(5.63 ± 0.51) than animals with the AA genotype (4.83 ± 0.15). BB animals also had a significantly ($P < 0.05$) smaller total (1687 ± 75 g) and average (335.4 ± 14.2 g) fetal weight per horn than AA animals (1821 ± 29 g, 368.7 ± 5.7 g). The ERβ gene appears to act in a dominant manner, with the B allele being dominant over the A allele. Animals with the dominant phenotype gestate larger, lighter litters of piglets than animals with the recessive phenotype. Other traits displayed statistically non-significant trends with respect to the BB genotype: increased fetal survival and total number of fetuses per uterus and decreased uterine weight and fetal space per horn. The ERβ gene is positively associated with several reproductive tract traits.

Key Words: Swine, Genetic Marker, Reproductive Traits

1516 Polymorphisms at the mink prolactin locus. T.L. Vardy and A. Farid, *Nova Scotia Agricultural College*.

The objective of this study was to find polymorphisms at the mink prolactin (PRL) locus. This gene plays important roles in mammary gland development, initiation and subsequent maintenance of lactation, termination of embryonic diapause as well as fur growth and coat molt cycles. Sequence of the cat PRL gene was used to design primers for the amplification of the mink PRL exon 1 and part of exon 2, which were not previously known, by the polymerase chain reaction (PCR). The entire exons 2, 3, 4 and 5 and the intervening introns were also PCR amplified using overlapping primers. PCR products were bidirectionally sequenced in four to seven mink of different colour types (black, pastel, brown, wild). Four nucleotide substitutions were detected in introns, which were in linkage disequilibrium. Genotypes of 86 mink (25 black, 20 pastel, 20 brown, 21 wild) were determined at a NlaIV site (C to G substitution) in intron 3. One allele which was not detected in black mink, had low frequencies in brown (0.05) and pastel (0.025), while it had a moderate frequency (0.20) in wild mink. The result may suggest that the region of DNA containing the PRL locus has been under selection pressure in ranched mink. Three polymorphic tandem repeats; a (GT)15 and a (TTC)5(T)47 in intron 2, and a (CA)7(GA)14 in intron 4, were also detected. These microsatellites facilitate genetic screening of mink at the PRL locus.

Key Words: Mink, Prolactin, Polymorphism

Dairy Foods Processing

1517 Implementation of HACCP system to large scale processing line of plain set yogurt. A. Rabi[1], R.R. Shaker[2], A. Banat[1], and S.A. Ibrahim*[3], [1]*Jordan University of Science and Technology,* [2]*Washington State University, Pullman, WA,* [3]*North Carolina Agriculture and Technical State University, Greensboro, NC*.

Limited data on the microbiological quality of traditional dairy products in Jordan are available. Recent studies have shown that yeast is the major contaminant in many of these products. The problem of such contamination could be attributed to many factors. Therefore, it is important to develop a hazard analysis and critical control points (HACCP) system for traditional products. The implementation of such system to yogurt is of great importance in order to produce microbiologically safe dairy product. The system was implemented for yogurt processing line as produced by large dairy company in Jordan. Six critical control points were identified in the flow chart of yogurt production; corrective actions and effective preventive measure were suggested. The microbial results have demonstrated how the hazards at the four critical control points of the process are easily and effectively controlled through implementation of the HACCP system. The microbial results demonstrate how the hazards at the critical control points (CCPs) of the process are easily and effectively controlled through the implementation of the HACCP system to popular dairy products

Key Words: yogurt, HACCP, safety

1518 Influence of lactic cultures, added linoleic acid, and fructo-oligosaccharides on conjugated linoleic acid concentration in nonfat set yogurt. Tung Lin*, *Chinese Culture University, Taipei, Taiwan*.

