

Mastitis Prevention by Selection of Sires

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Introduction

In the course of preceding investigations with regard to heredity and a means for possible selection, the following results were obtained.

1. A field survey on ten daughter groups

A field survey on 10 daughter groups was carried out to investigate whether it is in principle possible to prevent mastitis by selection of sires. The laboratory results revealed noticeable differences in the rate of sub-clinical mastitis between daughter groups. This indicates in principle a possibility for selection.

2. Experimental infection by mastitis agents on two daughter groups

From each of two sires A and Z, with respectively 18.5 and 24.8% mastitis in their daughters (M + S in Table I) in the survey under 1, 10 pregnant heifers were bought. The heifers calved, were kept at the experimental farm and were infected intramammary in their 3rd lactation with *Str. agalactiae*, *Str. dysgalactiae* and *staphylococci spp.*

Throughout the lactations before the infection, the milk cell count in the sire group Z was continuously higher (Table 2). Mastitis and milk loss was much more evident in group Z with higher cell counts (Table 2) than in group A. The cows from sire Z proved to be more susceptible to mastitis.

3. Difference between two breeds in liability to mastitis.

A national randomized survey revealed a difference between breeds in mastitis frequency. The results of the examination of quarter samples are given in Table 4 according to the IDF definitions (Table I). The differences between the breeds are noticeably increasing during the successive years of lactation: from 2.6% in the 1st to 15% in the 6th lactation.

4. The breed differences at an experimental farm.

Groups of 62 calves of the DF (Dutch Friesian) and the DRW (Dutch Red and White) breed were raised, kept and milked in one herd at an experimental farm of the Research Institute for Animal Husbandry at Zeist. Data with regard to subclinical mastitis were published (10). A main trait in these results as well was that the DF groups with lower "natural" cell counts are less liable to mastitis, subclinical and clinical (13).

5. Other investigations.

Afifi (1) established in 1968 significant differences in cell count between paternal daughter groups of DF cows. The paternal effect in the cell count was in the 4th lactation, 3x larger than in the 1st and so was the trend in frequency of

subclinical mastitis.

Alrawi *et al.* (2) reported significant differences in CMT scores between paternal half-sister groups.

In a study of Duysings *et al.* (5) on 1st lactation daughter groups, the paternal share in the cell count appeared much more obvious in the DRW than in the DF breed.

The investigation results mentioned led to the hypothesis: "Higher milk cell counts in the 1st lactation daughter groups indicate a higher susceptibility to mastitis and subsequently a higher mastitis prevalence with increasing age". The validity of this hypothesis has been investigated in the presented study by a simple scheme.

Older sires were selected for this purpose in order to establish the (different) predicting cell counts in their 1st lactation daughters - and - to examine quarter samples from respective older age groups for the prevalence of mastitis.

Material and Methods

Ten older DRW sires were selected at A.E. centres. Cow samples of 100 daughters at random from each of them were examined on cell count. Based upon established differences in cell count in these daughter groups, 4 sires were chosen for further examination in order to test the hypothesis mentioned: two sires with low cell count daughters and two with high cell count daughters (Table 5). For an optimal comparison of groups with regard to mastitis prevalence it is necessary to compare groups of older daughters from the same age. In order to meet this aim it appeared to be necessary to divide the 4 sire groups into 2 pairs (Table 4), each pair of similar age and equal number. The number of 1st lactation cows' samples was extended and the differences between the groups from A and B and from C and D were established statistically.

Milk cells were counted by Coulter Counter according to the IDF regulations. Quarter samples were taken at milking time from older cows from each sire. Quarters with subclinical mastitis (M) or disturbed secretion (S), based upon laboratory examination and the IDF definitions, were regarded to be subclinical quarters (Table 5). With the quarter sampling of the older cows a small inquiry was carried out with regard to an eventual previous treatment against clinical mastitis.

Results

In the pilot survey noticeable differences in cell count between the 10 random daughter groups were present. Cow samples with more than one million cells per ml. varied in these groups from 3-24%. Loe Cell counts, less than 300 (x 1000), varied between 25 and 62%. The random groups however were not really comparable because of differences in age distribution. The further investigation on 1st lactation combined with older daughter groups was carried out with the 2 pairs of sires: A-B and C-D (Table 5) and included critically balanced older age groups within each pair. Most 1st lactation cows from the mentioned four sires were samples and counted. The difference in milk cell count proved to be very significant in each of both pairs (P 0.01).

