0915 Physico-chemical properties and antioxidant efficacy of whey protein isolate and casein hydrolyzate stabilized nano-vesicular vehicle systems containing curcumin. Z. Z. Haque*and S. Mukherjee, *Food Science, Nutrition and Health Promotion, Mississippi State University, Mississippi State*.

Development of stable nano-emulsion systems, designed for efficient delivery of hyper-active natural antioxidants, nutraceuticals, and other bioactive compounds is crucial for effective enhancement of dairy product shelf-life as well as to alleviate the detrimental biological consequences caused by the reactive oxygen species. This study investigated the physicochemical and antioxidant properties of a nanoemulsion system, developed as nano-vesicular vehicles (NVVs) for efficient delivery of curcumin (CU), a highly potent, generally recognized as safe (GRAS) antioxidant. Coarse emulsions were first produced by dispersing whey protein isolate (WPI) (1% w/v, primary emulsifier), tween-20 (20% w/v of WPI, secondary emulsifier), chymotryptic hydrolyzate of casein (CH) (1:50 w/w of WPI), and CU (0.22% w/v) in 200 mM phosphate buffer with a pH of 8.0 (the continuous phase) for 3 h with gentle stirring at 22°C. The NVVs were generated by subjecting the coarse emulsion to single-pass ultra-high-pressure homogenization (UHPH) at 140 and 210 MPa. Physico-chemical and antioxidative properties of the CU-loaded-NVVs containing CH (CU+CH-NVVs) were analyzed and compared to the NVVs without CH (CU-NVVs) for 16 d of storage at 4°C. Increasing the trace amount of CH resulted in a significant enhancement ($P < 0.05$) of both short- and long-term antioxidative properties [antioxidant activity (AA) and persistence (AP), respectively], in all CU+CH-NVVs throughout the study compared to CU-NVVs. The CU+CH-NVVs generated using 210 MPa showed 497 and 567% enhancement of AA and AP, respectively, relative to the CU-NVVs on the 16th day of storage. The former also showed 6222 and 11278% enhancement of AA and AP compared to the control (buffer alone). The CU+CH-NVVs generated at 210 MPa exhibited a considerable (7.4%) reduction in mean globular particle diameter as well as a substantial increase (17%) in zeta potential compared to the CU-NVVs formulated using the same UHPH at the final day of storage, indicating the efficacy of even a minute quantity of CH to remarkably enhance the stability of NVVs.

Key Words: nanoemulsion, neutraceutical, free radical

MILK SYMPOSIUM: MARKETING MILK FOR ENTREPRENEURIAL AND BIG BUSINESS VALUE

0916 Get in the driver's seat: Marketing milk and dairy products to today's and tomorrow's consumers. D. M. Berry*, *Dairy & Food Communications, Inc., Chicago, IL*.

Who buys a head of iceberg lettuce anymore when pre-washed, trimmed lettuce blends are readily available? It's the same person who buys a gallon of the white stuff and a chunk of cheddar. It's not the consumer—today's consumer–who grew up with more than 87,000 possible Starbucks combinations to create a customized drink. Millennials and their offspring are today's and tomorrow's consumers, demographics with unprecedented expectations of the food supply chain. They want customization, simplicity, and transparency but at the same time demand convenience, deliciousness, and portability. According to the International Food Information Council Foundation's 2015 Food and Health Survey, compared to the general U.S. population, Millennials have differing opinions on traditional eating habits, usage of resources and information for staying healthy, and even on the value of some nutrients. Understanding these views is paramount for dairy brands to thrive. According to the International Dairy-Deli-Bakery Association, the food retail world is changing, and the products and the players must change in tandem. Traditional food retailers are the most challenged, with data suggesting they will experience a 9% drop in market share (from 71% to 62%) over the next 10 yr as non-traditional channels like fresh formats and online retailers gain 38% of the food market. Traditional supermarkets that want to survive are responding to the changing retail channel landscape by featuring full-service restaurants, smaller formats, and Millennial-focused products and services. In 2014, e-commerce sales for consumables were $24.4 billion, an increase of 13.5% from 2013. Online purchases of foods and beverages are projected to almost quadruple between 2015 and 2020, to $49 billion, representing 4.5% of all food retail sales. When it comes to dairy, deli, and bakery, as well as prepared foods, specialty cheese, and specialty meats, the six fresh parameter departments in the traditional supermarket, consumers continue to appreciate the in-person experience. It's no wonder that the greatest percentage of increase in store count has come from channels outside of traditional food, drug, and mass-merchandising formats, including convenience stores, warehouse clubs, and dollar stores. Stores that focus on fresh foods, in particular single-serve options and convenience, invite consumers inside. And once inside, they often buy more than they really intended. Dairy foods manufacturers must make sure they are competing in this space.

