

But I am talking about a herd health recording service, and one which is taken back to the farm and used there, not left in a filing drawer.

Perhaps if a recording system is such an advantage there may be many preventive medicine programs other than ours which record. But our program has really arisen out of a need. The need to find out what is going on as a result of what we do.

And these problems are of much greater magnitude in larger herds. But on the other hand, it is possible in large groups to analyse what happens in age groups or at different times of the year and so on.

For example, we have just acquired a new client with 10,000 breeding cows; Herefords and Angus. Ten years ago I would not have known which way to turn to record or analyse this. Now it is all so easy because we have a system which makes this easy and which will almost make the management decisions for us.

Because revisiting is part of the system and periodic analyses of results can also occur without an actual visit, our job is helped by the human failing of "wanting to tidy up before the cleaning lady comes".

We also find that nowadays we avoid one of the problems we used to have; the problem of having a recommended preventive medicine program received enthusiastically but having it discarded within a few months. Discarded often because no one has been along to prod and prompt, to iron out problems and to recommend modifications if the preventive techniques are not giving the desired result as shown by analysis of results or because there are practical difficulties.

One of the most important benefits to me as a veterinarian is that I get to know the individual farm and farmer so much better; the objectives, the resources, and the constraints, that all the service I

give from then on is flavoured by this more intimate knowledge and is so much the better for it.

If you are sufficiently confident of your knowledge of the Cattle Industry, and you must or should be sure of that because everything you do and recommend should be done in the light of its total effect, not its effect on a disease, it is then possible to predict the development of a disease situation.

That is a half of all the benefit—it is what preventive medicine—epidemiology—herd health is all about. Being able to set up monitoring systems that match productive indexes and figuratively ring bells when danger points are reached.

The other half of the system is being smugly self-satisfied when after the year is over you can look back and say that by all methods of reckoning, the targets were achieved, or at least that where the targets were not achieved the reasons for the shortfalls were known.

Even if that is not true, it is probable that you will know where the system is failing and it will be reasonably simple to set up a response trial to find out why. This is another one of the great virtues of the program that there is continuous recording so that if it becomes necessary to test the effect of any management procedure it is just a matter of plugging it in and measuring the new performance.

As a relatively slight advantage and principally to reinforce the message that all other forms of record are eliminated, we use a pocket diary, and a frequently-issued, updated printout replaces the old barn chart, which always was useless, and index cards which have great limitations.

A fully recording, self-analysing system, also has advantages, which may not be immediately apparent, for those other two big sectors of the profession: veterinarians in government regulator service and veterinarians in industry.

For the government service there are two principal benefits.

Firstly, veterinarians are kept in the field and working on cattle enterprises in at least present, probably significantly increased, numbers.

Secondly, they will be much more concerned with thinking prevention and with providing a supply of disease data which is literally staggering in quantity and quality—in scope and detail.

If any of you has the fleeting thought that privacy would be invaded, consider how else this data can be accumulated. There is no other way in a free enterprise culture.

This need to record a store of scientific and financial information about all diseases on a significant sample of herds is the most important task ahead of the rural veterinarian today.

Because the big gap in our knowledge is epidemiology, there must be a system of recording all the diseases, in all the species, in all management environments, if we are to know the epidemiological facts about many of the diseases with which we deal, especially if they are not lethal ones.

There are already such systems. Israel has one but reports back and analyses only on the reproductive performance. Czechoslovakia has an exhaustive disease recording system but does not analyze the results. Denmark (1) and Sweden (2) have systems which record the diseases which occur in their national herds, and the Swedish unit does report back to individual farmers on reproductive performance. The United Kingdom had a similar system, but it ran into trouble and folded, at least temporarily.

Like many veterinary schools in this country, we participate in a W.H.O. international program oriented towards zoonoses and comparative medicine but limited to those areas which are of course part of human health.

As far as I know, there is NO other disease recording system anywhere; (a) which reports back to individual farmers on disease prevention efficiency; (b) which predicts an upsurge of disease; (c) which contains raw materials for elucidating epidemiological patterns on which even better control programs can be built; and (d) which analyses the profitability of what we do for farmers in the name of veterinary science.

