280 Effects of refrigeration and extended frozen-storage on organic acid profiles of commercial soft goat milk cheeses. Y. W. Park*, J. H. Lee, and S. J. Lee, *Fort Valley State University, Fort Valley, GA.*

Acceptability of a cheese depends largely on flavors formed during its aging process. Organic acids are important flavor compounds in cheeses, and formed as a result of the hydrolysis of fatty acids, bacterial growth, or addition of acidulants during cheesemaking. Although organic acid compositions of goat cheeses are important flavor parameters for consumer acceptability, little information is available on this premise. Three lots of a commercial soft goat milk cheeses were purchased from a licensed goat dairy to study organic acid profiles and their changes in goat cheeses during extended refrigeration and frozen storage. The cheeses were subdivided into three equal portions. One subsample was stored as unfrozen control (UFC) at 4^{o}C for 4 weeks (0, 14, 28 days), and the other two portions were frozen at -20^{o}C and stored for 0 and 3 months (FZC and 3FZ), then immediately thawed at 4^{o}C, followed by aging at 4^{o}C for 4 wks. Concentrations of various organic acids were quantified using a HPLC (Hewlett Packard; LC-1100 Series) equipped with auto sampler, quaternary pump, vacuum degasser, diode array detector, and fluorescence detector. The column was reverse phase Hewlett Packard ODS Hypersil 5mm (125 X 4 mm), and solvent was 0.5% (wt/vol) $(NH_4)_2HPO_4$. The soft goat cheese contained all tested standard organic acids except pyruvic acid in various amounts including formic, malic, lactic, acetic, orotic, citric, uric, tartaric, and propionic acids. Many unidentified isomeric peaks appeared between the known standard peaks. Lactate was highest organic acid, followed by acetate in the soft cheeses. Storage treatments (UFC, FZC and 3FZ) significantly (P<0.05) affected most of the identified organic acid contents such as acetate, butyrate, citrate, formate, lactate, malate, orotate isomers, propionate, propionate isomers, a tartarate isomer and uric acid, while aging periods did not influence them. Acetic, orotic and propionic acids were most significantly (P<0.05) affected by frozen-storage, which could be important predictors for the soft goat cheese.

Key Words: Goat cheese, Organic acids, Frozen-storage

281 Effects of 3 month frozen-storage and refrigeration on proteolysis of soft goat milk cheeses determined by SDS-PAGE and gel image analysis. S. J. Lee[1], J. H. Lee[1], J. Rhodes[2], and Y. W. Park*[1], [1]*Fort Valley State University, Fort Valley, GA,* [2]*The University of Georgia, Athens, GA.*

Freezing cheeses is not a common industrial practice. However, the seasonality of goat milk production necessitates a food technological approach to alternative methods of year-round marketing such as frozen-storage of the goat products. Three batches of commercial plain soft caprine cheeses were purchased. Each lot of the cheese was divided into three equal portions. One portion was immediately stored at 4^{o}C for 0, 14 and 28 days, and the 2nd and 3rd subsamples were immediately frozen (-20^{o}C) for 0 and 3 months, thawed, and placed at 4^{o}C in the same way as the unfrozen control samples. Proteins of the cheeses were extracted with SDS- and Tris-buffers, and specific degradative protein bands were analyzed by SDS-PAGE and Kodak 1D Image Analysis Software System. Electrophoretic patterns of all unfrozen and frozen soft goat cheeses showed at least 8 distinct protein bands, including s_2-, - -, a_1-caseins, -lactoglobulin and some degraded polypeptides from caseins (CN). Other -CN degradative products (i.e., -I peptide) bands were faint but detectable. The s_2- and -CN were two major proteins in the goat cheeses, where the ranges of the two CNs of total proteins were 12-14% and 56-59%, respectively. All protein bands except band No. 6 showed significant (P<0.01) differences in the intensities of corresponding protein bands between batches. Effects of storage treatments (unfrozen, 0 and 3 month frozen) were significant (P<0.05) for bands 1, 3 and 8, while non-significant for bands 2, 4, 5, 6 and 7, indicating that s_2-CN was affected by storage group, while -CN was not. Cheeses with the longer storage groups and greater aging periods tended to show higher density of degradative proteins and peptides than those with the shorter storage and aging treatment groups.

