Economics of Lactation Therapy Based on High Somatic Cell Counts

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Mastitis is an expensive problem. Much of the problem is attributable to subclinical infections, which are more prevalent and longer lasting than clinical infections[7]. Data from Virginia[4] and the linear scoring work of Shook and Saeman measured subclinical infections indirectly through somatic cell counts (SCC); these analyses showed increasing losses of milk as SCC increased.

New infections can be prevented through hygiene and dry cow therapy. Existing infections can be eliminated from the herd by culling, but that means the loss of a cow. They can be eliminated often by dry cow therapy, but that means that nothing was done about the infection until the lactation was finished.

On the other hand, infections sometimes can be cleared by lactation therapy. This was shown in the blitz therapy trial of Mastitis Field Experiment 3 (MFE 3; 1). The number of infections in the blitzed cows dropped from 140 to <20 in <10 weeks. However, hygiene and dry cow therapy caused a gradual decrease in infections in the no blitz cows, such that both blitz and no blitz cow had the same number of infections (<10) at the 100th week of the study. Because of this, the scientists of MFE 3 concluded that blitz therapy wasn't to be recommended routinely. Heider also argued against lactation therapy in theory[3], because of treatment of false postitive cows, unknown bacterial sensitivities, and doubtful efficacy of traditional drug regimens.

However, MFE 3 didn't measure milk yields, which left the possibility that lactation therapy *might* be worthwhile, if the costs could be covered by increased milk sales. Although we frankly doubted that there would be a satisfactory pay-off, we designed a field trial of lactation therapy for subclinical mastitis in order to measure both costs and benefits.

SCC As Indication of Infection

In our trial, we needed to use a reasonable indicator of subclinical infections--something a dairyman could be expected to use. Monthly individual cow SCCs from Dairy Herd Improvement (DHI) are much cheaper than milk cultures and are increasingly in use for other reasons, so we tested the accuracy of the SCC for indicating infection status under our conditions.

Milk was collected for bacterial culture from 719 Holstein and Brown Swiss cows in 12 herds around Ithaca, NY. Collections were within a few days of the routine DHI test. Cultures were done using routine methods at the NY State Mastitis Control Laboratory; positive cultures were isolations of *Streptococcus agalactiae,* Streptococcus species, *Staphylococcus aureus,* and coliforms (no isolations were made of *Corynebacterium pyogenes).*

The percent of cows that were infected at each SCC level increased consistently. In increments of 100 x 10^3 cells/ml from 0-99 to≥600, the percentages of infected cows were 6, 17, 34, 45, 51, 65, and 79, respectively[5]. These levels of infection are similar to those reported by Eberhart[2] from Pennsylvania cows, so we felt confident that our SCC accuracies would generalize to other locations.

The Clinical Trial[6]

Five Holstein herds (from the previous 12 herds) agreed to participate in our study. Each herd used teat dipping and dry cow therapy and had monthly DHI SCC determinations. Within 7 days of the DHI sampling, individual quarter samples were taken for bacterial cultures as in the pilot study of SCC accuracy. The trial ran for 15 months.

Cows were assigned systematically to experimental or control groups based on odd versus even DHI cow index number. This method was used for practical reasons, but should have been free of bias. The treatment groups are described in Table 1.

Experimental group cows were infused in all 4 quarters with a commercial cepharpirin preparation (Today®, Bristol Veterinary Products, Syracuse, NY) the 1st time their SCC rose above 400,000 cells/ml in a lactation. At this threshold, the sensitivity for detecting infected cows was 60% and the specificity for detecting uninfected cows was 87%; the threshold was selected by NYDHI. Treatment was not done in the 1st 7 or last 60 days of lactation or if there had been treatment for clinical mastitis within the previous month, and treatment based on SCC was done only once in a lactation. Any case of clinical mastitis was treated routinely regardless of treatment group.

Cost of the Program

Costs of the program were calculated for the 254 cows in the experimental group. The SCC survey was $.15/cow/mo.

Labor was $5.00/hr for 1 hr/treatment regimen per cow infused (because any cow treated had to have special handling for 10 milkings). Drugs were $5.00/infusion x 2 infusions/cow treated. Milk value was $.31/kg ($14.00/cwt), and average milk discarded for 9 milkings was based on the average yield of cows on the test date that they were both infected and above SCC threshold. (Cost of bacterial cultures was not included because it would not be a typical part of this program in general practice.)

There were 103 experimental cows treated (54 true positives, 49 false positives) out of the 254 in the experimental group. Total price of the program was $4,991 (SCC $572, labor $515, discarded milk $2,874, drugs $1,030). This translates into a program cost of $19.65 per cow in the experimental group. (Had treatment of the 49 false positive cows been avoided, the cost would still have been $11.37 per cow.)

TABLE 1. Data pooled from all 15 test dates[a].

Variable	Treatment group: Control mean	Control s.d.	Experimental mean	Experimental s.d.
Number of cows	233		254	
Lactation number	3.5		3.5	
Mature equivalent milk yield (kg)	7268	115	7092	130
% Quarters infected	11.8	.1	11.8	.1
Log_e somatic cell count	11	1	11	1

[a]Holstein cows; 5 herds; Ithaca, NY; August 1980 to October 1981.

Lack of Response in Milk Yield

We reasoned that a beneficial effect of lactation therapy could only be expected in cows that were actually infected when treated. Therefore, we looked at milk yields only of those cows who ever had true positive high SCC counts--cows in either group who were >400,000 cells/ml the same DHI test date week that they had a positive culture. Test date milk yields of these cows are in Table 2. Test date yields of true positive treated (experimental group) and true positive untreated (control group) cows were the same on all occasions. (If there were a beneficial effect, the yields should have begun to differ after the initial test date.)

Discussion and Conclusion

We found no benefit of increased milk yield from lactation therapy that could be used to offset the costs of our lactation therapy program. This was not a particular surprise (although we couldn't be sure until we actually did the work). We feel that the explanation may lie in the damage caused by the infection. The udder is repaired and rebuilt in the dry period, in anticipation of the next calf. Physiologic conditions are not appropriate for repair *during* the lactation.

This does not mean that SCCs should be abandoned, because they have many uses in monitoring the level of subclinical mastitis. However, we cannot recommend using SCC counts of 4,000 cells/ml as indications for lactation therapy.

TABLE 2. Mean DHI test data milk yield (kg)[a].

Test date	Control $\bar{x}$	Control se	Control n	Treated[b] $\bar{x}$	Treated[b] se	Treated[b] n
Of high SCC (and treatment if experimental group)	21	1	56	20	1	54
After high SCC						
1	22	1	50	20	1	50
2	20	1	39	18	1	41
3	18	1	35	17	1	34
4	19	1	26	16	1	28
5	17	1	23	16	1	25
6	16	1	18	15	2	21
7	17	2	14	15	1	12
8	15	2	11	14	1	9
9	13	3	8	9	2	5

[a]5 Holstein herds; Ithaca, NY; August 1980 to October 1981.
[b]intramammary cephapirin the week of high SCC. Means in rows do not differ ($P \geq .19$, t-test).

References

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