EVALUATION OF CALIFORNIA MASTITIS TEST (CMT) AS A SCREENING METHOD FOR SUBCLINICAL MASTITIS IN MALABARI GOATS

S. Sreeja*, P. P Bineesh, K. Vijayakumar and M.R. Saseendranath

Department of Veterinary Epidemiology and Preventive Medicine, College of Veterinary and Animal Sciences, Mannuthy- 680 651 India

Received: 27-07-2011
Accepted: 12-03-2012

ABSTRACT

Milk samples from 642 udder halves of Malabari goats were screened for subclinical mastitis using CMT. Somatic cell counts (SCC) of the CMT positive samples were noted and isolation of bacteria was attempted on blood agar. CMT was found to have good correlation with the SCC values. Out of the CMT positive milk samples only 24.23% yielded pathogens. CMT is more useful for ruling out subclinical mastitis in Malabari goats.

Key words: CMT, Malabari goats, Screening, Subclinical mastitis.

Anionic detergents react with mastitic milk to produce a visible effect that can be scored numerically with reference to the content of somatic cells. In conditions like mastitis, bacterial multiplication commonly leads to acid production and increase in the SCC of milk. This principle is used in California Mastitis test (CMT) which is a routine test used for screening subclinical mastitis in cows. The CMT reaction gives a rough estimation of two parameters at a time, the cell count and the pH of the milk. Goat milk naturally has high concentration of somatic cells than cow milk. Hence this study was undertaken for evaluating the application of CMT in the diagnosis of subclinical mastitis in small ruminants.

As per the method described by Schalm et al. (1971), all lactating does of Kerala Agricultural University Sheep and Goat farm were screened for subclinical mastitis once in three months using California Mastitis Test (CMT). About 10 ml of milk from positive udder halves was collected aseptically in sterile vials and subjected to Somatic cell counts and Culture and sensitivity.

For noting the somatic cell count, milk smears were prepared as per the procedure of Prescott and Breed (1910) and was stained using Broadhurst-Paley triple step procedure described by Schalm et al. (1971). Milk solids were stained pink, mononuclear cells deep blue, polymorphonuclear leukocytes pale blue and bacteria either deep or light blue. A value of more than $1 \times 10^6$ cells per ml of milk was considered to be indicative of mastitis. Brain heart infusion (BHI) agar supplemented with 5 - 10% sterile bovine blood was used for isolation of bacteria and the isolates were stained by Grams method. The morphological, cultural, biochemical and sugar fermentation of the isolates belonging to different species were determined as per the methods described by Cowan (1974). Statistical analysis was done as per the procedure of Snedecor and Cochran (1994).

Using CMT, 642 milk samples were screened for the presence of subclinical mastitis. Out of these 194 (30.2%) samples were positive for CMT and 448 (69.78%) were negative (Table 1). Somatic cell counts of the CMT positive milk samples were noted. Statistical analysis showed that SCC in goat milk was not normally distributed. So the actual SCC were transformed to logarithmic form for further statistical analysis (Table 2).

Somatic cell count has been accepted as the best quantitative index of inflammation of bovine mammary gland and is used to evaluate the quality of milk and to predict udder infections. Several types of somatic cells have been reported to be present in normal milk (Schalm et al., 1971). The
content of these cells increases in mastitic milk primarily due to an overwhelming number of leukocytes infiltrating from blood. In the dairy cow the concentration of SCC in milk is considered indicative of mastitic condition of mammary glands. However, this conclusion may not be absolutely true in dairy goats. Milk secretion in goats is apocrine while that in cow is merocrine. As a result cytoplasmic particles are shed into milk from the apical portion of mammary secretory cells (Paape, 2000). These cytoplasmic particles are similar in size to milk leukocytes ranging from 5 to 30 µm (Dulin et al., 1983). Statistical analysis showed that CMT had good correlation with SCC (Table 2). Out of a total of 194 samples scored as ‘T’, ‘1’, ‘2’ and ‘3’ statistical difference was noticed between each score of CMT and for SCC values both untransformed and logarithmically transformed (P<0.01)(Table 2).

Although CMT is recognized as an indicator of abnormal milk due to inflammation of udder tissue, this does not necessarily mean infected milk. This corroborates with the findings of Pettersen (1981) who found that a CMT score of ‘1’, ‘2’ or ‘3’ should be regarded as normal in mid lactation.

