

Functionally bioreactive

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A review of bovine colostrum preservation techniques

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Abstract

Preservation of colostrum for neonatal dairy calves has seldom been seldom in recent years, much of the peer reviewed literature having been published in the 1970s and 80s. First milking colostrum is high in bioactive immune enhancers such as immunoglobulins, lactoferrins, lysozymes and cytokines and is vital to confer passive immunity to newborn dairy calves to promote their health, welfare and future productivity. Bovine colostrum is advisedly restricted from the bulk milk supply for the first 8 milkings post calving due to high somatic cell counts and the risk of antimicrobial residues. As such, many producers refer to 'colostrum' as not only the first milking post calving, but also the aforementioned 'transition' milk. Colostrum is preserved in order to protect supply for feeding when production may be poor or where there is a glut of colostrum such as in seasonal calving systems. There are multiple reasons for newborn calves not to have access to their dam's colostrum, including multiple births, acute mastitis or maladapted maternal behaviour, especially in first lactation heifers. Shortages in colostrum may also be precipitated by purposful discarding of colostrum from cows infected with *Mycobacterium avium subsp paratuberculosis* and *Mycoplasma bovis*. Broadly, colostrum may be preserved using low temperature (refrigeration or freezing) or chemical preservatives. The aim of this scoping review article was to identify options for preservation and gaps in research and to propose best practice for colostrum preservation.

Milk yield and composition in dairy goats fed extruded flaxseed or a high-palmitic acid fat supplement

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Canada

Abstract

We compared the potential of dietary lipid supplements of different fatty acid compositions to affect milk performance when early lactation dairy goats were fed a high-concentrate diet. Thirty Alpine goats at 23 ± 5 d in milk were allocated to 1 of 10 blocks according to parity and milk fat concentration. Within each block, goats were randomly assigned to receive, during a

period of 41d, either CONT) a basal diet with a forage to concentrate ratio of 45:55, used as control, or PALM) the basal diet + 2% of a palmitic acid-enriched fat supplement, or FLAX) the basal diet + 7% of extruded flaxseed. Body weight, dry matter intake and milk yield were not different between treatments. As compared with CONT, goats fed PALM and FLAX had a greater milk fat concentration. Moreover, milk fat yield was numerically (but non-significantly) greater with PALM than with CONT and FLAX. Milk fat from goats receiving PALM had a greater concentration of 16:0 as compared with CONT and FLAX, whereas a greater concentration of *cis*-9, *cis*-12, *cis*-15 18:3 was observed when goats were fed FLAX as compared with CONT and PALM. Under the conditions of the current experiment, dietary fat supplementation had only minor impacts on the yield of major milk constituents, with the exception of a modest increase in fat yield when goats were fed PALM. The impact of a greater concentration of 16:0 in milk fat of goats receiving this feed ingredient on the nutritive value of dairy products remains to be determined.

Green fodder cultivation improves technical efficiency of dairy farmers in semi-arid tropics of central India: A micro-analysis

Bishwa Bhaskar Choudhary, Purushottam Sharma, Priyanka Singh, Sunil Kumar, Gaurendra Gupta, S R Kantwa, Deepak Upadhyay, Vinod Kumar Wasnik, Mahendra Prasad and R K Sharma

India

Abstract

This study assessed the impact of improved green fodder production activities on technical efficiency (TE) of dairy farmers in climate vulnerable landscapes of central India. We estimated stochastic production frontiers, considering potential self-selection bias stemming from both observable and unobservable factors in adoption of fodder interventions at farm level. The empirical results show that TE for treated group ranges from 0.55 to 0.59 and that for control ranges from 0.41 to 0.48, depending on how biases are controlled. Additionally, the efficiency levels of both adopters and non-adopters would be underestimated if the selectivity bias is not appropriately accounted. As the average TE is consistently higher for adopter farmers than the control group, promoting improved fodder cultivation would increase input use efficiency, especially in resource-deprived small holder dairy farmers in the semi-arid tropics.

