INTERPRETIVE SUMMARIES, FEBRUARY 2024

Perspective: Can we actually do anything about inbreeding? By Cole, page 643. We are faced with increasingly complex problems in animal production, such as managing genetic diversity in cattle populations, and no easy solutions to these challenges exist. The demand for elite genetics drives the ongoing loss of genetic diversity and creates a fundamental conflict in our selection programs. Managing this challenge will require the participation of many stakeholders in this complex system, each of whom has different incentives. Achieving the necessary buy-in will require solid, objective evidence of an actual problem and tangible solutions. https://doi.org/10.3168/jds.2023-23958.

Invited review: Camel milk–derived bioactive peptides and diabetes—Molecular view and perspectives. By Ayoub et al., page 649. This review describes our up-to-date knowledge of the molecular and cellular mechanisms involved in the antidiabetic properties of camel milk (CM). This includes the pathways that are targeted and modulated by CM proteins and peptides in both insulin-sensitive tissues and the pancreatic β-cell. The fractionation of CM and the identification of bioactive peptides constitutes an important advance in the field, opening promising opportunities for developing a new generation of antidiabetic agents from CM. https://doi.org/10.3168/jds.2023-23733.

In vitro evaluation of the effect of yogurt acid whey fractions on iron bioavailability. By Stefos et al., page 683. The vast amounts of acid whey generated during the production of Greek-type strained yogurt cannot be disposed of for environmental reasons. The current methods for handling acid whey do not include its reintroduction to the food supply chain, though the cumulative protein amount lost by these methods is considerable. In this article, we evaluate the effect of acid whey on iron absorption in the intestine. Our work contributes toward understanding the different aspects of using acid whey as a food ingredient, which holds importance within the framework of turning a product with potential environmental hazards into a valuable end product. https://doi.org/10.3168/jds.2023-23643.

Effect of dipotassium phosphate addition and heat on proteins and minerals in milk protein beverages. By Pranata et al., page 695. The concentrations of soluble proteins, phosphorus, and calcium outside of casein micelles increased with added dipotassium phosphate (0.15%) and over time of storage at 4°C in micellar casein concentrate– and milk protein concentrate–based 7.5% milk protein beverages. In micellar casein concentrate beverages, the increases were greater than in milk protein concentrate beverages, and the effects were more prominent as the beverage-processing temperature decreased. https://doi.org/10.3168/jds.2023-23768.

Comparative lipidomics analysis of in vitro lipid digestion of sheep milk: Influence of homogenization and heat treatment. By Pan et al., page 711. The effects of homogenization and heat treatment on the lipid digestion of sheep milk were investigated using an in vitro human gastric simulator and a small intestinal (pH-stat) digestion model through comparative lipidomics analysis. Heat treatment and homogenization of sheep milk have an effect on the release of fat during gastric digestion and the lipid composition of fat in gastric digesta; those differences in the gastric phase among differently processed sheep milk are dependent on the surface structure of milk fat globules. Homogenization of sheep milk significantly increased the lipolysis rate compared with unhomogenized sheep milk but did not change the degree of lipolysis during small intestinal digestion. https://doi.org/10.3168/jds.2023-23446.

Effect of nanobubbles on powder morphology in the spray drying process. By Oh et al., page 759. Spray drying is widely used to obtain dry food powder, such as instant coffee, milk, and dairy foods. Enhancing the efficiency of spray drying—for example, by controlling the particle shape—is of great significance to the spray drying industry. In this study, we investigated the effect of inserting nitrogen gas nanobubbles into a maltodextrin solution on the morphology of spray-dried powders. The technology suggested in this article shows a promising performance compared with conventional foam spray drying and other methodologies. Therefore, we expect our results to be of great relevance to the development of novel spray drying technologies. https://doi.org/10.3168/jds.2023-23658.

Microwave vacuum drying of dairy cream: Processing, reconstitution, and whippability properties of a novel dairy product. By Dumpler and Moraru, page 774. This study investigated an innovative way to manufacture dehydrated, shelf-stable cream that can be reconstituted into cream with similar functionality as fresh, pasteurized cream. Such functionality is not possible using conventional processes using spray drying. The scientific findings
Effects of offering free-choice hay for the first 5 days postpartum on productivity, serum inflammatory markers, gut permeability, and colon gene expression in fresh dairy cows. By Engelking and Oba, page 813. Fresh cows often experience metabolic disorders and inflammation. We found that cows offered hay had lower dry matter intake and tended to have lower serum haptoglobin concentration compared with cows not offered hay. During the hay treatment, cows that consumed more hay had a smaller increase in serum inflammatory markers from days 1 to 3 after calving. Offering free-choice hay may reduce serum inflammatory marker concentration, but milk yield may not increase due to decreased intake. https://doi.org/10.3168/jds.2023-23670.

