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Shiva Jyothi
College of Veterinary Science, PVNR. Telangana Veterinary University, Rajendranagar, Hyderabad, Telangana, India

Dr. Kalyani Putty
College of Veterinary Science, PVNR. Telangana Veterinary University, Rajendranagar, Hyderabad, Telangana, India

Narasimha Reddy Y
College of Veterinary Science, PVNR. Telangana Veterinary University, Rajendranagar, Hyderabad, Telangana, India

Ramani Pushpa
NTR College of Veterinary Science, Gannavaram, SVVU, Tirupati, Andhra Pradesh, India

Dhanalakshmi K
College of Veterinary Science, PVNR. Telangana Veterinary University, Rajendranagar, Hyderabad, Telangana, India

Sushmitha B
Ella Foundation, Turkapally, Hyderabad, Telangana, India

Hannan Umair
College of Veterinary Science, PVNR. Telangana Veterinary University, Rajendranagar, Hyderabad, Telangana, India

Vijay Muley
Zoetis, Mumbai, India

Amol
Zoetis, Mumbai, India

Correspondence
Dr. Kalyani Putty
College of Veterinary Science, PVNR. Telangana Veterinary University, Rajendranagar, Hyderabad, Telangana, India

Somatic cell count: Mastitis causing organisms and its effect on milk protein and lactose

Shiva Jyothi, Kalyani Putty, Narasimha Reddy Y, Ramani Pushpa, Dhanalakshmi K, Sushmitha B, Hannan Umair, Vijay Muley and Amol

Abstract
High SCC is strongly associated with the incidence of bovine disease mastitis, which is one of the most significant and quantifiable sources of the costs arising from high SCC levels. It is the single most costly disease to dairy producers. Thereby the present study was carried out to detect the level of Somatic cell count with various bacterial infections with special reference to *Staphylococcus* and the effect of SCC on milk protein and lactose was estimated. The milk samples with somatic cell count (SCC) less than $2x10^5$ cells/ml were considered as culture negative. The means of the somatic cell count of milk samples with *staphylococcus sp* infection was found to be more than $12.4x10^6$ cells/ml and the means of the SCC with more than two isolates were $134x10^6$ cells/ml. furthermore to look into if there exists any relation between the effect of SCC on milk protein and lactose we found that the mean milk protein percentage and lactose percentage was higher in milk of low SCC when compared to that of the milk with moderate and high SCC. This situation proves the necessity of respecting and improving the quality of standard milk, where SCC can be used as an integral component of the control program.

Keywords: somatic cell count (SCC), protein, lactose.

Introduction
Milk composition and microbiological characteristics are important factors for the dairy farmer, dairy industry, and consumer. Milk composition varies according to factors such as breed, age, mammary gland health, lactation stage, nutritional management and season Malek dos (Reis *et al.,* 2013) [10]. Inflammation of mammary gland is followed with increase of somatic cells count in milk (Rodriguez *et al.,* 2000) [15]. In milk from healthy quarters somatic cells count (SCC) is less than 200.000 cells/ml, and it is made of epithelium cells and leukocytes (polimorphonuclear neutrophils, lymphocytes, macrophages and other cells). In cows, the somatic cell count (SCC) is a useful predictor of subclinical mastitis, and therefore, it is an important component of milk in terms of quality, hygiene, and mastitis control (Gonzalo *et al.,* 2004) [7]. According to Auldist *et al.,* many of the common mastitis-causing organisms are capable of fermenting lactose. The lower concentrations of lactose in mastitis milk may be partly due to the activities of these organisms (Malek dos Reis *et al.,* 2013) [10]. Somatic Cell Count (SCC) estimation was a reliable tool to be used to screen and identify intramammary infection (IMI), and its determination requires submission of sample to laboratory and is not readily accessible to on-farm use (Sargeant *et al.,* 2001). Certain studies reported that SCC was the most accurate test to diagnose subclinical mastitis followed by the modified CMT and the modified Whiteside Test (WST) based on the sensitivity and specificity values. (Sharma *et al.,* 2010; Reddy *et al.,* 1998; Tanwar *et al.,* 2001; Goswami *et al.,* 2003). Hence in the present study we have aimed at looking at the levels of SCC with the bacterial infection and also the effect of SCC on milk protein and lactose. [17, 14, 18, 8]