Skim milk mixed with 5% fructo-oligosaccharides and/or 0.1% linoleic acid (LA) was fermented with one of three lactic cultures: *Lactobacillus acidophilus* (CCRC14079), yogurt bacteria (*L. delbrueckii*ssp. *bulgaricus* and *Streptococcus salivarius* ssp. *thermophilus*), and mixed cultures of *L. acidophilus* (CCRC14079), and yogurt bacteria at 37°C for 8-24 h to reach a 0.9% acidity, and the levels of c9,t11-conjugated linoleic acid (c9,t11-CLA) were determined by HPLC. Sensory attributes and Hunter L, a, b values of the products were also evaluated. A significant increase in c9,t11-CLA level was observed in the LA added yogurt inoculated with mixed cultures, and the CLA content was 2.95 μg/g yogurt. The total acceptability ratings ranged from 6.0 to 6.7 were not significant difference among 8 yogurt treatments. Hunter L, a, and b values showed only slight differences among those yogurts too. Inoculations of mixed cultures with LA addition, therefore, are suggested for CLA-rich nonfat set yogurt production.

Key Words: Lactic culture, Conjugated linoleic acid, Fructo-oligosaccharides

1519 Viability of bifidobacteria in yogurt products found in North Carolina. J.P. Carr*, S.A. Ibrahim, G. Shahbazi, M. Worku, and C.W. Seo, *North Carolina Agricultural and Technical State University, Greensboro, NC*.

The use of bifidobacteria as dietary adjuncts is a subject of intense and growing interest. Several probiotic benefits such as improvement of gastrointestinal motility, lactose intolerance systems, and anticholesterolemic effects have been associated with bifidobacteria. Because of these benefits, there has been an increasing interest in incorporating viable cells of this microbial group into dairy products. However, during processing and storage, the number of viable cells tends to decline. There are few scientific studies reporting the viability of bifidobacteria in commercial yogurt products in the U. S. Therefore, the purpose of this work was to screen the yogurt products for viable yogurt cultures specifically bifidobacteria, and to test these isolates for probiotic properties. Fifty-eight commercial yogurt products (containing bifidobacteria in addition to the traditional yogurt culture) were obtained from local stores. Experiments were performed within 24h of purchase. MRS and G-M17 were used for the enumeration of *Lactobacillus burglarious* and *Streptococcus thermophilus*, respectively. Modified BIM-25 was used for the enumeration of bifidobacteria. All plates were incubated for 72h at 37C. Isolates of bifidobacteria were examined for the phenotypic and genotypic characteristics. Our results showed that the bacterial counts ranged from 6.00 to 9.89 Log_{10}CFU/ml, 6.60 to 9.48 Log_{10} CFU/ml, for Streptococcus, and Lactobacillus, respectively. The counts for bifidobacteria among the tested samples ranged from 0.00 to 5.00 Log_{10}CFU/ml. Of the 58 products claiming the inclusion of Bifidobacteria in their products, only 44 (75.9 %) contained viable cultures. The β-galactosidase activity for bifidobacteria isolates ranged between 200 and 500 Miller units. One strain showed antimicrobial activity against *E. coli* 0157:H7. The PCR fingerprinting procedure indicated that bifidobacteria isolates were closely related. Regulation on viable probiotic bacterial counts should be more restricted to ensure that products deliver sufficient amount of viable bifidobacteria.

Key Words: Bifidobacteria, Yogurt, Viability

1520 Effect of high pressure CO_2 on *Pseudomonas fluorescens* in saline and milk. M. Rajagopal* and J. Hotchkiss, *Northeast Dairy Foods Research Center, Ithaca, NY/USA*.

Alternatives or adjuncts to conventional pasteurization may find use in milk processing. Our objective was to study the inactivation of common milk spoilage organisms by high-pressure carbon dioxide. *Pseudomonas fluorescens* was treated in saline and milk with carbon dioxide at pressures up to 153 atm and temperatures up to 45°C for 0 to 60 min. Survivors were enumerated by standard methods. Inactivation curves were expressed as log (survivors) vs time and linear and non-linear models fit to the data. The combination of CO_2 pressure, temperature, and time reduced the counts from approximately 10^8 cfu/ml to 10^5 cfu/ml after 15 minutes and $2.8*10^4$ cfu/ml after 45 min. and $<10^1$ cfu/ml after 60 min. D-values ranged from 7.7 min to 16 min in a time, pressure, temperature-dependent manner. These data suggest that pressurized CO_2 might be useful for inactivating microorganisms in milk.

