Impact of pasture versus indoor feeding systems on quality characteristics, nutritional composition, sensory and volatile properties of full-fat Cheddar cheese. T. O’Callaghan1,2, D. Man- nion1, D. Hennessy1, S. McAultife1, M. O’Suillivan4, N. Leeu- wendaal1, T. Beresford1, P. Dillon1, K. Kilcawley1, J. Sheehan1, R. P. Ross2,3, and C. Stanton*1,2, 1Teagasc Food Research Center, Fermoy, Co. Cork, Ireland, 2APC Microbiome Institute, University College Cork, Cork, Ireland, 3Teagasc Animal and Grassland Research Center, Fermoy, Co. Cork, Ireland, 4University College Cork, Cork, Ireland.

The purpose of this study was to investigate the effects of pasture versus indoor total mixed ration (TMR) feeding systems on the chemical composition, quality characteristics and sensory properties of full fat Cheddar cheeses. Fifty-four multiparous and primiparous Friesian cows were divided into 3 groups (n = 18) for an entire lactation. Group 1 was housed indoors and fed a TMR diet of grass silage, maize silage and concentrates, Group 2 was maintained outdoors on perennial ryegrass only pasture (GRS), while Group 3 was also maintained outdoors on perennial ryegrass/white clover pasture (CLV). Full fat Cheddar cheeses were manufactured in triplicate at pilot scale, from each feeding system in September and were analyzed over a 270 d ripening period at 8°C for chemical composition, textural characteristics, sensory and volatile properties. Pasture derived feeding systems were shown to produce Cheddar cheeses more yellow in color than that of TMR, which was positively correlated with increased cheese β-carotene content. Feeding system had a significant effect on the fatty acid composition of the cheeses. The nutritional composition of Cheddar cheese was improved through pasture based feeding systems with significantly lower thermobobigenicity index scores and a greater than 2-fold increase in the concentration of vaccenic acid and the bioactive conjugated linoleic acid c9t11, while TMR derived cheeses had significantly higher palmitic acid content. Such alterations in the fatty acid profile of the cheeses resulted in pasture derived cheeses having reduced hardness scores at room temperature. Feeding system and ripening time had a significant effect on the volatile profile of the Cheddar cheeses. Pasture derived cheeses cheese had significantly higher concentrations of the hydrocarbon toluene. Ripening period resulted in acids, alcohols, aldehydes and ester based compounds. Fatty acid profiling of cheeses coupled with multivariate analysis showed clear separation of Cheddar cheeses derived from pasture-based diets (perennial ryegrass or perennial ryegrass/white clover) from that of a TMR system.

Key Words: pasture, total mixed ration, Cheddar cheese

Feeding reduced-fat dried distillers grains with solubles to lactating Holstein dairy cows does not negatively influence quality of baby Swiss cheese. E. D. Testroet*, M. R. O’Neil, D. C. Beitz, and S. Clark, Iowa State University, Ames, IA.

Swiss-type cheese quality is dependent on the formation of ideal shape, size and distribution of eyes. Late-blowing defects have a negative impact for both processors and consumers. Feeding dried distillers grains with solubles (DDGS) to lactating dairy cows has been implicated as a cause of late blowing defects but has limited scientific support. Our objectives were to test the impact of feeding reduced-fat dried distillers grains with solubles (RF-DDGS) to lactating dairy cows on the composition of milk and the suitability of milk for production of high-quality baby Swiss cheese. We hypothesized that feeding 20% RF-DDGS to dairy cows would not result in adverse effects in milk composition or in quality of baby Swiss cheese produced from that milk. Thirty-five multiparous and lactating Holstein dairy cows were assigned randomly to 1 of 2 dietary treatments in a 2 x 2 crossover design. Each period lasted 35 d. Treatment 1 was a standard corn/corn silage/hay diet and treatment 2 was based on the same diet with the exception of 20% of dry matter (DM) being RF-DDGS. Diets were isonitrogenous, isoenergetic, and contained similar limiting dietary amino acids. There was no treatment effect on milk yield (35.66 and 35.39 kg/day, control and RF-DDGS, respectively), milk fat percentage (3.65 and 3.61%), lactose percentage (4.62 and 4.64%), and milk total solids (12.19 and 12.28%). However, milk protein percentage increased (3.01 and 3.11%). For cheese production, milk was collected and pooled 6 times for each dietary treatment. Regarding appearance, cheeses were atypical, but the only significant differences were in eye size, with the control being closer to ideal than RF-DDGS cheese. There were significant interactions between production day and treatment, but no clear trend emerged, indicating that the make procedure has a greater impact on cheese quality than RF-DDGS. These results indicate that RF-DDGS can be fed to cows at a 20% inclusion rate (DM) without negatively influencing suitability of milk for production of quality baby Swiss cheese.

