TEAT SHAPE, PRODUCTION AND MASTITIS IN DAIRY COWS

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Summary

A total of 1,209 Friesian cows from 11 commercial dairy farms in New South Wales, selected at random, were grouped by teat shape categories.

The results show that cows with funnel shape teats produced 15.8% more milk than cows with cylindrical shape teats, when cows in both teat shape categories were compared at a similar stage of lactation and age. Based on a somatic cell count, cows with cylindrical shape teats had a significantly higher incidence of mastitis.

I. INTRODUCTION

There are very few reports in the literature dealing with the economic aspects of teat shape in dairy cattle. Wilke (1960) reported that correlation between peak flow and teat shape was not significant. Hickman (1964) reported that most of the differences among teat classifications were insignificant and short teats were significantly superior for milk production, It has been reported (Meigs et al. 1949; Anon. 1959) that machine milking compared to hand milking, contributes to mastitis. The organ of the cow which comes in direct contact with the milking machine is the teat, and it seems reasonable that research work on the teat is warranted. The objective of the present study was to investigate the relationship between teat shape, production and mastitis.

II. MATERIALS AND METHODS

The experimental animals consisted of 1,209 lactating Friesian cows from 11 commercial dairy farms. Milk yield from individual cows on all eleven farms were recorded to the nearest 0.23 kg, using milk meters. Additional milk samples from individual cows on only one farm (155 Friesians) were taken for a somatic cell count. The cows were scored for teat shape into two categories, funnel and cylindrical. In shape the teats were found to vary from cylindrical, i.e. essentially the same diameter throughout their length, to funnel, i.e. the free or bottom end of the teat is narrower than the top or attached end. Each of the four teats was classified independently. If both hind quarter teats and at least one fore quarter teat was of the same shape, the cow was classified in that category. Within each class there was a considerable variation. In some cases it was a rather arbitrary judgement whether a teat should be placed in one class or other, but on the whole the classification was not difficult.

Each of the four teats was classified immediately after udder preparation prior to milking in the afternoon. All the milking machines on the farms were tested and adjusted, where necessary, for pulsation ratios and reserve air prior to milking, for the uniformity of their operation.

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All cows on all eleven farms were used. Somatic cell count on individual cows on only one farm (155 cows) was carried out using the method described by Pearson, Wright and Greer (1970).

III. RESULTS

Table 1 shows the average performance by teat shape categories for 1,209 Friesian cows. Milk yield was higher in the cows with funnel shape teats when cows in both teat shape categories were compared at a similar stage of lactation and similar age.

TABLE 1

Mean values for measurements relating to 1,209 Friesian cows by teat shape categories on 11 farms

Variables	Funnel shape	Cylindrical shape
Total number of cows	617	592
Average milk yield per cow (kg/day)	20.9 ± 3.5**	17.6 ± 2.4
Average number of cows/herd	56 ± 29	53 ± 32
% of cows (per herd)	50.8 ± 9.5	49.2 ± 9.5
Age of the cow (months)	69.6 ± 27.7	67.6 ± 23.3
Stage of lactation (months)	5.5 ± 2.5	5.3 ± 2.4

** $P < 0.01$

Table 2shows the analysis of variance for milk yield when the 1,209 cows were grouped by teat shape categories and the variance was measured between herds. Differences in the level of production were significant at 1% level between teat shapes.

TABLE 2

Mean squares for milk yield in Friesian cows on 11 farms

Source of variance	d.f.	Mean squares
Farm	10	17.18 **
Teat shape	1	57.83 **
Residual	10	1.37

** $P < 0.01$

Table 3 shows the distributions of somatic cells in raw milk by teat shape categories on 155 Friesian cows on one farm. 97.8% of the cows with funnel shape teats had a somatic cell count below 500,000 compared to 80.3% of the cows with cylindrical shape teats. Somatic cell counts of 500,000 - 750,000 were found in samples of 2.2% and 10.6% of cows with funnel shape and cylindrical shape teats respectively. None of the cows

with funnel shape teats had somatic cell counts higher than '750,000; whereas, 4.5% of the cows with cylindrical shape teats had somatic cell counts of 750,000 - 1,000,000 and 4.5% of the cows with cylindrical shape teats had somatic cell counts over 1,000,000. Overall incidence of mastitis, as judged by average somatic cell count, was significantly , higher in cows with cylindrical shape teats than in cows with funnel shape teats.

