or d 1 OH-Pro and d 1 HP in ST. Western blot analysis for measuring the presence of the Troponin-T (**Tn-T**) 30kda fragment demonstrated more proteolysis in LD at d 3 in L than W or WxL. Breed differences in mechanical and sensory measures of tenderness existed (d 14 - LD and ST), but were not explained by FC, CA, OH-Pro, HP and Tn-T.

Key Words: Wagyu, Limousin, Beef Tenderness

1565 ***In-vitro*** **oxidation of bovine oxymyoglobin as affected by 4-hydroxy-nonenal.** A.L. Phillips*, S. Lee, L.K. Silbart, and C. Faustman, *University of Connecticut, Storrs, CT*.

Discoloration from the desirable cherry red to brown color in fresh meat is a result of oxidation of ferrous oxymyoglobin (OxyMb) to ferric metmyoglobin (MetMb). Lipid oxidation, among other factors, influences the rate of fresh meat discoloration. 4-Hydroxy-nonenal (HNE), a known product of ω-6 fatty acid oxidation, is very reactive toward protein and has been shown to accelerate equine cardiac OxyMb oxidation. Our objective was to determine the influence of HNE upon bovine skeletal OxyMb *in-vitro* under a variety of temperature (4, 25 and 37°C) and pH (5.6 and 7.4) conditions and to identify the adduction of HNE to OxyMb using Western Blots. Bovine skeletal muscle myoglobin (Mb) was purified from beef via ammonium sulfate fractionation and gel filtration chromatography. OxyMb was prepared by hyrdosulfite-mediated reduction and adjusted to physiologic or post-mortem pH via phosphate (pH 7.4) or citrate (pH 5.6) buffer dialysis, respectively. OxyMb (0.15 mM) was incubated with 1 mM HNE (OxyMb:HNE) at 4, 25 and 37°C; controls were aldehyde-free. Following incubation, samples were passed over a desalting column to remove unreacted HNE, scanned spectrophotometrically from 650 to 450 nm, and the percentage of MetMb calculated. Western Blot analysis was completed using control and OxyMb:HNE reacted at pH 7.4, 37°C for 2 hr. Identification of Mb bound HNE was visualized using a monoclonal antibody specific for HNE bound to histidine residues. Overall, MetMb formation increased with increasing temperatures and was greater at pH 5.6 than pH 7.4 ($P \leq 0.05$). At 37°C, a prooxidant effect of HNE was seen at pH 7.4 but not at pH 5.6 when compared to control ($P \leq 0.05$). At both 25 and 4°C, a prooxidant effect of HNE was seen at pH 7.4 and 5.6 relative to CON ($P \leq 0.05$). Western Blots revealed that OxyMb:HNE incubated at pH 7.4, 37°C yielded OxyMb:HNE adducts at histidine residues whereas control samples showed no reaction. This research suggests that HNE accelerates *in-vitro* bovine skeletal muscle OxyMb oxidation and appears to do so, in part, via covalent modification at histidine residues.

Key Words: 4-hydroxy-nonenal, Oxymyoglobin, Metmyoglobin

ADSA Dairy Foods: Products, Processing, Chemistry, Sensory

1566 Rheological Characterization of Butter Oil Obtained from Yogurt and Milk. Sevim Kaya* and Ahmet Kaya, *Gaziantep University*.

Butter oil, clarified butter or anhydrous milk fat is a widely consumed food product in southeast of Turkiye. The aims of the study were to investigate and compare the rheological characters of butter oil from yogurt and milk using flow curve and oscillation frequency sweep tests at various temperatures. The steady shear flow data of the butter oil samples were investigated using a rheometer HAAKE RheoStress RS1 with a cone and plate system (d:35 mm, α :2°) and in combination with a Peltier/Plate TCP/P temperature control unit at temperature range of 35-70 ± 0.05°C. Data were analyzed using a RheoWin Data Manager. The measurements were repeated three times, each time using a fresh sample and the average values were used to analyze data. Newtonian behavior was observed for the samples ($r^2 \geq 0.998$) at the temperature range studied. Increasing temperature decreased the viscosity. Activation energies of butter oil from yogurt and milk were 21.7 and 21.6 ± 0.2 kJ/mol, respectively showing that there was no difference between samples produced using different methods above the temperature 35°C. In addition to the temperature range studied above, another temperature range (35-29± 0.05°C) was studied to observe the structural conditions of the samples analyzed using a oscillation frequency sweep test. It was found that at low frequencies the viscous behavior reflected by loss modulus is dominant whereas at high frequencies the elastic behavior reflected by storage modulus is outweighing. This shows solid like behavior of samples at higher frequencies. When the log crossover point was plotted versus temperature, below 35°C samples made from yogurt and milk showed different characteristics due to different fatty acid composition of the samples.

Key Words: Butter oil, yogurt, rheology

1567 Acceptance of camel milk among elementary school students in Al Ain, UAE. Isameldin Hashim*, *United Arab Emirates University*.

Milk is an important food for children. Although camel is the dominant animal in the U.A.E., camel milk is not available commerically. The objectives of the study were to investigate: 1) consumption of milk and dairy products among elementary school students, 2) hedonic rating for sensory characteristics and overall acceptance of camel milk, and 3) acceptability of flavored camel milk. A questionnaire was designed to provide information on milk and dairy products consumption, milk flavor preference and willingness to participate on a milk tasting test. The questionnaire was distributed to 470 students (boys and girls, grades 4, 5 and 6) at elementary schools (public and private) in Al Ain. A panel of 173 students was selected to evaluate the milk samples (fresh cow milk , dried cow milk, fresh camel milk and chocolate-flavored camel milk). Seven-point hedonic scale (smiling faces) was used for rating the color, aroma, taste, texture, and overall acceptance of the milk. Most of the students (93.2%) drink milk and only few (9.6%) drink camel milk. Most of the participants drink choclate (43%) and strawberry-flavored (38.3%) milk. Beside the milk most of the participants consume other diary products (yogurt, liquid yogurt, chesses and ice-cream). Camel milk had the lowest ratings for taste (3.2), aroma (4.1), and overall acceptance (3.8) compared to the fresh and dried cow milk (5.3 - 5.9). However, flavoring camel milk with choclate enhanced the attributes of camel milk specially the taste (6.4), aroma (6.3) and overall acceptance (6.2).

Key Words: camel milk, acceptance, elementary school, UAE

1568 Effect of formulation and processing on emulsion stability of recombined sterilized milk. G. Prez-Hernndez, S. Bhatia, and R. L. Richter, *Texas A&M University, College Station, TX.*.

The objectives were to determine the effect of product formulation and processing conditions on the composition of the milk fat globule membrane in recombined sterilized milk and to determine the effect of these changes on the emulsion stability. Samples contained casein to whey protein ratios of 80:20, 60:40, 40:60 and 0:100, and 0.5% monoglycerides, 0.5% lecithin, or a mixture of lecithin with monoglycerides. The protein and fat concentrations of the milk were 3%. Samples were homogenized at 20 and 90 MPa and sterilized at 121°C for 15 min. Emulsions were characterized by stability index, protein load, particle size distribution, and rheological parameters. Inclusion of monoglycerides in the samples caused the mean pH for all samples to decrease from 6.58 to 6.56 ($p \leq 0.0152$). Maximum viscosity occurred in samples with a casein to whey protein ratio of 0:100. This was caused by denaturation of whey protein during sterilization. There was a four fold increase in volume surface average diameter as the ratio of whey protein in the samples was increased from 80:20 (0.4425μm) to 0:100(1.7175μm). The surface area of particles in all treatment increased as the homogenization pressure increased. Particle surface area increased when samples that had a casein to whey protein ratio of 0:100 were formulated with emulsifier. Emulsifiers did not affect the particle surface area in any other sample. The protein load increased as the ratio of whey protein in the samples increased. Inclusion of emulsifiers in the samples caused the protein load to decrease. Stability index increased as viscosity, particle surface area and relative distribution width increased and pH and protein load decreased.

