

## COLLECTED ABSTRACTS

### Editorial: Impact beyond data

Chris Knight

UK

### Research Reflection: Challenges and opportunities for quantifying greenhouse gas emissions through dairy cattle research in developing countries

Sineka Hansani Munidasa, Richard Eckard, Xuezhao Sun, Brendan Cullen, David McGill, Deli Chen and Long Cheng

Australia and China

#### Abstract

The global dairy sector is facing the challenge of reducing greenhouse gas (GHG) emissions whilst increasing productivity to feed a growing population. Despite the importance of this challenge, many developing countries do not have the required resources, specifically funding, expertise and facilities, for quantifying GHG emissions from dairy production and research. This paper aims to address this challenge by discussing the magnitude of the issue, potential mitigation approaches and benefits in quantifying GHG emissions in a developing country context. Further, the paper explores the opportunities for developing country dairy scientists to leverage resources from developed countries, such as using existing relevant GHG emission estimation models. It is clear that further research is required to support developing countries to quantify and understand GHG emissions from dairy production, as it brings significant benefits including helping to identify and implement appropriate mitigation strategies for local production systems, trading carbon credits and achieving the nationally determined contribution obligations of the Paris Agreement.

### The role of the European small ruminant dairy sector in stabilising global temperatures: lessons from GWP\* warming-equivalent emission metrics

Agustin del Prado, Pablo Manzano and Guillermo Pardo

Spain and Finland

#### Abstract

Recent calls advocate that a huge reduction in the consumption of animal products (including dairy) is essential to mitigate climate change and stabilise global warming below the 1.5° and 2°C targets. The Paris Agreement states that to stabilise temperatures we must reach a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases (GHG) in the second half of this century. Consequently, many countries have adopted overall GHG reduction targets (eg EU, at least 40% by 2030 compared to 1990). However, using conventional metric-equivalent emissions (CO<sub>2</sub>-e GWP<sub>100</sub>) as the basis to account for emissions does not result in capturing the effect on atmospheric warming of changing emission rates from short-lived GHG (eg methane: CH<sub>4</sub>),

which are the main source of GHG emissions by small ruminants. This shortcoming could be solved by using warming-equivalent emissions (CO<sub>2</sub>-we, GWP\*), which can accurately link annual GHG emission rates to its warming effect in the atmosphere. In our study, using this GWP\* methodology and different modelling approaches, we first examined the historical (1990-2018) contribution of European dairy small ruminant systems to additional atmosphere warming levels and then studied different emission target scenarios for 2100. These scenarios allow us to envision the necessary reduction of GHG emissions from Europe's dairy small ruminants to achieve a stable impact on global temperatures, ie to be climatically neutral. Our analysis showed that, using this type of approach, the whole European sheep and goat dairy sector seems not to have contributed to additional warming in the period 1990-2018. Considering each subsector separately, increases in dairy goat production has led to some level of additional warming into the atmosphere, but these have been compensated by larger emission reductions in the dairy sheep sector. The estimations of warming for future scenarios suggest that to achieve climate neutrality, understood as not adding additional warming to the atmosphere, modest GHG reductions of sheep and goat GHG would be required (eg via feed additives). This reduction would be even lower if potential soil organic carbon (SOC) from associated pastures is considered.

### **Genotype by environment interaction for fat and protein yields via reaction norms in Holstein cattle of southern Brazil**

Henrique Alberto Mulim, Paulo Luiz Souza Carneiro, Carlos Henrique Mendes Malhado, Luís Fernando Batista Pinto, Gerson Barreto Mourão, Altair Antônio Valloto and Victor Breno Pedrosa  
**Brazil**

#### **Abstract**

Our objective was to evaluate the genetic merit of Holstein cattle population in southern Brazil in response to variations in the regional temperature by analyzing the genotype by environment interaction using reaction norms. Fat yield (FY) and protein yield (PY) data of 67,360 primiparous cows were obtained from the database of the Paraná Holstein Breeders Association, Brazil (APCBRH). The regional average annual temperature was used as the environmental variable. A random regression model was adopted applying mixed models with Restricted Maximum Likelihood (REML) algorithm using WOMBAT software. The genetic merit of the 15 most representative bulls, depending on the temperature gradient, was evaluated. Heritability ranged from 0.21 to 0.27 for FY and from 0.14 to 0.20 for PY. The genetic correlation observed among the environmental gradients proved to be higher than 0.80 for both traits. Slight reranking of bulls for both traits was detected, demonstrating that non-relevant genotype by environment interaction for FY and PY were observed. Consequently, no inclusion of the temperature effect in the model of genetic evaluation in southern Brazilian Holstein breed is required.

