A REPORT ON THE CONSIDERABLE REDUCTION OF MILK TOTAL BACTERIAL COUNTS (TBC) IN A BROWN-SWISS DAIRY HERD

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Key words: total bacterial counts, somatic cell counts, milk hygiene, dairy herd.

Introduction

Milk, as a complete food is very important in human nutrition. More than 400 million tons of milk is produced by about 280 million dairy cows in the world annually. Therefore, considerable measures have been taken to improve milk quality especially its hygienic condition.

Milk, due to having various nutrients, provides a suitable medium for microbial growth. Fresh milk (immediately after milking) has less than 100/ml bacteria. Milk contaminating resources are internal and external surfaces of udder and other external resources. External resources including skin, milking equipment, workers, contaminated water and milk transportation tankers can have more severe effects.

Increasing various bacterial populations will change milk components. This induces unfavorable odor and flavor, increasing rate of going off and decreasing of its maintenance and applications. Also, it increases transmission of zoonotic diseases.

One of the usual methods to measure milk hygienic quality is total bacterial counts[1](namely SPC [2]and TVC[3]).Also, somatic cell counts (SCC) determines the presence or absence of mastitis, its severity and milk contamination by udder. Normal SCC is less than 200 thousands/ml.

Materials and methods

The present study was conducted on a 220 Brown-Swiss dairy herd in Khorasan province (Jihad-e-agriculture Education Complex) in Iran. Lactating cows (75 in total) were classified in three groups: low, medium and high milk producing cows. They were milked three times per day and the milk was collected in two cooling resevoirs.

[1] - TBC
[2] - Standard plate counts
[3] - Total vital counts

The collected milk was introduced to a milk pasteurizing factory. We had to attempt to decrease high TBC to a normal value. So, we undertook hygienic measures more seriously than before. These measures were as follows:

1- Choosing two workers only for milking.
2- Shaving hairs of tail extremity, ventral part of abdomen and udder.
3- Using special gloves and disinfecting them during milking by workers.
4- Installation of meshes on windows and doors of the milking parlour as well as installation of an electrical pesticide in the milking hall.
5- Preparation of dry litter in winter for lactating cows.
6- Preventing cows from lying after milking with keeping them in corridor and then feeding them.
7- Avoiding any stressful activities during milking.
8- Milking high, medium and low milk producing cows, respectively. Also, fresh cows were milked, first.
9- Milking cows that were affected by mastitis and cows with wounded teats by a portable milking unit, separately.
10- Testing all quarters by CMT every 30 days regularly.
11- Using DC treatment at proper time for dry cows.
12- Washing teats with lukewarm water, drying them with proper paper and milking each quarter three times by hand before milking to assess milk condition.
13- Monitoring the pressure of milking machine, pulse rate and milking duration.
14- Teat dipping after milking and changing disinfectants periodically.
15- Disinfecting teat cups between alternative milking.
16- Dividing collected milk in two cooling reservoirs to cool milk faster.
17- Washing the milking machine with warm water for 5 minutes and cold water for 2 minutes before milking for dust elimination.
18- Washing the Milking machine, cooling reservoirs and transportation tanker daily (CIP[4]).
19- Using a two-wall tanker to avoid increasing milk temperature during transportation. Also, milk was transported in the early morning.
20- Using filters at milk entrances of cooling reservoirs and tanker for elimination of physical milk contaminations.

[4] - Cleaning in-place

21- Finally, plate cooler is installed in order to accelerate milk cooling.

Results

Total bacterial counts and somatic cell counts were randomly measured several times every month in the factory when milk was taken there. The results are presented in table 1.Mean total bacterial counts varied between 1/5- 4/5 millions/ml (monthly) from Jan 2002 to Jan 2003. However, it apparently decreased in Feb 2003, so that it reached to 40000/ml in March 2003.

Also, we evaluated bacterial contamination of all parts of milking machine. That is, the samples were collected from fresh milk, cooling reservoirs and transportation tanker. The results indicated that TBC was 10000/ml in milking machine claw (fresh milk), 40000/ml in entering reservoirs and reached 4 millions/ml before transportation to factory.

The somatic cell counts varied between 250-550 thousands/ml during the study with a high increase in June, July and August 2003.

Table 1- Mean TBC and SCC during the study (16 months).

Time(month/year)	**Mean TBC/ml per month**	Mean SCC/ml per month
1/2002	1561167	314369
2/2002	2870760	258050
3/2002	2973479	343756
4/2002	29277057	340846
5/2002	456358	478902
6/2002	1866867	1043024
7/2002	1045632	2369945
8/2002	1429314	2077000
9/2002	1836574	745000
10/2002	2153566	620000
11/2002	2532777	554000
12/2002	1424000	554000
1/2003	4445424	554000
2/2003	604557	554000
3/2003	101801	494949
4/2003	74000	400546

Discussion

Given the references, sanitation apparently led to the decrease of TBC in milk. Based on our results, TBC irregularly varied from Jan 2002 to Jan 2003. Therefore, the evaluation of bacterial contamination or its increase in all parts of milking machine and reservoirs seemed necessary. It was also revealed that the main increasing TBC was in

cooling reservoirs. Therefore, it was determined that the increase in TBC was not due to the udder itself, but to the bacterial rapid growth because of low cooling power of reservoirs. Thus, the necessity of plate cooler installation was guaranteed. It was installed it in Jan 2003 to accelerate decreasing milk temperature. After using plate cooler, TBC apparently decreased. Our results indicated that the main cause of increasing TBC was due to the slow milk cooling.

Increasing SCC is due to mastitis. SCC varied from 200-550 thousands/ml during the study. This indicates that clinical mastitis has not been a serious problem of the herd. The increased SCC in June, July and August 2003 was due to incidence of streptococcal mastitis, so that after treatment of mastitis and its control, it returned to previous value. Also, we did not observe any proportional relationship between increasing TBC and SCC in the study. Again, it emphasizes the negligible role of udder in TBC increase.

Given the above-mentioned results, we suggest that milking management, preventing mastitis, sanitation measurements and especially using of plate cooler are very important and essential for dairy herds to decrease TBC in milk, improve the milk quality and increase human health conservation.

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