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Raw Milk Sampling Update

(Full Length Presentation)

QMI®

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Overview: Industry Changes Create Raw Milk Sampling Challenges

- ◆ Technology changes affect harvesting, cooling, storing and transporting raw milk
- ◆ Updated raw milk sampling regulations are needed
- ◆ Homeland Security issues are present

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Goals for Effective Raw Milk Sampling

- ◆ Accurate sampling
 - ◆ aseptic
 - ◆ representative
- ◆ Safety & security
 - ◆ OSHA
 - ◆ Homeland Security compliance
- ◆ User friendly procedures
- ◆ Economic benefits



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Raw Milk Sampling Challenges

- ♦ Petcock sampling is not aseptic
- ♦ Traditional dip sampling presents aseptic challenges
- ♦ Raw milk stratification results in sampling inaccuracy
- ♦ Unsecured lids compromise food safety and homeland security
- ♦ Dip sampling creates OSHA hazards
- ♦ Improve operating efficiency

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Food Safety & Homeland Security Concerns

- ♦ Unauthorized access
- ♦ Pasteurization will not control some intentional contamination
- ♦ Economic harm could be substantial

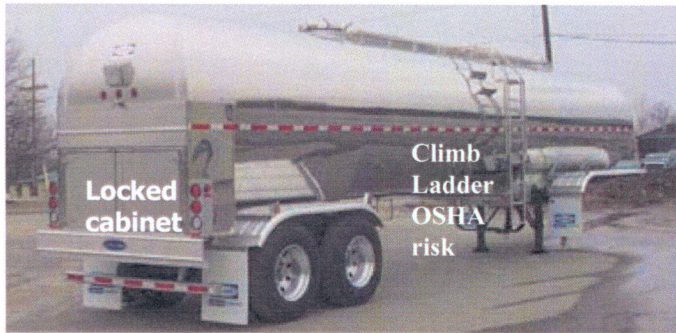
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Homeland Security Hypothetical

- ♦ What If . . .
 - Intentional adulteration of over-the-road tanker truck introducing { X } at 10^{10} concentration
 - After processing at dairy plant, concentration reduced to 10^2 /ml
 - Remains detectable in consumer product
- ♦ Emotional impact
- ♦ Financial impact

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Dip sampling creates OSHA hazards



The ideal location for the QMI® sampler and temperature probe is inside the locked cabinet.

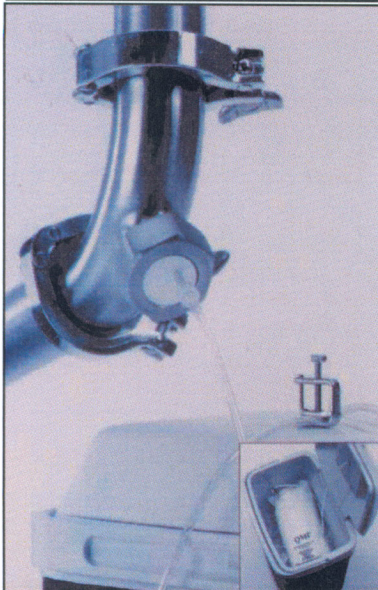
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Solution for Current Sampling Challenge:

The QMI® Aseptic Sampling System

- ◆ String Sampling on Dairy Farms
- ◆ Bulk Tank or Silo Sampling
- ◆ Direct Load Sampling
- ◆ Over-The-Road Tanker Truck Sampling

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QMI® Aseptic Sampling System For String Sampling

- ◆ Improve Milk Quality
 - ◆ somatic cell
 - ◆ bacteria counts
- ◆ Manage mastitis
 - ◆ cultures
- ◆ Accurate component analysis
 - ◆ fat, protein, etc.

