# A report on the prevalence of clinical mastitis and the somatic cell distribution associated with machine milking in a one-sided milking parlour

K.P. Walsh
Department of Agriculture and Water Affairs, Private Bag X9059, Pietermaritzburg, 3200 Republic of South Africa

Received 21 March 1985

A study was made of the incidence of clinical and sub-clinical mastitis in the Cedara dairy herd consisting of 110 Friesland cows. It involved an analysis of 103 cases of clinical mastitis which occurred over 4 years and the random sampling of milk from 20 cows for a somatic cell count (SCC). The results showed a distinct bias (68%) to right-quarter abnormalities.

Op Cedara Landbounavorsingstasie is 'n ondersoek uitgevoer om die voorkoms van kliniese mastitis onder die Cedara-melkkudde te bepaal. Honderd-en-drie gevalle van kliniese mastitis is ondersoek en 'n somatieseseltelling (SST) is op 20 ewekansiguitgesoekte koeie gedoen. Resultate toon 'n neiging (68%) vir meer abnormaliteite en 'n betekenisvolle hoër SST in die regterkwarte. Die koeie is elke dag vanaf die regterkant gemelk in 'n enkelry-visgraatportaal. Die afleiding is gemaak dat ingesuigde lug vanaf die losgemaakte linkerspeenkelke, melk en bakterieë in die regterspene inforseer. Dit mag verantwoordelik wees vir die voorkoms van mastitis in die regterhelfte van die uier.

**Keywords:** Mastitis, machine milking, cluster detachment

It is generally accepted that mastitis is one of the most costly diseases to affect the dairy herd. Estimates of the cost to the dairy industry in the Republic of South Africa are R149,20 per cow per annum (Giesecke, 1978).

Teat impaction can take place at the end of milking when air entering the first teat cup to be detached, forces milk into the other liners. Under these conditions, pathogenic bacteria can penetrate the teat canal. Bramley & Dodd (1984) thought that mastitis control can be improved if more information on the manner in which bacteria penetrate the teat duct could be determined.

An investigation was carried out at the Cedara Research Station of the incidence of clinical mastitis in the dairy herd from 1980 to 1983. This report deals with the occurrence of mastitis in the dairy herd over the above-mentioned period under a normal parlour milking regime.

The Cedara dairy herd, consisting of approximately 110 cows, with an average 300-day lactation of 6500 l, was milked twice daily through an Alfa Laval 8/8 Duovac single-sided herringbone parlour with low-level recording jars at a milking vacuum of 380 mm Hg and end of milking vacuum 250 mm Hg. The cows' teats were washed with plain dairy water, a sample was taken with a strip cup from each teat for a mastitis check, and the cups were then attached. The cups were attached evenly to the four teats due to the correct position of the milking unit relative to the cow's udder and the supporting of the long milk tube by a hook. After milking was completed the cups were removed by operating the vacuum shut-off valve at the base of the bowl and the unit was then detached towards the operator, releasing the two left-quarter teats first and then the two right-quarter teats. The teats were then sprayed with an iodophore teat dip. Cows that developed clinical mastitis, identified by strip cup sampling, were milked with a bucket unit used only for this purpose. After handling such a cow, the operator washed his hands for approximately 4 seconds in a 1% solution of an amphoteric surfactant sterilizer (Tego 51. Reg. No. G594).

After milking, the clusters were scrubbed thoroughly in a hypochlorite solution before the jetters were put on and warm water was drawn through the plant to rinse away milk residues. A hot (74°C) solution of a detergent/sterilizer was circulated for 8 minutes and this was followed by a warm water rinse. An acid solution was circulated round the plant once a week and a hypochlorite rinse was circulated in the milking plant before every milking.

The milking machine was given regular weekly checks and a thorough check once a year with pulsographs and a full range of vacuum flow tests. Any parts that showed wear were immediately replaced. Liners were replaced every 2000 milkings.

Over the period under investigation 103 cases of clinical mastitis occurred. Dry-cow therapy was practised on cows which had a clinical infection during their completed lactation, and cows with chronic mastitis were culled.

Detailed records were kept of each case of clinical mastitis, and the affected cow was treated with an intramammary antibiotic (Nafpenzal) and systemically, if necessary, with a tetracycline. A sample of the mastitic milk was sent to the Regional Veterinary laboratory at Allerton for identification of the causative organism by bacteriological culture. A repeat sample was taken 3 weeks later to check that the infection had been eliminated. Regular somatic cell counts (SCC) were done on all cows in the herd by electronic coulter counter. The statistical analysis of the clinical mastitis cases was done by $\chi^2$, and SCC by analysis of variance.

The data on the prevalence of clinical mastitis from 1980 to 1983 are presented in Table 1.

Data in Table 1 show a significantly high prevalence of mastitis infections of the right quarters. These results strongly indicate that teat impaction as described by Griffin, Grindal, Williams, Neave & Westgarth (1982) may have contributed to mastitis infections.

This analysis was followed by a somatic cell count (SCC) using the electronic coulter counter test on individual quarter samples from 20 cows chosen at random, a total of 80 samples. Samples were collected in sterile tubes after the strip cup had been used and the teats swabbed with methylated spirit. The results are presented in Table 2.

