

## COLLECTED ABSTRACTS

### Editorial: Balance, and the back-to-back problem

Chris Knight

UK

The full Editorial is available online at <https://www.journalofdairyresearch.org/editorials.html>

### Prospecting genomic regions associated with milk production traits in Egyptian buffalo

Hamdy Abdel-Shafy, Mohamed A.A. Awad, Hussein El-Regalaty, Salah El-Din El-Assal and Samy Abou-Bakr

Egypt

#### Abstract

The objectives of the current study were to detect putative genomic loci and to identify candidate genes associated with milk production traits in Egyptian buffalo. A total number of 161,479 daily milk yield (DMY) records and 60,318 monthly measures for fat and protein percentages (FP and PP, respectively), along with fat and protein yields (FY and PY, respectively) from 1,670 animals were used. Genotyping was performed using Axiom® Buffalo Genotyping 90 K array. Genome-wide association study (GWAS) for each trait was performed using PLINK. After Bonferroni correction, 47 SNPs were associated with one or more milk production traits. These SNPs were distributed over 36 quantitative trait loci (QTL) and located on 20 buffalo chromosomes (BBU). For the 47 SNPs, one was overlapped for three traits (DMY, FY, and PY), six were associated with two traits (one for PP and PY and five for FY and PY) while the rest were associated with only one trait. Out of 36 identified QTL, eleven were overlapped with previously reported loci in buffalo and/or cattle populations. Some of these SNPs are placed within or close to potential candidate genes, for example: *TPD52*, *ZBTB10*, *RALYL* and *SNX16* on BBU15, *ADGRD1* on BBU17, *ESRRG* on BBU5 and *GRIP1* on BBU4. This is the first reported study between genome-wide markers and milk components in Egyptian buffalo. Our findings provide useful information to explore the genetic mechanisms and relevant genes contributing to the variation in milk production traits. Further confirmation studies with larger population size are necessary to validate the findings and detect the causal genetic variants.

### Assessing effects of tannin-rich sainfoin supplements for grazing dairy goats on feed protein efficiency

Florian Leiber, Nadine Arnold, Felix Heckendorn and Steffen Werne

Switzerland

#### Abstract

This research communication presents a study evaluating the effects of dried sainfoin (*Onobrychis viciifolia*) supplemented to dairy goats on their milking performance and feed protein efficiency under commercial conditions. During July and August 2015, a herd of 20 Alpine goats was divided

into two treatments (n=10), balanced by milk yield and days in milk. They were supplied with either 700 g/day sainfoin pellets (condensed tannins: 4.0g /kg DM) or 700 g/day lucerne (*Medicago sativa*) pellets (condensed tannins: 0.3g /kg DM). The goats remained in one herd and were separated by treatments only during milking. In the milking parlour each goat received 350g of the respective pellets, twice daily. During the day, the herd had 5 h access to a high-quality pasture (crude protein >200 g/kg DM), whilst during the rest of the day and the night animals were housed and offered grass hay *ad libitum*. The experiment lasted for seven weeks. Individual milk yields and composition were controlled in weeks 1, 3, 5, and 7 after the start of the experiment. No differences between the treatments were found, either for milk, protein or urea yields, nor for protein, urea and fat concentrations. Urea to protein ratio in milk was lower with the sainfoin treatment. In conclusion, sainfoin compared to lucerne, supplied for 7 weeks to dairy goats at approximately 25% of the diet, had only weak beneficial and no adverse effects on milking performance, milk composition and feed protein efficiency under commercial conditions of pasture-based dairy production.

