Integrated Herd Health Programs in the Dairy Herd - The Israeli Experience

Oded Markusfeld *(Nir) BVSc, MRCVS*
Director of Clinical Services
Hachaklait § P.O. Box 9610, Haifa, Israel
Hachaklait, The Mutual Society for Cattle Insurance and Veterinary Services in Israel Ltd.
57 Balfour St, Nahariya, 22426, Israel

Abstract

A comprehensive, mutual veterinary service is practiced in Israel under the nationwide Mutual Society for Cattle Insurance and Veterinary Services "Hachaklait". The package offered under contract includes emergency treatment, preventive and herd medicine, consulting services and supportive laboratory services. The routine by which the balance between individual cow and herd medicine, and that between the clinical and the supportive services are achieved is described in detail. Early professional treatment of all clinical diseases, discovery of diseases by routine tests and examinations, a regular presence on the farm and the use of "real time" diagnostic laboratories are the essence of the individual cow therapy. The value of following feeding plans, vaccination programs, and other preventive measures in optimization disease prevalence is stressed. The statistical and clinical epidemiological approach to herd problems is described and some of the problems associated with integrated herd health programs are discussed.

Introduction

Veterinary medicine had traditionally been centered around individual animals. Veterinarians were educated as disease specialists expected to treat sick animals. With a changing dairy industry towards fewer and larger farms, strict quota regimes, rising productivity and low marginal profits on one hand and the control of most infective diseases on the other, demands from the profession have been changing. Veterinarians are now expected to add the function of "**health specialist**" to that of "**disease specialist**".[1] With emerging problems being mostly multifactorial a new "**multivariate approach**" was called for.

The outcome was the initiation of integrated programs for herd health. These programs are characterized by the adaptation of a population approach to clinical entities, shifting weight to preventive measures, and by being involved in considerations of production and profits. The rising number of studies dealing with herd medicine in "The Bovine Practitioner" (the official publication of the American Association of Bovine Practitioners) in the last ten years (Table 1) fairly represents the growing interest of the profession in this new field.

Table 1. Publications in "The Bovine Practitioner." Number of papers dealing with "Herd Medicine"

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
n papers	2	0	3	4	9	7	11	10	9	6

Evolving from the field operational needs but being developed in the academy, the re-introduction of herd medicine methods into everyday's practice seems to have its handicaps. "Selling" the product to both veterinarians and farmers proves to be difficult. Even when both are convinced by the economic advantages of the new approach, its practical application leads to more questions. Not losing ground in individual cow medicine when going into herd medicine, application of methods to small and large herds alike, and finally the advancement of techniques and methods serving the new approach are some of the main difficulties encountered.

Herd health programs in the dairy herds

Effective herd health programs are based on strategies to optimize disease prevalence. Programs should be rightly balanced between individual cow and herd medicine. The nucleus of any program should be the clinical services while nutritional, epidemiological or any other consultatory services offered, are of supportive nature only. The target is to form a health potential in the herd for optimal production and maximization of profits.[2] It is the author's opinion that the package described could be adapted to various conditions and demands moduled by the size of the herds, tradition and individual needs.

Presented as a Keynote Address, Canadian VMA Annual Convention; August, 1990.

The "Cow Component"

Routine diagnostic tests and examinations contribute to herd health by:

1. A more efficient individual cow therapy achieved by early discovery of the disease and its prompt treatment. Clinical diseases are often the observed peak of more subclinical cases. Damages associated with the latter cases could be greater than those caused by the observed clinical ones. (Subclinical mastitis and ketosis are well known examples).
2. Supplying the data needed to analyze herd problems. To be of value, routine examinations should be carried out in a uniform way and at the same stage of lactation. Significance of inactive ovaries in the postpartum cow is different when diagnosed 30d or 60d postpartum respectively.

