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Review Article

COMPARISION OF DIAGNOSTIC TESTS FOR THE DETECTION OF SUB-CLINICAL MASTITIS IN DAIRY FARMS OF ERODE DISTRICT

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Introduction

Mastitis is the most costly disease of dairy cattle due to economic losses from reduced milk production, treatment costs, increased labour, milk withheld following treatment, death, and premature culling (Miller *et al.*, 1993). Early detection of mastitic cows is important for most dairy farmers to reduce production losses and to enhance prospects of recovery. Diagnosis of clinical mastitis is based on the local and systemic reactions and changes in milk (e.g. off color, watery, bloody appearance and presence of flakes, clots and pus). The diagnosis of subclinical mastitis is more problematic since the milk appears normal but usually has an elevated somatic cell count. Early diagnosis of mastitis is vital because changes in the udder tissue take place much earlier than they become apparent. Various methods, based on physical and chemical changes of milk and cultural isolation of organisms, are used for diagnosis of subclinical mastitis (Emanuelson *et al.*, 1987).

The California mastitis test (CMT) and TANUVAS TRPVB ABT SCC Quick Count test are the reliable cowside screening tests for subclinical mastitis that can easily be applied. The CMT is a simple, inexpensive, rapid screening test for subclinical mastitis, based upon the amount of cellular nuclear protein present in the milk sample. Modern mastitis tests allow for indirect determination of the number of somatic cells in milk (Greiner *et al.*, 2000). As the inflammatory process develops in udder tissue, the number of these cells (particularly leukocytes) in milk sharply increases. SCC, CMT and intramammary infection are associated significantly; therefore these parameters provide the necessary information to evaluate udder health status in cows.

The objective of the present study was to evaluate and compare two indirect mastitis diagnostic tests – California mastitis test (CMT) and TANUVAS TRPVB ABT SCC Quick Count test for their ability to classify correctly udder health status of individual cows. The present study was designed to investigate the comparative efficiency of two indirect tests for the diagnosis of sub-clinical mastitis in dairy farms of Erode District. Results of this study

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will help to identify most appropriate test i.e. inexpensive, less time consuming, easily available, adoptable, interpretable and more sensitive for the diagnosis of sub-clinical mastitis under local farm conditions.

Materials and Methods:

Fifty different small dairy farms of Erode District were selected. A total of 250 crossbred dairy cows of different age groups (3 to 8 years), parities (1 to 5), stage of lactation (early, mid and late), milking (both hand and machine) were selected for this mastitis detection study. A total of 1000 milk samples (N = 1000) were collected from quarters of 250 apparently healthy cows at 50 different small dairy farms of Erode District.

Milk samples were collected aseptically by using the standard milk sampling techniques (Oliver *et al*., 2005). The teats were cleaned and wiped with $KMnO_4$ solution before taking the samples. The samples were collected from all four quarters. The first three to five squirts of milk were discarded from all four quarters and the samples were collected from all four quarters and tested on spot by CMT (DeLaval) (Schalm *et al*., 1971) and ABT-SCC test.

The CMT were performed, from each quarter 3 ml of milk sample was taken in the CMT paddle and equal quantity of CMT reagent (DeLaval) was added in each cup, rotated the CMT Paddle in a anticlockwise motion for few seconds to thoroughly mix the contents and the result was interpreted in 30 seconds with the CMT score as N (Negative, No infection, No thickening of the mixture, 0-200,000 cells/ml), 1 (Trace mastitis, Distinct slime but without gel formation, 200,000 – 5 million cells/ml) or 2 (Clinical mastitis, Immediate formation of gel which moves as a mass during swirling, more than 5 million cells/ ml).

The ABT-SCC test was performed, milk sample from each quarter was collected in a separate clean container. In a ABT-SCC tube a drop of milk sample is added using the pipette. Immediately added 3 drops of the enhancer and mixed well. The colour development is compared with the nearest colour in the ABT-SCC colour card. The colour card values are multiplied by 1000 to SCC. The result was interpreted in 30 minutes with the ABT-SCC colour card score as control, 100x1000 cells, 300x1000 cells, 500x1000 cells, 700x1000 cells, 900x1000 cells. Economics of these tests were analysed.

If the animal is positive for mastitis then one ml of milk sample from the affected quarter has to be taken in sterile test tube and sent to the lab for antibiotic sensitivity test. Farmers advised to wash the udder with $KMnO_4$ solution and dip the teat with post milking teat dip solution immediately after milking and suitable remedies were suggested to solve the problems based on the results.