Key Words: emulsion stability, recombined milk, sterilization

1569 Commercial whey protein concentrates: protein aggregation profile study. Samira Roufik*[1], Michel Britten[2], and Paul Paquin[1], [1]*Centre de recherche en sciences et technologie du lait (STELA), Universite Laval, Quebec/Canada,* [2]*Centre de recherche et de developpement sur les aliments (CRDA), St-Hyacinthe, Quebec/Canada.*

Commercial whey protein concentrates (WPCs) exhibit different functional properties even when they have nearly the same total protein content. The aim of this study was to investigate the WPCs protein aggregation profiles to see if we can explain their functional variability through differences in their aggregated state. High performance size exclusion chromatography (HPSEC) technique using a TSK Gel® G-4000 PW XL column was performed to study the protein aggregation profiles of seven commercial WPCs. Results show for all WPCs under study the presence of two protein fractions, the aggregated protein fraction (APF) and the native protein fraction (NPF). The WPCs apparent APF proportion varies between 9.83% and 29.21% which reflect their variable level of aggregation. By performing centrifugation at 48 000 g during 45 min (25°C), we have separated these two protein fractions. Then, using HPSEC technique with a TSK Gel® G-3000 PW XL column we have characterized the NPF while the APF was characterized with electrophoretic techniques.

Key Words: Whey protein concentrates, Aggregation profile, Protein fractions

1570 Effect of drying methods on functional properties of tarhana, a wheat flour-yogurt mixture. Mehmet Hayta*[1], Mehmet Alpaslan[1], and Ahmet Baysar[2], [1]*Inonu University,Department of Food Engineering,* [2]*Inonu University,Department of Chemical Engineering.*

Tarhana is a traditional product prepared by mixing wheat flour, yogurt, yeast and spices followed by fermentation for several days and drying after fermentation. The information on functional and sensory properties is essential for process design, quality control and consumer acceptability. In this study, the changes in functional and sensory properties of tarhana as affected by different drying methods were investigated. Tunnel-dried (TD) tarhana had significantly ($P<0.05$) higher foaming capacity compared to freeze-dried (FD), home microwave oven-dried (HMD) and industrial microwave-dried (IMD) samples. FD tarhana had the highest protein solubility value ($P<0.05$) and was followed by TD, IMD and HMD samples, respectively. All tarhana samples exhibited pseudoplastic behavior as apparent viscosity-rotational speed data fitted to a power law model. A significant ($P<0.05$) decrease in oil absorption capacity was observed for TD tarhana compared to other drying methods. Water absorption capacity of each tarhana sample was significantly ($P<0.005$) different. On the basis of soluble protein content, TD tarhana had the highest emulsion activity value. No significant differences were observed in odor and mouth-feel among the drying methods used. However, flavor of FD tarhana gruel was significantly ($p<0.05$) different from other samples. IMD tarhana gruel had the highest overall rating and was followed by TD, HMD and FD, respectively. The lightness (L) value of FD sample was the highest and the HMD sample had the lowest L value. The L values for HMD and IMD samples were smaller than TD and FD samples. In contrast, b value was found to be higher for HMD and IMD samples.

Key Words: Tarhana, functional properties, sensory properties

1571 Effect of freezing process on the microstructure and stability of stabilized ice cream-type systems. K. Montoya and H. D. Goff*, *University of Guelph, ON, Canada.*

Ice cream model systems without fat and in the presence and absence of locust bean gum (LBG) and guar gum were frozen quiescently and in a scraped-surface freezer (dynamic freezing) with both low and high overrun. Samples were temperature cycled from -10 to -20°C for 15 and 50 cycles. Cryo-Scanning Electron Microscopy (Cryo-SEM) techniques and image analysis were used to determine structure and ice crystal size distributions. Results showed that microstructure of the two systems was different; dynamic samples showed discrete, block shaped crystals without connectivity and randomly dispersed in a system comprised of a continuous serum phase and air cells whereas quiescent samples showed a more continuous ice phase with irregularities on a dendritic type of crystal, or elongated crystals closely packed and separated just by the serum. Stabilizers did not affect the initial size and distribution of ice crystals in either system. After temperature cycles, ice recrystallization occurred in the order of LBG < guar gum < no stabilizer only in quiescently frozen systems. For dynamic samples lower recrystallization rates were found compared to those of quiescent. In dynamic systems stabilizers did not exert a significant effect ($p<0.05$) in retarding ice recrystallization, although there was a trend towards lower recrystallization in LBG samples with low overrun ($p<0.10$). The mechanisms by which polysaccharide stabilizer may control ice recrystallization may have been affected by the freezing process. LBG effectiveness has been attributed to the formation of a gel matrix around the ice crystals enhanced by LBG-milk protein phase separation. The presence of shear during freezing in the scraped surface heat exchanger may have disrupted this microstructure. This provides further insight into stabilizer functionality and suggests caution in extrapolating the results from one process to the other.

Key Words: Ice cream, Polysaccharide stabilizer, Scanning electron microscopy

1572 Effect of Incubation Temperature and Homogenization on the Rheological Properties of Set Yogurt During Gelation Process. S.A. Ibrahim*[1], R.R. Shaker[2], B. Abu-Jdayil[2], and R.Y. Jumah[2], [1]*North Carolina Agricultural and Technical State University, Greensboro, NC.,* [2]*Jordan University of Science and Technology, Irbid, Jordan..*

Fresh raw milk was standardized (3% fat) and split into 2 portions. One portion was heated at 90C for 3 min using a plate heat exchanger and homogenized at 13.79 Mpa. The second portion was heated at 90C for 3 minutes without homogenization. Each portion was divided into 3 parts (450 ml each), inoculated with 3% yogurt starter culture (Joghurt 2 Type MK consisting of *Streptococcus thermophilus* and *lactobacillus* delbrukii sub. *bulgaricus*) and incubated at 40, 45, and 48C, respectively to determine the effect of incubation temperature and homogenization on the rheological properties of set yogurt during the gelation process using a cylindrical rotational viscometer. The optimum incubation temperature for acid development was observed at 45C. The minimum viscosity was observed at 40C while the maximum viscosity was at 48C. The results indicated that incubation temperature affected yogurt viscosity during the gelation process while homogenization had no significant effect. The power law model was used to describe the flow behavior of set yogurt. Increasing the incubation temperature decreased the flow behavior index and increases the consistency coefficient. Homogenization increased the flow behavior index and decreased the consistency coefficient.

