UT Extension
W182

Tennessee Quality Milk Initiative

Troubleshooting Bacteria Counts

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Troubleshooting high bacteria counts is the proverbial "needle in a haystack" situation. There are hundreds to thousands of places - from the cow to the bulk tank - where bacteria can invade, set up housekeeping and multiply at phenomenal rates. Typically, your first indication that there is a problem is a phone call from your milk buyer representative with notice that your SPC or PIC is high. This causes great concern because this phone call is in response to your bacteria count exceeding the regulatory limit, the milk buyer's limit and/or the premium limit. Not correcting the problem quickly will come at a high price, but where do you start? Much literature is available on bacteria counts, and most sources indicate high bacteria counts are due to improper cleaning or build-up. Unfortunately, that does not narrow the search for you, and realistically, it is more complicated than that. This publication outlines routine procedures to adopt as a guide - simple steps to prevent problems and to help you solve occasional problems.

Prevention

Many times, high bacteria counts result from routine tasks that must be performed by humans and machines not being completed. Unfortunately, neither of these is perfect. Following are suggestions that may help ensure tasks are performed as they should be.

Employee Training

Most farms must hire employees to milk cows. You depend on them to follow milking procedures accurately for good udder health and bulk tank milk quality. Also, they are required to use a number of different chemicals to accurately clean the milking equipment. Milkers are extremely important employees! If their job is not performed correctly, even during one milking, it may affect your bottom line.

When employees are first hired, they should receive extensive hands-on training, even if they have milked on another farm before. Each farm is unique; each milking system is unique; each set-up is unique; each cleaning system is unique. Spend a lot of time with new hires explaining each step - from udder prep to sanitizing the system. Do not simply go through the steps, but explain why each step is important and how it may affect cows and/or bulk tank milk quality if not performed correctly. It may also be helpful to provide a detailed written copy of all procedures. Typically, most training sessions are rushed, and there are a lot of steps for new employees to remember quickly. After explaining each procedure during training, ask questions to verify they fully understand how to perform each step. New hires should be paired with a trusted employee (or yourself) during their first few milking shifts and until they are comfortable completing assigned tasks on their own. Also, many farms find it helpful to conduct annual training sessions for all employees as reminders of procedures.

Other suggestions that have been used with success:

- Post all milking procedures in the parlor - include information about how to identify mastitis, treat cows, identify treated cows and discard milk from treated cows.
- Post cleaning procedures in the tank room - include amounts of each chemical to be added during each cycle.
- Use a marker to clearly identify all chemical barrels with content and use. Most barrels look the same, and sometimes only upon close inspection can you distinguish between them. Clearly labeling barrels with "Pre-dip", "Post-dip", "Detergent", "Acid Rinse", "Sanitizer", etc. may reduce employee confusion, as reading levels may vary among employees. Short, one-word clues are easier to understand than tiny print of chemical names on barrels. If chemicals must be mixed by hand or added into the system by hand, write the amount needed on barrels as well.
- Once a week, mark barrels with a permanent marker to keep track of usage. This will ensure that barrels do not run dry without anyone noticing.
- Provide clean udders for milkers. Dirty teats and udders are a huge source of high bacteria counts. Reduce the chances of a dirty teat being milked by improving udder hygiene through regular lot and alley scraping and proper bedding maintenance.
- Use a pre-dip to kill any bacteria on the teats before milking!
- All milkers should wear gloves during milking!
- Keep track of bacteria counts in relation to employee schedules. Occasionally, a pattern may be found, indicating one shift or one employee is not performing tasks as assigned.
- Observe milkers to ensure they are performing tasks properly. An unobtrusive way to check udder hygiene and udder prep is to frequently look at the milk filter after milking.
- Encourage employees to speak up if a problem occurs. Many times, employees are hesitant or fearful to come forward when they have failed to do an assigned task or something breaks down. If employees are comfortable with divulging problems, then you can react appropriately and quickly to solve the problem. A common source of a sudden bacteria spike is the tank cooler not being turned on. If you know ahead of time that it didn't occur until two hours into milking, then you won't be surprised when you get the phone call from your milk buyer.
- Post a calendar in the tank room (or office) that indicates when routine equipment observations and ordering of supplies should occur. Make note of which employee is responsible for each task (including yourself). When observations and checks occur, the outcome (ex: tank temperatures, etc.) should be recorded.

Routine Checks and Maintenance

Proper cleaning and sanitizing of milking equipment is necessary to maintain milk quality. Milk residues on equipment and milk contact surfaces support the growth of bacteria, even on "slightly dirty" surfaces. Additionally, automated systems are wonderful tools when they work properly. However, when they do not work correctly, you may spend a lot of time trying to find the problem. Routine checks and maintenance may reveal minor problems before they become major ones.