### **Yield gap in milk production is considerable in Indian Himalayan state of Meghalaya**

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**India**

#### **Abstract**

Yield gaps in milk production are here defined as the differential between the actual yield obtained by the dairy farmer and the potential farm yield (production achieved by the top 10% of farmers: Gap 2) as well as the differential between this potential farm yield and the yield registered in the research stations (Gap 1). Assessment of yield gaps provides valuable information on potential production enhancement and drivers. Milk production can be increased by narrowing the predominant large yield gaps in resource-poor smallholder farming system. Hence, this study assessed the milk yield gap and factors affecting the yield gap in Ri-Bhoi district of Meghalaya, a state located in the north-eastern Himalayan region of India. This research paper provides a scope for exploring the possibilities for improving dairy production in the state as well as contributing to literature through incorporating crucial determinants responsible for milk yield gap. A sample of 81 respondents was drawn purposely from two blocks of the district. The results indicated that the average number of cattle per household was 9.38 in standard animal units. The total yield gap was estimated at 6.20L (91.06%) per day, composed of 0.80L (11.76%) per day of yield gap I and 5.40L (79.30%) per day of yield gap II. This demonstrates that the top performing farms were achieving a production level not dissimilar to that obtained on the research stations, but many were doing far less well. The size of cattle shed, dairy farming experience, concentrate price and human labour were the important determinants of the yield gap. Hence, encouraging the right stocking density of cattle, training on the preparations of home-made concentrates, access to cheap and quality concentrates, incorporating training and experience sharing on proper dairy management practices and use of technology could benefit the dairy farmers of the region.

### **Effects of full-time vs. part-time grazing on seasonal changes in milk coagulation properties and fatty acid composition**

Franziska S. Akert, Michael Kreuzer, Carmen Kunz, Beat Reidy and Joel Berard

**Switzerland**

#### **Abstract**

For this research communication our objective was to investigate to what extent milk coagulation properties and milk fatty acid (FA) composition were affected by different feeding systems, season and their interaction. Eighteen cows in total were subjected to one of three different feeding system treatments: full-time grazing or part-time grazing combined with indoor feeding of fresh grass with low or high concentrate supplementation. Milk was sampled in spring, summer and autumn. Milk coagulation time was 15.0, 19.0 and 17.7 min, coagulation dynamics 1.67, 3.41 and 1.79 min, and curd firmness 52.7, 32.4 and 47.0 mm in spring, summer and autumn, respectively. Thus, milk coagulation properties of the milk were lower during summer. There were strong seasonal effects on milk FA proportions, but there were not always changes with progressing season, or changes were different with respect to the impact of the feeding systems (system × season interaction). The milk fat was favourably rich in oleic acid, conjugated linoleic acid and  $\alpha$ -linolenic acid and had a low n-6/n-3 fatty acid ratio in all systems. Factors like seasonal variations in grass composition and the energy balance of the cows were considered relevant for the milk FA composition. Overall, seasonal variations in milk quality were less pronounced with part-time grazing with fresh grass indoors as compared to full-time grazing without concentrate.

## The effect of cereal type and $\alpha$ -tocopherol supplementation on selective quality and processability parameters of milk from late lactation grazing dairy cows.

