W58 Higher oxidative product in UHT drinking milk originated from milk powder than that from raw milk. S. Santinate, W. Suriyasathaporn, and P. Vinitchaikul*, *Chiang Mai University*, *Muang, Chiang Mai, Thailand*.

In Thailand, the most popular liquid milk product is UHT milk. In our UHT commercial milk, it is originated from 2 sources of milk including raw milk and milk powder, whereas the latter will be recombined with water. Autoxidation takes place throughout storage of the powder, especially during importing processes time interval. The most important secondary product of autoxidation is the malondialdehyde (MDA) that is usually used as an indicator of the lipid peroxidation process. This product imparts that the milk quality has been decreased including off-flavors and loss of nutrients. Therefore, the objective of this study was to determine whether UHT milk originated from raw milk (RAW) had lower MDA than that from milk powder (POW). In addition, interval to expiration date was controlled from MDA production during storage after UHT milk process. Four commercial UHT liquid milk products known for sources of milk were selected. Approximately 15 packages of each commercial milk product with variation of expiration dates were collected from markets. MDA were measured. Analysis of variance was used to test whether MDA of among UHT milk were different from one another. Pearson correlation coefficient was used to evaluate the relationship between interval to expiration date and MDA. Means and standard error of means from RAW1, RAW2, POW1 and POW2 were 1200 + 92, 1460 + 95, 1945 + 85 and 1848 + 79 ppb, respectively. Statistical analysis showed that RAW1 and RAW2 were different from POW1 and POW2 ($P<0.05$). Higher intervals to expiration date decreased MDA concentrations ($p = -0.23$, $P< 0.05$). This indicates that UHT milk has lower quality from milk powder than raw milk. Increasing storage times after production process is associated with increase of malondialdehyde concentrations.

Key Words: Malondialdehyde, UHT Milk, Raw Milk

W59 Effect of cold storage and packaging material on butter flavor. P. R. Lozano[2], R. E. Miracle*[1], A. J. Krause[1], K. R. Cadwallader[2], and M. A. Drake[1], [1]*North Carolina State University*, *Raleigh*, [2]*University of Illinois*, *Champaign-Urbana*.

Sweet cream butter in the United States is often stored for several months under refrigerated and frozen storage in bulk (25 kg blocks) and quarters (commercially-packaged sticks). Deterioration of flavor may occur during this time. The objective of this study was to evaluate the flavor of bulk and stick butter across frozen and refrigerated storage under different packaging conditions. Butter (bulk and quarters) was collected on two occasions from two West coast facilities. Two packaging materials (wax parchment paper and foil) were represented. Butters were stored at 4°C or -20°C and evaluated after 0, 6, or 12 months storage. Descriptive sensory analysis using a trained panel was used to document flavor changes. Volatile compounds of butter and packaging material were identified using dynamic headspace analysis (DHA), solid phase micro-extraction (SPME), and solvent assisted flavor evaporation (SAFE) followed by gas chromatography mass spectrometry (GC-MS) and gas chromatography olfactometry (GC-O). The most intense aroma-active volatile components of pasteurized AA butter were butanoic acid, d-decalactone, 1-octen-3-one, dimethyl trisulfide and diacetyl. Lipid oxidation products and methyl ketones increased as a function of storage time. Butter stored at refrigeration temperatures (4°C) showed greater flavor deterioration by sensory and instrumental analyses than butter stored at freezing conditions (-20°C). The intensity and relative abundance of styrene increased as a function of storage time at refrigeration temperature. Butter frozen for 12 months exhibited lower levels of styrene and a flavor profile more similar to fresh butter compared to butter refrigerated for 12 mo. Foil wrapping material performed better than wax parchment paper to prevent styrene migration to butter, in minimizing the increase in the intensity of lipid oxidation and hydroxyl acid products, and in the loss of fresh butter flavor.

Key Words: Butter, Storage Stability, Packaging

W60 Persistence of conjugated linoleic acid (CLA) on three dairy products. M. A. Rodriguez[1], P. Pellegrini[1], G. Muset[1], P. Gatti[1], D. A. Garciarena[2], and G. A. Gagliostro*[2], [1]*Instituto Nacional de Tecnología Industrial (INTI). Lácteos*, *Buenos Aires, Argentina*, [2]*Instituto Nacional de Tecnología Agropecuaria (INTA)*, *Balcarce, Argentina*.

The study was designed to test the persistence of 9-cis 11-trans CLA on yogurt, white cheese and pasteurized milk elaborated from raw milk of high CLA content (3.54 g/100g FA). Six Holstein cows (520 ± 60 kg liveweight) producing about 10 kg of milk grazed an oat pasture (2800 kg DM/ha; 11 kg pasture DM/cow) and received also a TMR composed by corn grain (1.3 kg DM/cow/d), corn silage (5.6 kg DM/cow/d), sunflower oil (0.8 kg/cow/d), fish oil (0.24 kg/cow/d) and sunflower meal (0.89 kg DM/cow/d). After 10 days of adaptation individual milk samples were collected and transformed into yogurt, white cheese and pasteurized milk reproducing industrial conditions. Fatty acid composition of milk and dairy products was analyzed by gas chromatography. Differences in CLA concentration between raw milk and products were stated using the T-test for paired observations. In the case of pasteurized milk, two different processes were carried out at 72 °C for 15 seconds (HTST) and at 140 °C for 5 seconds (UHT). Results showed an average increase of CLA of 0.08 g/100g (ranging from 0.02 to 0.11 g/100g) over raw milk ($P<0,11$) for HTST and 0.07 g/100g (-0.03 to 0.19 g/100g) for UHT ($P<0,93$). White spreadable cheese elaborated from HTST pasteurized milk after adding a mesophilic starter and chymosin showed a CLA increase of 0.04 g/100g ranging from -0.04 to +0.09 g/100g ($P<0.97$). The six elaboration trials of yogurt using HTST pasteurized milk and adding sugar, non-fat milk powder and starter showed an average decrease in CLA of 0.19 g/100g ranging from -0.45 to +0.15 g/100g ($P<0.88$). The results showed that variations in CLA content were not significant whatever the dairy product tested. In this study, the CLA present in the raw milk was not lost during the processes of milk transformations. Negative metabolic actions of the starter or heat affects on final CLA content in the products were not detected.

Key Words: Conjugated Linoleic Acid, Dairy Products, Pasteurized Milk

W61 Effects of refrigeration and calcium on whey protein aggregation. M. R. Costa*[1,2], G. Brisson[1], M. L. Gigante[2], P. S. Tong[1], and R. Jiménez-Flores[1], [1]*California Polytechnic State University*, *San Luis Obispo*, [2]*State University of Campinas*, *Campinas, Brazil*.