The value of routine tests for the early diagnosis of clinical and subclinical diseases is illustrated in Tables 2 and 3. The rate of discovery of clinical ketosis by a routine urine test 5 to 12d postpartum is compared to that by herdsmen (Table 2). It is evident that herds benefited from such tests in farms where either rate of discovery by herdsmen was low, or prevalence of the disease was high.[3] Loss of milk because of ketosis was estimated at 233 kg of milk per lactation.[4] Our data (Unpublished) suggest that no loss of milk is associated with ketosis if early diagnosed and promptly treated. It can be calculated that on milk production alone, annual gross income could be increased for 250 cows herd #6 by U.S. $20 per cow. The interval in days from calving to diagnosis of cases of left displacement of the abomasum, is compared in Table 3 between a period when routine urine tests for ketones were carried out to one without such tests.[5] Auscultation of all cows with ketonuria greatly improved the rate of discovery of the disease. 77.9% and 43.4% of cases were discovered by 14d postpartum when routine urine test and no routine tests were carried out respectively.

Table 2. Rate of discovery of clinical ketosis by a routine urine test compared to discovery by herdsman(%)

	Discovery by	
Farm	Herdsman	Urine Test
Total	4.3	15.6
1	.6	13.4
2	2.0	15.0
3	7.6	18.8
4	6.1	10.0
5	5.9	19.5
6	7.6	30.0
7	1.8	10.3

Table 3. LDA: Time of diagnosis in days. (% cumulative from parturition)

	n	1-7d	1-14d	1-21d
No routine examination of post parturient cows is practiced	30	16.7	43.4	66.7
Routine examinations for PP uterine diseases and urinalysis are practiced	68	38.2	77.9	88.2

Introduction of routine tests should be considered according to the needs and the expected economic return. Under our system all cows are examined 5 to 12 days postpartum for postparturient diseases.[6] Some of the damages associated with the periparturient diseases are evaluated in Table 4. The odds ratios of cows with postparturient diseases either being culled or not pregnant by 150d postpartum are compared to cows with no such diseases. This index is a fair representative of the losses associated with the periparturient diseases. An early professional diagnosis and treatment should minimize the losses associated with those diseases. The amount of treatments carried out by farmers vary in various parts of the world and even within any one country. Cost-Benefit considerations will dictate the amount of professional advice sought. It is the author's opinion that not enough effort has been put into showing the extra financial return associated with a more professional treatment, while the costs side of the equation is always overstressed. The activity plan and the routine examinations carried out by the author are described in Table 5.

Table 4. The effects of periparturient traits on culling and reproduction

(The crude (r) and summary (R) relative risk of a cow with factor being culled, not being inseminated or not conceiving, within 150d postpartum, compared to one without a factor).

8 farms, Years: 1981-1988
n=15740 (15571) % with trait=43.2

Factor	% with factor	r	R
Twins	5.4	1.93**	1.47**
Stillbirth	4.4	1.39**	1.34**
Milk fever	1.0	1.61**	1.08
Prolapsed uterus	0.3	4.88**	4.60**
Retained placenta	16.0	1.84**	1.71**
Primary metritis	25.2	1.21**	1.34**
Displaced abomasum	1.2	3.13**	2.35**
Ketosis	8.1	1.72**	1.31**

Control factors: farms, parity, pp diseases (grouped together)
**$p \leq 0.01$

Table 5. Activity plan and routine examinations

Activity	Frequency			
	Day	Week	Month	Bi-annually
1. Treating sick animals	+			
2. Calves health				
a. Test serum of vit A and glutaraldehyde			+	
b. Vit A,D,E, injections		+		
c. Vaccinations		+		
d. Autopsies	+			
e. Replacements measurements				+
f. Ration analysis				+
3. Periparturient cows				
a. Dry cow ration analysis			+	
b. Se & Vit A,E injections		+		
c. Body scoring		+		
d. Induction	+			
e. Treatment of PP uterine diseases	+			
f. Routine PP examination		+		
4. Reproduction				
a. Anestrus		+		
b. Pregnancy check		+		
c. Abortions and returns	+			
d. Milk progesterone tests	+			
5. Udder health				
a. Somatic cell count			+	
b. Bacteriological survey				+
6. Vaccinations		+		

