

## **Do You Have Faulty Milk?**

Doreene R. Hyatt, PhD, Bacteriology Section Head  
CSU Veterinary Diagnostic Laboratories  
Page Dinsmore, DVM, ILM and Clinical Sciences

Milk faults (also known as milk diseases or taints) are abnormalities that change the consistency or the taste of the milk. They can cause the loss of an entire shipment of milk due to rejection by the processor. However, they are rarely considered as a factor in the production of milk at a dairy farm. Dairy producers aim to economically produce a product of high quality with emphasis on factors that affect public and animal health. While some milk faults, reduced shelf life and reduced manufactured product yield, can result from high somatic cell counts, most faults are due to the growth of certain bacterial species in the harvested milk.

Psychrotrophic (cold-tolerant) bacteria growing in raw milk cause spoilage due to the residual activity of enzymes. Many of these are extremely heat stable. They survive pasteurization and detrimentally affect the products produced from milk. Proteolysis causes bitter and putrid flavors, while lipolysis causes rancid and fruity flavors. Lipases, concentrated along with the fat in the curd, cause problems producing cheeses with a less acidic environment (i.e. Camembert and Brie). Even whole milk powders, non-fat dried milk, whey and whey protein concentrates with bacterial lipase can become rancid. Proteases can reduce the amount of cheese produced from raw milk by degrading casein. In general, proteins in spoiled milk will not coagulate, thereby eliminating the possibility of cheese production.

Milk is a good medium for bacterial growth due to high water content, neutral pH and a high concentration of nutrients. Freshly collected raw milk contains bacterial growth inhibitors, that decrease in effectiveness with storage. Since many of the bacteria responsible for faulty milk can grow well at refrigeration temperatures (<15°C), these bacteria can overgrow between milk collection and consumption, leading to a milk fault.

Recently a Colorado dairy was informed that for 2 consecutive days its milk was unacceptable to a particular processing plant because it was “ropy”. The shipment was transferred to another processing plant, resulting in significant inconvenience and expense for the processor and handler and confusion for the dairy. Very few processing plants test milk for “ropiness”. Raw milk is held for 18 hours at room temperature and then a loop or stick is used to look for the presence of stringiness or “rope”. This abnormal consistency is due to the overgrowth of psychrotrophic bacteria such as *Alcaligenes*. Soil, animals, plants (hay and grass), and even chlorinated water can harbor psychrotrophic bacteria.

Psychrotrophic bacteria colonize water hoses, nozzles, holding tanks and any rubber or other nonmetal materials that are difficult to sanitize because of microscopic pores or cracks. Data from CSU’s Bulk Tank Culture Program demonstrate that most cases of psychrotroph milk contamination are due to contamination of milking equipment, utensils and bulk tanks on the farm with water containing high numbers of psychrotrophic bacteria. Psychrotrophs cause more problems during the warm summer months.

Prevention involves a few basic steps that can and are practiced at most dairy farms.

\*\*\*Limit the amount of bacteria in the milk environment by instituting proper milking techniques.

\*\*\*Avoid excessive use of water in the milking parlor while cows are being milked: washing the teats and udders with water immediately before milking, rinsing the equipment and floors during milking, “chasing” residual milk at the end of milking with water introduced through an inlet in the milkline.

\*\*\*Proper cooling of milk after collection. Since contamination with these organisms is unavoidable, rapid (within 2 hours) cooling to less than 40C and maintenance below 100C regardless of new milk addition is an absolute necessity.

Very few processors test milk for ropiness, but most will smell and taste the raw milk on arrival at the processing plant. Bacteria counts performed by the handler or processor are the next best thing to testing for faults. The Standard Plate Count (SPC or “Raw Count”) estimates the total bacteria present in milk, and the Preliminary Incubation count (PI) tests for psychrotrophic bacteria responsible for most of the milk faults. If a dairy consistently experiences milk faults and/or high bacteria counts, the Colorado State Diagnostic Laboratory can identify the causative bacterial species and assist the producer in finding the source of the offending organisms. Call the Diagnostic Lab (970-491-1281) and Dr. Page Dinsmore (970-491-4471) for more information.

### **Milk Faults and Their Causes**

Milk fault	Bacterial contamination
Sour milk	Lactose fermenting bacteria ( <i>Lactococcus lactis</i> )
Gassiness or frothiness	<i>Enterobacter aerogenes</i> , lactose fermenting yeasts
Sweet clotting/sweet curdling	<i>Bacillus</i> in heat-treated milks
Ropiness or sliminess	<i>Klebsiella</i> , <i>Alcaligenes</i> , <i>Bacillus</i> , <i>Micrococcus</i> or yeasts in refrigerated milk
Broken cream/ bitty cream	<i>Bacillus</i> in cream
Bitter milk	<i>Aceinetobacter</i> , <i>Flavobacterium</i> , <i>Proteus</i>
Fruity taste	<i>Pseudomonas</i> , <i>Flavobacterium</i> , <i>Alcaligenes</i>
Discoloration	<i>Chromobacterium</i> , <i>Pseudomonas</i>
Bloody milk	<i>Serratia marcescens</i> or animal blood
Red milk	<i>Serratia marcescens</i> or <i>Brevibacterium</i>
Blue milk	<i>Pseudomonas aeruginosa</i>
Rancid milk	<i>Pseudomonas</i> , <i>Staphylococcus</i> , <i>Alcaligenes</i> , yeasts and other fungi