

NATIONAL MASTITIS ADVISORY COMMITTEE



THE COST OF MASTITIS DAIRY INSIGHT RESEARCH 2005/2006 Final Report

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BACKGROUND

The Background for this project is the result of a study done for the National Mastitis Advisory Committee (NMAC) in 1993 by Dr. Robert Holdaway who was then a post doctorate student at Massey University. The result of the study was an estimate that the (then) average farmer, who had a herd of 170 cows and a Bulk Milk Somatic Cell Count of 400,000 cells/ml was losing some \$14,639 per year due to mastitis. More recently this estimate has been informally updated to be \$30 per cow per year in a herd where the Bulk Milk SCC is 250,000 cells/ml. There is a need to revisit the Holdaway study and update the costs of mastitis to the New Zealand Dairy Farmer. The need is for credible evidence that mastitis is still of significant economic importance to the New Zealand dairy farmer. It follows that if it can be shown that mastitis continues to be a major cost then the industry will continue to invest in research and support other moves to lower the incidence of mastitis on New Zealand dairy farms.

RESEARCH PROJECT OBJECTIVES

The research will establish, in a range of farming situations:

1. What costs, both direct and indirect, farmers incur because cows are already infected with (or a risk from contracting) clinical and sub-clinical mastitis disease.
2. How much income is lost by farmers because mastitis infected cows (both clinical and subclinical) produce less milk with less useful and most-economically processable components.

EXPECTED OUTCOMES FROM RESEARCH

The research will enable the following:

- All parties associated with the New Zealand dairy industry will have updated and relevant data on the impact that mastitis is having on industry productivity by way of increased costs and lowered income at farm level in a variety of real farming situations. The data will be presented in such a way as to allow computer simulation models to be developed beyond this project.
- Farmers and their advisors will be able to use the relevant cost/income information for individual situations and make better decisions about control and treatment of mastitis in the interests of improving farm profitability on a long-term basis.
- Industry leaders could use the results of the research to identify areas of coordinated research, extension and/or payment systems that would encourage or otherwise influence farmers to lower the incidence of mastitis in their herds.

EXECUTIVE SUMMARY

The original 1993 Holdaway study assessed the costs of mastitis for the average New Zealand dairy farmer at \$14,639 per year, or \$85 per cow per year. The recent informal update by Woolford estimated the cost to be \$30 per cow per year in a herd where the Bulk Milk SCC is 250,000 cells/ml. This study has estimated the costs to the average supplier using representative management techniques as some \$36.50 per cow, \$11,500 for the herd, and some \$180 million for the New Zealand dairy industry.

These are minimum costs for the “average” supplier since there are many other costs for individual suppliers that have not been included in this study. Many suppliers could lose many more thousands of dollars for lost days in milk, milk quality penalties, insurance policies, and lost colostrum sales which are not included in this model, and for higher culling rates and dry cow treatment rates than used in this model. And of course no financial loss is apportioned to the stress of fighting mastitis infections at the busiest time of the year when all staff are stretched with calving and early lactation management.

Mastitis is a major and costly problem for the New Zealand dairy industry. Significant productivity gains can be made through reduction of the numbers of clinical mastitis events and the BMSCC. The next stage of this project is to prepare a computer model in which the actual costs for individual suppliers can be determined. This project is planned for 2007.

Each doubling of SCC results in:

- 1.8% production loss
- 5.8kg solids loss worth \$26

Mastitis costs for the “average” supplier:

- Production loss of some \$13 per cow
- Management loss of some \$23.50 per cow
- Total cost of \$36.50 per cow or \$11,500 per average herd

Gain for the “average” supplier moving from 212,000 cells/ml to the SAMM Plan recommendation of 150,000 cells/ml:

- Production gain of 2.8kg solids or some \$13 per cow
- Management gain (estimated) of some \$7 per cow
- Total gain of \$20 per cow or \$6,221 for the average herd

THE ORIGINAL HOLDAWAY STUDY

The original study (Holdaway 1993) performed during the 1992/93 season modelled the costs of a farmer with a BMSCC of 400,000 cells/ml against a supplier with an “uninfected” herd, presumably about 150,000 cells/ml, and drew the following conclusion:

