T30 Subpopulations of non-starter bacteria increase in the draining and matting conveyors during extended production shifts. B. Selover*, J. Johnson, and J. Waite-Cusick, Oregon State University, Corvallis, OR.

Cheese production environments are susceptible to microbial contamination in places where the temperature, pH, and available water and nutrients are sufficient to support growth. Long production runs can also contribute to non-starter bacteria growing in production equipment. Sources of contamination could originate from incoming raw milk or from biofilms within the draining and matting conveyor (DMC) that are reduced, but not eliminated by sanitation. The objective of this study was to identify areas in a commercial cheese production facility where bacterial populations increase during the production day. Combinations of milk, whey, curd, and/or food contact surface samples were collected on at the beginning, middle, end of the day, and after sanitation on 15 production days. Samples were enumerated for bacterial subpopulations using MacConkey, m-Enterococcus, Acinetobacter Chromogenic, and Pseudomonas Isolation agars. Representative isolates with unique morphologies were identified using 16S rRNA Sanger sequencing. Bacterial counts from swabs inside the DMC were usually below detection limit (10 cfu/mL) after sanitation; however, all subpopulations increased over the 18 h production day. Bacteria were detected at low levels (<2.4 Log cfu/mL) at mid-day. Inside the DMC (near the weir) at the end of the production day, coliform counts reached 5.3 Log cfu/mL and Acinetobacter increased to 6.2 Log cfu/mL. Throughout the DMC, Pseudomonas and Enterococcus were detected at levels as high as 3.1 Log cfu/mL and were detected after CIP (Pseudomonas: 1.4 Log cfu/mL; Enterococcus: 2.6 cfu/mL). Klebsiella, Escherichia, Enterobacter, Pseudomonas, Acinetobacter, Enterococcus and Streptococcus were all identified by 16S rRNA sequencing in samples collected from the DMC at the end of the day. Coliforms and Enterococcus increased 3.4 Log cfu/mL and 1.2 Log cfu/mL, respectively, inside the DMC in the final 8 h of the production day. This sharp increase demonstrates the critical need to consider the time between sanitation events for these subpopulations and consider their impact on finished product quality.

Key Words: cheese, microbiology, processing

T31 Influence of goat milk composition and level of $\alpha_s$-casein on the yield of fat-free fresh cheese model. F. Pinto1, J. L. Riveros2, and R. A. Ibáñez3,4. Pontificia Universidad Católica de Chile, Facultad de Agronomía e Ingeniería Forestal, Escuela de Graduados, Santiago, Chile, 2Pontificia Universidad Católica de Chile, Facultad de Agronomía e Ingeniería Forestal, Departamento de Ciencias Animales, Santiago, Chile, 3University of Wisconsin-Madison, Center for Dairy Research, Madison, WI.

In goat milk, the level of expression of $\alpha_s$-casein (CN) is associated with animal genetics and relates to the content of total solids of milk and cheese yield. In Chile, goat production is mainly extensive, non-specialized, and with mainly Creole animals with high genetic variability in both production and levels of total solids in milk. In recent years, goat milk production has experienced a considerable development and technification, forcing the genetic selection of herds toward increased production and yields, as required by market needs. In this study, we analyzed the relationship between the composition and levels of $\alpha_s$-CN in goat milk with the yield of fat-free fresh cheese made on a laboratory scale. A goat dairy farm located in the dryland area of Central Chile (33°32’24” S, 71°35’00” W, 154 m altitude) and comprised by 87 goats, was used for this study. Individual milk samples were collected at 200 ± 7 d (mean ± SD) of lactation and analyzed for composition, somatic cell count, levels of individual caseins by reversed-phase high performance liquid chromatography and cheese yield (kg cheese/100 kg milk) obtained from a miniature cheesemaking laboratory model based on milk composition and using 40 g of skim milk. Variables were evaluated according herd phenotype: Alpine (n = 4), Chilean Creole (n = 7), Crossbreeds (n = 20) and Saanen (n = 56); and levels of $\alpha_s$-CN in milk: high (>15% $\alpha_s$-CN/total CN), medium (10–15% $\alpha_s$-CN/total CN), low (5–10% $\alpha_s$-CN/total CN) and very low (0–5% $\alpha_s$-CN/total CN). A positive correlation ($r = 0.768$; $P < 0.05$) was found between protein content of milk and cheese yield. However, a low correlation ($r = 0.243$; $P < 0.05$) was found between the level of $\alpha_s$-CN in milk with cheese yield. These results suggest that standardization of cheesemaking protocols based on milk composition may reduce differences in cheese yield due to genetic variability of individuals in a herd.