Before I leave this area of regulatory health services I would like to make one more comment.

I think that it is easy for these programs to reach a point of detail where they really need financial justification before they proceed any further.

It could be advantageous for government services to be involved in economic analysis of disease control programs so that cost-benefit analysis might ultimately be applied to their own massive disease control programs.

A prime example of this sort of work is Ellis' monograph on the Cost Benefit Analysis of Hog Cholera Eradication in Great Britain. (See also U.S.A. reports by McCallon).

For industry there is the same advantage of knowing what the prevalence is of every disease, not just the communicable ones, and of a system of veterinary service which uses medicine in a rational preventive way, ensuring their appropriate use both in volume and rationale. What we have in effect is one great drug trial under commercial conditions. So that medicines are likely to be judged on their merits and I am sure you would be happy to settle for such a situation.

The Necessary Environment

For preventive medicine in the form of herd health programs to flourish, a particular and special climate, especially a financial climate, is necessary.

1. Firstly, it is necessary to have animal industries and individual farmers who are prepared to pay for the kind of insurance that the system provides.

This largely depends on his having sufficient uncommitted funds and a moderate degree of risk aversion.

A heartening aspect of this is that, in the dairy industry at least, there is no other area of activity into which the industry can move and make such significant financial gains.

In other words the farmer underinvests in disease control relative to his investment in other areas, such as feeding, and the rewards are correspondingly high in preventive medicine.

There is only one proviso. Agricultural products must not price themselves out of the market and herd health programs can only satisfactorily work provided they assess themselves numerically and thus make it possible to make the final decisions on the basis of financial criteria.

2. Secondly, it is necessary to include all the objectives in the total formula.

I have assumed that the most important objective by far is

economic gain. I feel that this is so and must be so if animal agriculture and farmers, and therefore large animal veterinarians, are to survive. But it is sure as hell not the only objective for many good farmers who should survive. There are still the needs to:

- i. Reduce the spread of the diseases of animals to man.
- ii. Improve the quality of life for the animals—animal welfare codes exist now—which cost money.
- iii. Improve the quality of life for farmers. To me this means being more financially efficient and being able to buy the tangible creature comforts which ensure the highest quality of life. To others, it means earth-gardening with manure squelching through your toes, on the hem of one's caftan and in your long hair and beard. It is an objective for which one has to pay and as an "AMENITY INDEX" it should be budgetable into the farm program in the same way as any other factor can.
- iv. Improve the quality of life for consumers. Very hygienic products, polyunsaturated, no chlorinated hydrocarbons, organophosphates, cyclamates, oestrogens, mercury, antibiotics, and the like.

We may be able to afford these supplementary objectives but the additional cost must be absorbed by the industry. Except zoonoses, of course. The cost of their control should come from public purse, etc.

3. Another requirement is for a force of veterinarians who are prepared to participate in this rather more cerebral, but less physically exciting, work. It is certainly less flamboyant than salvage practice.

To participate effectively the veterinarian needs to be prepared to participate actively in continuing his own education. The financial responsibility in the farmer's welfare which one assumes is such that no error of negligence or ignorance is permissible. Too much is at stake.

4. For both groups, farmers and veterinarians, there is a very large need to know where the expert information is and to be prepared to seek it.

For the veterinarian the need centers around his task of having to be prepared to write a self-contained herd health program for each farmer which takes into account the resources that the farmer has available, is within the scope of his competence, and which is a package deal, a finite plan which he can understand and possibly memorize.

To do this satisfactorily requires some expertise in the fields of animal health, animal production and management, especially nutrition and genetics, economics and some sociology.

5. *Whole Herd Involvement.* Possibly the most important environmental need for the veterinarian is the need to think of the financial welfare of the herd as a whole rather than of individual animals, or even of a single disease or even in terms of its disease prevalence.

Salvage practice includes financial involvement by the veterinarian in the farmer's welfare. Professional negligence or error can lead to litigation for compensation.

Much of what is said and done in those circumstances is inferred and inconclusive. We are

talking about a consultative arrangement in which very significant changes, requiring financial adjustments, will be recommended. This necessitates at least a realization of the importance of the whole herd concept.

