

**Editorial: Scholarly progression**

Christopher H Knight

UK

**Zoonotic risks of pathogens from dairy cattle and their milk borne transmission.**

Menno Holzhauer and Gerrit Jan Wennink

The Netherlands

**Abstract**

Dairy products are major sources of high-quality protein and bioavailable nutrients and dairy production contributes to local, regional and national-level economies. Consumption of raw milk and raw milk products does, however, carry a zoonotic risk, as does direct contact with cattle by farm husbandry staff and other employees. This review will mainly focus on the latter, and deal with it from the standpoint of a well-developed dairy industry, using the example of the Netherlands. With regard to dairy cattle, the main bacterial pathogens are *Salmonella spp.*, *Listeria monocytogenes* and *Leptospira hardjo* as well as *Brucella abortus* and *Chlamydia abortus*. The main viral pathogens associated with dairy are Rift Valley fever virus, rabies virus, cowpox virus and vaccinia virus. The main parasitological infections are *Echinococcus granulosus*, *Cryptosporidium parvum* and *Giardia duodenalis*, however, the last mentioned have mainly swimming pools as sources of human infection. Finally ectoparasites such as lice and mites and *Trichophyton verrucosum* may affect employees. Some pathogens may cause health problems due to contamination. Bacterial pathogens of importance that may contaminate milk are *Campylobacter jejuni*, *Escherichia coli*, *Mycobacterium avium subsp. paratuberculosis*, *Leptospira hardjo* and *Salmonella typhimurium*. Excretion of zoonotic viruses in milk is negligible in the Netherlands, and the endoparasite, *Toxocara vitulorum* is mainly found in suckling and fattening calves, whilst the risk in dairy cattle is limited. Excretion of transmissible spongiform encephalopathies (TSEs) or mycoses in milk are not expected and are, therefore, not of importance here. Being aware of the risks and working according to hygiene standards can substantially limit zoonotic risks for employees. Additionally, diseased employees are advised to limit their contact with cattle and to indicate that they work with cattle when consulting a physician. To prevent zoonotic risks through excretion of pathogens in milk, standard hygiene measures are necessary. Further, using only pasteurised milk for consumption and/or processing of milk can considerably limit the risks. If these measures are not possible, well-constructed monitoring can be followed. Monitoring programmes already exist for pathogens such as for *Salmonella typhimurium*, *Leptospira hardjo* and *Mycobacterium avium subsp. paratuberculosis*. For others, like *Campylobacter jejuni* and *E. coli*, programmes are not available yet as far as we know.

**Genetic aspects of Wood's lactation curve parameters in Jersey crossbred cattle using Bayesian approach**

Mokidur Rahman, Hasan Baneh, Indrajit Gayari, Muthupalani Karunakaran, Thiruvothur Venkatesan Raja, Sitangsu Mohan Deb and Ajoy Mandal

India and Russia

**Abstract**

The study was undertaken to estimate the genetic parameters of lactation curve parameters of Wood's function in Jersey crossbred cattle using the Bayesian approach. Data on 33,906 fortnightly test day milk yields of 1,718 lactation records of Jersey crossbred cows, maintained at the ICAR-

National Dairy Research Institute in West Bengal were collected over a period of 40 years. The lactation curve parameters including 'a' (initial milk yield after calving), 'b' (ascending slope up to peak yield) and 'c' (descending slope after peak yield) and lactation curve traits peak yield ( $y_{max}$ ), time of peak yield ( $t_{max}$ ) and persistency of milk yield (P) of individual cow for each lactation were estimated using the incomplete gamma function (Wood's model) by fitting the Gauss–Newton algorithm as an iteration method using PROC NLIN procedure of SAS 9.3. Variance components and genetic parameters of lactation curve parameters/traits were estimated by a repeatability animal model using the Bayesian approach. Estimates of heritabilities were found to be  $0.18 \pm 0.05$ ,  $0.09 \pm 0.03$  and  $0.11 \pm 0.04$  for parameters 'a', 'b' and 'c', respectively and  $0.24 \pm 0.05$ ,  $0.12 \pm 0.04$ , and  $0.15 \pm 0.05$  for  $y_{max}$ ,  $t_{max}$  and P, respectively. Repeatability estimates were  $0.31 \pm 0.03$ ,  $0.21 \pm 0.04$  and  $0.30 \pm 0.04$  for parameters 'a', 'b' and 'c' respectively and  $0.39 \pm 0.03$ ,  $0.24 \pm 0.03$  and  $0.37 \pm 0.03$  for  $y_{max}$ ,  $t_{max}$  and P, respectively. Genetic correlations among lactation curve parameters/traits ranged from -0.75 to 0.95. Existence of genetic correlations among lactation curve parameters/traits indicated substantial genetic and physiological relationships among lactation curve parameters/traits of Jersey crossbred cattle.

