



MilkTech International



Cleaning and Sanitation Introduction Bulk Tank Bacteria Diagnosis



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NMC Procedures for Troubleshooting High Bacteria Counts in Farm Milk

- 🐘 These procedures are divided into five parts.
- 🐘 This lesson will introduce you to Part 1.
- 🐘 **Part 1: Analysis of Bulk Tank Bacteria Counts**
- 🐘 Part 2: Observe CIP Procedures
- 🐘 Part 3: Water Quantity
- 🐘 Part 4: Unit Flow Balance
- 🐘 Part 5: Milkline Slug Flow Analysis

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Part 1A: Bulk Tank Analysis

- 🐘 We will use the differential diagnosis method presented by Guterbock and Blackmer (1984) as a tool to determine the most likely cause of high bacteria counts.
- 🐘 These three bacterial tests are used for a differential diagnosis.
 - Standard Plate Count (SPC)
 - Lab Pasteurized Count (LPC) or Thermoturic Count
 - Coliform Count (Coli)



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SPC Is a Routine Test Conducted by the Milk Plant

- 🐘 Some plants use a plate loop count (PLC), total bacteria count (TBC), or direct bacteria count (Bactoscan).
 - These are broad-spectrum tests that indicate the total number of bacteria, but not the type of bacteria.
 - They indicate if there is a problem, but they cannot identify the source of the problem.

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Diagnostic Tests to Determine the Source of Problems

-  Lab pasteurized count (LPC) or thermoduric count
 - Pasteurization eliminates mastitis bacteria and common environmental organisms.
 - This is the best indicator of a persistent cleaning failure.
-  Coliform count (Coli)
 - Coliforms indicate fecal contamination of milk.
 - This is the best indicator of milking hygiene problems and the environmental contamination of milk.



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Levels That Indicate Excellence, Warning, or That Immediate Action Is Required (SCC is included as a reference)

	Good	Warning	Bad
SPC	<1,000	5,000	50,000
LPC	<10	100	750
Coli	<10	100	750
SCC	<100 k	250 k	>400 k

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Differential Diagnosis




-  This method relies on the **RELATIVE COMPARISON** between numbers to formulate a diagnosis.
-  The most common misapplication of the method is the formulation of a diagnosis based on only one of these numbers without considering the relative values of the others.

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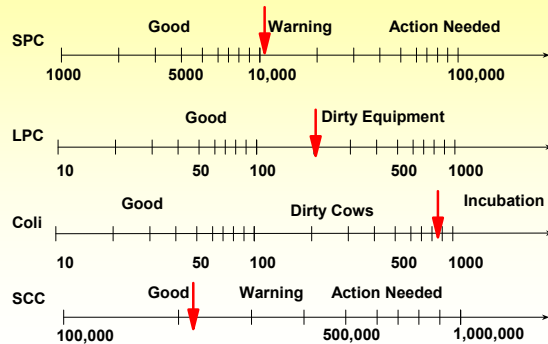
Factors Contributing to the Growth of Bacteria Already in the Milking Machine

-  Cleaning failure
 - Incubation site for bacteria during milkings and between milkings.
-  Long milking time
 - Incubation of bacteria during milking.
-  Poor cooling
 - Incubation of bacteria in milk storage tank.

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See the next slide for the decision rules for this diagnosis.

Example of Poor Milking Hygiene



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3 parts to the decision rule

Milking wet and/or dirty cows (and there are no other sanitation problems).

- ❶ COLI is between 100 and 1000, and
- ❷ LPC is less than COLI, and
- ❸ SPC is moderately elevated (5000 - 20,000).

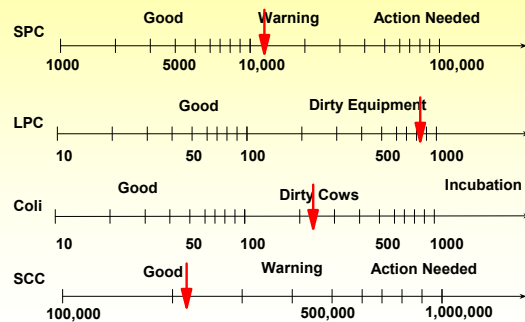
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See the next slide for the decision rules for this diagnosis.

Example Equipment Cleaning Problem



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3 parts to the decision rule

Persistent milking machine cleaning problem exists (and there are no other sanitation problems).

- ❶ LPC is between 100 and 1000, and
- ❷ COLI less than LPC, and
 - ✓ (probably because of the use of an effective sanitize cycle)
- ❸ SPC is moderately elevated (5000 - 20,000).