Routine Checks and Maintenance - Continued

Bulk Tanks:

- Bulk tanks should be washed and sanitized after each milk collection, not just simply rinsed. Most milk haulers perform this task, but not all. In some cases, the driver started the process, but the equipment failed. After each collection, someone should look into the tank to ensure it was washed. If not, it will need to be washed before the next milking!
- Flat tanks (i.e., square tanks) pose an additional problem. The inside of these lids are constantly splashed with milk. These droplets will stay on the lid of the tank, because their shape does not allow for draining, and there are numerous corners that can harbor milk droplets. Drivers should rinse the inside of lids before starting the tank wash because it will not get completely cleaned without a pre-rinse. It is similar to loading a plate of last night's spaghetti supper into the dishwasher the next morning. Despite all of the claims, I haven't found a dishwasher that can scrub off caked-on food!
- Once a week, look into the bulk tank with a flashlight for evidence of build-up. In a dry tank, if there is a bluish line, there is milk stone build up. (You cannot see milk stone on wet surfaces.) Milk stone is most visible at the highest milk levels. Although most believe milk stone is simply a mineral build-up, it also harbors other residues and bacteria. As one field representative explained it: Milk stone is similar to a two-day old cow pile. If it crusts over, it doesn't stink, but if you break it open, it stinks. If the tank is only being cleaned halfway, you break open the milk stone and it sheds bacteria. You have to fully get rid of it. If there is a yellow coloring or water beads in a wet tank, there is fat buildup. (Fat deposits will also feel greasy to the touch.) Any type of buildup indicates that the tank wash is not functioning properly.
- Once a month, observe the tank wash to ensure appropriate amounts of chemicals are being added. Common problems observed include automatic dispensers not pumping prescribed amounts into the system, cup threads wearing out and detaching from the system during the wash cycle.
- Improper tank temperatures are a huge problem. It is common knowledge that milk should be cooled to less than 40 degrees F within two hours of milking and stay below 45 degrees F during subsequent milkings. (Some processors require less than 42 degrees F.) Systems with a recording thermometer have an advantage, because cooling problems will be indicated quickly. However, for systems that do not have recording thermometers, checking bulk tank temperatures at least once a month during consecutive milkings and between milkings is necessary.

Other Equipment - From Milking Claw to Bulk Tank:

- Worn rubber parts are a bacteria haven! All rubber parts (gaskets, tubes, liners, etc.) should be replaced according to manufacturer's recommendations, because chemicals used for cleaning break down rubber surfaces. Even the slightest crack in a gasket is a welcome mat for bacteria. A good indicator of conditions inside rubber parts is the condition of the outside. If the outside looks worn, the inside is worn! A quick check for rubber hoses is to scrape a knife along the inside wall. If the hose breaks down easily and debris is removed, it needs to be replaced. Keep records of when all parts are replaced. This applies to ALL rubber parts, including those in the pulsator and vacuum systems. Also, gaskets in swing lines will wear out very quickly if they are not loosened before turning. They will need to be replaced more often.

Routine Checks and Maintenance - Continued

Other Equipment - From Milking Claw to Bulk Tank:

- Once a month, observe a complete cleaning routine. Verify that each cycle occurs, the chemical concentrations or amounts used and water temperature at the beginning and ending of each cycle. Wash water temperature should start at approximately 160 degrees F (which means temperature of a full vat, not simply the temperature when you turn the water on) and the end temperature should not be below 120 degrees F. However, excessively high temperatures in a pre-rinse will make proteins strongly adhere to surfaces. Use a thermometer to record temperatures! Simply running your hand under the water to see if it is hot is not adequate. Besides, if you can touch the water without getting scalded, it is not hot enough. Remember, not too hot, not too cold, but just right!
- During parlor clean up, hose exteriors should be washed off because milkers touch hoses and then attach milk units. Debris and bacteria on hose exteriors can enter the system in advertently.
- Bucket milkers (i.e., pot milkers, can milkers, etc.) must be thoroughly cleaned by hand after each milking. Typically, the cleaning process focuses on buckets, but the lid, inlets (hook-ups) and hoses are neglected. If attention is not paid to these other parts, there is no sense in washing the bucket!
- Failure to sanitize milk lines before milking will lead to elevated bacteria counts! If you do not sanitize equipment, you should adopt this practice immediately.
- Adopting a routine bulk tank milk culture program (once per week) will allow you to monitor specific bacteria levels in the tank. If specific bacteria levels start to climb, it is an indicator of potential problems.
- Pulsator and vacuum lines should be checked for milk deposits and buildup. Many believe that milk does not enter these systems. The fact is.... it does! If you are still not convinced, check your vacuum overflow. Many look like a science experiment. They need to be cleaned regularly. Air movements through the system will pick up small milk droplets and bacteria. These bacteria will thrive in dirty pulsator and vacuum lines. These lines need to be checked regularly and cleaned when necessary. Many high bacteria counts can be avoided by adopting this routine procedure. If milk enters the line frequently, this check may need to be performed more often.
- When routine pulsator and vacuum evaluations are performed, air injectors should also be evaluated. A proper slug is necessary for proper cleaning. Making sure air injectors are performing correctly will help ensure this component of the cleaning system is functioning as it should.
- Checking milk lines routinely for buildup may not be necessary when there is not a bacteria problem. However, when bacteria problems are encountered, looking inside milk lines will be necessary. An easier routine check may be to look into the receiver for buildup of milk stone, fat or protein.

