



Pasteurizers become part of heifer program

By Hal Schulte, DVM

Milk is the gold standard for raising healthy calves. After all, what was it originally designed for? The problem with milk, however, is that it also has high value in the bulk tank.

Top quality milk replacers are also effective for raising healthy calves. When replacers' nutrient levels meet calves' needs, they will grow well. The problem with milk replacers, however, is similar to that for milk - high quality products are expensive.

The need to make money on milk sales or save money on milk replacers has prompted many dairy producers to search for a more cost-effective means to provide good nutrition to their growing calves. Waste milk is an option.

Waste milk is any milk not fit for sale, including milk from cows treated with antibiotics, from fresh cows before their milk is salable and from cows with clinical mastitis signs even when not treated with antibiotics. Milk from these sources has nutritional value for calves in spite of quality issues.

Since few dairies can handle discard milk to the same quality standards of bulk-tank milk, bacteria counts are the major impediment to feeding it to calves. To address high bacteria levels, veterinarians and nutritionists have turned to commercial pasteurizers. To be cost effective, the price of purchasing a pasteurizer, which can range roughly from \$4,000 to \$10,000, then operating and maintaining a unit, must be lower than the other feeding options for calves.

Some pasteurizer history

In the mid-1800s, the food industry was expanding to provide food for workers moving from farms to cities as part of the industrial revolution. In those days, bacterial contamination was an unknown concept but a major killer. Death and suffering due to food contamination was widespread.

During the industrial revolution, scientific knowledge was increasing, and the science of bacteriology was no exception.

Pasteurization, a discovery credited to Louis Pasteur, is not sterilization of food. Rather, it lowers the numbers of bacteria in a food by raising the temperature of the food to a specific level for a specified length of time. A temperature that's high enough kills growing bacteria and also destroys the spores of certain disease-causing bacteria such as *Salmonella*, *E. coli* and *Listeria*.

Since pasteurization of milk became commonplace, there has been a huge reduction of milk-born diseases, such as tuberculosis, brucellosis and other cow-to-human transmitted diseases.

Pasteurized for calves

What must a pasteurizer do to help raise healthy heifers on dairies? The simple answer: Reduce the number of disease-causing bacteria in the milk to levels below which heifers become sick.

For successful pasteurization, two things must occur:

1. Waste milk must start out as free of bacteria as possible. You can't make a quality product for calves from a low quality input.

2. The temperature must be raised to a specific level for a set time. For a high-temperature short-time (HTST), or flash, pasteurizer, the temperature must be raised to 161 degrees for 15 seconds. For a low-temperature long-time (LTLT) pasteurizer, also called a batch pasteurizer, the temperature must be at 145 degrees for 30 minutes.

On the surface, it would seem that a short time at 161 degrees makes the most sense. The caveat: At 161 degrees, the high protein in the colostrum coagulates into a lump, and the immunoglobulins are ruined.

The batch pasteurizer would seem to have an advantage over the flash pasteurizer by causing a relatively small reduction in colostrum quality. The problem is that the temperature window between pasteurization and cooking the colostrum is miniscule. Coagulation can start at 140 to 141 degrees and be complete by

146 to 147 degrees. The pasteurization requirement is 145 degrees.

The Pasteurized Milk Ordinance (PMO) says effective pasteurization must yield a 5-log reduction in the number of bacteria present in the pre-pasteurized milk sample. This means going from 100,000 bacteria per cubic centimeter (cc) of milk to 1 bacteria per cc, or from 1 million bacteria to 10 per cc of milk.

Since pasteurization is not sterilization, bacteria begin replication after the milk's temperature returns to bacteria's ideal temperature ranges for growth. If milk isn't chilled to 40 degrees as soon as possible after pasteurization, bacteria counts can double every 20 to 30 minutes.

Research has shown that recovering and pasteurizing waste milk to feed calves is cost effective when the bacterial quality of pre-pasteurized milk is adequate. Ideally, that's less than 100 colony forming units (CFU) per milliliter (ml). In the real world, 1,000 to 10,000 CFU/ml is good.

Of the dairy pasteurizers on the market, some are simple and require a lot of attention to assure correct function and cleaning. Others are more automated. Whatever type you might buy, routine maintenance and attention to detail are essential to assure pasteurizers function properly. If you don't ensure all parts of the pasteurizer are clean, you can contaminate a perfectly good product after

pasteurization and render it useless or harmful.

Alternatively, you can't make gold from garbage, and waste milk doesn't get magically better after pasteurization. If waste milk's bacterial quality is too poor before pasteurization, nothing will resurrect it. And if milk isn't cooled quickly after pasteurization, bacteria counts can double quickly.

To reach...



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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 University.

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

For information on QMPS, see its website: <http://qmps.vet.cornell.edu>

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The next Quality Milk News, a newsletter of QMPS, will appear in the July issue of *Northeast DairyBusiness*.

A Case Study

Pasteurizer results on dairies

Quality Milk Production Services (QMPS) collected pre- and post-pasteurized milk samples from seven dairies during an eight-week period last summer. All dairies had pasteurizers and were saving waste milk to be fed to calves.

In the QMPS study, we recorded the temperatures pasteurizers achieved, the length of time the temperature held, the units' manufacturers and models, and the pre- and post-pasteurized bacteria counts, shown in Figure 1 as colony forming units per milliliter.

In every case, the pasteurizers lowered the bacteria counts but in some samples, the reductions were not very big. (Figure 1) Farm 1 had a 2-log reduction, taking the counts from more than 100,000 to about 1,000 CFU/ml of milk. Farms 2 and 3 show less than 1-log reductions in bacteria counts; Farms 4, 5 and 6 had more than 1-log reductions. Farm 7 shows the best overall counts, starting at just over 10,000 CFU/ml and falling to slightly more than 10 CFU/ml after pasteurization. On which dairy would you like to be a heifer?

The All Farm Averages in Figure 1 tell the story: On average, waste milk starts out at poor quality levels, near 100,000 CFU/ml of milk. This is barely under the legal limit for shipping milk.

The pasteurizers lowered bacteria counts significantly, down to just below 10,000 CFU/ml. This isn't as good as we expected the results to be, but clearly heifers benefit from having pasteurizers on these dairies.

Two questions need to be answered:

1. Why didn't we see a 5-log reduction in bacteria count numbers? Cleaning and maintenance regimes might be the answer. Dairies must follow the manufacturers' recommendations for cleaning and maintaining pasteurizers exactly. No shortcuts can be tolerated.

2. What can we do to help our heifers? Improve the quality of waste milk. If it starts from a lower level of bacterial contamination, waste milk can reach lower levels after pasteurization.

Pasteurizers are coming to dairies for good reasons. Dairy farmers have seen that these units improve the overall health of their heifers. To be effective, we must harvest colostrum correctly and make it better with a pasteurizer that works well and is maintained correctly.