Key Words: $\alpha_s$-casein, goat milk, cheese yield

T32 Perception of cheese aromas: The case of 2-nonanone. C. C. Licon*,2, H. Razafindrazaka3, D. Pierron*, and M. Bensafi1, 1Department of Food Science and Nutrition, California State University, Fresno, CA, 2Lyon Neuroscience Research Center; CNRS UMR5292, INSERM U1028, Université Claude Bernard Lyon 1, Lyon, France, 3Institute for Advanced Study in Toulouse, Université Toulouse 1 Capitole, Toulouse, France, 4Paul Sabatier University-Toulouse III, Toulouse, France.

Olfaction is one of the key aspects that drive food enjoyment and preference; cheese is not an exception, its quality is defined by its flavor and aroma compounds. It is known that all cheeses share almost the same aromatic compounds: alcohols, aldehydes, or ketones, among others, but only a few aromas are responsible for cheese odor perception. Thus, it is of interest to investigate the perception of some of the major compounds in cheese. A good example is 2-nonanone, a methyl-ketone produced in Gorgonzola, ripened Ragusano, Camembert, and Brie due to enzymatic activity of molds (Penicillium camemberti, P. roqueforti or G. candidum). From a sensory perspective, this molecule has been commonly associated with malty and fruity notes but also as cheesy and pungent, having a dual perceptual nature. The objective of this work was to study the perception of 2-nonanone by studying its aromatic threshold and description. Eighty-seven participants were tested in 2017, with ages between 19 and 25 years old (mean 21 ± 1.4), 23 males and 64 females. The threshold of 2-nonanone was calculated using the best estimate threshold (BET) method using 5 ascending concentrations (0.1 ppb, 1 ppb, 0.01 ppm, 0.1 ppm, 1 ppm) with an alternative forced-choice task (using 4 flashes, 3 of them blank). We also asked the participants to rate the aroma (pleasantness, intensity, familiarity, edibility, irritation in a scale from 1 to 7 and aromatic description) at 0.1 ppm if they were able to detect it. The 2-nonanone was diluted in deodorized mineral oil and presented in a 15-ml flask (diameter 1.7 cm; height, 5.8 cm; filled with 5 ml of liquid). Results showed that the group BET for 2-nonanone in mineral oil was 14 ppb. We found that 13 participants (14.94%) were not able to identify any of the concentrations presented while 4 participants (4.6%) were able to identify all concentrations correctly. No significant correlations were found ($P > 0.05$) between the threshold and the perceptual attributes. The aroma was described as chemical, cheesy, fruity, floral and unpleasant. Further analysis is needed to determine if there is a correlation between the perception of this compound and cheese consumption.

Key Words: cheese aroma, perception, 2-nonanone

T33 Profiles of fatty acid composition in relation to water activity of powder goat milk stored under different storage time and temperature. R. Paswan1,2, A. Siddique2, A. Mishra3, and Y. W. Park1, 1Fort Valley State University, Fort Valley, GA, 2University of Georgia, Athens, GA.