Combined effects of CXCL8 (IL-8) and CXCR2 (IL-8R) gene polymorphisms on deregressed MACE EBV indexes of milk-related traits in Simmental bulls

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Italy

Abstract

CXCL8 (also known as IL-8) is a member of the CXC subfamily of chemokines that binds two of the seven transmembrane G-protein-coupled receptors (GPCRs), CXCR1 and CXCR2, to mediate and regulate leukocyte accumulation and activation at sites of inflammation. They are known to play a critical role in both disease susceptibility and infection outcome. The aim of this study was to investigate the entire sequences of *CXCL8* and *CXCR2* genes in thirty-one Simmental sires to evaluate the effects of genomic variants on the indexes of the bulls for milk, fat and protein yields, and for Somatic Cell Score (SCS). Five new single nucleotide polymorphisms (SNPs) were found in *CXCR2* gene. The analysis of association indicated that one SNP in *CXCL8* and two in *CXCR2* influenced the considered traits. To evaluate the existence of functional haplotypic effects, combinations among the three genomic variants (SNP 1 in *CXCL8*, SNP 6 and SNP 7 in *CXCR2*) were investigated. Four different haplotypic alleles were identified in the experimental population, one of which at a high frequency (61%). Bulls with Hap 4 (G-C-G at SNP 1, SNP 6, and SNP 7 respectively) had more favorable indexes for SCS ($P < 0.05$). These results suggest that the SNPs in *CXCL8* and *CXCR2* may be potential genetic markers to improve udder health in the Simmental breed.

Validation of a body condition scoring system in Nili Ravi dairy buffaloes (*Bubalus bubalis*): Inter-and intra-assessor variability

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Pakistan and the Gambia

Abstract

The aim of the research reported in this Research Communication was to apply the 5-point body condition scoring (BCS) system to dairy buffaloes and subjectively validate it by assessing the intra- and inter-assessor agreement. For this purpose, the BCS system developed for dairy cows was applied to buffaloes. A total of 230 Nili Ravi buffaloes of varying parity, lactation stages and pregnancy status were enrolled from the Buffalo Research Institute, Pattoki, Pakistan. Four observers independently assigned BCS values to each enrolled buffalo in two phases, as follows: 1) during phase I, the assessors were trained for BCS assessment using a BCS chart developed by Elanco Animal Health Ltd.; and 2) during phase II, the assessors were trained using live buffaloes for BCS assessment. Kappa statistics (k_w) were used to determine the intra- and inter-assessor agreement. The results revealed that the exact overall inter- and intra-assessor agreement was moderate ($k_w = 0.48$ – 0.55) and increased to substantial levels after training on live animals ($k_w = 0.63$ – 0.87). Furthermore, the intra- and inter-assessor exact agreement was higher ($k_w = 0.57$ – 0.58) for buffaloes tied to the mangers compared to the buffaloes standing in the loafing area ($k_w = 0.50$). The inter-assessor agreements within 0.25 and 0.5 points were almost perfect ($k_w = 0.97$ – 1.0). The current results suggested that

the 5-point BCS system (using a scale from 1–5 with 0.25 increments) had substantial agreement for assessment and repeatability when applied to buffaloes.

Effect of mother bonded rearing on growth, health and physiological state of Murrah buffalo calves

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India

Abstract

We investigated the effect of different types of mother-young contacts (fenceline, restricted and no contact) on the health, growth performance, behaviour and physiological state of Murrah buffalo calves. A total of 24 calves were allocated to three groups of 8: NCM (no calf-mother contact), RCM (restricted calf-mother contact) and FCM (fenceline calf-mother contact). At three months of age, the FCM calves had a higher average body weight (58.6 ± 1.5 kg) than the RCM (52.8 ± 1.3 kg) and NCM (53.6 ± 1.3 kg) calves ($P < 0.05$). The average daily gain (ADG) at three months of age was greater in FCM (0.6 ± 0.1 kg/d) than RCM (0.5 ± 0.1 kg/d) and NCM (0.5 ± 0.1 kg/d) calves ($P < 0.05$). The mean immunoglobulin G (IgG) concentrations were significantly greater on d 7, 28, 42 and d 56 of sampling ($P < 0.05$ for all comparisons) in FCM than RCM and NCM calves. The mean cortisol levels were highest in the NCM calves followed by RCM and the lowest values were observed in FCM calves on d 0, d 7, d 28, d 42 and d 56, respectively ($P < 0.05$, for all recorded days). The diarrhea score and eggs per gram of faeces (EPG) were significantly greater in the NCM group compared to the RCM and FCM groups. The time spent in cross sucking, licking inanimate objects and self-licking was greatest ($P < 0.05$) in NCM calves, followed by RCM calves, and was almost non-existent in the FCM group on all the recorded weeks. Time spent in backward ear position was greater ($P < 0.05$) in FCM than RCM and NCM calves. The average time spent in forward ear position was greatest ($P < 0.05$) in the RCM calves followed by NCM with the lowest time observed in FCM calves. The mean duration of time spent by calves in the asymmetrical and axial ear position differed significantly ($P < 0.05$) among NCM, RCM and FCM calves, $P < 0.05$. The full and fenceline buffalo calf-mother contact system showed higher growth rates, lower levels of stress responses, oral stereotypies and eggs per gram of faeces. In addition, ear postures may be used as a dependable, and reliable measure of positive, low arousal emotional states.