Aggregation of whey proteins in 5% protein solution was studied using a laser diffraction particle size analyzer. Two whey protein concentrate powders (WPC80) with similar composition were evaluated: WPC1 was produced by traditional commercial procedures, and for WPC2 the liquid whey protein concentrate (LWPC, obtained by ultrafiltration) was refrigerated (4°C, overnight) prior being spray-dried. We studied the effects of refrigeration, adding calcium (50mM $CaCl_2$) to each of the WPC solutions, and heating (50°C/8min). Our results show that WPC1 solutions did not have particles larger than 6µm initially. However, calcium addition produced large aggregates (10-60µm diameter) that became the main volumetric fraction (78.6±0.2%). Aggregation was independent of heating, and the formed aggregates did not change after either heating or overnight refrigeration. In the WPC2 solutions, calcium addition did not have the same pronounced impact on aggregate formation as in the WPC1 solutions. The main volumetric fraction in the calcium-added solutions switched from particles smaller than 2µm to particles between 2 and 10µm diameter (54.5±0.8%) only after heating. However, after overnight refrigeration these largest aggregates were partially disrupted into the smallest particles, which returned as the main volumetric fraction (58.6±0.7%). The addition of β-mercaptoethanol (0.1%) had no particle size distribution effect over the solutions, while the presence of urea (4M) changed the turbid solutions immediately to clearer ones. This suggests the contribution of non-covalent interactions to aggregates formation. In addition to the noticeable large aggregate formation, our results show that refrigerating the LWPC prior spray-drying reduced the proteins susceptibility to $CaCl_2$-induced aggregation in the reconstituted WPC. The aggregates formed in this solution after calcium addition were not too big and reversible by refrigeration, indicating they were held together by hydrophobic interactions. In contrast, the $CaCl_2$-induced aggregates from WPC manufactured without the refrigerating step were much larger and formed irreversible aggregates.

Key Words: Whey Protein Concentrate, Whey Protein Aggregation, Particle Size Distribution

W62 Seasonal variation of conjugated linoleic acid (CLA) and n-3 fatty acids of goat milk fat and its transfer into cheese. A. Nudda[1], G. Battacone[1], S. Testone[2], and G. Pulina*[1], [1]*Dipartimento di Scienze Zootecniche - Università di Sassari*, *Sassari, Italy*, [2]*Associazione Regionale Allevatori della Sardegna*, *Cagliari, Italy*.

The seasonal variation in conjugated linoleic acid (CLA), vaccenic acid (VA) and n-3 fatty acid contents in goat milk and the extent of their transfer from milk into cheese fat were investigated. Samples of milk and of the derived fresh cheese were collected in two milk processing plants located in middle-east Sardinia (Italy) every two weeks from early-spring (March-April) through early-summer (July). The concentrations of individual fatty acid in each sample of milk and cheese were determined by gas chromatography. Data were analyzed with a linear model that included the effect of processing plant, period and source (milk or cheese). Concentrations of CLA, VA and omega-3 fatty acids did not differ between milk and cheese (c9,t11 CLA content 0.62 and 0.67 mg/100 mg FA, VA content 1.09 and 1.06, and omega-3 content 0.88 and 0.79, respectively for milk and cheese). The FA composition of both milk and cheese was significantly affected by period of sampling: the mean of C18:3 n-3 concentration decreased linearly from early spring to early summer (0.91 vs 0.61 mg/100 mg FA). On the other hand, the means of VA and c9,t11 CLA decrease markedly from March (1.93 and 0.98, respectively) to April (1.03 and 0.66, respectively), and remain stable until early summer. A possible explanation for the different pattern of individual fatty acids can be found in the farming system of goat in this geographic area, where natural pasture and Mediterranean maquis scrubs represent the main feeding source. The reduction of C18:3 n3 in milk, for example, may reflect the reduced availability of grass, which is the main source of C18:3 n-3 fatty acid, that occurs in late spring-summer. No differences were observed between the two cheese plants for c9,t11 CLA and VA concentration in milk and cheese. *Acknowledgements: Research supported by the Ministry of University and Research (FISR grant).*

Key Words: Conjugated Linoleic Acid, Goat Milk, Cheese

W63 Survey of fluid milk quality. C. A. Boeneke*, K. J. Aryana, D. W. Olson, and J. L. Vargas, *Losuisiana State University Agricultural Center*, *Baton Rouge*.

Nineteen dairy processing plants located in the west, midwest, and southern regions of the U. S. were surveyed in order to determine milk quality. Whole, two percent, and skim milks were obtained in duplicate from the plants. Milk samples were shipped overnight to the Dairy Science Building at Louisiana State University. A temperature control was included with each set of samples. One set of milk samples were evaluated upon arrival for sediment, freezing point, lab pasteurization counts, coliform counts, standard plate counts, protein, fat, and somatic cells. Milks were evaluated for flavor using the Collegiate Dairy Products Evaluation Score Sheet. Milks were then stored at 7° C for two weeks. At the end of the two week period, milks were evaluated again for flavor by a 5 member trained panel. The entire experiment was repeated once every three months over a nine month period. Coliform counts on fresh samples were all less than ten colony forming units (CFU's) per ml. Standard plate counts ranged from less than 100 to 6300 CFU's per ml. No sediment was found in any of the samples. Samples received scores ranging from 8 to 9 out of 10 possible points for sensory evaluation upon arrival with the most common criticism being cooked. Sensory evaluation scores at the end of the two week period ranged from 1 to 9 out of 10. Common criticisms of samples were cooked, rancid, unclean, and fermented fruity. Region of the U. S. the samples were received from showed no differences in the quality of the samples.

Key Words: Shelf Life, Milk, Quality

W64 Effect of total protein content and whey to casein ratio on the texture of ice cream. J. M. Morton[1], P. Quok*[2], J. Estrade[1], W. Wang-Nolan[1], S. Vink[1], and P. S. Tong[1], [1]*Dairy Products Technology Center*, *San Luis Obispo, CA*, [2]*California Polytechnic State University*, *San Luis Obispo*.

Whey protein concentrate (WPC) is used in ice cream for its nutritional and functional properties. The functional properties of WPC enhance freeze-thaw stability and help minimize ice crystal formation, which

improve texture and mouthfeel. This study examined the effect of total protein content and whey to casein ratio (W/C) on the texture of ice cream. Regular (4.1%) and high (5.7%) protein ice creams were prepared with W/C levels of 1:1, 1:2, 2:1, and 4:1, for a total of 4 matched treatments and 1 matched control (no WPC). Nonfat dry milk and WPC 34 were used to adjust W/C and total protein content. Ice cream samples were tempered at -15°C for 4 to 6 hours before cutting. Twelve, 2.5 cm cubes were cut from the core of each ice cream block, positioned with the same surface facing up in covered serving cups, and stored at -18°C until testing the following day. Nine judges trained in descriptive analysis of ice cream evaluated the texture of the samples from first inspection, visual, to final mastication stage, chew down. Judges rated the intensities of each textural component on 15 cm line scales anchored by reference standards. Judges individually evaluated each sample in triplicate following a balanced block test design with a randomized, sequential monadic serving order. ANOVA of the data showed that when total protein content and W/C were accounted for, significant differences ($p \leq 0.05$) existed for hardness, rate of breakdown, rate of melt, and density. The high protein ice creams were less icy, softer, oilier, less foamy, and had higher mouthcoating than regular protein ice creams. Ice creams with the highest W/C were stickier, softer, foamier, and had higher rates of breakdown and melt. These findings suggest that both total protein content and milk protein composition affect ice cream texture.

Key Words: Ice Cream, Whey Protein, Sensory

W65 Influence of form of vitamins on yogurt characteristics. B. Dufrene*[1] and K. J. Aryana[2], [1]*Louisiana State University*, *Baton Rouge*, [2]*Louisiana State University Agricultural Center*, *Baton Rouge*.

