legal standards, more attention is needed from milk processors to milk flavor characteristics.

Key Words: Milk, Flavor, Defect

1038 The effect of milkfat on the sensory threshold of three impact odorants of strawberry flavor. S. Gaddamu, N. Slaughter, K. Adhikari*, and I. Gruen, *Department of Food Science, University of Missouri.*

The in-mouth release and subsequent perception of flavor compounds changes depending on the composition of the matrix, particularly fat content, because most flavor compounds are fat-soluble. The main objective of this study was to determine the effect of milkfat on the sensory threshold of three impact odorants of strawberry flavor. Dairy mixes containing either 4% or 10% milkfat, 5% sucrose and 10% milk solids-not-fat were used as the experimental matrices to determine the threshold of ethyl-3-methyl-3-phenylglycidate, α-ionone and *cis*-3-hexenol. A paired difference test was performed using a panel of 22 judges to find threshold values of the three compounds. Seven concentration levels of each compound were paired with blanks. The order of serving was randomized within each pair and also among the concentration levels. Two replicates were carried out for each compound. Results were analyzed by plotting % correct response (y-axis) against the concentration of the compounds (x-axis). A logistic regression model (sigmoidal curve) was used for curve fitting and the concentration value corresponding to 66.7% correct response was calculated. The threshold concentrations for ethyl-3-methyl-3-phenylglycidate, α-ionone and *cis*-3-hexenol, were 360, 680 and 500 ppb, respectively, for the 4% fat mixes. For the 10% fat mixes, these values were 460, 600 and 190 ppb, respectively. The higher threshold concentration for the water-insoluble, aromatic ethyl-3-methyl-3-phenylglycidate in the 10% fat mix indicates a slower release at higher fat levels, and is explainable by the greater affinity to the lipid phase in the dairy mixes. While α-ionone is also an aromatic compound, it is slightly more water-soluble than ethyl-3-methyl-3-phenylglycidate and showed a slightly slower release in the 4% fat mix, although the difference was not very large. The higher threshold concentration of *cis*-3-hexenol, an aliphatic compound, which is slightly soluble in water, in the 4% fat mix indicates a slower release compared to the 10% fat mix. Chemical analyses will be performed to determine the solubility and the liquid-air partition coefficients of these flavor compounds in 4% and 10% fat emulsions to correlate to the results of the sensory threshold test.

Key Words: strawberry flavor, threshold, milkfat

1039 Odor profile of typical Sicilian cheeses: Maiorchino, Pecorino, Provola dei Nebrodi and Ricotta infornata. S. Mallia[1], S. Carpino*[1], E. Lavin[2], G. Di Rosa[1], G. Licitra[3], and T.E. Acree[2], [1]*Consorzio Ricerca Filiera Lattiero Casearia, 97100 Ragusa, Italy,* [2]*Cornell University, Geneva, NY 14853,* [3]*D.A.C.P.A., Catania University, 95100 Catania, Italy.*

Odor-active volatiles present in cheese products may be important markers of both cheese quality and diversity. Developing methods to identify odor-active compounds and evaluate their sensory impact on artisanal cheeses will impact both quality control and authentication protocols for these cheese products. In this study, the aroma volatile profiles of four native Sicilian artisanal cheeses were assayed using Headspace Solid Phase Microextraction (HSPME) and Gas Chromatography Olfactometry (GCO) dilution analysis (Charm analysis) (Acree et al., 1984), in order to identify the odor-active compounds in the cheeses and to rank their relative odor potencies. Selected compounds with high potency were subsequently quantified in the cheese headspace using HSPME GC/MS calibrated to SPME (Deibler, 2001), static headspace and solvent injected standards. Maiorchino, Pecorino, Provola dei Nebrodi and Ricotta infornata cheeses were studied. Thirty-one different odors were detected in the cheeses by GCO analysis with 26 of these identified by GC/MS, published retention index matches (FlavorNET, Arn & Acree, 1998) and running authentic standards. SPME dilution analysis found ethyl hexanoate, ethyl butyrate, (E)-2-nonenal, methional, 1-octen-3-one, 2-nonanone, dimethyl disulfide, dimethyl trisulfide, nonanal and butyric acid as having the highest odor-potencies in the cheeses. Butyric and acetic acids were the only FVFA's to produce odor responses in GCO analyses. Pecorino and Maiorchino cheeses were found to have the most diversified odor profiles, which included the odor-active terpenoids α-pinene, sabinene, linalool, L-carvone, citronellol and geranyl acetate. These terpenoids were not found in the Provola dei Nebrodi and Ricotta infornata cheeses. Selected compounds from the list of most potent odorants were quantified via headspace analysis.