Characterization of a model of hindgut acidosis in mid-lactation cows: A pilot study. By Sanz-Fernandez et al., page 829. Hindgut acidosis concomitantly develops with subacute rumen acidosis in response to highly fermentable diets, although its relative contribution to the grain overload syndrome is insufficiently understood. This pilot study aimed to contribute to the development of an experimental model to study hindgut acidosis. Infusing cornstarch postruminally successfully induced hindgut acidosis, resulting in gut damage and increased intestinal permeability, although no signs of systemic inflammation were observed. https://doi.org/10.3168/jds.2023-23607.

Effects of cashew nut shell extract and monensin on in vitro ruminal fermentation, methane production, and ruminal bacterial community. By Sarmikasoglu et al., page 840. Enteric CH4 emissions from ruminants are a major environmental pollutant and an important topic of interest in the dairy industry. Ionophores such as monensin and phenolic compounds such as cashew nut shell extract (CNSE) have been reported to reduce CH4 emissions, improve energetic efficiency, and prevent ruminal acidosis. We aimed to evaluate the effects of CNSE and monensin on ruminal in vitro fermentation, total gas, CH4 production, and bacterial communities. Our results indicate that CNSE decreased CH4 production compared with monensin; however, further studies allowing for longer microbial adaptation warrant further investigation to provide a better understanding on the anti-methanogenic potential of CNSE. https://doi.org/10.3168/jds.2023-23669.

Effect of a blend of cinnamaldehyde, eugenol, and Capsicum oleoresin on methane emission and lactation performance of Holstein-Friesian dairy cows. By Van Gastelen et al., page 857. Although methane is an important hydrogen sink that promotes good rumen functionality, methane emissions from dairy cattle contribute to global warming. This study investigated the methane-mitigation potential of a blend of 3 phytonutrients, eugenol, cinnamaldehyde, and Capsicum oleoresin, and its persistence when fed to dairy cows. The results showed that this blend of phytonutrients decreased methane emission relative to feed intake on average by 3.4% (on average, by 3.9% from 6 weeks after the start of supplementation onward). This blend of essential oils also increased feed intake and body weight, whereas no negative responses were observed. https://doi.org/10.3168/jds.2023-23406.

Graduate Student Literature Review: System, plant, and animal factors controlling dietary pasture inclusion and their impact on ration formulation for dairy cows. By Morales et al., page 870. This review addresses the effect of including fresh pasture in dairy cow diets and the potential limitations to meet the nutritional requirements in both quality and quantity as cow production increases. In practice, there is a wide diversity of pasture-based systems with predominant to minimal use of pasture. A more specific classification of this system would help to establish benchmarks and management recommendations according to each goal. A comprehensive chemical characterization of pastures throughout the year is necessary, as is identifying which specific mechanisms differ in cows consuming pastures as part of their diets. https://doi.org/10.3168/jds.2023-23810.

Supply of palmitic, stearic, and oleic acid changes rumen fiber digestibility and microbial composition. By Sears et al., page 902. Recent studies suggest a beneficial effect of specific fatty acids on total-tract fiber digestibility in dairy cows. In this study, we investigated the potential mechanisms by which dietary palmitic, stearic, and oleic acid could modulate ruminal fiber digestion using an in vitro approach. Our results indicate that dietary palmitic acid enhanced fiber digestion by altering bacterial fatty acid metabolism as well as the growth and abundance of fiber-degrading bacteria in the microbial community. https://doi.org/10.3168/jds.2023-23568.

The effects of seasonality, management, infrastructure, and automation on the milking efficiency of herringbone and rotary milking parlors in Ireland. By Prendergast et al., page 917. The objective of this study was to document the ef-
fects of (1) seasonality, (2) parlor infrastructure, (3) management practices, and (4) parlor automations on milking efficiency. A novel methodology based on empirical data from video cameras, infrastructure surveys, and milk yield data allowed for the accurate computation of milking efficiency metrics. We added novel data to the literature by quantifying the effects of seasonality, the number of operators present at milking, and parlor automations on milking efficiency across 2 parlor types. https://doi.org/10.3168/jds.2023-23540.