Zoe C. McKay, Michael O' Sullivan, Mary B. Lynch, Finbar J. Mulligan, Lu. Ma, Gaurav Rajauria and Karina M. Pierce

**Ireland and China**

### Abstract

This research communication addressed the hypothesis that late lactation cows offered an oat-grain-based supplement or a high level of  $\alpha$ -TOC supplementation at pasture would have improved milk composition and processability. Over a grazing period of 49 d, 48 Holstein Friesian dairy cows were randomly assigned to one of four dietary treatments. The dietary treatments were: control, pasture only (**CTRL**), pasture + 2.65 kg DM barley-based concentrate + 350 IU  $\alpha$ -TOC/kg (**BARLO**), pasture + 2.65 kg DM oat-based concentrate + 350 IU  $\alpha$ -TOC/kg (**OATLO**) and pasture + 2.65 kg DM oat-based concentrate + 1050 IU  $\alpha$ -TOC/kg (**OATHI**). Within this randomised complete block design experiment cows were blocked on days in milk (DIM) and balanced for parity, milky yield and composition. Rennet coagulation time (RCT) was reduced in milk from cows offered OATHI compared to CTRL cows and OATLO. Concentration of conjugated linoleic acid (CLA) was increased by OATHI compared to OATLO and in OATLO compared to CTRL. Supplementation with OATHI reduced individual saturated fatty acids (SFAs) in milk compared to OATLO. In conclusion, supplementing grazing dairy cows with an oat-based supplement improved total milk CLA concentration compared to pasture only. Offering a high level of  $\alpha$ -TOC (2931 IU/d) to dairy cows reduced RCT, individual SFA and increased total CLA concentration of milk compared to a lower  $\alpha$ -TOC level (738 IU  $\alpha$ -TOC/d).

## Evaluation of different acute-phase proteins for herd health diagnostics in early postpartum Holstein-Friesian dairy cows

Ruth Schmitt, Laura Pieper, L. Antonio Gonzalez-Grajales, Jantijn Swinkels, Carl-Christian Gelfert and Rudolf Staufenbiel

**Germany, The Netherlands and Austria**

### Abstract

This research communication describes 1) the comparison of acute-phase protein (APP) concentrations in transition dairy cows on different farms using both pooled and individual blood samples, and 2) the association among different APP and clinical health parameters.

The first hypothesis was that early postpartum dairy cows from different farms differ in the level of inflammation, which might be determined using APP assays in both pooled and individual blood samples. The second hypothesis was that the APP haptoglobin (Hp) might be the most sensitive parameter to detect cows at risk of excessive postpartum inflammation concomitant with systemic disease. Serum concentrations of Hp, serum amyloid-A (SAA), total protein (TP), albumin (Alb), coaguloplasmin (Cp) and C-reactive protein (CRP) in 100 fresh lactating cows (within 0 - 8 days postpartum) from 10 farms were compared and associated to clinical health parameters (rectal body temperature, vaginal discharge (Metricheck™ score), rumen fill, vulvovaginal laceration) using both pooled and individual blood samples. Mean serum concentrations of Hp, SAA and TP revealed significant differences among farms. Pooled serum samples of farms showed high correlations with

the mean of individual samples. Only Hp was significantly positively correlated to both body temperature and Metrichick™ score. In conclusion, Hp differentiates dairy farms regarding the inflammatory state of transition cows using individual and pooled serum samples within the first week postpartum. It also mirrors the individual degree of inflammation, thus proving to be a diagnostic parameter of high interest during the periparturient period.

### **Comparison between two preventive treatments for hyperketonemia carried out pre-partum: effects on non-esterified fatty acids, $\beta$ -hydroxybutyrate and some biochemical parameters during peripartum and early lactation**

Enrico Fiore, Laura Perillo, Matteo Giancesella, Claudia Giannetto, Elisabetta Giudice, Giuseppe Piccione and Massimo Morgante

