A COST BENEFIT EVALUATION OF THE NORWEGIAN BOVINE VIRUS DIARRHOEA CONTROL AND ERADICATION PROGRAM

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The bovine virus diarrhoea virus (BVDV) eradication strategy chosen by the Nordic countries and a few others has been met with scepticism and a "wait and see" attitude. It was therefore of interest to perform a retrospective cost benefit evaluation of the Norwegian control and eradication program, from 1993 through 1997.

Materials and methods

Information regarding the program cost parameters was gathered from the participating parties, the cattle industry (TINE and GENO) – covering the test equipment costs, The National Animal Health Authorities (NAHA) – covering the district veterinary officer (DVO) field work costs, and The National Veterinary Institute (VI) – performing the tests of milk and blood samples. Only variable costs directly associated with the control program, and costs carried by the farmers as a consequence of the program, were accounted for. Overhead costs were not included.

The benefit of the control program was estimated as the difference between the assumed losses without control – represented by the static 1993 BVDV infection level – and the observed losses during the program period. The financial losses associated with BVDV infection were estimated from studies of the herd level effects of BVDV on health, reproduction, and production in BVDV sero-converted (SC) herds and herds with BVDV antibody positive young stock (YS)[1].

The calculations were performed in Microsoft Excel, and the add-in program @RISK was used to account for the uncertainty in the program cost and financial loss estimates. The annual net benefits over the five years were discounted to a 1993 net present value (NPV) basis using a 6% discount rate.

Results

At the start of the control program the national losses in Norway were estimated to 40-50 million NKr per year[2]. The estimates used to calculate the financial losses cause by BVDV infection in the present study are shown in Table 1.

The costs directly associated with the BVD program for the respective parties are presented together with the farmer's consequential costs in the top half of Table 2.

Table 1. Biologic and economic input parameters[1] of the model to estimate the national financial losses associated with the bovine virus diarrhoea virus (BVDV) infection in the Norwegian cattle population.

Herd level parameters affected by BVDV	Estimated effect			Monetary value		
	Min.	Most likely	Max.	Min.	Most likely	Max.
Extra days open/heifer in the year after SC	1.4	14.2	27.1	20	23	26
Extra days open/heifer in YS positive herds	– 0.7	18.2	37.4	20	23	26
Reduced milk production (kg in the year after SC	–28	96	220	2.9	3.3	3.5
Extra animals culled/100 in the year of SC	– 0.4	2. 5	5.7	2000	3500	7000
Extra animals culled/100 in the year after SC	– 0.5	2.3	5.7	2000	3500	7000
Extra animals lost/died/100 in the year before SC	– 0.02	0.2	0.5	1000	5000	12000
Extra animals lost/died/100 in the year of SC	– 0.01	0.25	0.6	1000	5000	12000
Extra animals lost/died/100 in YS positive herds	– 0.02	0.32	0.9	1000	5000	12000
Extra animals treated/100 in the year of SC	– 1.4	9.8	21	300	450	900
Extra animals treated/100 in YS positive herds	– 2.8	21	48	300	450	900
				Min.	Most likely	Max.
Multiplication factor for extra animals lost/died if no control				1.7	2	3.5
			Mean	Var.	Min.	Max.
Cow years in affected dairy herds			14	6	3	100
Cow years in affected beef herds			5	2	3	25

[1] Minimum, most likely and maximum for the @RISK BetaPERT distribution and mean, variance, minimum and maximum for the @RISK (Truncated) NORMAL distribution.

The industry and the farmers supported about 75% of the total costs of the BVD program. The expected losses without the control program in place, the observed losses under the program and the resulting annual animal health benefit are provided at the bottom of Table 2.

The observed and expected numbers of sero-converted and young stock positive herds used in the estimation of the national annual losses are shown in Figure 1. The numbers are to be seen in comparison with the national population of about 24,000 dairy herds and 4,000 beef herds.

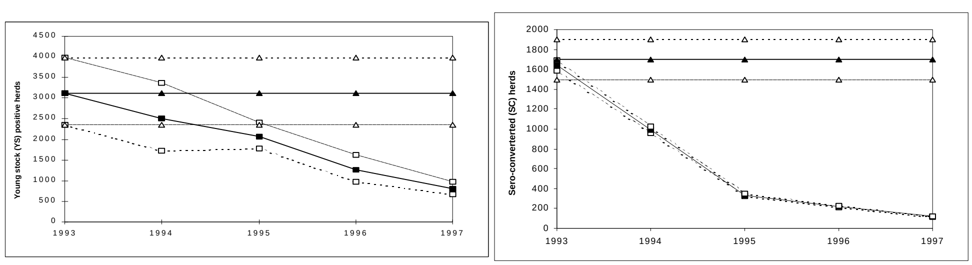

Figure 1. The annual number of bovine virus diarrhoea virus sero-converted dairy herds and young stock positive dairy and beef herds as observed under the Norwegian BVD program, and the reference level used for estimation of financial benefits of the program (i.e. a flat 1993 status). The 5'th and 95'th percentile for the uncertainty distributions are included as dotted lines.

When subtracting the annual BVD program costs from the annual animal health benefits in Table 2, we arrived at an annual median net cash flow for the BVD program over the five years of: – 215, 5,292; 12,001; 20,237 and 23,189x10^3 NKr yielding a median NPV (1993) of 48 million NKr. The 5th and 95th percentiles of the NPV distribution were 0 and +125 million NKr, respectively.

Table 2. Direct and indirect (consequential) costs (in thousands of NKr.) for the co-operative Norwegian bovine virus diarrhoea control and eradication program by year and parties taking the costs, and expected and observed losses by year, from 1993 through 1997.

Parties	1993	1994	1995	1996	1997	1993-97
Cattle industry contribution	1,558	1,299	1,240	1,298	918	6,314
NAHA contribution	1,885	1,902	1,714	1,057	955	7,514
VI + industry laboratory contribution	549	509	516	459	451	2,484
SUM direct program costs	3,992	3,710	3,470	2,814	2,324	16,312
Consequential (Farmers) costs	2,100	5,354	5,913	2,722	2,647	18,744
Median for BVD program cost distribution	6,093	9,064	9,386	5,537	4,969	35,049
Expected losses without BVD control	31,897	31,897	31,897	31,897	31,897	159,484
Observed losses under the BVD program	25,583	17,316	10,334	6,012	3,674	62,966
Median for animal health benefit distribution	5,887	14,325	21,404	25,757	28,151	95,764

Discussion

Recently, Dufour et al.[3] presented an evaluation of an eradication strategy in France, and reported that such a strategy would be cost-efficient only after approximately fifteen years. The Norwegian experience stands in contrast to this by showing a cost-effectiveness beginning in the second year of the program. A major difference is the degree of individual animal testing between the programs. The identification and isolation of possible infected premises without massive individual animals testing together with the low initial BVDV herd prevalence, the efficiency of these measurements via bulk milk testing, the low cost test scheme and the co-operative nature using already existing resources were major factors contributing to keeping the total program costs down. Sparse information was available for the assessment of the BVDV trend in Norway without a control program. However, based on indications of an increasing prevalence and incidence of BVDV at the start of the program, in 1993, the chosen reference level was regarded as conservative.

The negative effects of BVDV appear to be more severe in e.g. Sweden and Denmark[4,5]. Therefore the potential for benefits following control in these and other similar populations, is likely larger than in Norway. However, before choosing an eradication strategy the risk of re-infection is of major importance to assess.

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