Source of Loss	Cost to farmer
Loss of milk production	\$ 9,095.00
Clinical Mastitis (Labour)	\$ 163.86
Clinical Mastitis (Antibiotics)	\$ 216.51
Clinical mastitis (Discarded milk)	\$ 62.68
Dry cow therapy (Labour)	\$ 27.60
Dry cow therapy (Antibiotics)	\$ 459.48
Culling	\$ 4,614.00
Total Cost	\$ 14,639.13

There are a number of problems with this approach:

- The bulk of the costs arise from loss of milk production. Holdaway derived these figures from a survey of 3 Manawatu dairy farms. The raw data is no longer available and expert opinion was that that these losses were too large.
- It is not related to cow numbers and is therefore not readily customised to different herd sizes.
- It was prepared for the 1992/93 season before penalties were applied for BMSCCs. Under the current penalty situation, a herd with a BMSCC of 400,000 cells/ml is most unusual.
- The costs are now 13 years out of date.

THE CURRENT STUDY

The current study was funded by Dairy Insight and herd test data analysis was performed by the Animal Evaluation Unit of the Livestock Improvement Corporation. The project was overseen by a Steering Group of mastitis experts from the National Mastitis Advisory Committee and managed by Dave Malcolm.

1. LOSS OF MILK PRODUCTION

a) Source of Data

The National Herd Testing database was examined to determine the association between an increase in somatic cell count (SCC) and loss of milk production. For this study, the national herd test data was used for Sire Proving Scheme (SPS) herds from 1995 to 2004. Animals were recruited into this study as heifers in SPS herds during this 1995 to 2004 period and they remained in the study for subsequent lactations. Each year new heifers were recruited and the only older cows studied were those recruited in earlier years. Consequently the number of older cows in the study is less than the younger cows.

Sire Proving Scheme Herds are contracted to get a high proportion of cows in-calf to progeny test bull semen in Year 0, and to intensively record the production of the resulting heifers in Year 3. They are stratified by herd size, region, and predominant breed in order to provide an overall representation of the national herd. Recording in these herds is generally of a noticeably higher standard than in typical herds.

The database used the following records:

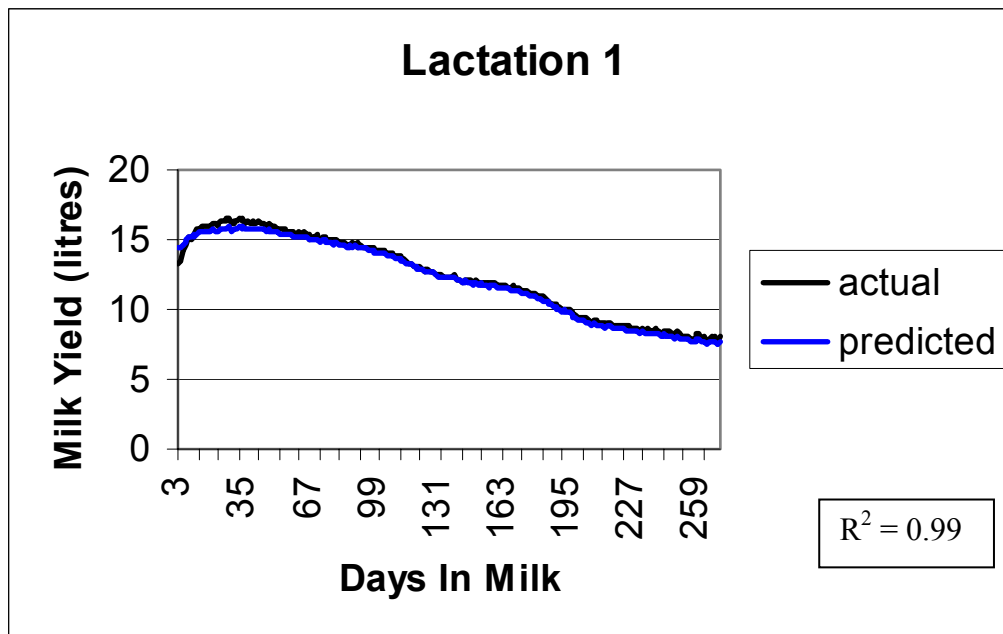
Lactation	No. Cows	No. Records
1	165,871	630,406
2	111,067	410,078
3	83,168	301,806
4	61,186	219,349
5	42,313	150,234
6+	26,485	92,631
Total	490,090	1,804,504

b) Modelling Production

The 'Wood' model is used to predict the yield of milk, fat, and protein using the following equation:

- $\log(\text{Milk Yield}) = \text{Days in Milk} + \log(\text{Days in Milk}) + \log(\text{Somatic Cell Count})$
- $\log(\text{Fat Yield}) = \text{Days in Milk} + \log(\text{Days in Milk}) + \log(\text{Somatic Cell Count})$
- $\log(\text{Protein Yield}) = \text{Days in Milk} + \log(\text{Days in Milk}) + \log(\text{Somatic Cell Count})$

Actual Versus Predicted Milk Yield (Lactation 1)



The Wood model accurately estimated milk yield and was then used to model the effects of increased SCCs on production.

c) Effect of Increase in SCC on Production

For each of the 1.8 million herd test records in the database, the effect of an increase in SCC was modelled by:

- Obtaining a predicted value for each observation in the data
- Obtaining a predicted value for each observation where the $\log(2)SCC$ was increased by 1.
- Calculating difference between the two predictions
- Averaging the difference over each day in the lactation
- Sum the differences over the entire lactation

Increasing the $\log(2)$ SCC by 1 is in effect doubling the SCC as illustrated below:

Example of Log(2) Calculations

SCC (*1000)	Log(2)
32	5
64	6
128	7
256	8
512	9
1024	10
100	6.6
200	7.6
Difference	1.0

The modelling gave the following results for different age cows:

Loss in Yield Associated with a Log(2) Increase in SCC

Age	Loss in Milk Yield (Litres)	Loss in Fat Yield (kg)	Loss in Protein Yield (kg)
2	78	2.39	2.04
3	87	2.86	2.28
4	98	3.34	2.67
5	99	3.63	2.72
6	94	3.59	2.59
6+	85	3.63	2.36
Average	90	3.24	2.44

These findings are of similar proportions to the few overseas studies that have used similar analytical techniques (R. F. Raubertas et al 1982, Koldeweij et al 1999, Hortet et al 1998).

The age distribution from the 2004/2005 Dairy Statistics (Dairy Statistics 2005) is:

Age	H-F	Jer	X-breed	Total	National Herd Age Distribution	Age
2	193034	71101	155530	419665	0.2009	2
3	177218	63259	132412	372889	0.1785	3
4	147692	54887	106051	308630	0.1477	4
5	122078	45716	83524	251318	0.1203	5
6	106507	38246	67405	212158	0.1016	6
7	89957	32306	58314	180577	0.0864	7
8	72163	22371	33257	127791	0.0612	8
9	55004	15327	23383	93714	0.0449	9
10+	70962	19343	31934	122239	0.0585	10+
	1034615	362556	691810	2088981	1	

When the loss for different age groups is adjusted for the age distribution of the national herd, the production loss for the “average mixed age cow” in the national herd then becomes:

	Milk Yield	Fat Yield	Protein Yield	Total Solids
	litres	Kg	Kg	Kg
Loss in Production	88.5	3.2	2.39	5.59
Average Production	3574	176	132	308
% Loss	2.5%	1.8%	1.8%	1.8%

It is clear that the loss in milk volume is greater than the loss in milk solids. This is a common finding in several studies where the main driver of losses is volume with lesser changes in solids.

The aim of this project was to determine the costs of mastitis for the average supplier, and this has been determined for the average cow as a production loss of 1.8% of milk solids for a doubling of SCC. Initial more detailed analysis of the data indicates that this loss is similar for both low and high BMSCC herds, and low and high producing herds. A full analysis of these parameters will be published at a later date as a peer-reviewed scientific paper by the LIC team.

d) Value of Production Loss

Fonterra pay their suppliers for milk on the following formula:

Cents per kg of milkfat + cents per kilogram protein +/- volume adjustment charge.