Key Words: Shelf life, Carbon dioxide, Milk

1521 Develop an environmentally safe wood finish product using whey protein as a co-binding material. Jiancai Li* and Mingruo Guo, *University of Vermont, Burlington VT 04505*.

Whey is a byproduct from cheese making. Expanding the use of whey is a high priority for the dairy industry. Whey proteins have been shown to be a good film-forming agent. The objective of this study was to develop an environmentally friendly wood finish coating formulation system by using whey protein isolate (WPI) and an environmentally safe acrylic resin as the binding materials. Thermally denatured (90C, 30min) whey protein isolate solution was incorporated into an acrylic-based environmentally safe wood finish coating mix at ratios of whey protein to total solids ranged from 0 (control), 10, 15, and 25% (w/w). The physiochemical properties (pH, density, viscosity, drying time, hardness, color, and etc.) of coating mix and/or the films were examined in comparison with selected commercial wood finish products. Incorporation of WPI significantly increased the pH (from 6.3 to 6.6), density (from 1.00 to 1.02 g/cm^3), and viscosity (from 17.76 to 437mPa.s)($p<0.05$) of the WPI-acrylic resin coating formulations, which release a much smaller amount ($<$ 80g/l) of volatile organic compounds than the commercial wood finish products (250-450g/l). The WPI-acrylic coatings displayed shorter drying-through time and higher gouge and scratch hardness compared to those of commercial products. Improved clarity and color attributes of the coatings by the addition of WPI were observed. Puncture strength (PS) and water vapor permeability (WVP) of the WPI-acrylic composite films ranged 46-64N/mm and 0.16-1.32 $g.mm/m^2.h.kPa$ depending on the ratios of the protein to total solids in the formulations. Both of PS and WVP of the films were comparable to the commercial counterparts. The results show that the environmentally friendly wood finish coating prototype product may be a good alternative for coating furniture, toys, and other high-end wooden products.

Key Words: Whey protein, environmentally safe, wood finish

1522 Combined effects of casein concentration and stabilizers on textural properties of stirred yoghurt. Caroline Lapointe*[1], Daniel St-Gelais[1], and Mario Proulx[2], [1]*Food Research and Development Centre, Agriculture and Agri-Food Canada, St-Hyacinthe, Quebec,* [2]*Ultima Foods Inc., Granby, Quebec, Canada*.

In this study, stirred yoghurts were produced from milk standardized to 4% total proteins with sodium caseinate and whey protein concentrate (WPC 35), 1% fat and 0.125% of calcium. However, the contribution of casein to total protein was 66, 73, 78 or 83%. Three stabilizers, a starch derived from waxy maize (S1), a starch used to prepare gelatin-free yogurt (S2), and a combination of starch S1 with an agar agar (S1A) were added to milk base to produce three types of stirred yoghurt (YS1, YS2 and YS1A, respectively). The manufacture of all stirred yoghurts was similar. The effects of casein concentrations and stabilizers on textural properties were investigated. A dynamic stress rheometer was used to determine apparent viscosity (AV). A TA-XT2 Texture Analyser was used to determine the gel strength (GS). The susceptibility of syneresis was tested by a centrifugal method and the microstructure was determined by transmission electron microscopy. The experiment was replicated five times. A factorial design was used to compare treatments. The AV and the GS were lower, whereas the syneresis was higher for yoghurts YS1 than for yoghurts YS2. In addition, for yoghurts YS2, the GS and the AV decreased, whereas the syneresis increased with casein concentration. The apparent viscosity and the gel strength for yoghurts YS1 were not affected by casein content but the syneresis increased with casein concentration. However, with addition of agar to yoghurt YS1, the AV and the GS increased, whereas the syneresis decreased with casein concentration. Stabilizers and casein concentration affected the microstructure of yoghurt. The addition of agar and casein resulted in the formation of larger cluster of casein micelles. The results confirm that casein content has a real impact on textural properties of yoghurt but the effects of casein depend on the stabilizer used.