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Two University Studies for Field Validation

Journal of Dairy Science

QMI® Aseptic Sampling Systems
are proven methods of sampling for
dairy herd management:

***Milk Quality and Udder Health, and
Milk Component Data.***

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QMI® Aseptic Sampling System For Farm Bulk Tank or Silo Sampling

- ◆ Assure quality bonuses
- ◆ Proven Aseptic
- ◆ Other systems are not aseptic
 - ◆ Petcock sampling is not aseptic
 - ◆ Dip sampling is not aseptic Assure quality bonuses

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The FDA Approves The QMI® Aseptic Sampling System For Silo Sampling

- ◆ *Option One:*
draw sample with needle & syringe,
then empty syringe into vial sample
container
- ◆ *Option Two:*
use needle as a spout to fill vial

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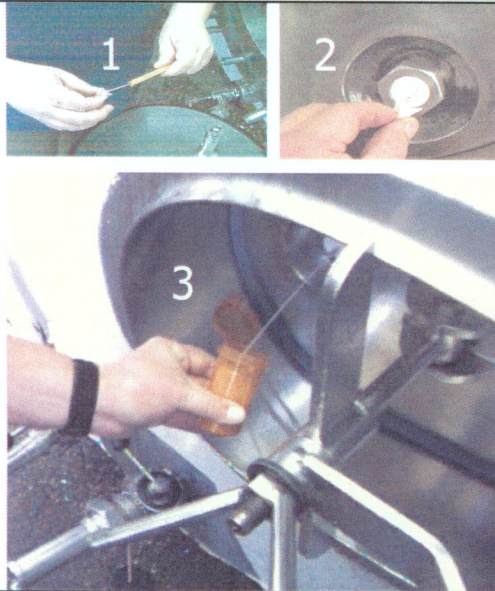


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Aseptic Sampling

Needle Only Method

1. Aseptically remove needle from case - hold needle with alcohol swab
2. Insert needle through one of seven sampler guide holes
3. Fill sampling container without touching container to needle
4. Immediately place sample container on ice



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The FDA Approves The QMI® Aseptic Sampling System For Direct Load Sampling

- ♦ SOP – Standard Operating Procedures
 - ♦ available from QMI®
- ♦ Use the QMI® Composite Sampling Assembly
 - ♦ needle, tube, 2 L or 5 L bag
- ♦ Tanker truck sampling article on QMI Website:
 - ♦ www.qmisystems.com
/ Newsletters / March 2005

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QMI® Aseptic Sampling System For Over-The-Road Tanker Truck Sampling

- The QMI® System allows sampling before milk stratification
- OSHA compliance
- Improve receiving bay efficiency
- Secure top hatch (Homeland Security issues)
- Approved for component sampling

Note: QMI® is conducting research for FDA approval of quality sampling

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QMI® Aseptic Sampling System Allows Sampling Before Stratification Of Milk During Truck Hauling

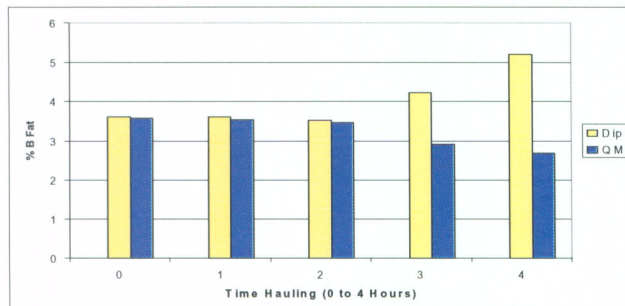


Chart Bars: Dip [yellow] = traditional dip sample taken near top of truck
QMI [blue] = QMI Aseptic Sample taken near bottom of truck

Conclusion: To obtain a representative sample, take a QMI Aseptic Sample immediately after filling the tanker truck, before stratification occurs during hauling.

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CHANGES IN DAIRY INDUSTRY

- ◆ Improved Sanitation
- ◆ Improved Equipment
- ◆ Regulatory Involvement

- ◆ Effective industry quality efforts resulted in effective control of post pasteurization contamination (PPC).



