
Two predominant alleles for β-casein exist in dairy cattle: A1 and A2. Cows that are homozygous for the A1 allele produce a variant of β-casein that differs by 1 amino acid from cows that are homozygous for the A2 allele. With the increasing prevalence of niche markets for dairy products, A2 milk has moved into the spotlight, bringing with it conflicting views about possible benefits. Three studies were evaluated to determine the impact of A2 milk on the dairy industry, from producers to consumers. Bugeac et al. (2015) found that Holstein-Friesian cows homozygous for the A2 allele produced 2,564 kg more milk over the lactation period compared with homozygous A1 cows. However, although A2 cows exhibited an increase in yield, Poulsen et al. (2017) examined the relationship between β-casein variants and milk coagulation properties and identified a possible negative impact for processors. Milk with the A2 variant was associated with longer rennet coagulation times and lower curd firming rates, making it a poor choice for cheese production. Finally, Jianqin et al. (2016) explored possible effects of A1/A2 versus purely A2 milk on the gastrointestinal physiology of consumers who had reported an intolerance to “traditional” (commercially available A1/A2) milk. Switching from A1/A2 to purely A2 milk was reported to reduce stomach inflammation in 36.4% of those who suffered from it, compared with only 11.1% who improved when switched from A2 milk to the A1/A2 combination. In addition, A2 milk was associated with fewer gastrointestinal symptoms and shorter transit times. Although there is great potential for additional research, these studies have indicated that while the A2 allele may reduce the efficiency of cheese production, it can provide milk yield benefits to farmers and possibly positive health effects to consumers.

Key Words: A2 variant, β-casein, protein structure

Spore-forming bacteria reduce milk quality. Z. P. Itle* and D. R. Olver, The Pennsylvania State University, University Park, PA.

Extended shelf life (ESL) fluid milk products have made significant gains in sales across the world. Research by the National Center for Biotechnology Information indicates that psychrotolerant spore-forming bacteria (PSF) often lead to premature spoilage in these beverages. PSF may reduce pasteurized milk shelf life by several days, thus restricting a processor’s ability to market the milk as ESL. Studies have shown that almost 20% of the most commonly sold HTST pasteurized milk in the United States is discarded before consumption. Much of this microbial spoilage can be attributed to PSF. Extensive studies have shown that the Paenibacillus strains are the predominant PSF found in fluid milk and can originate on the farm environment from sources such as fermented feeds and bedding. Additionally, udder cleanliness and milking preparation directly correlate with raw milk quality in the bulk tank. These highly heat-resistant endospores exhibit thermophilic and mesophilic properties that allow them to survive harsh environments such as UHT pasteurization. Post pasteurization contamination (PPC) has also been implicated in PSF growth. Biofilm formation in corners, cracks, crevices, and dead ends of stainless steel processing lines can result in PPC because milk is an ideal culture medium for the growth of food spoilage flora such as PSF. Effective practices to extend shelf life of milk by limiting PPC and PSF include using aseptic lines that eliminate corners, strict adherence to cleaning-in place processes (CIP), and biofilm control by detergents. Controlling PSF in the milk supply offers dairy producers and processors the opportunity to improve milk quality and profitability.

Key Words: milk processing, psychrotolerant spore-forming bacteria

An udder option: A2 milk. B. Davidson*, B. Dado-Senn, and J. Laporta, University of Florida, Gainesville, FL.

Starting 20 years ago, research has been conducted on the correlation of milk consumption and disease outbreaks around the world. Researchers found a high percentage of lactose intolerance claims which led the research into lactose intolerance causes and prevalence. It was discovered that a very small portion, about 4 to 5% of those who self-diagnosed as lactose intolerant (75 million worldwide), may actually only be milk protein intolerant. One protein of recent consideration is β-casein, the second major protein found in milk. Two variants A1 and A2 have been identified, differing only by one AA at position 67 on the 209 AA chain. People never medically tested for lactose intolerance that experience discomfort after consuming milk may turn to plant-based milk alternatives and juices under the misconception that lactose was to blame. This
proved to be detrimental to the dairy industry, thus, prompting the A2 Milk Company to lead research exploring the cause of consumer milk consumption discomfort. It was determined that A1 milk, when digested, will produce β-casomorphin-7 (BCM-7) which has been linked to poor gastrointestinal function and increased inflammation in the gut. Breaking research is still being conducted to determine if A2 milk confers more health benefits than A1 milk, such as reduced allergic reactions and higher digestibility. If such benefits are found, there is an increased chance that consumers will return to consuming milk and milk products. With an increased demand for A2 milk products, the industry should focus on developing more A2 milk protein herds through, for example, focusing on breeding programs. We believe A2 milk will continue to provide a wholesome, nutrient-rich, and safe product for consumers with an added benefit of reduced digestive complications.

Key Words: A1, A2, milk