### Lack of evidence for association between the leptin/*Sau3AI* gene and milk yield traits in Holstein Friesian dairy cattle

Mustafa Kibar and İbrahim Aytekin

Turkey

#### Abstract

This study aimed to investigate the effect of leptin gene polymorphism and some environmental factors on milk production traits. Blood samples from 212 Holstein Friesian dairy cattle reared on a private farm were used. The intron 2 region of the leptin gene was digested with *Sau3AI* restriction enzyme using the PCR-RFLP method. A and B alleles and AA, AB, and BB genotype frequencies for the *Sau3AI* polymorphism were determined as 0.8821 and 0.1179, and 0.764, 0.236 and 0.000, respectively. Chi-square analysis revealed that the leptin gene polymorphism followed the Hardy-Weinberg equilibrium, including the absence of animals with the BB genotype. The effect of leptin gene polymorphism on all milk production traits was insignificant. For milk production traits, direct heritability ( $h_a^2$ ) varied between  $0.03 \pm 0.283$  (for the dry period) and  $0.50 \pm 0.183$  (for milk conductivity). Regarding the milking time (MT), the estimated breeding values (EBVs) of cattle with the AA genotype were higher than the AB genotype ( $P < 0.05$ ). As a result of this study, in the selection program, allele or genotype could not be suggested as a marker for milk yield characteristics except for the possible exception of milking time and its relationship to mastitis incidence.

### Impact of parity number, milk production and somatic cell count on the reproduction of Holstein cows

Bianca Letícia Barbosa, Victor Breno Pedrosa, Luciana da Silva Leal Karolewski, Caio César de Godoi and Adriana de Souza Martins

Brazil

#### Abstract

This research communication describes the reproductive and productive parameters and somatic cell count (SCC) of primiparous and multiparous cows from specialized dairy Holstein herds in South region of Brazil, and correlates these parameters using test-day records. A total of 24,011 records of animals from 75 producers obtained between 2017 and 2018 were used. The variables analyzed included milk production, SCC, milk fat, protein and urea nitrogen contents and reproductive characteristics (number of services per conception, service period and percentage of pregnant cows). Data were

analyzed using multivariate logistic regression and the statistical differentiation between the classes of SCC and milk production. Milk production, SCC, number of services per conception and service period were all higher in multiparous cows. The percentage of pregnant cows was higher when the SCC was less than 200,000 cells/mL and was higher in primiparous cows. There was no adverse effect of milk production on reproductive parameters in high producing cows (>40 kg milk/day), however, the percentage of pregnant cows with this production level was significantly higher in multiparous cows. In conclusion, the milk production level need not affect the reproduction of specialized dairy cows if the animals are kept under adequate environmental conditions.