Key Words: Sicilian Cheese, HPSPME, GCO

1040 Effect of the utilization of an adjunct starter culture on the volatile compounds and sensory characteristics of a Spanish raw ewes' milk cheese. Maria Ortigosa[1], Jesus M. Izco*[2], Cristina Arizcun[1], and Paloma Torre[1], [1]*Dpto. Ciencias Medio Natural, Universidad Publica de Navarra, Spain,* [2]*Dairy Products Technology Center, Cal Poly University, San Luis Obispo, CA.*

The aim of this work is to evaluate the effect caused by the utilization of an adjunct starter culture on the volatile compounds and sensory characteristics of an ewes' milk cheese. Three cheese batches were made, one with raw milk (batch C), another with pasteurized milk (batch P), and a third with pasteurized milk in which an added adjunct starter culture (*Lb. casei* + *Lb. Plantarum*) in addition to the commercial starter was utilized (batch F). Cheese was made according to the protocol for Roncal cheese with Denomination of Origin. Cheeses were sampled at 1, 120 and 240 days of ripening. The volatile components were extracted by purge and trap and analyzed by GC-MS. Cheeses aged for 120 and 240 days underwent sensory analysis by a panel of at least eight expert assessors. Eighty-six components belonging to the following chemical families were identified: hydrocarbons, fatty acids, esters, sulfur-containing compounds, ketones, aldehydes, and especially alcohols. Pasteurization decreased the quantity of some alcohols, aldehydes and ketones. Trimethylpyrazine increased in cheese made with pasteurized milk. Pyrazines formed by the heat treatment have been related to chocolate and coffee flavors in cheese. In fact, cheese P obtained higher number of sensory perceptions of this sensory descriptor grouping than the rest. Significant differences ($p<0.05$) for characteristic odor, aroma and flavor were recorded between 4 month-cheeses from batches C and P. However, 8 month-cheeses from batches C and F showed similar scores between them and higher than those obtained by batch P. This could be caused by higher concentration of some acids (2-metyl propanoic and 3-methyl butanoic) and esters (methanoic acid, methyl ester; methanoic acid, butyl ester and heptanoic acid, ethyl ester) in C and F. Pasteurization of milk has influenced the concentration of certain volatile compounds, affecting adversely the characteristic flavor of cheese. However, the utilization of *Lb. casei* + *Lb. Plantarum* as adjunct starter culture in addition to the commercial starter improves the flavor when using pasteurized milk to make this kind of cheese.

Key Words: ewe's milk cheese, volatile components, adjunt starter culture

Food Safety

1041 The use of immunoaffinity columns for the isolation of ractopamine from edible tissues of food animals. W. L. Shelver* and D. J. Smith, *USDA/ARS/Biosciences Research Laboratory, Fargo, ND.*

Ractopamine (Paylean^{TM}) (RAC) is a beta-adrenergic leanness-enhancing agent recently approved for use in finishing swine. The currently available determinative method for RAC in tissues employs a lengthy cleanup procedure. Our objective was to determine the utility of a RAC immunoaffinity column (IAC) as a simple cleanup method for RAC in muscle, liver, and kidney. RAC and ractopamine glucuronide (RAC-G) fortified tissues were homogenized in phosphate buffered saline (pH 7.2), passed through a 1-mL RAC IAC, and the IAC washed with 10% methanol to remove non-bound material. RAC and RAC-G were eluted with 50 mM glycine, pH 2.8. Recoveries of RAC and RAC-G from cattle muscle, liver, and kidney were 82.1 7.6, 87.8 1.9, and 92.5 0.4 %, respectively (n=3). Recoveries of RAC and RAC-G from sheep muscle, liver, and kidney were 91.8 0.2, 91.7 0.3, and 92.7 0.6 % respectively (n=3). Subsequent HPLC with florescence detection indicated that IAC

has potential as a one-step cleanup procedure because RAC was baseline separated from a small amount of co-extracted material. The IAC was rugged; with glycine as the eluent IAC columns were stable for greater than 20 uses over a 3-month period. In conclusion, RAC IAC has the potential to decrease solvent use and greatly simplify RAC analysis in incurred tissues.