**Attitudes of western Canadian dairy farmers toward technology.** By von Keyserlingk et al., page 933. The increasing integration of technology on dairy farms can impact farm animal management, including animal care. Farmers were interviewed about their views on the use of technologies and how these help in making animal-care decisions; the responses revolved around the changing role of the farmer, the impact of technology on the cow-farmer relationship, and the role of technology in the future. Participants focused on existing technologies, such as automated milking systems; when asked about gene editing, some viewed this technology as another innovation among many, and others felt this type of technology raised different types of concerns. https://doi.org/10.3168/jds.2023-23279.

**Effects of 2 gradual debonding strategies on machine milk yield, flow, and composition in a cow-driven cow-calf contact system.** By Sørby et al., page 944. There is increasing interest in keeping dairy cows with their calves during the milk-feeding period. This allows for natural behaviors, but more research is needed on how to break the cow-calf bond in a way that minimizes stress responses and negative effects on milk production. In this study, we compared the effects on milk production when we gradually reduced the cows’ access to the calf using different strategies. We found that a longer debonding period initiated earlier may be more favorable for cow performance. https://doi.org/10.3168/jds.2022-23117.

**Predicting methane emissions of individual grazing dairy cows from spectral analyses of their milk samples.** By McParland et al., page 978. Data on individual cow methane emissions can be used in genetic evaluations to breed for lower-emitting cows. The current method to accurately measure methane on individual cows is resource-intensive, thus limiting widespread measurement. Being able to predict cows’ daily methane emissions from milk samples could be valuable, even if the prediction accuracy is not perfect. Results from this study demonstrate that the spectra generated from the transmittance of electromagnetic light through individual cow milk samples can predict individual cow methane emissions with reasonable accuracy. https://doi.org/10.3168/jds.2023-23577.

**Genetic parameters and genome-wide association studies for mozzarella and milk production traits, lactation length, and lactation persistency in Murrah buffaloes.** By Lázaro et al., page 992. Water buffaloes produce an economically attractive milk source for producing specialized dairy products such as mozzarella cheese. There is a need to optimize breeding schemes to improve the productive efficiency of the herds, especially for longitudinal traits related to milk yield and lactation persistency. Therefore, we evaluated the usefulness of random regression test-day models based on various covariance functions to evaluate the genomic background of milk-related traits in Murrah buffaloes. Our results indicate that milk traits in Murrah buffaloes are heritable, and substantial genetic progress can be achieved through genetic and genomic selection. Including genomic information resulted in more accurate and less biased breeding values for milk, protein, fat, and mozzarella yields, fat-to-protein ratio, and somatic cell score. Furthermore, various candidate genes associated with these traits were identified. https://doi.org/10.3168/jds.2023-23284.

**Investigating the potential for genetic selection of dairy calf disease traits using management data.** By Lynch et al., page 1022. This study aimed to understand the current impact of calf diseases by investigating incidence rates, estimating genetic parameters, and providing industry recommendations to improve calf disease-recording practices on farms. Heritability estimates for respiratory problems (RESP) and diarrhea (DIAR) ranged from 0.02 to 0.07 across analyses, while estimated genetic correlations between trait RESP and DIAR ranged from 0.50 to 0.62. The reported results are promising for the inclusion of both DIAR and RESP in Canadian genetic evaluations; however, the development of a data pipeline is required for effective genetic evaluation in the future. https://doi.org/10.3168/jds.2023-23780.

**Consistency of dry matter intake in Holstein cows: Heritability estimates and associations with feed efficiency.** By Cavani et al., page 1054. As we seek to enhance the sustainability of dairy farming, it will become more important to consider the ability of dairy cows to perform under variable environmental and management conditions. Analyzing fluctuations in daily feed intake can be a promising tool for identify-
Assessing the emotional states of dairy cows housed with or without their calves. By Neave et al., page 1085. The emotional states of cows housed together versus separated from their calves were assessed with a visual judgment bias test. Cows with only part-time calf contact showed more pessimistic responses when presented with ambiguous information (i.e., interpreting the proverbial glass as half empty rather than half full), indicating a more negative emotional state than cows with full-time calf contact. Cows without calf contact showed no difference in judgment bias compared with full- or part-time calf contact, suggesting they likely do not experience a pervasive negative emotional state approximately 1 month after calf separation. Part-time-contact cows experienced repeated separations from the calf, which may explain their relatively negative emotional state. https://doi.org/10.3168/jds.2023-23720.