Key Words: Yogurt, Rheological properties , Homogenization

1573 The Effect of Salep and Locust Bean Gum Concentration on the Rheological Characteristics of a Turkish-type Ice-cream Mix. Sevim Kaya*[1], [1]*Gaziantep University.*

A traditional Turkish type ice cream is prepared from whole milk, sugar and salep. Salep, a natural polysaccharide, is used as a stabilizer. The effect of salep and locust bean gum concentration (0.2, 0.4, 0.78 and 1.00 g per 100 mL) on the flow behavior of the ice-cream mix has been investigated over a range of shear rates. The temperature dependency of the flow behavior of the mixes was also studied obtaining data at four different temperatures. The steady shear flow data of the ice-cream mixes were investigated using a rheometer HAAKE RheoStress RS1 with a cone and plate system (d:35 mm, α :2°) and in combination with a Peltier/Plate TCP/P temperature control unit at temperature range of 5-30 0.05°C. Data were analyzed using a RheoWin Data Manager and SigmaPlot for Windows. The measurements were repeated three times, each time using a fresh sample and the average values were used to analyze data. The empirical power law was observed to fit the shear stress-shear rate data ($r\leq0.998$). Increasing stabilizer concentration decreased the power law index values which were in the range of 1.00-0.30 and 0.79-0.53 for 0.2-1.0 g salep per 100 mL mix and 0.2-0.78 g locust bean gum per 100 mL mix at 5°C, respectively. A gradual increase in salep concentration was found to alter the rheological characteristics of the mix from Newtonian to non-Newtonian. It was found that there was not any significant difference between apparent viscosity values of ice cream mixes containing 1 g of salep per 100 mL or 0.4 g locust bean gum per 100 mL ($p\leq0.05$). The temperature-dependency of the

apparent viscosities of the samples with different salep and locust bean gum concentrations was also determined. It was observed that temperature effect were not significant on the apparent viscosity values of each concentration studied ($p \leq 0.05$) except 0.2 and 0.4 g per 100 mL salep concentration.

Key Words: salep, rheology, ice-cream

1574 Effect of double homogenization and whey protein concentrate on the texture of ice cream. P. R. Ruger*[1], R. J. Baer[1], and K. M. Kasperson[1], [1]*Dairy Science Department, South Dakota State University, Brookings, SD, USA.*

Ice cream was made with a mix composition of 11% milk fat, 11% milk solids-non-fat (MSNF), 13% sucrose, 3% corn syrup solids (36 dextrose equivalent), 0.28% stabilizer blend or 0.1% emulsifier and vanilla extract. Mixes were HTST pasteurized at 80°C for 35 s, homogenized at 141 kg/cm^2-35 kg/cm^2 (2000 psi-500 psi), and cooled to 3°C. Six treatments were prepared from 4 batches of mix. Mix from batch one consisted of 0.1% emulsifier. Half of this batch, treatment 1 (T1), was cooled to 3°C and the other half, upon exiting the pasteurizer, was heated to 60°C, rehomogenized at 141 kg/cm^2-35 kg/cm^2 (T2), and cooled to 3°C. Mix from batch two consisted of 0.28% stabilizer blend. Half of this batch was used as the control (T3), the other half, upon exiting the pasteurizer, was heated to 60°C, rehomogenized at 141 kg/cm^2-35 kg/cm^2 (T4) and cooled to 3°C. Batch three consisted of 0.1% emulsifier and 1% whey protein concentrate (WPC) substituted for 1% MSNF. It was heated to 60°C, rehomogenized at 141 kg/cm^2-35 kg/cm^2 (T5), and cooled to 3°C. Batch four consisted of 0.28% stabilizer blend and 1% WPC substituted for 1% MSNF. It was heated to 60°C, rehomogenized at 141 kg/cm^2-35 kg/cm^2 (T6), and cooled to 3°C. Results showed no difference ($P > 0.05$) in mean ice crystal size between T3, T4, and T6, however T4 and T6 had a smaller mean ice crystal size than T1, T2, and T5. Mix viscosities were tested one day after manufacture. The viscosity of T3 was greater ($P < 0.05$) than all other treatments and the viscosities of T4 and T6 were greater than T1, T2, and T5. Milk fat and total solids of all treatment mixes were similar ($P > 0.05$).

Key Words: Ice cream, Homogenization, Whey protein concentrate

1575 Lack of effect of a specially designed yogurt for the eradication of *Helicobacter pylori* infection. L. Ozimek*[1], C. Wendakoon[1], S. Appelman[2], and A. Thomson[2], [1]*Department of Agricultural, Food & Nutritional Sc.,* [2]*Division of Gastroenterology, University of Alberta.*

Helicobacter pylori infection is associated with an increased risk for the development of duodenal and gastric ulcers, chronic active gastritis, MALToma and gastric cancer. Various consensus guidelines have been developed to recommend when it is appropriate to test for and treat the presence of *H. pylori*. Standard treatment usually involves triple therapy with one two week course of antibiotics plus proton pump inhibitor. This regimen is approximately 85% effective, yet it it is expensive, difficult to take and may be associated with the risk of development of diarrhea and eteric infection. Probiotics have been suggested as a posible therapeutic agent, and a specially designed yogurt derived from three strains of lactobacillus has been shown to be of a comparable inhibitory effect of *H. pylori in vitro* as compared with standard concentrations of amoxycillin and clarithromycin. Because the *in vitro* sensitivity of *H. pylori* may not necessarily predict its *in vivo* effect, we undertook an open study with 27 asymptomatic post-menopausal women positive for *H. pylori* on gastric biopsy, and administered 250 cc of yogurt three times a day for one month. Then, one month later, a ^{13}C-urea breath test (UBT) was administered. In all 26 of 27 patients the UBT remained positive one month after a course of yogurt. in summary, the *in vitro* anti-Helicobacter effect of a mixture of specially designed yogurt does not predict the *in vivo* eradication of the infection.

Key Words: *Helicobacter pylori*, Probiotics, *In vitro & in vivo* studies

1576 Determination of B_{12}, biotin, and folic acid in infant formula by Biomolecular Interactive Assay. Thom Grace*[1], Deliang Cai[2], and Mingruo Guo[2], [1]*Biacore Inc. 384 Sam Webb Rd. Fairfax, VT. 05454,* [2]*Dept. of Nutrition and Food Sciences, University of Vermont, Burlington, VT 05405.*

The current methodologies for water soluble vitamin analysis are generally manipulative, and imprecise or insensitive. In this study, the precision and accuracy of the BIACORE Q system of biomolecular interaction analysis for the quantitative determination of B_{12}, biotin and folic acid in infant formula were evaluated. Two types (soy-based and milk-based) of commercial powdered infant formula were used for the analyses. Fifteen separate samples were prepared for each formula type and run singularly for reproducibility analysis. A single sample was also analyzed in replicates of 16 for the reproducibility of the instrument. The values of coefficient of variation (CV) for B_{12}, biotin, and folic acid were 6.2, 5.6, and 3.7%, respectively. Recovery test was also carried out by spiking with each vitamin at four different concentrations across each assay range of detection. The recovery rates were ranging from 96 to 105% for all the three assays. The results of this study show that the Biacore biomolecular interactive technology may be a good alternative for quantification of the water soluble vitamins, to the traditional methods

Key Words: Biomolecular interactive assay, infant formula, water soluble vitamin

1577 Microbial content and distribution in Turkish kefir grains. Z. B. Guzel-Seydim*, A. C. Seydim, J. T. Wyffels, and A. K. Greene, *Clemson University, Clemson, SC, USA.*

Kefir is a fermented dairy product made by addition of kefir grains into milk. In kefir grains, lactic acid bacteria and yeast symbiotically live in a slimy polysaccharide matrix known as kefiran. The objectives of this study were to determine the microbial content of grains and to observe the microbial distribution in Turkish kefir grains using scanning electron microscopy. Kefir grains had a ratio of 10^6 cfu/g yeast to 10^9 cfu/g lactic acid. Scanning electron microscopy indicated yeast colonization on the surface and middle of the kefir grain. Short, long and curved lactobacilli were throughout the grain. Lactococci were not observed under SEM; preparation of kefir grains for SEM may have caused removal of lactococci from the grains if they were lightly bound to the grains.