Integration of a diagnostic laboratory is an essential component of the integrated medicine. Such laboratories not only help in a "real time" diagnosis of clinical diseases, but serve as the major monitoring tool of subclinical diseases like mastitis on a regular basis. It should be realized that with most diseases involving bacteria, anti-bacterial treatment is in fact a **"probability"** one. Choice of drug is based on past anti-biograms, the one with wider range has a higher probability of being effective against the bacteria in hand. **"Sensitivity mapping"** is therefore an essential instrument when treating populations. Both treatment of clinical cases and application of preventive measures such as dry cow therapy might prove futile if such routine is not practiced.

Prevention of diseases is achieved by a regular follow up of feeding plans and practice and by the adaption of vaccination routine or other preventive measures. The relative effect of a routine injection of 1αOHD3 to all cows of parity 4 and higher on the incidence of clinical hypocalcemia, is compared to the change in diet calcium concentration (Table 6). Dietary preventive measures were more effective in cost\effectiveness considerations.[7] Rate of subclinical hypocalcaemia was reduced from 9.1% to 3.6% in that population with the reduction of the calcium content in the dry cow ration from 63 gram to 21 gram per day. It is the author's opinion that if veterinarians were to shift most of their efforts to disease prevention through routine activities, **some form of contract practice should exist.**

Table 6. The relative effect of a routine injection of 1αOHD3 to all cows of parity 4 and higher compared to a change in diet calcium concentration on the incidence of parturient paresis.

	Year	
	1983	1985
n Calvings	460	391
% age with parturient paresis	9.1	3.6*
% treated with 1.OHD3	55.4	40.7
Calcium concentration of dry cow ration (g/day)	63.0	21.0

$p \leq 0.001$

The "herd component"

In order to cross the line from individual to herd medicine, data should be recorded and processed so that both statistical and epidemiological evaluations could be carried out. It should be realized that **palpation is not herd medicine and statistics are not epidemi-**

ology. Palpation is of a limited value when used for individual cow diagnosis only. Its value is enhanced when the findings are used for epidemiological purposes to uncover possible causative factors.

Integrated computer programs are commonly used and designed to provide ongoing monitoring of herd performance which is compared to preset targets of performance. Reports serve as an alarm for any fall from targets and as such should be short, concise, engulf all aspects of herd health and issued at regular times.[8,9] Herd size is a limiting factor for both statistical and epidemiological reports. Herd health reports when issued for small sized herds and cover short periods often prove futile, and therefore **could not serve as the loophole for the introduction of herd health programs.**

The chapters dealing with periparturient traits and diseases other than those associated with replacements, mastitis, and reproduction from our monitoring report are presented in Table 7 (*denotes values beyond intervention levels). It can be seen that the importance of "other diseases" is limited. If stress is on multifactorial diseases in modern dairying, a herd health system should be able to give multivariate answers. Epidemiological evaluations of factors responsible for the falls from targets, should become a routine. Multivariate analytic techniques which reduce the descriptive data into multivariate relationships must be employed.[10] It should be remembered that herd health monitoring is done on populations, not on individuals, but individual cow data are essential if interactions between factors are to be clarified.