Effect of loose house dairy cattle barn modification on udder health and production performance of Jersey crossbred cows in tropical lower Gangetic plains

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India

Abstract

The results reported in this research communication aimed to reduce the housing discomfort and mastitis incidence of lactating Jersey crossbred cows through modifications to the roof and floor of loose housing stalls. The experiment was conducted on twenty Jersey crossbred cows and they were distributed equally into two different types of housing: (i) existing shed/control group (T_0) - concrete floor and asbestos roof and (ii) modified shed/treatment group (T_1)- sand flooring (4-6 inch deep; 38% of total area) and a thatch ceiling (4" thick) under an asbestos roof. Under-roof surface temperature differed significantly ($P < 0.01$) between the two sheds during both the winter season but a greater difference was observed in the summer (modified sheds were 5-9°C cooler than the control shed during peak hours (10 am to 3 pm) of the day. The milk yield (kg/d) in both seasons was significantly higher in the treatment group than in the control group ($P < 0.01$). The overall milk fat and total solid percentage were significantly higher in the treatment than the control group ($P < 0.01$) but solids not fat (SNF) did not show any difference between the groups. The percentage of milk fat did not differ significantly between the seasons, while the SNF and total solids were also significantly higher in the winter than the summer season ($P < 0.01$). There was a significantly lower subclinical mastitis test score (MCMT grade: $P < 0.05$) in the treatment group than in the control group. In the treatment group the somatic cell count (SCC) was numerically but non-significantly less than in the controls. No differences in MCMT and SCC were observed between seasons ($P > 0.05$). It was concluded that the provision of sand as stall flooring and an under-roof thatch ceiling as a heat insulator was significantly associated with increased milk yield, milk composition and, possibly, lower somatic cell count in dairy Jersey crossbred cows. However, since the study was limited to a single replicate of each housing system with analysis done at individual cow level, further work is needed to confirm these conclusions.

Effect of parturition time and climatic conditions on milk productivity, milk quality and udder morphometry in Saanen goats in a semi-intensive system

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Turkey

Abstract

This study is the first report to investigate the relationships between time of parturition and milk productivity and quality, as well as indices related to udder measurements and meteorological variables, in Saanen goats raised under semi-intensive conditions. Goats giving birth in the hours of darkness had higher milk production than those that gave birth in

the hours of daylight, while those giving birth during the evening hours had lower somatic cell count (SCC) and electrical conductivity than those with parturition during the daylight and night hours ($P < 0.05$). In addition, the time of parturition was associated with rear udder depth, udder circumference, and udder volume traits ($P < 0.01$). The effects of parity, and time of parturition \times parity interaction on lactation milk yield and lactation length, as well as milk fat, protein, lactose, total solids content and electrical conductivity, were significant ($P < 0.05$ to $P < 0.01$). The lactation stages influenced the SCC, total solids, electrical conductivity, pH, and freezing point of milk ($P < 0.05$). Ambient temperature and daylight length had strong effects on daily milk yield ($P < 0.05$). These findings have practical implications for productivity, quality, and health promotion efforts aimed at increasing Saanen goat dairy productivity consistently in the face of climatical changes in a semi-intensive system.

Effect of experimental stress and cortisol release induced by ACTH administration on expression of key genes related to milk synthesis and apoptosis during mammary involution of Saanen goats.