Key Words: kefir, fermented dairy products, scanning electron microscopy (SEM)

1578 Comparison of component interactions and mineral distribution in infant formulas prepared with organic or inorganic mineral salts. Casey R. Smith*[1], Mingruo Guo[1], Gregory M. Hendricks[2], and Robert S. Tyzbir[1], [1]*Dept. Nutrition and Food Sciences, University of Vermont,* [2]*Medical School, University of Massachusetts.*

Poor bioavailability of essential trace elements, such as copper, iron, and zinc, in commercial infant formula may be related to their low solubility, which may be affected by the forms of added mineral salts. Substituting organic for inorganic mineral salts may increase solubility and availability of minerals in infant formula. Ten 2.5 kg paired batches of whey-protein dominated liquid infant formula (40:60 casein to whey protein ratio) were processed in our university laboratory, with either organic or inorganic salts of Cu, Fe, and Zn. Organic formula (OF) and inorganic formula (IF) were heated to 55C, 60C, 65C, 70C, or 75C immediately preceding homogenization. Nitrogen (N) and mineral distribution were determined by measuring the contents of N and selected minerals in the fat, serum, and pellet fractions obtained on centrifuging the formula at 45,000Xg for 2 hours at 4C. Mineral levels were evaluated by inductively coupled plasma atomic emission spectroscopy, and nitrogen content was determined by the macro-Kjeldahl method. There were no notable differences in mineral and nitrogen distribution between unheated OF and IF. However, pre-homogenization heat treatment (PHT) seemed to have an impact on both nitrogen and mineral distributions in the experimental formulas. The level of iron in the serum was higher for OF at a PHT of 55C with 58.93% of total Fe in the serum fraction, compared to IF which was highest at 60C with a maximum of 49.64%. There was no significant difference detected in the percentage of copper in the serum fraction between OF and IF. Serum Zn was significantly higher ($p<.05$) in OF than IF (38.52% vs 30.65%) at PHT 55C. Percentage of N in the

serum fraction of both OF and IF was highest at a PHT of 60C. Total solids (TS), protein, and ash in the formulas were also analyzed. OF averaged slightly higher TS at 11.75%, whereas IF averaged 11.66%. Ash content in IF (0.33%) was slightly higher than that of OF (0.32%). The microstructures of both formulas were also examined. According to our results, organic mineral salts of Fe and Zn may be substituted for inorganic salts of Fe and Zn to enhance mineral solubility in infant formula, however, further research is needed to elucidate and verify methods to increase trace mineral solubility.

Key Words: Infant formula, component interaction, mineral distribution

1579 The effect of human milk pasteurization on the growth of Bifidobacteria. Luciana M. Borba[1], Celia L. L F. Ferreira*[1], Sylvia C. Franceschini[1], and Tania Toledo[1], [1]*Federal University of Viosa.*

There is an increasing recognition of the importance of human milk banks. In such institutions, the donated milk is pasteurized to increase its safety. However little is known about the effect of heated milk upon the desirable microbiota of the newborn. In this work, pools of human milk (same age of maturiry) were analyzed through addition of 4 different strains of Bifidobacteria, human origin. Isolates from *Bifidobacterium bifidum* (*B. bifidum*) ATCC 29521, *B. breve* ATCC 15700, *B. longum* ATCC 15707, and a newly isolate *B. breve* AJ 32 were innoculated in a whole pasteurized human milk (WPHM), and WPHM plus pasteurized human milk filtrate (35%) and plus unpasteurized human milk filtrate (35%). After a 24 hours incubation at 37^{o}C, under anaerobic conditions, the contents of each treatment were plated in TPY agar (SCARDOVI, 1986), counted and compared with the counts of the initial time of incubation (time0). The difference between time 24 and 0, gives the degree of the stimulation or innhibition of the heated/unheated milk. The log average of the three repetitions of the CFU/mL of this difference were: -0,28/-0,18/+0,33 for ATCC 29521; -0,30/-0,26/+0,12 for ATCC 15700; -0,18/-0,22/+0,10 for ATCC 15707; and #0,25/-0,26/+0,17 for AJ 32, in the WPHM; WPHM + pasteurized filtrate; and WPHM + unpasteurized filtrate, in that order. The addition of the unpasteurized milk filtrate in the base (pasteurized) stimulate the growth of the 4 strains evaluated here in, and the difference of this treatment was statistically significant (p<0,05). This results indicate that the addition of Bifidobacteria of human origin to the pasteurized milk in the human banks could be benefical to the newborn.

Key Words: Human milk, Pasteurization, Bifidobacteria

1580 *Lactobacillus acidophilus* translocation in rats feeding cholesterol rich diet. Dayse F. Machado[1], Celia L. L F. Ferreira*[1], Neuza M. B. Costa[1], Lorena M. Ybarra[1], Eveline M. C. Azevedo[1], and Maria R. G. Cond[1], [1]*Federal University of Viosa.*

Probiotics are known as functional foods and individuals consuming a rich cholesterol diet are prone to consume such products. This work was devised to verify the effect of a cholesterol rich diet in translocation - the passage of microorganisms from intestinal environment to other organs and tissues, and rate of "clearing" of *Lactobacillus acidophilus* NCFM. One hundred and sixty weaned Wistar rats, divided in 4 groups and caged individually were used. The diets administered were: (1) standard (AIN-93G, *"ad libitum"*); (2) control (AIN-93G plus cholesterol and cholic acid); (3) control plus 0,1ml/day of Reconstituted Skimmed Milk (RSM) at 10%; (4) control plus 0,1ml/day of acidophilus concentrate at levels of 10^{10} CFU/ml, for 14 days. Translocation was evaluated in heart, kidney, liver and spleen of all animals at 0 and 28 days after the end of probiotic administration, through the screening for total count in MRS agar. Translocation was observed in all organs of group 4, but not in the others. The average translocation (± standard deviation) were 35(±3,49)/ 16(±2,28); 45(±2,62)/ 27 (±2,51); 26 (±3,28)/ 11 (±1,84); 68 (±2,52)/ 22 (±2,96) CFU/g from heart, kidney, liver and spleen, respectively at 0 and 28 days. The time required for the complete elimination of *Lactobacillus* from the organs was calculated according to adjusted regression models and corresponded to 48, 68, 48 and 41 days for heart, kidney, liver and spleen, respectively. Results from previous studies with rats receiving standard diet with RSM or *L. acidophilus* at the same levels and periods, showed initial average translocation number higher than in this work however the clearing time was shorter - 28, 26, 28 and 32 days. The current data indicated that cholesterol rich diet could increase the clearing rate of probiotic microorganisms. Since the implication of microbial translocation in the host is not known especially in those with different degrees of debility, the translocation capacity and the rate of clearing are suggested to be important parameters for the selection of strains to be used as probiotics.