The following investigation of factors responsible for "cows open greater than 150d" illustrates such a routine epidemiological study. Risk factors responsible for the trait are quantitatively evaluated, first diagnosis only for each case is taken into account (Table 8). Rates of "cows open greater than 150 days" are high for both heifers and cows (29.7% and 33.2% respectively). Quantitatively, anestrus contributed 4.3% and 8.6% out of the above rates for heifers and cows respectively. Factors responsible for anestrus are further investigated. No contribution of known determinants could be defined, so that anestrus can only be explained by "other factors" (Table 9). A structured case-control study[11] is used to establish an association between anestrus and high milk yield before service. Odds ratio of high yielding cows being anestrus was 8.5 compared to their low yielders counterparts (Table 10). Anestrus was previously shown to be associated with a negative energy balance in the pre-breeding period.[12] It can be postulated that high yielders kept at the same feeding group will be in a relative shortage of energy compared to their low yielders counterparts. Milk yield in the first 3 months after calving may therefore be used to indicate an energy deficient diet. The above procedure enables the clinician to concentrate both his efforts and resources, in clinical and laboratory investigations, at the most promising directions. This often proves essential if results are expected.[13]

Table 7. Monthly monitoring report

3. Calving Traits

	Heifers		Cows	
	Month	Year	Month	Year
a. n Calvings	14	145	38	234
b. % twins	0.0	0.0	2.6	6.8
c. % stillbirth	0.0	9.6(*)	2.6	4.3(*)
d. % milk fever	0.0	0.0	2.6(*)	1.7
e. % prolapsed uteri	7.1	1.5	0.0	0.0
f. % displaced abomasum	0.0	1.5	0.0	3.1
g. % retained placenta	14.3	13.1	11.1	8.8
h. % primary metritis	28.6	26.2(*)	11.1	10.1
i. % ketosis	0.0	0.0	0.0	1.3
j. % calved with mastitis	0.0	5.9(*)	0.0	0.9
k. % daydry >70d	****	****	11.1	20.5(*)
l. % daydry <55d	****	****	22.2(*)	36.3(*)
m.% induced	7.1	0.7	0.0	0.9

(*) Denotes values beyond "intervention levels"

4. Other diseases

	% Month	% Year
a. Digestive	0.3	2.4
b. Foot	0.3	0.6
c. General	0.0	0.6
d. Toxic	0.0	0.0
e. External factors	0.0	1.8
f. Eyes	0.0	0.0
g. Skin	0.0	5.0
h. Infectious	0.3	0.9
i. Others	0.0	0.3

Table 8. Contribution to "OPEN GREATER THAN 150d FROM CALVING"
Farm #7 1/11/87-31/10/89

n Calvings	Heifers 202		Cows 220	
	% In population	% contribution	% In population	% contribution
% not conceived		29.7		33.2
Twins	1.5	-1.0	8.6	5.1
Retained placenta	5.4	0.9	15.9	4.5**
Metritis	31.2	5.3*	9.5	0.6
Ketosis	0.0	0.0	2.3	0.5
Anestrus	21.8	2.7	24.5	4.9*
Inactive ovaries	2.0	1.6**	12.7	3.7**
Repeat breeders	4.5	4.5	3.2	3.2
Others	33.7	15.7	23.2	10.7
	100.1		99.9	
	p≤0.05		p≤0.01	

Table 9. Contribution to Anestrus
Farm #7 1/11/87-31/10/89

n Calvings	Heifers 202		Cows 220	
	% In population	% contribution	% In population	% contribution
% with anestrus		43.1		58.6
Twins	1.5	-0.1	8.6	1.8
Retained placenta	5.4	1.4	15.9	-1.1
Metritis	31.2	3.4	9.5	0.6
Ketosis	0.0	0.0	2.3	0.0
Others	61.9	38.4	63.6	58.6
	100.0		99.9	

Table 10. Association of anestrus with high milk yield
Farm # 7 01/01/88-31/12/88

With factor		Without factor		
n	% positive	n	% positive	"R"
23	73.9	23	26.1	8.0**

"R" = Risk of a cow with high yield before service to be anestrus compares to her low yielder counterpart.
** p≤0.01

When positive conclusions can be drawn out of the epidemiological study, cost/benefits considerations should be taken into account. The risk of a particular course of action can be quantified and used together with expected return value as duel criteria for ranking alternatives in decision analysis. It is advisable that recommendations for changes should be commonly drawn by farmer and the veterinarian, chances of them being carried out are higher.