For the 2004/2005 season, the fat payment was 260.58 c/kg and the protein payment was 723.84 c/kg.

The volume adjustment charge is designed to reflect the transport and processing charges so that milk with high milksolids content is rewarded and low solids milk is penalised. It has a minor effect on these calculations and is not included in this study.

The financial loss for the “average mixed age cow” in the national herd associated with a doubling in SCC, and production loss of 5.6kg solids, then becomes \$25.63.

We now need to use the findings of the current study to estimate the losses for the “average” supplier if he were to decrease his SCC to the level where it is considered that he has mastitis under control. The current

average BMSCC level for Fonterra is 212,000 cells/ml. The SAMM plan objective for the measure of success in producing quality milk from healthy udders is that the seasonal BMSCC average is less than 150,000 cells/ml.

The $\log(2)$ difference between 212,000 and 150,000 is 0.50, therefore the losses associated with this decrease are 0.50 times the losses associated with a 1 log decrease. The value of this 2.8kg of solids for the average mixed age cow is \$12.79 per cow, or \$4,028.85 for a 315 cow herd.

2. CLINICAL MASTITIS (LABOUR)

Each episode of clinical mastitis requires significant time for treatment and management. The following assumptions are made for each episode:

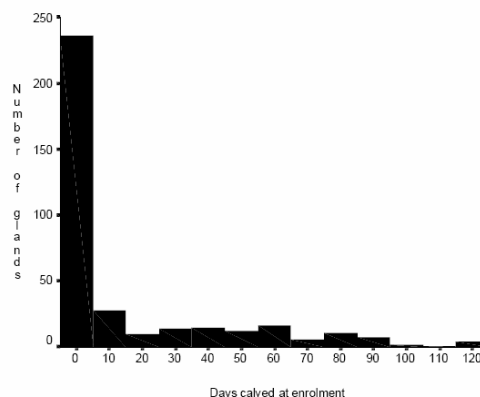
- 5 minutes required per milking during the treatment phase
- 2 minutes required per milking during the withholding period
- 30 minutes required per day for management of the mastitis herd
- No account is taken of the time spent checking the herd for clinicals
- Labour costs = \$16/hour (Dexcel 2005)

The rates of clinical mastitis vary widely between herds. The study “Reproductive Performance of Dairy Cows in New Zealand” (Xu and Burton 2003) monitored 101,185 cows for the 3 seasons 1998-2000 and identified 12.0% of clinical mastitis cases per lactation. This figure is in agreement with the practical experiences of several veterinary practices and will be used throughout this report as the clinical mastitis rate for the “average” supplier. For the average 315 cow herd, this rate equals 38 clinical mastitis cases per year.

a) Timeframe for Clinical Mastitis Events

It is important to define the time within the lactation that clinical mastitis events occurs so that relevant values can be assigned to the losses of colostrum, calf milk, and milk and to management procedures for maintenance of the hospital herd. The most robust information was gathered by Scott McDougall (McDougall 2003) in a study of 4 central Waikato herds in which the following frequency was observed:

Figure 1: Distribution of clinical mastitis cases by time postpartum (McDougall 2003)



This survey gives a split of 65% of clinical mastitis cases occurring in the first 5 days of lactation, 5% in the second 5 days, and 30% for the remainder of the lactation. The veterinary advisors to the study are in agreement with this frequency distribution.

b) Operation of the Mastitis Mob

Cows that are treated with antibiotics to relieve clinical mastitis must be run in a separate mob to minimise the risk of antibiotic contamination to the milk supply. During the calving period, a separate mob of calf milk cows must also be maintained. The antibiotic-treated cows are often run with the calf milk mob, and the management of this antibiotic mob can be either assigned no value because the calf milk mob is already being managed, or assigned a value because it is managed separately.

Assuming a 10 week calving spread, a calf milk mob will be maintained for 70 days. The frequency distribution indicates that some 80% of CM cases will occur during this 10 week period. So some 30 CM events will occur while the calf milk mob is being operated and some 8 CM events will occur outside the calf milk mob period. Each CM event will have a treatment and WHT period of 7 days with some overlap because of concurrent infections.