Key Words: *Lactobacillus acidophilus*, Translocation, Cholesterol diet

1581 A comparitive study of the microstructure of casiens in dried milk products. B. S. Oommen*[1], D. J. McMahon[1], and W. R. McManus[1], [1]*Utah State University.*

Microstructure of caseins in non-fat dried milk, calcium caseinate, sodium caseinate, and calcium caseinate formed from acid casein dissolved using calcium hydroxide were studied using transmission electron microscopy. Solutions of all the dried products were made to a casein concentration of 2.4% and the pH of the solution adjusted to 6.7. The powders were hydrated at 40 °C, and allowed to stabilize for 4 h. These solutions were diluted 100 times and the casein micelles were adsorbed on to parlodion coated copper grids. These grids were stained using uranyl acetate and oxalic acid, quick frozen in liquefied Freon 22, and freeze dried so that whole casein micelles in a form as close to their native state was imaged. Images were photographed at 50,000×, 85,000× and 140,000×. Casein micelles in non-fat dried milk appeared to have lost its perfect spherical shape forming incomplete spherical shapes with some hollow spots inside the micelle. Calcium caseinate formed large micellar structures which were stained heavily. When acid casein was dissolved in water by the addition of calcium hydroxide, the structure of the calcium caseinate formed was different from the former. These formed smaller particles with irregular shapes. Soduim caseinate did not form any micelles. It formed a network very similar to a gel-like structure. The microstructural changes in caseins from different sources may be attributed to the processing conditions and can be used to correlate its functional properties.

Key Words: Casein Micelle, Microstructure, Dried Milk Products

1582 Effect of SCC on proteolysis and lipolysis of pasteurized fluid milk during shelf-life storage. M. V. Santos*[1], Y. Ma[2], and D. M. Barbano[2], [1]*Universidade de Sao Paulo, Sao Paulo, SP, Brazil,* [2]*Cornell University, Ithaca, NY.*

The objectives of the study were to determine: (1) the time in days for a pasteurized (76^{o}C for 30 s), homogenized 2% milk to develop off-flavor due to lipolysis and proteolysis caused by native milk enzymes associated with milks of different SCC (i.e., about 20,000, 210,000, 410,000, and 750,000 cells/ml) at 0.5 and 6.0^{o}C, independent of microbiological spoilage of milk; (2) if fat content of milk (i.e., 1, 2, and 3.25%) influences the level of proteolysis or lipolysis caused by native milk enzymes; and (3) the number of days for 2% fat milk made from milks of differing SCC to develop off-flavor due to the combination of the action of native milk enzymes and microbial growth. Lipolysis was determined by the copper soap method. Proteolysis was by the Kjeldahl method using the decrease in casein as a percentage of true protein as an index of proteolysis during 61 d of storage. There was a significant effect of SCC and temperature of storage on fat and protein degradation by native milk enzymes in pasteurized 2% fat milk. Based on previous data for flavor and objective measures of lipolysis and proteolysis (JDS 83:264-274), the milk flavor in the present study would have been unacceptable at about 14 and 42 d for the high SCC milk and 49 and > 61 d for the low SCC milk, at 6 and 0.5^{o}C, respectively. Fat concentration in milk had an impact on lipolysis, with both the level and rate of increase of FFA content increasing with increasing fat content. The combined effect of microbial growth plus native milk enzymes on lipolysis and proteolysis was larger at 6 than 0.5^{o}C. Generally, low SCC milk spoiled due to microbial growth, not native milk enzyme action, by 26 days at 6oC, while high SCC milk had levels of proteolysis and lipolysis sufficient to produce off-flavor at about d 12, which was prior to microbial failure. At 0.5^{o}C, the microbial counts were < 2000 cfu/ml at day 29 for both low and high SCC milk, but the proteolysis in the high SCC milk was just reaching the level that is sufficient to product off-flavor.

Key Words: pasteurized milk, somatic cell count, proteolysis and lipolysis

1583 Rheological properties of primary stabilizer/milk protein/κ-carrageenan/sucrose systems simulating ice cream mix. S. Thaiudom* and H.D. Goff, *University of Guelph, Guelph, ON, Canada* .

The influence of primary stabilizers, preparation temperature and the concentration of κ-carrageenan on the rheological behaviour of aqueous systems simulating ice cream mix was studied using dynamic rheological techniques with a controlled stress rheometer. Three different primary stabilizers (locust bean gum (LBG), guar, and xanthan), two heat treatments (69°C/30min and 85°C/30min), and three concentrations of κ-carrageenan (0.0, 0.025, and 0.05% w/w) were fitted to a factorial experimental design. All samples were comprised of 12% (w/w) sucrose and were aged overnight at 4°C before rheological properties were measured at the same temperature. Flow behaviour of all samples with κ-carrageenan showed a thixotropic loop due to the interaction of κ-carrageenan and milk protein whereas samples without κ-carrageenan showed pseudoplastic behaviour. Phase separations were seen in all samples without κ-carrageenan due to depletion-flocculation of primary stabilizers and milk proteins. However, samples with LBG showed less phase separation than samples with guar or xanthan. Storage and loss moduli were governed by type of primary stabilizer, preparation temperature, concentration of κ-carrageenan, and the interactions of these main effects. Storage and loss moduli increased significantly with both increasing concentration of κ-carrageenan and/or preparation temperature at 85°C. This is presumably due to either the gelation of κ-carrageenan or the interaction between κ-carrageenan and milk proteins inducing solid-like characteristics. Samples comprised of xanthan with or without κ-carrageenan showed significantly higher storage moduli than the samples with guar or LBG, probably due to self-association of xanthan to form a weak gel in the system. However, loss moduli of samples comprised of xanthan with 0.025 or 0.05% (w/w) κ-carrageenan were very small, possibly due to κ-carrageenan gelation or enhanced self-association of xanthan, resulting in less liquid-like behaviour. Thus, we have concluded that the addition of κ-carrageenan has developed a more elastic in the aqueous solution.

Key Words: rheology, milk protein, κ-carrageenan

1584 Control of acidification of yogurt by microencapsulated bacteriocin. J. Y. Imm*[1], S. J. Oh[2], J. S. Kim[1], and S. H. Kim[3], [1]*Korea Food Research Institute,* [2]*Korea Yakult Co. Ltd.,* [3]*Korea University*.

The purpose of this study was to examine the effect of microencapsulated bacteriocin to control excessive acidification of yogurt. *Lactococcus* sp. KU109, a bacteriocin producer was isolated from swiss cheese and crude bacteriocin was prepared by lyophilization of *Lactococcus* sp. KU109 culture grown in 10% skim milk containing 1% glucose. Bacteriocin powder was encapsulated with acid release coating material, Eudragit EPO by surface reforming method (hybridization). Yogurt was made by adding 0.02% (w/w) commercial starter to pasteurized 12% reconstituted milk either with (0.5, 1 and 1.5%, w/w) or without incorporation of encapsulated bacteriocin. The size and appearance of encapsulated bacteriocin was observed using scanning electron microscopy and the effect of incorporated bacteriocin on viable cells, pH and titratable acidity (TA) was monitored during incubation at 42°C for 24 h. The encapsulation with formulation ratio of 9:1 (bacteriocin:Eudragit EPO, w/w) formed sphere shaped particles of smooth surface with mean size of 25 μm. The activity of 1.5% bacteriocin was 100 AU/mL. There was no substantial difference in time to reach pH 4.6 and the pH after 6 h incubation was ranged from 4.56 to 4.69. More than 6 h incubation, yogurt containing bacteriocin started showing difference in pH and the amount of acid production. The pH and TA of control yoghurt were 3.97 and 1.29% after 24 h whereas they were 4.25 and 1.16% in yogurt containing 1.5% encapsulated bacteriocin. The incorporation of bacteriocin in yogurt significantly inhibited the growth of *L. bulgaricus* and the extent of inhibition was increased as the concentration of bacteriocin increased. After 9 h incubation, growth of *L. bulgaricus* was resulted in 2 log reduction in the presence of 1.5% bacteriocin. However, the growth of *S. thermophilus* showed only 0.5 log reduction during incubation. The result suggests that the microencapsulated bacteriocin has potential to control excessive growth of *L. bulgaricus* caused by temperature abuse or post-acidification.