Water activity ($a_w$) is important index for food quality, safety and storage stability, where $a_w$ is closely related to bacterial growth. It was reported that...
a, affected the fatty acid composition of dehydrated bovine milk, because lipid oxidation in low moisture foods caused changes in fatty acid composition of the products. However, such reports on powdered goat milk (PGM) have been scarce. The purpose of this study was to determine fatty acid (FA) profiles in commercial PGM products in relation to a. Three batches of commercial PGM products were purchased from a local retail outlet in Warner Robins, GA, and assigned to 2 storage temperatures (ST) (4°C and 25°C) for 10 storage periods (SP) (0, 3, 7, 14, 21, 30, 60, 90, 120 and 180 d). Basic nutrient contents of the PGM samples were determined using the AOAC (1995) procedures. Water activity of the PGM samples was determined using the AquaLab water activity meter (cx-2; Decagon Devices). FA profiles of all experimental PGM samples were quantified using a gas chromatograph (GC-2010; Shimadzu), equipped with a fused silica capillary column (Supelco-2560), flame ionization detector and AOC-20s auto sampler. Results showed that oleic acid (C18:1) had highest, caprylic acid (C8:0) was the second highest, and behenic acid (C22:0) had lowest level among all the FAs identified in experimental PGM samples. The samples stored at 4°C had slightly higher FA values than those stored at 25°C, except for C18:0 and C18:1 at 4-mo storage. Majority of FAs tested were significantly affected by SP, while effects of ST were not significant for C8:0, C14:0, C16:0, C18:1, C18:3, C20:0, C22:0, C24:0 acids. No significant correlations (r) were found between a and fatty acids contents in the PGM stored at 25°C, whereas those r values of the samples stored at 4°C were significant for C8:0, C16:1, C18:1 and C18:2 acids. The C:8 content revealed the highest r value with a among all FAs analyzed. It was concluded that majority of FAs concentrations in the commercial PGM were affected by main factors, especially batch and storage period treatments.

Key Words: powdered goat milk, fatty acids, water activity

T34 The stability of whipped cream: Effect of emulsifier synergy on partial coalescence and crystallization of milk fat. Y. Wang*,1, 2 R. Hartel†, and L. Zhang*, 1University of Wisconsin–Madison, Madison, WI, 2China Agricultural University, Beijing, China.

Whipped cream is a triphasic system where the air is introduced and finally enveloped by a network of partially-coalesced fat globules (FGs). Emulsifiers are an important factor affecting the partial coalescence of FGs, which is critical for the stabilization of whipped cream. Therefore, we investigated the synergy of different emulsifier formulas in the bulk anhydrous milk fat (AMF) system, whipping cream emulsions, as well as how it related to the stabilization of whipped cream. Lactic acid esters of mono-and diglycerides (LACTEM, 0.2 wt.%), Sodium stearyl lactate (SSL, 0.2 wt.%) or Tween80 (0.05 wt.%), either singly or in combination with mono-and diglycerides (MDG, 0.1 wt.%) were used as different emulsifier formulas. The partial coalescence and crystallization profile of bulk AMF blends were examined. Furthermore, the particle size distribution, apparent viscosity, and creaming rate of whipping cream were measured, while the whipping properties and microstructure of whipped cream were analyzed. Results showed that the different emulsifier formulas exhibited various interfacial properties and fat crystallization behavior, affecting the texture of the final whipped cream. Lipophilic-emulsifier formulas accelerated fat crystallization and achieved higher foam firmness, while the MDG had a significant positive effect on the crystallization behavior of bulk AMF blends compared with the minor impact on emulsification. Moreover, the highly viscous whipping creams were obtained by combining additional hydrophilic emulsifiers (SSL or Tween80) could be attributed to FG partial coalescence and smaller particle size. The 4-blend emulsifier formula produced a lower emulsion creaming rate (0.25 ± 0.00 a.u.) and higher overrun (177.03 ± 3.50%). The foam displayed regularly-shaped air bubbles enveloped by fat network consisting of round and well-distributed FGs. Overall, the results provided an interesting starting point for further work on controlling the partial coalescence of FGs and fat crystallization behavior by selecting appropriate emulsifier formula to achieve better texture of whipped cream.