Key Words: yoghurt, casein concentration, stabilizer

1523 Effect of ultrasound treatment on total bacteria and *Listeria monocytogenes* levels in milk. M. Guo*, T. M. Silk, and J. Wu, *Univerisity of Vermont, Burlington VT 05045*.

Heat treatment is widely used to pasteurize milk and other fluid food products. Although heating can kill pathogens, it can cause undesirable side effects such as loss of nutrients, and unacceptable changes in color and flavor. Heating can also induce interactions between components (protein-protein, protein-carbohydrate, and protein-lipid interactions) in food systems. The objective of this study is to use ultrasound as an alternative means to treat milk and other liquid food products. Milk samples were treated using a digital Sonifier (Model 450W, Branson Ultrasonics Co.) at a constant frequency (20kHz) and 110 W ultrasonic output power that was measued calorimetrically with a thermocouple. Raw milk, from the University farm, was portioned into 20 ml samples at the time of treatment. Milk samples were placed in steril aluminum tubes (23 X 80 mm). During treatment, the tubes were kept on ice minimizing temperature increases of the milk samples resulting from ultrasound treatment. Samples were individually treated with ultrasound for one or three minutes. Treated milk was then appropriately diluted in Butterfield's phosphate buffer and plated on Petrifilm APC plates. Plates were incubated at 35°C for 48 hours. In addition, UHT milk was inoculated with *Listeria monocytogenes* strain F5069(ATCC 51414) serotype 4b and treated with ultrasound. Ultrasound treatment of raw milk resulted in an overall reduction of microorganisms. Aerobic bacterial levels in raw milk decreased from 7.04+/-0.20 log CFU/ml to 5.62+/-0.25 log CFU/ml with one minute of treatment. Microbial levels decreased to 3.33+/- 0.11 log CFU/ml with three minutes of treatment. Levels of *Listeria monocytogenes*, inoculated milk decreased from 7.53 log CFU/ml to 7.07 log CFU/ml with one minute of treatment. Three minutes of ultrasound treatment decreased *Listeria monocytogenes* levels to 6.04 log CFU/ml. The results show that ultrasonic treatment might be a promising alternative method for milk treatment.

Key Words: Ultrasound treatment, milk, microbial reduction

1524 Coagulation properties of skim milk fortified with various dried milk proteins. B. S. Oommen*[1] and D. J. McMahon[1], [1]*Utah State University*.

Coagulation properties such as rennet coagulation time (RCT) and curd firmness of skim milk (2.91% protein) fortified with non-fat dried milk (NFDM), calcium caseinate, and sodium caseinate to a protein concentration of 2.99%, 3.17% and 3.35% were measured using a Formagraph. The dried protein powders were hydrated in water as a 12% protein solution by high shear mixing for 5min and subsequent stabilization for 8h before supplementation with skim milk. At higher levels of added calcium caseinate and sodium caseinate, the milk exhibited undesirable coagulation properties such as longer RCT. Therefore, potassium-dihydrogen-phosphate and calcium chloride were added to milks supplemented with calcium caseinate and sodium caseinate respectively, prior to rennet addition in the Formagraph. Coagulation time of milk fortified with NFDM decreased with higher amounts of fortification while that of milks supplemented with calcium caseinate increased with higher rates of supplementation. These differences diminished with phosphate addition and the RCT was comparable to that of milk between 9 and 18 mM of phosphate addition. A similar trend of increased RCT with increased fortification and diminishing RCT with calcium addition was seen in sodium caseinate supplemented milks. With 0.6 to 1.2 mM of added calcium, the RCT was comparable to that of control milk. Curd firmness increased with higher fortification with NFDM. Curd firmness for calcium caseinate supplemented milks decreased when compared to the control milk while it increased with addition of phosphate. Similarly, with milk supplemented with sodium caseinate there was a reduction in

curd firmness and addition of Ca increased the firmness to that of the control skim milk. The microstructure of the curds made from skim milk supplemented with proteins did not show any apprarent differnce. Even though milk supplementation with various milk proteins can destabilize the coagulation properties, these can be brought back to that of original milk by addition of various salts such as calcium hydroxide and potassium phosphate without affecting the microstructure.

