Culturally Speaking: Raw Milk Quality

By Phillip Tong
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A vast and complex array of technologies is now routinely utilized to process raw milk. It may be concentrated, separated, pasteurized, fortified, fractionated, dried, sheared and homogenized.

During these and other processes, we inactivate, inoculate, incorporate, fortify, destroy, texturize, stabilize, emulsify, interact and ferment various microorganisms, enzymes and milk components to achieve the vast range of dairy foods and ingredients with desired functionality, sensory properties, nutritional quality and shelf-life.

Because these processing steps are important to gaining the product properties desired, processors can sometimes overlook the negative impact of changes in the properties of the starting material, raw milk. On the contrary, because we expect our dairy foods and ingredients to taste good for longer times, and perform or contribute product attributes that we would never have expected just a few years ago, processors need to be extra diligent to insure the highest raw milk quality is being used.

High quality in, high quality out? While it is no guarantee, using high-quality raw milk is an essential first step to produce the best products. High-quality milk should have a slightly sweet, clean flavor with no distinct aftertaste. High-quality milk will have low bacterial count and low somatic cell counts, be fresh and of the right composition, and meet all the legal requirements for raw milk.

However, poor farm practices or poor milk handling practices can result in lower-quality raw milk that still could meet legal raw milk standards. Use of lower-quality raw milk can leave an indelible fingerprint on finished product sensory properties, functional properties and keeping quality even when we use the full arsenal of technologies to process the milk. Sometimes practices are changed on dairy farms, which inadvertently impacts milk quality and composition. Unfortunately, I would venture to say that most of us have had the experience of tasting a poor-quality dairy product that could be partially attributed to lower raw-milk quality.

Lower-quality raw milk can have off flavors and odors defects that can carry into finished dairy foods and ingredients. They can be absorbed, bacterial or chemical in origin. Typical absorbed flavors – such as cowy, feed or barny – can occur from the cow or on farm storage of milk in areas with poor air circulation. Bacterial off-flavors (fruity, acid, malty, bitter, putrid, rancid) occur from the growth of bacteria in the milk due to poor sanitation or milk-handling practices. And chemical off-flavors occur from absorption of cleaning compounds, abusive handling of raw milk (which can promote lipolysis, or rancid flavors) or from cows suffering from ketosis or mastitis.

Raw milk with poor microbiological quality can also impact the functionality and keeping quality of dairy foods and ingredients that are made from it. While many of the bacteria typically found in raw milk can be killed by pasteurization, deleterious changes may have already occurred in the milk prior to thermal processing. Further, some organisms have heat stable lipolytic and proteolytic enzymes that can cause off-flavor and product instability in final product applications during storage and distribution. Additionally, in some cases thermoduric organisms and sporeformers that can survive thermal processing conditions and subsequently grow and contribute to off flavor formation and product instability that effect final product quality. Bacterial spores with origin from the farm environment can find their way into the raw milk and survive through the many steps in dairy foods or dairy ingredients manufacture and later germinate and negatively impact the end use product quality.

Poor-quality milk associated with higher somatic cell-count milks contain higher levels of plasmin (a proteolytic enzyme that degrades milk caseins) that can effect milk's processability and flavor. In fact, poor gel strength, lower cheese yields and bitter flavors have been associated with cottage cheese, hard cheeses and other dairy foods made from milks with higher somatic cell counts.

Further, incoming raw milk of poor quality may result in biofilms on heat exchanger surfaces that reduce plant operating efficiency and promote an environment in which these organisms can grow and negatively impact quality of the products manufactured. The extended process runs occurring as our plants become larger can magnify the negative impact of such biofilms.

Hence, in order to insure the best-quality dairy products and ingredients, raw-milk users are committed to working with their suppliers to insure that the best-quality raw milk is consistently obtained. They encourage and reward receipt of the highest raw-milk quality. They foster good management practices, good sanitation, well-maintained equipment, well-trained workers and routine sampling and monitoring of activities from farm to the finished dairy food or ingredient.

When you are committed to these principles and practices, you can fully realize the potential for manufacturing the highest-quality dairy products and ingredients coming from high-quality raw milk.

For additional information on raw-milk quality, visit these sites:

• www.foodscience.cornell.edu/cals/foodsci/extension/milk-quality-improvement-program.cfm

• www.vetmed.ucdavis.edu/vetext/INF-DA/Finished-Milk-Products.pdf

• www.extension.psu.edu/mastitis

• www.uwex.edu/milkquality.

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