Key Words: whipped cream, milkfat crystallization, stability

T35 Using iso-conversational kinetics to study the effect of α-tocopherol on the oxidation of formulated milk powder. K. A. Al-saleem*,1, 2 K. Muthukumarappan3, and S. I. Martínez-Montagudo4, 1Dairy and Food Science Department, South Dakota State University, Brookings, SD, 2Food Science and Human Nutrition Department, Qassim University, Al-Qassim, Saudi Arabia, 3Agricultural and Biosystems Engineering Department, South Dakota State University, Brookings, SD.

Formulated milk powders are used in several applications, including recombined evaporated milk, yogurt, cheese, infant formulas, and beverages. During processing and subsequent storage, the fat in the powder can be oxidized and generate undesirable changes in the final product. The addition of antioxidants is a widespread practice to prevent the oxidation of formulated milk powders. In this work, we studied the effect of α-tocopherol on the kinetic parameters (pre-exponential factor, activation energy, and reaction model) during the oxidation of formulated milk powder. The oxidation kinetics were obtained using thermogravimetical analysis (TGA) under non-isothermal conditions. Samples were formulated with either α-Tocopherol at 2% (α-Toc), hydrogen peroxide (H₂O₂), and α-Toc+H₂O₂. Then, the formulated samples were oxidized at different heating rates (3, 6, 9, and 12°C min⁻¹) in a temperature range of 100–300°C. In general, the addition of α-Toc delayed the oxidation of formulated milk powders. The lowest value of oxidation onset temperature was obtained for α-Toc, followed by α-Toc+H₂O₂ and H₂O₂, yielding values of 128.2 ± 0.2, 231.8 ± 0.5, and 248.5 ± 0.2°C, respectively. The activation energy values were 58.12 ± 3.21, 46.91 ± 2.75, 69.43 ± 3.05, and 65.89 ± 5.12 kJ mol⁻¹ for formulated milk powder, H₂O₂, α-Toc, and α-Toc+H₂O₂, respectively. The reaction model for the different samples was initially screened by fitting 13 different models. The most suitable reaction model to describe the oxidation of formulated milk powders was the Avrami-Erofeev model (A3). The obtained kinetic parameters were interpreted in terms of the oxidation mechanism. The obtained results may enable further process development, design, and optimization.

Key Words: α-tocopherol, isoconversational methods, formulated milk powders

T36 Comparison of milk iodine concentration between retail conventional and organic milk in the United States. M. Ghelichkhani*,2 L. H. P. Silva2, R. C. R. Timini3, J. G. Dessbesell1, M. A. Zambom1, and A. F. Brito2,1Universidade Estadual do Oeste do Paraná, Marechal Cândido Rondon, Brazil, 2University of New Hampshire, Durham, NH.

Previous research showed that over 50% of organic dairies in the Northeast and Upper Midwest US feed Ascophyllum nodosum meal known to be a rich source of iodine (I). Therefore, milk I concentration (MIC) in retail organic milk may be greater than that of conventional milk. Further, different feeding practices between organic and conventional dairies have been shown to seasonally change MIC, which can be also affected by processing method. However, a comprehensive survey of conventional and organic retail MIC has not been conducted in the US. A total of 299 samples of 2%-reduced fat organic (n = 96; ultra-high temperature (UHT), n = 62; pasteurized, n = 34 and conventional (n = 203; UHT, n = 25; pasteurized, n = 178) milk were purchased in selected grocery stores (n = 73) in June 2017 (summer) and March–April 2018 (spring) from the 11 northeastern states and Washington DC (n = 23 cities visited). No duplicate brand (n = 108) or milk plant (n = 82) was included in the MIC data set. Statistical analyses were done in JMP Pro 15.0.0 using a full factorial ANOVA model that included season (summer vs. spring), production system (conventional vs. organic), and milk processing (UHT vs. pasteurized) as independent variables, as well as interactions. A season by production system interaction (P < 0.001) was observed; while conventional milk tended to have greater MIC (P = 0.09; 388 ± 17 μg/L) than organic (341 ± 22 μg/L) during the summer, organic milk had increased MIC (P < 0.01; 515 ± 21 μg/L)
µg/L) compared with conventional milk (437 ± 16 µg/L) in the spring. This seasonal difference likely results from intake of I-binding goitrogens present in pasture that prevent the transfer of I into milk. UHT milk also had greater MIC (< 0.01; 455 ± 16 µg/L) than pasteurized milk (386 ± 12 µg/L). Note that organic milk had greater MIC during winter than conventional milk and most was UHT processed, indicating that our milk processing data should be interpreted cautiously. Overall, season and processing appear to affect MIC as shown in previous research, and MIC was generally below the 500-µg/L threshold considered safe for consumers.