**Italy**

#### **Abstract**

The objective of this study was to compare the effect of two different preventive protocols, on serum  $\beta$ -hydroxybutyrate (BHB) concentration and liver health indices pre-partum and during early-lactation in high-yielding Holstein dairy cows. One hundred cows were randomly divided into three groups: control group (CTRL, n=20, without preventive treatment), second group (SUPP, n=40 animals treated with a compound based on acetyl-methionine, inositol, cyanocobalamin, l-alanine, l-arginine, l-threonine, l-glutamic acid supplementation and  $\alpha$ -lipoic acid) and third group (MON, n=40 animals treated with monensin). Blood samples were collected from all cows at on 3 occasions pre-partum and 3 occasions post-partum. Body condition (BCS) score was evaluated and glucose, non-esterified fatty acids (NEFA), BHB, triglycerides, total cholesterol, alanine aminotransferase (ALT), aspartate aminotransferase (AST),  $\gamma$ -glutamyltransferase (GGT), total bilirubin, total proteins, globulins, albumin and urea concentrations were assessed. Two-way repeated measures analysis of variance was applied. Statistically significant differences among the three experimental groups were found in the values of all studied parameters ( $P<0.05$ ). Our results confirm the established beneficial effect of MON treatment in decreasing BHB levels and increasing glucose availability after calving. Serum biochemical analysis revealed the expected post-partum alterations attributable to adaptations that influenced the metabolism and liver function in CTRL, whereas these alterations were reduced or absent in SUPP and MON. Results from the present study suggest that both preventive protocols, but in particular SUPP, could positively affect selected indicators of energy metabolism reducing the risk of hyperketonaemia and increase of liver function in Holstein dairy cows, both pre- and post-partum.

### **Effect of grouping on behaviour of dairy heifers and cows in the transition period**

Maria Soonberg, Marko Kass, Tanel Kaart, Rosie Barraclough, Marie J. Haskell and David R. Arney

**Estonia and UK**

#### **Abstract**

Regrouping dairy cows is a common feature of dairy farm management. Cows are grouped based on lactation stage, age, milk yield and other factors. Regrouping cows during the dry period (from far-off area to close up area and from close up area to the main herd) brings new challenges. This is

especially true for heifers who, after being confirmed gravid, may be grouped into a new pen with dried off cows. The aims of this study were to determine how grouping affects activity, nearest neighbour relationships and aggression, and how heifers' acclimatisation to a new group differs from cows. Therefore, the hypotheses were that regrouping cows has less of an effect on older cows compared to heifers, and cows' individuality affects acclimatization to a new group. Aggression data were recorded using a video camera that was directed at the feed bunk, and activity was recorded with activity monitors that were attached around the right hind leg. Synchrony and distance to nearest neighbour were recorded, as was the cows' location on the first three days from the day they returned to the main herd. Motion index, mean number of steps and number of lying bouts were significantly higher after calving compared to the week before calving and the difference was higher amongst heifers compared to cows ( $p < 0.001$ ). Both cows and heifers lay down more in the strawyard compared to cubicle housing ( $p < 0.01$ ) and cows were more aggressive than heifers in both housing systems ( $p < 0.001$  and  $p < 0.05$ , respectively). As hypothesized, heifers were more affected by regrouping and cows with more experience settled quicker to their new environment.

### **Investigating cow-calf contact in cow-driven systems: Behaviour of the dairy cow and calf**

Julie Føske Johnsen, Juni Rosann Engelién Johanssen, Anna Vøien Aaby, Stine Grønmo Kischel, Lars Erik Ruud, Augustin Soki-Makilutila, Therese Bjørklund Kristiansen, Anne Gladsø Wibe, Knut Egil Bøe and Sabine Ferneborg