Comparison and interobserver reliability between a visual analog scale and the Wisconsin Calf Health Scoring Chart for detection of respiratory disease in dairy calves. By Møller et al., page 1102. Detecting respiratory disease in dairy calves is a continuous challenge. In this study, 126 dairy calves were clinically scored using the composite Wisconsin Calf Health Score Chart and a simpler visual analog scale (VAS). The VAS was compared with the Wisconsin Calf Health Score Chart as a reference test, and both systems agreed to a high degree. Interobserver reliability was calculated between observers (including veterinary students). We found poor to moderate reliability among the observers in the study. However, with training, it seems possible to use the more practically feasible VAS to detect respiratory disease in dairy calves in the future. https://doi.org/10.3168/jds.2023-23554.

New insight into social relationships in dairy cows and how time of birth, parity, and relatedness affect spatial interactions later in life. By Marina et al., page 1110. Understanding social interactions between cows is crucial to improving animal welfare and production. Real-time location systems provide an opportunity to study dyadic social contacts inside dairy freestall barns. We investigated the effect of different cow characteristics on the likelihood of the formation and persistence of social contacts in dairy cattle. Our main finding was that cows born within 7 days of each other had more consistent interactions, a kind of “kindergarten effect,” as well as cows of the same parity or related by pedigree. https://doi.org/10.3168/jds.2023-23483.

A 2-year study reveals implications of feeding management and exposure to mycotoxins on udder health, performance, and fertility in dairy herds. By Penagos-Tabares et al., page 1124. This ecological study suggests links between dietary contamination with Fusarium-derived toxins and greater odds of udder health issues (higher occurrences of elevated somatic cell counts). Suboptimal nutritional status (related to protein and energy balance like elevated milk urea nitrogen) was associated with decreased fertility performance in Austrian dairy herds. https://doi.org/10.3168/jds.2023-23476.

Training dairy heifers with positive reinforcement: Effects on anticipatory behavior. By Heinsius et al., page 1143. We trained dairy heifers to voluntarily enter a chute using food rewards and compared the responses with a group of heifers that had not received the training. The trained group showed more anticipatory behavior and play behavior as they made their way up and into the chute. These results indicate that positive reinforcement training allows for a more positive experience during handling and restraint. https://doi.org/10.3168/jds.2023-23709.

Bacterial culture and susceptibility test results for clinical mastitis samples from Australia’s subtropical dairy region. By Langhorne et al., page 1151. Clinical mastitis is a challenging condition in Australia’s subtropical dairy region. This study describes the culture and susceptibility results for milk samples collected from cows with clinical mastitis in this region. The most common pathogens isolated were Streptococcus uberis and the non-aureus staphylococci and mammaliicocci bacterial group. Some variation in isolate prevalence was detectable by location (Southeast Queensland, North Queensland, and New South Wales). Variation also occurred in the proportion of pathogens isolated by individual farm. The isolates examined generally showed low levels of antimicrobial resistance. This research highlights the importance of understanding regional and farm-level mastitis pathogens for optimal control and prevention of clinical mastitis. https://doi.org/10.3168/jds.2023-23838.
Heat stress–associated changes in the intestinal barrier, inflammatory signals, and microbiome communities in dairy calves. By Yu et al., page 1175. This study aimed to evaluate the effects of heat stress on molecular components of the intestinal barrier, inflammatory signals, and intestinal microbiota community composition in calves. Heat stress–associated alterations of intestinal barrier function appear to be segment specific and accompanied by changes in the expression of tight junction proteins, pro- and anti-inflammatory signals, and alterations of microbiome composition and functional pathways. The changes elicited by heat stress may be part of a coordinated response to restore homeostasis. [https://doi.org/10.3168/jds.2023-23873](https://doi.org/10.3168/jds.2023-23873).

Peripheral blood mononuclear cell mitochondrial enzyme activity in calves is associated with average daily gain, reproductive outcomes, lactation performance, and survival. By Niesen and Rossow, page 1197. This research highlights the dairy industry’s need to explore novel technologies for mitochondrial function to assess cow performance and energy status. Using mitochondrial enzyme activities could provide greater insight into predicting cow health, survival, reproductive performance, and milk production. [https://doi.org/10.3168/jds.2023-23856](https://doi.org/10.3168/jds.2023-23856).