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Control of PPC improved:

- ◆ Shelf life
- ◆ Safety
- ◆ Quality

- ◆ Fluid milk shelf-life has improved from 10-14 days to 18-21 days

- ◆ NEXT: heat-resistant psychrotrophic bacteria need to be monitored and controlled



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Challenge for Dairy Industry

- ◆ Recognize the effect of heat-resistant psychrotrophic bacteria on market milk

- ◆ Establish methods of monitoring and controlling heat-resistant psychrotrophic bacteria



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Effect of Psychrotrophic Sporeforming Bacteria on Quality of Market Milk With Longer Shelf Life



- ◆ Raw Milk Quality can influence the keeping quality of market milk
- ◆ Psychrotrophic sporeforming bacteria can cause defect in 18 days or more

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University of Minnesota Study

To determine the effect of psychrotrophic spores on today's milk quality, plate counts were conducted on samples collected with the QMI® Aseptic Sampler and the QMI® Composite Bag from the discharge of the HTST.

- Samples were free from gram-negative bacteria
- Gram-positive (psychrotrophic sporeforming) bacteria grew in some samples.

The study showed that psychrotrophic spores can affect the quality of market milk.

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University of Minnesota Study

Effect of Gram-Positive Psychrotrophic Bacteria on Dairy Product Quality

Sample	Dairy	Bag	Week 3 CFU/ml	Week 4 CFU/ml
			Gram +	Gram +
3/16/2004	Plant B	A	<10	<10
Tuesday		B	<10	<10
3/17/2004	Plant A	A	7.56×10^4	1.0×10^6
Wednesday		B	2.33×10^4	1.93×10^6
3/24/2004	Plant A	A	1.41×10^6	1.05×10^7
Wednesday		B	0.95×10^6	3.1×10^7
3/31/2004	Plant A	A	<10	<10
Wednesday		B	<10	<10
4/2/2004	Plant B	A	6.7×10^5	2.5×10^6
Friday		B	4.96×10^5	6.5×10^6
4/15/2004	Plant B	A	<10	6 x 10
Thursday		B	<10	<10

Weekly Counts from Milk Samples Taken at the HTST and stored at 45° F

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Cornell University Study

Found that the most significant factor affecting shelf life was the growth of heat resistant, psychrotrophic, gram-positive bacteria.

- 50% of samples: bacteria counts were greater than 1,000,000 CFU/mL after 17 days of refrigerated storage
- 87% of microbial colonies analyzed were gram-positive rods
- *Paenibacillus*, *Bacillus*, *Microbacterium*
- *Paenibacillus* appears to be gram-negative in staining procedures, but actually is gram-variable.

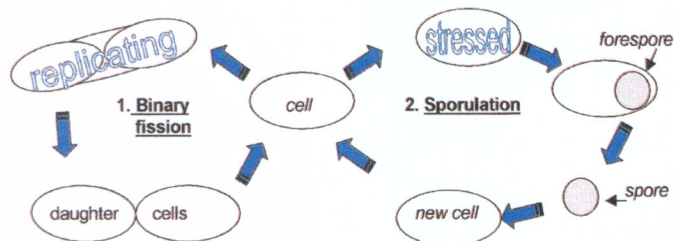
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Why Spore Forming Bacteria are a Problem to the Dairy Industry

- ◆ Spores are resistant to:
 - ◆ Chemicals
 - ◆ Heat
 - ◆ Sanitizers
- ◆ Raw milk dairy equipment may be selecting for psychrotrophic spore-forming bacteria
- ◆ HTST - Heat shock spores into out growth

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SPORULATION OF GRAM POSITIVE BACTERIA



Raw milk dairy equipment creates sporulation conditions

HTST – heat shocks spores into outgrowth

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Raw Milk Handling Equipment: Source of Psychrotrophic Spores

- ♦ *Bacillus* species – tendency to form biofilms
- ♦ Cold environment of raw milk handling equipment - favors psychrotrophic bacteria
- ♦ Stresses to bacteria (i.e. removal of nutrients) can cause bacteria to sporulate

continued on next slide ...