**Norway**

#### **Abstract**

Research is needed on how technology can facilitate cow-calf contact (CCC). This research communication describes the behaviour of dairy cow-calf pairs in two cow-driven CCC-systems differing in cows' access to the calves through computer-controlled access gates (smart gates, SG). Specifically, cow traffic through SG when visiting their calves, allogrooming, suckling and cross-suckling, cows' eating and resting behaviour and finally vocal response to separation were assessed. After three d in an individual calving pen, pairs ( $n=8$ ) were moved to the CCC compartment with a cow area, a calf creep and a meeting area. During the next 31 d calves could suckle the cows whenever they visited the meeting area (suckling phase). Cows had free (group 1,  $n=4$  pairs) or restricted access to the calves based on previous activity in the automatic milking system (group 2,  $n=4$  pairs). SG's controlled cow traffic between the meeting area and the cow area, in which the cows could access resources such as feed, cubicles, and the automatic milking system. Following the suckling phase cow access into the meeting area was gradually decreased over 9 d (separation phase). During the suckling phase, cows paid frequent and short visits to their calves. Pairs spent in total approximately one h/d suckling and allogrooming. However, the duration and frequencies of these events varied among pairs and groups, as did the vocal response to separation. Restricted access- cows performed more (unrewarded) attempts to visit the calves who cross-suckled more. Collectively, free access to the calves may have been more intuitive and welfare friendly. Although a low sample size limits interpretation beyond description and enabling hypothesis formulation for future research, the results indicate that the cow is motivated to visit her calf, albeit through a SG, thus facilitating particular behaviours for which cow-calf pairs are highly motivated.

## Investigating cow-calf contact in a cow-driven system: Performance of cow and calf

Julie Føske Johnsen, Stine Grønmo Kischel, Maren Sætervik Rognskog, Inga Vagle, Juni Rosann Engelién Johanssen, Lars Erik Ruud and Sabine Ferneborg

Norway

### Abstract

In this research communication we describe the performance of dairy cow-calf pairs in two cow-driven CCC-systems differing in cows' access to the calves through computer-controlled access gates (smart gates, SG). We investigated cows' machine milk yield in the automatic milking system (AMS), calf growth, and intake of supplemental milk and concentrate. Two groups each with four cow-calf pairs were housed in a system with a cow area, a calf creep and a meeting area. SG's controlled cow traffic between the meeting area and the cow area where cows could obtain feed, cubicles and the AMS. Calves had *ad libitum* access to supplemental milk and concentrate. During the suckling phase of 31 d, cow access to the meeting area was free 24 h/d (group 1) or restricted (group 2) based on milking permission. Following the suckling phase, cow access was gradually decreased over 9 d (separation phase). During the suckling phase, cows' machine milk yield (mean  $\pm$  SD) in the AMS was  $11.4 \pm 6.38$  kg/d. In the separation phase, the yield increased to  $25.0 \pm 10.37$  kg/d. Calf average daily gain (ADG) was high during the suckling phase:  $1.2 \pm 0.74$  kg. During the separation phase, ADG decreased to  $0.4 \pm 0.72$  kg which may be related to a low intake of supplemental milk. Calves' concentrate intake increased with age, and all calves consumed  $>1$  kg/d after separation. We conclude that cows nurse the calf in a cow-directed CCC system well resulting in high ADG, and AMS milk yields were, at least, partially maintained during the suckling phase. Although the AMS yields increased in response to separation, calf ADG was decreased. A low sample size limits interpretation beyond description but provides a basis for hypotheses regarding future research into CCC-systems.

## Measuring the impact of bovine digital dermatitis research on knowledge and practice of biosecurity during cattle foot-trimming.

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UK

### Abstract

This research communication reports the results from questionnaires used to identify the impact of recent research into the disinfection of cattle foot-trimming equipment to prevent bovine digital dermatitis (BDD) transmission on a) biosecurity knowledge and b) hygiene practice of foot health professionals. An initial questionnaire found that more than half of participating farmers, veterinary surgeons and commercial foot-trimmers were not considering hand or hoof-knife hygiene in their working practices. The following year, after the release of a foot-trimming hygiene protocol and a comprehensive knowledge exchange programme by the University of Liverpool, a second survey showed 36/80 (45.0%) farmers, veterinary surgeons and commercial foot-trimmers sampled considered they were now more aware of the risk of spreading BDD during foot-trimming. Furthermore, 36/80 (45.0%) had enhanced their hygiene practice in the last year, impacting an estimated 1383 farms and 5130 cows trimmed each week. Participants who reported having seen both the foot-trimming hygiene protocol we developed with AHDB Dairy and other articles about foot-trimming hygiene in the farming and veterinary press, were significantly more likely to have

changed their working practices. Difficulties accessing water and cleaning facilities on farms were identified as the greatest barrier to improving biosecurity practices. Participants' preferred priority for future research was continued collection of evidence for the importance and efficacy of good foot-trimming hygiene practices.

