Preventive Veterinary Medicine in Canada: Study on Results of a Survey

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I. SUMMARY AND RECOMMENDATIONS

The main requirements for the improvement of animal health management (HM), as identified in this study, are: 1) better information systems, enabling veterinarians to help producers visualize their losses from disease and sub-optimal production; 2) field projects to examine the economics and operation of such HM programs; and 3) increased collaboration by government, academic, professional and producer organizations.

The loss from management-responsive disease and impaired reproduction is incalculable — probably in the order of a billion dollars annually in Canada — and the lack of improvement justifies substantial, sustained and co-ordinated effort to reduce it.

A majority of practitioners are active in the health management aspects of their work. Of 550 practitioners who responded to a questionnaire, 333 (60%) deal mainly with food animals; and 268 (80%) of the 333 view some of their work as HM. Of the overall average of 30% of their time devoted to HM for all species, by far the greatest percentage was spent with dairy herds. Most HM is by private arrangement between veterinarian and client, except in the case of swine where there is considerable provincial government and commercial HM activity. In the view of the great majority of practitioners, the most important ingredient lacking in HM is better systems to inform producers of the economic benefits of preventive medicine. Close to 75% of practitioners favor the use of public funds for the promotion and development of HM, with some 50% (West) to 63% (East) favoring their use for HM delivery as well.

An immense volume of observations and data is recorded about livestock production; much of it has a bearing on HM, but no integrated HM systems are operated by veterinarians to aid the understanding or advancement of the field.

In brief, a majority of practitioners provide HM services to a minority of producers, but have no means for assessing the economic value of such services; no indices of the prevalence of management-responsive diseases are in general use except somatic cell counts of milk; and the average productivity of herds, being mediocre, should be increased in the national interest.

The following specific recommendations are for infrastructure and field research, by means of which coordinated action may serve to enhance the HM services now provided.

a) *Form a national Animal Health Management organization to plan and conduct pilot projects on HM where there is a need to develop and/or utilize integrated HM information systems.*

An example of an activity which would be undertaken by this body is the use of slaughter checks in swine as an aid in reducing the loss from disease conditions such as pneumonia. As a beginning Agriculture Canada would indicate its interest in a pilot project to key organizations, arrange discussions of feasibility of collaboration, and invite proposals for pilot projects. The possible composition and function of a Working Group for such a project can be summarized under the following headings:

Composition — Representatives of producers, veterinarians, processors, meat inspectors, and epidemiologists, with the power to add others as required.

Purposes — To employ swine slaughter checks to aid in reducing the loss from pneumonia and roundworms; and, simultaneously, to build databanks to deal with other complex management-responsive diseases of swine and provide feedback (to participants) as an aid to farm decision-making, and estimate the cost-effectiveness of the system.

Contractor — A university, either alone or in co-operation with other agencies, with planning and conduct of the work directed by the Working Group.

Methods — Adapted from operating systems in Denmark, Sweden and U.S.A.

Cost of Pilot Project — $200,000 (est.)

Probability of Success — High; incidence of pneumonia in Danish swine is a small fraction of that in Canada.

Loss — The current loss is $35-55 million (3.25-5.- per pig) yearly.

Funds — Jointly from government and the swine industry.

Sequence of Future Actions — If success in attaining these objectives is indicated, adapt and expand for general use with phased-in funding by industry and users, and provide for a semi-autonomous board to direct operations.

b) *Demonstrate influence of HM on economic return of casually-managed cow-calf herds.*

Composition of Working Group
— Producer Association(s);
Veterinary Association(s) or Society of Veterinarians;
Government and University.

Purpose — To hasten adoption of technological advances among cow-calf producers by adding a health component to the ROP program.

Method — No exact model exists, but the agencies named above have operated separately for many years.

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Sequence — Conceptual planning by Working Group. Direction, Work Plan, and Annual Report subject to approval of Working Group. If successful in attaining objectives, organize autonomous operation as self-supporting service.

Probable Cost — $50,000 - $100,000 per year for five years.

Administration and Analysis — Federal Provincial ROP (Beef); Provincial Veterinary Services.

Note: A comparable approach could be taken for sheep operations.

c) *Provide funds for field research by universities to evaluate the economics of HM, with emphasis on beef, swine, and sheep.*

There are arguments indicating that such services are beneficial, as demonstrated in dairy HM. However, in the absence of substantial data, producers cannot make rational decisions about the allocation of resources for HM. It is noteworthy that information from applied research has been invaluable to producers in such areas as crop and land management systems, use of fertilizers and agricultural chemicals, ration formulation and marketing systems. The scale of potential return from improved HM is hundreds of millions of dollars annually, and funding by Agriculture Canada to determine the potential payback to producers is plainly worthwhile.

d) *Conduct research on HM information systems, computerized databanks, and economic epidemiology.*

Field studies of HM information collection and management systems are required to aid in improved managerial control and decision-making at the herd level. These studies would include making the use and mastery of intelligent computer terminal technology simpler for practitioners in order to give them input and access to databanks. A second need is the development and use of databanks and networks to improve the efficiency of HM by applying statistical and epidemiological methods, and providing periodic printouts, for which a producer would pay, summarizing the influence of health and productivity on the profitability of his herd. These databanks would also provide data, for which breed associations would pay, to advance the genetic quality of breeding stock, and supply means for recording animal disease occurrences, and for teaching and research for which the user would pay. Much of these data could be assembled from existing sources, on due payment to the supplier, then processed, and utilized as follows:

Information Management and Databanks

People or Organizations	Information (as required by user)	Uses of Information & Services
Practitioners	Case records	Summaries of Herd HM records Business administration Ability to predict outcome of serious cases
Producers	Objective observations	Numerical indicators of herd health and productivity
Lending Agencies	—	Economic or numerical indicators of performance of specific herds
Inspection, diagnostic and analytical services	Objective data and advisory information	—
Colleges	Access to specific databases	Specific data for teaching and research
Government Administrators	—	Specific data for regulatory purposes — e.g. selenium supplementation of feeds
Breed Associations	—	Identification of genetic faults in individual animals and families

These studies would be conducted by universities, with initial funding by government and industry, in the expectation that the system would ultimately become self-supporting on a user-pay basis and be directed by an autonomous board, representative of its major clientele.

II. INTRODUCTION

A survey of preventive veterinary medicine programs for beef and dairy cattle, swine and sheep has been conducted at the request of the Canadian Veterinary Medical Association and paid for by Agriculture Canada. The central purposes were to determine 1) what programs and procedures are currently available in Canada and elsewhere; 2) how they are delivered; 3) what is known of their costs and benefits; 4) what systems are being used for record keeping and analysis; and 5) the composition of an ideal team for delivery. Recommendations were to be made regarding specific topics in preventive medicine which require further research in Canada.

This report is based on the following sources of information:

1. A survey of veterinarians engaged in food animal practice in Canada;
2. A review of scientific literature and other publications;
3. Several hundred interviews with such persons as veterinarians in private practice, government and universities personnel, animal and crop scientists, nutritionists, agricultural engineers, economists, animal breeders, commodity association and marketing board officers, producers, consumers, bankers, and data-processors;
4. International correspondence with veterinarians in private practice, and/or government or university service in the U.K., the U.S.A., Sweden, Denmark, Holland, Australia and New Zealand.

The results of the veterinarian survey form the first part of this report; the other sources of information listed above are the basis for the remainder.

III. VETERINARIAN SURVEY

A questionnaire, printed in French and English, was mailed to the 1580 names on the Large Animal, Mixed Practice and Commercial sections of the 1979-'80 CVMA Directory.

Eighty-six were sent back as undeliverable. The data from the 550 completed forms were entered into a computer for analysis.

Profile of Health Management (HM) Work By Respondents

Of the 550 respondents, 333 (60%) indicated that their practices were primarily with food animals, and 268 of the 333 (80%) viewed some of their work as HM.

The percentage of respondents devoting time to HM with a given species, and the mean percentage of time devoted to HM of that species, is shown in Table I. The mean percentage of time devoted to HM, categorized by province and species, is also shown in Figure 1.

The data from 110 of the Ontario respondents permitted the following analyses. A plot of the percentage of time devoted to all HM work in relation to years since graduation suggests that, in view of the age distribution of Canadian veterinarians (18), participation in HM was little influenced by this variable (Figure 2). The percentage of time devoted to dairy HM and the number of animals receiving HM services per respondent is shown in a plot for 69 Ontario practitioners in Figure 3. The mean number of dairy animals was 1082 (S.D. 1348; S.E. 157). A comparable calculation made for sows in farrow-wean operations in Ontario showed the mean number of sows supervised by 28 respondents to be 913 (S.D. 1892; S.E. 268).

Use of Public Funds for HM

The distribution of opinions regarding the use of public funds for the development, promotion, and delivery of HM programs is summarized in Table II and shown in Figure 4. The weight of veterinarians' support for the public funding of HM is clearly on the promotion and development aspects, with the user-pay system more popular than state funding where delivery is concerned. The exceptions in this regard are Quebec and the Atlantic Provinces, in which subsidies for delivery of veterinary services are highest; 85 percent of respondents in these areas favored subsidized delivery of HM services. Opposition to the use of public funds for delivery of HM programs was often stated in strong terms.

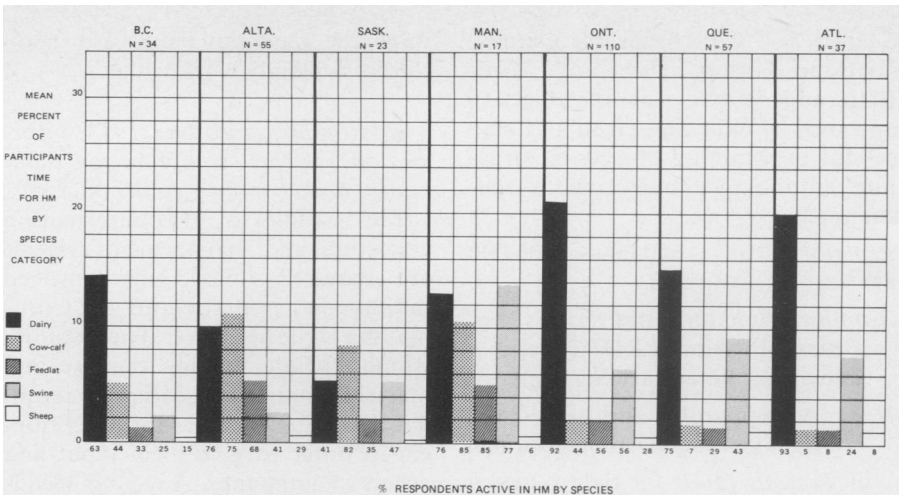

FIGURE 1. The mean percent of practitioners' time devoted to HM, by provinces and species, is depicted above together with percent of respondents who devoted time to HM services, by species.