Key Words: dairy food, milk plant, milk processing

T37 Influence of monk fruit sweetener on the physico-chemical characteristics of camel milk yogurts. A. Buchilina*, and K. Aryana1,2, Louisiana State University, Baton Rouge, LA, 2Louisiana State University Agricultural Center, Baton Rouge, LA.

Monk fruit sweetener contains antioxidants and is a natural zero calorie sweetener with the sweetness from 100 to 250 times that of sucrose. Camel milk has many beneficial nutritional and therapeutic characteristics and is used to treat different human diseases because of the presence of natural bioactive components. Camel milk yogurts with 0, 3.2, 9.6, and 19.2g of the added monk fruit sweetener per 7.57 L of camel milk were prepared and stored at 4°C for 6 weeks. During storage, the pH, titratable acidity, viscosity, and color (L*, a*, b*, C*, and h*) were measured weekly. Three replications were conducted. Data were analyzed using Proc Mixed of the SAS and Bonferroni (Dunn) t-test was used to determine significant differences at P < 0.05. The presence of monk fruit sweetener significantly decreased the pH and significantly increased the viscosity of the yogurts. Yogurt with 0g of the sweetener had significantly higher pH (4.38 ± 0.10) than the yogurts with 9.6 (4.30 ± 0.07) and 19.2g (4.31 ± 0.10) of monk fruit sweetener. Viscosity of the yogurt with 0g of the sweetener was significantly lower (1394.98 ± 321.83) than the samples with 9.6 (1595.78 ± 219.20) and 19.2g (1646.92 ± 181.50) of the sweetener and no different from the sample with 3.2g of the sweetener (1539.33 ± 131.81). The instrumental color attributes a*, b*, C*, and h* were also significantly affected by the addition of the sweetener. The a* values of yogurts significantly increased, the b*, C*, and h* values of yogurts significantly decreased. The supplementation of yogurt with the sweetener did not affect the titratable acidity and the L* value of yogurt samples. Monk fruit sweetener can be used as a sweetener in the camel milk yogurt production.

Key Words: fermented, yogurt, physico-chemical

T38 Impact of butterfat content and composition on the quality of laminated pastries. S. Ramirez, T. Kongraksawech, Q. Ferraris, B. Riesgaard, A. Ross, M. Qian, L. Meunier-Giodik, and J. Watte-Cusice*, Oregon State University, Corvallis, OR.

Bakers (professional and amateur) often choose butters with higher butterfat content (>82% butterfat) and the industry is responding with a variety of options that deliver certain butterfat percentages (up to 85% butterfat). Higher butterfat products are more challenging to manufacture; however, they also demand a higher price point making their production appealing to processors. The objective of this study was to associate butter characteristics (butterfat, fatty acid profile, etc) with dough performance and finished quality of laminated pastries (height, weight). Commercial butters (n = 14) were sourced from local retailers and used as the fat component in a standardized croissant dough. The dough was laminated and sheeted at approximately 12°C using the Rondo SSO615 Ecomat Floor Model Sheeter. Dough was cut and formed into croissants, proofed at 30°C for 90 min at 80% RH, and baked at 196°C for 15 min in a rotating convection oven. The butterfat content, fatty acid profiles, and melting profiles of each butter were characterized using Mojonner method AOAC 922.06, GC-FAME, and differential scanning calorimetry, respectively. Heights and weights and crumb characteristics of laminated and baked pastries were measured.