### **Orange juice industry by-product silage can increase fat and protein in Holstein cow's milk**

Luís Carlos Vinhas Ítavo, Noemila Débora Kozerski, Camila Celeste Brandão Ferreira Ítavo, Alexandre Menezes Dias, Hélène Veronique Petit, Chaouki Benchaar, Tadeu Vinhas Voltolini, Cloves Cabreira Jobim and Geraldo Tadeu dos Santos

**Brazil**

#### **Abstract**

We aimed to evaluate the effect of replacing corn silage by orange peel silage on nutrient intake, ruminal parameters and milk production of multiparous lactating Holstein cows. Eight fistulated Holstein cows averaging 587.5±39.6 kg and 111±22 days in milking were randomly assigned to a double 4×4 Latin square design carried out two times to determine the effects of feeding with orange peel silage (OPS) in substitution of whole plant corn silage (WPCS). The treatments were a control diet with WPCS only or diets with OPS replacing WPCS in the total mixed diet (250, 500, or 750 g/kg DM). All cows were fed the same 750:250 g/kg roughage:concentrate ratio. The DM intake and milk production were reduced with the OPS inclusion, with decreases in consumption of neutral detergent fibre and increased consumption of non-fibrous carbohydrates. Diets with 250 and 500 g/kg OPS showed similar milk production and protein content in milk to the standard WPCS diet, whilst 750 g/kg orange peel silage as roughage increased fat and protein contents significantly. The orange peel silage as a substitute for corn silage for feeding dairy cows did not show adverse changes in the rumen environment and showed promising results in the increase of fat in milk of Holstein cows.

### **Indian dairy farmers' willingness to pay for sexed semen**

Kumari Vijaya Sneh Verma, Sanchita Garai, Sanjit Maiti, B S Meena, Mukesh Bhakat and K S Kadian

**India**

#### **Abstract**

Sexed semen is one of the newest reproductive technologies available for dairy farmers and can fulfill their desire to produce a high percentage of female calves. The present study was designed to define the willingness of Indian dairy farmers to pay for sexed semen. Hence, 120 small holder dairy farmers and 90 commercial dairy farmers were randomly selected from Karnal and Yamunanagar

districts in North-western Haryana, where there is a high proportion of crossbred dairy cattle. Willingness to pay for sexed semen was evaluated by a contingent valuation method and its determinants by an interval regression model. The majority of the small holder dairy farmers (81.67%) were willing to pay for sexed semen and they were ready to pay around INR 340 per sexed semen straw. Almost all (99%) of the commercial dairy farmers were willing to pay around Rs. 770 per sexed semen straw, ie more than double the value identified by small holder dairy farmers. Among all the predictors fitted in the interval regression model to explain the willingness to pay for sexed semen by the commercial dairy farmers, namely education level, herd size and attitude towards public extension systems, were positive and significant contributors. Our findings may help to identify what subsidy is required to promote sexed semen among dairy farmers, and as a consequence further improve breeding policies by introducing this new livestock production technology with the active participation of the dairy farmers.

### **Skeletal health, redox balance and gastrointestinal functionality in dairy cows: connecting bugs and bones**

Pietro Celi, Maik Kindermann, Luis FM Tamassia and Nicola Walker  
**Switzerland and Australia**

#### **Abstract**

This research reflection examines the physiological links between redox balance, skeletal health and gastrointestinal functionality in dairy cows. With the increase in demand of animal products caused by the growth in human population, the dairy industry needs to develop and implement innovative strategies which are profitable, sustainable and cow friendly. Redox balance, skeletal health and gastrointestinal functionality are three key physiological systems that are often seen as independent entities. In this research reflection we intend to stress that the antioxidant system, bone health and the microbiome are intimately intertwined. Antioxidants are crucial for the maintenance of redox homeostasis and optimal immune function. Optimal gastrointestinal functionality is important to maintain animal performance, health and welfare. In particular, the intestinal microbiome is increasingly seen as a driver of health and disease. Vitamin D metabolism is pivotal not only for optimal skeletal health, but in light of all the extra-skeletal effect of vitamin D, it is the foundation for optimal productive life. It makes sense to ask the question “how are redox balance and the microbiome involved in the modulation of bone health and immune function?” In other words, are bugs and bones connected in dairy cows! The existing data available in the literature suggests that this might be the case. The characterization of the interactions between redox balance, skeletal health and the microbiome, will allow the development of a multisystem biological approach to refine nutritional interventions to improve dairy cattle health, welfare and productive longevity.