### **Effect of shortening the dry period on colostrum and milk quality, blood parameters and some reproductive parameters in high-producing Holstein cows of different body condition score**

Nazanin Javani Javani, Ahmad Riasi, Esmaeil Montazeri, Saeid Ansari Mahyari and Mohammad Choupani

**Iran and Italy**

#### **Abstract**

This study aimed to evaluate the effect of shortening the dry period in high-yielding cows of different body condition scores (BCS). We report colostrum and milk quality, some serum metabolites, BCS changes and some reproductive parameters with measurements being made over the first two months of lactation. Cows were grouped based on the length of the dry period (normal: about 50 days and short: about 28 days) and BCS (moderate: 2.75 to 3.5 and high  $\geq 3.5$ ). Short dry period decreased colostrum volume and, in combination with high BCS only, caused a decrease in milk production. Short dry period moderate BCS cows had the highest serum insulin concentration on day 14 after calving and highest glucose concentration on day 28, but neither differed significantly when measured over the whole period. By contrast, short dry period cows had significantly lower concentrations of non-esterified fatty acids and beta-hydroxybutyrate measured over the whole period. Post-partum loss of BCS was less in short and especially so in the short, moderate BCS group. The cows with a short dry period and moderate BCS had lower open days, days to first postpartum estrus and services per conception. It was concluded that short dry periods and moderate BCS had a positive influence on serum metabolites, BCS changes and reproductive parameters.

### **Age at first calving and productive performance of primiparous Holsteins**

Rafael Ceolim Braganholo, Ferenc Istvan Bankuti, Fabio Seiji dos Santos, Victor Breno Pedrosa, Maximiliane Alavarse Zambom, Altair Antônio Valloto and Geraldo Tadeu dos Santos

**Brazil**

#### **Abstract**

This study investigated the age at first calving in Holstein heifers and its impact on various production parameters. A sample of 737 Holstein heifers born between 2015 and 2018 and finishing their first lactations between 2018 and 2020 was included. Cluster analysis revealed three groups based on age at first calving: high precocity, medium precocity and low precocity. Medium-precocity group exhibited the highest 305-day milk yield and peak milk production. Additionally, the same group demonstrated superior mean production per lactation, 305-day milk protein content, and 305-day milk yield. The lowest somatic cell count was found in the low-precocity group. In conclusion, medium-precocity cows showed better results such as higher 305-day milk yield and peak milk production.

## Evaluating the impact of sprinkler cycle and flow rate on dairy buffalo performance during heat stress

Syed I Hussain, Nisar Ahmed, Saeed Ahmad, Maqsood Akhter and Muhammad Q Shahid  
Pakistan

### Abstract

The aim of this study was to evaluate the effect of the sprinkler cycle and flow rate on physiological, behavioral and productive responses in dairy buffaloes. Nine Nili Ravi lactating buffaloes were subjected to three sprinkler cycles and two flow rates using a double replicated 3 × 3 Latin square design. The flow rates were 1.25 and 2 L/min, and the sprinkler cycles (minutes water on/off, number of cycles/h) were: 3/3, 10 cycles; 3/6, 7 cycles and 3/9, 5 cycles. The showering was applied from 0800 till 1630 h daily. In the first square of 21 d, each of the three sprinkler cycles was applied using a 1.25 L/min flow rate for 7 d per cycle. In the later square, the same treatments (sprinkler cycles) were applied using the 2 L/min flow rate. The average temperature humidity index during the study period was  $85.7 \pm 3.8$  (Mean  $\pm$  SD). The result showed that the 3/3 treatment group had lower body temperature and respiration rate than the other groups. The buffaloes in the 3/3 group produced 0.5 and 0.7 kg more milk with 1.4 and 2.4% more fat than the 3/6 and the 3/9 treatment groups, respectively. Similarly, the 2 L/min flow rate had a lower core body temperature and respiration rate and higher milk yield than the 1.25 L/min group. The 3/3 showering cycle with a 2 L/min flow rate appeared effective in improving physiological responses and milk yield in dairy buffaloes.

## Right on the money? U.S. dairy farmers' varied understanding of consumer preferences and attitudes towards animal health, welfare and biotechnology

Danielle J Ufer and David L Ortega  
USA

### Abstract

This Research Communication investigates how well U.S. dairy farmers understand the voting behaviour and willingness to pay of consumers for products with production traits relevant to animal health, welfare and biotechnology. Accurately understanding consumer behaviour is key to making sound production decisions and reducing risks. Comparing survey data with the literature shows that U.S. dairy farmers correctly assess consumer attitudes and behaviour over animal welfare practices like pain-controlled dehorning but could improve knowledge of attitudes towards antibiotic use and novel biotechnologies like gene editing.