The laboratory results of the quarter samples from the older daughter groups differed significantly as well. The results are shortly presented in Table 5. The subclinical mastitis rate in sire group A is 38% and in group B 29%. This difference in mastitis rate is much larger for the pair of sires C-D being respectively 57% and 30% which corresponds with the larger difference in cell count between the heifer groups of C and D.

The inquiry results with regard to the older sire groups whether they were ever treated for clinical mastitis revealed differences which are analogous to the differences in subclinical quarters within each compared pair of sires.

Discussion and Conclusion

The polymorphonuclear neutrophil leucocytes are the most numerous of the milk cells. The leucocytes constitute one of the essential body defences against infection and under infection in particular (4, 14, 16).

These statements seem to be quite incompatible with the investigated hypothesis, nevertheless we have to accept facts.

- It is generally accepted that heifers have lower milk cell counts and are less susceptible to mastitis.

- A breed with higher cell counts in 1st lactation appeared to be more liable to mastitis (10,11).

- Highland breeds have a lower mastitis rate and lower milk cell counts (15). - A group of paternal half-sisters within one breed, with higher milk cell counts in 1st lactation showed more susceptibility to experimental mastitis in 3rd lactation (9) than another half-sister group.

The results of this investigation agree with the results mentioned above. The older paternal half-sisters of the heifer groups with high cell counts in the presented survey show a considerably higher mastitis level.

In the additional inquiry on clinical mastitis, the differences between the groups were quite in harmony with those of subclinical mastitis.

In conclusion it is claimed that the hypothesis investigated has been confirmed: "Higher milk cell counts in 1st lactation daughter groups indicate a higher susceptibility to mastitis and subsequently a higher mastitis rate with increasing age".

This opens realistic perspectives to a selection of sires as a means of mastitis prevention.

Table I

IDF - classification of quarters

	normal	latent inf.	dist. secretion	mastitis
Cell count	N	L	S	M
x 1000	500	500	500	500
Bacteriological	neg.	pos.	neg.	pos.

Table II

Cell counts before experimental infection in weekly quarter samples. Subgroups in percents

	1st lactation		2nd lactation	
	0 - 100	500	0 - 100	500
10 A daughters	62.1	5.4	46.5	21.9
10 Z daughters	54.5	12.3	36.5	27.1

a) 100 + 100 x 1000 per ml, etc.

Table III

Milk production per week, before and after the infection in comparison with the expected production in respect of both daughter groups.

week	10 A-daughters			10 Z-daughters		
	expected	observed	kg loss	expected	observed	kg loss
0	147.6	147.6	0	176.3	176.3	0
1	145.4	109.8	35.6	172.8	105.9	66.9
2	141.7	123.6	18.1	168.4	121.9	46.5
3	138.0	126.0	12.0	163.1	121.4	41.7
4	134.3	126.4	7.9	157.8	115.3	42.5
treatment						
5	130.6	124.3	6.3	152.5	115.8	36.7

Table IV

The number of cows and the percentage of their quarters with mastitis (M) and secretion disturbance (S) per lactation number for the breeds DF (Dutch Friesian) and DRW (Dutch Red and White).

lactation number	percentage quarters M + S		difference in M + S rate
	DF breed	DRW breed	
1	15.3	17.9	+ 2.6
2	22.2	26.2	+ 4.0
3	26.1	30.8	+ 4.7
4	31.7	39.4	+ 7.7
5	32.7	42.0	+ 9.3
6	32.5	47.5	+ 15.0
7	39.1	50.6	+ 11.5
8	33.1	48.9	+ 15.8
9	37.0	47.3	+ 10.3
9	39.9	51.3	+ 11.4
total average	25.5	30.3	+ 4.8
No. quarters	29408	11894	

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Investigations on the Ability of Cattle to Distinguish Colours

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Summary

The subject of this paper is an investigation of colour perception in cattle. The six young bulls available for the tests were first trained on the colour green. In this, and in the ensuing tests, the animals were offered three feeding boxes, one marked with a colour card and two with grey cards. The animals had to find and open the box marked with the colour and, upon so doing were rewarded with food. The coloured and grey cards were systematically exchanged before each test. Each of the colours red, yellow, medium

blue, green and light blue were tested in combination with six grey shades within the same range of intensity.

The test results showed significantly that red, yellow, green and light blue could be distinguished from grey, thus demonstrating that cattle possess colour vision. Only two animals could differentiate between medium blue and the corresponding grey shades. In the case of the remaining animals the results were inconclusive in this point.

In further tests the animals were offered various combinations of colours without corresponding grey shades. A preference for yellow and green to red, light blue and medium blue was established. These results provide additional evidence of colour perception in cattle.