Despite the adoption of routine checks, most producers will receive a phone call at some point indicating high bacteria levels. The last reaction to high counts should be taking the entire system apart. You should begin with the simplest actions first. Would you take the remote control apart when it stopped working or simply replace the batteries first?

Ask questions:

- Are there cows in the herd infected with *Strep. ag.*? Cows shedding high numbers of *Strep. ag.* can cause high SPCs. To answer this question, a routine culturing program must be in place to identify contagious pathogens.
- Are there cows with new infections? Cows may shed high numbers of coliform bacteria before clinical signs are apparent and cause PICs to spike. As a general rule, if the SPC is higher than the PIC, it is an indication of cows with mastitis being milked into the bulk tank.
- Most of the time, sudden spikes in bacteria counts are because routine procedures were not followed. Ask employees (or yourself):
  - Was the tank washed and sanitized?
  - Was the tank turned on at the beginning of milking?
  - Did soap/acid/sanitizer barrels run dry?
  - Others problems?
- Are spikes in bacteria counts routine? If yes, keep records of each incidence, including the cause of the spike. For most farms, it is the same reoccurring problem. If a pattern becomes evident, fix the problem!
- When were rubber parts last replaced (or checked)? Keep records of all rubber changes. Most of us rely on our memory to recall when something was last done. However, you may remember that it was done about a month ago, when in reality it was done two months ago or longer. Having those records to fall back on is an assurance that replacements are made on time.
- Are clean udders coming in the parlor? Did the lots get scraped? Was bedding maintenance performed as needed? If dirty udders are coming in the parlor, the chances of a high bacteria count occurring are fairly high.
- What was the PIC in relation to the SPC?
  - PICs are generally higher than SPCs (by 2-3 times). If PIC is 3-4 times the SPC, it typically suggests:
    - Improper cleaning and sanitation of milking system (lines and bulk tank)
    - Poor udder prep before milking (i.e., milking dirty cows, using water to wash udder or teats and not completely drying, not fore-stripping cows, etc.)
    - Failure to cool milk rapidly
    - Prolonged storage times
- For high PICs, when was the sample taken and when was the sample plated in the lab? Recent UT research indicates that PIC can be influenced by storage times, even at appropriate temperatures. If samples are taken on Friday evening and not plated until Monday, results from that analysis may indicate very high PICs. *However, this does not occur in every sample!* At this time, it is unclear if or which specific pathogens are involved. High PICs from samples with extended storage time should be interpreted cautiously. A fresh sample should be taken and delivered to a laboratory quickly for analysis. If the new sample has a low PIC, this does not mean that there isn't an underlying or overall problem. A PIC is a quality indicator of storage. If your bulk tank sample reveals that storing milk at appropriate temperatures for a few days causes elevated PICs, it is a problem, because most milk is stored in holding tanks at the plant for some time before being processed.

- Quick visual checks to perform:
  - Use a flashlight and look in *dry bulk tanks for milk stone* (bluish tint), then *wet bulk tanks for milk fat* (water beads, greasy film).
  - Bulk tank temperatures within two hours of milking, between milkings and at subsequent milkings
  - Bucket milkers, including lids, inlets and hoses
  - Vacuum overflows
  - Observe a complete cleaning routine and verify it is operating correctly (appropriate amounts of chemicals and temperatures)

General Rules of Thumb:

If SPC > 20,000 cfu/ml and bulk tank SCC > 250,000 cells ml:
- And PIC is < 3-4 X SPC - Cows with mastitis are the likeliest suspects. Udder hygiene and milking practices may also play a role.
- And PIC is > 3-4 X SPC - Milking time hygiene and failure to clean equipment are most common. Cows with mastitis may also contribute.

If SPC > 20,000 cfu/ml and bulk tank SCC < 250,000 cells/ml
- And PIC is < 3-4 X SPC - Milking time hygiene is the likeliest contributor.
- And PIC > 3-4 X SPC - Milking time hygiene, then milking equipment cleanliness are the likeliest sources of problems.

After ruling out all of the quick and easy solutions, it is time to start taking things apart. Look for buildup at ALL gaskets, connections, cut-off valves and dead-ends in any pipes. Weigh jars can be more difficult to deal with because there are more gaskets, more hoses and more places for residues and bacteria to become trapped, and they are more difficult to take apart and clean.

Most of the time, high bacteria counts can be solved with a record of prior problems, revealing sudden changes in procedures, a good set of eyes, a flashlight, a thermometer and a mirror. A good relationship with your employees, your milk hauler, your milk buyer representative, your equipment service representative and your chemical supplier will help you prevent most problems and help you quickly find solutions to occasional problems.