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Brazil

Abstract

This research paper addresses the hypothesis that stress, induced by ACTH administration and cortisol release increases somatic cell count (SCC) in mammary secretion, and improves the effectiveness of dry off in goats. We report indicators of milk synthesis and mammary gland involution during dry off. Thirty Saanen goats were subjected to abrupt dry off and treatments: (1) ACTH administration (ACTH) or (2) placebo (Control) on days 1, 3, 6, 9, 12, 15, 30, and 60 of dry off. The expression of target genes in mammary tissue that are related to milk synthesis and cell survival such as insulin-like growth factor 1 receptor (IGF1R), phosphatidylinositol-3-kinase (PIK3CA), protein kinase B (AKT1) and mechanistic target of rapamycin (MTOR), casein (CSN2), lactalbumin (LALBA) and lactoferrin (LF) were evaluated, and plasma cortisol concentration, SCC, leucocyte count, and microbiological analyses in milk and mammary secretions were assessed. ACTH significantly downregulated the expression of IGF1R and upregulated the expression of PIK3CA in mammary tissue, increased lactoferrin concentration and SCC, and changed immune cell levels in mammary secretions compared to Control. Furthermore, ACTH administration increased the percentage of dry goats compared to the Control (73 versus 46%, respectively). We conclude that the effect of stress via ACTH administration and cortisol release accelerated mammary involution during the early dry-off period.

PPAR γ -AGPAT6 signaling mediates acetate-induced mTORC1 activation and milk fat synthesis in mammary epithelial cells of dairy cows

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China

Abstract

This research communication investigated the role and the underlying mechanism of sn-1-acylglycerol-3-phosphate O-acyltransferase 6 (AGPAT6) in acetate-induced mTORC1 signaling activation and milk fat synthesis in dairy cow mammary epithelial cells. The data showed AGPAT6 knockdown significantly decreased acetate-induced phosphorylation of mTORC1 signaling molecules and intracellular triacylglycerol (TAG) content, whereas this inhibition effect was reversed after the addition of 16:0,18:1 phosphatidic acid (PA), suggesting that AGPAT6 could generate PA in response to acetate stimulation, that in turn activates mTORC1 signaling. PPAR γ is the upstream regulator of AGPAT6 upon acetate stimulation. Luciferase assay with clones containing various deletions and mutation in AGPAT6 promoter showed that there is a RXR α binding sequence located at -96bp of AGPAT6 promoter. Acetate stimulation significantly increased the interaction between PPAR γ and AGPAT6 via this RXR α binding site. Taken together, our data indicated that AGPAT6 could activate mTORC1 signaling by producing PA during acetate-induced milk fat synthesis, and PPAR γ acts as a transcription factor to mediate the effect of acetate on AGPAT6 via RXR α .

A novel approach in the prevention of mastitis: Electrical teat dipping

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Kyrgyzstan and Turkey

Abstract

Teat dipping is widely used in dairy cattle, especially to protect against contagious mastitis. Here we determine the effect of the device called “Electrical Teat Dipping” (ETD), which was developed by combining teat dipping application and electrical field stimulation technique on teats. For this purpose, the front teats of 100 Holstein breed milking cows were evaluated in two groups, with ETD being applied once to the left front teat of these cows, and conventional teat dipping (CTD) being applied once to the right front teat, both after milking. Ultrasonographic measurements of the teats were made before milking and after teat dipping. We found that the width of the teat canal (1.88 ± 0.07 mm) in the teat using ETD was narrower after the application compared to those with CTD (2.28 ± 0.05 mm). Based on our findings, we conclude that the effects of ETD on the teat are very positive and can potentially be used as a new approach in the preventative control of mastitis in cows.

Influence of *Mycoplasma bovis* infection on milk production and quality of Holstein dairy cows

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Brazil

Abstract

We wished to determine if *Mycoplasma bovis* infection can negatively impact milk quality and production in Holstein dairy cows. For this Research Communication, milk samples (271) from Holstein cows from 3 herds were screened for *M. bovis* by real-time PCR. Positive (n=21) and negative animals (n=21) were matched by herd, age, lactations and days in milk (DIM). Pairs were evaluated in 7 stages of lactation: D1-50, D51-100, D101-150, D151-200, D201-250, D251-300, and D ≥301. A mixed model was used to assess the effect of groups (*M. bovis*⁺ x *M. bovis*⁻), time (lactation) and groups x time interaction. Cows positive for *M. bovis* had lower average milk production per day and high somatic cells count (SCC).