The majority of commercial butters performed acceptably (no cracks or tears) during lamination and produced finished croissants of good quality; however, one dough was noticeably sticky and difficult to handle. Four of the commercial butters produced finished pastry of low baked height, likely a function of poor rise during proofing. Butterfat content was not found to be responsible for the difference in dough quality (P > 0.05). Instead increased unsaturated fat content (highly dependent on C18:1; P = 0.04) was associated with decreased baked pastry height. None of the other measured characteristics were associated with finished product quality.

Key Words: butter, croissant, baking

T39 Influence of cell surface properties on the adhesion potential of environmental Listeria isolates to dairy floors. N. Singh1,2, S. Anand1,2, and B. Kraus1, Midwest Dairy Foods Research Center, Brookings, SD, 2South Dakota State University, Brookings, SD, 3Wellers Enterprises Inc, Le Mars, IA.

The prevalence of Listeria in dairy manufacturing environment poses a cross-contamination risk. The current study compares 3 Listeria isolates from dairy plants; L. monocytogenes (Lm), L. innocua (Li), and L. welshimeri (Lw), for their cell surface properties and adhesion on different floor types; clay brick, poured concrete, and grout. For evaluating cell attachment, different floor chips (1x1cm²) were immersed in sterile distilled water, containing 6 logs/mL of the individual Listeria strain, and held for 1h at 22.4°C in a shaker incubator. The attached cells were retrieved from floor chips using 3M sponge sticks and plated on brain heart infusion agar. The counts obtained were reported as cfu/cm². The cell surface hydrophobicity was determined by the hexadecane method. The absorbance of aqueous layers was measured, and % hydrophobicity was calculated. The zeta potential was determined by the Zeta sizer Nano series instrument (Malvern Panalytical, UK). In addition, the contact angle of HPLC water on the dairy floor types was measured using the Sessile Drop device. For each of the analyses, 3 trials were conducted, with samples drawn in triplicates, and the means were compared by ANOVA. The results from the attachment study indicated the highest adhesion (log cfu/cm²) of all 3 isolates on poured concrete (Lm 3.54 ± 0.04, Li 3.27 ± 0.16 and Lw 3.70 ± 0.24), as compared with grout (Lm 3.28 ± 0.51, Li 2.67 ± 0.41 and Lw 2.71 ± 0.53), and clay brick (Lm 2.91 ± 0.16, Li 2.73 ± 0.04 and Lw 2.89 ± 0.40). The water contact angles on all 3 surfaces were less than 90° (clay brick 43. ± 0.78, poured concrete 47.9 ± 3.23 and grout 64.5 ± 2.85) indicating them to be hydrophilic and thus supporting the attachment. Of the 3 isolates, Lm and Lw resulted in a greater attachment than Li, which was also supported by their respective hydrophobicity values (20.13%,21.15%, and 13.88%). The zeta potential values, however, were similar (~15.8 mV, ~16.2 mV and ~15.5 mV, respectively) and did not appear to influence attachment. The study provides critical information for selecting the type of floors that may reduce the colonization and biofilm formation by the environmental Listeria in dairy plants.