### **Efficacy of *Panax ginseng* extract combined with cephalexin as a dry cow therapy**

Camila Beccaria, Celina Baravalle, Paula Silvestrini, María S. Renna, Ana I. Molineri, Marcelo L. Signorini, Verónica E. Neder, Guillermo A. Suarez Archilla, Luis F. Calvino and Bibiana E. Dallard  
**Argentina**

#### **Abstract**

Our objective was to evaluate the efficacy of intramammary administration, at drying-off, of a *Panax ginseng* extract (PGe) combined with cephalexin (Ceph) on the post-calving bacteriological cure rate of pre-existing intramammary infections (IMI) and on the occurrence of new IMI during the dry period. In addition, milk yield and somatic cell count (SCC) in the post-treatment lactation were evaluated. One hundred and eight late-lactation cows were randomly divided into two experimental groups and were treated at drying-off with Ceph alone or PGe combined with Ceph. Cure rates for IMI present at drying-off were similar for both treatments (OR=0.95, 95% CI=0.33-2.74). Cure rates for *Staphylococcus aureus* were lower (OR=15.4, 95% CI=1.66-142.52) in quarters treated with PGe + Ceph than in those treated with Ceph alone. Intramammary infusion of PGe + Ceph at drying-off had no effect on preventing new dry period IMI (OR=0.75, 95% CI=0.38-1.51), compared with infusion of Ceph alone. Milk production and SCC in the ensuing lactation were not affected by PGe + Ceph treatment. In conclusion, addition of PGe to dry cow therapy did not show any advantage over the use of dry cow therapy alone.

### **Somatic cell count in buffalo milk using fuzzy clustering and image processing techniques**

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**Brazil**

#### **Abstract**

This research communication presents an automatic method for the counting of somatic cells in buffalo milk, which includes the application of a fuzzy clustering method and image processing techniques (somatic cell count with fuzzy clustering and image processing|, SCCFCI). Somatic cell count (SCC) in milk is the main biomarker for assessing milk quality and it is traditionally performed by exhaustive methods consisting of the visual observation of cells in milk smears through a microscope, which generates uncertainties associated with human interpretation. Unlike other similar works, the proposed method applies the Fuzzy C-Means (FCM) method as a preprocessing step in order to separate the images (objects) of the cells into clusters according to the color intensity. This contributes significantly to the performance of the subsequent processing steps (thresholding, segmentation and recognition/identification). Two methods of thresholding were evaluated and the Watershed Transform was used for the identification and separation of nearby cells. A detailed statistical analysis of the results showed that the SCCFCI method is able to provide



results which are consistent with those obtained by conventional counting. This method therefore represents a viable alternative for quality control in buffalo milk production.

### **Transcripts and protein levels of *CSN1S1* and *CSN3* genes in dairy cattle mammary gland secretory tissue during chronic staphylococcal infection**

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**Poland**

#### **Abstract**

The objective of the work described in this research communication was to determine the influence of chronic coagulase-positive staphylococci (CoPS) or coagulase-negative staphylococci (CoNS) infection on the mRNA and protein levels of two main milk proteins responsible for cheese curd quantity and quality, alpha-S1-casein (*CSN1S1*) and kappa-casein (*CSN3*). Measurements were made in cow mammary parenchyma with a prevalence of secretory tissue (MGST). Samples of MGST were collected from the separate quarters and divided into CoPS, CoNS and bacteria-free (H) groups according to the microbiological status of the quarter milk. No differences in *CSN1S1* and *CSN3* mRNA level were found between groups, however, *CSN1S1* protein level was significantly higher in the H group than the CoNS group, and *CSN3* protein level was significantly higher in H than CoPS group. Hence, while the *CSN1S1* and *CSN3* genes appear to be constitutively expressed at the mRNA level in dairy cow MGST, CoNS infection negatively affected *CSN1S1* protein level, and CoPS infection negatively affected *CSN3* protein level. The lack of change at the mRNA level suggests that staphylococcal infection may affect the post-transcriptional or post-translational modifications.