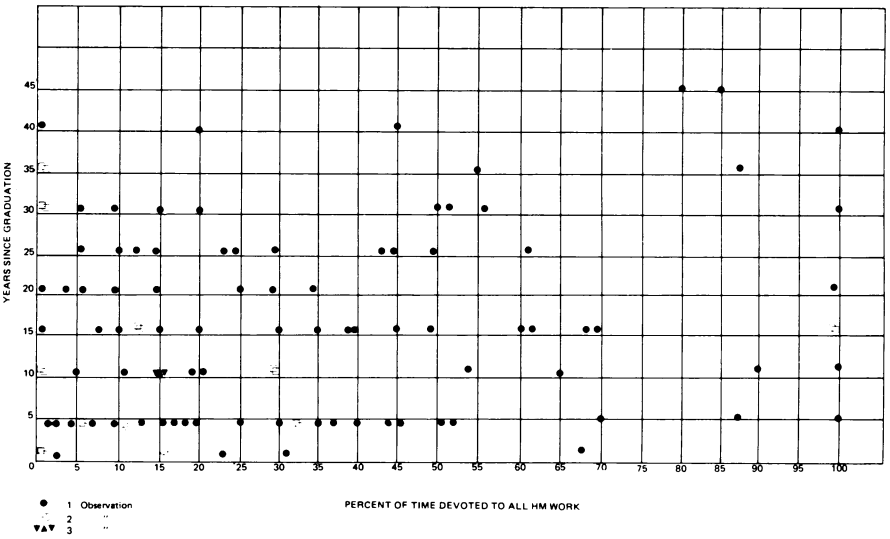

FIGURE 2. The percent of time devoted to HM in all species in relation to years since graduation is depicted above for 110 Ontario respondents. The data were rounded to intervals of 5.

TABLE I

a) PERCENTAGE OF RESPONDENTS DEVOTING TIME TO HM
b) MEAN PERCENT OF TIME DEVOTED TO A SPECIES

	Dairy Cattle		Cow-calf		Feedlot		Swine		Sheep		Total
	a) %	b)	a) %	b)	a) %	b)	a) %	b)	a) %	b)	
West	68	10.7	65	9.1	66	3.7	61	4.3	22	0.5	28.5
East	90	20.2	65	1.9	52	1.7	53	7.2	21	0.9	32.1

TABLE II

PERCENTAGE OF PRACTITIONERS IN FAVOR OF USE OF PUBLIC FUNDS FOR PROMOTION, DEVELOPMENT, OR DELIVERY OF HERD HEALTH PROGRAMS

	West	East	Anomalous B.C.	Man.	Ont.	Que/Atl
Promotion	72	73				
Development	65	72				
Delivery	51	63	25	31	40	85

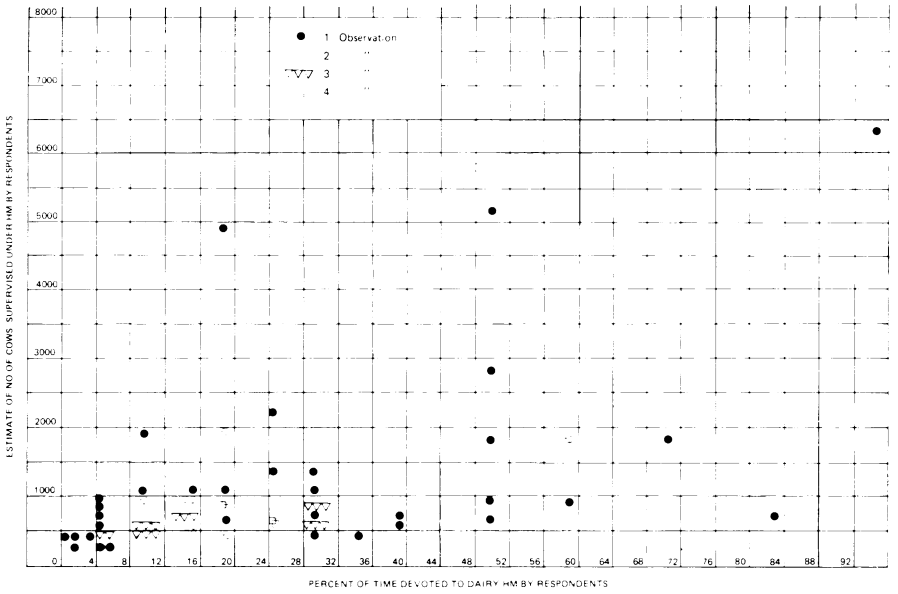

FIGURE 3. The percent of time devoted to dairy HM and number of dairy animals receiving HM services as reported by 69 Ontario respondents is shown above. Mean: 1082; S.D. 1348; S.E. 157.