Key Words: bacteriocin, encapsulation, yogurt

1585 Consumer evaluation of "high-CLA dairy products" produced from cows fed fish oil. S. T. Franklin, L. J. Maynard, A. Pasley, and M. C. Newman, *University of Kentucky, Lexington, KY*.

Milk from cows fed fish oil contains high concentrations of conjugated linoleic acid (CLA) and increased n-3 fatty acids. Dairy products processed from this milk could provide substantial health benefits for consumers, however, questions exist as to the taste of dairy products produced from cows fed fish oil. Thus, eight Holstein cows in late lactation were assigned to treatments of a control (C) diet or a diet containing fish oil (FO) at 2% of dry matter in a 2 X 2 Latin square design. Cows were moved to a tie-stall barn 1 wk prior to the start of the trial to allow for acclimation. Each period consisted of 4 wk, with 2 wk for acclimation to the diets. Milk was collected from cows during the last 2 wk of each period and processed into butter, yogurt, and 2% milk. Products processed during the second period were allocated into individual samples for blind taste test by 111 consumers. Consumers also answered surveys concerning willingness-to-pay for products containing high CLA. Results of the consumer taste tests were that 34% of the consumers preferred the C milk, 21% preferred the FO milk, and 45% had no preference; with 60% of the consumers reporting that the taste of the FO milk was acceptable or better compared with 75% for the C milk. For the yogurt, 57% of the consumers reported that the taste of the FO yogurt was acceptable or better compared to 84% for the C yogurt. The flavor of the FO butter was rated as acceptable or better by 77% of the consumers compared to 96% for the C butter. Preference for the FO butter was 18% compared with a 42% preference for the C butter and 40% with no preference. No consumers reported a "fishy" flavor in any of the products. Willingness-to-pay for high-CLA products was correlated with the survey setting, the respondents' status as primary household shopper, gender, and priorities placed on price, fat content, and taste. In conclusion, dairy products made from milk from cows fed fish oil were found by the majority of the participants to be acceptable in flavor and high-CLA products could command a premium price.

Key Words: Conjugated linoleic acid, Dairy products, Fish oil

1586 Sensory and analytical analysis of milk formulations with sweet cream buttermilk. J. Powell*, S.E. Duncan, S.F. O'Keefe, and S.S. Sumner, *Virginia Polytechnic Institute and State University*.

The sensory and analytical characteristics of three dairy beverages were analyzed using two underutilized dairy products, liquid sweet cream buttermilk and dried sweet cream buttermilk, with skim to produce two lowfat (.5%) formulations. A hedonic test was used to measure the overall acceptability of these products as compared to skim milk, and the "just right" test was used to determine if there was a significant difference in flavor color and viscosity among the three samples. Sensory characteristics of nonfat milks were enhanced or changed by adding the liquid buttermilk and the dried buttermilk. The hedonic test showed that on an increasing scale from likes extremely to dislikes extremely, the skim milk scored a five, the liquid buttermilk formulation scored a 4, and the dried buttermilk formulation scored a nine. These results showed the liquid buttermilk formulation was more acceptable than the traditional skim or the dried buttermilk formulation. The average value for the "just right" test with 3 being "just right", showed that for the previously mentioned attributes, the cream and liquid buttermilk were "just right", and the dry buttermilk was evaluated above the "just right" score with a score of 4. Solid Phase Microextraction-Gas Chromatography/Mass Spectrometry was used to elucidate key flavor compound susceptible to light oxidation.

Key Words: Lowfat, Buttermilk, Sensory

1587 Use of Capillary Electrophoresis (CE) to determine metabolic organic acids in milk. Jesus M. Izco*[1], Monica Tormo[1], and Rafael Jimenez-Flores[1], [1]*Dairy Products Technology Center, Cal Poly*.

The aim of this work is to optimize a CE method for the simultaneous determination of eleven metabolically important organic acids (oxalic, citric, formic, succinic, orotic, uric, pyruvic, acetic, propionic, lactic and butiryc). This method was tested to evaluate carbohydrate catabolism in lactic acid bacteria and *Bacillus* ssp. Organic acids have little or no

UV absorbance, thus indirect UV detection is necessary. Also, a surfactant was used to avoid electroosmotic flow. The separation was carried out on an uncoated capillary (110 cm, 75μm I.D.) at 20kV for 18 min. Running buffer was tested at different pH values between 5.0 and 12.0. Addition of methanol was tested to improve the separation. Sterilized permeate obtained from skim milk, was inoculated with spores from 4 different strains (*B. licheniformis* 12759 and DPTC bacillus strains 14580, SL3 and CL6) and incubated at 40C in the BactiAlert^{TM} System until detection by the sensor. Sample preparation consisted on treating 1 ml of permeate samples with sulfuric acid 4.5 mM, containing 15 ppm of boric acid as internal standard. Also, yogurt organic acids were analyzed in order to test the versatility of the technique. Good separation for all organic acids was achieved, except for pyruvic and acetic acids, which migrated as a single peak. Linearity was established between 2 and 100 ppm for most of them, with R^2 values between 0.97 and 0.99. Citric, succinic, orotic, pyruvic-acetic, propionic and lactic acids were detected and quantified in all of the permeate samples. Values of 85031, 557, 778, 783, 4810 and 1365 ppm respectively were found in sterilized permeate. Depending on the strain, different profiles have been defined. In the case of *B. licheniformis* 12759, the peak area of most organic acids was reduced, indicating a different metabolism. In yogurt, this test showed no presence of butyric acid, the lactic acid peak prevented quantification of propionic acid, and the rest of them were quantified successfully. The proposed method is useful to analyze the metabolism of different bacteria grown in milk substrates giving us a rapid tool to evaluate the quality of dairy products during manufacturing and storage.

Key Words: Organic acids, Capillary Electrophoresis, Dairy products

1588 Effect of addition of whey protein concentrate in the manufacturing of set yogurt. S. C. G. Lima, A. J. Petenate, and M. L. Gigante*, *State University of Campinas, Campinas, SP/Brazil*.

The increase in the level of milk solids used in the manufacturing of yogurt aims to improve the firmness and to reduce product syneresis. The object of this study was to compare the firmness, susceptibility to syneresis and pH of set yogurts manufactured with the addition of skim milk powder (SMP) or whey protein concentrate (WPC) in different concentrations. A Split-Plot design with tree replicate was used. The milk was divided into portions and five treatments were applied at random in the portions. The treatments were the following: without addition of solids and with addition of SMP or WPC in order to increase the level of solids to 13 and 15%. Set yogurts were stored in plastic container at 4°C and randomly chosen after 1, 8, 16 and 23 d. and analyzed for firmness, susceptibility to syneresis and pH. After the manufacturing, the set yogurts were analysed for total solids, protein, fat, lactose and ash. The set yogurts without the addition of solids, with the addition of SMP or WPC in order to increase the level of solids to 13 and 15% presented, respectively, 11.13, 13.01, 14.98, 13.04 and 15.04% of total solids. Set yogurts with SMP were significantly firmer and the firmness of all products increased significantly during storage. Set yogurts with WPC and 13% of total solids presented significant reduction of syneresis during storage, differing from the others which presented a significant increase of syneresis during storage. Products to which SMP or WPC were added in order to increase the level of solids to 15% presented, respectively, the greatest (29.86) and the smallest (9.13) percentage of increase of syneresis during storage. The treatment did not significantly influenced the post-acidification of the products, which was significantly influenced by storage duration. The substitution of SMP for WPC to increase the level of solids in milk used for the manufacturing of set yogurt resulted in less firm products, with less syneresis and no change in post-acidification.