### **Effects of 2,4- thiazolidinedione (TZD) on milk fatty acid profile and serum vitamins in dairy goats challenged with intramammary infusion of *Streptococcus uberis***

Chia-Yu Tsai, Fernanda Rosa, and Massimo Bionaz and Pedram Rezamand  
**USA**

#### **Abstract**

The study included two experiments. In the first, 24 lactating Saanen dairy goats received low-energy diet without vitamin supplements. Twelve goats received a daily IV injection of 2,4-

thiazolidinedione (TZD), others received saline injection. A week later, 6 goats from each treatment were challenged with intramammary infusion (IMI) of saline (CTRL) or *Streptococcus uberis*. In the second experiment, 12 Saanen lactating dairy goats received supplemental vitamins to reach NRC recommendation level. Six goats in each group were injected with TZD or saline daily, and 14 d later received *Streptococcus uberis* IMI in the right half of the udder. The hypotheses were 1) TZD does not affect the level of retinol in blood, and 2) the fatty acid profile is affected by the interaction between mammary infection and TZD in dairy goats. In the first experiment blood samples were collected on d -7, -2, 1, 2, 12 and milk samples were collected on d -8, 1, 4, 7, and 12, both relative to IMI. In the second experiment, blood samples were collected on d -15, 0, 1, and 10 relative to IMI. Milk and serum samples were analyzed for retinol,  $\alpha$ -tocopherol and fatty acid profile. Serum retinol and  $\beta$ -carotene concentrations were higher in the second experiment compared to the first. Serum  $\beta$ -carotene and  $\alpha$ -tocopherol were greater in TZD than CTRL and there was a TZD  $\times$  time interaction in the first experiment. In addition, the TZD  $\times$  time interaction showed that the milk fatty acid were reduced in C16:0 while C18:3 n3 while total omega 3 fatty acids were increased, as well as with minor effect on preventing a transient increase in  $\alpha$ -tocopherol in milk. Overall, the TZD may affect the lipid-soluble vitamins and fatty acid profile, potentially altering immune responses, during mastitis in dairy goats.

### **Simmental x Holstein crossbred: comparison of immunological traits with parental breeds during peripartum and early lactation period**

Maria Carmela Scatà, Francesco Grandoni, Vittoria Lucia Barile, Gennaro Catillo and Giovanna De Matteis

**Italy**

#### **Abstract**

The experiment described in this research communication aimed to compare the immunological traits of Simmental (sire) x Holstein (dam) crossbred cows with the two parental breeds in the peripartum and early lactation period and to estimate the effects of heterosis for these traits. Flow cytometric evaluation of leukocyte subpopulations was assessed in 16 Crossbred (CR), 8 Holstein (HO) and 8 Simmental (SI) cows. Estimated average values of innate and adaptive immune cells showed statistically significant differences between the crossbred cows and parental breeds. Interestingly, the most relevant differences between the three groups related to adaptive immune cells. In particular, the CR cows showed a lower percentage of CD3<sup>+</sup> T lymphocytes compared with the SI group ( $P < 0.0001$ ) and the highest proportions of CD21<sup>+</sup> B lymphocytes among the three groups ( $P < 0.0001$ ). Furthermore, we found the highest positive value of heterosis for the CD21<sup>+</sup> B lymphocytes (7.0) and the lowest negative value for CD3<sup>+</sup> T lymphocytes (-4.8) in F1 derived population. It seems reasonable to believe that these differences could affect immune function of crossbred cows.

### **Effects of oral supplementation with organically modified clinoptilolite during prepartum period on colostrum quality in primiparous dairy cows**

Milica Stojić, Vesna Ilić, Marijana Kovačić, Dragan Gvozdić, Silvana Stajković, Branislav Vejnović, Olivera Savić and Natalija Fratrić

