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INHERITANCE OF CLINICAL MASTITIS AND THEIR RELATIONSHIP WITH MILK PRODUCTION IN FRIESIAN COWS IN EGYPT

(With 3 Table)

By

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دراسة وراثية لالتهاب الضرع وعلاقته بانتاج اللبن
في أبقار الفريزيان في مصر

يوسف غانـــم ، خيري البيومـــي ، محمد منـــدور ، أحمد بـــــدران

أجريت هذه الدراسة علي عدد ٢٨٥ بقرة فريزيان في مزرعتين تابعتين لوزارة الدفـــاع احداهما في الرأس السوداء في الاسكندرية والأخري في شبرا شهاب القريبة من القاهـــرة وكان متوسط ٣٠٥ يوم انتاج اللبن لعدد ١١٢ بقرة مصابة بالتهاب الضرع في الموسميـــــن الأول والثاني في المزرعتين تحت الدراسة ٣٥٠٦ كيلوجرام ، بينما كان المتوسط لعـــد ١٧٣ بقرة سليمة ٢٩٢١ كيلوجرام وكان الفرق بينهما عالي المعنوية · وكان معامل الانحدار لانتـاج اللبن اليومي خلال الأحد عشر يوما قبل بداية الاصابة بالتهاب الضرع في الحيوانات المصابة ٠٫١٥٥ بينما كان المعامل للأحد عشر يوما بعد العلاج ٠٫٠٠٨ وكان الفرق بينهما عـــــالي المعنوية · وكان المكافي الوراثي لمرض التهاب الضرع (باستخدام البنات علي الامهـــات) عالي نسبيا ٠٫٥٢ ·

SUMMARY

The data used in this investigation were taken from 285 Friesian Cows in two farms belonging to Ministry of Defense at two locations, in Rass El-Soda in Alexandria and the other in Shobra Shehab near Cairo.

The average 305-days milk production of 112 cows affected with mastitis in their first or second lactation in the two farms was 3506 kgs, while the average of comparable but healthy 173 cows was 2921 kgs, the difference was highly significant. The regression of daily milk yield during eleven days before the onset of mastitis in affected cows was found to be 0.155 while that obtained for the eleven days after treatments was -0.008, the difference between two regression was found to be highly significant. The heritability of mastitis (using regression of daughters on dam) was found to be relatively high (0.52).

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INTRODUCTION

Bovine mastitis is a multifactor disease that continues to be enigma for the dairy industry. The continuing problem of economic losses such as tremendous losses in milk yield, increase in replacement heifer costs, loss of antibiotic-contaminated milk, drug and veterinary costs, extra labour, as well as from reduced genetic progress, as reviewed by GAVORA and SPENCER (1983). In order to limit the extent of these costs, the improvement of genetic resistence to infectious diseases is a matter of great importance.

The disease is in every dairy herd but the amount varies widely between cows managed alike in the same herd and between herds where the management appears to be much the same. Various traits that could be used in indirect selection for improved resistence to mastitis have recently been reviewed by MILLER (1984). The possibility of selection to reduce infection rates has been raised by indications of genetic resistance to udder infections (LUSH, 1950; LEGATES and GRINNELS, 1952; VAN VLECK, 1964; AFIFI, 1967 and MILLER, 1982). Other author however, has found either no-genetic resistance (O'BLENESS, et al. 1960) or varying estimates depending on the criterion of infection (SCHMIDT and VAN VLECK, 1975).

The objectives of this investigation were to determine the heritability of clinical mastitis and to study the effect of mastitis on current milk yield.

MATERIAL and METHODS

The data used in this investigation were taken from 285 Friesian cows in two farms belonging to Ministry of Defense, at two locations, Rass El-Soda in Alexandria and the other in Shobra Shehab near Cairo.