Results of changes introduced should be re-evaluated after a proper period. The prevalence rates of some periparturient traits are compared between two years in which a restriction of energy in the low-yielders and dry cows rations was introduced (Table 11). The contribution of the change of diet to the reduction of rate of the diseases associated with overfeeding before calving is evident.

Table 11. Periparturient traits. Comparison between two years

Trait	1983	1986
n Calvings	1293	1391
Twins	8.4	8.2
Stillbirth	5.1	3.9
Milk fever	3.5	1.0**
Prolapsed uterus	0.5	0.3
Retained placenta	21.4	19.1
Primary metritis	34.0	16.8**
Displaced abomasum	2.3	0.7*
Ketosis	28.6	15.9**

$p \leq 0.001$* $p \leq 0.0001$ **

Conclusions

1. The nucleus of any program should be the clinical services while nutritional, epidemiological or any other consultatory services offered, are of supportive nature only.

2. Health program should be rightly balanced between individual cow and herd medicine.

3. Some form of contract practice should exist if veterinarians are to shift most of their efforts to disease prevention through routine activities.

4. Palpation is not herd medicine and statistics are not epidemiology. Palpation could only serve as the "Trojan Horse" by which to get into herd medicine.

References

1. Goodrich R.D. Animal Research-A look at the future. The Bovine Prac. 1988; 23: 56-58. 2. Weaver, L.D.; Goodger, W.J. Design and economic evaluation of dairy reproductive health programs for large diary herds-Part I. Compend. Contin. Educ. Pract. Vet. 1987; 9(9): F297-366. 3. Markusfeld (Nir), O.; Nahari, N.; Adler, H. Evaluation of a routine testing for ketonuria and aciduria in detection of sub and clinical ketosis associated with overfeeding in dairy cattle. The Bovine Prac. 1984; 19: 219-222. 4. Saun, Van R.; Bartlett, P.C.; Morrow, D. Monitoring effects of postpartum diseases on milk production in dairy cattle. Comp. Food Anim. 1987; 9(6) F213-F220. 5. Markusfeld, O. The association of displaced abomasum with various periparturient factors in dairy cows. A retrospective study. Prev. Vet. Med. 1986; 4: 173-183. 6. Markusfeld, O. Periparturient traits in seven high dairy herds. Incidence rates, association with parity, and interrelationships among traits. J. Dairy Sci. 1987; 70:158-166. 7. Markusfeld, O. The evaluation of a routine treatment with lahydroxyvitaminD3 for the prevention of bovine parturient paresis Prev. Vet. Med. 1989; 7: 1-9. 8. Radostits, O.M.; Blood, D.C. Herd Health. A Textbook of Health and Production Management of Agricultural Animals. W.B. Saunders Company, Philadelphia. 9. Bartlett, P.C.; Kaneene, J.B.; Kirk, J.H.; Wilke, M.A.; Martenuik, J.V. Development of a computerized dairy herd health data base for epidemiological research. Prev. Vet. Med. 1986; 4: 3-14. 10. Cowen, P.; Schwabe, C.W.; Rosenberg, H.R.; BonDurant, R.H.; Franti, C.E.; Goodger, W.J. Reproductive management practices among Tulare, California, Dairy Herds. II. Analytical studies. Prev. Vet. Med. 1989; 7: 101-111. 11. Mantel, N.; Haenszel, H. Statistical aspects of analysis of data from retrospective studies of disease. J. Nat'l. Cancer Inst. 1959; 22: 719-747. 12. Markusfeld, O. Inactive Ovaries in high yielding dairy cows before service: Aetiology and effect on conception. Vet. Rec. 1987; 121: 149-143. 13. Fetrow, J.; Harrington, B.; Henry, E.T.; Anderson, K.L. Dairy herd health monitoring. Part I. Description of monitoring systems and sources of data. Comp. Food. Anim. 1987; 9: F389-F398.