According to Schalm et al. (1971) CMT scores of ‘1’ to ‘3’ did not correspond to the cell count in milk from cows. This was because the number of cells in milk from goats scoring ‘1’, ‘2’ or ‘3’ was higher than those of cows milk. Moreover it has been observed in studies of goats that SCC increased without infection in low milk yield goats or goats in late lactation (Siddique et al., 1988). Does with high SCC had no mammary gland tissue changes or other mastitic conditions in udder. CMT scores of ‘1’ were dominant throughout lactation in non infected animals (Maisi, 1990) and goats with 85% of udder halves infected by major pathogens had a CMT score over ‘1’ (Poutrel and Lerondelle, 1983). However, in CMT score of ‘3’ the differentiation between leukocytic cells and cytoplasmic particles was difficult since these were mostly seen together as small clumps.

In this study, stage of lactation and parity were not considered while taking the observations. This may be another probable reason for the high SCC counts. Dairy goat lactation is seasonal and hence SCC naturally exceeds the limit especially in late lactation stages (Dulin et al., 1983; Hinckley, 1990).

### TABLE 1. Screening for subclinical mastitis

<table>
<thead>
<tr>
<th>No: of goats screened</th>
<th>No: of udder halves</th>
<th>No: of goats +ve by CMT</th>
<th>No: of blind udder halves</th>
<th>No: of CMT + ve halves</th>
<th>No: of CMT - ve halves</th>
<th>CMT Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>135</td>
<td>267</td>
<td>32</td>
<td>3</td>
<td>64 (23.97)</td>
<td>203 (76.03)</td>
<td>13 (20.3)</td>
</tr>
<tr>
<td>104</td>
<td>207</td>
<td>38</td>
<td>1</td>
<td>70 (33.82)</td>
<td>137 (66.18)</td>
<td>9 (12.86)</td>
</tr>
<tr>
<td>85</td>
<td>168</td>
<td>33</td>
<td>2</td>
<td>60 (35.71)</td>
<td>108 (64.29)</td>
<td>7 (11.67)</td>
</tr>
<tr>
<td>324</td>
<td>642</td>
<td>103</td>
<td>6</td>
<td>194 (30.2)</td>
<td>448 (69.78)</td>
<td>29 (14.95)</td>
</tr>
</tbody>
</table>

Figures in parenthesis indicate percentage to total udder halves in each screening.

### TABLE 2. Mean somatic cell counts (log_{10}) for CMT scores

<table>
<thead>
<tr>
<th>CMT score</th>
<th>Mean log cell count</th>
<th>SD</th>
<th>Arithmetic SCC (x10^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>6.237^a</td>
<td>0.04</td>
<td>0.736 ± 0.033</td>
</tr>
<tr>
<td>1</td>
<td>6.339^b</td>
<td>0.05</td>
<td>1.99 ± 0.031</td>
</tr>
<tr>
<td>2</td>
<td>6.428^c</td>
<td>0.08</td>
<td>1.732 ± 0.086</td>
</tr>
<tr>
<td>3</td>
<td>7.325^d</td>
<td>0.08</td>
<td>20.417 ± 0.851</td>
</tr>
</tbody>
</table>

*P < 0.05. Means having same superscripts do not differ significantly.
Out of the 194 CMT positive samples with elevated SCC levels only 47 (24.23 %) yielded pathogens. Bacterial origin of intramammary infection cannot explain all elevated cell counts in goats. 90% of the difference in goat SCC was not due to intramammary infection (Wilson et al., 1995). So prediction of intramammary infection by assessing the SCC levels is difficult. The current legal limit for SCC in bulk tank milk of goats in the United States is 1x 10^6 cells/ml. In this study it was found that majority of the samples exceeded this limit yet only 24.23 % were bacteriologically positive.

CONCLUSIONS
CMT in goat subclinical mastitis will not detect certainly every cell count or pick out every infected quarter, but the test could be a valuable aid to mastitis control enabling the veterinarian to reduce infection in a flock without undertaking large scale bacteriological tests. It can hence be concluded that CMT is more useful for ruling out than diagnosing mastitis in goats and rapid diagnosis of mastitis in goats using only cell count needs further re-evaluation.

REFERENCES
Prescott, S.C. and Breed, R.S. (1910). The determination of the number of body cells in milk by a direct method. J. Infect. Dis. 7: 632