Key Words: protein supplementation, microstructure, Formagraph

1525 Effect of temperature on strain ratio during continuous production of lactic starters containing probiotics with immobilized cell technology. Y Doleyres, I Fliss, and C Lacroix, *Dairy Research Centre STELA, Université Laval, Québec, PQ, Canada*.

Fermented dairy products are the main carriers for probiotic cultures. However, these cultures are fastidious to grow and usually not propagated in mixed cultures. In this study, cell immobilization (separate entrapment) in polysaccharide gel beads (2.75 % κ-carrageenan and 0.25 % locust bean gum) was studied for the continuous production of a mixed culture composed of an acidifying strain, *Lactococcus lactis* ssp. *lactis* biovar. *diacetylactis* MD, and a probiotic culture, *Bifidobacterium longum* ATCC 15707. A two-stage fermentation system was used, with a first reactor (R1, 120 ml) containing immobilized cells (separate entrapment) and a second reactor (R2, 600 ml) in series operated with free cells released from beads in R1. The system was fed with MRS-cystein medium (240 ml/h) and different temperatures in the range from 32 to 37C were tested with pH controlled at 6.0 in both reactors. Cell concentrations in gel beads and medium for both strains were strongly temperature-dependent, and at 35C a balanced culture of the two strains was produced in the fermented medium from R2, with $3.40.5*10^8$ CFU/ml *B. longum* and $7.80.2*10^9$ CFU/ml *L. diacetylactis*. *B. longum* did not grow in the second reactor, which served as a conditioning step to increase stress resistance of the culture, whereas *L. diacetylactis* concentrations were up to five times higher in R2 than in R1. A surface cross-contamination from the other strain of the mixed culture was observed in gel beads entrapping a pure culture using an immunofluorescent method involving double color labelling and confocal microscopy. After 17 days, all beads had the same composition, with $3.70.7*10^{10}$ and $8.31.7*10^9$ CFU/g for *L. diacetylactis* and *B. longum*, respectively. Our study showed that cell immobilization permits a stable continuous production of mixed cultures with a probiotic strain, and that temperature can be used to control the strain ratio in the mixed cultures.

1526 Development of vanilla-flavored ice cream using sucralose as sweetener. K. Adhikari*, R.D. Linhardt, A.T. Woods, K.A. Hein, and H. Heymann, [1] *University of Missouri*.

Alternative sweeteners have replaced sucrose as the sweetening agents in many food products that boast fewer calories and more choice to diabetic consumers. Sucralose is one such sweetener whose chemical composition is very similar to sucrose, although it is about 600 times sweeter than sucrose and the human body cannot metabolize sucralose. The primary objective of this study was to develop vanilla flavored ice cream using sucralose as the sweetener, and compare their sensory characteristics to ice creams containing sucrose. Regular- (10%) and reduced-fat (7.5%) fat ice creams with 0%, 25%, 50%, 75% and 100% sucrose replacement with sucralose (equivalent amounts in sweetness) were manufactured. Physical measurements included viscosity of ice cream mixes and hardness of ice creams. Descriptive sensory analysis was performed out on the ice creams by a panel of 10 judges. Canonical variate analysis (CVA) was done to find differences among the ice creams, and partial least square (PLS2) regression was done to correlate the sensory data to the physical data. Multivariate analysis of variance showed that #ice cream effect# was highly significant, indicating notable differences among the various ice creams. The CVA biplot showed that ice creams with up to 50% sucrose replacement were comparable to the control ice creams. The ice creams with higher replacement of sucrose were perceived to be porous, dry, bitter and chewy due to the presence higher concentrations of maltodextrin, which was used as a bulking agent. PLSR2 indicated that viscosity of the mixes and hardness of the ice creams were able to predict the creaminess, fluffiness, chewiness, crumbliness and meltdown (sensory texture attributes) with correlation coefficients (**r**) more than 0.77. The PLSR2 biplot also indicated that the ice creams mixes and ice creams containing higher concentrations of sucralose were more viscous and harder (physical attributes), respectively, which correlated well with sensory texture attributes such as fluffiness, chewiness and crumbliness. In conclusion, further work is necessary to optimize the type and amount of bulking agent used to replace the solids lost due to the use of high intensity sweeteners.