Key Words: Goat cheese, Proteolysis, SDS-PAGE

282 Tocopherol concentrations and their changes in caprine milk cheeses during extended refrigeration and frozen storage. J. H. Lee*, S. J. Lee, B. L Gadiyaram, and Y. W. Park, *Fort Valley State University, Fort Valley, GA.*

Vitamin E has antioxidant activity capable of protecting polyunsaturated lipids in biological systems from oxidative degradation. Vitamin E activity in foods is derived from a series of compounds of plant origin, the tocopherols and tocotrienols. The study was conducted to determine tocopherol contents of caprine milk cheeses and evaluate effects of refrigerated and frozen storage on tocopherol levels in the products. Three lots of commercial plain soft caprine cheeses were purchased and 3 lots of Monterey Jack goat cheeses were manufactured at the university dairy pilot plant. Each lot of both cheese varieties was divided into three equal portions. One portion was immediately stored at 4^{o}C for 0, 14 and 28 days, and the 2nd and 3rd portions were immediately frozen (-20^{o}C) for 0 and 3 months, then thawed, and stored as the same way as the unfrozen samples. Concentrations of tocopherol were quantified using a HPLC (Hewlett Packard; LC-1100 Series) equipped with auto sampler, quaternary pump, vacuum degasser, diode array detector, and fluorescence detector. The column used was reverse phase column Bio-Sil ODS-5S (250 X 4 mm, i.d.), and solvent was mobile phase (Hexane:Isopropanol; v/v-98.5:1.5). Flow rate was 1.5 mL/min, and detector was Hewlett Packard 1046A programmable fluorescence detector, fluorescent set at excitation wavelength of 295 nm and emission wavelength of 330 nm. The pooled data of the mean -tocopherol (g/g cheese) for the unfrozen, 0 and 3 months frozen soft goat cheeses at 4^{o}C for 4 wks were: 7.47, 7.98 and 7.28, indicating no difference between storage treatments. The corresponding mean -tocopherol contents of Monterey Jack hard cheese were: 18.2, 12.2, and 6.66, showing that significant (P<0.05) differences in vitamin E between storage treatments. There was a significant (P<0.01) and negative correlation between -tocopherol level and storage period, while no relations were found between vitamin E levels and acid degree value or pH of the experimental cheeses.

Key Words: Caprine cheese, Tocopherol, Refrigerated storage

283 Capacity of milk processing industry in Hungary. G. Virag[1], J. S. Zsarnoczai*[2], and H. F. Salem[2], [1]*Agricultural Intervention Centre, Budapest, Hungary,* [2]*Szent Istvan University, Godollo, Hungary.*

By the end of 1990s in Hungary 80 % of purchased milk was milk of extra quality. After joining to EU only this part of milk can be used for human consumption concerning qualitative demands of EU. In spite of decreasing the milk production, the consumption and production were balanced, and the seasonal overproduction was dicontinued by export. The self-sufficiency of milk products was changing between 110 and 123% between 1994-1998. Capacity of pasteurized milk processing was only 32%, also the ultra pasteurized milk processing was 33%. Capacity of the tasted milk product processing 27% in average, but capacity of the sour milk product processing was higher, 48%, curd production capacity was 26%, tasted curd product capacity was 37%. The capacity of natural cheese production was very high, namely 68%, and capacity of processed cheese in bulk was less, namely 42%, and butter production one was 20%, but the butter-cream production capacity was at the highest level, because it was 72%. The capacity utilization was at low level in Hungary, but differences were considerable between the regions. In general the capacity of those milk product processing was higher, which were much more demanded by consumers, like butter-cream and natural cheese. In general the Hungarian milk processing is charachterized by a large number of factories, which is much more, than in EU. The concentration is considerable in EU, but concentration process of milk industry is going on in Hungary. Also in Hungary the efficiency of human resources should be increased in ordet that the milk industry will be more competitiveness.