Vitamins A and D are commonly added during the processing of some dairy products. Objective was to study the effect of liquid and powdered forms of vitamins A and D added separately during the manufacturing of yogurt. Vitamin A palmitate and Vitamin D_3 were incorporated at the rate of 1000 IU and 200 IU respectively per 8 oz of yogurt. Syneresis, pH, viscosity, color (L^*, a^* and b^*) sensory, lactic acid bacterial counts were enumerated on the yogurts at 0, 1, 3 and 5 weeks of storage. The treatment x storage time interaction effect was not significant for any of the attributes studied other than lactic acid bacterial counts. For lactic acid bacterial counts significant difference were noticed between vitamin D_3 liquid at weeks 0 and 5, vitamin A liquid at weeks 0 and 5, vitamin A powder at weeks 0 and 5, vitamin D_3 liquid and powder at week 0. There was no treatment effect for any of the characteristics studied. Storage time was significant for flavor appearance, body texture, L^* and a^*. As storage time increased to week 5 there was a significant drop in flavor and body texture compared to week 0. Lightness values significantly increased and a^* values significantly decreased at week 5 compared to week 0. The form of vitamin, liquid or powder, did not have any effect on the characteristics of yogurt.

Key Words: Vitamin, Form, Yogurt

W66 Effects of raw milk storage time and pasteurized milk storage temperature on milk shelf-life. G. B. Sanvido, D. Y. Kabuki, M. R. Costa*, and M. L. Gigante, *State University of Campinas*, *Campinas, SP, Brazil*.

The effects of psychrotrophic microorganisms development on pasteurized milk shelf-life were not a concern in Brazil until recently when raw milk cold storage start to be required by law in this country. This work evaluated the effects of raw milk storage time (0, 4 or 7 days at 5°C) and pasteurized milk storage temperature (5°C or 10°C) on its shelf-life. Milk was submitted to HTST pasteurization process (72°C/15sec), cooled at 5°C and then packaged in low-density polyethylene bags. Raw and pasteurized milk were initially analyzed by physicochemical (acidity, pH, total nitrogen, soluble nitrogen at pH 4.6 and TCA 24%) and microbiological analyses (standard plate, psychrotrophic microorganisms and Pseudomonas spp counts), and these parameter were monitored during storage of both raw and pasteurized milk. Raw milk also was initially analyzed for antibiotic presence and somatic cell count, and pasteurized milk for Coliform and Salmonella spp counts. Pasteurized milk shelf-life was defined as the time necessary to reach 8×10^4 ufc/mL on the standard plate count. A Split-split-plot design was used and the whole experiment was repeated three times. The longer raw milk storage time, the higher were acidity, proteolysis and bacteria counts. The standard plate, psychrotrophic and Pseudomonas spp counts increased from around 10^3, 10^3 and 10^2 ufc/ml (day 0) to 10^8, 10^7 and 10^6 ufc/ml (day 7), respectively. The lag phase was significantly longer for all analyzed microorganisms at shorter raw milk storage time and lower pasteurized milk storage temperature. The longer raw milk storage time and lower pasteurized milk storage temperature, the longer was its shelf life. The milk processed right after milking and stored at 5°C had 10.7 days of shelf-life while the milk processed after 7 days of raw milk storage and stored at 10°C had just 2.3 days of shelf-life. These results confirm the importance of having short raw milk storage time and low pasteurized milk storage temperature, besides good quality raw milk, to extend the pasteurized milk shelf-life and guarantee a safe product during this period.

Key Words: Shelf-Life, Pasteurized Milk, Raw Milk

W67 Colostrum fortified probiotic fat free yogurt. E. Albers[1], O. Cueva[1], and K. J. Aryana*[2], [1]*Louisiana State University*, *Baton Rouge*, [2]*Louisiana State University Agricultural Center*, *Baton Rouge*.

Colostrum is a good source of immune and growth factors. The probiotic bacterium *Lactobacillus acidophilus* offers several health benefits. Objective was to study the effect of colostrum on the physicochemical, microbiological and sensory characteristics of yogurt containing *Lactobacillus acidophilus*. Colostrum powder was added during yogurt mix preparation at 0, 4, 8 and 12 g per 228 g (8 oz) cup of yogurt. Colostrum incorporation in the manufacture of yogurt with *L. acidophilus* increased apparent viscosity, b^* (yellowness) values and decreased pH, syneresis, L^* (lightness) and a^* values. Colostrum incorporated at 4 or 8 g per 228 g yogurt increased lactobacilli counts over storage while use of colostrum at 12 g significantly decreased lactobacilli counts at 35 days of storage. Colostrum incorporated at 4 g per 228 g of yogurt improved the sensory characteristics namely, flavor, appearance and color, and body and texture of the yogurts. Colostrum incorporated at 12 g per 228 g of yogurt adversely affected product flavor and made the yogurts lumpy and too firm. It is perceived that the health benefits of colostrum can be added to probiotic yogurts by incorporation of colostrum at 4 g per 228 g of yogurt without adversely influencing product characteristics.

Key Words: Colostrum, Yogurt, Probiotic

W68 The effect of the ratio of ice cream mix to yogurt on the properties of the resulting yogurt ice creams. D. Olson*, K. J. Aryana, and C. Boeneke, *Louisiana State University Agricultural Center*, *Baton Rouge*.

The effect of varying the ratio of ice cream mix to whole milk yogurt on the characteristics of the resulting yogurt ice creams was investigated. Ratios of ice cream mix to yogurt included 0% ice cream mix and 100% yogurt (I) for the air-whipped and frozen yogurt control, 25% ice cream mix and 75% yogurt (II), 50% ice cream mix and 50% yogurt (III), 75% ice cream mix and 25% yogurt (IV), and 100% ice cream mix and 0% frozen yogurt (V) for the ice cream control. The resulting mixes were analyzed for total solids content, fat content, pH, and viscosity and frozen in a batch freezer. The frozen products were analyzed for sensory properties (flavor and body/texture), rate of meltdown of 100 g of frozen product at 21°C (volume after 1 h and time for 15 mL to melt), and MRS lactobacilli counts. The total solids contents were 11.7, 18.0, 26.4, 33.2, and 40.6%, and the fat contents were 3, 4, 7, 11, and 13% for I, II, III, IV, and V, respectively. The pH ranged from 4.54 for I to 6.73 for V. The I sample had the highest viscosity. The frozen products IV and V received the highest sensory scores, while I and II had the highest MRS lactobacilli counts. The rate of meltdown increased with increasing proportion of ice cream in the yogurt ice creams as no meltdown after 1 h was observed for I. Times needed to collect 15 mL of frozen product ranged from 40 min for V to 115 minutes for I. Yogurt ice cream made from IV had more desirable properties than yogurt ice cream made from II and III.

Key Words: Yogurt, Ice Cream, Yogurt-Ice Cream

W69 Characteristics of ice cream as influenced by a weight loss ingredient. K. J. Aryana*[1], D. Olson[1], and A. Greenbaum[2], [1]*Louisiana State University Agricultural Center*, *Baton Rouge*, [2]*Louisiana State University*, *Baton Rouge*.