Key Words: set yogurt, WPC, syneresis

1589 Texture Profiling of Skim Milk and Carrageenan Solutions. N.R. Pollen*[1] and C.R. Daubert[1], [1]*North Carolina State University*.

The texture profile of skim milk and carrageenan solution has been studied using rheological and sensory techniques. Three rheological properties were considered to characterize sensory properties of fluid foods: yield stress, steady shear viscosity at 50 s^{-1}, and extensional viscosity. All analyses were performed at 25°C on skim milk samples stabilized with κ and λ - carrageenan blends of 50/50, 33/67, and 25/75 in addition 100% pure κ and λ -carrageenan. All solutions were tested between the concentration range of 0-0.20% (wt/wt), with 0% as pure skim milk. Steady shear viscosity as well as yield stress were determined using a Haake VT550 viscometer with a concentric cylinder or vane attachment, respectively. Shear rates were ramped from 0 to 100, then back to 0 s^{-1}. Extensional viscosity was measured using a specifically designed tube viscometer of expandable- length tubing, 5.08 cm in diameter. Fluids exited these vertically hanging tubes though small holes with a radius ranging from 0.5 to 10 mm. Pressure drop, flow rate, and strain rate at a constant entrance angle (90°) were measured for extensional flow calculations. As anticipated, results supported the direct relationships between carrageenan concentration and viscosity and yield stress. Also expected, κ-carrageenan formed the strongest gels at all concentrations. The extensional viscosity of solutions containing λ-carrageenan produced higher Trouton ratios, indicating the λ-carrageenan molecule was more readily extendible. Preliminary sensory results of mouthfeel viscosity and finger characterization of stringiness correspond with rheological testing; these correlations support the selection of the fundamental rheological parameters as predictors for sensory response for fluid food systems.

Key Words: Texture Profiling, Extensional Viscosity, Carrageenan

1590 Effect of sterilization on physical properties of recombined milk. G. Prez-Hernndez, B. Magaa-Ypez*, and R. L. Richter, *Texas A&M University, College Station, TX*..

The objective of this research was to determine the effect of retort sterilization on some physical characteristics of the emulsion and on particle size parameters of the emulsion. Emulsions containing casein to whey protein ratios of 80:20, 60:40, 40:60, 0:100, and 0.5% monoglycerides, 0.5% lecithin, or a mixture of lecithin with monoglycerides were homogenized at 20 and 90MPa. The protein and fat concentrations of the milk were 3%. Stability index, pH, viscosity and particle size distribution parameters were measured before and after sterilization at 121°C for 15 min. The heat treatment lowered the pH from 6.63 to 6.57 ($p \leq 0.0001$). Viscosity was affected by the interaction between the heat treatment and the casein:whey protein ratio ($p \leq 0.0001$). Viscosity increased from 2.62cp to 7.46cp for the sample that contained only whey protein, but differences in viscosity for other ratios of casein to whey protein were not found. The volume surface average diameter was affected by the interaction between heat treatment and casein:whey protein ratio. The volume surface average diameter increased from 0.4663μm before heating to 1.058μm after heating in the sample with casein to whey protein ratio of 40:60 ($p \leq 0.06$), and from 0.5309μm before heating to 1.7168μm after heating for the sample with 100% whey protein ($p \leq 0.0003$). The surface area of particles increased in the samples that contained 80 and 60% of the protein as casein during heating at both homogenization pressures, but decreased in the sample which had a casein to whey protein ratio of 40:60 homogenized at 90 MPa and with the sample that did not contain casein homogenized at 20 and 90MPa. Particle size surface area decreased after heat treatment in the samples with casein to whey protein ratios of 40:60 and 0:100 when the samples contained emulsifier. However, the decrease in surface area of the particles was significant only for the sample that contained no casein. The stability index increased after sterilization for all treatments containing emulsifiers.

Key Words: Recombined milk, Sterilization, Emulsion

1591 Selection of Cows Producing Fat of Low- and High-atherogenicity and the properties of butter and cheese made from their milk. She Chen[1], Shelly Zimmerman[1], Earl Hammond[1], Gene Freeman[1], David Kelley[1], Naomi Scott[2], Cindie Luhman[2], and Donald Beitz*[1], [1]*Iowa State University,* [2]*Land O'Lakes/Farmland*.

Milk fat from approximately 330 cows from Iowa State University and Land O'Lakes/Farmland herds was analyzed for fatty acid composition. The index of atherogenicity (IA) of each fat sample was calculated by using the formula of Ulbricht and Southgate (Lancet 338:985, 1991): IA=[% lauric + 4(% myristic) + % palmitic] / % unsaturated acids. Milk fat ranged from 1.1 to 4.0 in IA. Four cows from both herds with highest and lowest IAs were selected. Milks from low-IA and high-IA cows and bulk tanks were pasteurized and converted into butter and Cheddar and provolone cheeses. Flavor notes of products were identified and scored by taste panels. Texture of butter and cheeses was

measured with a Texture Analyzer. Butters were achieved with low-IA (1.5), high-IA (2.3), and bulk tank-IA (1.9). Corresponding values for Cheddar were 2.1, 3.4, and 2.4 and for provolone 1.6, 2.6, and 2.1. Panels detected no differences in flavor notes for the three IA types of butter. For Cheddar, sour and bitter flavor notes approached but did not achieve significance at 0.05. Provolone showed differences in buttery flavor, with both high- and low-IA being significantly less than bulk tank. High-IA butter was harder than low-IA butter as measured by penetration and creep. Similar differences were observed in the hardness of Cheddar and provolone cheeses, with high-IA being harder than low-IA. Seemingly, cows that give milk fat with a low IA will yield butter and cheeses with insignificant differences in flavor but slightly softer textures.

