ALTERATION IN LACTATE DEHYDROGENASE ACTIVITY IN COW MILK RELATED TO UDDER HEALTH STATUS

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ABSTRACT

An experiment was conducted to investigate the change in the activity of lactate dehydrogenase (EC 1.1.1.27) in the milk-whey and blood-plasma associated with udder health status of cows. A total of 60 quarter milk samples were collected on the basis of clinical examination of udder and California Mastitis Test (CMT) score, and grouped as normal, subclinical (1^+, 2^+, 3^+) and clinical. The pH and somatic cell count (SCC) were determined in the whole milk and the lactate dehydrogenase (LDH) activity was estimated in the milk-whey and blood-plasma, collected from the cows under study.

The average values of pH and SCC in whole milk samples differ significantly among different udder health groups and revealed a direct relationship with CMT score and the LDH activity in milk-whey. The LDH activity in milk-whey differs significantly among different udder health status, however, it did not differ significantly in blood-plasma. The assay of LDH activity in milk-whey is therefore recommended to be useful parameter to assess the udder health status of the cows.

KEY WORDS: CMT, SCC, LDH, Mastitis, Milk-whey.

INTRODUCTION

Mastitis is an inflammatory reaction of mammary gland. Bovine mastitis is a multi-etiological ailment which occurs in subclinical, clinical and chronic forms, caused by about 137 microbial species, subspecies and serovars (Watts 1988). Instances of subclinical mastitis (10-15 %) usually remains unnoticed; therefore, it is more important than clinical mastitis (1-10 %) in cows (Joshi and Gokhale, 2006). Economic aspects also interferes with routine application of bacteriological examination of quarter wise milk samples, eventually causing premature culling of genetically superior cows due to their decreased productive and reproductive performance. Moreover, mastitic milk is hazardous not only to new borns calves but also to the human-beings.

In milk the level of enzymes is directly related to the udder health. However bacterial infection of udder results in damaging to the ductal and secretory epithelium, opening thereby the tight junctions between the secretory cells, concomitant with their rupture and increase in the permeability of the blood capillaries, consequently spill various enzymes into the milk. Enzyme activities in the milk might serve as the most suitable indicator for the diagnosis of udder infection (El Zubeir *et al*., 2005).Hence the present study was undertaken to investigate pH and enzymatic changes in mastitis affected animals .

MATERIALS & METHODS

The cows were randomly selected irrespective of their age, breed, feeding practices, stages and season of lactation from Gorakshan Mandal, Mhaispur, Livestock Instructional Farm Dr. PDKV Akola, Gorakshan Mandal, Akola, Teaching Veterinary Clinical Complex PGIVAS Akola, Veterinary Polyclinic of Akola and cows of farmers in and around Akola. Preliminary screening of udder was done by physical examination of mammary glands, therefore milk samples were colleted and screened carefully by CMT as per method of Durry and Reed, (1961). Subsequent to the collection of milk samples, blood samples were collected from jugular vein of the same cow.

From each freshly collected milk sample, the pH was tested using digital pH meter (E.I. Model 101 E) and SCC was measured according to Schalm *et al.* (1971) followed by separation of milk-whey as per the method of Olson *et al.* (1981).

Blood samples were centrifuged to obtain blood-plasma. The LDH activity in each sample of whey and plasma

was estimated as per the method described by Cabaud *et al.* (1958). The standard curve of LDH units against optical densities observed at 520 nm was plotted. The data was statistically analyzed using procedure laid down by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The average pH of milk was the lowest (6.59 ± 0.03), in normal group and the highest (7.36 ± 0.04) in clinical group. The average pH values for subclinical 1^+, 2^+, 3^+ groups were 6.77± 0.01, 6.93 ± 0.01, 7.07 ± 0.01, respectively. There was significant increase in pH of cow milk by 0.19 for each unit rise in CMT scores and by 0.07 for each unit rise in SCC (Table 1).

From the table it is revealed that the increasing trend of pH ,SCC and LDH activity was observed . All the changes were statistically different . The present findings corroborated with findings of Hovarth et al.(1980),Tuteja et al. (2000), Pyorala (2003) , Ambade (2005) and Batavani *et al.* (2007)

The average LDH activity in blood-plasma was 493.02 ± 9.17 LDH U/ml for normal group, for subclinical group 1^+, 2^+, 3^+ group it was 496.51 ± 10.08, 495.36 ± 3.63, 489.40 ± 8.22 LDH U/ml, respectively and that for clinical group it was 491.19 ± 7.60 LDH U/ml. The LDH activities in plasma did not differ significantly between the groups and were in fair agreement with the reports of Grun *et al.* (1992) and Bugalia *et al.* (1996). The LDH activity in whey differs significantly(**(P < 0.01)**

According to Schalm *et al.* (1971), slight acidity of normal milk was due to acidic groups of casein, citrate, phosphate, dissolved carbon di-oxide and the increase in alkalinity of mastitis milk was because of lactose production and the increased selective transduction of alkaline salts by the udder tissue. inflammation of udder could serve as a major line of defense, for an influx of polymorphnuclear neutrophil (PMN), into the site of infection caused by chemical messengers or chemotactic agents released from leukocytes, normally present in milk or inflamed tissues, consequently, would lead to increase in the SCC of milk (Harmon, 1994).

The enzymes being the cellular constituents, concomitant with the rupture of cell or tissues, are spilled into milk (Shahani, 1966). Moreover, Batavani *et al.* (2003) also reported that higher LDH activity in subclinically and clinically mastic milk was suggestive of tissue damage due to bacterial infection.

The LDH activity in blood-plasma of experimentally induced mastitic cows was not altered (Hoeben *et al.*, 2000) as was found with the experimental cows in the present study.

The LDH, an ubiquitous enzyme can be a promising parameter for the diagnosis of subclinical mastitis (Pyorala, 2003 . Our result for alterations in LDH activity in milk-whey associated with different status of subclinical mastitis, are also suggestive of diagnostic significance.

Table 1: pH, SCC, Lactate dehydrogenase, in milk-whey of cows suffering from mastitis.

Parameters	Normal	Sub-clinical			Clinical	C.D.	Regression	
		1^+	2^+	3^+			On CMT	On SCC
pH	6.59^{a} ± 0.03	6.77^{b} ± 0.01	6.93^{c} ± 0.01	7.07^{d} ± 0.01	7.36^{e} ± 0.04	0.096	0.19	0.07
Somatic Cell Count ($x10^5$cells/ml)	1.56^{a} ± 0.18	1.81^{ab} ± 0.05	2.66^{b} ± 0.09	4.56^{c} ± 0.11	9.97^{d} ± 0.18	0.92	1.96	-
Lactate dehydrogenase (U/ml)	454.41^{a}± 3.70	665.53^{b} ±9.47	959.91^{c}± 11.26	1218.92^{d} ±18.44	1476.57^{e} ±19.15	51.69	259.77	98.66

Different superscript with in same row indicates significant (P < 0.01) difference.

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