The labour involvement for management of the mastitis mob is then likely to be:

- When run with the calf milk mob and no extra labour assigned to the mastitis mob during this period:
 - 8 CM events outside the calving period requiring separate management * 7 days = 56 days with some overlap = 45 days. So the total days that a CM mob is maintained separately to the calf milk mob for the season = 45 days * 30 minutes = 22.5 hours * \$16/h = \$360.00.
- When run separately to the calf milk mob and extra labour is assigned to the mob management all season:
 - 30 CM events during the calving period requiring separate management * 7 days = 210 days with significant overlap = 50 days * 30 minutes = 25.0 hours * \$16/h = \$400.00.
 - 8 CM events outside the calving period requiring separate management * 7 days = 56 days with some overlap = 45 days * 30 minutes = 22.5 hours * \$16/h = \$360.00.
 - Total labour cost for maintaining a separate CM herd = \$760.00.

c) Treatment During Lactation

38 CM cases per year each with each requiring 3 treatments * 5 minutes and 11 milkings during which the milk is withheld * 2 minutes = 37 minutes per CM * 38 * \$16/hr = \$374.93.

d) Total Costs

- Operation of CM mob when clinicals run with calf milk mob = \$360.00
- Operation of CM mob when clinicals run separately all season = \$760.00
- Time for treatment and withholding = \$374.93
- Total (with clinicals run with calf milk mob) = \$734.93
- Total (with clinicals run separately all season) = \$1,134.93

3. CLINICAL MASTITIS (ANTIBIOTICS)

Consultation with the veterinary practitioners has examined antibiotic costs and withholding times. When weighted for approximate market share, a representative lactational therapy has been determined as costing \$21.25 in antibiotics and involving the discard of 12.5 milkings. No veterinary consultation fee is charged. We have assumed that the milk from the milking at which clinical mastitis is diagnosed is also discarded, making the number of milkings discarded for each CM event 13.5.

With 38 CM events annually, the value of antibiotics used is $\$21.25 * 38 = \807.50 .

4. CLINICAL MASTITIS (DISCARDED MILK)

The McDougall survey indicated a 65/5/30 split for first week/second week/remainder of lactation CM events. We can then calculate product losses:

	Day	CM Events	Milking	CM Events	Cows Out	Litres (6.6)	Total Loss
Colostrum	1	65% (25)	1	5	5	33	
			2	5	10	66	
	2		3	4	14	92	Calf Milk
			4	4	18	119	904
Calf Milk	3		5	3	21	139	
			6	1	22	145	
	4		7	1	23	152	
			8	1	24	158	
Milk	5	5% (2)	9	1	25	165	
			10	1	26	172	
	6		11		26	172	
			12	1	27	178	
	7		13		27	178	Milk
			14		22	145	1412
	8		15		17	112	
			16		13	86	
	9		17		9	59	
			18		6	40	
	10		19		5	33	
		20		4	26		
	11	30% (11)	21		3	20	
			22		2	13	
	12		23		1	7	Milk
			24	11	1	7	1960
	13		25		0	0	
			26		0	0	

There are 2 ways of addressing the value of milk discarded following the administration of antibiotic therapy to cows with mastitis infection:

- A common practice is to feed antibiotic contaminated milk to replacement calves. This milk can be assigned no value when used as a calf feed since it would otherwise need to be replaced with milk drawn from the vat or purchased as milk replacer. Milk discarded outside the calf rearing period could have been offered for sale and should be assigned a loss value.
- Many farmers, particularly with large herds, routinely discard contaminated milk to minimise the opportunity for contamination of either the bulk milk supply or bobby calves. In this case, all milk discarded after Day 4 should be assigned a value since it could have otherwise been offered for sale.

a) Value When Contaminated Milk is Fed to Calves During the Calf Rearing Period

We are assuming that all clinical events occurring within 4 days of calving are concurrent with the 12 week calf rearing period, that the discarded milk is fed to calves, and that this contaminated milk has no value. We are also assuming that 8 of the 13 CM events occurring after Day 4 are outside the calf rearing period and should be assigned a value. With an average daily production of 13.2 litres and an average discard period of 13.5 milkings, discarded milk for these 8 CM events totals 713 litres with a value of \$263.74.

b) Value When All Contaminated Milk is Discarded

The total amount of milk suitable for sale (after Day 4) when all contaminated milk is discarded is 3372 litres. At average composition, this has a value of \$1,247.64.