## Milk fat globule membrane: formation and transformation

F B Peter Wooding and Masanao Kinoshita  
UK and Japan

### Abstract

The milk fat globule membrane (MFGM) is formed by complex cell biological processes in the lactating mammary epithelial cell which result in the release of the milk fat globule (MFG) into the secretory alveolus. The MFG is bounded by a continuous unit membrane (UM), separated from the MFG lipid by a thin layer of cytoplasm. This unique apocrine secretion process has been shown in all of the mammary species so far investigated. Once the MFG is released into the alveolus there is a considerable transformation of the UM with its attached cytoplasm. This is the MFGM. The transformation is stable and expressed milk shows the same transformed MFGM structure. Again, this transformation of structure is common to all mammalian species so far investigated. However, the explanation of the transformation very much depends on the method of investigation. Transmission

electron microscope (TEM) studies suggest a literal breakdown to a discontinuous UM plus cytoplasm in patches and strands, whereas more recent confocal laser scanning light microscopy (CLSM) studies indicate a separation, in a continuous UM, of two phases, one liquid ordered and the other liquid disordered. This review is designed to show that the TEM and CLSM results show different views of the same structures once certain deficiencies in techniques are factored in.

### ***In vitro* evaluation of nanocomposites of linseed mucilage and k-carrageenan loaded with *Achyrocline satureioides* nanoemulsion: a gradual-release candidate of antimicrobials for the treatment of bovine mastitis**

Gabriela Tasso Pinheiro Machado, Roberto Gabriel Ferreira, Maria Beatriz Veleirinho, Luciana Aparecida Honorato, Roberta de Oliveira Ramos, Marcos Antônio Segatto Silva and Shirley Kuhnen  
**Brazil**

#### **Abstract**

This research paper presents the development and evaluation of pioneering nanocomposites (NCs) based on the combination of k-carrageenan and linseed mucilage. When loaded with macela extract nanoemulsion they present an innovative approach for the sustained release of antimicrobial herbal constituents, specifically tailored for bovine mastitis treatment. The NCs, encompassing various ratios of k-carrageenan and linseed mucilage polymers (8:2, 7:3, and 5:5 w/w) with 1.25 mg of macela extract/g of gel, underwent *in vitro* assessment, emphasizing viscosity, degradation speed, release of herbal actives from macela nanoemulsion and antimicrobial activity. The NCs exhibited thermoreversible characteristics, transitioning from liquid at 60°C to a gel at 25°C. NCs allowed a gradual release of phenolic compounds, reaching approximately 80% of total phenolics release (w/v) within 72 h. NCs inhibited the growth of MRSA (ATCC 33592) until 8 h of incubation. No toxic effect *in vitro* of NCs was found on MAC-T cells. Thus, the developed materials are relevant for the treatment of bovine mastitis, especially in the dry period, and the data support future evaluations *in vivo*.

### **Ozone use in the treatment of subclinical mastitis in dairy cows.**

Esther Abihail Fuentes, Jamile A Achy, Davi F da Silva, Amanda CG Graboschii, Juliana de O Bernardo, Jean G Joaquim, Angelina B Fraga and Pierre B Escodro

**Brazil**

#### **Abstract**

This research communication paper addresses the hypothesis that the use of therapeutic alternatives for mastitis, such as intramammary ozone, can cure the disease with lower costs and without harmful residues for human consumption and without formation of microbial resistance like the ones caused by indiscriminate use of antibiotics in dairy farms. The study was performed in 36 mammary quarters from 12 dairy cows with subclinical mastitis grade three. The experimental units were randomly assigned into four groups and each group received a treatment. Treatments comprised a) 20 µg/mL ozone gas; b) 40 µg/mL ozone gas; c) negative control treatment of 12.5 µg/mL ozonated saline and d) positive control treatment of 100mg of cephalexin + 100mg of neomycin + 10mg of prednisolone, all by intramammary injection. In all quarters, milk was collected before and after the application of treatments for California mastitis test and evaluation of milk composition, somatic cell count, and bacterial cultures. The results indicated that the use of intramammary ozone did have a therapeutic effect, and whilst this was less than that of antibiotics, ozone does confer some advantages. Treated milk had a good composition, the treatment cost was low, milk withdrawal may not be necessary and there is no risk of antibiotic resistance.