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Raw Milk Handling Equipment: Source of Psychrotrophic Spores

... Concluded

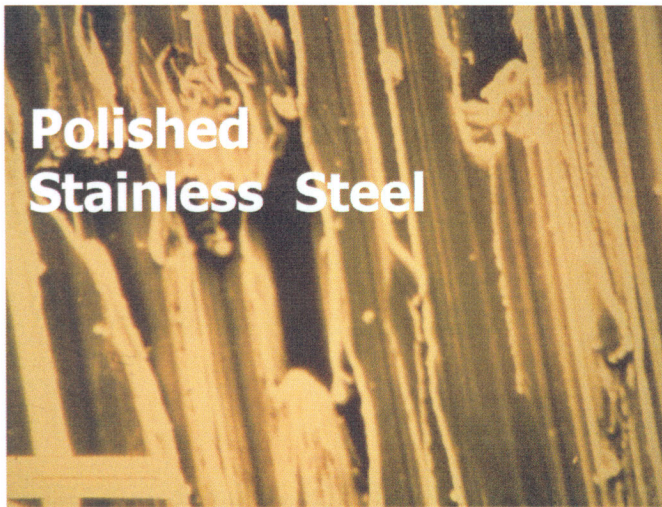
- ♦ Effective sanitation of raw milk handling equipment is often neglected
- ♦ High humidity conditions favor sporulation
- ♦ Contamination rates as low as 1/liter could cause quality defects in pasteurized milk

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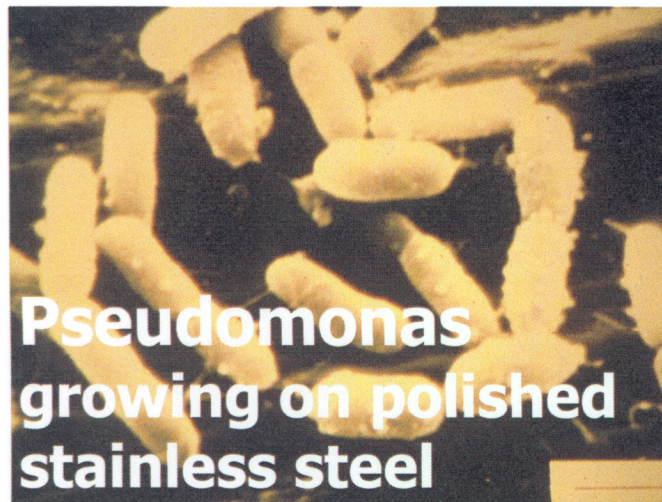
QMI[®] Heat Resistant Psychrotrophic Test Results

Plant Silos	1/23/2006	9.0×10^5	1.0×10^7
	1/29/2006	2.0×10^5	2.0×10^6
	2/ 2/2006	6.7×10^7	1.0×10^6
	2/ 3/2006	2.0×10^5	$< 10^4$
	2/ 8/2006	3.5×10^7	3.5×10^7
Farm Bulk Tanks	2/24/2006	$< 10^4$	$< 10^4$
	2/26/2006	3.0×10^5	1.5×10^6
* LP samples stored at 45° F for 18 days			

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Procedure One:

To determine if psychrotrophic
sporeformers are affecting the quality
of your market milk products:



Sampling

1. Use the QMI® Aseptic Sampling System, aseptically obtain a 2L or 5L pasteurized milk sample using the QMI® Composite Sampling Bag

continued ...

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Procedure One, concluded:

To determine if psychrotrophic sporeformers are affecting the quality of your market milk products:

Testing

2. Incubate the sample in the bag for 18 – 24 days (end of code) at 45°F (7°C).
3. Conduct a Standard Plate Count.
4. Identify any bacteria using gram stain procedures or other procedures for samples with counts greater than 1,000,000/ml.