Obesity is a health problem in the United States. A novel form of (-) hydroxycitric acid is being marketed as a weight loss ingredient (WLI). The objective was to study the effect of various amounts of the WLI on the physico-chemical, microbiological and sensory characteristics of ice cream. The WLI was incorporated into ice cream mixes at 0 (control), 1.5, 3.0 and 4.5 g per 473 mL of ice cream. Three replications were performed. Viscosity and pH were determined on ice cream mixes after one day of aging. Meltdown time for the first 15 mL, meltdown volume in one hour, bacterial counts, sensory flavor and body texture, heat shocked flavor and body texture were determined at weeks 2, 5, 9, 13 after product manufacture. The WLI decreased pH, increased viscosity of the ice cream mixes and increased meltdown volume of the ice creams. Use of WLI at 3.0 and 4.5 g resulted in faster meltdown and increased aerobic counts of the ice creams. The WLI did not influence flavor, body texture and heat shocked body texture of the ice creams. Use of WLI at 1.5 and 3.0 g resulted in the best heat shocked flavor. The WLI can successfully be used in ice cream manufacture.

Key Words: Obesity, Weight Loss, Ice Cream

W70 Influence of garlic on the characteristics of yogurt. K. Bridges[1] and K. J. Aryana*[2], [1]*Louisiana State University*, *Baton Rouge*, [2]*Louisiana State University Agricultural Center*, *Baton Rouge*.

Garlic has been researched for its ability to reduce cholesterol and triglycerides, prevent cancer, reduce blood pressure and hardening of the arteries and clotting and protect the liver. Garlic may also increase the effects of the immune system and reduce blood sugar levels. Objective was to study the influence of garlic on the microbiological physico-chemical, and sensory characteristics of yogurt. Powdered garlic was incorporated into the plain yogurts at 0, 0.5, 1 and 2 g per 8 oz of yogurt. Product manufacture was replicated three times. Garlic did not influence the lactic acid bacterial counts, the syneresis (released serum) and the pH of the yogurts. Garlic adversely influenced the flavor of the yogurts.

Key Words: Garlic, Spice, Yogurt

W71 Fatty acid composition of dairy foods and their intake in humans. T. R. Dhiman*, A. Hopkins, and N. Garg, *Utah State University*, *Logan*.

The objective of this study was to analyze dairy products and relate to fatty acid (FA) intake in humans. A total of 180 samples of dairy foods were collected from 43 different stores in selected 17 counties of Utah. Within the selected counties, cities, towns and stores were selected using random sampling tables. The samples included: 23 whole milk, 13 cream, 17 butter, 12 yoghurt, 13 sour cream, 12 cottage cheese, 14 cream cheese and 76 cheeses. Food samples were analyzed for FA profile, including conjugated linoleic acid (CLA). FA intake, g per serving was calculated. Fat, grams per 100 g of product and serving size data from USDA approved food labels and the USDA National Nutrient Database was used to calculate the FA intakes. Data was statistically analyzed as a two way factorial design. To simplify the presentation FA were grouped into saturated FA (SFA), *trans* FA, monounsaturated FA (MUFA), CLA, polyunsaturated FA (PUFA), n-6 FA, and n-3 FA. The proportion of SFA, in dairy foods (n=180) ranged from 63.9-66.3% of total FA, with fluid milk being lower than other dairy products. The proportions of total *trans* FA (C16:1 and C18:1) ranged from 4.52-5.31% of total FA. Cheese samples had lower total *trans* FA compared to other foods. The proportions of MUFA ranged from 24.7-26.1% of total FA, with fluid milk being higher than other dairy foods. The mean CLA content was 0.58 ± 0.05 % of total FA and did not differ among tested dairy foods. The proportions of PUFA, n-6 and n-3 FA ranged from 4.45-4.93, 3.19-3.80 and 0.51-0.64% of total FA in foods, respectively. The average intake of *trans* FA and MUFA was 0.4 and 0.5 g, 2.1 and 2.7g, from one serving of milk (240-ml) and cheese (28.35 g), respectively. Consuming one serving of whole milk or cheese provided 0.05 and 0.07 g of CLA, respectively. Assuming 69.25 g/d of fat intake in adult human with 5.2% as *trans* fat, our results suggest that one serving of whole milk contributes about 10% of total trans fat intake. Using the value 0.182 g of CLA intake/d in the United States from National Academy of Science report, consuming one serving of whole milk and cheese together will provide 66% of total daily CLA intake.

Key Words: Milk, Fatty Acid, Dairy

W72 High pressure processing prevents formation of overset eyes in Swiss cheese. N. Koca*[1,2], N. A. Kocaoglu-Vurma[2], V. M. Balasubramaniam[2], and W. J. Harper[2], [1]*Ege University*, *Bornova, Izmir, Turkey*, [2]*The Ohio State University*, *Columbus*.

Formation of overset eyes is a common problem encountered by Swiss cheese manufactures when lower than traditional cook temperatures (< 48°C) are used to produce Kosher whey. High pressure processing (HPP) can reduce the oversetting by eliminating nucleation sites and changing textural properties, provided that the starter cultures necessary for formation of characteristic eyes are not negatively affected by HPP. The objective of this study was to explore the effect of HPP on culture viability, eye formation, and textural characteristics of Swiss cheese. Swiss cheese was produced using 200 L pilot scale vats. The cheese blocks were divided into pieces (6x6x5 cm), brined, and vacuum packaged. Sample temperature was adjusted before pressure treatment to reach to 25±2°C during processing. Cheese samples were pressure treated at 50, 100, 200, 300, 400, 500 and 600 MPa over various pressure holding times (up to 15 min). Two sets of cheese samples held at refrigeration and room temperatures were used as controls. *Lactobacillus* spp., *Streptococcus thermophilus*, and *Propionibacterium* spp. were enumerated immediately after HPP and at the end of warm room ripening. Cheese samples were evaluated for eye formation at the end of warm room ripening. The texture profile and the pH of the samples were also determined. All pressure treatments with holding time of 5 min prevented the formation of overset eyes, 15 min treatments resulted in complete elimination of eye formation. The cheeses pressurized at 400 MPa for 5 min had excellent eye characteristics. Sample cohesiveness values increased until 400 MPa for the 5 min application whereas springiness values decreased until 300 MPa. Pressures above 300 MPa reduced the viable counts of *S. thermophilus* and *Lactobacillus* spp. whereas the propionibacteria counts remained unaffected. High pressure application has the potential to reduce overset eyes, and provides valuable information in understanding the relationship between texture of the cheese and oversetting.

Key Words: High Pressure Processing, Swiss Cheese, Eye Formation

W73 Effect of UHT and HTST processing on sweetness perception in sucrose–sweetened milk. J. M. Morton[1], S. J. Gualco*[2], P. Durongwong[2], J. Estrade[1], S. Vink[1], and P. S. Tong[1], [1]*Dairy Products Technology Center*, *San Luis Obispo, CA*, [2]*California Polytechnic State University*, *San Luis Obispo*.