For example, it is apparent that in the sort of system we are discussing there will be a premium on *fast, accurate* diagnosis. But the diagnostic need will not depend only on the field veterinary service, and the path. lab. being available at all times.

The additional requirement arises because large dairy farms run on strictly business lines will keep a very keen eye on the percentage return on investment and they will require advice on whether their total management is financially efficient or not.

If efficiency is not optimum, is the error in the disease control sector? If it is, what is the area of inefficiency? Is the mastitis status O.K.? Is the reproductive performance O.K.? Is the calf survival index O.K.?

If efficiency is down in one of these indexes, what should be done to give a better financial advantage?

The questions are not simple ones and neither are the answers, because whatever is done to modify a disease situation is likely to have important other implications for management, and therefore profitability.

As veterinarians we cannot be, we *must* not be, concerned solely with the control of a disease. We can only be concerned with limiting the occurrence of a disease to a point where the best financial advantage is gained.

The major problems in that simple program are:

1. What questions do you ask to get answers to the above questions. Much of our work has been concerned with determining which criteria to use and how to express them. We think we know the questions to ask for dairy farms operating within our husbandry system.

2. Where to ask such complicated questions which require so many factors to be taken into consideration before an answer can be given. The answer is fairly obviously the computer and most of you will have had experience of this situation in one shape or other.

I saw it in action in Michigan in 1971 and being used in a similar situation—it was a matter of formulating dairy rations. On a farm the nutrition adviser determined that a major component of the ration had become unavailable. A portable computer terminal was hooked into a telephone jack, and information punched in, operator identification, the problem, the feeds available, productivity level in the herd, the objective in the enterprise—the least cost ration to produce a herd average of 1500 gals. a year of 4.2% fat and 6.2% SNF milk.

Back came the telephone voice "You have provided wrong information. Go back to line 22. check and punch in again." We had misplaced a decimal point. We were hooked into a major computer which contained a mathematical model of an efficient ration. The model had been drawn up by nutritionists using all the information they had. (Which might not mean all the information they really needed and all models need modification from time to time).

This is the only way to get answers to such complicated problems with reasonable certainty of avoiding such side-effects as having to employ more staff, or something else unforeseen which completely wrecks the planned increase in, or increased efficiency of, production.

We are now in a position where we have a mathematical model for mastitis, and one for fertility almost completed. The models take a very great deal of preparation, and use a great deal of information, acquired in our case over a period of about 5 years.

That will mean that for a particular farm, with its own individual peculiarities of resources of labor and land and income, we can determine what is financially best for him.

This is our principal concern. I hope it is yours, too.

Research and Development

All that I have described until now has been the utilization of veterinary techniques devised by others to limit the prevalence of disease and to measure performance, and correct deviations from pre-set targets, and to measure costs and results.

There must, of course, be a research and development program to back up the tactical moves.

For the first time in my experience the issues in the preventive medicine research and development program suddenly become very clear and very pressing.

For example, the two diseases which individually easily outweighed on financial grounds all the others put together in our environment are mastitis and infertility. It is so important to know the magnitude of this difference and the cost of the control program.

And these are the kinds of problems that are now pressing. Not problems in the area of aetiology or pathogenesis or diagnosis, but problems of cost/benefit analysis.

What does the average case of left abomasal displacement cost in terms of lowered production and veterinary fees?

Which is economically more profitable, a drying-off quarter infection rate as an indicator of mastitis or a bulk milk cell count? And if the first, what is the financially optimum quarter infection rate?

The complete requirements in this area include:

- a. Epidemiological data for identification of diseases, their diagnosis and rational prevention.
- b. Numerical data on disease identifications and losses resulting to identify relative size of problems.
- c. Cost-benefit analyses of individual disease control techniques and whole herd health programs to permit economic rationalization of preventive medicine.

I want to finally introduce a different aspect to the back-up research program which is necessary.

I think it is the most important matter with

respect to our kind of problems and the kind of answers we need.

We are still devoted, of course, to: The Scientific Method, Koch's postulates and Classical Statistics as the bases of science.

They were designed for purposes of establishing causes. They are an essential part of the Science of Causes, but we are much more concerned with the science of relationships and the prediction of outcomes.