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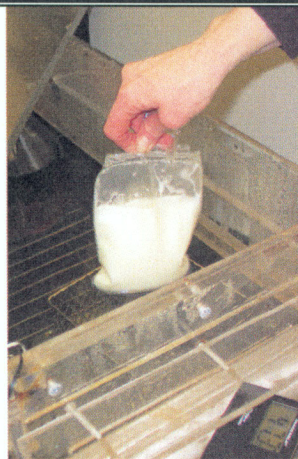
Procedure Two:

QMI® Heat Resistant
Psychrotrophic Bacteria Test

Objective: Determine Sources

1. Aseptically fill a 250ml bag with raw milk
2. Lab pasteurize (LP) sample at 75°C for 20 minutes
3. Place in 45°F (7°C) keeping quality incubator
4. Determine SPC at 18 days or end of code
5. Identify bacteria

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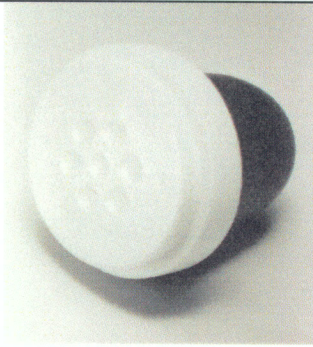


Lab pasteurize QMI® 250ml aseptic sampling bag

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QMI® Successful History

- ♦ 30 years of successful sampling
- ♦ Customers in thirty countries
- ♦ Used in more than 1000 processing plants
- ♦ Used on hundreds of dairy farms
- ♦ Accepted by farmers and veterinarians for components and herd management



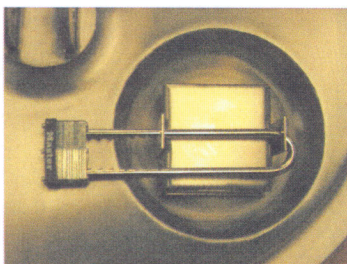
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QMI® System Features

- ♦ Aseptic
- ♦ University validated
- ♦ Allowed by *Standard Methods*
- ♦ Conforms to H A C C P principles
- ♦ Authorized to use 3A symbol
- ♦ Pre-sterilized
- ♦ Stable for heat, pressure and length of use
- ♦ Easy to install

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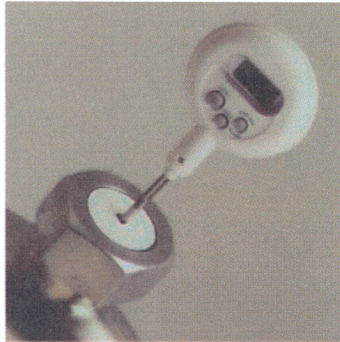
QMI® Locking system covers sampling ports



Pad lock system shown above.
Also available: tamper evident plastic with security seal.

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QMI[®] Probe System



Standard
Thermometer
or
Recording
Thermometer

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PUBLIC HEALTH SECURITY AND BIOTERRORISM PREPAREDNESS AND RESPONSE ACT OF 2002

Requires improvements in
sampling methodologies and
securing the food supply
to prevent the intentional contamination

See website:
www.fda.gov/oc/bioterrorism/bioact.html

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QMI's Current Research

- ♦ QMI[®] – Quality Management, Incorporated, conducts on-going research in various aspects of continuous process monitoring.
- ♦ Ask for QMI's Newsletter. Send your mailing information to QMI:
Email: info@qmisystems.com
Mail: QMI, 426 Hayward Ave. No., Oakdale, MN 55128
Tel: 651 - 501 - 2337
Fax: 651 - 501 - 5797
- ♦ QMI[®] Systems are protected by various domestic and foreign patents and other intellectual property protections.
- ♦ Visit QMI's website: www.qmisystems.com

This is the end of: *QMI's Raw Milk Sampling Update (Full Length Presentation)*

See also: *QMI's presentations on:*
Effective Line & Tank Sampling On Dairy Farms,
Installation Instructions For Dairy Farms, and
Monitoring Microbial Contamination.

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