To study the effect of clinical mastitis, the average 305 days milk production (recorded in kilogram) of 112 cows affected with mastitis in their first or second lactation was compared with 173 healthy cows. Moreover, the effect of mastitis itself on milk production is carried out by comparing the rate of decline of daily milk production immediately before the detection of mastitis with that following treatment. This was done by the analysis of covariance and the regression of daily milk yield during eleven days before the onset of mastitis in affected cows and that for the eleven days after treatment.

For estimating the heritability of the incidence of mastitis, only the first and second lactations were considered in cows that had dams in the two herds as well as their daughters. A cow which was affected by at least one quarter in her first or second lactation was considered positive and was given a score of one, while those not affected (healthy) were given a score of zero. Affection during other lactation was not

considered as most of the daughters were young and have completed only one or two lactations the heritability of the incidence of mastitis was estimated using the method of regression of daughter on dam (TURNER and YOUNG, 1969).

Statistical analysis of the data was analysed according to SNEDECOR and COCHRAN (1971).

RESULTS

The average 305 days milk production of 112 cows affected with mastitis in their first or second lactation in the two farms was 3506 kgs, while the average of comparable but healthy 173 cows was 2921 kgs. The difference was highly significant as presented in Table 1.

The regression of daily milk yield during eleven days before the onset of mastitis in affected cows was found to be -0.155, while that obtained for the eleven days after treatment was -0.008. The difference between the two regressions was found to be highly significant (Table 2).

Moreover, the heritability estimate of the incidence of mastitis (using regression of daughter on dam) was found to be 0.52 $\pm$ 0.16 as presented in (Table 3).

DISCUSSION

The average 305-days milk production of 112 cows affected with mastitis in their first or second lactation in the two farms was 3506 kgs, while the average of comparable but healthy 173 cows was 2921 kgs. The difference was highly significant. Cows that are higher milk producer tend to be more liable to being affected by mastitis than relatively lower producing cows as shown by the higher average (3506 kgs vs. 2921 kgs). This agrees with the results obtained by SMITH and SCHULTZE(1970). This may be interpreted as an indication of the higher susceptibility to infection of the high producing cows. This entails very strict managerial and health measures to prevent the occurence of the disease in modern dairy farms.

The regression of daily milk yield during eleven days before the onset of mastitis in affected cows was found to be -0.155, while that obtained for the eleven days after treatment was -0.008. The difference between the two regressions was found to be highly significant. This means that the rate of decline in milk production was less pronounced in days after treatment and could be attributed to the natural decline in milk curve.

The heritability of mastitis was found to be relatively high (0.52) which may be due to few numbers of pairs of animals used in this study. LUSH (1950) and LEGATES and GRINNELLS (1952) have reported heritability estimates for mastitis resistance of 0.38 and 0.27, respectively.

Therefore, although the culling of mastitis cows would lead to lowering the incidence of the disease, yet there is the danger of culling cows of higher milk producing abilities. Accordingly, each case should be scrutinized well before deciding whether to keep it or cull it. Another alternative would be avoid infection from the first beginning by applying prophylactic measures including better health and management systems and applying periodical testing for early detection and treatment of affected cows.

Moreover, resistence to infection is dependent on various mechanisms for different types of diseases. A high production of antibodies may be beneficial for one type of infection but not for another type, as discussed by BIOZZI, et al. (1979). One way to improve the overall resistence to disease is to combine several markers or traits of the immune system in an index, as suggested by ALMLID (1981) and BUSCHMANN, et al. (1985). This index could include both marker traits and disease data, as discussed by LIE and SOLBU (1981). To effectively improve disease resistence it may be necessary to concentrate breeding efforts on improving the resistence to some of the more serious diseases in the species concerned.

REFERENCES

Afifi, Y.A. (1967): Genetical and some environmental influences affecting the level of leucocyte counts in the milk cows. Mededelingen Landouwhogeschool. J. Wageningen, 67: 11-15.

Almlid, T. (1981): Indirect selection of bulls for improved resistence to diseases in dairy cattle. Livest. Prod. Sci., 8: 321-329.