TABLE 3

Distribution of somatic cell count in raw milk by teat shape

Cell count	(Mastitis incidence)	Funnel shape		Cylindrical shape	
		No. of cows	%	No. of cows	%
< 250,000	(Low)	59	66.3	32	48.5
250,000 - 500,000	(Medium)	28	31.5	21	31.8
500,000 - 750,000	(M.high)	2	2.2	7	10.6*
750,000 - 1,000,000	(High)	0	0.0	3	4.5*
> 1,000,000	(V.high)	0	0.0	3	4.5*
Average somatic cell count		207,888 ± 123,221		440,621 ± 394,621**	

* $P < 0.05$

** $P < 0.01$

IV. DISCUSSION

The results of the present investigation show that cows with funnel shape teats produced 15.8% more milk than cows with cylindrical shape teats, when cows in both teat shape categories were compared at a similar stage of lactation and age. Based on a somatic cell count, cows with cylindrical shape teats had a significantly higher incidence of mastitis.

It is well known that machine milking, compared to hand milking, contributes to mastitis. Rathore (1975a) reported that teat cup crawl was significantly higher in the cows with cylindrical shape teats than in cows with funnel shape teats. There was a significant reduction in milk yield due to teat cup crawl in both groups of cows, the reduction in milk yield being higher in the cows with cylindrical shape teats. Rathore (1975b) suggested that the genes influencing anatomy, and thus the shape and structure of the- teats, could have an effect on the resistance or susceptibility to mastitis.

In the present study, 50.8% of the cows had funnel shape teats and 49.2% of cows had cylindrical shape teats. It appears that in Friesian population there is no selection for or against any particular type of teat shape and, because of the random distribution of the teat shape, cows in both categories are at a similar stage of lactation and similar age.

Johansson (1961) reported that heritability estimates of teat diameter to be 0.38 ± 0.22, Rathore (1975b) reported that cows with funnel shape teats had higher teat diameter gradient (difference betweenproximal and distal end diameter of the teat) values compared to the cows with cylindrical shape teats, and that teat diameter gradient was highly

correlated (γ = 0.926) with the proximal end diameter of the teat. Based on the above relationship it would be reasonable to assume the heritability of teat shape (i.e. teat diameter gradient) to be about 0.30. If heritability of teat shape really is this high, culling of the cows with cylindrical shape teats and paying a moderate amount of attention to not using bulls whose sisters or dams had cylindrical shape teats, should reduce the proportion of cows with cylindrical shape teats in dairy herds rather rapidly per cow generation. Since the parents average age is about 4-5 years when the dairy calf is born, even a rather rapid amount of such genetic improvement per generation might appear slow in a herd/s where the distribution of teat shape is 50/50 for cylindrical and funnel shape.

On the other hand, most of the commercial dairy farms where selection is done against low production, must automatically involve considerable selection against cows with cylindrical shape teats, but as per the Table1 random distribution of teat shape among cows is 50/50, makes it seem doubtful that heritability could be as high as 0.30, or perhaps dairy breeders (consciously or unconsciously) are using bulls whose sisters and dams have cylindrical shape teats (lower teat diameter gradients). Cylindrical shape teats might not be so great a disadvantage if the cows are hand milked, but because of the high cost of labour and the desirefor greater efficiency in the dairy, most farmers have resorted to machine milking and therefore cows with funnel shape teats are more desirablethan those with cylindrical shape teats.

Until now, mastitis control has rested largely with milking shed hygiene. The results of the present experiment introduces a new concept in the fight against mastitis and provides a simple way of identifying those cows likely to give most milk. The modification of the teat cup to reduce or prevent teat cup crawl would also appear to be necessary.

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