## Phenotypic evaluation of mast cells in bovine mammary tissue and mastitis in the context of fibrosis

Cansel Güzin Özgüden Akkoc, Ayşe Meriç Mutlu, Abdülkadir Keskin, Ezgi Yumuşak and Ahmet Akkoc  
Turkey

### Abstract

This research paper addresses the hypothesis that mast cells (MCs) contribute to the formation of mammary fibrosis. MCs are important immune regulatory and immune modulatory cells that play major roles in the inflammatory process. Since there is no detailed knowledge, this research study aimed to comparatively investigate the presence, localization, and immunophenotypes of MCs in healthy and mastitic mammary tissues. A total of 264 mammary samples were evaluated for the examination of mast cells and fibrosis. The mean mast cell number in both acute and chronic mastitis samples were very significantly higher than the control group ( $P<0.001$ ). A 7.9-fold increase in the number of mast cells was found when the chronic mastitis group was compared with the control (healthy) group. Immunohistochemistry revealed presence of all three immune phenotypes in control and mastitic mammary samples (tryptase+ ( $MC_T$ ), chymase+ ( $MC_C$ ) and both chymase and tryptase+ ( $MC_{TC}$ )). The mean  $MC_T$ ,  $MC_C$ , and  $MC_{TC}$  numbers in the chronic mastitis group were found to be significantly higher than the control ( $P<0.001$  for all three phenotypes) but did not differ significantly between control and acute mastitis samples. When the mean numbers of  $MC_T$ ,  $MC_C$ , and  $MC_{TC}$  in the control group and chronic mastitis group were compared, a 10.5, 7.8, and a 4.1-fold increase was observed, respectively. The amount of connective tissue was strongly increased in tissues with chronic mastitis and a 3.01-fold increase was detected compared to the control group. A statistically significant relation was also found between the amount of fibrosis and the increased number of total MCs ( $P<0.001$ ).

## Incomplete milking before drying off does not impair the udder health of cows infected with minor pathogens

Ute Müller, Lisett Marie Hefter, Sophia Dorothea Wedeking, Wolfgang Büscher and Kerstin Barth  
Germany

### Abstract

When implementing the transition from regular milk production to the dry period, drying off is mostly conducted simply by abrupt cessation of milking. Efforts to reduce milk synthesis before cessation of milking aim to reduce stress in cows as well as to lower the risk of mastitis. A previous study demonstrated that incomplete milking during the last ten days of lactation gradually reduced the milk yield of healthy, high-yielding cows. However, a reduction period of ten days might be too long for cows with lower yields. Therefore, a follow-up study was conducted on an organic dairy research farm with a lower average milk yield. We investigated whether automated incomplete milking can reduce milk synthesis within one week without impairing the health status of udder quarters infected with minor pathogens. Before drying off, 15 German-Holstein cows with 58 lactating quarters, 21 of which were infected with minor pathogens (coagulase-negative *Staphylococci* (CNS) and *Corynebacterium bovis*), were milked twice daily using the software module AutoDry (GEA Farm Technologies) with the 5%-step-down-per-day-program. The level of udder emptying was gradually reduced over 8–10 milkings beginning at a mean milk yield of  $17.2\pm 4.4$  kg d<sup>-1</sup>. During the last three milkings before drying off, milking clusters were automatically removed when a milk flow rate of 0.3 kg min<sup>-1</sup> was reached. Quarter fore-milk samples were collected at two time points (14 days before and at the date of the last milking, ie drying off) and were analysed for mastitis pathogens and somatic cell count. The gradual reduced emptying of the udder induced a clear decline in milk yield by  $0.8\pm 0.3$  kg d<sup>-1</sup>. Within the reduction period, the somatic cell count of quarter foremilk did not change regardless of the infection status. Furthermore, no cow suffered from clinical mastitis. Thus, a reduction in milk

synthesis could be achieved within less than one week before drying off without any impairment in udder health of cows, even when infected with minor mastitis pathogens.