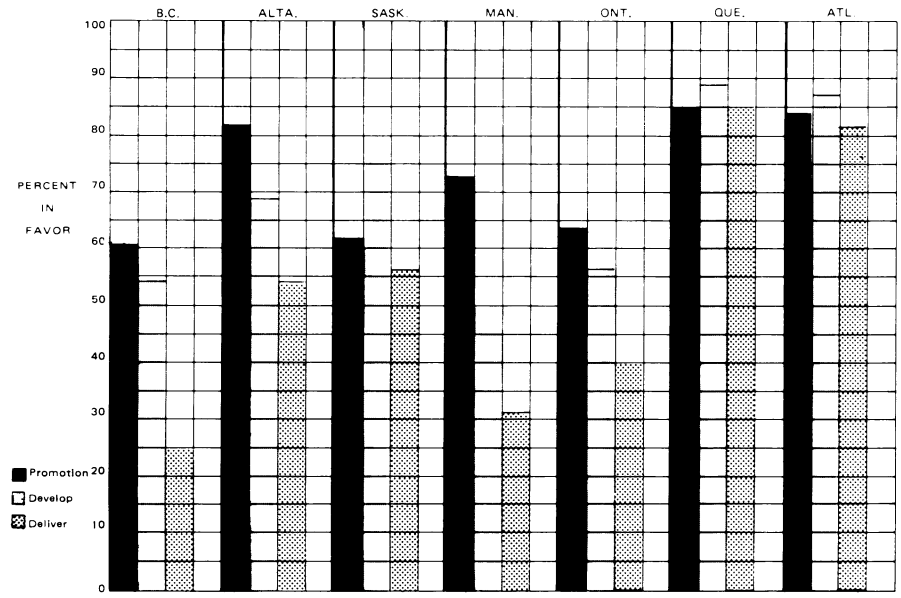

FIGURE 4. The percent distribution of respondents in favor of use of public funds for promotion, development, and delivery of HM program is indicated above.

Practitioners' Suggestions on Measures to Advance HM

Of 325 suggestions, 237 (73%) related to economics of HM and 88 (27%) to science and technology. Seventy-four practitioners commented that veterinarians should be in a position to demonstrate the economic benefit of HM; they emphasized the need for research on this subject. Increased assistance by governments and other agencies to develop simpler and more effective recording systems, preferably using computers, was high on the list of suggestions.

Respondents were asked why certain practitioners may not participate in HM work. "Not enough owners are interested" was the most frequent response; "there is not enough time available" and "veterinarians lack adequate training" were nearly tied for second place. The rankings were identical between two groups: those who devoted less or more than 25 percent of their time to HM work.

IV. HEALTH MANAGEMENT TEAM

Respondents consulted their colleagues in the following order of frequency: first, diagnostic laboratories (by far the most frequently); then college veterinarians, government veterinarians and nutritionists (with about equal frequency); followed in sequence by livestock species specialists, agricultural engineers, and animal breeding (AI) officers. Such advisory information is often augmented by research findings with practical application for HM problems. (For example, in a study of heat and moisture loads and air quality in commercial broiler barns in Alberta, Feddes *et al* found that a carbon dioxide analyser could be used to quickly estimate ventilation rates (22,26). This technique may be useful in dealing with ill-ventilated swine housing). The quality of the advice received was ranked as good or superior by the great majority of respondents; in a small minority of instances, the quality was judged to be in need of improvement.

With a few exceptions, participation of practitioners in structured or integrated HM programs is minimal.

V. LITERATURE REVIEW

Health management programs have been described for all food animals production enterprises. The state of the art is best developed in dairy farming (6,9,12,23), followed in order by swine (46), beef feedlot (38,70), cow-calf (56), and sheep (14,30,34) operations. Estimates of the loss from certain disease conditions and suboptimal productivity in Canada are found in Table III. The costs of veterinary fees and medicines and the benefit/return ratio from HM programs in individual herds are reported from numerous sources in Table IV. No economic studies of substance were located regarding HM programs for beef, swine, or sheep.

Dairy

In an economic study of herds on a HM scheme at Guelph, four levels of efficiency of managerial response were identified (9). The performance of an individual herd corresponded with the level of efficiency of its manager in relation to all five parameters analysed: cow mortality, calf mortality,

TABLE III
ESTIMATE OF LOSS FROM CERTAIN DISEASE CONDITIONS AND SUB-OPTIMAL PRODUCTIVITY IN CANADA

Category	Disease or Cause of Loss		Annual Loss (millions $)
Dairy[1,2,3]	Mastitis	Mean somatic cell count 300,000 above base level = 39.78 L less milk per month per cow. 39.78 × 12 × 1.6882 million cows × 0.40¢	200-300
Beef:			
Cow-Calf[4]	Sub-optimal productivity	On 3.5 million cows increase productivity 7.6% by raising calving to 80%. 7.6% × 3 billion	228
	Calf Scours	Annual loss in Alberta and Saskatchewan herds	77
Feedlot[5]	Respiratory Disease	Cost per head in feedlot (Alberta data extended to Canadian numbers) $7.70 × 3 million head	23.1
Swine[6,7]	Enzootic pneumonia and worms	Cost per pig: $3.25 - $5. - × 11 million slaughter pigs	35-55

