

Raw Milk Quality Tests

Background and Herd Health

In order to make dairy products of high-quality, high-quality milk is required. Once raw milk is defective, it cannot be improved through processing or other means. Therefore, it is important that raw milk be produced and handled from farm to plant under conditions that do not reduce its quality or the quality of the product. There are many factors that can influence the quality of raw milk.

Unhealthy dairy cows have the potential to give milk that is lower in quality and wholesomeness. Mastitis, inflammation of the udder, is one of the most common herd health concerns. Mastitis most often results from bacterial infection. The infection causes an increase in milk somatic cell levels. While the limit for Grade "A" milk is 750,000 cells per milliliter (ml), somatic cell counts (SCC) exceeding 2-300,000 generally indicate mastitis in the herd. High SCCs can result in quality defects in raw milk and processed dairy products.



Bacterial Contamination

Milk secreted from the udder of a healthy cow contains relatively low numbers of bacteria. Bacteria counts increase in raw milk due to contamination of and/or growth in the milk. Causes of high bacteria counts include:

- Poor pre-milking hygiene methods
- Inadequate cleaning and sanitization of milk equipment
- Poor cooling
- Mastitis

While the legal limit for total bacteria in farm Grade "A" raw milk is 100,000/ml, counts of 10,000 or less is considered desirable and achievable by most farms. Although pasteurization and more severe heat treatments kill most bacteria in milk, some strains produce enzymes that survive the heat treatment. Heat-stable enzymes have the potential of further degrading the processed product, especially long-life, shelf-stable products (UHT milk). Certain types of bacteria can survive pasteurization and among these, certain strains grow under refrigeration, limiting the shelf-life of pasteurized fluid milk products.

Antibiotics and Drug Residues

Antibiotics and other drugs are often used to treat cows with mastitis or other infections. When a cow is treated, its milk is generally withheld from the bulk tank until treatment stops and milk is free of drug residues. All raw milk tank trucks are screened for the presence of beta-lactam drugs (i.e., the penicillin family) at dairy plants before they are unloaded, therefore minimizing the potential for contaminants in processed dairy products. Other antibiotics are tested for randomly or routinely in some plants. Antibiotics in milk are a concern due to the risk of allergic reactions and the development of antibiotic resistant pathogens.



Sediment

Sediment in milk is generally due to poor pre-milking hygiene procedures. Proper conditions for cow cleanliness are important to reduce soil on animals. Sediment in milk is measured by filtering the milk and visually examining it and comparing to a standard. High sediment levels in milk are associated with filth and the potential for bacterial contaminants that can influence quality.

Added Water and Freezing Point of Milk

Added water can occur in milk due to unintentional (e.g., poor system drainage) and intentional addition. Added water can be detected in milk by measuring its freezing point (FP). The FP of milk is slightly less than that of pure water and relatively constant. Raw milk generally has an FP below minus 0.542 degrees Hortvett ($^{\circ}\text{H}$); $^{\circ}\text{H}$. NY State uses a cut-off of minus 0.530 $^{\circ}\text{H}$ or higher (less negative) as cause for investigation. Added water reduces the value of the milk by diluting the protein and other milk components and will influence product yields.

Farm Related Off-Flavors

Off-flavors and odors can be present in raw milk due to practices on the farm. Most flavor/odor defects will be carried over into the finished product, although some of the volatile defects can be partially removed. Defects in milk can be classified as:

- Absorbed: odors breathed in by cows or odors directly absorbed by the milk during storage
- Bacterial: spoilage microorganisms
- Chemical: related to enzymes and spontaneous chemical reactions, health of the cow, and/or direct chemical contamination.

Want more information on [raw milk](#), [quality tests](#), and the MQIP? Contact Nicole Martin (nicole.martin@cornell.edu) in the Milk Quality Improvement Program or visit our website

<https://foodsafety.foodscience.cornell.edu/mqip/>

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