**Serbia**

## Abstract

This research paper addresses the hypothesis that an oral supplementation with organically modified clinoptilolite will improve colostrum quality in primiparous dairy cows whilst having no adverse effects on the cows' health. A total of 36 pregnant Holstein primiparous dairy cattle were randomly assigned to receive daily oral drenching, two hours following morning feeding, with 1 L of water containing either 0 g/L (n=16) or 150 g/L (n=20) of clinoptilolite. Treatment lasted from  $24 \pm 4$  days prior to expected parturition until two days postpartum (pp). Colostrum was collected at 2 to 3 h, 12 h, 24 h and 36 h pp and blood samples were collected at  $24 \pm 4$  and  $4 \pm 2$  days prior to parturition and 1, 2 and 7 days pp. Overall mean dry matter, fat and total protein percentage as well as IgG concentration and mass were significantly greater in colostrum collected from cattle drenched with clinoptilolite (total protein increased by 15% and IgG concentration and mass by 21% and 38% respectively at first sampling and further at second sampling). Total  $\gamma$  globulin and most other blood serum biochemistry parameters did not differ between cattle treated and not treated with clinoptilolite, the only exception being the fast anionic  $\gamma$  globulin fraction that was 17 % greater at  $4 \pm 2$  days prior to parturition and 10 % lower on the 1<sup>st</sup> day pp in treated cattle. These results showed that organically modified oral clinoptilolite supplementation at 150 g/d significantly increases the IgG concentration in colostrum and has no adverse effects on the energy status, protein, lipid, and mineral metabolism in primiparous dairy cattle during prepartum period.

## Fourier transform infrared spectroscopy of milk samples as a tool to estimate energy balance, energy- and dry matter intake in lactating dairy cows

Amira Rachah, Olav Reksen, Nils Kristian Afseth, Valeria Tafintseva, Sabine Ferneborg, Adam Dunstan Martin, Achim Kohler and Egil Prestløkken

Norway

## Abstract

The objective of the study was to evaluate the potential of Fourier transform infrared spectroscopy (FTIR) analysis of milk samples to predict body energy status and related traits (energy balance (EB), dry matter intake (DMI) and efficient energy intake (EEI)) in lactating dairy cows. The data included 2371 milk samples from 63 Norwegian Red dairy cows collected during the first 105 days in milk (DIM). To predict the body energy status traits, calibration models were developed using Partial Least Squares Regression (PLSR). Calibration models were established using split-sample (leave-one cow-out) cross-validation approach and validated using an external test set. The PLSR method was implemented using just the FTIR spectra or using the FTIR together with milk yield (MY) or concentrate intake (CONCTR) as predictors of traits. Analyses were conducted for the entire first 105 DIM and separately for the two lactation periods:  $5 \leq \text{DIM} \leq 55$  and  $55 < \text{DIM} \leq 105$ . To test the models, an external validation using an independent test set was performed. Predictions depending on the parity (1st, 2<sup>nd</sup> and 3rd-to 6th parities) in early lactation were also investigated. Accuracy of prediction (r) for both cross-validation and external test set was defined as the correlation between the predicted and observed values for body energy status traits. Analyzing FTIR in combination with MY by PLSR, resulted in relatively high r-values to estimate EB (r = 0.63), DMI (r = 0.83), EEI (r = 0.84) using an external validation. Only moderate correlations between FTIR spectra and traits like EB, EEI and dry matter intake (DMI) have so far been published. Our hypothesis was that improvements in the FTIR predictions of EB, EEI and DMI can be obtained by 1) stratification into different stages of lactations and different parities, or 2) by adding additional information on milking and feeding traits.

Stratification of the lactation stages improved predictions compared with the analyses including all data  $5 \leq \text{DIM} \leq 105$ . The accuracy was improved if additional data (MY or CONCTR) were included in the prediction model. Furthermore, stratification into parity groups, improved the predictions of body energy status. Our results show that FTIR spectral data combined with MY or CONCTR can be used to obtain improved estimation of body energy status compared to only using the FTIR spectra in Norwegian Red dairy cattle. The best prediction results were achieved using FTIR spectra together with MY for early lactation. The results obtained in the study suggest that the modelling approach used in this paper can be considered as a viable method for predicting an individual cow's energy status.