5. DRY COW TREATMENTS (LABOUR)

Consultation with the veterinary practitioners on the project Steering Group has estimated the current average use rate of dry cow treatments at 70%, and agreed upon a time commitment of 2 minutes/cow for administration and 1 hour per herd for selection and drafting.

With 70% of the herd treated, the value of the time at \$16 per hour = \$133.60.

6. DRY COW TREATMENTS (ANTIBIOTICS AND TEAT SEAL)

Consultation with the veterinary practitioners on the project Steering Group has derived the representative cost of a dry cow treatment (including Teat Seal) as \$13.35. No milk discard is assigned and no veterinary consultation fee is charged. With a 70% treatment rate, the treatment costs are \$2943.67.

7. CULLING

a) Number of Cows Culled on Mastitis Parameters

The herd testing database used for the production loss calculations does not contain reliable information on culling decisions and this information needs to be derived from other sources. The LIC report "Reproductive Performance of Dairy Cows in New Zealand" (Xu and Burton 2003) surveyed 414 herds over the seasons 1998 – 2000 involving 101,185 cows.

The findings from their report are presented below:

	1998	1999	2000	Overall
Total number of cows (n) [†]	29041	43868	25322	98231
Cows left herds (n)	5984	8646	4286	18916
Replacement rates (%)	20.6	19.7	16.9	19.3
%cows left due to				
Death	1.9	2.2	2.1	2.1
Sale	4.7	4.8	4.0	4.6
Culling	13.9	12.7	10.8	12.6
Main reasons for culling [‡]				
Total number of cows	4047	5587	2742	12376
Abortion	1.5	1.4	1.9	1.6
Facial eczema	2.0	1.3	2.1	1.7
Late conception	2.2	1.9	2.0	2.0
Low production	16.0	16.4	14.7	15.9
Mastitis	4.1	3.6	3.9	3.8
Empty	45.3	45.4	43.0	44.8
Old age	5.1	5.4	7.1	5.7
High somatic cell count	4.3	3.2	3.9	3.7
Slow milking	1.5	1.7	1.1	1.5
Temperament	1.1	1.5	2.3	1.5
Udder type and problem	2.2	2.7	4.3	2.9
Unspecified causes	9.8	9.7	6.0	9.0

[†] A few herds were excluded because they were closed at the end of the breeding season.
[‡] Expressed as percentage of total cows culled. Only reasons exceeding 1% are listed.

Total number of cows	98231
Total number of cows culled	12376
Numbers culled for mastitis	470
Numbers culled for high SCC	458
Numbers culled for udder type and problems	359
Total culled on mastitis parameters	1287
% of total culls	10.4%
% of total numbers	1.3%

An analysis of the data from all 3 seasons shows that 10.4% of the animals that were culled were done so on the basis of mastitis parameters, this is equivalent to 1.3% of the total number of animals surveyed.

The general consensus of the Steering Group is that this estimate are likely to be on the light side, with a 1.3% culling rate on the 315 cow average herd equivalent to 4 cows. Accurate recording of the reasons for culling is complicated by some animals being culled for several reasons, although most of the herds in the Monitoring Fertility Project were SPS herds where meticulous recording is a prerequisite. The Monitoring Fertility Project provides a very robust estimate of the NZ situation and this estimate is the best that we can expect. Of course, there will be herds where the culling rate is much higher than this assumed 1.3%.

b) Cost of Culled Cows

The cost of a culled cow is most simply defined as the “Cost of the Replacement Cow” – the “Value of the “Culled Cow”.