Key Words: Ractopamine, Immunoaffinity column, analysis

1042 Decline of PCB concentration in milk of accidentally highly contaminated cows. G. Piva*[1], M. Morlacchini[2], T. Bertuzzi[1], and F. Rossi[1], [1]*Facoltà di Agraria, Piacenza, Italy* , [2]*CERZOO, San Bonico, Piacenza, Italy*.

Six pregnant heifers, coming from a herd with a history of high concentration of PCB into the milk, were fed a low-PCB diet since the 6^{th} month of pregnancy. After parturition cows were milked for at least 190 d with a maximum of 270 d. Diet was made of: corn silage (31.7% of DMI), dehydrated alfalfa (13.3% of DMI), grass hay (3.7% of DMI) and concentrate (51.3% of DMI). The average DMI was 23.12 kg/d. Milk production was recorded and samples of milk and blood were taken and analyzed for PCB (18, 28, 31, 52, 44, 101, 149, 118, 153, 138, 180 and 194 congeners) content using a GC-MS technique. The average milk yield (kg/d) of the 6 cows was 26.0, 22.5, 23.2, 24.5, 28.9, 29.3. The maximum permitted (by Italian law) PCB concentration of 100 ng/g of fat was reached after 144-209 d of lactation. One animal after 204 days had a PCB concentration of 102 ng/g fat. If $\log_{10}$ of PCB concentration (ppb) in milk fat is regressed against days in milking (DIM) the following significant equation was obtained: $\log_{10}$ PCB (ng/g of milk fat) = 2.796 - 0.00474 DIM; r^2 0.72; $P<0.01$. At the end of the trial the animals were slaughtered and xenobiotic concentration determined. The PCB content of liver ranged 0.35-1.2 ppb and was negatively correlated with average PCB blood levels ($r = -0.84$; $P<0.05$). In kidney the lower concentration of PCB detected was 2.29 ppb while the maximum one was 10.18 ppb. Body fat was more heavily contaminated with a maximum level of 460.66 ppb. PCB concentration in kidney fat and tail fat was strongly correlated ($r = 0.97$; $P<0.01$). A strong differences between cows for PCB content of organs and fat was observed.

Key Words: PCB, Dairy cows, Milk

1043 Excretion of aflatoxin M1 in milk of dairy ewes treated with different doses of aflatoxin B1. G. Battacone, A. Nudda, A. Cannas, A. Cappio Borlino, and G. Pulina*, *Dipartimento di Scienze Zootecniche - University of Sassari, Sassari, Italy*.

Two trials were carried out to evaluate the carry-over of aflatoxin B1 (AFB1) into aflatoxin M1 (AFM1) in sheep milk. In the first trial, four dairy ewes in early lactation received a single dose of 2 mg of pure AFB1. Individual milk samples were taken in the following five days to measure AFM1 concentration. The average excretion of AFM1 in milk followed an exponential decreasing pattern with two intermediate peaks at 24 h and 48 h, suggesting the presence of three excretion compartments. No AFM1 was detected in milk 96 h after dosing. The mean carry-over of AFB1 into AFM1 was 0.032%, with high individual variability (SD = 0.017%). In the second trial, sixteen dairy ewes in mid-lactation were divided in four groups that received different daily doses of AFB1 (0, 32, 64 and 128 μg in control, T1, T2 and T3 groups respectively) for 14 days. Pure AFB1 was administered to each animal divided in two daily doses. Individual milk samples were collected at 12, 24, 36, 48, 72, 96, 144, 216, and 312 h after the first administration during the intoxication period and every 24 h for 7 days after this period. AFM1 was detected in the milk of all animals of the treated groups even in the first milking after the administration of AFB1. In all treated groups, milk AFM1 concentration increased from 12 h to 144 h after the beginning of administration. Then decreased, reaching a stable concentration at 216 h and 312 h after the first administration. No AFM1 was detected in milk 3 days after the last administration of AFB1. Milk AFM1 concentration measured at steady-state condition was significantly affected by the AFB1 dose (0.031, 0.095 and 0.166 μg/L in T1, T2 and T3 groups respectively), while the carry-over (AFM1/AFB1 ratio) was not significantly affected. Its mean value was 0.112%. In both trials the carry-overs were lower than those reported for dairy cattle and goats, suggesting a better ability of sheep to degrade AFB1.