[1]Barnum and Meek, 1981. (10)
[2]Blosser, 1979. (13)
[3]Moxley *et al*, 1978. (45)
[4]Saskatchewan Agriculture, 1981. (58); C. Gracey, 1981. (29); Acres, 1976. (1)
[5]Church and Radostits, 1981. (20)
[6]Leman *et al*, 1981. (35)
[7]Polley and Mostert, 1980. (55)

TABLE IV
COSTS OF VETERINARY FEES AND MEDICINES AND BENEFIT-RETURN RATIO OF HEALTH MANAGEMENT PROGRAMS IN LIVESTOCK

Category	Vet. Fees	Medicines & Supplies	Vet. Fees & Medicines	Times by which increased costs for HM program were returned
	Percent of Output Value			
Dairy	1.1[a]		1.3[a]	18.2[c] 9.2[d] 3-10[e]
			1.4[b]	0.33 - 5[f]
Beef:				
Cow-calf	0.8[g]	1.81[g]	1.8[i]	N.S.D.
	0.9[h]		1.0[j]	
Feedlot	0.03[m] = 18.5¢/head*	2.13[m]		N.S.D.
Swine:				
Farrow-wean			1.0[l]	
			4.7[n]	N.S.D.
Farrow-finish	0.17[p]			
			2.47[q]	N.S.D.
Sheep			3.1[r]	N.S.D.

N.S.D. — No substantial data available.
*All other health expenses, including labor, plus mortality cost as percent of live weight value

a OMAF, 1981. (48)
b Alberta Agric., 1980. (2)
c Williamson, 1980. (69)
d Moller, 1978. (42)
e Swann, 1975. (60)
f Barfoot *et al*, 1971. (9)
g Sask.-Agric., 1981. (58)
h Alberta Agric., 1981. (3)
i Canada Senate, 1981. (16)
j Br. Col. Agric., 1978. (15)
m Church and Radostits, 1981. (20)
l OPPMB, 1981. (52)
n OMAF, 1981. (48)
q Sask. Agric., 1979. (59)
p Muirhead, 1980. (46)
r OMAF, 1980. (51)

average open interval, milk production, and the culling rate for health reasons. This observation has obvious implications regarding the selection of simple, accurate performance-indicators.

Field observations in Canada confirm the research evidence that HM is associated with improved performance and better mastitis control (25,36,43).

Studies in Australia, New Zealand, and Great Britain (6,12,19,42,44,69) involved an analysis of the total farm enterprise of paired program and surveillance farms. In all cases, the relative gains in productivity and economic efficiency were greater for program farms than for control farms.

Thompson examined the possible impact of improved technology on the agricultural resources used for dairy farming in Canada (64). A national average milk yield per cow of 4,850 litres per year could be attained by improved feeding methods, reduction of calving intervals, and artificial insemination. A projected demand for 64.7 million hectolitres of milk in 1983 could be met by a national herd of 1.35 million cows, three quarters of a million less than the 1975 herd. Approximately 1.8 million hectares of land and 17,000 man-years of labor would be freed for other enterprises. Net revenue per cow would be increased by $213, with milk priced at $22.25 per hectolitre (excluding the cost of quota). In the 1981 Census, cows in dairy herds numbered 1,593,104 and their average production was estimated to be 4502 kg (24.)

Beef Cow-Calf

Health management programs have been described for cow-calf herds, with emphasis on proper nutrition and management of the breeding herd in order to maximize reproductive efficiency and prevent and control disease (56). The cost of disease and death in adult beef breeding cows was estimated to be $32 per cow and calf in Saskatchewan (58); the principal loss is from sub-optimal reproduction. Broadly-based surveys of cow-calf herds reveal that 14% — 15% of the cows fail to become pregnant (32), and 11.5% fail to deliver and suckle a calf (1). This reproductive deficiency of 25.5% is in line with a calculation of

the calf crop by Charles Gracey, based on Statistics Canada slaughter data and the estimate of the national beef breeding herd two years earlier. These databases indicated that 74.5% of all cows have calves which survive to slaughter age (29).

Beef Feedlot

Health management is a major concern in feedlot operations. In some, a veterinarian supervises the HM programs, makes regular visits, trains lay staff, performs necropsies, and has the health status under constant review. In others, a veterinarian is called in by the operator only as required (20).

A retrospective study of 24 feedlots in Alberta revealed that the total costs associated with disease and death, including labor for surveillance, segregation, and treatment, came to $12.40 per head; respiratory disease at $7.70 per head was the major cause of loss. The cost of veterinary fees was less than one-tenth of the cost for drugs and vaccines. Losses from disease in this study did not differ substantially from American results (20).

Epidemiological studies conducted over three years in 69 Ontario farm feedlots revealed a wide variation in the cost of morbidity and mortality (38). Many management factors, including the type of ration, were found to influence both morbidity and mortality. In Alberta feedlots, an epidemiological study has been undertaken to determine the factors affecting the incidence and severity of respiratory diseases (70).

Swine

A detailed on-farm procedure for a comprehensive HM system for large operations has been described (46). A SUIS (Swine-Unit-Information System) program has been developed for minicomputers (33).

