

The Effect of Poor Quality Raw Milk on Finished Products

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One of the results of mastitis in dairy cows is an increase in the somatic cell count (SCC) in the milk. The increase takes place with both clinical and sub-clinical mastitis. For sub-clinical mastitis where the milk appears normal, the increase in SCC has been used as an indirect measure of mastitis by techniques such as the California Mastitis Test on the dairy and the electronic SCC on bulk tank milk at the creamery. Milk loss due to sub-clinical mastitis can be estimated based on SCC. The quantity or level of SCC in the bulk tank milk has also been used to set milk quality standards for interstate shipment of milk as well as local cooperative standards. In some areas, the bulk tank SCC serves as the basis for premium payments for high quality milk or penalty deductions for poor quality milk. The purpose of this article is to focus on the impact of elevated SCC on finished milk products.

When the SCC in the milk increases due to mastitis, there are other changes in the milk as well. There are also changes in the enzymes within the milk resulting in increased breakdown of protein and fat. One of these enzymes is called plasmin. Plasmin is increased following the elevation of the SCC with mastitis. Plasmin acts to degrade or breakdown the milk casein. This begins to happen when the SCC exceeds 100,000 cells per ml. As the SCC continues to increase with more severe and chronic cases of mastitis, the impact on casein becomes more intense. During Cheddar cheese production there are decreased cheese yields when the milk casein is degraded by the plasmin. In addition to the yield losses, there is also reduced curd firmness, increased fat and casein loss in the whey and compromised sensory quality. Each of these affects the bottom-line of the cheese industry along with consumer acceptance.

With cultured milk products like cottage cheese, low quality milk (high SCC milk) can increase the chances for flavor defects. These off flavors probably also relate to increased action of proteolytic enzymes. The breakdown products from proteolysis produce the off flavors. There is also a decrease in yield efficiency as the SCC increases compared to the yield from low SCC, high quality milk.

While most research studies have concentrated on the effects of poor quality milk in the production of cheeses, there have also been some more recent reports on the influence of poor quality raw milk with high SCC on the shelf-life of properly stored, pasteurized milk. In one study, milk was collected from cows before and after experimental infections with Streptococcus agalactiae. Before infection, the SCC for the cows average about 45,000 cells/ml and after infection the counts rose to greater than the legal limit for interstate shipment of milk at nearly 850,000 cells/ml. The amounts of free fatty acids were found to increase by 3X and the casein loss by 2X comparing the high SCC with

low SCC milk. There was little difference noted in the standard plate count or coliform counts between the low and high SCC milk. However, low SCC milk retained high quality taste and smell for a full 21 days at 41 F while the high SCC milk developed detectable sensory defects at 14 to 21 days. The reduction in quality was caused by rancidity and bitterness that are related to high levels of free fatty acids and break down of proteins.

Another more recent study reported on the extent to which high SCC milk would influence the flavor of 2%, pasteurized milk held at 33 F or 43 F. The SCC in the milk samples used to produce the pasteurized milk was 26,000, 376,000, 726,000 and 1,113,000 cells/ml. Based on the assumption that 50% of consumers could detect an off-flavor when the casein to true protein ratio decreased by 5%, low SCC milk would retain its flavor for over 60 days at 33 F and over 54 days at 43 F compared to high SCC milk where off-flavor could be detected by 54 days at 33 F and 19 days at 43 F. This study also demonstrates the need for consistent low temperature storage from processing to consumption to prolong milk quality and acceptability of consumers.

In summary, prevention of mastitis is critical to production of high quality milk on the dairy. As attention to control of mastitis dwindles on the dairy, the quality of the raw milk can be anticipated to decrease as monitored by increasing SCC. Despite pasteurization, the effects of bottling milk with poor quality can not prevent the development of disagreeable milk quality in terms of off-flavors that consumers can readily detect. With the ever present need to keep and find markets for increased milk production, the production of high quality, low SCC milk should be the goal of every dairyman.

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Finished products
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