Market insights and consumer trends in fluid milk and beverages. M. Wilcox*, Significant Outcomes LLC, Pandora, OH.

Ninety-five percent of US households purchase fluid milk at retail and are increasingly demanding wholesome, nutritious, and sustainable products. These shifts in consumer demand present a growth opportunity for the dairy industry to create value-added products for the fluid milk and beverage categories beyond the traditional gallon jug. Based upon data from the IRI DMI Custom Dairy Milk Database, flavored milk, lactose-free milk, and whole milk retail sales increased 6.6%, 15.8% and 5.3% respectively, in 2016. While much of the increase in whole milk sales has occurred from switching away from lower fat versions, some whole milk households are increasing their overall milk usage. Whole milk now represents over a third of the fluid milk category. Whole milk’s gaining acceptance may be tied to consumers’ interest in real and natural and emerging science finding no link between saturated fat and increased risk of heart disease, stroke, or diabetes. Refuel milks focused on consumer interest for additional protein have also increased 36.7%. Understanding the evolving marketplace and emerging nutritional findings is important when considering which advancements in dairy product and process research will need to occur to meet the needs of consumers today and in the future.

Key Words: fluid milk, whole milk, protein

The influence of protein and fat on sensory properties and consumer perception of fluid milk. M. A. Drake*1 and D. M. Barbano2, 1 North Carolina State University, Raleigh, NC, 2 Cornell University, Ithaca, NY.

Sensory properties of milk are crucial to its consumer appeal. Milk heat treatment and composition (fat and protein) impact sensory properties and consumer liking. Higher heat treatments associated with extended shelf life (ESL) are not preferred over traditional high temperature short time (HTST) pasteurized milk by most consumers, conceptually or by tasting. The fat content of milk is the most readily adjusted compositional factor of milk. Fat plays a multi modal role in the sensory properties of milk, providing appearance cues but also mouthfeel and flavor properties that have varying appeal to different consumer segments. Finally, the sensory properties of milk can also be adjusted by altering protein content and casein:true protein ratio. Cooked/sulfur and cardboard flavors, viscosity and throat clinge can be increased with protein content (3.00, 3.67, 4.34, and 5.00%; P<0.05) while increased casein as a percentage of true protein (5, 25, 50, 75, and 80%) can be applied to decrease cardboard flavor and astringency (P<0.05) and to increase cooked/milky, cooked/sulfur and throat clinge (P<0.05). These results demonstrate that heat treatment and fat influence sensory properties of traditional milk, but also that membrane fractionation can be applied to optimize physical and sensory properties of milk beverages.

Key Words: milk, sensory properties, consumer liking

Preserving milk freshness in retail environment. S. E. Duncan*, Virginia Tech, Blacksburg, VA.

“Freshness” is a valued quality attribute for fluid milk but interpretation and assumptions associated with the term may be different to scientists, processors, retailers, and consumers. Dairy production and processing professionals influence fluid milk freshness, from cow to cup, based on production and processing decisions and practices. Consumer perception of fluid milk freshness of fluid milk begins at the point of purchase and continues through their experience with the product in their home. Storage conditions and handling in the retail environment can have significant effect on consumer perception of freshness of fluid milk, but has received very limited attention. Retailer decisions on dairy retail case design and management, employee training, and interaction with customers can influence freshness and customer satisfaction with fluid milk quality. This presentation will explore the (1) influence of retail display case lighting and milk packaging on consumer perception of freshness and acceptability; (2) opportunity for protecting freshness and quality through the training of retail dairy managers; and (3) potential influence of such decisions and actions on consumer perception of milk freshness and quality. In our recent studies, we verified that controlled LED lighting positively influenced milk acceptability in contrast to the traditional fluorescent lighting. Preliminary evidence from our laboratory illustrates that dairy retail managers are not familiar with the influence of lighting on milk quality and relationship to consumer perception of freshness. Retail case lighting and case design innovation benefits from controlled research studies and discussion with experts in packaging, milk processing and quality, retail economics and marketing, and consumer insights to protect milk freshness.

Key Words: milk, quality, consumer

Building consumer trust: Milk composition as a predictor of sustainability and animal health. D. M. Barbano*1, H. M. Dann2, and R. J. Grant2, 1 Cornell University, Ithaca, NY, 2 Miner Institute, Chazy, NY.

Consumers are concerned about the health of animals and the sustainability of animal agriculture. Transparency from farm to consumer is needed. The dairy industry needs to continue the development and use of appropriate milk analysis tools and control systems to maintain consumer trust in the milk production system. For consumers, milk safety is a given. Milk unequivocally needs to be safe and the dairy industry needs to be very open with control systems and systems used to ensure chemical safety of milk. Milk testing for antibiotics and the protocols for isolation and tracking of antibiotic-positive milk is an example of the control system to assure and verify for consumers that milk is safe. Today, consumers are concerned about individual cow health and management practices. Consumers expect each cow’s health to be taken care of and they want assurance there is a system in place to do that, no matter what the milk production management system is, small or large. Intensive milk production systems are likely to be under more scrutiny. This is where new automated milk analysis systems and sensors may be able to address this need. Currently, near infrared analysis to determine fat and protein during milk is available. New rapid milk analysis tools to measure milk fatty acid composition, estimate blood NEFA and blood BHB can be used as indices of cow health. Analytical tools to both improve animal well-being and demonstrate proper care of the health of animals in intensive milk production systems are needed. The status of this technology currently is that many of these tests can be done in a milk testing laboratory. The challenge is to transform these milk analysis tools into a sensor(s) that work in real-time in the milk harvesting system to enable real-time management reactions and control.
This will improve the efficiency and sustainability of milk production while providing consumers with a demonstration of what the dairy industry is doing to meet their expectations.

**Key Words:** fatty acids, blood NEFA, blood BHB

**387 Impact of post-pasteurization contamination on milk quality.**  N. Martin*, A. Alles, S. Reichler, K. Boor, and M. Wiedmann,  *Cornell University, Ithaca, NY.*

Fluid milk quality in the US has improved steadily over the last 2 decades, in large part due to the reduction in post-pasteurization contamination (PPC). Despite these improvements, nearly 50% of fluid milk is still spoiled (i.e., reaching bacterial levels > 20,000 cfu/mL) due to PPC. Over 30% of all dairy products are lost each year before consumption, in part due to bacterial contamination. Gram-negative spoilage bacteria when introduced as PPC grow rapidly at refrigeration temperatures and lead to spoilage within 7–10 d of processing. Other notable organisms that cause PPC are psychrotolerant coliforms and Enterobacteriaceae. These organisms are known to produce a variety of enzymes that lead to flavor, odor and body defects which can ultimately impact consumer perception and willingness to buy. Detecting PPC in freshly pasteurized HTST fluid milk can be challenging because many times PPC occurs sporadically and at low levels. Additionally, indicator organisms typically used in fluid milk (i.e., coliforms) have been shown to represent only a fraction of the total PPC. Recent studies indicate that coliforms account for less than 20% of the total gram-negative organisms introduced into fluid milk post-pasteurization. In contrast, *Pseudomonas*, which is not a coliform and therefore is not detected using coliform media, is the most commonly isolated genus in PPC fluid milk. To reduce PPC processors must begin to use testing methods that can both detect coliforms as well as non-coliform gram-negatives (i.e., *Pseudomonas*). This “total Gram-negative” approach will allow the industry to detect and respond to PPC, thereby providing consumers with the highest quality product.

**Key Words:** post-processing contamination, quality, fluid milk