

Dairy Foods Symposium: Processing and ingredient innovations to grow fluid milk sales

777 Market implications and opportunities in the fluid milk and beverage sector. Alan Reed*¹, Madlyn Daley¹, Marla Buerk¹, and Chris Costagli², ¹*Dairy Management Inc., Rosemont, IL*, ²*Information Resources Inc., Chicago, IL*.

Changing consumer demographics, habits, practices, and attitudes create both challenges and opportunities for fluid milk in the current beverage marketplace. This presentation will explore data from a variety of sources detailing these consumer trends, and suggest possible opportunities and strategies for growth in the fluid milk category. Data demonstrating the market and consumer impacts of competitive entrants, including non-dairy alternatives made of soy, almond, coconut and rice, will also be explored.

Key Words: milk, seminar, consumer

778 Implications of microbial quality of incoming milk and plant sanitation on shelf life and acceptance. Nicole H. Martin*, Rachel A. Miller, Stephanie N. Masiello, David J. Kent, Kathryn J. Boor, and Martin Wiedmann, *Cornell University, Ithaca, NY*.

Microbial growth in fluid milk is one of the primary drivers of consumer liking. In an age of declining fluid milk consumption, control of microbial growth is critical. The 2 primary mechanisms of microbial spoilage in fluid milk are (1) post-pasteurization contamination (PPC) in the processing facility with psychrotolerant gram-negative bacteria (i.e., *Pseudomonas*); and (2) entry of psychrotolerant sporeforming bacteria (i.e., *Paenibacillus*) via raw milk contamination. Historically, the majority of fluid milk was spoiled by psychrotolerant gram-negative bacteria introduced into the product post-pasteurization. This type of contamination leads to drastically reduced shelf-life and significant flavor, body and odor defects. Results of recent work indicate that over 50% of fluid milk samples show signs of PPC, and of those samples, only 40% are contaminated with coliform bacteria, a commonly used indicator of PPC. These results indicate that PPC is still an issue that needs to be addressed by the dairy industry to offer consumers the highest quality fluid milk. Additionally, traditionally used hygiene indicators (i.e., coliform) need to be reexamined to provide relevant, actionable information to dairy processors regarding PPC. In the absence of PPC, psychrotolerant sporeforming bacteria become the limiting biological factor in fluid milk shelf-life. Addressing fluid milk spoilage from psychrotolerant sporeforming bacteria includes understanding and reducing the transmission of these organisms through identification of key management practices associated with their presence in raw milk, as well as sources of these organisms in the farm environment. Recent work indicates that udder hygiene and farm size are associated with the presence of psychrotolerant spores in raw bulk tank milk. Further, these organisms have been identified in diverse environmental samples (e.g., bedding, feed, manure and soil), indicating their abundance in the dairy farm environment. Ultimately, providing consumers with high quality, long lasting fluid milk requires a systems approach to preventing contamination of fluid milk throughout the grass to glass continuum.

Key Words: quality, sporeformer, sanitation

779 Effect of milk composition and processing conditions on consumer liking. M. A. Drake*, *Southeast Dairy Foods Research Center, North Carolina State University, Raleigh, NC*.

Fluid milk consumption has decreased in the past 20 years while the beverage market continues to expand and diversify. Understanding consumer desires and perceptions for milk and milk flavor are crucial to identify opportunities. A combination of consumer and product research is required. Surveys and interviews demonstrate that flavor and nutrition are the key desires for consumers, and fluid milk holds unique associations with comfort and family. Variety and enhanced protein are 2 opportunities for milk/milk beverage expansion. Appearance plays a critical role in fluid milk preferences, especially for skim milk, and fat, protein and heat treatment also influence the sensory properties. A thorough knowledge of the role of processing conditions and composition on sensory properties and consumer perception of fluid milks will enable milk and milk beverage innovation.

Key Words: milk, consumer liking, processing

780 Shedding light on consumer acceptability of fluid milk: The partnership of retail dairy case lighting systems and packaging. Susan Duncan*, *Virginia Tech, Blacksburg, VA*.

Declining fluid milk purchasing and consumption trends suggest that fluid milk is not competing well in the beverage market. Contributors to this trend include a lack of established packaging selection criteria as well as storage conditions during the early stages of shelf-life before purchase. Fluid milk quality changes rapidly during light exposure, especially in retail lighted display cases. However, lighting in retail refrigerated cases enhances product marketing by showcasing product and package color. Traditionally, fluorescent light is used in retail systems; however, LED lighting systems are increasing because of new federal mandates for energy conservation as well as brighter, more efficient, more attractive display capabilities. It is well established that translucent or clear packaging with no light protective additives does not protect milk flavor and nutrient quality. However, only limited information is available on how fluorescent or LED light exposure influences milk acceptability. Changes in milk flavor are detectable within 2 to 3 h of lighted exposure and acceptability decreases significantly within 8 h of storage under fluorescent lighting when packaged in a translucent high-density polyethylene package. Acceptability does not tell the complete story though. In a recent study from our laboratory, consumers reported more negative emotion terms, specifically disgust, when light-exposed milk was evaluated. Lower hedonic scores were directly related to negative emotions. Milk that was packaged for light protection retained high acceptability scores and positive emotional terminology through 7 d of lighted retail storage conditions. Processors should select packaging that protects milk quality during retail dairy case display lighting to positively influence fluid milk purchasing and consumption behavior. Packaging criteria for protecting fresh fluid milk flavor and nutrients from processing to purchase will be described and justified.

Key Words: consumer, milk, packaging

781 Characterizing factors that influence milk flavor quality.

Smaro Kokkinidou, David Potts, and Devin Peterson*, *University of Minnesota, St. Paul, MN.*

Flavor is known to be a key attribute that determines the acceptability of milk. This presentation will cover a range of off-flavor development sources, from farm to processing, focusing on spontaneous oxidized flavor (SOF) milk as well as aseptically processed milk. Spontaneous oxidized flavor (SOF) milk has been a problem for the dairy industry for many years, causing significant economic losses. After collecting raw milk labeled as SOF milk from the Midwest, causative off-flavor compounds were identified as microbial taints (i.e., 2-methylisoborneol) and disproved the hypothesis that the off-flavor was of oxidative origin. Identifying the source of the off-flavor marker provided a basis to improve farming practices to produce higher quality milk. Additionally

it demonstrated the likelihood off-flavors in milk of the misclassification as SOF milk, which would inhibit developing solutions. In the second part of this presentation, a more in-depth understanding of the off-flavors generated during aseptic thermal treatment and subsequent storage will be discussed. Milk undergoes aseptic processing to enhance product stability and shelf life but the high temperature short time treatment can also be detrimental to flavor quality. Key off-flavor markers in aseptic milk were identified and pathways of generation were defined providing information for the development of successful flavor improvement strategies. The application of common food phenolic compounds (i.e., in cocoa, tea, and soybeans) to suppress off-flavor development and improve consumer acceptability in UHT products will also be discussed.

Key Words: milk flavor, quality, off-flavor