Harnessing the untapped potential of indigenous cow milk in producing set-type yoghurts: Case of Thamankaduwa White and Lankan cattle

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Sri Lanka, Sweden and Australia

Abstract

This research paper assessed textural, microstructural, sensory and colour properties of set-yoghurts produced using milk from two indigenous cattle types, Thamankaduwa White (TW) and Lankan cattle (LC) compared to two generic cattle breeds, Friesian and Jersey. Instrumental texture profile (firmness, adhesiveness, cohesiveness and springiness), colour space (L* a* b*) and scanning electron micrographs of set-yoghurts during 21 days of storage (4±1°C) were evaluated. Sensory quality attributes were evaluated with 40 untrained panellists using a five-point hedonic scale. Set-yoghurts prepared using indigenous cow milk showed higher (p< 0.05) firmness, cohesiveness and apparent viscosity values compared to those prepared using generic cow milk. As revealed by micrographs, set-yoghurts made from TW milk had lesser and smaller void spaces and a dense protein gel network than gels made from LC and the two generic breeds. The gel network made from Friesian milk showed a comparatively larger porous gel structure and thinner protein strands resulting in a weaker gel than other milk gels. The highest lightness (L*) and yellowness (b*) were observed from set-yoghurt produced from Friesian and LC milk, respectively. Set-yoghurts from TW milk had the highest (p<0.05) sensory scores for all sensory attributes. The lowest sensory acceptance was recorded in set-yoghurt made from Friesian milk. Thus, milk from TW and LC is likely to be suitable in producing set-yoghurts with superior textural, microstructural and sensory

properties, compared to milk from Jersey and Friesian. Our results suggest the merits of using indigenous cow milk in producing set-yoghurts and, thereby, prioritizing the preservation of the genetic pool of these indigenous breeds.

Nanoformulation approach for improved antimicrobial activity of bovine lactoperoxidase

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India

Abstract

Lactoperoxidase (LPO) is a glycosylated antimicrobial protein present in milk with a molecular mass of 78 kDa. LPO is included in many biological processes and is well-known to have biocidal actions, acting as an active antibiotic and antiviral agent. The wide spectrum biocidal activity of LPO is mediated via a definite inhibitory system named lactoperoxidase system which plays a potent role in the innate immune response. With the current advancement in nanotechnology, nanoformulations can be developed for stabilizing and potentiating the activity of LPO for several applications. In the research described in this Research Communication, fresh LPO purified from bovine mammary gland secretions was used for nanoparticle synthesis using a simple thermal process at different pH and temperatures. The round-shaped nanoparticles (average size 229 nm) were successfully synthesized at pH 7.0 and a temperature of 75°C. These nanoparticles were tested against four different bacterial species namely *S. flexineri*, *P. aeruginosa*, *S. aureus*, and *E. coli*. The prepared nanoparticles exhibited strong inhibition of the growth against all four bacterial species as stated by their MIC and ZOI values. These results may help in increasing the efficiency of lactoperoxidase system and will assist in identifying novel avenues to enhance the stability and antimicrobial function of LPO in drug discovery and industrial processes.

Evaluation of the impact of hydrogen-rich water on the quality attribute notes of butter

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Turkey

Abstract

The effects of washing raw butter with hydrogen-rich water (HRW), prepared with hydrogen (H₂) and/or magnesium (Mg), on butter quality were investigated in this research paper. During the washing process, titratable acidity (TA) decreased by 12% for all washed samples. During the storage period, TA increased by 28% and 93% (control), 14% and 58% (H₂), and 10% and 66% (Mg) for the 60th and 90th days, respectively. Peroxide value (mEq O₂/kg) increased to 2.76 and 8.83 (control), 1.92 and 7.25 (H₂), and 2.02 and 8.12 (Mg) for the 60th and 90th days. HRW samples showed the lowest acid degree value (ADV) and the highest color notes (L*, C*, and h). The HRW treatment of raw butter has shown improving effects on the product without any harmful residuals in the final product or the environment.