Key Words: Concentration of milk industry, Human consumption, Qualitative demands of EU

284 Subsidy for private storing butter and cream in Hungary. I. Feher[1], G. Virag[2], S. J. Zsarnoczai*[1], H. F. Salem[1], and L. Villanyi[1], [1]*Szent Istvan University, Godollo, Hungary,* [2]*Agricultural Intervention Centre, Budapest, Hungary.*

The aim of the subsidy for private storing at ensuring the adequate butter supply in European Union. After joining to EU also this kind of subsidies will be used in Hungary The subsidy for private storing could be provided based on the following conditions: 1. for pasteurized cream, which has fat content between 35-80%, 2. for non salted butter made of pasteurized cream or milk in factory permitted by EU and its fat content is 82% at minimum level and its water content is 16% at maximum level, 3. for salted butter made of pasteurized cream or milk in factory permitted by EU and its fat content is 82% at minimum level and its water content is 16% at maximum level. The subsidy is determined by storing cost and possible changing prices of fresh butter and butter-stock. The condition of subsidy for private storing is to make an contract for storing based on decided demands with Agency of Payment belonging to state member, in areas of which butter and cream are stored. The subsidy can be claimed in writing form from Agency of Payment for butter and cream having been stored between 15th of March and 15th of August in given year. The application for subsidy should be sent to Agency of Payment, when products have arrived to store within 28 days. The contract for storing is signed, when the application has received at Agency within 30 days. The contracting party or person responsible for storing should keep a record of products stored relevant to contract. In case of contract for private storing the storing period extents between 90 and 210 days. If the contracting party does not keep the deadline, the subsidy will be decreased by 15% and be payed only for that period, when butter and cream were really stored.

Key Words: Subsidy for private storing, Pasteurized cream, Contract for private storing

Horse: Equine production & management

285 Effect of n-3 polyunsaturated fatty acid source on plasma fatty acid profiles of horses. P. D. Siciliano*[1], S. K. Webel[2], L. S. Brown[2], L. K. Warren[1], T. E. Engle[1], and P. D. Burns[1], [1]*Colorado State University, Fort Collins, CO/USA ,* [2]*United Feeds, Inc., Sheridan, IN/USA.*

Eighteen mature geldings of American Quarter Horse, Arabian, and Thoroughbred breeding, with an average body weight of 569 $\pm$ 8 kg were randomly assigned to one of three dietary treatments, control (CTRL, n = 6), ground whole flaxseed (FS, n = 6) or protected n-3 polyunsaturated fatty acid source (PFA, n = 6; United Feeds, Inc., Sheridan, IN, USA) to determine the effect of n-3 fatty acid source on plasma fatty acid profiles. All horses were group-fed brome grass hay ad libitum. All horses were individually fed 0.8 kg as-fed of a vitamin mineral supplement top-dressed with 0.57 kg as-fed of their respective dietary treatment, daily. The total n-3 fatty acid concentration of the top-dressed supplements, calculated as the sum of C18:3n-3, C20:5n-3, and C22:6n-3, was 0.47, 5.56 and 5.02 g/100g diet as-fed for CTRL, FS and PFA, respectively. Experimental diets were fed for a period of 28 d. Blood samples were collected on d 0, 14, and 28 by jugular venipuncture, and plasma was harvested and analyzed for fatty acid composition. The individual plasma fatty acids C16:0, C16:1n-7, C18:0, C18:1n-9, the sum of C18:2n-6 and n-9, C18:3n-3, C20:0, C20:4n-6, C20:5n-3, C22:5n-3, and C22:6n-3 were expressed as a percent of the total plasma fatty acids. The percent total n-3 fatty acid composition of plasma was calculated as the sum of the percentages of total plasma fatty acids for C18:3n-3, C20:5n-3, C22:5n-3, C22:6n-3. Data were analyzed as a repeated measures design using the PROC MIXED ANOVA procedure of SAS. Mean plasma C20:4n-6, C20:5n-3, C22:6n-3, and total n-3 fatty acids in horses fed PFA increased from d 0 to 14 ($P < 0.01$), and then remained unchanged from d 14 to 28 resulting in greater ($P < 0.01$) proportions of these fatty acids on d 14 and 28 in PFA as compared to FS and CTRL (treatment x time; $P < 0.015$). These results suggest that supplemental PFA increased the proportion of n-3 fatty acids in plasma of horses, whereas a similar amount of n-3 fatty acids provided by ground whole flax seed did not.

