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QUALITY MANAGEMENT, INC. (QMI)

More Than 500 Dairy Farmers Now Utilize The QMI Composite Farm Sampling System

INSIDE THIS ISSUE:

The QMI Composite Farm Sampling System now is used by more than 500 dairy farmers as a way to obtain representative samples for herd health management as well as for obtaining samples for nutritional monitoring programs.

The University of Minnesota conducted two studies and both were published in the Journal of Dairy Science. The first is titled "Field Validation of a Milk Line Sampling Device for Monitoring Milk Quality and Udder Health", conducted by S. Godden and Associates (85:1468-1475), 2002. The second study is titled "Field Validation of a Milk Line Sampling Device for Monitoring Milk Component Data", also conducted by S. Godden and Associates (85:2192-2196), 2002.

The objective of these studies was to investigate the ability of the QMI milk line sampling device to obtain representative samples under field conditions. The first study compared the milk component composition between milk line and bulk tank samples and also compared SCC and bacterial culture results between milk line and bulk tank samples for milk harvested from the same group of cows at the same milking.

As stated by these researchers, the results of these studies suggest that the milk line sampling is a very good monitoring tool. It provides producers with timely and inexpensive information that will help to improve programs for monitoring milk quality and udder health in commercial dairy herds.

Microbial Spoilage of Market Milk

Post-Pasteurization Contamination vs. Heat-Resistant Psychrotrophs

Fluid milk quality and/or shelf life can be affected by many factors. Chemically induced oxidized flavors, flavors inherent in raw milk such as feed flavors and enzyme induced off flavors are just a few.

The biggest factor affecting milk quality, however, is growth of psychrotrophic bacteria. Psychrotrophic bacteria are those that are capable of growth at refrigeration temperatures. Since fluid milk is such an ideal growth medium, many bacteria are capable of rapid growth at refrigeration temperatures in milk.

Two common types of bacteria are capable of growth or milk spoilage. These are gram-negative bacteria (post-pasteurization contaminants) and gram-positive bacteria (heat-resistant psychrotrophs). These bacteria have different cell structure and different growth characteristics in milk. Gram-negative bacteria are heat sensitive and will be killed if exposed to proper pasteurization procedures. Gram-positive (heat resistant psychrotrophs) are typically spore-forming bacteria that originate from raw milk.

General differences are outlined in Table 1.

Table 1:

MICROBIAL SPOLIAGE OF MARKET MILK

Post-Pasteurization Contamination:	**Heat Resistant Psychrotrophs:**
Spoilage 10 - 14 days	Spoilage 18+ days
Gram-Negative Bacteria	Gram-Positive Bacteria
(e.g. *Pseudomonas*)	(e.g. *Bacillus*)
Stress Test: Growth	Stress Test: No Growth
Mosely Test: Out of Specifications	Mosely Test: Within Specifications
Coliform Test: Out of Specifications	Coliform Test: Within Specifications
Line Sample: Gram-Negative	Line Sample: Gram-Positive

The dairy industry has undergone several changes including improved sanitation, upgraded engineering and increased regulatory involvement. These changes have drastically reduced the amount of post-pasteurization contamination. With extending pull dates, however, the slower growing heat-resistant psychrotrophs are becoming the primary cause of product defects in fluid milk.

Historically when shelf-life problems have occurred, dairy plants have undergone corrective action by improved post-pasteurization equipment sanitation, engineering upgrades or cleaning up environmental issues. For the most part, these measures improved the quality when the spoilage was due to post-pasteurization contamination. These corrective actions, however, will not affect the spoilage occurring due to heat resistant psychrotrophs.

In a previous QMI Newsletter (May 2006), we outlined procedures for identifying sources of heat resistant psychrotrophs (the QMI Heat Resistant Psychrotroph Test—Table 2). There are several sources of these bacteria on the farm including feed, bedding, manure, soil, etc. However, it is the opinion of QMI that the primary source of the heat resistant psychrotrophs is the raw milk handling equipment.

Our premise is that the raw milk handling equipment (bulk tank, truck, plant raw silos) actually selects for these bacteria. Several factors lead us to believe this.

1. *Bacillus* growth tend to form biofilms, protecting them from sanitizers,

2. The cold environment for the raw milk handling equipment favors psychrotrophic bacteria,

3. The stress to the bacteria after removing the nutrients may cause the bacteria to sporulate,

4. Raw milk handling equipment is often not cleaned or sanitized effectively,

5. The humid conditions of the raw milk handling equipment could favor sporulation, and

6. Contamination rates as low as one heat-resistant psychrotroph per liter could result in quality defects in pasteurized products.

While eliminating the heat-resistant psychrotrophs from raw milk may be impossible or at least highly unlikely, there are some things that can be done to reduce their effect on pasteurized milk quality.

1. Implement effective sanitation programs with the raw milk handling equipment, particularly for the over-the-road tanker trucks. These include sprayball monitoring , visual inspection (when surfaces have dried), monitor CIP solutions (time, temperature, solution concentration, pressure/flow), use of hygiene monitoring systems and routine acid washes. Raw milk equipment requires the same level of care as pasteurized milk handling equipment,

2. Keep the pasteurized product as cold as possible. Heat resistant psychrotrophs do not grow as well at temperatures below 40ºF,

3. Follow manufacturer's recommendations for desludging cycle and "shoot" times, and

4. Educate, motivate and monitor suppliers or find new suppliers.

A number of our customers who have implemented these measure have improved the quality of their products.

TABLE 2:

The QMI Heat Resistant Psychrotroph Test:

1. Aseptically collect a sample of raw milk using the 250ml QMI bag and the QMI Aseptic Sampler,
2. Lab Pasteurize the sample in the bag at 75ºC for 20 minutes,
3. Place in a 45ºF incubator, and
4. Determine Standard Plate Counts at the end of code. Identify bacteria using gram-staining procedures.

NOTE: At the present time, Dr. Mansel Griffiths and associates from the University of Guelph in Canada are conducting research to investigate procedures to improve the QMI Heat Resistant Psychrotroph Test and to find ways of shortening the time it takes to obtain results.

To learn more about monitoring the sources of heat-resistant psychrotrophs, please contact QMI.

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You can find the following information now on our website:

- Regulatory Approvals/Validation Studies
- Standard Operating Procedures (SOP's) - English and Spanish versions
- News and Announcements
- Order Form for Placing Online Orders
- Newsletters (Current and Archived)
- Complete Parts List with Photos

We hope that the updated site will help QMI customers become more familiar with our products and product use.

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