Raw goat's milk fermented Anbaris from Lebanon: insights into the microbial dynamics and chemical changes occurring during artisanal production, with a focus on yeasts

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Lebanon

Abstract

Anbaris is a raw goat milk product naturally fermented in terracotta jars. The aim of this research paper was to follow the dynamics underlying an artisanal production to understand the concomitant evolution of the microbial populations in relation to the chemical changes occurring within the product, make sure of the sanitary conditions prevailing during the production and uncover for the first time its culturable yeasts population. Throughout the fermentation process, Anbaris was endowed with high acidity and included high microbial populations of LAB and yeasts that were rapidly installed within the product and maintained as regular new milk additions were made, contributing to lipolytic and proteolytic activities. Salt content varied according to the arbitrary salt additions made during the process but was high in the end product while protein and fat contents varied inversely to moisture. Frequent additions of Enterobacteriaceae and Coliforms contaminated milk samples seemingly fueled a contamination of the product during its manufacturing and in the final fresh Anbaris. Seven species of culturable yeasts, *Pichia kudriavzevii*, *Kluyveromyces marxianus*, *Rhodotorula mucilaginosa*, *Saccharomyces cerevisiae*, *Debaryomyces hansenii*, *Candida parapsilosis* and *Kazachstania exigua* were found during the production. The first two dominated the process in terms of frequency of occurrence and abundance at the different stages and might be signature species of the product. The same lineage of *K.marxianus* isolates was maintained throughout the fermentation and sample specific patterns were observed. Strains of this species exhibited low diversity within our product, and more globally in the Lebanese products we studied.

Comparative qualitative and quantitative analysis of lactic acid bacteria by molecular methods in different Greek cheeses

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Greece

Abstract

In the present research communication, we report on identification and quantification of four main lactic acid bacteria (LAB) genera (Lactococcus, Lactobacillus, Streptococcus and Leuconostoc), most common in Greek cheeses, by a novel culture-independent method. More specifically, new primers were designed to be used in both multiplex PCR for

simultaneous identification and in real-time PCR for quantification of the LAB. The method was validated by applying it in parallel to culture-dependent method in a variety of cheeses from different Greek geographical locations, of different animal milk origins and of different production methods. While the standard plate culture method showed absence of *Leuconostoc* sp. in all cheeses, the culture-independent methods detected all four LAB genera studied. Furthermore, the relative presence of the four genera detected by the culture-independent method showed a pattern present in almost all cheese samples tested, indicating *Lactococcus* genus as the dominant one.

The development and usability of a web-based mobile application as a dairy intake screener for South African adults

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South Africa.

Abstract

Paper-based dietary assessment tools such as food frequency questionnaires (FFQ) and especially dietary screeners are making way for versions that use technology. Amidst low intakes of dairy and dairy-related nutrients in South Africa, and to increase public awareness thereof, we aimed to develop and evaluate the usability of an application (app) to screen for dairy intake in higher income South African adults. In a consultative process, a dairy intake screener (“Dairy Diary”) was developed as an eight-item quantitative FFQ with four types of commonly consumed local dairy products: milk, maas (fermented milk), yoghurt, and cheese. For each dairy product, usual frequency of consumption and portion size per eating occasion were scored resulting in three risk classes: <1 serving daily; 1–<2 servings daily; ≥2 servings daily. Digitalisation included product- and portion-specific graphics with linkage to risk class-relevant preliminary dairy-related guidance as part of a web-based mobile app. For the evaluation of the usability, the 26-item end-user version of the Mobile Application Rating Scale (uMARS) was used in an online cross-sectional survey (Qualtrics; April 2020). Items were scored on a 5-point Likert-type scale, resulting in three final app scores. From a conveniently recruited sample of 1102, 703 (64%; 81% female; mean age 29.8±11.0 years) were retained for analysis. uMARS-informed descriptive statistics summarise the findings. The uMARS app mean objective quality score (3.9±0.85), app subjective quality score (3.5±0.77), app-specific score (3.6±0.94), and additional question on e-portion (4.3±0.78) met the minimum acceptability score of ≥3.0. For the subscales, the mean score for aesthetics was the highest (4.4±0.82), followed by information (4.3±0.90) and functionality (4.0±1.33). Engagement scored lowest (3.0±1.55). The “Dairy Diary” is a user-friendly screener for dairy intake.