CHANGES IN CONSTITUENTS OF SUB-CLINICAL MASTITIC MILK OF CATTLE#

Savita[1], Anju Chahar, T.K. Tanwar[2],T.C. Nayak[1] and M. Sahu[2]
Department of Epidemiology and Preventive Veterinary Medicine, College of Veterinary and Animal Science
Rajasthan University of Veterinary and Animal Sciences, Bikaner-334 001, Rajasthan, India

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ABSTRACT

The present study was envisaged with the objective to determine changes in constituents of sub-clinical mastitic milk of cattle. The average mean ± SE values of fat, protein and lactose in sub-clinical mastitic milk were 3.89 ± 0.038, 3.20 ± 0.024 and 4.756 ± 0.029 (ranged between 2.8 - 4.5, 2.6 - 3.6 and 4.1 -5.1) then the average mean ± SE value of fat, protein and lactose in normal milk were4.2 ± 0.031, 3.43 ± 0.017 and 5.11 ± 0.010 (ranged between 3.5 - 4.9, 3.1 - 3.9 and 4.8 - 5.3), respectively. The average fat, protein and lactose contents exhibit slight variations between normal and sub-clinical mastitic milk.

Key words: Sub-clinical mastitis, cattle

Introduction

Mastitis occurs mostly due to bacterial infection which penetrates through the teat canal. This initiates an inflammatory reaction, which reduced the ability of the mammary epithelium to synthesize and secrete specific milk constituents (Eberhart *et al*., 1987) and increased the leakage in the tight junctions at the blood-milk barrier. This implies that less lactose and casein were synthesized, and that level of whey proteins and salts were increased in milk (Pyorala, 2003; Sandholm *et al*., 1995). The high somatic cell count (SCC) is usually associated with changes in milk constituents such as decreased lactose (Kitchen, 1981), casein (Barbano *et al*., 1991) and increased in sodium and chloride concentration (Rogers and Mitchell, 1989). Mastitis leads to loss of about 1 per cent of total solids by changes in milk composition (fat, casein and lactose are reduced and whey proteins, pH, chlorides are increased), which interferes with manufacturing processes and responsible for economic losses (Radostits *et al*., 2007). Average reduction in milk yield due to clinical and sub-clinical mastitis was estimated to be 50 and 17.5 per cent, respectively (Joshi and Gokhle, 2006).

There were significant changes in milk components (i.e. protein, lactose and fat) due to impaired synthetic and secretory activity of udder epithelial cells (Schultz, 1977). The blood capillary permeability changes and tight junction between epithelial cells open up. This results in increase in the influx of ions and protein from the blood into milk (Peaker, 1975).

Mostly mastitis occurs as a low grade infection, as sub-clinical state, which affects 10-15 per cent cows, increased milk leukocyte and bacterial count, reduced milk production. These all factors contributed to reduce milk value as a food and in monetary terms (Barbano, 2004). There were certain changes in composition of milk as a result of microbial infection and its effect on secretory tissue. This renders milk unsuitable for consumption and processing (Joshi *et al*., 1976).

Materials and Methods

A total of 200 quarter milk samples were collected aseptically from 50 apparently healthy cows of different parity from college dairy farm and private dairies in surrounding area in Bikaner city. All the milk samples were examined for changes in milk constituents.

Mastitis leads to changes in composition of milk protein, fat, lactose etc. Changes in constituents of mastitic milk is usually depends on the severity of damage of udder tissue by pathogenic microbes. These were determined by MilkoScan - The milk analyzer. Measurement of changes in composition of milk was done by passing milk through the milk analyzer.

Procedure

The MilkoScan was turned ON, the option of cattle milk was selected. Milk sample which to be tested taken in to receptacle which was provided along with the MilkoScan. The receptacle was brought below the suction pipe of the MilkoScan and ran the instrument by pressing enter key. Results were displayed within 1 minute. Then the exit key was pressed to remove residual milk from MilkoScan and at last thorough cleaning of MilkoScan with acidic and alkaline solution was done.