### **Phylogenetic genotyping, virulence genes and antimicrobial susceptibility of *Escherichia coli* isolates from cases of bovine mastitis**

Nashmil Aslam, Saeed-Ul-Hassan Khan, Tahir Usman and Tariq Ali

**Pakistan and China**

#### **Abstract**

The study described in this research communication used phylogenetic genotyping to identify virulence genes and antimicrobial susceptibility in *Escherichia coli* recovered from cases of bovine mastitis. From 385 mastitic milk samples, 30 (7.8%) isolates were confirmed as *E. coli*. Most isolates (80%) belonged to phylo-group A. These 30 *E. coli* isolates were also screened for 11 different virulence genes. The majority of isolates (63%) harbored no virulence gene. Only 11 (37%) isolates tested positive for two virulence genes, either the iron uptake gene *iucD* in 3 (10%) isolates or the serum resistance gene *traT* in 2 (7%) isolates or both *traT* and *iucD* in 6 (20%) isolates. The *E. coli* isolates showed highest susceptibility to gentamicin, meropenem, and piperacillin. Most isolates were resistant to ampicillin, cefotaxime and streptomycin. This study suggests that mastitis causing *E. coli* might originate from commensal bacteria and that the presence of these virulence genes, common in extra-intestinal pathogenic *E. coli* (ExPEC) strains could be attributed to high genetic variability of mastitis-causing *E. coli*.

## Influence of nutrient availability on *in vitro* growth of major bovine mastitis pathogens

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Switzerland

### Abstract

The aim of the present study was to investigate the effects of milk composition changes on the *in vitro* growth of bovine mastitis pathogens. Nutritional requirements of three major bovine mastitis pathogens *Escherichia coli* (*E. coli*), *Staphylococcus aureus* (*S. aureus*), and *Streptococcus uberis* (*S. uberis*) were investigated *in vitro*. We used ultra-high temperature (UHT) treated milk with different contents of fat, protein, and carbohydrates to test the influence of the availability of various milk constituents on pathogen growth characteristics. Additionally, the bacterial growth was investigated under experimentally modified nutrient availability by dilution and subsequent supplementation with individual nutrients (carbohydrates, different nitrogen sources, minerals, and different types of B vitamins) either to milk or to a conventional medium (thioglycolate broth, TB). Varying contents of fat, protein or lactose did not affect bacterial growth with the exception of growth of *S. uberis* being promoted in protein-enriched milk. The addition of nutrients to diluted whole milk and TB partly revealed different effects, indicating that there are media-specific growth limiting factors after dilution. Supplementation of minerals to diluted milk did not affect growth rates of all studied bacteria. Bacterial growth in diluted whole milk was decreased by the addition of high concentrations of amino acids in *S. aureus*, and by urea and additional B vitamins in *E. coli* and *S. aureus*. The growth rate of *S. uberis* was increased by the addition of B vitamins to diluted whole milk. The present results demonstrate that growth-limiting nutrients differ among pathogen types. Because reduced bacterial growth was only shown in diluted milk or TB, it is unlikely that alterations in nutrient availability occurring as a consequence of physiological changes of milk composition in the cow's udder would directly affect the susceptibility or course of bovine mastitis.

## Factors influencing milk osteopontin concentration based on measurements from Danish Holstein cows

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Denmark

### Abstract

Our objective was to determine the content of the bioactive protein osteopontin (OPN) in bovine milk and identify factors influencing its concentration. OPN is expressed in many tissues and body fluids, with by far the highest concentrations in milk. OPN plays a role in immunological and developmental processes and it has been associated with several milk production traits and lactation persistency in cows. In the present study, we report the development of an enzyme linked immunosorbent assay (ELISA) for measurement of OPN in bovine milk. The method was used to determine the concentration of OPN in milk from 661 individual Danish Holstein cows. The median OPN level was determined to 21.9 mg/L with a pronounced level of individual variation ranging from 0.4 mg/L to 67.8 mg/L. Breeding for increased OPN in cow's milk is of significant interest, however,

the heritability of OPN in milk was found to be relatively low, with an estimated value of 0.19 in the current dataset. The variation explained by the herd was also found to be low suggesting that OPN levels are not affected by farm management or feeding. Interestingly, the concentration of OPN was found to increase with days in milk and to decrease with parity.

