

Effect of Subclinical Mastitis on Milk of Cross Bred Sahiwal × Jersey Cows: A Biochemical Study

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ABSTRACT : The experiment was undertaken to study the effect of subclinical mastitis on the biochemical parameters of milk in crossbred (Sahiwal × Jersey) cows. Subclinical mastitis was judged using California Mastitis Test and graded on a scale of 0 to 2. Twenty six milk samples of each grade were subjected to somatic cell count. Separated milk whey was analysed for total protein, immunoglobulin and trace mineral content. Results indicate linear increases in somatic cell count, total protein and immunoglobulin concentrations in milk with increase in grade of subclinical mastitis. However, copper, zinc, manganese and iron concentration in milk was not affected by grade of mastitis. (*Asian-Aust. J. Anim. Sci.* 2001. Vol. 14, No. 3 : 382-383)

Key Words : Subclinical Mastitis, Cows, Trace Minerals

INTRODUCTION

In veterinary practice bovine mastitis is a frequently encountered condition; a high prevalence of subclinical mastitis (SCM) has been reported from all over the world. Consumers and processors from international market are demanding safe and high quality dairy products. As an inflammation of udder, SCM produces alteration in the composition of milk (Kitchen, 1981). Information regarding the status of immunoglobulin and specially that of microelements during SCM is scanty. These components are important as they are associated with microbial growth, udder defense mechanism (Van Miert, 1990) and quality of milk. The present study aimed to study changes in the microcomposition of milk due to SCM in cows.

MATERIALS AND METHODS

In the present study 50 (Sahiwal × Jersey) crossbred cows from organised dairy farms were screened for subclinical mastitis employing California Mastitis Test (CMT) and degree of SCM was graded according to the scheme of Schalm et al. (1971) as -: negative, +: trace, ++: positive and +++: strongly positive. Twenty six milk samples of each CMT grade were collected. Somatic cell count of milk samples was undertaken as described by Prescott and Breed (1910). Citric acid 10 mg was added to 10 ml of milk which was allowed

to coagulate, centrifuged, and then whey was collected for biochemical studies. Protein concentration was estimated using commercial available kits (Span diagnostic kit, India). For estimation of immunoglobulin (Ig) concentration, to 1.9 ml of solutions of sodium sulphite of several concentrations, 0.1 ml of whey sample was added and allowed to react at room temperature for 15 min. Optimum flocculation at 10, 12, 14, 16, 18, 20, 22, 24, 26 and 28 per cent sodium sulphite solution was equivalent to 19, 17, 15, 13, 11, 9, 7, 5, 3 and 1 mg/ml Ig concentration in whey, respectively (Deshpande et al., 1991). Trace minerals, copper, zinc, manganese and iron were estimated with an atomic absorption spectrophotometer (Varian Tectran, Australia). The data were analysed statistically using a completely randomised design as per Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

Average somatic cell count of milk samples was observed to be $125.75 \times 10^4/\text{ml}$, $155.75 \times 10^4/\text{ml}$, $244.75 \times 10^4/\text{ml}$ and $496.50 \times 10^4/\text{ml}$ in CMT -ve (normal), +, + and ++ reactions, respectively. The finding of elevated somatic cell count during SCM is in accordance with Tuteja et al. (1993) and Bharadwaj (1996). Increased somatic cell count during SCM is due to inflammatory changes coupled with tissue damage due to bacterial colonization.

Total whey protein concentration was found to increase with the severity of SCM (table 1). An increase in whey protein concentration during SCM has been reported by Singh and Ganguli (1975) and Charjan (1996). The variation in whey protein concentration during SCM could be due to selective transudation of proteins by cytologically changed acinar cells of the mastitic glands as reported earlier by Carroll (1961). The present finding of a positive

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Table 1. Effect of subclinical mastitis on whey total protein, immunoglobulin and microminerals

Parameter	Milk status (CMT reaction)			
	Normal	±	+	++
Total protein (g/dl)	1.04 ^a ± 0.24	2.09 ^{bc} ± 0.32	1.76 ^b ± 0.32	2.74 ^c ± 0.29
Immunoglobulins (mg/ml)	3.00 ^a ± 0.36	5.92 ^{bc} ± 0.61	6.76 ^c ± 0.59	5.07 ^b ± 0.51
Copper (mg/L)	1.26 ± 0.04	1.20 ± 0.04	1.26 ± 0.05	1.25 ± 0.04
Zinc (mg/L)	1.20 ± 0.14	1.20 ± 0.04	1.26 ± 0.05	1.25 ± 0.04
Manganese (mg/L)	1.38 ± 0.06	1.37 ± 0.06	1.36 ± 0.06	1.29 ± 0.06
Iron (mg/L)	1.67 ± 0.14	1.91 ± 0.20	1.76 ± 0.17	1.70 ± 0.14

^{a,b,c} Means showing a common letter in the superscript do not differ significantly within rows.

relation between degree of SCM and immunoglobulin content of whey of milk samples substantiates the observations made by Anderson and Andrews (1977) and Deshpande et al. (1991). Charjan (1996) reported an increase in Ig concentration by 2.88 mg/ml with unit increased in CMT reaction. Increase in Ig concentration during SCM could be attributed to increase vascular permeability due to inflammation of udder.

Trace minerals are required for normal body functioning and development of immunocompetence (Chandra, 1976). Several workers have documented changes in trace mineral levels during infection (Chandra and Dayton, 1982). Bacteria require large amounts of iron and zinc for cell growth and the ability of host to remove trace elements from tissue fluids seems to be a fundamental host defense mechanism (Van Meirt, 1990). It was expected that SCM would alter the trace mineral profile in milk. However, in the present study no significant difference between trace mineral profile of normal and mastitic milk was observed. Present findings are in contrast with earlier observations made by Tallamy and Randolph (1970). They recorded 3 to 20 per cent higher iron, copper and zinc concentration in mastitic milk which could be due to tissue degeneration associated with altered diffusibility of the mammary membrane. Hence further detailed study in this respect is required.

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