Sensory analyses of milk have found Ultra High Temperature (UHT) processing to have a significantly different effect on the sensory properties of milk compared to High Temperature Short Time (HTST) processing. UHT processing of milk increases cooked and sulfur aromas and flavors as well as viscosity, which may suppress sweetness perception in UHT milks. We hypothesize that changes in these sensory modalities lead to a decrease in perceived sweetness, which would have significant ramifications for sucrose-sweetened flavored milks. Low fat (1% fat) milk was heat treated via either HTST (72.5°C for 15 seconds) pasteurization or indirect heat UHT (138.9°C for 3 seconds) process. Sucrose was added post-processing at levels of 1, 3, 5, 7, 9, and 11 percent by mass to produce 12 matched treatments plus 2 matched controls. Nine judges trained in descriptive analysis of sweetened milk evaluated the milks for appearance, aroma, taste, flavor, texture, and aftertaste. Judges individually evaluated each sample five times following a balanced block test design with a randomized, sequential monadic serving order. Although UHT and HTST milks differed significantly in aroma, flavor, and aftertaste ($p < 0.05$), ANOVA did not indicate a significant difference in sweetness intensity between matched UHT and HTST milks. However, Principle Components Analysis (PCA) of the milks revealed strong positive relationships between sucrose concentration and overall flavor, overall aftertaste, artificial sweetness, and sweetness intensity, with UHT milks showing a stronger relationship to these attributes than HTST milks. UHT milks were more strongly correlated with overall aroma, cooked aroma, opacity, viscosity, yellow color, and milky aftertaste than their HTST counterparts. These results suggest that sucrose-sweetened milks may be either UHT processed or HTST pasteurized without making adjustments to sucrose levels for equal sweetness intensity. Perceived sweetness appears to be more important for overall flavor and aftertaste in UHT processed milks.

Key Words: Sensory, Milk, Descriptive Analysis

W74 Gelation of β-lactoglobulin at low pH: Concentration effects. P. Mudgal*, C. R. Daubert, and E. A. Foegeding, *North Carolina State University*, *Raleigh*.

A modification procedure for whey proteins was patented by the Food Rheology laboratory at NC State University. This procedure imparts cold thickening functionality to whey proteins. Understanding the effect of protein concentration on thermal gelation and final functionality of the modified whey ingredient at low pH is the objective of the current study. Protein solutions of varying concentrations (c = 2-9 % w/w) were made from BioPure® β-lactoglobulin. Solutions were then pH adjusted to 3.35 with 6N HCl, followed by 3 hours of heating at 85°C. Following overnight incubation, specific viscosities of these solutions were determined at 25°C using a Cannon-Fenske capillary viscometer. From the results, intrinsic viscosity of heated β-lactoglobulin solutions was approximated to be 5 ml/g. The specific viscosity data was used to identify a critical concentration, reflecting a coil overlap concentration for biopolymer solutions. This concentration likely indicates the beginning of secondary interactions arising from the thermal treatment. To investigate the concentration effects on final functionality of a modified β-lactoglobulin ingredient, powders were prepared using two concentrations above (7, 9 % w/w) and two below (3, 5 % w/w) the critical concentration (6.9 % w/w). All powders were reconstituted in water at 10 % wt/wt and hydrated at 5°C for 24 hours. Shear rate sweeps were performed at 25°C to evaluate the thickening functionality. Significant differences were observed in apparent viscosities of solutions above and below critical concentration. Apparent viscosity at shear rate (˜10 s^{-1}) were found to be 3.28, 4.04, 31.9 and 3950 mPa-s for powders made from 3, 5, 7, and 9 % concentrations respectively. These results clearly show that preliminary protein concentration has significant effect on final ingredient functionality. Understanding these effects may be crucial to development of ingredients with improved functionality and provide insight into bio-molecular interactions during the gelation process of whey proteins at pH 3.35.

Key Words: Beta-Lactoglobulin, Gelation, Concentration

W75 Development of the hazard analysis and critical control points (haccp) in a milk pasteurizing plant. J. Aranda*, D. N. Garza, R. González, and L. A. Villarreal, *Universidad Autónoma de Nuevo León*, *San Nicolás de los Garza, México*.

The analysis of hazard and critical control points (HACCP) is a system dedicated to guarantee the harmlessness of the foods. The present work was carried out, in a milk pasteurizing plant with the purpose of evaluating the pre-requirements that should exist for the implementation of the HACCP. This evaluation was divided in three stages, in the first one it was carried out a diagnosis of the plant. This stage was focused on: the knowledge of the policies of the company, the existence of process manuals, the analysis of the production data, and quality of the product (according to NOM-091-SSA1-1994 NOM-184-SSA1-2000). It was registered 1053 data corresponding to the milk delivery for one year by the suppliers of the municipalities of Apodaca, Zuazua, Ramones, Santa Rosa, Dr. González, Salinas, Agualeguas and Marín. N. L., Mexico. In the second stage it was carried out an evaluation of the degree of fulfillment of the good manufacturing practices (GMP) and of standard operating procedures (SOPs). In the third stage it was developed a model of the system of analysis of hazards and critical control points, following the methodology of the HACCP. According to the results it was found that: the density, the percentage of water and the freezing point presented bigger deviation in most of the cases, as much in non-pasteurized milk as in the finished product, according to the NOM's indicated before. Regarding the degree of fulfillment of the GMP, the plant registered a percentage of fulfillment of 65.26%. Using the decision tree to identify the critical control points (CCP), the pasteurization stage was identified as CCP1 (it eliminates the hazard) and the storage and the transport as CCP2 (it controls the hazard).

Key Words: HACCP, Dairy, Quality

W76 Temporal global transcriptome analysis of *Lactobacillus acidophilus* during growth in milk. M. A. Azcarate-Peril* and T. R. Klaenhammer, *North Carolina State University*, *Raleigh*.

Microarray hybridization experiments were employed to monitor gene expression of *Lactobacillus acidophilus* NCFM cells propagated in 11% skim milk (SM) during early, mid and late logarithmic phase, and stationary phase. Approximately 21% of 1,864 ORFs were differentially expressed at least in one time point. Genes differentially expressed in SM included several members of the proteolytic enzyme system. Expression of *prt*P (proteinase precursor) and *prt*M (maturase) increased over time as well as several peptidases and transport systems. Expression of Opp1 (oligopeptide transport system 1) was highest at 4h, while gene expression of Opp2 increased over time reaching its highest at 12h. These results suggest that Opp1 and Opp2 have different specificities. Expression of LBA1525HPK-LBA1525RR, a previously characterized two-component regulatory system involved in acid resistance (Azcarate-Peril *et al.*, AEM, 71:5794), increased during early log and early stationary phase of growth. These results correlated well with survival experiments previously conducted that indicated that a chromosomally interrupted HPK mutant was more sensitive to acid challenge during early logarithmic phase of growth. To investigate the relationship between milk, growth and probiotic properties, *L. acidophilus*, 15 derivative strains, with mutations in genes identified in the microarray analysis as important for growth in milk, were selected for further analysis. Acidification rates were measured and correlated with the initial cell concentration in order to determine if any of the inactivated genes were involved in acidification activity and, hence, growth in milk in *L. acidophilus*. Five mutant strains with mutations in the surface layer protein *cdp*A, mucin-binding protein, putative myosin cross-reactive antigen, and a nicotinic acid mononucleotide adenylyltransferase *nad*D showed significantly ($P < 0.1$) different *tm* values than the parent control.

Key Words: Lactobacillus, Gene Expression

W77 Validation of Petrifilm plates for enumeration of total bacteria, psychotropic bacteria, and coliforms in goat milk. S. S. Chen[1,2], J. S. Van Kessel[3], B. Bah[1], F. Z. Ren[2], and S. S. Zeng*[1], [1]*Langston University*, *Langston, OK*, [2]*China Agricultural University*, *Beijing, China*, [3]*USDA-ARS*, *Beltsville, MD*.

