On dairy farms, raw milk encounters bacteria either through cases of mastitis or from environmental contamination of the milking system. If cleaning and sanitizing procedures are inadequate, these bacteria can multiply on the inner surfaces of pipelines and storage units and become major contaminants of the raw milk, resulting in high standard plate, preliminary incubation, lab pasteurized and coliform counts.

Chemical, thermal and physical processes are used to clean milking equipment. A failure in any one of these processes may enable bacterial growth and a loss of quality, losses of premiums and, in some cases, rejection of entire loads of milk.

Cleaning problems can occur whether you are milking 50 cows or 5,000 cows. It is wise for every farmer to establish best management practices to minimize the risk of cleaning system failures. A yearly wash evaluation is recommended to help identify wash system issues and milking system problem areas that may reduce milk quality.

A complete wash analysis of clean-in-place systems (CIP) include:

- Measurements and evaluations of temperature
- Conductivity (a measure of pH; pink line) and temperature (red line) for a CIP cycle. Temperature for the initial rinse ranges between 104° and 94° F; for the wash, it ranges between 154° to 104° F. The green line in the bottom graph shows the amount of turbulence in the system during the cycle. Turbulence during main wash ranges from 5 to 9.5, indicating proper “scrubbing” of the system.

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Dr. Linda Tikofsky

When milk prices are low, it is a shame to leave milk quality premiums on the table. Create standard operating procedures for daily monitoring of your cleaning procedures, and schedule an annual wash system evaluation.
Cycle length and slugging action

Wash system steps

Before we can troubleshoot wash problems, we need to understand the components of the wash cycle.

As soon as cows have been milked and all milk has been transferred to the bulk tank, the milking system should be rinsed with warm water (100°-130° F) to effectively melt fats, but to avoid cooking milk proteins to the inside of the system. The rinse should be completed in one pass, and rinse water should not be recirculated.

Although a thorough rinse will remove much of the fat and protein residues remaining on surfaces, it is necessary to then wash the system with a detergent (most commonly these are chlorinated, alkali detergents).

Since water hardness may alter the effectiveness of detergents, it is important to have your water hardness tested to select detergents appropriate for your water. Water required for the wash cycle should be hotter than that used for rinsing (160°-170° F) and dump water should be at least 120° F. One of the most common causes of cleaning failures is water that is not hot enough (failing hot water heater) or not enough hot water available (insufficiently sized hot water heater). Usual length of the rinse cycle is 3-5 minutes.

Vacuum is used to pull cleaning fluids through the milking system rapidly. Most larger systems use an air injector to intermittently introduce air into the pipeline to create slugs of cleaning solution. These repeated slugs move through the system quickly (20-30 ft./second) and essentially “scrub” the inside of the pipeline clean. Wash water should circulate for 8-10 minutes before dumping.

Alkaline detergents will leave residues in the system which should be neutralized to prevent the build-up of detergent films. Acid rinses are commonly used as neutralizing agents and also dissolve any mineral deposits on the inner surfaces of pipelines and holding tanks. Acid rinse cycle lengths are similar to the length of the initial rinse, commonly 4-6 minutes.

Finally, the Pasteurized Milk Ordinance (PMO) requires that the milking system be sanitized immediately before the next milking to eliminate any bacteria that may have grown on surfaces between milkings. Most sanitizers are chlorine or iodine-based, although some farms use acid sanitizers that combine the rinse and sanitization steps into one.

Troubleshooting cleaning problems

According to the PMO, the regulatory limit for a standard plate count (SPC) in raw milk is 100,000 colony-forming-units per milliliter (cfu/ml). Most processors, however, will pay premiums for raw milk with SPC’s less than 10,000 cfu/ml. If bacteria counts are a problem, or if you wish to lower your bacteria count to reach a premium level, there are simple parameters you can monitor regularly to identify problems with your wash system.

With a stopwatch, a thermometer, pH paper and a good flashlight, you have the tools to measure circulation times, the temperatures of rinse, wash and dump fluids, and the acidity or alkalinity of different fluids to be sure you are using the proper concentrations. Visually inspect surfaces that are in contact with milk. Hard-to-clean components of the milking system include milk meters, receivers, worn liners, joints, gaskets, elbows in the pipeline and short milk tubes. Spray balls for bulk tank cleaning may become plugged and fail to clean areas inside the bulk tank.

The QMPS Wash System Analysis Service can further identify breakdowns in your wash system. QMPS technicians are trained with state-of-the-art equipment to independently assess CIP procedures on dairy farms of any size. More sophisticated equipment is necessary to measure slug formation and rate of passage through the pipeline more sophisticated equipment is necessary. QMPS technicians usually measure these parameters using a LactoCorder™, which can measure turbulence, solution temperature and pH all at the same time.

Examples of a proper system wash (Figure 1) and a poor system wash (Figure 2) are provided.

When milk prices are low, it is a shame to leave money on the table by losing out on premiums for quality. Take some time to create some standard operating procedures for daily monitoring of your cleaning procedures and schedule your annual wash system evaluation. p

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dairyone.com

How to reach us...
Dr. Linda Tikofsky is Sr. Extension Veterinarian in Ithaca, N.Y. Tel: 607-255-8202. Email: lg40@cornell.edu.

QMPS is a program within the Animal Health Diagnostic Center, a partnership between the New York State Department of Agriculture and Markets and the College of Veterinary Medicine at Cornell.

The QMPS staff of veterinarians, technicians and researchers works with New York dairies to improve milk quality by addressing high somatic cell counts, milking equipment and procedures, and milker training in English and Spanish. QMPS also conducts research and teaching programs.

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Dairy One is an information technology cooperative, providing DHI records services and herd management software to dairies throughout the Northeast and Mid-Atlantic region. A comprehensive laboratory network provides milk quality testing as well as forage, soil, manure and water testing.

Contact Dairy One Cooperative Inc. at 730 Warren Rd., Ithaca, N.Y. 14850. Tel: 800-344-2697. Email: dmr@dairyone.com Website: www.dairyone.com

Veterinarian in Ithaca, N.Y . Tel: 607-255-8202. Email: lg40@cornell.edu.

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