Key Words: sucralose, ice cream, descriptive analysis

1527 Large-scale production of water-soluble whey protein-based microcapsules for stabilization and controlled release of food ingredients. A. Picot[1] and C. Lacroix*[1], [1] *Dairy Research Centre STELA*.

An original technology based on spray-drying was developed to produce water-insoluble food-grade microcapsules with diameter lower than 100 μm suitable for stabilization and/or controlled release of food ingredients. A suspension of polymerized whey proteins (10% w/w heat-denatured WPI solution) was used as coating (method A) or immobilizing (method B) agent to prepare microparticles designed to protect hydrophobic or hydrophilic compounds (e.g. active molecules, lipids, vitamins and minerals) and sensitive probiotic lactic cultures, respectively. Method A consisted in dispersing an hydrophobic phase, which contained the hydrophobic or hydrophilic material to be protected, in soluble WPI polymers and spray-drying the resulting o/w emulsion. The hydrophilic material is incorporated in the form of fine dried particles by suspending a micronized powder in the hydrophobic phase before emulsification. The process is operated continuously by using a dynamic loop mixer connected to a spray-dryer. Anhydrous milk fat and skim milk powder (SMP) were used as model core materials during the development of the technique and optimization of the operating conditions. Best results in terms of encapsulation efficiencies were obtained with a 95/5 (w/w) hydrophilic/hydrophobic phase ratio, 5% (w/w) SMP in the hydrophobic phase, and SMP particle size with a $D(v,\ 0.9) < 25$ μm. Using method B, powder particles containing up to 2 x 10^9 cfu/g of *Bifidobacterium* ssp. were prepared by dispersing fresh cultures in soluble WPI polymers and spray-drying the resulting cell suspension. Immobilization of probiotic bacteria in whey protein-based microcapsules increased significantly their survival during refrigerated storage in yoghurt and when subjected to conditions similar to those encountered in the human gastrointestinal tract. The simple whey protein-based microencapsulation technology developed in this study, with low cost and large-scale capacity, could be used in foods or supplements to deliver efficiently bioactive ingredients to the consumers.

Key Words: Microencapsulation, Whey proteins, Spray-drying

1528 Evaluation of sodium caseinate isolate and whey protein concentrate in liquid coffee creamers. A. E. Golde and K. A. Schmidt*, [1] *Kansas State University, ASI Dept*.

The majority of U.S. consumers adds a sweetener or creaming agent to their brewed coffee to soften the acidic taste. When placed in coffee, an ideal coffee creamer should have a cream-like flavor, remain stable (not feather), dissolve readily and provide good whitening ability. The objectives of this study were to: develop a visual feathering guide for creamer evaluation and to evaluate sodium caseinate (SCI), whey protein concentrate (WPC) and their combination as coffee creamers.
Coffee creamers (11% fat, 5.5% sweetener, 3% protein, 2.4% emulsifiers and 0.45% stabilizer and buffer) were made. A visual feathering guide was developed for evaluation of coffees in 4, 6 and 8% brewed coffee solutions, by utilizing different acid concentrations to induce feathering. Laminated, color photo guides were made. Creamer samples were evaluated for density, pH, and color (L^*, a^*, b^*) as individual liquids. Coffee creamers were placed in brewed coffee (4, 6 and 8% (w/v) concentration) and evaluated for feathering tendency and whitening ability.
Statistical analyses indicated that as coffee creamers, the SCI samples were lower in b^*, density, hue angle, pH and saturation index and higher in a^* than the WPC and SCI/WPC samples. However, all coffee creamers were stable in the hot coffee solutions and did not exhibit any tendency to feather. Also, when coffee creamers were added to hot, brewed coffee, similar whitening properties were observed.
These results indicate that WPC may be used as a partial replacement for sodium caseinate in liquid coffee creamers.