There are no reports of the cost-effectiveness of HM for swine, although convincing arguments of its value are offered. In a review of the literature on enzootic pneumonia, Leman *et al* concluded that the cost of the disease could not be precisely inferred (35); but an assessment of this review would suggest that an added production cost of $3.25 per pig is reasonable for pneumonia-positive compared with pneumonia-free herds. Similarly, the cost of ascarid infestation in Canada is not known (55); but data obtained after scaling down an estimate of the loss in American production of $3. per pig to $1.75, on the grounds that the effects may not be additive, suggest a loss from enzootic pneumonia and ascarids greater than $5. per pig marketed in Canada.

Herd health monitoring by means of slaughter inspection data, as conducted in Denmark and Sweden, has revealed a number of important facts: within groups of herds of similar sizes, extensive variations exist in the rate of lesions from enzootic pneumonia and other disease conditions; the problems in a herd are commonly associated with factors related to health management which can be quantitatively evaluated for their effects either as single factors or as interacting, multifactorial determinants; and the most favorable cost-benefit ratio is gained when the rate of lesions in a herd is high, a datum favoring the selection of large herds for control measures (68).

A recent survey of swine lungs in Saskatchewan (54) showed that the prevalence of lesions from enzootic pneumonia was several times greater (37%: 5%-8%) than that recorded in Denmark (67), but was comparable to that in Illinois, as reported by Backstrom *et al* (8).

At the Veterinary Infectious Diseases Organization (VIDO) in Saskatoon, Saskatchewan, research on technical manipulation of swine performance which will have a quick payback to the producer is currently being conducted in consultation with a Swine Technical Services Council (65).

Sheep

Health Management programs for sheep have been described (14,30,34). A few veterinarians provide this service in Canada, particularly to producers involved in intensive lamb raising.

A whole-farm approach to the economic influence of HM on profitability is being developed in Australia (11).

In New Zealand, a PAHAPS (Planned Animal Health and Production) program is being operated experimentally for a three-year period; the economic benefits will be examined on its completion (40).

VI. PRODUCTIVITY OF HERDS

In 1981, the average Canadian milk production per cow (4,502 kg.) was ranked seventh among 16 countries (the U.S.A. was third) (24).

Pigs weaned per sow in Canada, based on Statistics Canada data, averaged 14.6 per year in the period 1975-79 (a decline of six percent from 1970-74), compared with 20.5 in U.K. breeding herds weaning at 26-32 days (41).

In 114 cow-calf herds in Saskatchewan the average weaned weight of calves was estimated to be 338 lbs. (21), whereas in the Federal-Provincial ROP for Beef Cattle, 1980-'81, the average 200-day adjusted weights of male and female cross-bred calves in Saskatchewan were 603 and 577 lbs. respectively.

It is clear from these data that a large proportion of livestock operations in Canada have the potential for greater productivity.

VII. DELIVERY OF HM PROGRAMS

Experimental

Research studies, limited to dairy herd health management, have been undertaken by universities in Canada. In other countries, universities and veterinary association (the U.K.), or producer associations, universities, and government agencies (Australia and New Zealand), have co-operated in this type of research. The PAHAPS concept has now been extended to experimental study of sheep and beef cow-calf producers in New Zealand (40).

Operational

The participation of practitioners in provincial animal health programs in Canada is depicted in Table V. The provincial governments in the Atlantic provinces and Saskatchewan, and in Alberta by support to VSI, all subsidize health management services by veterinary practitioners; these include a beef calf pre-conditioning program in Alberta. In Quebec, 35 provincial government veterinarians operate preventive medicine programs for all animal species; mastitis control is a major program. However, the feed companies which control the bulk of the swine production in Quebec, employ their own veterinarians to

supervise their HM programs. In the other provinces, as in the U.S.A. and the U.K., practitioners provide HM services to their clients mainly on a private treaty basis.

In Sweden and Denmark, cooperative epidemiological study programs based on slaughter checks of swine have been jointly supported by the government, producer associations, and the cooperatively owned processing industry. These programs have helped to reduce the frequency of certain disease conditions. The Ontario Swine Research Committee report in 1981 gave top priority to adapting the slaughter check method in order to improve pig health and production (53).

In Sweden, the veterinarian's role is also linked with animal welfare regulations. Codes of practice for the care of farm livestock are under study in Canada (31).

After the success of the HM research programs was established in dairy herds of Australia and New Zealand, practitioners were invited to participate in extending these programs as part of their practices. Correspondents in New Zealand report that not all veterinarians are participating, because some prefer curative styles of practice; this may affect the adoption of HM by dairy producers there. The HM program in Australia is being provided to a steadily increasing clientele, now numbering in hundreds of dairy herds and supervised by a number of separate practices.

The approach to HM taken in the U.K., Australia, and New Zealand — i.e., the evaluation of formal HM programs in field studies on a limited number of herds, followed by extension to the veterinary profession at large — is in marked contrast to the unstructured approach in Canada and the U.S.A., where education of veterinary students in the principles of HM is followed by on-farm adoption of the concept.