Key Words: Aflatoxin, Milk, Sheep

1044 Isolation of *Clostridium botulinum* (types A, B & E) in sediments from coastal areas of the north of Iran. H. R. Tavakoli*, *Nutrition and Food Hygiene Dept; Faculty of Hygiene, Univ. of Baghyatollah Medical Sciences, Tehran*.

Clostridium botulinum has long been recognized as an etiological agent of food borne botulism and has been shown to be distributed widely in fresh water, brackish water and marine environments. This bacterium has been reported as an important food safety hazard. The aim of this study was to obtain information about *C. botulinum* distribution and contamination levels in sediments in order to ascertain the risks associated with consumption and processing of fish from these waters. Two hundred and seventy samples of sediments from coastal areas of "Gilan" and "Mazandaran" states of Iran were collected and analysed. Suspension of samples were prepared and then centrifuged at 5000 RPM for 20 min. The supernatants were inoculated into 10 ml cooked meat media (C.M.M.). After incubation for 2-4 days at 30C, grown specimens were gram stained and checked microscopically. For complementary test, specimens from above mentioned media were inoculated into Egg yolk agar media containing trimethoprim and sulphamethoxazole. After centrifugation, the supernatants were divided into three portions: one portion remaining untreated, one heated to demonstrate the labile nature of the toxin (control), and one tripsinised to demonstrate the presence of inactive protoxin. Samples (0.5 ml) were inoculated intraperitoneally into mice (182) and controlled for 4 days to detect positive samples. Polyvalent (A, B and E) and monovalent standard antitoxins were used to toxin type detection. The present study revealed that the prevalence of *C. botulinum* (types A, B and E) in sediments from different areas of Gillan and Mazandaran were 3.6% and 4.6% respectively, and mean prevalence of *C. botulinum* in sediments from north regions of Iran was 4.1%. It is also demonstrated that *C. botulinum* type E is predominant type seen in aquatic environments of the coastal areas of Iran. This is the first report of *C. botulinum* distribution in the sediments from coastal area of Iran. The potential hazards of types A, B & E is clearly indicated thus revealing a risk of extended storage of raw or mildly thermally processed sea foods and the need to protect these products from temperature abuse until their final use.

Key Words: *Clostridium botulinum*, Coastal areas sediments, Food safety

1045 HACCP - Have another cup of coffee and pray? N. Unger*[1], J. Shelford[1], D. Fraser[1], A. Moore[2], B. Skura[1], D. Weary[1], and F. Brunger[1], [1]*University of British Columbia, Vancover, BC,* [2]*BC Ministry of Agriculture, Food and Fisheries*.

Dairy Farmers of Canada developed an on-farm HACCP-based food safety program for dairy producers and the project evaluated the material; costs and time commitments; effects on milk and meat quality; and producers opinions of the program. Fifteen volunteers underwent training, implementation and validation. Questionnaires, interviews and participant observation were used to gather data. Of the fourteen farms validated, five passed, five conditionally passed and four failed. Producers spent an average of 11 hours setting up the program and about 10 minutes maintaining daily records. The average initial program cost was $1,068 and annual costs were estimated at $1,404. Some producers felt that the program was positive, while others thought it was unnecessary. Most wanted the program simplified and had difficulty understanding the new concepts. Everyone wanted compensation for implementing the program and some were concerned that the various programs being developed would become too expensive to maintain. Other issues were resistance to change, writing extralabel prescriptions, testing new animals for inhibitors, and addressing meat safety. Furthermore, the program needs to add pesticide storage, annual equipment checks and veterinary treatment protocols and validators are going to need extensive training and a complete validation protocol. The program needs to work with all stakeholders in the industry (e.g. veterinarians and equipment dealers), to be implemented uniformly across Canada and to develop a communication plan from producers to consumers. The program is an excellent tool to reduce food safety risks; but, it needs to reduce inconsistencies, gain producer acceptance and ensure credibility from producers to consumers.