Key Words: Sodium caseinate, Whey protein concentrate, Coffee creamer

1529 The effect of antioxidants on solubility of trace minerals in infant formula. C. R. Smith*, M. R. Guo, and R. S. Tyzbir, *University of Vermont, Burlington VT 05405*.

In infant formula, the solubility and availability of essential trace elements, especially iron (Fe) and zinc (Zn), may be affected by the forms of added mineral salts as well as the oxidation state of the mineral. Solubility and bioavailability of Fe may also be related to the oxidation state, being more soluble in a reduced state. To maintain a reduced environment in formula, we used high levels (200-300% RDA) of the naturally occurring antioxidant nutrients ascorbic acid (vitamin C) and vitamin E, both of which can be used at up to 10,000% of the RDA with little or no side effects. Ten 2.0 kg paired batches of milk-based, whey-protein dominated liquid infant formula (40:60 casein to whey protein ratio) were processed in our university laboratory, with either organic salts, i.e., gluconate, (OF) or inorganic salts, i.e., sulfate, (IF) of Fe and Zn; and 100% (control), 200%, or 300% the RDA of vitamin C or vitamin E. Mineral distribution was determined by measuring contents of the minerals in the fat, serum, and pellet fractions obtained on centrifuging the formula at 45,000 X g for 2 hours at 4°C. Mineral levels were evaluated by inductively coupled plasma atomic emission spectroscopy. There were no significant improvements on the solubility of iron and zinc in OF and IF by either ascorbic acid or vitamin E at all levels (200 & 300%). According to these results, the antioxidants used may have no effect on the solubility of trace minerals in infant formula. Further research is needed to elucidate and verify methods to increase trace mineral solubility and availability in infant formula.

Key Words: Infant formula, mineral solubility, antioxidant

1530 Carbonation of frozen soft-serve confections. L.V. Ogden*, L.K. Jefferies, and A. Ellsworth, [1]*Brigham Young University, Provo UT*.

A Taylor model 8756 soft-serve freezer was modified to pump carbon dioxide, instead of overrun air into the pressurized freezing chamber as the mix was freezing. Non-fat Yogurt soft-serve mix containing 12% MSNF was frozen while injecting carbon dioxide. The amount of carbon dioxide injected was adjusted the maximum that could be uniformly incorporated in the product. Soft frozen product at -7 °C had an overrun of 60 % and contained 1.3 volumes of dissolved carbon dioxide. The product had a distinct and pleasant carbonation flavor. Hard freezing the product resulted large carbon dioxide containing voids as gas was excluded from the freezing matrix.

Key Words: Frozen, Confecton, Carbonation

1531 Effect of homogenization pressure on rheological properties and microstructures of heat-set whey protein emulsion gels. R. Suhareli*, G. Perez-Hernandez, and R. Richter, *Texas A&M University, College Station, TX*.

The objective of this experiment was to determine the effect of homogenization pressure on heat-set, whey protein emulsion gels. Whey protein concentrates from acid and sweet whey were used. Gels contained 10 % protein and 20 % milkfat. Samples were heated to 65 C for homogenization at 20 and 90 MPa. The Dvs and viscosity of the emulsions were analyzed before the emulsions were heated at 90 C for 30 minutes. Stress-relaxation parameters were determined for the gels. Gels microstructure was observed by using ESEM.
The particle size distribution was affected by protein source and homogenization pressure. The Dvs of emulsions prepared with acid whey increased when the homogenization pressure was increased from 20 to 90 MPa. However, the Dvs of emulsions prepared with sweet whey decreased as the homogenization pressure was increased from 20 to 90 MPa. The consistency coefficient of the emulsion increased when the homogenization pressure was increased for emulsions from both sweet and acid whey. Emulsions prepared with acid whey had a higher consistency value compare to gels made with sweet whey.
The emulsions prepared with acid whey exhibited shear-thinning ($n<1$). Emulsions prepared with sweet whey had Newtonian behavior after homogenization at 20 MPa but were susceptible to shear-thinning when the emulsions were homogenized at 90 MPa. Gels prepared from acid whey were stiffer after homogenization of the emulsions at 90 MPa than gels made from emulsions homogenized at 20 MPa. The micrographs showed that acid gels had a textured surface compare to sweet whey that had smoother surfaces.

