

Bulk Tank Milk Analysis: a Useful Tool for Ascertaining Information on Milk Quality and Herd Udder Health

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Introduction

The demand of consumers for safe high quality milk has placed a significant responsibility on dairy producers, retailers and manufacturers to produce and market safe milk and milk products. The first step in the production of quality milk begins at the dairy farm; therefore, the responsibility lies with the dairy producer to produce raw milk under the strictest hygienic standards. All dairy producers recognize the fact that production of quality milk and lowered incidence of mastitis will result in increased returns for the milk produced. However the task of producing quality milk and maintaining cows with low incidence of mastitis is a management challenge for all dairy producers. As dairy farming becomes more complex and intense the need to provide assistance to dairy producers on milk quality and mastitis through the transition process is critical. Pennsylvania ranks fourth in both milk production (10,931 million lbs) and number of cows (616,000 cows), with an average production of 17,745 lb/day/cow (11 rank). However in terms of milk quality measured by somatic cell count, Pennsylvania ranks 20th with a state average of 331,000 cells/ml of milk. Pennsylvania ranks last among the 4 leading states in milk production that include California (271,000 cells/ml), Wisconsin (300,000 cells/ml) and New York (322, 000 cells/ml). A total of 14 states currently export milk to other states; Pennsylvania ranks 13th out of the 14 states for SCC (Anon, 2000a&b). *This clearly suggests that there is considerable need for improvement of milk quality in Pennsylvania as improved milk quality results in improved productivity and profitability.* A project called "Pennsylvania Quality Milk Program" was initiated on January 1, 2000 by the Veterinary Science Extension Group. The extension and research program was conducted with the purpose of educating dairy producers, veterinarians, county extension agents on collecting, analyzing, and interpreting BTM microbiology test results. The information on bulk tank milk (BTM) analysis was utilized to make decisions on improving udder health of the herd and improving milk quality. This paper describes the extension project outline and its outcome following implementation.

Extension Project Outline

Phase I: The Veterinary Extension Group with the support of the county extension agents implemented the Pennsylvania Quality Milk and Mastitis Program. County extension agents who had opted to participate in the plan of work related to milk and mastitis for the year 2000 and 2001 were solicited to participate and facilitate the program. A total of 12 county extension agents (Armstrong, Bradford, Butler, Clarion, Franklin, Lancaster, Lebanon, Lycoming, Mercer Wayne, Washington, Westmoreland) and one milk cooperative participated in the program. The county extension agents or milk cooperative personnel served as facilitators of the program and were instrumental in

soliciting participation of dairy producers who would be active participants and would benefit from the extension program. Each of the participating county extension agent/milk cooperative signed up 7-11 dairy producers from their county or region. Dairy producers who opted to participate in the program received a questionnaire (self-administered) through their county extension agent. The questionnaire consisted of 20 questions that sought information on the herd characteristics, farm management, milking and mastitis prevention and control practices. The information from the questionnaire was used to interpret the BTM analysis report in light of farm management, milking and mastitis prevention and control practices adopted on the farm. Dairy herd improvement records of dairy farms that were members of the Dairy Herd Improvement Association were also requested.

Phase II: Collection and analyses of BTM was initiated based on the region of Pennsylvania. For example BTM from the dairy herds in the southwest region were all collected and examined simultaneously. The county extension agent provided on farm instruction on BTM collection and handling procedure. Dairy producers collected the sample in the first and third week of each month for 2 months (4 samples total; 2 samples/month). The containers, gloves, racks, tubes and labels for milk sample collection were provided to the dairy producer. Within 24 hours of collection; all milk samples from the region were shipped on ice overnight by Federal Express to Penn State (shipping cost paid by Penn State).