### **The effect of diet restriction on raw milk stability: a meta-analytical approach**

Lisiane da Silveira Garcia, Arthur Fernandes Bettencourt, Julia Fernandes Aires, Inês Andretta and Vivian Fischer

**Brazil**

#### **Abstract**

This research communication was designed to evaluate the effects of different levels of diet restriction on the composition and ethanol stability (MES) of raw bovine milk. This research was carried out using three electronic databases: Scopus, Pubmed and Web of Science. The main inclusion criteria were: (i) original research, (ii) use of alcohol (ethanol) test as a method to assess milk stability, (iii) measure different levels of feed restriction and (iv) allow access to the raw data of articles. Of the nine publications that addressed the subject filtered by the systematic review, seven fitted the selection criteria and were selected to perform the meta-analysis. Feed restriction (reduction of 20, 30, 40 and 50% of the dietary dry matter offered) decreased ( $P < 0.01$ ) milk yield (-18%), ethanol stability (-5%), acidity (-4%), protein (-3%) and lactose (-2%) concentrations, but did not affect the values of pH, density, fat and total solids concentrations, nor somatic cell count. The correlation between milk yield and MES was low but positive and numerically higher in the control group compared with the restriction group. The milk of cows fed the control diet presented greater ethanol stability (76.5%) compared with milk of cows fed the restrictive diet (72.8%). This decrease by up to 4 percentage units due to restriction levels ranging from 20 to 50 % of diet intake may cause limitations in milk processing at the dairy industry, increasing milk rejection.

### **Lactoferrin's potential application in enhancing yoghurt's microbial and sensory qualities, with emphasis on the starter culture activity**

Walaa G. Nadi, Eman M. Taher, Abeer Abdel Nasser Awad and Lamiaa Ibrahim Ahmed

**Egypt**

#### **Abstract**

This research paper aimed to examine the antibacterial activity of lactoferrin (LF) as a potential natural alternative in the dairy sector, by measuring its minimum inhibitory concentration (MIC) against a number of common food-borne pathogens as well as *Pseudomonas aeruginosa*, one of the major dairy product spoiling microorganisms. Additionally, a viability experiment was applied to laboratory-manufactured set yoghurt to assess its impact on the activity of starter culture, sensory properties and STEC survivability. The findings demonstrated that LF exhibited significant antimicrobial activity, particularly against *E. coli* and *S. typhimurium* with MIC values of 0.0001 and 0.01mg/ml, respectively. However, *P. aeruginosa* and *B. cereus* were quite resistant to LF requiring higher concentrations for MIC (2.5mg/ml). By the third day of storage, LF at 0.0001 and 0.001mg/ml significantly reduced the survivability of shiga toxin-producing *E. coli* STEC by 70 and 91.6% respectively in the lab-manufactured yoghurt. Furthermore, LF enhanced the sensory properties of fortified yoghurt with a statistically significant difference in comparison to the control yoghurt group. There was no interference with the activity of the starter culture throughout the manufacturing process and the storage period. In conclusion, the potent antimicrobial effect of LF opens a new avenue for the dairy industry's potential applications of LF as a natural preservative without negatively influencing the sensory properties and starter culture activity of fermented products.

### **Lactoferrin in breast milk-based powders**

Efstathia Tsakali, Aggarwal Rakesh, Dimitra Houhoula, Spiridon Konteles, Athimia Batrinou, Davy Verheyen, Jan FM Van Impe and Arhontoula Chatzilazarou  
**Greece, Australia and Belgium**

#### **Abstract**

This study aimed to determine lactoferrin (LF) in breast milk based powders and formulas. Lactoferrin is an important whey protein in all mammalian milks and is responsible in large part for the known anti-infective effects of human milk in particular. As breast feeding is not always possible, formulae based on cows milk have been developed in order to meet the nutritional needs of the newborn, while more recently human breast milk-based powders have been introduced to offer the biological functionality of human milk. In the present work, the amount of LF in commercial breast milk-based powders was tested by a validated RF-HPLC method for the determination of LF in breast milk in order to examine both the applicability of the method but at a second level the amount of LF in these commercial products. The detection of LF was possible but the complexity of the matrix lead us to the use the standard addition methodology in order to achieve quantification. The results indicated that breast milk-based powders had higher amount of LF than cows milk-based formulas, both non-fortified and fortified.