Key Words: Milk Fat, Butter, Cheese

ASAS/ADSA Physiology: General Physiology

1592 Influence of corticotropin-releasing hormone (CRH) on the expression of steroidogenic acute regulatory (StAR) protein in neonatal pigs derived by Caesarian section or natural birth. J.A. Carroll*[1], D. Alberts[2], D.J. Parzik[2], D.M. Stocco[2,3], and T.H. Welsh, Jr[2,3], [1]*Animal Physiology Research Unit, ARS-USDA, Columbia, MO,* [2]*Texas Tech University Health Science Center, Lubbock, TX,* [3]*Texas A&M University, College Station, TX.*

We previously reported that pigs born by Caesarian section (C-section) have greater basal and CRH-induced cortisol (CS) secretion compared to natural birth pigs. This study evaluated potential differences in StAR protein and cytochrome P450 side-chain cleavage enzyme (P450scc) protein expression in C-section pigs which may have contributed to this altered CS secretion. Eight crossbred sows were selected for the study (n = 4 natural birth and n = 4 C-section). Gestation length did not differ between natural birth and C-section pigs (113.6 ± .1 and 113.2 ± .3 d, respectively). Blood and tissue samples from 38 pigs were collected at birth. Remaining pigs were sustained with natural birth sows until 2wk of age (n = 39). At 2wk of age, pigs were non-surgically cannulated for blood sample collection to assess pituitary-adrenal responsiveness to porcine CRH (10 μg/kg). Blood samples were collected at -30, -15, 0, 5, 10, 20, 40, 60, and 90 min, with CRH or saline given at Time 0. Total RNA was isolated from the pituitary and adrenal glands to evaluate mRNAs specific for pro-opiomelanocortin (POMC) and for the ACTH receptor. Adrenocortical samples were used in Western blot procedures to determine StAR and P450scc protein content. While basal serum concentration of CS was not different at birth (P = .86), adrenocortical expression of StAR protein was lower (P < 0.0001) in C-section pigs as compared to natural birth pigs. Interestingly, serum ACTH (P = 0.0008) and ACTH receptor mRNA (tendency; P < 0.06) were greater in C-section pigs, suggesting a compensational effect due to the reduced expression of StAR protein in these pigs. A developmental decrease was observed in serum CS (P < 0.0001) and ACTH (P < 0.044), while a developmental increase was observed in POMC mRNA (P < 0.0001). ACTH receptor mRNA expression tended (P < 0.07) to decrease with age. Both, serum concentration of CS and StAR protein expression were increased following the CRH challenge (P < .05) whereas no change was detected in P450scc protein expression. Type of birth, age, and CRH challenge each influenced the correlations among various components of the HPA axis. These data suggest an important role for StAR and P450scc adrenocortical proteins in mediating developmental- and hormonal-induced changes in CS synthesis and secretion in the young pig.

Key Words: StAR protein, Cortisol, Pigs

1593 Hepatic corticosteroid-binding globulin (CBG) mRNA expression and plasma CBG levels in pigs in response to social and heat stress. J. Heo*[1], H. G. Kattesh[1], M. P. Roberts[1], R. L. Matteri[2], J. L. Morrow[3], and J. W. Dailey[3], [1]*University of Tennessee, Knoxville TN,* [2]*ARS-USDA, Columbia MO,* [3]*ARS-USDA, Lubbock TX.*

Plasma cortisol, CBG, hepatic CBG expression, and other physiological as well as behavioral measures of stress were studied in pigs in response to elevated temperature in conjunction with establishing social hierarchy. Twenty-four pigs (four pigs/litter) were weaned at 25 days of age and housed by litter for 2 wk at 23 ± 2°C. On d 0, animals were weighed and placed under general anesthesia for collection of blood (10 ml) and liver tissue (∼100 mg). On d 1, three pigs of similar weight (23 ± .9 kg) but from different litters were allotted to eight nursery pens within two environmentally controlled rooms (12 animals/room). One room was maintained at 23 ± 2°C (CONT) and the other at 33 ± 2°C (HEAT). On d 8-14 both rooms were maintained at 23 ± 2°C (REC). Animals were videotaped for 72 h beginning on d 1 and 8 to document behavioral changes in response to room temperature and to determine social order. Blood and liver tissue were collected again on d 7 and 14. Data was analyzed as a randomized complete block design using Proc Mixed procedure of SAS. Plasma haptoglobin increased (467.2 ± 122.5 vs 763.4 ± 112.9 ug/ml; d 0 vs d 7, P<.05) and cortisol and CBG decreased (9.92 vs 8.51 ± .83 ug/dl, 11.41 vs 9.93 ± 1.07 ug/ml; d 0 vs d 7, respectively, P<.05) in the HEAT group. Hepatic CBG mRNA level and neutrophil: lymphocyte ratio were not affected (P>.1) by treatment. HEAT pigs displayed increased (P<.01) drinking but reduced feeding (P<.01) and lying in contact with other pigs (P<.05) behaviors. ADG tended (P=.06) to be lower for HEAT (.64 ± .06 kg/d) compared to CONT (.82 ± .06 kg/d) pigs. During REC, HEAT pigs had similar (P>.1) ADG, plasma cortisol, CBG, haptoglobin, and drinking and feeding but increased (P<.01) lying with contact behaviors compared to CONT. Measured physiological and behavioral responses were not related to social status. These results indicate that reduced circulating levels of cortisol and CBG in pigs following 7-d exposure to elevated temperature may not be determined by hepatic CBG mRNA expression.

Key Words: Pig, Heat stress, CBG

1594 Cold-induced changes in brown adipose tissue (BAT) composition and iodothyronine 5'-deiodinase (5'D) activity in newborn Angus and Brahman calves. S.J. Falck*[1], G.E. Carstens[1], S. Kahl[2], S.R. Busch[1], L.J. Slay[1], C.D. Gilbert[1], and S.B. Smith[1], [1]*Texas A&M University, College Station, TX,* [2]*USDA, Agricultural Research Service, Beltsville, MD.*

We previously found that newborn Brahman **(BR)** calves generate less heat from BAT in response to a norepinephrine challenge than Angus **(AN)** calves even though BAT 5'D activities (converts thyroxine, T_4 to triiodothyronine, T_3) were higher in BR calves. The aim of this study was to further characterize 5'D in newborn calves, and to examine breed effects on cold-induced changes in BAT composition, 5'D activity, and plasma T_3 and T_4 levels. AN (n = 15) and BR (n = 20) calves were each assigned to 1 of 3 postnatal treatments: newborn **(N)**, cold **(C)** and warm **(W)** calves. Newborn calves were killed at 9 h of age, whereas, C and W calves were killed after 48 h of exposure to 4 and 20° C. Rectal temperature **(RT)** and blood samples were collected at 0, 12, 24 and 48 h, and plasma analyzed for T_3 and T_4. Deiodinating activity of BAT was determined by quantifying $^{125}I^-$ released from ^{125}I-labeled reverse-T_3 using assay conditions for type I **(5'D-I)** and type II **(5'D-II)**. RT were higher (P < .01) in AN calves at time 0 (38.8 vs 38.1 ± .16° C, but were similar to BR calves thereafter. BR calves had higher plasma T_3 (61%; P < .001) and T_4 (31%; P < .05) levels than AN calves, but plasma T_3 increased more due to cold in BR (62%; P < .001) than AN (10%; P = .80). Overall, plasma T_4 levels were 31% higher (P < .001) in C than W calves. Compared to AN calves, BR had less (P < .05) BAT lipid at birth (2.12 vs 1.33) and after C (1.95 vs .63), but similar amounts after W treatment (2.32 vs 1.89 ± .28 g/kg BW). Cytochrome c oxidase activity (μmol/min/g BAT) was unaffected by breed and was 68% higher in C than W calves. BAT 5'D-I activity was higher (P < .001) in BR calves at birth (.53 vs .95 ± .01 nmol I/h/mg protein), but not after C or W treatment. Cold decreased (P < .01) 5'D-I activity 29% in BR calves, but numerically increased 5'D-I in AN calves. 5'D-II activity was higher (P < .001) in BR calves (.29 vs .94 ± .12 pmol I/h/mg), but was unaffected by postnatal treatment. The results suggest that although BR calves mobilize BAT lipid more rapidly during cold exposure, this substrate is not effectively used to support BAT thermogenesis.

Key Words: Brown Fat, 5'-Deiodinase, Thyroid Hormones