Key Words: Homogenization, Whey Protein, Emulsion Gels

1532 Folic acid fortified fat free sugar free plain set yogurt. Kayanush Aryana*, *Louisiana State University*.

Folic acid is used in preventing birth defects of the spine and brain, hardening of arteries and colon cancer. Yogurt is not a good source of folic acid. Fortifying yogurt with folic acid may or may not alter its characteristics. Objective was to elucidate the effect of folic acid on the texture of yogurt. Texture was studied using a Brookfield DV II + viscometer fitted with a T-C spindle which operated at 30 rpm. Folic acid was added at either of the two stages, during mix preparation or after culture addition. Folic acid was also added at either of the two levels, a quarter or half the recommended daily allowance of 300 micrograms. Means were separated using the least significant difference test and the differences were determined at 5 percent level of significance. Addition of folic acid prior to heat treatment increased the viscosity significantly from 130.56 dyn.s/cm2 in control to 140.73 dyn.s/cm2. Doubling the concentration of folic acid significantly decreased the viscosity of yogurt from 128.39 dyn.s/cm2 to 106.02 dyn.s/cm2. Folic acid impacted the texture of yogurt.

Key Words: supplement, health

Forages and Pastures
Silages, Small Grains, and Fertilization

1533 Effects of molasses-based preservative on fermentation and nutritive value of Albizia lebbeck silage. T. Clavero* and R. Razz, *La Universidad del Zulia*.

A trial was carried out in Venezuela in order to evaluate fermentation characteristics and silage quality of Albizia lebbeck with different levels of molasses. Chopped fresh plant materials of about 1 cm length were ensiled into a laboratory silo and stored at 25C. Treatments were applied according to a 3x3 factorial arrangements in a completely randomized design. Factors studied were three rates of legumes: molasses, 1:2, 1:4, 1:8 (w/v) and three storage times (1, 2 and 3 months). After opening the silos, pH, total nitrogen content (TN), rumen soluble nitrogen (SN), NFAD, nitrogen fixed to the cell wall of the total nitrogen (NFND/NT) and in vitro DM digestibility (IVDMD) were determined. Addition of molasses significantly ($P<0.01$) decreased pH values but increased NT. The lowest pH values (5.1) and the highest TN values (2.44) were obtained with the relation 1:8. No significant differences ($P>0.05$) in SN, NFAD, NFND/NT and IVDMD were found between levels of molasses. The time of storage significantly affected ($P<0.01$) the loss of TN, SN, NFAD and NFND/NT. IVDMD was reduced significantly by the ensiling process, from 71.76% after 1 month to 70.1 after 3 months of ensiling. This study concluded that Albizia lebbeck fodder can be preserved successfully by ensiling with the addition of molasses.

Key Words: Albizia lebbeck, Silage quality, Molasses

1534 Effects of molasses-formic acid silage preservatives on fermentation of Leucaena leucocephala silage. M. Betancourt*[1], T. Clavero[2], R. Razz[2], S. Pietrosemoli[2], and O. Araujo[2], [1]*INIA*, [2]*La Universidad del Zulia*.

A trial conducted at tropical very dry forest located in the western part of Venezuela in order to evaluate the effect of molasses, formic acid and fermentation time on the pH and temperature of microsilos of Leucaena leucocephala. A factorial arrangement (3x3x8) with two replications was used, three levels molasses (0, 2.5 and 5%, three levels of formic acid (0,