Key Words: dairy floors, attachment, Listeria


Listeria monocytogenes is a ubiquitous pathogen that grows at refrigeration temperature and can cause mortality in immunocompromised individuals. Hispanic-style fresh cheeses are susceptible to the growth of L. monocytogenes due to their high water activity, low salt content, and near neutral pH. Traditionally, these cheeses are produced using raw milk which increases the risk of L. monocytogenes contamination due to the lack of a pasteurization step. The use of antimicrobials in raw milk is a potential way to control L. monocytogenes growth in processes without a thermal kill step. Microbial-based enzymes offer a clean-label approach for control of L. monocytogenes. Lactase oxidase (LO) is a microbial-derived en-
zyme with antimicrobial activity. It oxidizes lactose into lactobionic acid and generates hydrogen peroxide. This study investigated the utilization of LO for the control of L. monocytogenes growth in UHT skim milk as a model system for future applications in raw milk. Three concentrations of LO, 0.006, 0.012, and 0.12 g/L, were evaluated for their ability to inhibit L. monocytogenes growth at 6°C over 21 d. UHT skim milk samples containing these LO concentrations, and a control with no LO, were inoculated with either 4 log cfu/mL or 2 log cfu/mL of a 5-strain cocktail of L. monocytogenes. Samples were enumerated for growth of L. monocytogenes on d 0, 2, 4, 7, 14, and 21. Analysis of Variance and Tukey’s Honest Significant Difference tests were performed individually for each time point and log differences between the control and treatments were determined. 

Bacterial spoilage limits the refrigerated shelf-life of conventionally pasteurized fluid milk, but the specific metabolic processes that result in many types of milk spoilage are not well-understood. To address this deficiency, bacterial strains that reliably and reproducibly generate specific sensory defects in fluid milk must first be identified. Human sensory panels are the current standard for sensory defect identification, but the safety of panelists must be ensured if they are to taste intentionally inoculated milk. This raises a particular concern for the Bacillus cereus group, members of which are associated with both milk spoilage and foodborne illness. We used BTyper, a computational tool for virulence-based classification of B. cereus group isolates, to examine the whole genome assemblies of 37 dairy-associated Bacillus spp. for 4 common virulence factors associated with enteric illness: cereulide, hemolysin BL, non-hemolytic enterotoxin, and cytotoxin K. Genes encoding all 4 of these factors were detected among the 37 Bacillus spp. isolate assemblies. Specifically, a gene necessary for cereulide production (cesC) was detected in 4 isolates, the 4-gene operon necessary for hemolysin BL production (hblCDA) was detected in 27 isolates, the 3-gene operon necessary for non-hemolytic enterotoxin production (nheABC) was detected in 36 isolates, and the gene necessary for cytotoxin K-2 production was detected in 16 isolates. In addition to these virulence factors, genes encoding resistance to β-lactams, fosfomycin, or vancomycin were detected in each of the 37 Bacillus spp. genomes. In contrast, none of these 4 virulence factors and very few anti-microbial resistance genes were detected in 61 whole genome assemblies of Pseudobacillus spp. or in 5 whole genome assemblies of Viridibacillus spp. Based on these findings, we were unable to identify any B. cereus group isolates that we judged sufficiently lacking in potential hazards to justify their intentional exposure to a human sensory panel. Hence, other methods must be used to assess the spoilage potential of Bacillus spp.

**Key Words:** Listeria, enzymatic preservation, milk

**T41 Bacillus cereus group species isolated from dairy products and dairy environments are not appropriate for use in inoculated-milk human sensory studies.** S. Reichler*1, N. Martin, and M. Wiedmann, Cornell University, Ithaca, NY.