Phase III. The BTM samples were examined for bulk tank somatic cell count (BTSCC) and bacterial counts including; 1) Standard plate count (SPC), 2) Preliminary incubation count (PIC), 3) Laboratory pasteurization count (LPC), 4) *Staphylococcus aureus* (SA) count, 6) Coagulase negative staphylococcal (CNS) count, 7) Streptococci and streptococci-like organisms (SSLO) count, 8) Coliform count (CC) and 9) Gram-negative non-coliform (NC) bacteria. The BTSCC was done by the Dairy Herd Improvement Association testing facility in State College, PA. Bacteriological tests for milk quality were done as described by the American Public Health Association (3,5). Isolation, identification and characterization of mastitis pathogens was done as described by Hogan et al., (4). The samples were examined at no cost to those dairy producers participating in the study.

Phase IV. On completion of four BTM analyses for each of the participating dairy producer, a single BTM report was prepared that covered all four bulk tank milk sample analyses. This report was mailed to the county extension agent within 10 days of the analysis of the last BTM sample. The county extension agent sent copies of the report to the dairy producer or their veterinarian as requested by the producer.

Phase V. On receiving the reports, the county extension consulted with the dairy producers and set up a meeting so that the dairy producers could interact with the Veterinary Extension Group.

Phase VI. The Penn State Veterinary Extension Group traveled to the given region to interact with the dairy producers. Following introduction, the first 20 minutes consisted of a general presentation on how to interpret BTM results. Following which questions if any were answered. The next 2 hours was dedicated to one-on-one meetings with dairy producers, (one-on-one included the dairy producer, his veterinarian, sanitarian, farm manager, family members if present and the extension agent in the room). The meeting generally lasted about 10 to 30 minutes. Based on BTM analysis report the veterinary extension group made suggestions to help correct the problem that was perceived on the farm and answer any other questions that were relevant to milk quality and mastitis. Those dairy producers who were waiting to meet the extension group were engaged by initiating a group activity or a video program that addressed issues related to milk quality or mastitis.

Phase V. The BTM program was evaluated using a standardized evaluation form. The evaluation form encompassed of the indicators that were needed to assess the program based on the guidelines of Penn State Cooperative Extension Program.

Outcome of the extension program

A total of 13 extension meetings were held at regional county offices to discuss about BTM quality. Of the 126 dairy producers who participated in the program, 120 them were present at the extension meetings for one on one consultation about milk quality and to help them interpret the analysis results of the milk produced on their farm. The program was evaluated extensively (n=116 dairy producers), and the summary of the evaluation is as follows:

Question	Yes	%
1. Did you gain new information on BTM analysis?	114/116	98
2. Is BTM analysis useful to address issues related to mastitis and milk quality?	113/116	97
3. Do you intend to use BTM analysis?	110/116	95
4. Would you recommend BTM analysis to other producers?	113/116	97
5. Would you participate in a similar program?	114/116	98

The process of developing and implementing the program, and interacting with clientele (dairy producers, extension agent, veterinarians, farm managers, sanitarians) served as an excellent learning process for the Veterinary Extension Group. The information that was gathered from this extension program on BTM quality and mastitis has become a significant knowledge base, which will serve well in developing subsequent extension programs to meet the needs of the clientele.

Extension resource materials:

The following materials can be requested by contacting Dr. Jayarao (bmj3@psu.edu) or Dr. Wolfgang (drw12@psu.edu).

1) Survey questionnaire on farm management practices, 2) Instructions on collection and handling of BTM sample, 3) Bulk tank report format, 4) Program evaluation form, 5) Power point slide set on BTM analysis.

References:

1. Anonymous. 2000a. Somatic Cells going up. Hoard's Dairyman. Feb. 25, 2000 issue. p. 161.
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3. Frank, J.L., G. L., Christen, L. B. Bullerman. 1992 Test for groups of microorganisms, in Marshall RT (ed):*Standard Methods for Examination of Dairy Products*.16th ed, Washington DC, APHA. pp 271-286.
4. Hogan, J.S., R. N. Gonzalez, R. J. Harmon, et al. 1999. *Laboratory handbook on bovine mastitis*. Madison, WI, National Mastitis Council, Inc. pp 1-188.
5. Houghtby G.A., L. J. Maturin, E. K. Koeing. 1992. Microbiological count methods, in Marshall RT (ed):*Standard Methods for Examination of Dairy Products*.16th ed, Washington DC, APHA. pp 213-246.