Key Words: HACCP, Canadian Quality Milk, Best Management Practices

1046 Food safety in the retail ice cream (soft serve) market. I. Okpala*[1], [1]*Michigan State University, Lansing, MI,* [2]*Michigan Department of Agriculture, Lansing, MI.*

In 1983, the Michigan legislature adopted changes in the Frozen Desserts Act, Act 298, Public Acts of 1968, as amended, which eliminated the need for the Michigan Department of Agriculture (MDA) to license, sample and inspect those facilities which manufactured frozen desserts in a food service setting. Since all food service establishments are licensed and inspected by the local health department, this decision was based on the fact that a food service facility should not be inspected by two regulatory agencies. Local health departments were not provided with the resources necessary to deal with the added responsibility and very little work has been done to monitor the quality of soft serve products manufactured at food service establishments. Many local health agencies do not have laboratories in which food products can be analyzed and have not set up sampling and inspection procedures for the frozen dessert part of food service establishments. MDA, therefore continues to license, inspect and sample those establishments not covered by the Public Health code. In cooperation with local health departments, a soft serve risk assessment survey was conducted. The results of the sampling and survey will be used to: 1) to determine and characterize the type and baseline levels of microbiological organisms which are found in soft serve desserts, 2) assess the effectiveness of sanitation practices currently used in soft serve production and to determine if establishment practices have an impact on these levels, and 3) to justify the changes that the Michigan Department of Agriculture made to the state dairy laws.

1047 Prevalence and distribution of *Campylobacter* spp. in a swine slaughter and processing facility. R Pearce[1], R Dudley[2], F.M. Wallace*[2], J.E. Call[2], and J.B. Luchansky[2], [1]*The National Food Centre, Teagasc, Dunsinea, Castleknock, Dublin, Ireland,* [2]*USDA, Agricultural Research, Eastern Regional Research Center, Wyndmoor, PA.*

The objective of this study was to establish the prevalence and distribution of *Campylobacter* spp. in a swine slaughter and processing facility. Samples obtained over the course of three visits included composite carcass samples (30), representing 360 swine carcasses, obtained at selected points along the slaughter process, matching composite rectal samples (30), and non-matching individual colon samples (60). In addition, samples were collected on the same three visits from equipment used in the slaughter and processing operations. A preliminary study to determine the most efficient recovery method showed that direct plating onto Campy-Line agar (CLA) recovered *Campylobacter* spp. at a significantly higher ($P<0.05$) rate when compared to three other recovery methods. Using CLA, *Campylobacter* spp. were detected on 33% (10/30) of carcasses immediately after stunning, 0% (0/30) after flaming/polishing, 3% (1/30) immediately before chilling and 0% (0/30) after overnight chilling. The pathogen was recovered from 63% (19/30) of the composite rectal samples which were collected from carcasses immediately after stunning, and 58% (35/60) of the individual colon samples which were collected following carcass evisceration. *Campylobacter* spp. were detected on dehairing equipment used in the slaughter process but were not detected on equipment used in the processing operation. The results of this study show that direct plating onto CLA is an effective recovery method for *Campylobacter* spp. Additionally, the results indicate that the prevalence of *Campylobacter* spp. is reduced as hog carcasses progress through the slaughtering process.

Key Words: *Campylobacter*, Swine, Prevalence

1048 Evaluation of bacteriophage DC22 for control of *Escherichia coli* O157:H7. S.J. Bach*[1], T.A. McAllister[1], D.M. Veira[2], V.P.J. Gannon[3], and R.A. Holley[4], [1]*Agriculture and Agri-Food Canada, Lethbridge, AB,* [2]*Agriculture and Agri-Food Canada, Kamloops, BC,* [3]*Health Canada, Animal Diseases Research Institute, Lethbridge, AB,* [4]*University of Manitoba, Winnipeg.*