Results and Discussion

The average mean value of fat, protein and lactose content in sub-clinically affected milk samples were 3.89 ± 0.038, 3.20 ± 0.024 and 4.756 ± 0.029 (ranged between 2.8-4.5, 2.6 - 3.6 and 4.1 -5.1) and the mean value of fat, protein and lactose content in normal milk were4.2 ± 0.031, 3.43 ± 0.017 and 5.11 ± 0.010 (ranged between 3.5-4.9, 3.1-3.9 and 4.8-5.3), respectively (Table 1).

In agreement with present finding, Hassan (2013) also evaluated the effect of sub-clinical mastitis on physio-chemical composition of cows milk and concluded that fat content of normal and sub-clinical mastitic milk was 4.09 ± 0.06 and 3.81 ± 0.17, protein content of normal and sub-clinical mastitic milk was 3.85 ± 0.11 and 3.36 ± 0.04 and lactose content of normal and sub-clinical mastitic milk was 5.00 ± 0.08 and 4.83 ± 0.04, respectively.

Agarwal and Narayanan (1976) found that the average fat content of mastitic milk (2.81 per cent) was significantly

[1#]Part of M.V.Sc. Thesis. Corresponding author and present address: Ph.D. Scholar, Deptt. of Clinical Veterinary Medicine, Ethics and Jurisprudence, Email: drnandalsavita@gmail.com; [2] Veterinary Officer. Dept. of Animal Husbandry; Govt of Rajashan

Table 1: Mean ± SE values of fat, protein and lactose contents in Sub-clinical mastitic and normal milk samples

Milk constituents	Sub-clinical mastitic milk		Normal milk	
	Mean ± SE	Range	Mean ± SE	Range
Fat (%)	3.89 ± 0.038	2.8 - 4.5	4.2 ± 0.031	3.5 - 4.9
Lactose (%)	4.756 ± 0.029	4.1 - 5.1	5.11 ± 0.010	4.8 - 5.3
Protein (%)	3.20 ± 0.024	2.6 - 3.6	3.43 ± 0.017	3.1 - 3.9

lower than normal milk (4.89 per cent), respectively. Auldist and Hubble (1998) examined the effect of mastitis on raw milk of cattle and reported that the decrease in fat, lactose and protein content of mastitic milk as compare to normal healthy cattle milk. Cooney *et al*. (2000) reported that as somatic cell count (SCC) increased, lactose and casein percentage decreased in mastitic milk. Bruckmaier *et al.* (2004) noted the effect of sub-clinical mastitis on milk protein and lactose concentration. They concluded that lactose content of normal and sub-clinical mastitic milk was 48.1 ± 0.6 and 43.8 ± 1.0 (g/lt), protein content of normal and sub-clinical mastitic milk was 34.4 ± 1.2 and 35.3 ± 1.17 (g/lt), respectively. Ogola *et al*. (2007) observed the concentrations of non-casein fractions, sodium, chloride, and free fatty acid were higher ($p<0.05$), while casein content, lactose, casein-to-total protein, potassium, and calcium were lower ($p<0.05$) in infected quarters compared to normal quarters.

Sharma *et al*. (2011) reported that as somatic cell count increased in milk, the protein, fat and lactose contents decreased in milk. They found that when SCC ($\times 10^3$cells/ml) >100 then concentration of lactose, casein and fat were 4.90, 2.81 and 3.74 per cent, when SCC <250 then concentration of lactose, casein and fat were 4.74, 2.79 and 3.69 per cent, when SCC 500-1000 then concentration of lactose, casein and fat were 4.60, 2.65 and 3.51 per cent and when SCC >1000 then concentration of lactose, casein and fat were 4.21, 2.25 and 3.13 per cent, respectively. Alemu *et al*. (2013) stated that statistically significant difference of $P<0.05$ was observed in the mean fat composition among different mastitic milk. Jagadeesh *et al.* (2016) reported that milk fat and solids not fat (SNF) exhibited slight variance between normal and sub-clinical mastitic milk. The fat per cent was 3.5 ± 0.1 and 3.4 ± 0.1 in normal and sub-clinical mastitic milk and solids not fat (SNF) content was 8.8 ± 0.1 and 8.6 ± 0.1 in normal and sub-clinical mastitic milk, respectively.

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