VIII. RECORDS, ANALYSES, COMPUTER NETWORKS AND EPIDEMIOLOGICAL MODELS

Detailed health records are kept by practitioners, mainly of reproduction of dairy cows, less frequently for sows and rarely for cow-calf herds.

Without adequate records producers cannot know their loss from disease and sub-optimal productivity, and at present veterinarians in Canada do not have a system to provide this information. Recognizing this deficiency, practitioners emphasize the need for systems to record, analyse and communicate the economic benefit of their work, and for help in mastering the relevant computer technology. Eleven respondents had computers and 18 expected to have them next year, but suitable software for HM is currently lacking.

A wealth of health-related records flow from meat inspection, milk and swine marketing boards, diagnostic laboratories, and animal breeding organizations. This information, suitably organized, would be invaluable for assessing production efficiency and genetic quality, for research and teaching, and for regulatory and surveillance purposes.

Some of the foregoing groups could both provide and utilize such information; others might be exclusively providers or users. The necessary ingredients for "networking" seem to be present; the question is one of economic feasibility and a viable formula for cost-sharing.

One example of an operating system is the Danish epidemiological model, based on slaughter checks of swine (67). An experimental network involving 20 dairy farms and four veterinary practices is operating in Michigan. The goal is a state-wide database for research, teaching, and on-farm management decisions. Once established, it is to be self-supporting (39).

An example of a computerized dairy HM program is the Australian system, where data provided by participating practices is stored and analysed centrally and periodic printouts are issued on the intelligent terminal at each practice (69). The Veterinary Investigation Recording User Systems (VIRUS) program for dairy cattle, operated on a minicomputer with access to main frame computers for large scale analysis, is being further developed in the U.K. to search out genetic differences and interrelationships regarding health and productivity (37).

TABLE V
PROVINCIAL GOVERNMENT ANIMAL HEALTH PROGRAMS: CO-OPERATION WITH PRACTITIONERS

	Beef	Dairy	Swine	Sheep	Remarks
Nfld		+	+		Food animal practitioners are prov. gov. employees. HM services provided at reduced rates.
PEI		+P	+P		Subsidy to practitioner for HM services.
NS		*		*	Subsidy to practitioner
		+	+P	+P	for HM services.
NB		+	+		Food animal practitioners are prov. gov. employees. HM services provided at reduced rates.
Que	+	+	+	+	Central drug purchasing service.
Ont			+		
Man			+P		Central drug purchasing service.
Sask		+P	+P		Subsidy to HM services decreases to 25% during 4 years.
Alta	+PI		+P	+PI	Practitioners paid by
	††	††	††	††	government to present health
	†				topics at extension courses for industry.
BC	**		+P		

+ Program operated by salaried staff
+P Program involves practitioners
* Pilot Projects
** Program being planned
† Alberta Certified Preconditioned Feeder Program
I Pasture Health Inspection Programs
†† VSI program in frontier regions

Species	Location	Percent	Participation	Year	Reference
Dairy	Ontario	24.9	(441)*	1979	10
Feedlot	Alberta	16.6	(24)	1978	20
Cow-Calf	Sask.	2	(114)	1976	21
Swine	Ontario	20	(54)	1981	61

*Number of herds in population surveyed.

IX. FACTORS IMPEDING PARTICIPATION IN HM PROGRAMS

The following data indicate the proportion of producers who received HM services in certain locations, along with the year of the study:

What is the producer's perception of HM, and is the profession collectively providing the HM services the industry needs? The type of HM service deemed important by producers has been investigated in cow-calf herds in Saskatchewan (21). In a survey of 114 cow-calf herds, Church found that 53 producers were not interested in herd health programs, mainly because they "had no trouble" and hence saw no need; but 60 were interested in herd health service, preferably without a formal program. They placed client education and post-mortem examinations first and second in importance, with pregnancy diagnosis and bull evaluation in fifth and seventh place respectively. Church concluded there is a greater market than is generally realized for HM services among these small, mostly casually-managed herds, and that a better understanding of the advantages of a short intercalving interval would arouse interest in improved reproductive performance.

In a study of the future HM needs of 32 large scale dairy producers in California, Goodger concluded that a major need is the ability to make decisions about input resources (28). The operators need an integrated approach to health and production management; but, since they perceive veterinarians as providers of technical services only, rely on a variety of other sources of specialized information, many of them unable to put disease into the perspective of the overall operation.

A survey of problems and concerns of swine producers was conducted by the Saskatchewan Pork Production Committee in 1981. Herd health programs were among ten leading areas of concern identified as most important by the 456 respondents. Five of the ten were engineering problems of housing and equipment, and four concerned nutrition (62).

A group of four sheep raisers in Ontario, in presenting the provincial Agriculture Ministry with a ten-step proposal for the development of their industry, included two items on disease control — the non-availability of certain drugs and the need for research on two examples of management-responsive diseases (5).

What is to be inferred from these observations?

The concept of HM held by the 53 cow-calf raisers is not in accord with accepted HM principles (56). Large scale dairy operators have not perceived veterinarians to be suppliers of specialized information in areas such as nutrition, nor in relation to a whole-enterprise approach to milk production (27). Generally, HM services as currently provided by practitioners are unstructured. There are no standard systems for periodically analyzing the influence of HM on the performance of the individual herd; the task of integrating HM information into the larger perspective lies with the producer or others. Overall, there is inadequate information about HM — in some sectors on the part of the producer, and in others on the part of the profession, which has been slow to respond to the needs of the industry.