### **Natural tree shade increases milk stability of lactating dairy cows during the summer in the subtropics**

Alexandre S Abreu, Vivian Fischer, Marcelo T Stumpf, Concepta M McManus, Felix HD González, Jéssica BS da Silva and Guilherme Heisler

**Brazil**

#### **Abstract**

This research communication addresses the hypothesis that, during the summer in the subtropics, natural tree shade helps to improve milk functional characteristics such as stability and acidity. Sixteen Holstein lactating cows were enrolled. The study consisted of three periods (pre-stress, heat stress and post-stress) based on allocating grazing cows into two treatments (with and without access to shade during the Heat Stress period). Overall THI during the trial was (mean  $\pm$  SE)  $76.0 \pm 3.4$ . Access to shade prevented the heat stress-related decrease in milk stability both in the ethanol and in the coagulation time test, as well as maintained milk acidity within an acceptable range (14 to 18°D).

### **Feeding level regulates the expression of some genes involved with programmed cell death and remodeling in goat and ewe mammary tissue**

Eleni Tsiplakou, Christina Mitsiopolou, Dimitrios Skliros, Alexandros Mavrommatis and Emmanouil Flemetakis

**Greece**

#### **Abstract**

Mammary tissue (MT) turnover is characterized by programmed cell death and remodeling which might be affected by both feeding level and animal species. Thus, twenty-four dairy goats and the same number of sheep were assigned to three homogenous sub-groups per animal species and fed the same diet in quantities which met 70% (FL70), 100% (FL100) and 130% (FL130) of their daily energy and crude protein requirements. Individual MT samples were taken by biopsy from the animals on the 30<sup>th</sup> and 60<sup>th</sup> experimental day. The results showed, in the first sampling time, a significant reduction in the mRNA abundance for selected genes involved in programmed cell death in both FL 70 fed goats (*STAT3* and *BECN1*) and sheep (*CASPASE8* and *BECN1*) compared with the respective FL100 groups. The FL130, in comparison with the FL100, caused a significant increase in transcripts accumulation of *STAT3* gene in both sampling times and *CASPASE8* gene in the second sampling time in goat MT, while the opposite happened for the mRNA expression of *CASPASE8* and *BECN1* genes in sheep MT, but only in the first sampling time. Moreover, a significant up regulation

in the mRNA levels of *MMP2* gene in MT of FL130 fed sheep was observed. The FL130, in comparison with the FL70, caused an enhancement in the mRNA expression levels of *BECN1*, *CASPASE8*, *BAX* and *STAT3* genes in goat MT only. It was also shown that apoptosis and autophagy can be affected simultaneously by the feeding level. Overfeeding affects MT programmed cell death and remodeling by a completely different way in goats than sheep. In conclusion, feeding level and animal species have strong effects on both MT programmed cell death (apoptosis and autophagy) and remodeling but the molecular mechanisms need further investigation.

### **Liver X receptor $\alpha$ participates in LPS-induced reduction of triglyceride synthesis in bovine mammary epithelial cells**

Jianfa Wang, Shuai Lian, Jun Song, Hai Wang, Xu Zhang, Xianjing He, Dandan Hao and Rui Wu  
China

#### **Abstract**

Lipopolysaccharides (LPS) could induce milk fat depression via regulating the body and blood fat metabolism. However, it is not completely clear how LPS might regulate triglyceride synthesis in dairy cow mammary epithelial cells (DCMECs). DCMECs were isolated and purified from dairy cow mammary tissue and treated with LPS. The level of triglyceride synthesis, the expression and activity of the liver X receptor  $\alpha$  (LXR $\alpha$ ), enzymes related to *de novo* fatty acid synthesis, and the expression of the fatty acid transporters were investigated. We found that LPS decreased the level of triglyceride synthesis via a down-regulation of the transcription, translation, and nuclear translocation level of the LXR $\alpha$ . The results also indicated that the transcription level of the LXR $\alpha$  target genes, sterol regulatory element binding protein 1 (*SREBP1*), fatty acid synthetase (*FAS*), acetyl-CoA carboxylase-1 (*ACC1*), were significantly down-regulated in DCMECs after LPS treatment. Our data may provide new insight into the mechanisms of milk fat depression caused by LPS.