**Table 1** The prevalence of clinical mastitis in left or right quarters of the udder in the Cedara herd from 1980 to 1983.

| | Left quarters | Right quarters | Total |
|---|---|---|---|
| Observed | 33 | 70 | 103 |
| Expected | 51,5 | 51,5 | 103 |

$\chi^2(1DF)$ = 12,58 $P < 0{,}001$

The results show the cell count in the right quarters was significantly higher ($P < 0{,}01$) than left quarters. This finding further supports the reasoning that teat impaction could be a factor in mastitis infections in this herd and suggests that some cows with no history of clinical mastitis have in fact reacted to the phenomenon under investigation.

When the milking operation was observed, it was quite clear that when the cups were detached, air was admitted into the left-side cups a second or so before the right-hand cups were removed. The vacuum 'shut off' valve at the base of the claw bowl was operated before detachment to shut off the vacuum from the jar to the cups. However, due to the vacuum trapped in the cups and claw, easy removal was not always possible. From the foregoing observation it seemed likely that although the Alfa Laval Duovac system operates at 250 mm Hg at the end of milking, some cases of infection were being caused by a milk aerosol carrying pathogenic bacteria impacting the right-side teats by air admitted from the left-side cups. It would seem likely that the lower 'end of milking vacuum' used in this system, would result in a less violent transfer of a milk aerosol to the opposite cups at detachment.

The transmission of pathogenic bacteria by the milking machine in the manner described in this article has been shown by Griffins, *et al.* (1982) using artificial methods such as injecting *Streptococcus* spp. into the milking claw prior to detachment. This report substantiates the work of Griffin, *et al.*, 1982 in that a right-sided bias has been demonstrated under practical conditions.

Work carried out by Griffin, Mein, Westgarth, Neave, Thompson & Maguire (1979) using deflector shields positioned between the liner barrel and the short milk tube reduced

**Table 2** The mean somatic cell count values for each quarter, left and right sides, front and back sections of the udder presented on $\log_e$ transformation and untransformed values.

| | Left quarters | | Right quarters | | Front vs. back quarters | |
|---|---|---|---|---|---|---|
| | $\mathrm{Log_e}$ | Actual* | $\mathrm{Log_e}$ | Actual* | $\log_e$ | Actual* |
| Front quarters | $4{,}87^{Ab}$ | 250 | $5{,}73^{Ac}$ | 591 | 5,3 | 420,5 |
| Back quarters | $5{,}23^{c}$ | 358 | $5{,}50^{b}$ | 470 | 5,37 | 414 |
| Left quarters vs. right quarters | $5{,}05^{D}$ | 304 | $5{,}61^{D}$ | 530,5 | | |

*Actual cell counts × 1000

A & D significantly different at 1% level

b & c significantly different at 5% level

Least Significant Difference (LSD's) of individual quarters at 5% = 0,476; 1% = 0,633 LSD's of left side vs. right, and front vs. back at 5% = 0,337; 1% = 0,449 mastitis by 15% to 50%. This range seemed to be correlated to the use of teat dip and other factors.

In an experiment carried out by Griffin, *et al.* (1982) two methods of cup removal were used, with a bacterial culture injected into the claw piece during the last pulsations of milking. The first method was a 'gentle removal' with the claw and teat cup pulsation chamber vented, allowing the cups to fall off after milking. The second method, 'abrupt removal', involved pulling off one teat cup before milking and pulsation vacuum was shut off, thus allowing a sufficient drop in vacuum to remove the cups. During the experimental period, 25 of the 40 quarters subjected to abrupt cluster removal became infected, while only seven subjected to the gentle removal were infected. This indicated that the air admitted into the teat cup in the second method, caused teat impaction on the other quarters.

The evidence given in this article suggests that teat impaction as reported by Griffin, *et al.* (1982) may well have had a marked effect on the udder health of the Cedara herd.

## Acknowledgements

The author wishes to thank Messrs P.G. Stewart, T.J. Dugmore, A. van Niekerk and Mrs A. Hockly for their assistance in the preparation of this report. Mrs M. Smith for the statistical analysis of the data and Dr R.W. Bryson for the somatic cell counts.

## References

BRAMLEY, A.J., & DODD, F.H., 1984. Mastitis control — Progress and prospects *J. Dairy Res.* 51, 481.

GIESECKE, W.H., 1979. Proceedings — 1st S.A. Symposium on Mastitis Control in Dairy Herds. Veterinary Research Inst. Onderstepoort. p. 30 – 40.

GRIFFIN, T.K., GRINDAL, R.J., WILLIAMS, R., NEAVE, F.K. & WESTGARTH, D.R., 1982. Effect of the method of removal of the milking machine cluster on new udder infections. *J. Dairy Res.* 49, 361.

GRIFFIN, T.K., MEIN, G.A., WESTGARTH, D.R., NEAVE, F.K., THOMPSON, W.H. & MAGUIRE, P.D., 1979. Effect of deflector shields fitted in the milking machine teat cup liner on bovine udder disease. *J. Dairy Res.* 47, 1.