Petrifilm™ Aerobic Count (AC) and Coliform Count (CC) plates were validated against standard methods for enumeration of coliforms, total bacteria, and psychrotrophic bacteria in raw (n = 39) and pasteurized goat milk (n = 17) samples. All microbiological data were transformed into log form and statistically analyzed using paired comparison t-test of SAS. There were no significant differences ($P < 0.01$) between Petrifilm™ CC and the standard Violet Red Bile Agar Petri dish method. Petrifilm™ AC was as accurate ($P > 0.05$) as the standard Petri dish methods for both total bacteria and psychrotrophic bacteria when the total bacteria count was less than $1x10^6$ CFU/ml. Correlations between Petrifilm™ plates and the standard Petri dish agar methods were high (r = 0.992, 0.997, and 0.974 for coliform, total bacteria, and psychrotrophic bacteria, respectively). In conclusion, Petrifilm™ AC and CC plates can be used as alternatives to standard methods for enumeration of total bacteria, psychrotrophic bacteria, and of coliforms, respectively. Advantages of Petrifilm™ plates include rapidity, ease of performance, labor saving, and no need for agar preparation or autoclaving. This validation is of practical importance to goat milk producers and processors because of the limited numbers of goat milk samples available daily and the lack of advanced laboratory facilities on most goat farms and in most goat milk processing plants.

Key Words: Goat Milk, Petrifilm Plates, Bacteria Count

W78 Applying slide-cover-glass method for cultivating anaerobic rumen fungi and employing polymerase chain reaction technique for their molecular identification. M. H. Sekhavati, M. R. Nassiry, M. Danesh Mesgaran*, and H. Tavasoli, *Ferdowsi University of Mashhad*, *Mashhad, Iran*.

The objective of the present study was to introduce a simple method (slide-cover-glass) for cultivating anaerobic rumen fungi and their molecular identification using PCR method. Rumen fluid, from a rumen fistulated sheep (live weight of 45 Kg) fed a 50:50 concentration:hay ration, was clarified by centrifugation at 10000 × g for 30 min and used as a source of inoculum. Then, 10 µ l inoculum was added to 290 µ l rumen fluid-agar medium (RFM) which were obtained in medium 10, containing antibiotic. This mixture was placed on a sterile slide on a warming table, covering it with a sterile cover glass, sealing their edges with paraffin, then incubated at 39°C for 3 days. After observing

the colonies on slides using an inverted microscope, in attempt to isolate specific fungi, colonies were picked and transferred into broth medium. DNA was extracted from pure culture medium by Guanidine Thiocyanate-Silica Gel method. Primers NS1 (5′GTAGTCATAT-GCTTGTCTC-3′) and NS2 (5′GGCTGCTGGCACCAGACTTGC-3′) were used to amplify a fragment from SSU 18S rDNA. In a volume of 20µl PCR reactions contained: 50 ng of template DNA, 2 µl 10-X PCR buffer , 2.5 mM MgCl2, 200 µM each dNTPs, 10 pM of each primer, and 1 U Taq DNA polymerase. Thermal conditions for 35 cycles were 95 °C (40 sec), 45 °C (40 sec), and 72 °C (1 min) . PCR products were visualized by electrophoresis on 1.3% agarose gel stained with etithium bromide. Microscopic studies on slide-cover-glass shows some anaerobes with filamentous colonies like fungi and the 550-bp fragment of nuclear-small-subunit (SSU; 18S rDNA) confirmed it. Since, Hungate roll tube technique for culturing and counting some anaerobes with vegetative growth is problematic, even impossible; therefore, it seems that this culturing method allows the handling of anaerobic rumen fungi in a more convenient approach.

Key Words: Slide-Cover-Glass, Anaerobic Rumen Fungi, PCR

W79 Quantification of *Staphylococcus aureus* which harboring sea in milk by real-time PCR. Y. Li* and Y. Jiang, *Key Lab of Dairy Science, Ministry of Education, Northeast Agricultural University*, *Harbin,China*.

Abstract: The presence of *Staphylococcus aureus* in milk, especially which produce enterotoxin A, is of major concern in the dairy industry. Staphylococcal enterotoxin A (SEA) is among the most potent of the growing list of known enterotoxins produced by *Staphylococcus aureus*, and a doses of less than µg of enterotoxins in contaminated food, which is produced by more than 105 CFU/g, will produce symptoms after 1-6 h in sensitive persons (FDA reported). In this study, we developed two real-time PCR assays, using either fluorophore-labeled DNA probes or DNA-binding dye SYBR Green, to identify the *Staphylococcus aureus* ATCC 13565 which harboring SEA genes. The detection procedure was applied to sterile milk samples artificially contaminated by *Staphylococcus aureus* ATCC 13565. And the assays we developed enable us to detect 83 CFU/ml in sterile milk. Both of the assays can be accomplished within 8 hours. The work really can offer a very quick, reliable alternative to identify the *Staphylococcus aureus*. And it would be offer great help to the further detection of *Staphylococcus aureus* which harboring sea genes in raw milk.

Key Words: Quantification, *Staphylococcus aureus*, Milk

W80 Detection of viable *Listeria monocytogenes* in milk by Real time RT-PCR. B. Yan* and Y. Jiang, *National Research Center of Dairy Engineering and Technology*, *Harbin, Heilongjiang, China*.

Detection of pathogens, such as *Listeria monocytogenes*, in contaminated food by PCR can result in false-positive data due to the amplification of DNA from nonviable cells. In this paper, a new method based on real-time reverse transcription PCR (RT-PCR) amplification of mRNA for the specific detection of viable was developed. Listeriolysin O (hlyA) gene was used as amplification targets. Total RNA from *Listeria monocytogenes* was isolated, and was amplified by real-time RT-PCR with a previously reported Taqman probe and primers specific for hlyA genes. The results show that this assay was positive for the *Listeria monocytogenes* standard strains and negative for all other strains such as *Staphylococcus aureus*, *Salmonella* and *Escherichia coli*. In pure culture, the sensitivity of detection Listeria monocytogenes is ca. 3×102 CFU/ml after enrichment 1-h, ca. 30 CFU/ml after enrichment 3-hrs. The feasibility of real-time RT-PCR amplification for the detection of viable *Listeria monocytogenes* was validated in artificially contaminated milk. Following a 6-hrs enrichment incubation *Listeria monocytogenes* could be detected that was originally inoculated in milk with ca. 17 CFU/ml. These results support the availability of real-time RT-PCR amplification of mRNA as a sensitive method for the specific detection of viable *Listeria monocytogenes* and indicate that this method may prove effective in the detection of this pathogen in milk products and other ready-to-eat.

Key Words: *Listeria monocytogenes*, Viable, Artificially Contaminated Milk

W81 PCR detection by rapid obtaining *Salmonella* in raw milk with filtration method. L. Wei and J. Yu-jun*, *National Research Center of Dairy Engineering and Technology*, *Harbin, Heilongjiang, China*.

A rapid, simple and sensitive PCR assay was developed for the determination of *Salmonella* in raw milk. Although many assays based on PCR for detecting food borne pathogen have been established, most of those techniques require 8~12h preenrichment step and thus are time consuming. This assay used filtration method to direct obtain bacteria in milk. Upon addition of disodium EDTA to skim milk which had been artificially contaminated by *Salmonellae*, casein micelles was dispersed to micromicelles and filtrated through 0.45 µm filter membrane. The Salmonellae in milk could been obtained from the membrane. It was then proceed with PCR to detect the bacteria which has been rapidly obtained by filtration method. The PCR system had been optimised to provide the best resolution of these analytes. The assay can be completed in 6.5h and reach 1~10 cfu/ml detection limit. To compare with other PCR assays, this assay without 8~12h preenrichment step saved a lot of time. The assay could be used for detecting *Salmonella* in raw milk and deserved to be generalize and applied to routine detection for food borne pathogen in raw milk.