Effects of dietary rumen-protected choline supplementation to periparturient dairy cattle on inflammation and metabolism in mammary and liver tissue during an intramammary lipopolysaccharide challenge. By Swartz et al., page 1211. We assessed the effects of dietary rumen-protected choline (RPC) supplementation to periparturient dairy cattle on inflammatory markers and metabolites during an intramammary lipopolysaccharide challenge. Dietary RPC supplementation did not have a clear effect on inflammatory responses in either liver or mammary tissue. Dietary RPC supplementation also did not increase concentrations of choline metabolites in mammary tissue; potentially, this is the reason why dietary RPC supplementation did not attenuate tissue inflammation. [https://doi.org/10.3168/jds.2023-23752](https://doi.org/10.3168/jds.2023-23752).

Influence of prepartum dietary cation-anion difference and the magnitude of calcium decline at the onset of lactation on mineral metabolism and physiological responses. By Connelly et al., page 1228. The onset of lactation results in a marked increase in calcium demand due to calcium included in milk. We demonstrated that feeding a negative dietary cation-anion difference diet prepartum maintained higher blood calcium in cows as they approached parturition. The cows fed a negative dietary cation-anion difference diet required less exogenous calcium supplementation to maintain normocalcemia. Including calcium gluconate during the immediate 24 hours postpartum disrupted mineral metabolism during the 24 hours of infusion and in the immediate days after termination of infusion. Collectively, the data herein demonstrates that reducing prepartum dietary cation-anion difference reduces the magnitude of calcium decline at the onset of lactation and length of transient hypocalcemia. Moreover, calcium infusion during transient hypocalcemia robustly disrupts blood calcium and phosphorous dynamics. [https://doi.org/10.3168/jds.2023-23588](https://doi.org/10.3168/jds.2023-23588).

Effects of ruminal lipopolysaccharide exposure on primary bovine ruminal epithelial cells. By Sarmikasoglou et al., page 1244. Ruminal acidosis has been associated with elevated levels of lipopolysaccharides. Ruminal lipopolysaccharides have lower endotoxicity when compared with lipopolysaccharides derived from species such as Escherichia coli. We aimed to investigate the immunopotential of ruminal lipopolysaccharides and E. coli lipopolysaccharides on viability and gene expression in primary bovine ruminal epithelial cells. The results from our 3 experiments demonstrate that, compared with E. coli lipopolysaccharides, ruminal lipopolysaccharides are weaker at upregulating the transcripts related to a proinflammatory response. Moreover, ruminal lipopolysaccharides antagonize E. coli lipopolysaccharides, protecting cells from strong inflammatory responses. [https://doi.org/10.3168/jds.2023-23736](https://doi.org/10.3168/jds.2023-23736).

Longitudinal characterization of the metabolome of dairy cows transitioning from one lactation to the next: Investigations in blood serum. By Ghaffari et al., page 1263. Metabolic profiling provides detailed insights into the response of dairy cows to drying-off, calving, and early lactation. The objective of this study was to characterize changes in the serum metabolome and various indicators of oxidative balance in dairy cows starting 2 weeks before dry-off until week 16 of lactation. We used targeted metabolomics with the Biocrates Life Sciences AG MxP Quant 500 kit for the serum analysis of 12 cows. Our results underscored the significant metabolic shifts and increased oxidative stress between lactation periods. The transition into the dry period had a particular effect on cow metabolism, highlighting the importance of this phase for overall productivity. [https://doi.org/10.3168/jds.2023-23841](https://doi.org/10.3168/jds.2023-23841).
Dynamics of oxidative stress and immune responses in neonatal calves during diarrhea. By Fu et al., page 1286. Calf diarrhea is one of the most common health problems that can cause huge economic losses in the dairy industry. Enteric infections have been shown to affect oxidative stress in the gut of mice. To date, the occurrence of oxidative stress in calves when they develop diarrhea is not well defined. Our study evaluated the major oxidative stress indicators in healthy and diarrheic calves, as well as their dynamics when they recovered from sickness or developed diarrhea. The findings from this study revealed an association between oxidative stress and the dynamics of enteric health status. Our findings will aid in finding preventative measures to mitigate oxidative stress during early life to maintain calf gut health.

https://doi.org/10.3168/jds.2023-23630.