The effectiveness of DC22, an *Escherichia coli* O157:H7-specific bacteriophage, for controlling *E. coli* O157:H7 was investigated in vitro, using the Rumen Simulation Technique (Rusitec) and in vivo, with experimentally inoculated wethers. In Exp. 1, fermentations were established in eight Rusitec vessels using rumimal inoculum confirmed negative for *E. coli* O157:H7. Each vessel was inoculated with 10^4 CFU/mL of *E. coli* O157:H7 strain 3081, then 8 h later with 10^5 PFU/CFU of DC22 or an equivalent amount of SM buffer as a control ($n = 4$). Both *E. coli* O157:H7 and phage DC22 were enumerated 4 and 12 h after inoculation of DC22, and daily thereafter for 7 d. In the DC22-treated vessels, *E. coli* O157:H7 was eliminated within 4 h of challenge, whereas the bacterium persisted in the control vessels for up to 168 h ($P < 0.05$). In Exp. 2, 12 wethers were inoculated orally with 10^8 CFU of *E. coli* O157:H7 strain E318N, then 2 d later, with 10^5 PFU/CFU of DC22 or an equivalent amount of SM buffer ($n = 6$). Fecal samples were collected for enumeration of *E. coli* O157:H7 and DC22 following inoculation and following DC22 challenge, then daily for 8 d, then twice weekly for 3 wk. Treatment with DC22 did not affect ($P > 0.05$) levels of *E. coli* O157:H7 shed by the wethers during the 30-d period. Levels of DC22 recovered from feces decreased rapidly following inoculation, suggesting the phage did not replicate lytically in the ovine gut. Although 10^5 PFU of DC22/CFU *E. coli* O157:H7 was adequate for eliminating *E. coli* O157:H7 in the Rusitec ($P < 0.05$), this dose did not effect maintenance of the phage in the gastrointestinal tract of the wethers in levels sufficient to cause lysis of *E. coli* O157:H7. Non-specific adsorption of DC22 may have reduced its availability to lyse *E. coli* O157:H7. Bacteriophage DC22 was not effective for controlling fecal shedding of *E. coli* O157:H7 by sheep.

Key Words: Bacteriophage, *E. coli* O157:H7, Sheep

1049 Antimicrobial activity of ginkgo biloba and Origanox on *Escherichia coli* O157:H7 and *Salmonella agona*. H. Nasri, S. A. Ibrahim*, T. N. Evans, T. Jordan, C. W. Seo, and G. Shahbazi, *North Carolina A&T State University, Greensboro, NC.*

The Pathogen Reduction Program of the U.S. Department of Agriculture Food Safety and Inspection Service recommends antimicrobial treatments including herb extracts to reduce or inactivate pathogenic bacteria in foods. Ginkgo Biloba (GB) and Origanox (OX) have been used in foods as functional ingredients. However, they have never been used as antimicrobial agents. Therefore, the objective of this study was to evaluate the effect of GB and OX on the survival and growth of *Escherichia coli* O157:H7 and *Salmonella agona* in BHI broth. Prior to media sterilization select concentrations of GB and OX extracts were added separately into the broths. *E. coli* O157:H7 (380-94), and two strains of *Salmonella agona* (F5567, H6115) were inoculated to provide a final inoculum level of 2.5×10^2 CFU/ml. Samples were incubated at 37^oC for 6 hours. Samples were withdrawn every 2 hours and surface plated on EMB agar and TSBYE agar for the enumeration of *E. coli* and *Salmonella*, respectively. Results showed that the addition of 1.25% GB and 0.1% OX significantly inhibited the growth of pathogenic bacteria ($P < 0.05$). During the 6 hours storage period, populations of bacteria increased by 6.0 log CFU/ml in control samples while bacterial populations in treated samples only increased by 2.0 log CFU/ml. These results indicate the potential applicability of GB and OX as antimicrobials in foods.

Key Words: *Salmonella agona*, Ginkgo biloba, Origanox

Physiology
Estrus Synchronization

1050 Postpartum suppression of ovarian activity with a Deslorelin implant enhanced uterine involution in lactating dairy cows. F.T. Silvestre*[1], J.A. Bartolome[1], S. Kamimura[1], A. C. M. Arteche[1], S.M. Pancarci[1], T. Trigg[2], and W.W. Thatcher[1], [1]*University of Florida, Gainesville, FL, USA,* [2]*Peptech Animal Health, North Ryde, Australia.*

Ovarian follicular activity, presence of a CL and uterine involution were evaluated for cows treated with a non-degradable Deslorelin (DES) implant (5 mg; n = 10) or a control group (n = 9) that did not receive an implant. All cows were assigned randomly to treatments on 6-25-2001 and received DES implants between 1d to 4d postpartum (PP). Cows