Key Words: Horse, Polyunsaturated fatty acids, Flax seed

286 Development of a Model for Treating Insulin Resistance in Mares. M. M. Vick*, D. R. Sessions, S. E. Reedy, B. A. Murphy, E. L. Kennedy, and B. P. Fitzgerald, *University of Kentucky, Lexington KY.*

Obesity in mares is associated with insulin resistance (IR), which in turn may predispose them to laminitis and other inflammatory disease states. In obese humans, biguanides are a family of drugs that have been successfully used to treat IR. The goal of this study was to test the hypothesis that in the horse, dietary-induced insulin resistance can be alleviated by treatment with the biguanide, metformin. Fourteen mares (body condition score 5-7) were maintained at pasture and supplemented with .75 kg mixed grain and corn oil per day (2.64Mcal/kg) for a period of two months to increase obesity and induce insulin resistance. IR was determined by hyperinsulinemic euglycemic clamp procedure. All mares were considered insulin resistant based on low glucose infusion rates during the clamp procedure. Subsequently, the mares were allocated to control (n=7) and treatment (n=7) groups that were balanced for body weight, body condition, and degree of IR. Metformin hydrochloride was tested at three dose levels (1.5, 3.0, and 4.5g PO, x2 daily). Each dose was tested for successive periods of 30 days, beginning June 1st. Peripheral insulin sensitivity was determined by the clamp procedure at the end of each 30-day interval. Additionally, blood samples were collected x3 per week and body weight and percent body fat were determined at 3-week intervals. Treatment with metformin (1.5g x2/day) was associated with increased insulin sensitivity compared to untreated mares ($P<0.05$). The highest dose (4.5g) was unaccompanied by increased insulin sensitivity. At a dose of 3.0g, insulin sensitivity was greater than pretreatment ($P<0.05$) and accompanied by reduced fasting insulin concentrations; however, the degree of sensitivity was not different from that observed in untreated mares. In conclusion, observations from this preliminary study suggest that treatment of obese, insulin resistant mares with metformin may lead to increased insulin sensitivity. This effect may be dose dependent since only lower doses appeared to be effective.

Key Words: Metformin, Insulin resistance

287 Factors associated with mare reproductive loss syndrome in central Kentucky and surrounding areas. S. L. Gray*[1], D. L. Cross[1], K. E. Panter[2], W. C. Bridges[1], and T. Gimenez[1], [1]*Clemson University, Clemson, SC,* [2]*USDA Poisonous Plants Research Lab, Logan, UT.*

On 10 May 2001, a study of the Mare Reproductive Loss Syndrome (MRLS) reported in Central Kentucky and surrounding areas was initiated. This syndrome caused several thousand mares in this area to abort many early-term and a few late-term foals. The mares showed few signs of toxicity. Thirty-eight pastures on 11 farms were studied. Pastures were divided into two groups; those with early fetal losses (Treatment), and those without losses (Control). Overall botanical composition of pastures was evaluated. Chi square analysis of the botanical data showed a relationship between the evidence of consumption ($p<0.0001$) of Poison Hemlock (Conium maculatum) in problem pastures and MRLS. Subsequent chemical analysis determined that the Poison Hemlock plants contained 0.8-1.0% piperidenic alkaloids that are known to be toxic to animals. To study the clinical response to Conium maculatum in gravid mares, 14 mares were bred for experimental study. At gestational age 45 days, mares were randomly assigned to one of three groups:(1)Control-received no Conium; (2)Low (L)-received Conium at an alkaloid titration of 2.8mg/kg body weight; (3)High (H)-received Conium at an alkaloid titration of 4.3mg/kg body weight. Conium maculatum slurry was administered once per day for 4 days. Foals were observed by transrectal ultrasound. Mares were physically examined and blood samples were collected at times 0h, 1h, 2h, 3h, 4h, 5h, 6h, 24h, 25h, 48h, 49h, 72h, and 73h. Blood samples were analyzed for piperidinic alkaloid concentrations, blood chemistry components, and progesterone levels. Compared to the control mares, the H mares expressed decreased body weight, higher pulse and respiration rates, more ataxia, colic, salivation, and sweating ($p<.05$). The H and L groups both showed increased frequencies of incoordination and tremors