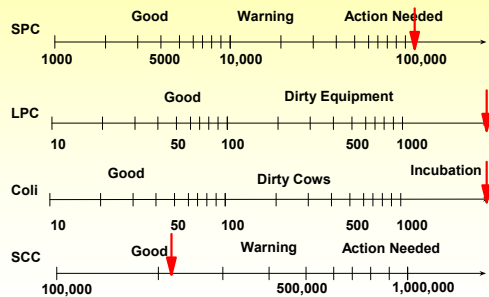
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See the next slide for the decision rules for this diagnosis.

Example Incubation Problem Strategic Sampling Recommended



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Incubation in the milk handling system - usually during milking

Multiple sanitation problems could be contributing to these elevated counts and further investigation is recommended (strategic sampling).

- ❶ COLI is greater than 1000 (or TNTC), and
- ❷ LPC is greater than 100 but less than COLI (Or TNTC), and
- ❸ SPC is extremely elevated (greater than 50,000 to 100,000 or TNTC).

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Know your enemy

- 📁 There are many types of bacteria present in the environment, the udder and the bulk tank.
- 📁 The more you know about the specific types of bacterial in bulk tank milk, the better your diagnosis will be.
- 📁 Quantitative Bulk Tank Cultures, commonly used for Mastitis Control, is an excellent source of this data.

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Understanding: Mastitis organisms in the bulk tank

- 📁 Mastitis organisms that most often influence bulk milk count are:
 - ❶ Streptococcus spp.,
 - ✓ Most notably *S. agalactiae* and *S. uberis*.
 - 📁 Staphylococcus aureus
 - ❷ Is not a frequent contributor to total bulk tank bacteria count.


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Understanding: Mastitis organisms in the bulk tank

 Detection of environmental mastitis pathogens does not necessarily indicate that they originated from cows.


- ❶ Environmental mastitis pathogens occur in milk as a result factors other than mastitis infection.
- ❷ Correlation of somatic cell responses and bulk tank environmental mastitis organisms is poor.

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Understanding: Environmental bacteria in the bulk tank

 Organisms associated with bedding materials that contaminate the surface of teats and udders include:


- ❶ Streptococci,
- ❷ Staphylococci,
- ❸ Spore-formers (thermodurics),
- ❹ Coliform, and
- ❺ Other Gram-negative bacteria.

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Understanding: Environmental bacteria in the bulk tank

 Both thermoduric (bacteria that survive pasteurization) and psychrotrophic (bacteria that grow under refrigeration) bacteria are commonly found on teat surfaces.


- ❶ Contamination from the exterior of the udder can influence SPC, LPC and PIC.

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Understanding: Environmental bacteria in the bulk tank

 Milking heavily soiled cows could potentially result in bulk milk bacteria counts exceeding 10,000 cfu/ml

- ❶ higher coliform, or other environmental bacteria counts are more likely to occur due to incubation in milk handling equipment.
- ❷ Elevated bulk tank coliform counts can also result from coliform mastitis in the herd.

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Bacteria related to Cleaning and Sanitation

- ☞ Significant buildup of thermophilic organisms (LPC) in milk residue may take several days to weeks and are therefore an indication of a persistent cleaning failure.
 - Old cracked rubber parts provide a breeding location and are also associated with higher levels of thermophilic bacteria.

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Bacteria related to Cleaning and Sanitation

- ☞ Some types of cleaning failures can also select for faster growing, less resistant organisms, principally.
 - Gram-negative rods (coliforms and Pseudomonads) and
 - Lactic streptococci and can result in high PIC.

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Bacteria related to Cleaning and Sanitation

- ☞ Effective use of chlorine or iodine sanitizers has been associated with reduced levels of psychrotrophic bacteria that cause high PIC.

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Bacteria related to Refrigerated Milk

- ☞ Elevated psychrotrophic bacteria counts are often associated with poorly cleaned refrigerated bulk tanks.
 - Psychrotrophic bacteria can quickly become dominant after incubation at 4.4° C (40° F) resulting high PIC.

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Other Diagnostic tests

Preliminary Incubation Count (PIC)



- Used by some dairy plants as an indication of shelf life of fluid milk.
- Organisms associated with high PI counts can continue to grow during raw storage (i.e. at the plant).
 - ✓ Associated with production of heat stable enzymes that cause defects in milk.

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Other Diagnostic tests




-  PIC is performed by holding a milk sample at 12.8° C (55° F) for 18 hrs. followed by the SPC procedure.
 - PIC selects for bacteria that can grow at cool temperatures.
-  PIC values should be less than 3-4x the SPC,
 - or less than 25-50,000/ml.

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Why Should Bulk Tank Cultures Be Performed Regularly?

-  To provide an early warning of a developing problem.
-  To provide background information and how bacteria counts change over time as an aid to interpretation and diagnosis.
-  To help identify and solve problems more effectively and efficiently.

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