### **Comparative evaluation of A1A2 and A2A2 cow milk-containing diets on biochemical and histological parameters of Wistar rats**

Ravindra Semwal, Ankit Kumar, Ruchi Badoni Semwal, Ashutosh Chauhan, Sunil Kumar Joshi, Kumud Upadhyaya, Monika Shodhi and Deepak Kumar Semwal  
**India**

#### **Abstract**

This Research Communication aims to compare the effect of A1A2 and A2A2 cow milk diets on the biochemical and histological parameters of rats. The rats were divided into four groups and fed with a normal diet, A2 milk powder, A1A2 or A2A2 cow milk diets for 90 days. Blood glucose, kidney function, liver function and lipid profile were examined during the experimental period. The study showed an increase in the body weight of the A1A2 group whereas a slight decrease in the A2A2 group, and blood glucose levels increased from d 0 to day 90 in all experimental groups. However, none of these changes were found to be statistically insignificant ( $p>0.05$ ). Moreover, no significant changes were recorded in other parameters (serum glutamic pyruvic transferase and serum glutamic-oxaloacetic transaminase for liver function, bilirubin direct, cholesterol, triglycerides, creatinine and uric acid). The histology of the liver, kidney and pancreas also showed no changes in all groups. Overall, this study revealed no significant difference in the nutritional values of A1A2 and A2A2 milk types and hence equally beneficial for health. Although the present study showed no significant difference in the effect of both milk types in 90 days, further studies might be conducted to evaluate their longer term effects.

### **Letter to the Editor: Current landscape of antimicrobial resistance genes in *Staphylococcus aureus* from milk: a thousand genome-based analysis**

Daniel FM Monte and Celso Jose Bruno de Oliveira  
**Brazil**

#### **To the Editor**

The use of antibiotics in dairy farming is a common practice to treat and prevent bacterial infections in cows, including mastitis caused by *Staphylococcus aureus* (Rajamanickam et al., 2020).



However, the widespread use of antibiotics in agriculture is believed to have contributed to the dissemination of antimicrobial resistance (AMR) in bacteria, including *S. aureus*. This organism can cause chronic intramammary infections and antimicrobial resistant strains can play a role as sources of antimicrobial resistant genes in milk. Furthermore, certain *S. aureus* strains can be associated with infections in humans, such as livestock associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA). MRSA strains are resistant to virtually all beta-lactam antibiotics, posing an increasing threat to public health (Paramasivam et al., 2023). In this regard, we analyzed 1,103 publicly available *S. aureus* genomes to understand the current landscape of AMR genes distributed in milk. We uncovered a high prevalence of *S. aureus* carrying *tet* (99.7%), *mepA* (95.4%), *blaZ* (31.4%), and *fosB* (25.7%) genes. Moreover, the clinically important AMR gene *mecA* (7.6%) was identified. Most interestingly, several *S. aureus* strains isolated from milk phylogenetically clustered with clinical strains from different years and countries. The clustering of milk-derived *S. aureus* strains with clinical strains from diverse geographic regions and time periods suggests a genetic relatedness between these isolates. This raises questions about how these strains are transmitted and whether certain strains have a broader distribution than previously thought. In addition, the data raise questions about the genetic factors that allow these strains to persist in different environments and hosts. We should convey that anthropological actions might be the major significant factor that contributes to contamination of milk in *dairy production*, especially in low-income countries. In summary, the presence of AMR genes in *Staphylococcus aureus* isolated from milk highlights the need for stringent antibiotic use in dairy farming, improved hygiene practices and ongoing efforts to monitor and address antimicrobial resistance in both animal and human health contexts.