Dairy Guidelines

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Control of Psychrophilic Bacteria in Raw Milk Supplies

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What Are Psychrophilic Bacteria and Why Are They a Problem?

Psychrophilic bacteria are those which are capable of relatively rapid growth at low temperatures, commonly within the range of 35° to 50°F. These bacteria, therefore, are a problem in the refrigerated storage of raw milk.

Today, all Grade A milk in Virginia is cooled and stored on the farm in bulk tanks. Every other day, the milk is picked up and hauled to a receiving station or a milk processing plant. There it is pumped into large storage tanks and either: processed immediately; held overnight to be processed the next day; or loaded again into large over-the-road tank trucks to be transported long distances to other markets. In the latter case, the milk may again be stored overnight before it can be pasteurized. Thus, milk may be held in its raw state from 2 to as many as 4 days before it is pasteurized. Frequently, by the time the milk has reached its final destination, the psychrophilic bacteria count has grown into millions.

Psychrophilic bacteria are killed by pasteurization temperatures. So once the milk is pasteurized, they represent no problem unless the milk is recontaminated. These types of bacteria are not disease germs, but large populations of them in milk can change its physical appearance and cause the development of many types of off-flavors.

What Can Be Done To Control Psychrophilic Bacteria In Milk?

Psychrophilic bacteria originate from soil and water. They most often gain entrance into milk from the exterior of cows' udders and from unclean surfaces of milk equipment. Basically then, the control of psychrophilic bacteria requires no more consideration and effort than dairymen should already be giving to the production and care of high quality milk.

ISSUED IN FURTHERANCE OF COOPERATIVE EXTENSION WORK, ACTS OF MAY 8 AND JUNE 30, 1914, IN COOPERATION WITH THE U. S. DEPARTMENT OF AGRICULTURE. W. E. SKELTON, DIRECTOR OF EXTENSION SERVICE, VIRGINIA POLYTECHNIC INSTITUTE, BLACKSBURG, VIRGINIA 24061.

Farm ponds and marshy areas, where stagnant water exists, are ideal habitats for psychrophilic bacteria. Such ponds and marshes should be fenced to prevent animals from wading into them.

Farm water supplies are often grossly contaminated with psychrophilic organisms. The use of such water, in the dairy operation, however, represents no great problem as long as recommended practices for cleaning and sanitizing are followed.

Udders of cows come into contact with soil and water frequently, and therefore become grossly contaminated with psychrophilic bacteria. For this reason, it is important that they be thoroughly cleaned and sanitized prior to milking. This is best done with single-service paper towels or with individual cloths that have been dipped in a sanitizing solution and used only on one cow. The towel or cloth should never be dipped back into the sanitizing solution as this will add organic matter to the solution and destroy the effectiveness of the sanitizer. When cows are extremely dirty, discard the used towel and use an extra one to complete the job. After washing, wipe udders thoroughly with dry towels to remove excess water.

Surfaces of milking equipment that come in contact with milk should be cleaned thoroughly after each milking. This is best done by rinsing with cold or warm (95°-110°F) water; then washing and scrubbing with a hot chlorinated detergent solution; and finally rinsing with a hot acidified rinse (1-1½ ounces of milkstone remover in each 10 gallons of water). Use the proper brush and the proper detergent for the job to be done. (For more detailed directions, refer to the Dairy Guideline Series 478.) All equipment should be drained thoroughly and stored clean and dry until the next use. Before use, it must be given a thorough treatment with a bactericidal solution containing 200 parts per million of available chlorine or other approved sanitizer used at the proper concentration. This cleaning and sanitization procedure is the most effective approach to psychrophilic, or any other type of bacterial contamination of milk.

The Farm Bulk Tank

Much of the apparent improvement in Grade A milk quality in recent years, as measured by the Standard Plate Count, has resulted from the universal adoption of farm bulk cooling and storage tanks. However, the low bacterial counts obtained may be the result of false interpretation, since psychrophilic bacteria do not grow rapidly at warm incubation temperatures used in the procedure of the Standard Plate Count. Because of this, some serious consideration is presently being given to a change in the official methods for determining the numbers of bacteria in raw milk supplies.

Because the low storage temperature provided by the farm bulk tank prevents or retards the growth of most microorganisms, some dairymen have tended to rely more and more on refrigeration to do the whole job of quality control for them. Thus, much of the industry's troubles with psychrophilic bacteria has risen from improper cleaning and sanitizing of dairy equipment, including the farm bulk tank.

The milk hauler is usually responsible for the rinsing of the bulk tank immediately after the milk has been removed. The dairyman still has the responsibility to see that the bulk tank is thoroughly cleaned and sanitized before the next milking. Oftentimes, a mistake is made, or someone forgets, and the tank is used again without being cleaned and sanitized. At other times, the milk is picked up just prior to milking and, in the rush to get things done, the tank gets only a superficial or once-over-lightly cleaning prior to milking. Such procedures leave the door wide open to gross contamination of milk with psychrophilic bacteria. The coolness of the tank, and the accumulated deposits of moist milk and milkstone make ideal conditions for the growth of these types of organisms during the next 2 days.

Proper cleaning of bulk tanks requires: (1) thorough rinsing of all inside surfaces of the tank with cool or warm (95^{o}-110^{o}F) water to remove a large portion of the residual milk; (2) thorough cleaning with a concentrated chlorinated detergent solution followed by a thorough rinse with tap water; and, (3) an acidified water rinse (1 to 1½ ounces of milkstone remover in each 10 gallons of water) to prevent the formation of a milkstone film. When cleaning, particular attention should be given to thorough washing of the outlet valve, agitator, measuring stick, and the underside of the bridge and tank covers. Use proper brushes for the particular cleaning job to be done. Within ½ hour of the next milking, sanitize the tank thoroughly with a solution containing 200 p.p.m. available chlorine, or other approved sanitizer used at the proper concentration.

Drain the tank thoroughly before milking. Separate spray devices may be used for the acidified rinse and sanitizing solutions if they are adjusted to give the proper solution concentration.

Summary

Modern methods for the storage and transporting of Grade A milk have opened the door to quality problems associated with psychrophilic bacteria. Both the temperature at which the raw milk is held and the extended length of time between the act of milking and pasteurization are favorable for the growth of these types

of microorganisms. Basically, the control of psychrophilic bacteria is of a sanitary nature; that is--strict adherence to the milking of clean cows and the handling and storing of milk in clean, sanitized equipment. Dairymen must pay attention to:

1. Preventing access of the milking herd to areas where stagnant water exists. Fence off farm ponds and marshy areas. Provide good drainage in and away from housing and feeding areas.
2. Thorough cleaning and sanitizing of cows udders prior to milking.
3. Thorough cleaning and sanitizing of milk equipment, with special emphasis on the care of the farm bulk tank.