The value of the replacement is most accurately taken as a mixed-age cow, because it is a mixed-age cow that is being replaced. Inland Revenue annually publishes (Inland Revenue Department 2005) National Average Market Values for mixed age cows retained for dairying. The series is reported in Table 1.

Table 1: National Average Market Value (mixed age, mixed breed, cows retained for dairying)

Year	Value (\$)	Value (inflation adjusted)
1996	855	1012
1997	656	768
1998	648	746
1999	771	891
2000	855	969
2001	1292	1418
2002	1208	1291
2003	809	852
2004	800	823
2005	1053	1053
Average Value (2005 dollars)		982

The two series associated with Friesian type cows and Jersey type cows have been combined with weights 0.67 and 0.33 respectively for this study.

The series fluctuates markedly with time, consequently adopting a ten-year inflation-adjusted average for the value of a herd cow is sensible for our purposes — resulting in an average of \$982.

The value of a culled cow is available from Meat & Wool New Zealand data. Extrapolating from this data, typical New Zealand cull cows (450 kg liveweight) had the values reported in Table 2.

Table 2: Cull cow values (inflation adjusted)

Year	Cents/kg (carcass weight)	Cull Cow Value (inflation adjusted)
1996	138.4	315
1997	140.7	317
1998	181.4	402
1999	202.0	449
2000	259.5	566
2001	322.9	682
2002	334.6	688
2003	231.2	468
2004	215.7	427
2005	238.6	459
Average Value (2005 dollars)		477

This calculation gives the ten-year inflation-adjusted average cost of a replacement cow as \$505.00, and the cost of culling for the average supplier culling 1.3% of the herd (4 cows) at \$2,020.00.

8. MILK QUALITY PENALTIES

There are 2 potential areas of financial loss due to milk quality penalties associated with mastitis:

a) Somatic Cell Count

Fonterra advise that the very few BMSCC penalties for exceeding the regulatory limit of 400,000 cells/ml were assigned during the 2004/2005 season. No financial penalty is applied for the first 2 occasions in any month when a quality defect which incurs 2 demerit points or less is applied. The number of demerit days on which penalties were applied was small, and therefore the financial impact of BMSCC penalties for the “average supplier” is assigned as nil.

b) Inhibitory Substances

The use of antibiotics to treat infected animals is major risk factor for contamination of the milk vat and severe penalties are applied. Fonterra advise that the average cost of a penalty when the milk is determined to contain inhibitory substances is \$2,100. However the number of penalties applied is very small and the risk to the average supplier is assigned as nil.

Because of the high costs of penalties, many farms now carry insurance against contamination. A standard policy to cover penalties of \$2500 is \$66 per year, and extra policies are available to cover the possibilities of consequential loss. No value for insurance has been incorporated in this study.

9. FACTORS NOT CONSIDERED

There are many other costs associated with the control of mastitis which are particular to individual farms and which have not been included in this study. It is intended as the next stage of this study to develop a model in which the costs for particular farms can be calculated. The factors that have not been covered in this study include:

- Costs of teat spraying
- Time spent checking the herd for clinical mastitis
- Potential losses though inability to cull poor producers since mastitis cows must be involuntarily culled.
- Potential death of animals through peracute mastitis
- Discard of colostrum that could have been offered for sale if the supplier was contracted to supply colostrum. Using the McDougall survey for the distribution of CM events and the Fonterra figures for average production per cow, 193 litres of colostrum eligible for sale to Fonterra is likely to be affected by antibiotics. At an average payment of \$1.16 per litre, this colostrum is worth \$223.88 were it to be offered for sale.
- Culling rates based on mastitis parameters higher than the 1.3%, or 4 cows per 315 cow herd assumed by this study.
- Dry cow treatment rates higher than the 70% rate assumed by this study.
- Insurance policies to cover milk penalties and consequential loss through antibiotic contamination of the milk supply.
- The stress involved with dealing with mastitis infections at the busiest and most stressful time of the year.
- Lost days in milk. Toward the end of the typical seasonal dairying cycle when production falls, SCCs rise proportionately. Many farmers must dry off infected cows early to prevent the BMSCC rising to levels at which milk quality penalties would be incurred. The Steering Group has determined that the average farmer is likely to dry off the 3% of the herd with the highest SCCs at the end of January, and a further 5% of the herd at the end of March. These animals would have produced another 3 months and 1 month of milk respectively if they had not had to be dried off prematurely because of high SCCs. At 50% of average production, this involves the loss of 594 litres and 198 litres per cow respectively, giving a total value for the average 315 cow herd of \$3,230.77.
- Potential impacts on reproduction. Recent research indicates that mastitis infection may have a detrimental effect on reproductive performance.
- Costs outside the farm gate. This study was only concerned with the costs to the individual farmer within the farm gate. High SCC milk is not as valuable as low SCC milk for manufacturing purposes. There are a number of manufacturing problems including lower cheese and casein yields, shorter shelf life of liquid UHT products, and flavour problems with milk powder. These problems are likely to contribute significantly to the profitability of the dairy industry as a whole.