Bacterial spoilage limits the refrigerated shelf-life of conventionally pasteurized fluid milk, but the specific metabolic processes that result in many types of milk spoilage are not well-understood. To address this deficiency, bacterial strains that reliably and reproducibly generate specific sensory defects in fluid milk must first be identified. Human sensory panels are the current standard for sensory defect identification, but the safety of panelists must be ensured if they are to taste intentionally inoculated milk. This raises a particular concern for the Bacillus cereus group, members of which are associated with both milk spoilage and foodborne illness. We used BTyper, a computational tool for virulence-based classification of B. cereus group isolates, to examine the whole genome assemblies of 37 dairy-associated Bacillus spp. for 4 common virulence factors associated with enteric illness: cereulide, hemolysin BL, non-hemolytic enterotoxin, and cytotoxin K. Genes encoding all 4 of these factors were detected among the 37 Bacillus spp. isolate assemblies. Specifically, a gene necessary for cereulide production (cesC) was detected in 4 isolates, the 4-gene operon necessary for hemolysin BL production (hblCDA) was detected in 27 isolates, the 3-gene operon necessary for non-hemolytic enterotoxin production (nheABC) was detected in 36 isolates, and the gene necessary for cytotoxin K-2 production was detected in 16 isolates. In addition to these virulence factors, genes encoding resistance to β-lactams, fosfomycin, or vancomycin were detected in each of the 37 Bacillus spp. genomes. In contrast, none of these 4 virulence factors and very few anti-microbial resistance genes were detected in 61 whole genome assemblies of Pseudobacillus spp. or in 5 whole genome assemblies of Viridibacillus spp. Based on these findings, we were unable to identify any B. cereus group isolates that we judged sufficiently lacking in potential hazards to justify their intentional exposure to a human sensory panel. Hence, other methods must be used to assess the spoilage potential of Bacillus spp.

**Key Words:** milk protein concentrate, hydrodynamic cavitation, nanofiltration

**T43 Development and characterization of whey-buttermilk fermented beverages with Gabiroba pulp (Campomanesia xanthocarpa).** L. Damasceno*1, R. T. Pfrimer1, A. F. Cruz1, C. F. Cardoso2, T. V. de Almeida1, E. Arnhold1, E. S. Nicolau1, and C. Gebara1, 1Food Research Center, School of Veterinary Medicine and Animal Science, Federal University of Goiás, Goiânia, Goiás, Brazil, 2School of Agronomy, Federal University of Goiás, Goiânia, Goiás, Brazil.

The use of dairy coproducts such as whey and buttermilk is a high-value food production strategy. This work aims to develop and to characterize whey-buttermilk fermented beverages with gabiroba pulp (Campomanesia xanthocarpa). Were produced 13 formulations according to the simplex-centroid mixture, designed with different concentrations of whey and buttermilk between 0 and 44%, UHT milk between 40 and 56% and pulp between 10 and 20%. Batches of 20 L of milk, whey and buttermilk were heated at 85°C/5 min, cooled at 42°C and fermented with 2.5% of starter culture YoFlex Harmony 1.0 (Chr. Hansen, Denmark) for 3h until reach pH 4.85. Fermented beverages were cooled, added of gabiroba pulp, packaging in glass bottles and then stored at 5°C. Physicochemical and microbiological characteristics were determined (n = 3) by official methods including analysis of lactic acid bacteria (LAB) by MRS agar at 37°C/72h, coliforms by BGBB 2% broth at 35°C/48 h and EC broth at 45°C/24 h. Presence of Salmonella sp. was evaluated using buffered peptone water at 37°C/18 h, RVS broth at 41.5°C/24 h, MKTTn at 37°C/24 h and XLD agar and BS agar at 37°C/24h. Results were evaluated by ANOVA and mean values were compared by Scott-Knott’s test (P < 0.05). All beverages met the expected characteristics for quality and food safety. They presented pH between 4.34 and 4.76, acidity between 0.34 and 0.56%, moisture between 79.51 and 83.05%, ash between 0.33 and 0.50%, protein between 1.49 and 2.24%, casein between 1.14 and 1.88%, whey proteins between 0.02 and 0.48%, lipids between 1.09 and 1.78% and carbohydrates between 13.53 and 15.96%. All beverages presented a significant difference (P < 0.05) for physicochemical parameters. This
result was due to different concentrations of ingredients. A higher concentration of milk results in higher protein and lipid content, and a higher concentration of buttermilk results in higher moisture. All the beverages presented LAB above 6.0 log^{10} CFU/mL for 7 weeks and 6 of them for 13 weeks. The use of whey and buttermilk to produce fermented beverages is a suitable way of making functional and sustainable dairy products.

**Key Words:** functional, coproducts, innovation