These predictions must be in terms of what will happen in a commercial situation where all the variables are operating. Therefore, none of the above rules of science have very much application at the level at which we work.

The level at which we use all of our client's farms as the experimental material. The farms vary between themselves, and within themselves from time to time. Sometimes it is necessary to change procedures, personnel or program, for some very good financial reason, right in the middle of what we might call a field experiment.

It is essential to work on our farms in this way because results obtained on, for example, one technique of mastitis control under a specific set of conditions on a research farm run by expert technicians with five cows to milk, does not necessarily tell us what we want to know.

If we do it the way we want to do it we have the advantage of involving the whole community in a search for more information and this helps spread the gospel.

As far as we are concerned it means that we have turned towards our patients and our clients and consider *their* problems in the light of *their* objectives and *their* resources, rather than look upon them as experimental material and turn to our scientific colleagues for approval and recognition.

Perhaps if I can put this philosophy just one more way, it is this.

What we do as veterinarians may affect the bacteriology or cell count of milk, but more importantly it interacts with the Economics, the Ecology, and the Sociology of the dairy farmers in Werribee South, Victoria, Australia, and by extrapolation possibly many other similar communities.

Our clients are our experiment, and I think they can be any interested practitioner's too. The only difficulty, of course, is to conduct and experiment and derive some results which mean something.

The answer is to collect a great deal of relevant data and store it in a data bank, and a computer is the only mechanism which makes this possible.

This data can then be analysed to show the relationship, for example, between the use of a control program in an uncontrolled environment and the prevalence of mastitis.

Provided it is possible to collect enough data, under enough different circumstances it is possible to build a mathematical model from which results can be derived simply by stating the circumstances that prevail.

It is possible to use a new kind of statistics, and for aficionados I refer to Bayesian and neoclassical decision theory which can be used to select between two options in a much more realistic and predictive way than classical statistical analysis.

I have tried to set down the prerequisites for the practice of complex preventive veterinary medicine by bovine practitioners because this is where I think our future lies.

It includes the will on the part of the veterinarians, a suitable financial, technical and

sociological environment on the farms, and a planned package of performance.

I think that all of these prerequisites are, in general, present in our circumstances now. Preventive medicine in the form of herd health programs is already being practised, probably more extensively in this country than in any other.

Where these prerequisites are not already present, agriculture is either vastly underdeveloped or has an uncertain future, anyway.

Where they are present, preventive medicine will bring about major advances, especially if it is linked to a system of self-analysis which keeps it within the bounds of economic reality.

If we can do that, it will be appropriate for us to say at last that:

We have taken everything that science has to offer and turned it to the full advantage of the cattle owner. I can't imagine anything more satisfying than that.

The Bovine Practitioner and the Federal Veterinarian

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Thank you for inviting me to take part in your annual meeting. We have a few urgent factors that we feel need attention and I appreciate the opportunity of presenting them to you. There are five specific items, as a matter of fact.

1. How good are the biologics that you have available?
2. We better heed withdrawal instructions or we may lose some valuable tools to fight disease.
3. The profession needs to provide leadership in the evaluation of the pros and cons of the significance of chemicals used in our food supply.
4. A re-evaluation of our brucellosis eradication goals.
5. The bovine practitioners' role in emergency animal disease eradication programs.

How Good are the Biologics that You Use?

I have been in Washington since 1952 and during that time I have seen quite an evolution in the

licensing of veterinary biologics. At that time we had our personnel stationed in the establishments monitoring the operation. When we look at today's standards and compare them with them, we must admit that we didn't know too much about the quality of those products.

Many of these products came on the market a lone time before that, so we can say that back then we knew even less than we did in 1952. The product that we knew the most about was hog cholera since we had been producing some type of hog cholera product since 1913. However, I recall vividly that when I attended state veterinary association meetings a lot of conversation was about adverse reactions following vaccination.

It was not until 1930 that the first potency test for rabies vaccine was available. You all are familiar with the steps that followed. Remember at one time we felt that viruses could only be grown in the host animals. But soon we learned they could be grown in chick embryos, then tissue culture