Results and Discussion

Table 1: Results of CMT and ABT-SCC test conducted in dairy farms of Erode District

	Total animals	Total test	Negative	Subclinical Mastitis	Clinical Mastitis
CMT test	250	1000	616 (61.6%)	328 (32.8%)	56 (5.6%)
ABT-SCC test	250	1000	600 (60.0%)	342 (34.2%)	58 (5.8%)

(N= 1000)

In this study as per CMT test the occurrence of subclinical mastitis (32.8%) and clinical mastitis (5.6%), as per ABT-SCC test the occurrence of subclinical mastitis (34.2%) and clinical mastitis (5.8%).

Table 2: Cost and time taken, sub-clinical mastitis tests and their ranking for availability, adoptability, interpretability and sensitivity

	Sub-clinical mastitis tests	
Parameters	**ABT-SCC test**	**CMT test**
Cost per test (Rs.)[a]	2.50	2.60
Time taken per test[b]	30 -40 minutes	10 seconds
Availability[c]	2	1
Adoptability[d]	2	1
Interpretability[e]	1	1
Sensitivity[f]	1	1

a. Cost per test includes test ingredients.

b. Time taken per test measured from time required for preparing reagent and test conducted.

c. Availability observed on the ease of access to the test reagents in the study area.

d. Adoptability observed on the ease of use of various laboratory sub-clinical mastitis tests.

e. Interpretability based on the degree of appearing the gel consistency.

f. Sensitivity based on negative/positive cases of sub-clinical mastitis.

Table 2 display the cost and time taken by sub-clinical mastitis tests and their ranking for availability, adoptability, interpretability and sensitivity. Costs and ranking are computed based on the self observations. The cost per CMT was Rs. 2.6 as compared to Rs. 2.5 for ABT-SCC test. However, time taken for preparing reagents and carrying out CMT is less (10 seconds) than that of ABT-SCC tests (30-40 minutes). Among the two tests, reagents used in the ABT-SCC Test can be found in the TANUVAS TRPVB and easily adoptable at the farm as compared to the reagents used in the CMT.

The positive reaction of CMT and ABT-SCC seems to depend on the concentration of somatic cells in the milk (Sharma *et al*., 2008). SCC needs a skilled personnel, adequate laboratory facilities and time, just as bacterial culture, so other tests (e.g. CMT, ABT-SCC test) were developed as alternatives. In the present investigation, in regard to accuracy CMT and ABT-SCC test was equal but from field point of view it is assessed as sufficient to diagnose the pre-clinical cases of mastitis.

Present findings are in agreement with Sharma *et al.,*2008. They reported that SCC was the most accurate test for the diagnosis of subclinical mastitis followed by the modified California mastitis test (MCMT) and the modified White side test (MWST). Patel *et al.* (2000) reported higher reliability of CMT (85.69%) followed by MWST (79.74%). Reddy *et al.*(1998) compared the specificity and sensitivity of CMT and SCC with standard cultural test and observed 100% predictive value with the cultural test of the milk, 84.84% specificity for SCC and 73.30% for CMT. Tanwar *et al.* (2001) also compared various diagnostic tests for detection of subclinical mastitis and indicated 100% sensitivity for SCC and 96% for CMT reaction. According to Goswami *et al.* (2003), animal-wise efficacy of indirect tests taking cultural examination as a standard was in the following descending order: SCC (97.46%), MCMT (69.62%) and MWST (63.29%). So, the present findings regarding accuracy and sensitivity of indirect tests for detection of subclinical mastitis support the earlier observations.

The present study suggests that ABT-SCC and CMT could be used as regular mastitis screening test in field condition, even by less trained dairymen. California Mastitis Test and ABT-SCC tests were easier to interpret the results both are most sensitive. The cost of ABT-SCC test was Rs.0.10 less than CMT test.

Conclusions

The present findings suggested close relationship between CMT and ABT-SCC test at farm level to screen out cows and buffaloes for sub-clinical mastitis. Efficiency of CMT and ABT-

SCC test was equal, when the inflammation in the udder was at subclinical stage. Discrepancy in test scores was not found due to species effect. Hence there was no difference between these two tests on sensitivity. The benefit of low cost, easy availability and adoptability of both tests were equal except the time taken to analyses the sample was high in ABT-SCC (30-40 minutes) than CMT (10 seconds). In conclusion, both ABT-SCC test and CMT test were the most reliable diagnostic method for use in field conditions.

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