Key Words: dried distillers grains with solubles (DDGS), late-blowing, sensory

Chemical and sensory characteristics of Chanco cheese from dairy cows supplemented with olive oil and partially hydrogenated vegetable oil. E. Vargas-Bello-Pérez*, C. Gar- rido*, C. Geldsetzer-Mendoza1, M. S. Morales2, P. Toro-Mujica1, R. A. Ibáñez1, and P. C. Garnsworthy3, 1Departamento de Ciencias Animales, Pontificia Universidad Católica de Chile, Santiago, Chile, 2Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile, Santiago, Chile, 3School of Biosciences, The University of Nottingham, Sutton Bonington Campus, Loughborough, United Kingdom.

The aim of this study was to assess the effects of unrefined olive oil (OO; unsaturated fatty acid source) and hydrogenated vegetable oil (HVO; saturated fatty acid source) in dairy cow diets on chemical and sensory characteristics of cheese. Fifteen multiparous Holstein cows were used during a 9 wk study. Cows averaging 189 ± 28 d in milk (average ± SD) at the beginning of the study were assigned to different treatments that included a control diet with no added lipid (n = 5), and fat-supplemented diets containing OO (n = 5; unrefined oil; 30 g/kg of dry matter; DM) and HVO (n = 5; manufactured from palm oil; 30 g/kg DM). Diets were based on corn silage and alfalfa silage. Ether extract (g/kg DM) was 50 for control and 70 for both OO and HVO diets. Individual milk samples were taken on d 21, 42 and 63 for proximate analysis. During the same sampling days, milk collected from individual cows from the same treatment was pooled and made into cheese (n = 4) and ripened for 7 d and analyzed for fatty acid (FA) profile. Sensory evaluation of cheeses was carried out in relation to appearance, odor, flavor, and texture. Milk production (35.0 ± 1.8 kg/d) milk fat (3.1 ± 0.16 g/100g) and milk protein (3.3 ± 0.11 g/100g) were not affected by dietary treatments. Moisture (51.3 ± 2.2 g/100g), fat (23.1 ± 1.2 g/100g), total protein (20.7 ± 1.7 g/100g) and ash (2.3 ± 0.1 g/100g) from cheeses were not affected by treatment day and treatment, but no clear trend emerged, indicating that the make procedure has a greater impact on cheese quality than RF-DDGS. These results indicate that RF-DDGS can be fed to cows at a 20% inclusion rate (DM) without negatively influencing suitability of milk for production of quality baby Swiss cheese.

Key Words: dried distillers grains with solubles (DDGS), late-blowing, sensory
Lactoferrin is increasingly supplemented in foods for its multiple functions. It is necessary to establish a reliable analytical method for nutritional assessment and quality control. A method for determination of native lactoferrin in milk using HiTrap Heparin HP column coupled with HPLC was developed and validated. Native lactoferrin was separated from denatured lactoferrin by centrifuging the samples that were adjusted to pH 4.6. Response surface design was used to find the optimal conditions for lactoferrin using HiTrap Heparin HP column as below: 10.35 mmol L⁻¹ disodium hydrogen phosphate for equilibration solutions, pH 6.02 for equilibration solutions, 1.78 mol L⁻¹ NaCl in elution solutions, and pH 7.26 for elution solutions. Subsequently lactoferrin was quantified using HPLC-PDA. A linear range from 2 to 100 mg L⁻¹ of lactoferrin standards was obtained, with a value of R² equal to 0.9989. The limit of detection (LOD) and quantification (LOQ) were 2.00 and 6.67 mg L⁻¹ for lactoferrin standard, and 0.57 and 1.90 mg L⁻¹ for milk sample considering enrichment factor involved in the pre-treatment procedures. In addition, milk spiked with lactoferrin at 3 concentration levels (2, 5 and 10 mg/L) showed that overall mean recovery were 88.3%, 90.2 and 95.1%, respectively. Relative standard deviation of intra-day and inter-day precision was 1.3–4.8%, and 2.1–5.7%, respectively, demonstrating good performances of the proposed method. The developed method was subsequently applied to determine lactoferrin in raw milk and processed milk. Results showed that this established method can be used to determine lactoferrin in different processed milk. Levels of lactoferrin in raw milk and processed milk were ranging from around 0.8 to 44.9 mg/L, indicating its level was strongly relying on the actual heat load that milk samples were exposed to. As expected, increasing the temperature from 72.5°C to 120°C resulted in lower native lactoferrin in milk. In addition, quantification of lactoferrin in raw milk and processed milk using this method displayed the usefulness and effectiveness of the proposed method.