Biozzi, G.; Mouton, D; Sant. Anna, O.A.; Passos, H.C.; Gennari, M.; Reis, M.H.; Ferreria, V.C.A.; Heumann, A.M.; Bouthillier, Y.; Ibanez, O.M.; Stiffel, C. and Siqueira, M. (1979): Genetics of immune responsiveness to natural antigens in the mouse. Current Topics Microbiol. Immunol. 85: 31-98.

Buschmann, H.; Junge, V.; Krausslich, H. and Radzikowski, A. (1984): A study of the immune response to sheep erythrocytes in several breeds of swine. Med. Microbiol. Immunol. 159: 179-190.

Buschmann, H.; Krausslich, H.; Herrmann, H.; Meyer, J. and Kleinschmidt, A. (1985): Quantitative immunological parameters in pigs- experiences with the evaluation of an immunocompetence profile. 3rd World Congress on Genetics Applied to Livestock Production (Lincolin, Nebraska, U.S.A.).

Gavora, J.S. and Spenser, J.L. (1983): Breeding for immune responsiveness and disease resistance. Anim. Blood Grps Biochem. Genet., 14: 159-180.

Legates, J.E. and Grinnels, C.D. (1952): Genetic relationships in resistence to mastitis in dairy cattle. J. Dairy Sci., 35: 829-833.

Lie, O. and Solbu, H. (1981): A working model for the evaluation of different immunological trait as indicator of resistance to infection in dairy cattle. Acta Vet. Scand. 22: 238-245.

Lush, J.L. (1950): Inheritance of susceptibility to mastitis. J. Dairy Sci., 33: 121-125.

Miller, R.H. (1982): Genetics of resistance to mastitis. Proc. 2nd World Congr. Genet. Appl. Livest. Prod., V. 186-189. Madrid Publicaciones Agreias.

Miller, R.H. (1984): Traits for sire selection related to udder health and management. J. Dairy Sci. 67: 459-471.

O'Bleness, G.V.; Van Vleck, L.D. and Henderson, C.R. (1960): Heritablities of some type appraisal traits and their genetic and phenotypic correlations with production. J. Dairy Sci., 43: 1490-1496.

Schmidt, G.H. and Van Vleck, L.D. (1965): Heritability estimates of udder disease as measured by various tests and their relationship to each other and to milk yield, age and milking times. J. Dairy Sci., 48: 51-56.

Smith, J.W. and Schultze, W.D. (1970): Factors related to the level of natural resistance to udder infection. pp. 38 in Proc. 6th Int. Conf. on cattle disease. Philadelphia, PA.

Snedecor, G.W. and Cochran, G.W. (1971): Statistical Methods. Book, 6th Ed., Iowa, Iowa State Univ. Press.

Turner, H.N. and Young, S.S.Y. (1969): Quantative genetic in sheep breeding. Book, Liuri, Press Pty Ltd, 550 Victorid.

Table 1: Comparison between 305-Days Milk Yield of Mastitic and Healthy Cows.

Item	Mastitic	Healthy
No. of cows	112	173
Average 305-days milk production	3506 Kgs	2921 Kgs
S.E.	± 93.74	
t	6.25**	

** Significant at 1% level.

Table 2: Covariance Analysis and Regression of Daily Milk Yield before Incidence of Mastitis and after Treatment.

Source of variation	d.F	x^2	xy	y^2	b	$S.E_{b_1-b_2}$
Within cows (before incidence)	330	3630.0	-561.6	565.9	-0.155	
Within cows (after treatment)	330	3630.0	- 29.4	303.5	-0.008	0.044

Table 3: Covariance Analysis for Clinical Mastitis to Determine Regression of Daughter (Y) on Dam (X).

Source of variation	d.f	x^2	xy	y^2	Regression Y on X
Between farms	1	0.16	0.03	0	
Within farms	150	37.42	9.57	36.10	0.26 $\pm$ 0.08

Heritability (0.52 $\pm$ 0.16) is computed as twice the regression of Y on X.