### **Quality assessment of artisanal cheeses in the northwest region of Paraná**

Ana Carolina B. Castilho, Ana Paula Stafussa, Jéssica Caroline B. Ribeiro, Magali S. dos Santos Pozza, Hélène Tormo and Grasiela S. Madrona

**Brazil and France**

#### **Abstract**

Artisanal unripened cheeses produced in northwestern Paraná, Brazil, were studied for microbiological quality and sensory quality. The cheeses analyzed showed high counts of aerobic mesophilic microorganisms and *S. aureus*. However, even with the results showing poor microbiological quality, from a sensory point of view, consumers considered cheeses acceptable (high acceptance index). The results may indicate that there is still a lack of training and knowledge of production procedures to reduce microbiological contamination of artisanal cheese produced in northwestern Paraná.

### **Probiotic Greek yogurt: effect of the addition of prebiotic fat substitutes on the physicochemical characteristics, probiotic survival, and sensory acceptance**

Sofia Sestito Dias, Damarys de Souza Vergílio, Arthur Marroni Pereira, Suellen Jensen Klososki, Vanessa Aparecida Marcolino, Rayane Monique Sete da Cruz, Giselle Nobre Costa, Carlos Eduardo Barão and Tatiana Colombo Pimentel

**Brazil**

#### **Abstract**

In this research communication we evaluate the impact of the addition of prebiotic components (inulin, polydextrose, and modified starch, 40 g/L) as fat substitutes on the physicochemical characteristics, probiotic survival, and sensory acceptance of probiotic (*Lactocaseibacillus casei* 01,  $10^8$  CFU/mL) Greek yogurts during storage (7 °C, 28 days). All formulations had probiotic counts higher than  $10^7$  CFU/mL during storage and simulated gastrointestinal conditions (SGIC). The prebiotic components increased the probiotic survival to the enteric phase of the SGIC, with inulin producing the most pronounced effect. Inulin addition resulted in products with lower pH values and consistency and higher titratable acidity during storage, with negative impact on the sensory acceptance (flavor, texture, and overall impression) at the end of the storage period. Modified starch addition impacted negatively on the acceptance of the products (appearance, flavor, texture, and overall impression). Polydextrose addition resulted in products with lower consistency, but similar sensory acceptance to the full-fat yogurt. It can be concluded that it is possible to prepare potentially synbiotic Greek yogurts by desorption technique using *L. casei* as probiotic culture and inulin, polydextrose or modified starch as prebiotic components, with the utilization of polydextrose being advisable.

## **Invited Review: Milk fat globule membrane in infant nutrition: A dairy industry perspective**

Roberta Claro da Silva, Heather L. Colleran and Salam A. Ibrahim

**USA**

### **Abstract**

This review provides an overview of the composition, structure, and biological activities of milk fat globule membrane (MFGM) compounds with focus on the future application of this compound as a food ingredient. MFGM is a particular component of mammalian milks and is comprised of a tri-layer of polar lipids, glycolipids and proteins. In recent years, MFGM has been extensively studied for the purpose of enhancing the efficacy of infant nutrition formula. For example, infant formulas supplemented with bovine MFGM have shown promising results with regard to neurodevelopment and defense against infections. Components of MFGM have been shown to present several health benefits as the proteins of the membrane have shown antiviral activity and a reduction in the incidence of diarrhea. Moreover, the presence of sphingomyelin, a phospholipid, implies beneficial effects on human health such as enhanced neuronal development in infants and the protection of neonates from bacterial infections. The development of a lipid that is similar to human milk fat would represent a significant advance for the infant formula industry and would offer high technology formulas for those infants that depend on infant formula. The complexity of the structure of MFGM and its nutritional and technological properties is critically examined in this review with a focus on issues relevant to the dairy industry.