University of Minnesota

Agricultural Extension Service ● U. S. Department of Agriculture

FACT SHEET

Bacteria in Milk

DAIRY INDUSTRIES NO. 7

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Bacteria are commonly associated with quality problems of milk. Control depends upon preventing their entrance and creating conditions unfavorable to growth.

REQUIREMENTS OF BACTERIAL GROWTH

Most conditions under which bacteria grow and multiply are similar to those needed for human survival. Bacteria must have:

Water. Therefore, if milk handling and storage equipment is stored drained and dry, bacteria levels do not increase between milkings.

Food. Milk is an excellent source of many nutrients needed by bacteria. Removal of milk solids during cleaning helps starve them out.

Oxygen. Some bacteria require oxygen (aerobes), others grow only in its absence (anaerobes). Still others are capable of living with or without oxygen (facultative).

Favorable Temperature. All bacteria grow best at certain specific temperatures. However, these optimum temperatures differ among species. But no bacteria multiply at a maximum rate at temperatures below 40°F. So cooling is an effective method for controlling growth.

Favorable pH (acid or alkaline reaction). Bacteria grow best in solutions neither highly acid nor highly alkaline. Milk is slightly acid and favorable for their development.

TYPES OF BACTERIA IN MILK

One way bacteria may be classified is by their response to temperature. From this knowledge, insight can be obtained about their source and control.

1. Thermoduric bacteria are literally durable to heat, thus thermo (heat)-durics. They survive pasteurization and are reported to producers in pasteurized counts on milk. They cause milk to sour and can decrease shelf life of milk.

Thermodurics can grow at temperatures between 45° and 104°F. Their primary source is dirty equipment. Old cracked inflations and milkstone deposits are common sources. They are usually a summer problem when warm temperatures permit rapid multiplication. Clean equipment and cold temperatures help control them.

2. Thermophilics are heat loving. They can grow even at pasteurization temperatures and readily multiply at 131°F. You might find thermophilic bacteria in hot water lines or hot water storage tanks. Other sources are soil, bedding, and feeds.

3. Psychrophile bacteria can grow at relatively cold temperatures--even refrigeration temperatures. But they grow much slower at temperatures below 40°F. than at those above. Their best growth rate occurs between 68° and 86°F.

Psychrophiles have become more significant with the advent of bulk handling because milk is held on the farm longer than previously. When contaminated with psychrophiles, opportunity for growth is present. Major responsibility for keeping psychrophiles out of milk lies with the producer.

Off flavors caused by psychrophiles are bitter, fruity, rancid, stale, and putrid. They also cause a physical defect -- ropiness in milk.

Water may contribute large numbers of these bacteria. So rinse water used on equipment should always be sanitized. Add 5-10 parts per million of chlorine. Use an acid rinse. And keep equipment clean and milkrooms ventilated and dry.

Psychrophiles are usually a raw milk problem. Pasteurization destroys them and they get into finished products only through postpasteurization contamination.

COLIFORM BACTERIA

Coliform bacteria have a special significance to the dairy industry. Their presence in water supplies indicates undesirable contamination. Coliform are present in the intestinal tract of humans and animals and when found in water can be taken as evidence of possible contamination with fecal material. Disease-producing bacteria originate from these same sources.

In raw milk, presence of coliform means either: (1) potential contamination from fecal material, or (2) an extremely damaging case of mastitis. Dirty equipment and the cow's coat are major sources of coliform in raw milk.

In pasteurized dairy products, presence of coliform indicates postpasteurization contamination. Some heat resistant strains have been isolated but their contribution to the coliform count in pasteurized products is slight if not negligible.

OTHER CLASSES OF BACTERIA

Bacteria are grouped, in some cases, according to the nutrients on which they grow.

Proteolytic bacteria utilize protein in their growth. Off-flavors that result are bitter or putrid. They may be found in water supplies or in milkstone deposits; proteins are present in milkstone.

When equipment is scratched, cleaning and sanitization of the surface are practically impossible. Scratches become a constant source of proteolytics.

Lipolytic bacteria can break down butterfat, causing pungent odors and bitter flavors. Much fat breakdown is due to lipase action (see Dairy Industries Fact Sheet 5). However, in products stored for several days or longer, lipolytic bacteria can cause fat breakdown (rancidity).

Lipolytics are often psychrophilic and therefore are particularly undesirable contaminants.

Spores are highly resistant forms of bacteria. One bacterial cell forms one spore; only certain species of bacteria can do this. Spores resist killing by heat, chemicals, light, and drying. They are often found in dust so barn should not be swept just prior to milking.

KILLING BACTERIA

Bacteria are killed with heat in the form of hot air, hot water, or steam. Today, chemical agents are commonly used. Active ingredients in chemical sanitizers are chlorine, iodine, quaternary ammonium compounds, and acid.

Effectiveness of chlorine is greatly retarded in the presence of organic matter. Whenever milk, dirt, or manure gets into a chlorine sanitizer, chlorine is tied up and prevented from working. Prepare a fresh solution when this happens.

A chlorine solution exposed to air dissipates quite rapidly, especially at warm solution temperatures. Don't attempt to save the sanitizer from one milking to the next.

Hypochlorites are effective in fairly hard water.

Iodine sanitizers (iodophors) may be slower acting than hypochlorites. They are quite stable, relatively noncorrosive, and nonchapping to skin.

Quaternary ammonium sanitizers are adversely influenced by presence of water hardness compounds, although formulations may be prepared with water hardness control agents. They are generally effective against thermoduric type bacteria but less effective than chlorine sanitizers against some psychrophilic bacteria and coliform.

Effectiveness of acid sanitizers may be reduced by water hardness compounds unless acidity is taken to a fairly low level (pH 2.5-3.0). Acids do a good job of sanitizing.

CLEAN SURFACE IMPORTANT

Remember! Efficient and effective sanitization of equipment can occur only if the surface is clean and smooth! Don't neglect cleaning and expect sanitizers to do the job alone. A thin scale of milkstone can protect large numbers of bacteria from sanitizer action.

Follow a regular cleaning and sanitizing program. Only high quality products will assure the dairyman a place in the food market.

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