Key Words: *Salmonella*, PCR, Filtration

W82 Acoustical emissions generated by *Lactococcus lactis* ssp *lactis* C2. C. L. Hicks*[1], J. M. Stencel[2], and H. Song[2], [1]*University of Kentucky*, *Lexington*, [2]*Tribo Flow Separations*, *Lexington, KY*.

Lactococcus lactis ssp *lactis* C2 bacteria in M17 medium and M17 agar was monitored (at 32°C for11 h) using contact acoustic sensors (20 to 50 kHz and 50 to 200 kHz) attached to the sides of the growth vessels. Acoustical emissions detected as waveforms, where each wave was referred to as a 'Hit' were generated by the bacteria . Hit sensitivity was in the µsec range. Fast Fourier transform analysis was used to calculate average peak frequencies of the emissions. Initial analysis showed that Hit detection began within 5 min after the medium was inoculated with *L. lactis* ssp *lactis* C2. Hits per min in

the agar medium increased from time of inoculation until the 9th h (beginning of the stationary phase) and then decreased until the 11th h. When C2 was grown in M17 broth and infected with c2 phage multiple periodic cycles of 36 min could be observed which appeared to match the phage lysis cycles. The average peak frequencies data showed a shift in frequencies as the bacteria moved from the lag into the log phase (from inoculation to 150 min). Some peak frequencies shifted by as much as 5 kHz during this growth period while most peaks had shifts in their relative intensities that increased or decreased with time. When average peak frequency data from C2 and *E. coli* 15q were compared (from the first 60 min of growth) only three of the peak frequencies were in alignment, while all other peak frequencies appeared to result from different acoustical emitting activities. These data suggest that average peak frequencies for C2 and *E. coli* 15q were sufficiently different in frequency and intensity during the initial lag phase that specific strain identification might be possible. Thus, acoustic emissions from bacteria may be specific enough to acoustically fingerprint bacteria and result in a rapid assay method.

Key Words: Acoustic, Lactococcus, Assays

W83 Survey of lactic acid bacteria in Hispanic-style cheeses for antimicrobial activity. J. A. Renye*, G. A. Somkuti, and D. L. Van Hekken, *Eastern Regional Research Center, USDA-ARS*, *Wyndmoor, PA*.

Lactic acid bacteria isolated from Hispanic-style cheeses were screened for antimicrobial activity against dairy starter bacteria (*Lactococcus lactis* and *Streptococcus thermophilus*) and potential foodborne pathogens or spoilage organisms (*Listeri*a, *Escherichia, Staphylococcus*, *Shigella*, *Salmonella*, *Enterobacter* and *Pseudomonas*). The LAB species screened included *S. thermophilus* (8), *S. macedonicus* (7), *L. lactis* (4), *Leuconostoc mesenteroides* (13), *Lactobacillus plantarum* (8), *Enterococcus faecium* (14), and *Enterococcus faecalis* (11). The LAB isolates were grown overnight in M17 (streptococci) or MRS (lactobacilli and leuconostocs) medium and tested for antimicrobial activity by the agar-well diffusion method. One *S. thermophilus* isolate showed activity against both *S. thermophilus* and *L. lactis* target strains, while another inhibited *L. lactis* only. The *L. lactis* target strain was also inhibited by one *L. lactis* and one *E. faecium* isolate. All 8 *L. plantarum* isolates inhibited the growth of *P. fluorescens*. Four of the isolates were also inhibitory to *E. coli* and *S. epidermidis*, while 2 other isolates inhibited only *E. coli*. All 6 of *L. mesenteroides* strains showed activity against *P. fluorescens*. The 3 *E. faecium* isolates active against *Listeria monocytogenes* were further screened by PCR for genes encoding known bacteriocins. Two of the isolates were shown to have PCR products corresponding to enterocins A, P and L50B. The third *E. faecium* isolate did not test positive for any of the known enterocins (A, B, P, BC25, L50A, L50B and Q), suggesting the possibility of a novel antimicrobial peptide. None of the isolates screened showed activity against *S. sonnei*, *S. infantis* and *E. sakazakii*. Further biochemical characterization of the antimicrobial compounds produced by the LAB is in progress.

Key Words: Antimicrobial, Bacteriocin, Lactic Acid Bacteria

W84 Production of bacteriocins by staphylococcal strains isolated from Brazilian cheese. M. A. V. P. Brito[1] and G. A. Somkuti*[2], [1]*EMBPRAPA Dairy Cattle Research Center*, *Juiz de Fora, Brazil*, [2]*Eastern Regional Research Center, USDA-ARS*, *Wyndmoor, PA*.

A total of 285 staphylococcus isolates were recovered from *Minas frescal* cheese, a traditional Brazilian fresh cheese made with pasteurized milk, and screened for the production of antibacterial substances. The staphylococci were isolated from 50 lots of commercial cheese and cultured on mannitol salt agar. Isolates were evaluated for colony and cell characteristics, catalase production and further classified as coagulase-positive (169) or coagulase-negative (116) by the tube coagulase test. Bacteriocin activity of cell-free supernatants of overnight cultures was tested by the agar-well diffusion method with *Listeria monocytogenes* Scott, *L. ivanovii*, *Staphylococcus aureus* 305 and *Streptococcus agalactiae* 5778 as targets. Bacteriocin production was associated with 30 coagulase-positive staphylococci (10%), including activity against *L. monocytogenes* (24), *S. aureus* 305 (26), *L. ivanovii* (13) and *S. agalactiae* (3). Plasmid samples isolated from bacteriocin-producing isolates were checked with PCR techniques using primers specific to the staphylococcal bacteriocins aureocin A70 and A53, and staphylococcin BacR1. All 24 isolates with antilisterial activity yielded PCR products and positive Southern blots indicating the presence of the aureocin A70 structural gene but only 20 of the 24 isolates carried the 8-kb plasmid that is usually associated with aureocin production. The 5 additional isolates active against *S. aureus* 305 only and tested negative with BacR1 primers may be producers of novel bacteriocins. The results have shown that antilisterial cheese isolates of *S. aureus* produced plasmid borne aureocin A70 similar to strains often recovered from bovine milk. The presence of bacteriocin activity may increase the competitiveness of the producing strain and may also have a role in preventing contamination by *L. monocytogenes*.

Key Words: Bacteriocin, Staphylococcus, Cheese

W85 Inhibitory effect of *Lactobacillus* species on *Streptococcus mutans in vitro*. W. Y. Yang[1], A. R. Hostetler[1], C. S. Huh[2], and H. S. Kim*[1], [1]*Culture Systems, Inc.*, *Mishawaka, IN*, [2]*Korea yakult Co.*, *Yongin Si, Kyunggi Do, Korea*.