X. CONTINUING EDUCATION

The concerns of educators, producers and veterinarians that the food animal practitioner is ill-equipped to respond to the needs of intensive livestock management have been reviewed by Goodger (28), and were expressed recently by Weir (66). The efficacy of current systems of continuing education has been questioned in a discussion of responsibility for competence of graduate veterinarians (63).

Consider two successful models which are relevant to both producer and practitioner. First, the livestock producer marketing agencies of today grew from the Farm Forums of many years past. The producers, having agreed on a need, directed the development of the appropriate organizations and systems, hired resource people to operate them for their own individual and collective benefit, and kept them flexible to adapt to change. Second, there is the manner in which the adoption of the technique of somatic cell counting of bulk tank milk as an aid in mastitis control evolved from joint undertakings of the Dairy Farmers of Canada, the Canadian National Committee of the International Dairy Federation (7), and the Canadian Milk Recording Board (4). Both examples are in many respects analogous to the present need for a system which can inform the individual producer of the influence which the health status of his herd has on the overall economics of his operation.

Successful participation in such a system would provide both an ongoing stimulus for continuing education by the practitioner and cumulative evidence of its effectiveness in application. Species specialists could gain recognition for their status by aiding in the development and operation of such a system, developing procedures for strengthening the competence of their peers, and employing integrated HM as an educational tool for producers (17).

The prospects for successful HM programs would be brighter if producers and veterinarians recognized the paradox that, while their organizations hold formal joint meetings on regulatory aspects of animal health, which are generally satisfactory; when it comes to the costly problems of management-responsive diseases they are still largely silent. At present there are many producers and practitioners who are doing a good job of HM, but they do so mainly on their own. Through their organizations they should take the initiative to establish collaborative mechanisms which will spark the projects needed to advance HM in Canada.

XI. DISCUSSION

The results of the survey indicate that a large majority of respondents view part of their services in cattle herds as

HM, while slightly more than half devote some time to swine and a fifth provide sheep HM, mostly devoting five percent or less of their time to this species.

Their services to individual herds are anchored primarily in attention to reproduction; emphasis on other HM components varies, reflecting the problems of the producer and interests of the practitioner. Typically there is no system available for informing the producer of the economic influence of health status factors on the success of his operation; but practitioners identify such systems as a major need. Many veterinarians believe that producers do not expect to pay for such information; yet, in fact, producers currently pay fees for milk recording services which are comparable to the cost of HM services.

Veterinarians dwelling in regions where government subsidies for HM work are presently provided clearly favor such subsidies; but the contrary opinion is so strong in the provinces without such schemes that possibility of utilizing public funds for the delivery of national HM services would require extensive preliminary discussion with veterinary associations.

Among producers, a minority receive regular service for HM purposes, participation being greatest among dairy, swine and feedlot enterprises; the proportion among cow-calf producers is extremely small. The need for better information on HM amongst producers is indicated by the increasing degree of participation by dairy farmers in milk recording services, as the scope of the HM information provided has been enlarged (47).

In brief, veterinarians in Canada devote a significant proportion of their services to HM, but the economic effect of these efforts cannot be estimated in relation either to individual operations or to whole industries, since they have no integrated HM systems to compile and analyze data and no research is currently directed to these ends. In contrast to the unstructured state of HM in Canada, integrated HM programs exist in several other countries, either as routine operations or as experimental projects which may be suitable models for our needs.

Educators, producers and others all talk of a whole-farm approach to HM, of HM as a multi-faceted entity, with the veterinarian heading a team of specialists to co-ordinate multi-disciplinary action as needed on the farm. All the relevant specialists and producers have national and regional organizations; but a comprehensive national or regional focus for co-ordinated HM action is presently lacking, and is needed as a catalyst. Specific studies and pilot projects are proposed and discussed in the Summary and Recommendations section (Part I of this article).

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ABSTRACT

BRETZLAFF KN, WHITMORE HL, SPAHR SL, OTT RS. **Incidence and treatments of postpartum reproductive problems in a dairy herd.** *Theriogenology* 1982; 17: 527-535. (Dep. Vet. Clin. Med., Coll. Vet. Med., Univ., Urbana, Illinois 61801).

Prevalence of assisted births, retained fetal membranes (RFM), and endometritis were recorded in 100 dairy cows from parturition to 14 days after calving. Manual removal of RFM was not attempted. All RFM were excised inside the vulva and observations of natural RFM expulsion were recorded. Fifteen of the cows had assisted births, 27 had RFM, 8 had primary metritis not associated with other postpartum reproductive problems, and 26 had secondary metritis. *E. coli* was the most common organism isolated (69.4%) from uterine swabs. Sensitivities of all isolates to penicillin, tetracycline, and triple sulfa were 44, 59.5% and 36.9%, respectively. Despite treatment with tetracycline or penicillin, 26 of 34 cows having either assisted birth and/or RFM developed metritis (76%). These poor results suggested the futility of routine administration of therapeutic agents for postpartum reproductive problems. Treatment failure was attributed to ineffective drugs or inadequate dosage.

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