### **Microbiological and physicochemical characteristics of buffalo milk used for dairy products in southern Brazil**

Fernanda MS Godinho, Melina Krug, Renata Figueiredo, Alexandre Müller, Louise Jank, Caroline Andrade Tomaszewski, Daniel Rodrigo Hillesheim, Éder J Kinast, Ana Paula G Frazzon and Amanda S Motta

Brazil

#### **Abstract**

In Brazil, the buffalo milk market has been growing. However, identity and quality standards have not been established for this raw material, nor have proper distinctions between buffalo milk and bovine milk been defined. Currently, the State of Rio Grande do Sul (RS) has only three producers that supply raw material for officially marketed derivatives. The aim of this study was to determine the identity and quality standards of raw buffalo milk in this region. Samples were obtained biweekly from three farm cooling tanks between June 2017 and August 2018, to reach a total of 69 samples. The averages for the results of the physicochemical parameters fat, protein, lactose, total solids, SNF (solids-not-fat), calcium, density, FP, acidity and SCC were 5.5g/100g, 4.06g/100g, 5.07g/100g, 15.5g/100g, 9.96g/100g, 0.161g/100g, 1.034 g/mL, -0.527°C, 16°D and 95x10<sup>3</sup> cells/mL, respectively. With reference to the microbiological parameters, the mean of the Standard Plate Count (SPC) and thermotolerant coliforms were 9,0x10<sup>4</sup> CFU/mL and 1.6x10<sup>2</sup> MPN/mL, respectively.

Regarding coagulase-positive staphylococci, 36 samples tested positive (52% of total). Neither *Salmonella* spp. nor *Listeria monocytogenes*, nor antibiotic or antiparasitic residues were detected in any sample. In conclusion, the buffalo milk used as raw material for dairy products in southern Brazil demonstrated satisfactory physicochemical and microbiological characteristics, in accordance with recent scientific literature.

### **Bacterial starter cultures induce suitable changes in milk fatty acid profiles at different fermentation conditions.**

Gholamreza Bahrami, Ali Mostafaie, Amir Kiani and Maryam Chalabi  
Iran

#### **Abstract**

This study aimed to compare the effect of different ratios of *Streptococcus thermophilus* to *Lactobacillus bulgaricus* (3:1, 1:1, and 1:3) under the various stressful temperatures (37 and 45 °C) on the fatty acid profiles quality of Kermanshahi roghan (yogurt by-product) and sour cream to obtain a formula for producing a kind of animal fat healthier than milk and cream. Stresses such as fermentation play an important role in bacterial behavior and consequently in food quality. Our findings presented a significant difference between roghan and sour cream fatty acid levels only at 37 °C. Furthermore, starter culture 3:1 was the best starter for producing products with a higher quality of fatty acid profile at 37 °C, and a 1:1 *S. thermophilus* to *L. bulgaricus* ratio was optimal at 45 °C. It seems that bacteria adapt to harsh growth conditions by changing the fatty acid profiles, and these changes warrant consideration in the production of a kind of animal fat with the best fatty acid profiles. In conclusion, the roghan fatty acid profile is more suitable than sour cream only at 37 °C.

### **Shelf life extension of mozzarella cheese packed in preserving liquid with calcium lactate and bergamot juice concentrate**

Angela Zappia, Maria Luisa Branca, Amalia Piscopo and Marco Poiana  
Italy

#### **Abstract**

Traditional Mozzarella is a fresh cheese produced in Italian local market without additives that shows a short shelf life of about 5 days. This work tested the use of natural additives (bergamot juice concentrate-BJ and calcium lactate-CL) in preserving liquid for a Mozzarella cheese with the aim to extend its shelf life, regarding the microbial growth and overall cheese quality. Results of qualitative analyses showed that the preserving liquid with the mix of BJ and CL promoted an extension of mozzarella shelf life up to 20 days. A slightly reduced growth of *Pseudomonas* species was evidenced after 5 days of storage, whereas no inhibition of lactic acid bacteria was observed for the storage period. Moreover, mozzarella cheese packed in mixed preserving liquid possessed better textural properties, evidenced by the lowest proteolysis index measured after 13 days of storage, and a good antioxidant activity.