S. mutans has been recognized as an important etiological agent in human dental caries. It has been suggested that these cariogenic bacteria could be eliminated from dental plaque by application of *Lactobacillus* or bacteriocin-like inhibitory substances. Recent clinical and experimental observations showed that specific probiotic microorganisms may provide therapeutic benefits in human dental disease. However, few data exist on the ability of *Lactobacilli* to inhibit the growth of *S. mutans*. The purpose of this study was to isolate and characterize *Lactobacilli* that inhibit the growth of *S. mutans* and to test the possibility that probiotic *Lactobacillus* strains are able to reduce dental caries. Four *Lactobacillus* species, *Lactobacillus fermentum* CS6039, *Lactobacillus reuteri* CS6032, *Lactobacillus acidophilus* CS6051, *Lactobacillus fermentum* CS332, were isolated from volunteers classified as having good oral hygiene and breast feeding mothers. The inhibition of *S. mutans* treated with probiotics was monitored by agar plate assay, competition test, and a turbidity and inhibition method. Using the agar plate assay and competition test, the diameters of the clearance zones surrounding the inoculated bacteria (which indicated the presence of bacteriocin produced by probiotic cultures) were measured. All tested-lactic acid bacteria were able to

inhibit the growth of *S. mutans in vitro*, with *L. fermentum* CS6039 exhibiting the highest inhibition. The turbidity and inhibition method was also performed to confirm the results from agar plate assay and competition test. All of the probiotic cultures, except *L. reuteri* CS332, significantly inhibited growth of *S. mutans* ($P<0.05$). Based on these data, we suggest that lactic acid bacteria have a beneficial impact on inhibition of S. mutans and preventing dental caries.

Key Words: *Lactobacillus*, *Streptococcus Mutans*, Inhibition

W86 Lipid binding characterization of lactic acid bacteria in dairy products. D. Bachiero*, S. Uson III, and R. Jimenez-Flores, *California Polytechnic State University*, *San Luis Obispo*.

Probiotic bacteria are defined as a supplement that provides well being to the consumer when they are live and active. These microorganisms have gained more attention because of their known health benefits such as gastrointestinal health, enhancement of the immune system and their ability to inhibit pathogenic bacteria. However, there is still disagreement in defining their mechanisms of activity as well as methods of assessing them. An important limitation is the lack of knowledge regarding the nature in which these bacteria interact and bind in the gut as well as in the dairy system. Many studies have focused on the protein binding properties while the binding to lipids has been poorly studied. We focused on developing an assay that gives a quantitative measurement of lactic acid bacteria's (LAB) affinity to bind to various lipids found in dairy foods. LAB strains used in this study were genetically characterized, isolated and typed using pulse field electrophoresis. Cells were used in their exponential phase of growth for the experiments. An immunobloting technique was used as a quantitative measurement of bacteria's binding to various lipids from milk or buttermilk. Extracted lipids were separated on a TLC silica membrane, blotted on to PDF membranes and then exposed to biotinylated bacteria, to observe binding affinity. The bacteria/lipid interaction was measured using Avidin-HRP and Diaminobenzidine for a visual color reaction. We found two types of lipid binding: non-specific binding to triglycerides (non-polar lipids), in which the lipid concentration was the significant variable, and strain specific binding to phospholipids (polar lipids), where regardless of composition, each strain showed specific binding affinity. More importantly, these results show the specificity of binding as the direct result of the degree of processing of the dairy product. Those powders undergoing supercritical fluid extraction showed an increase in binding to phospholipids. These results will help in the design and formulation of dairy foods containing probiotic strains thus optimizing the bacteria's beneficial effects on health.

Key Words: Lactic Acid Bacteria, Binding, Lipids

Egg and Meat Science and Muscle Biology - Livestock and Poultry III

W87 Growth of muscular and adipose tissues of young heifers from different genetic groups. E. Rodrigues, M. D. B. Arrigoni, A. M. Jorge, P. S. A. Moreira, W. Bianchini, J. C. Hadlich, C. Andrighetto, C. L. Martins, D. D. Millen*, and R. D. L. Pacheco, *FMVZ/UNESP–Botucatu*, *São Paulo, Brazil*.

The objective of this study was to evaluate the growth of young heifers from different genetic groups (GG) in an intensive meat production system. It was used 42 animals of 4 different GG: 12 3/4 Canchim × 1/4 Nellore (3/4 CN), 12 1/2 Canchim × 1/2 Nellore (1/2 CN), 10 Crossbreed where the Simmental had predominance (SI) and 10 Three way cross – 1/4 Simmental × 1/4 Nellore × 1/2 Angus (TC). The Canchim breed is composed by 5/8 Charolais and 3/8 Nellore (Zebu breed). The experiment was conducted at the experimental feedlot of the Veterinary Medicine and Animal Science College, São Paulo State University, Botucatu campus (UNESP), Brazil. The animals received creep feeding supplementation and were weaned at 210 days of age with 247.4 ±16.48kg. It was analyzed the body weight characteristics, average daily gain (ADG), muscular and fat tissues growth. Real time ultrasound evaluation was used to measure rib eye area (REA, Longissimus dorsi muscle), back fat thickness (BFT) and P8 (Top rump, Biceps femoris) fat thickness. The animals were fed for 132 (±14) days in feedlot system with a high concentrate diet. ADG was measured every 28 days. The heifers were slaughtered when the final weight of 350 kg and 5mm of back fat thickness predicts were reached. TC heifers had smaller ($P<0.05$) final (TC=61.6, 3/4 CN=69.4, 1/2 CN=66.2, SI= 65.2) and adjusted at 100 kg/BW (TC=15.2, 3/4 CN=17.8, 1/2 CN=17.7, SI=18.9) rib eye area (cm^2) compared to the others GG. This group also had a greater ($P<0.05$) final body weight in kilos (TC=405, 3/4 CN=390, 1/2 CN=374, SI=350), better ADG ($P<0.01$) in kilos/day (TC=1.07, 3/4 CN=1.04, 1/2 CN=0.95, SI=0.94) and an intermediate days of feeding. There was not significant differences for initial REA, BFT and P8, but when the values were adjusted for fewer days of feeding (114 days), greater values ($P<0.01$) were found for TC and SI for P8 114 (TC=8.8, 3/4 CN=6.5, 1/2 CN=5.7, SI=8.4) and for SI for REA 114 (TC=55.7, 3/4 CN=55.3, 1/2 CN=52.7, SI=65.2). Thus, heifers TC performed better than other GG tested showing a grain adaptation as zebu percentage in GG composition got lower.

Key Words: Rib Eye Area, Back Fat Thickness, Ultrasound

W88 Evaluation of performance, tissue growth and meat tenderness of Nellore, Brangus and Canchim young bulls. R. B. Rodrigues, M. D. B. Arrigoni, E. Rodrigues, D. D. Millen, R. D. L. Pacheco*, H. N. Oliveira, C. C. Laurino, M. V. Fossa, L. M. N. Sarti, M. Parrili, S. A. Matsuhara, C. L. Martins, J. P. S. T. Bastos, and T. M. Mariani, *FMVZ/UNESP–Botucatu*, *São Paulo, Brazil*.

This study had the objective to compare three different genetic groups with different zebu percentage in their compositions: Nellore (N), Brangus – 5/8 Red Angus, 3/8 Nellore (BC) and Canchim – 5/8 Charolais, 3/8 Nellore (CC). It was used 87 animals (27 CC, 30 N and 30 BC) separated by genetic groups and randomly disposed. The weaning weight in kilos was 244.6, 243.6 and 295.0 for N, BC and CC respectively with 8 months old, which were supposed to be slaughtered with 15 months of age around 450 to 500kg in a commercial packing plant. The experiment was conducted at the experimental feedlot of the Veterinary Medicine and Animal Science College, São Paulo State University, Botucatu campus (UNESP), Brazil. The feeding period