Key Words: Millennials, innovation, consumer

0917 Practices and programs to ensure the safety of artisan cheese. D. J. D'Amico*, *University of Connecticut, Storrs*.

Historically, milk processing and cheesemaking were conducted on farms. In the mid-1800s the factory system for cheesemaking was introduced in the United States and quickly came to dominate the industry. By the beginning of the 20th century, farmstead cheesemaking in the U.S. had all but disappeared. More recently, small-scale and on-farm processing of dairy products is experiencing a resurgence as producers are looking to add value to milk while consumers are increasingly looking for unique and locally produced products with minimal processing. This growth is particularly apparent in the artisan cheese sector that has seen the number of U.S. producers increase from ~75 in 1990 to ~1000 today. Increasing demand provides opportunities for selling and marketing unique dairy products in local, national, and international markets. From a food safety perspective, artisan and farmstead cheese producers face common as well as unique risks and challenges including those related to on-farm processing, the production of higher-risk cheese varieties, and the renewed interest in the use of unpasteurized milk. Many small and very small establishments may also lack the resources, capital, technical expertise, or training to implement robust food safety programs and related technology. With the changing food safety and regulatory landscape and the expansion of international trade, there is a need to preserve traditional practices and products while ensuring food safety. Using examples from various countries, including efforts in the U.S., this presentation addresses these food safety risks and challenges and discusses food safety programs and best practices.

Key Words: safety, small-scale, cheese

0918 Camel milk from commodity to added value product. The science behind the development of the camel dairy industry. P. Nagy*, *Emirates Industries for Camel Milk and Products, Dubai, United Arab Emirates*.

Until recently, camels were regarded mainly as packing or racing animals by many, including the general public, scientists, funding agencies, and policymakers, but the food production potential of the species has been neglected. Camel milk had been produced exclusively by hand milking in traditional farming systems for household consumption. Such production could not provide a constant quantity and acceptable quality of raw milk for urban markets. However, during the last 10 to 15 yr, intensive camel milk production has been going through a major development. Machine milking has been introduced in several traditional camel-keeping countries, like the United Arab Emirates, Saudi Arabia, and Tunisia. Small-scale farms in Australia, Europe, and the USA have also been reported to be using milking machines for dromedaries. The world's first large-scale camel dairy farm (EICMP, Dubai, UAE) with a processing facility and distribution was established during this period. In addition, several commercial and scientific projects have been started. The demand for camel milk triggered research and development on camel lactation physiology, behavior, nutrition, reproduction, husbandry, management, etc. In addition, camel milk microbiological quality and chemical composition have been defined; studies were conducted to improve product characteristics and new products were developed, such as probiotic fermented milk, laban, labneh, cheese, milk, and whey powder. The medicinal properties of camel milk has also received increased attention, and data have been published in peer-reviewed medical journals that support field observations and anecdotes from camel-keeping countries. Despite significant progress made in intensive dairy management, machine milking, composition, and product development, the task is far from completion. More basic and applied research is required in all of the above fields for better understanding and optimized production. Important areas for research could be (1) improvement of machine milking technologies, (2) neuro-endocrine control of lactation, (3) phenotypic and genetic variation of breeds/ecotypes, (4) role and application of environmental factors (like photoperiod, nutrition), (5) variation in milk quality and composition, and (6) chemistry of camel milk proteins. The aim of this presentation is to review the recent development of the camel dairy industry, summarize our present knowledge on camel milk production and processing, and highlight areas for future research.

Key Words: camel milk, intensive management, machine milking

0919 Terroir: Science based or marketing gimmick. L. Goddik*, *Oregon State University, Corvallis*.

The concept of terroir is rapidly gaining importance in the U.S. marketplace in alignment with the growth of the local food sector. Terroir for products such as coffee and wine are well recognized, but there is little science to support terroir for dairy products. Nevertheless, it's common to see promotions for regional cheeses such as Wisconsin cheese or New York Cheddar. This presentation will evaluate factors that influence farm and regional milk sources and their impact on cheese characteristics. Our current research has focused on the simple question: If all other factors are kept constant, will milk from different farms and regions produce cheeses that are different? Initial results have demonstrated that milk from farms, selected due to similar herd management principles, produce Cheddar cheeses that are different based on sensory and flavor chemistry profiles. Non-starter lactic acid bacteria (NSLAB) profiles

are unique to individual farms. The link to the individual farms (terroir effect) is more pronounced in 5 mo aged Cheddar than in 9 mo aged Cheddar. Milk from coastal regions appears to be particularly suited for cheese production, likely due to complex NSLAB profiles and flavor development.

Key Words: milk source, cheese, flavor

NONRUMINANT NUTRITION: ENZYMES

0920 The effect of increasing *Buttiauxella* phytase dose on performance in piglets: Meta-analysis from 5 trial studies. Y. Dersjant-Li, R. M. Bold, and W. Li*, *Danisco Animal Nutrition, DuPont Industrial Biosciences, Marlborough, United Kingdom*.