10. TOTAL COSTS

There are many different strategies for controlling mastitis and managing animal treatment and milk discard. It is very difficult to assign costs for the “average” dairy farmer, however the Steering Group has used their collective experience to set some representative costs as below:

Source of Loss	Cost to Farmer
Loss of Milk Production	\$4,028.85
Clinical Mastitis (Labour)	
Treated cows with colostrum mob	\$734.93
Treated cows managed separately	\$1,134.93
Clinical Mastitis (Antibiotics)	\$807.50
Clinical Mastitis (Discarded Milk)	
Antibiotic milk fed to calves	\$263.74
Antibiotic milk discarded	\$1,247.64
Dry Cow Treatments (Labour)	\$133.60
Dry Cow Treatments (Antibiotics)	\$2,943.67
Culling	\$2,020.00
Total (treated cows run with colostrum mob and antibiotic milk fed to calves)	\$10,932.29
Total (treated cows managed separately and antibiotic milk discarded)	\$12,316.19
Average	\$11,624.24

So the cost of mastitis to the average supplier using representative management techniques is some \$11,500 for the herd, \$36.50 per cow, or some \$180 million for the New Zealand dairy industry. It is important to note that the costs for individual suppliers can be significantly higher than this figure. Many suppliers could lose many more thousands of dollars for lost days in milk, milk quality penalties, insurance policies, and lost colostrum sales which are not included in this model, and for higher culling rates and dry cow treatment rates than used in this model. And of course no financial loss is apportioned to the stress of fighting mastitis infections at the busiest time of the year when all staff are stretched with calving management.

11. GAINS TO BE MADE BY CONTROLLING MASTITIS

Although not within the original scope of this project, it is now possible to estimate the gains likely to be made for the average supplier if he drops his BMSCC from the Fonterra average of 212,000 cells/ml to the SAMM Plan recommendation of 150,000 cells/ml. We have calculated that the production gain to be made from this reduction at 2.8kg of solids for the average mixed age cow, \$12.79 per cow, or \$4,028.85 for a 315 cow herd.

It is not possible to derive a strong relationship between the BMSCC and the number of CM events because of the many differences between farm management practices and the epidemiology of different mastitis infections. However, the mastitis experts on the Steering Group estimate that such a drop in BMSCC could be accompanied by a decrease in the CM rate from 12% to 6%. Many of the costs associated with the management of CM would then drop proportionately. If we halve the costs for the labour and antibiotics used to treat CM, the milk discarded due to CM and the number of cows culled, but leave the cost of dry cow treatment the same, the management costs are reduced from \$14 per cow to some \$7 per cow. When this management saving of \$7 per cow is added to the production saving of \$13 per cow, total savings then made by reducing the BMSCC are some \$20 per cow, or \$6,221 for the average 315 cow herd.

12. DISCUSSION

Mastitis is a major and costly problem for the New Zealand dairy industry. This study has detailed the current costs for the "average" New Zealand supplier, and identified further costs that may apply to individual suppliers. Significant productivity gains can be made through reduction of the numbers of clinical mastitis events and the BMSCC. The next stage of this project is to prepare a computer model in which the actual costs for individual suppliers can be determined. This project is planned for 2007.

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