### **Milk quality, production process and physicochemical characteristics of Porungo, an artisanal cheese from the state of Sao Paulo, Brazil**



Naaman Francisco Nogueira Silva, Ketilin Siqueira de Aguiar, Natan de Jesus Pimentel Filho, Iuri Emmanuel de Paula Ferreira, Caetano Afonso Lanzoni Troiani, Alline Artigiani Lima Tribst and Antônio Fernandes de Carvalho

**Brazil**

**Abstract**

Porungo is a traditional *pasta filata* cheese produced using raw milk throughout the southwest region of the state of São Paulo, Brazil. The objectives of this Research Communication were to evaluate the quality of raw milk used to make Porungo cheese, to characterise its production process, and to determine its chemical composition. The results showed that the raw milk met both Brazilian and international quality requirements. Chemically, Porungo can be classified as a medium to full fat semi-hard fresh cheese. Our study has allowed the first standards and regulations for Porungo to be established in Brazil. By virtue of this, the local producers are able to formalise their activity while consumers can have access to a safe and certified product.

**Denaturation of selected bioactive whey proteins during pasteurization and their ability to modulate milk immunogenicity**

Dimuthu Bogahawaththa and Todor Vasiljevic

**Australia**

**Abstract**

This research communication relates to the hypothesis that the consumption of raw or unprocessed cow's milk contributes to lowered prevalence of allergies. Thermal pasteurization of bovine milk can result in denaturation of minor whey proteins and loss of their bioactivity. Denaturation of bovine serum albumin (BSA), immunoglobulin G (IgG) and lactoferrin (LF) in skim milk was studied under different temperature (72, 75 or 78 °C) and time (0-300 s) combinations. Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) results revealed that denaturation of all 3 proteins occurred at 72 °C and progressed with increase in temperature and holding time. About 59% of LF and 12% of IgG denatured under high-temperature short-time (72°C/ 15 s) pasteurization, while BSA was least impacted. To assess modulation of milk immunogenicity, secretion of selected T helper (Th)-type cytokines by human peripheral blood mononuclear cells (PBMCs) was studied *in vitro* in response to different concentrations of BSA (0.4-1.0 mg mL<sup>-1</sup>) and IgG (0.8-1.6 mg mL<sup>-1</sup>) in unheated skim milk. Addition of IgG at 1.6 mg mL<sup>-1</sup> induced a prominent Th1-skewed cytokine profile that may not trigger a Th2-skewed allergic reaction. BSA did not appear to modulate milk immunogenicity to any significant extent.

**Changes in the chemical and *in-vitro* antihypertensive properties of sweet whey obtained from miniature fresh, Chanco and Gouda-style model cheeses**

Josemaría Godoy, Marie Peslerbes, Stefanie Vyhmeister, Einar Vargas-Bello-Pérez, María Angélica Fellenberg and Rodrigo A Ibáñez

**Chile, Denmark and USA**

**Abstract**

This Technical Research Communication evaluated the influence of various cheese manufacture methods on the composition and *in vitro* antihypertensive activity of sweet whey samples obtained

from miniature models for fresh, Chanco and Gouda-style cheese processing using bulk-tank milks throughout a year. Raw milks from morning milking were standardised, pasteurised and used to obtain sweet whey using cheesemaking protocols for each variety on 200 g scale, as well the use of whey dilution at levels of 0, 15, 30 and 45% in Chanco and Gouda-style making. The composition of sweet whey obtained within each cheesemaking variety was similar among different timepoints of the year ( $P > 0.05$ ), which was attributed to similar composition of milks and the use standardised cheesemaking protocols used for this study. As expected, the use of whey dilution led to sweet whey samples with reduced levels of total solids ( $P < 0.05$ ), but they exhibited an improvement of the *in vitro* antihypertensive properties, which may be attributed to the formation of low-molecular weight bioactive peptides due to increased cheese making times. The results of this study suggest that modifying cheese manufacture protocols may have a direct impact on the bioactive properties of sweet whey. Future work will be required to identify and evaluate the feasibility to purify bioactive peptides obtained from sweet whey.