The effect of *Buttiauxella* phytase on the performance of piglets was evaluated combining the datasets of five trials. A total of 234 data points (364 piglets, average initial BW 10 kg) were used in the analysis. Treatments included a nutritionally adequate positive control diet (PC), a negative control diet (NC, with an average reduction of 0.15% calcium and 0.19% phosphorus compared to the PC), and NC supplemented with *Buttiauxella* sp. phytase at 500, 1000, or 2000 phytase units (FTU)/kg feed. One FTU was defined as the amount of enzyme required to release 1 μmol of iP per minute from sodium phytate at pH 5.5 at 37°C. Piglets received the test diets (based on corn/SBM, wheat/SBM or wheat/barley and SBM) for 14 d. No grain source × phytase dose interaction was found, thus data from the 5 trials were pooled for statistical analysis (JMP 11.0, SAS). Treatment means were separated using Tukey's HSD test, trial was used as a random factor. Linear or nonlinear response was tested with increasing phytase dose from 0 (NC) to 2000 FTU/kg. Phytase dose at 1000 and 2000 FTU/kg improved ADG by 12.3 and 19.3% respectively vs. NC ($P < 0.05$), and by 3 and 9.4% vs. PC ($P > 0.05$). No significant differences were seen in feed intake. FCR was improved with phytase at 1000 and 2000 FTU/kg by 8.8 and 10.2% vs. NC ($P < 0.05$), and by 5.5 and 6.3% vs. PC ($P > 0.05$). Increasing phytase dose from 0 (NC) to 2000 FTU/kg increased ($P < 0.05$) ADG linearly and reduced FCR in a nonlinear manner. The data demonstrated that phytase at 500 FTU/kg could replace 0.19% P and 0.15% Ca. Increasing phytase dose to 1000 or 2000 FTU/kg could further improve performance of piglets fed P and Ca deficient diets, most likely due to the extra-phosphoric effects of the phytase. Cost calculation (based on feed cost and 14-d performance data) showed a net value of $0.11, 0.35, and 0.62 per pig ($11.8, 39, and 65/ton of feed) with *Buttiauxella* phytase at 500, 1000, and 2000 FTU/kg respectively compared to PC. In conclusion, increasing *Buttiauxella* phytase dose up to 2000 FTU/kg may provide production benefits in piglets.

Key Words: piglets, meta-analysis, performance

0921 Effects of dietary β-mannanase supplementation with soybean meal in the performances in weanling pigs. B. Balasubramanian*, H. M. Yun, Y. M. Kim, J. K. Kim, and I. H. Kim, *Department of Animal Resource & Science, Dankook University, Cheonan, South Korea*.

Soybean meal (SBM) is by far the most popular protein source used for feeding livestock. The objective of the present study was to test the efficacy of supplementation of β-mannanase in diets containing de-hulled or conventional hulled SBM (44% and 48%) as well as to evaluate the interactive effects of SBM and enzyme on growth performance, nutrient digestibility, fecal microflora, and noxious gas emission in weanling pigs. In total, 140 pigs [(Landrace × Yorkshire) ×Duroc] with a initial BW of 5.97 ± 1.01 kg were used in a 6-wk feeding trial, randomly allotted in a 2 × 2 factorial arrangement, with feed consisting of hulled or de-hulled SBM with or without β-mannanase [T1 (SBM 44%), T2 (SBM 44% + 0.05% β-mannanase), T3 (SBM 48%), and T4 (SBM 48% + 0.05% β-mannanase)]. Pigs were allocated randomly to 4 treatment groups consisting of 7 replicate pens per treatment with 5 pigs per pen. Pen was the experimental unit. In this study, pigs fed diets containing 0.05% β-mannanase had greater BW, ADG, G:F, and ADFI than pigs fed diets without β-mannanase, but the differences were not statistically significant; however, interactions of SBM diets showed significant differences for ADFI ($P = 0.0334$) at the second week and showed significant effects on DM ($P = 0.0077$), N ($P = 0.0082$), E ($P = 0.0362$), P ($P = 0.0472$) at the sixth week. Furthermore, when compared with SBM, β-mannanase had effects on DM ($P = 0.0105$), N ($P = 0.0416$), P ($P = 0.0591$), but not E and Ca. There were no significant differences for serum BUN, WBC, Lymphocytes, however observed significance on RBC ($P = 0.0130$), when compared with SBM diets at the sixth week. Effects on diarrhea score ($P = 0.0469$) at d 3 and noxious gas emission were not significantly different ($P > 0.05$). The significant effects of β-mannanase supplementation with SBM on fecal microflora (*E. coli* and *Lactobacillus*) showed a significant difference at sixth week ($P < 0.05$). In conclusion, β-mannanase supplementation in a SBM diet showed positive effects on nutrient digestibility (DM, N, E, P), on feed efficiency, and for reducing *E.coli* population in weanling pigs.

Key Words: β-mannanase, soybean meal, weanling pigs