Materials and methods
Milk samples (480) were collected in duplicates for bacteriological examination and for evaluation of somatic cell count (SCC), using the Eko milk somatic cells scan (SCC Analyzer). About 10 ml of milk sample was used to conduct somatic cell count. In brief about 10 ml of milk was mixed with 5ml of detergent provided by the manufacturer and the milk was allowed to pass through the lacto scanner the readings were noted in terms of cells/ml, protein & lactose percentage were recorded as given by the milk analyzer. For bacterial detection milk samples were centrifuged at 2000 g at 37^0C for 10 minutes, supernatant was discarded, and 5 ml of BHI broth was added to the sediment and incubated at 37^0C for 24 h. The isolates were

also subjected to various biochemical tests as per the methods described by Cruickshank *et al.*. (1975) and Bailey and Scott's (2007) [4].

Results and Discussion

The present study showed that the somatic cell count was lower (<2X10^{5}cells/ml) in animals with no infection. Milk samples with SCC <2X10^{5}cells/ml was also culture negative for mastitis pathogens. Milk samples with only *Staphylococcus* infection showed a mean somatic cell count of 12.4x10^{6}cells/ml. In animals with mixed infections the mean SCC was 134 x10^6 cells/ml of milk. The results were in agreement with Fry *et al.*, (2014) [6] who described that the SCC was higher in infected animals when compared to the uninfected animals. The somatic cell counts obtained in the study were lower when compared to the studies of Boddie *et al.*, (1987) [3], Malinowski *et al.*, (2006) and Nickerson (2009) [11, 12]. The variation in the reports may be due to magnitude of SCC response to major pathogens that varies among cows and differentiation of pathogens seems impossible based on SCC alone (Dohoo and Meek, 1982) [5]. For studying the effect of somatic cell count on milk protein and lactose milk SCC were characterized into three groups i; e the SCC ranging from 90000 to 2 lakhs were categorized as low SCC, cell count ranging from 2lakhs to 6 lakhs were under moderate cell count and somatic cell count higher than 6 lakhs were categorized under high cell count. The means of SCC for animals with low SCC, moderate SCC and high cell count were compared with that of the normal protein and lactose levels, which showed that the increase in SCC had a decrease in milk protein and lactose (Table 1). When two way analysis of variance was calculated between the milk protein lactose and SCC a significant difference at P≤0.05 was observed. The present study showed a negative correlation between the milk protein, lactose and increasing somatic cell count at 0.01level. The results were in accordance with Philpot 2003 who reported the effect of SCC on milk components that the total protein decreases slightly, lactose decreases between 5 and 20%. The results were slightly lower than the reports of Blowey and Edmodson (2010) who reported that protein was 3.35% in low SCC and 3.32% in high SCC, lactose was 4.6 in low SCC and 4.2 in high SCC. Jones (2006) [9] reported that the lactose percent was 4.2%, and protein was 3.56 in the milk high somatic cell counts. The most likely reasons for these differences could be the difference in the stage of lactation or due to differences in the nutritional diets.

Table1: Effect of somatic cell count on milk protein and lactose

Milk parameter	Normal levels	Low SCC	Moderate SCC	High SCC
Protein	3.6	3.43	2.76	2.27
Lactose	5.4	4.88	3.56	2.5

Increasing Somatic cell count milk had a reduction in protein and lactose values

Conclusion

This study indicates that high SCC negatively affects not only milk yield but also milk composition and quality. Therefore, it is suggested that the animal's environment should be as clean and dry as possible. The animal should have no access to manure, mud, or pools of stagnant water and calving area must be clean. Post milking teat dipping with a germicidal dip is recommended. Proper antibiotic therapy is recommended for all quarters of all animals at drying off which aids in the control of clinical mastitis postpartum.

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