### **Application of batch system ultraviolet light on the surface of kashar cheese, a kind of pasta-filata cheese: Effects on mould inactivation, lipid oxidation, colour, hardness and sensory properties**

Nurcan Koca and Müge Urgan Öztürk

**Turkey**

#### **Abstract**

This research paper addresses the hypothesis that the application of ultraviolet (UV) light before packaging of pasta-filata cheese has the potential to eliminate or control post-processing contamination whilst maintaining chemical and sensorial quality. The surfaces of kashar cheese were treated at different doses of UV light (0.32-9.63 kJ/m<sup>2</sup>) in a batch UV cabinet system to determine effects on physicochemical and sensorial quality as well as mould inactivation. Untreated cheese samples were also used for comparison. Kashar cheese was naturally contaminated in a mouldy environment to provide the desired mould numbers before UV treatments. Log reductions of 0.34, 0.69 and 2.49 were achieved in samples treated at doses of 0.32, 0.96 and 1.93 kJ/m<sup>2</sup>, respectively and the mould count of sample treated at 9.63 kJ/m<sup>2</sup> was below the detection limit. We found no significant differences in composition and hardness values between any of the treated or control cheeses. Although some individual colour values increased as the UV doses increased, this change was not observed visually in sensory analysis. Increased light intensity accelerated the lipid oxidation causing a perception of off-flavour. The results of this study show that it is necessary to examine the relationship between the oxidative and sensory interactions while determining the effective doses applied to cheese surface for microbial inactivation.

### **Dietary phytanic acid-induced changes in tissue fatty acid profiles in mice**

Tomonori Nakanishi, Kazuhiro Kagamizono, Sayaka Yokoyama, Ryoji Suzuki, Hiroyuki Sakakibara, Kazuhiro Sugamoto, Laurie Erickson and Satoshi Kawahara

**Japan and USA**

#### **Abstract**

The aims of this research communication were to investigate the *in vivo* tissue accumulation of phytanic acid (PA) and any changes in the tissue fatty acid profiles in mice. Previous *in vitro* studies have demonstrated that PA is a milk component with the potential to cause both beneficial effects

on lipid and glucose metabolism and detrimental effects on neuronal cells. However, there is limited information about its *in vivo* actions. In this study, mice were fed diets containing either 0.00% or 0.05% 3*RS*, 7*R*, 11*R*-PA, which is the isomer found in milk and the human body. After 4 weeks, adipose tissue, liver and brain were harvested and their fatty acid profiles were determined by gas chromatographic analysis. The results showed that PA and its metabolite pristanic acid accumulated in the adipose tissue of PA-fed mice, and that dietary PA decreased the hepatic compositions of several saturated fatty acids such as palmitic acid while increasing the compositions of polyunsaturated fatty acids including linoleic acid and docosahexaenoic acid. However, dietary PA neither accumulated nor had a high impact on the fatty acid profile in the brain. These results suggested that dietary PA could exert its biological activities in adipose tissue and liver, although the brain is relatively less affected by dietary PA. These data provide a basis for understanding the *in vivo* physiological actions of PA.

### **Effects of high and low frequency ultrasound on the production of volatile compounds in milk and milk products – A review**

Anh Thi Hong Bui, Daniel Cozzolino, Bogdan Zisu and Jayani Chandrapala

**Australia**

#### **Abstract**

The effects of low and high frequency ultrasound on the production of volatile compounds along with their derivation and corresponding off-flavours in milk and milk products are discussed in this review. The review will simultaneously discuss possible mechanisms of applied ultrasound and their respective chemical and physical effects on milk components in relation to the production of volatile compounds. Ultrasound offers potential benefits in dairy applications over conventional heat treatment processes. Physical effects enhance the positive alteration of the physicochemical properties of milk proteins and fat. However, chemical effects propagated by free radical generation cause redox oxidations which in turn produce undesirable volatile compounds such as aldehydes, ketones, acids, esters, alcohols and sulphur, producing off-flavours. The extent of volatile compounds produced depends on ultrasonic processing conditions such as sonication time, temperature and frequency. Low frequency ultrasound limits free radical formation and results in few volatile compounds, while high ultrasonic frequency induces greater level of free radical formation. Furthermore, the compositional variations in terms of milk proteins and fat within the milk systems influence the production of volatile compounds. These factors could be controlled and optimized to reduce the production of undesirable volatiles, eliminate off-flavours, and promote the application of ultrasound technology in the dairy field.