Key Words: lactoferrin, heparin, HPLC

218 Development and quality enhancement of cottage-type cheese made from Nili Ravi buffalo postpartum milk (colostrum). M. Batool1, S. Inayat*1, M. Ayaz1, S. Ahmad1, and S. Akhtar2, 1University of Veterinary & Animal Sciences, Lahore, Punjab, Pakistan, 2Bahauddin Zakariya University, Multan, Punjab, Pakistan.

Cottage-type cheese was prepared from Nili Ravi buffalo first 5 d colostrum and the results were compared with cottage cheese made from normal buffalo milk (Control). The milk pasteurization temperature was optimized after many trials for all treatments (63°C for 30 min); for optimization different time and temperature combinations were applied for different days colostrums, physico-chemical quality was analyzed and then various steps for Cottage cheese manufacturing were finalized. Pragmatic gel formation took 3 h in T1 whereas in T2, T3, T4, T5 and control after 45 min firm coagulum was produced. After cutting in cubes, cooking at 55°C and whey drainage was performed; it was found that percentages of all chemical contents decreases with the increase in age (days) of colostrum. The data collected were analyzed through one way ANOVA under completely randomized Design and means were compared through Duncan’s Multiple Range test with the help of SAS 9.1 (Statistical Software). Results showed that maximum cheese yield was obtained in T1, then T2, T3, T4, and T5 respectively. Cottage cheese...
prepared from second-day colostrum was found and scored better in all quality attributes, having cottage cheese characteristics and good yield.

**Key Words:** colostrum, buffalo, cottage cheese

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**Flavor profile of UHT conjugated linoleic acid-enriched milk based on headspace solid-phase microextraction coupled to gas chromatography-mass spectrometry.**

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There is industrial interest to reformulate dairy products by increasing the concentration of certain trans fatty acids, consumption has been associated with improved human health. Examples of such fatty acids are conjugated linoleic acid (CLA, C18:2), trans-vaccenic acid (TVA, C18:111), eicosapentaenoic acid (EPA, C20:5 ω3), and docosahexaenoic acid (DHA, C22:6 ω3). Unfortunately, the concentration of such fatty acids in milk is rather low, which limits the use of milk fat as a primary source of bioactive lipids in the human diet. Ruminant scientists have developed cattle nutritional guidelines that increase the concentration of bioactive lipids through rumen biohydrogenation, offering commercial opportunities to formulate healthier dairy products. However, changes in the milk fat composition that are desirable from nutritional purpose may have significant impact on the flavor profile during thermal processing. This study evaluated the impact of UHT (125–145°C/2–20 s) on the flavor profile of CLA-enriched milk. Headspace solid-phase microextraction (HS-SPME) coupled to gas chromatography-mass spectrometry (GC-MS) was used to characterize the volatile compounds, followed by multivariate analysis. After UHT treatments, 18 volatiles were identified, including linear aldehydes (propanal, hexanal, heptanal, octanal, nonanal and decanal), branched aldehydes (3-methylpropanal, 2-methylbutanal, 3-methylbutanal, furfural and benzaldehyde), ketones (diacetyl, 2-pentanone, 2-hexanone, 2-heptanone, 2-octanone, 2-nonanone, 2-decanone and 2-undecanone) and dimethyl sulfide. The concentration of total aldehydes increased up to 4-fold with respect of methyl ketones when increasing temperature from 125 to 145°C. Heptanal was the most abundant volatile, resulting from UHT processing and a potential suitable marker for heat treatment of enriched-CLA milk.

**Key Words:** UHT, flavor profile, CLA