Invited review: The importance of colostrum in the newborn dairy calf. By Lopez and Heinrichs, page 2793. Colostrum provides a crucial first meal for newborn calves, and management of this critical resource affects calf health, both during the preweaning period and throughout life. This review will discuss colostrum composition, the nutritional importance of colostrum, storage methods, feeding methods, immunoglobulin G absorption, and failure of passive immunity. https://doi.org/10.3168/jds.2020-20114.

Evaluating the in vitro efficacy of bovine lactoferrin products against SARS-CoV-2 variants of concern. By Wotring et al., page 2791. Bovine lactoferrin (bLF) has antiviral characteristics. An in vitro model using a human lung cell line showed that bLF strongly inhibited severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Several strains were studied, including WA1 (US), B.1.351 (Africa), B.1.1.7 (UK), P.1 (Brazil), and Delta (India). Several dairy ingredients were screened for antiviral activity, including whey protein isolate, concentrate, hydrolysates, and enriched fractions containing bLF. Antiviral activity correlated with bLF content in the base ingredient. Bovine lactoferrin is a prime candidate for further clinical research to study prophylactic and therapeutic applications because of its relative abundance and safety. https://doi.org/10.3168/jds.2021-21247.

Effects of genetic variants and sialylation on in vitro digestibility of purified κ-casein. By Sheng et al., page 2803. Both genetic variation and the nature of posttranslational modifications of milk proteins may influence their digestibilities. The present study investigates differences in the in vitro digestibility of purified κ-casein (κ-CN) genetic variants A, B, and E, as well as relative to sialylation of attached O-linked oligosaccharides. κ-Casein variant B, representing a higher glycosylation degree, was found to exhibit a higher level of both gastric and intestinal hydrolysis, as well as relative to sialylation of attached O-linked glycosylation degree could increase the digestibility of κ-CN, a potential application in dairy products with enhanced digestibility. https://doi.org/10.3168/jds.2021-21289.

Feeding hydrogenated palm fatty acids and rumen-protected protein to lactating Holstein-Friesian dairy cows modifies milk fat triacylglycerol composition and structure, and solid fat content. By Pacheco-Pappenheim et al., page 2828. Hydrogenated palm fatty acid supplementation to dairy cattle rations increases the energy density of the diet and can increase milk fat production. We found that this nutritional strategy increased the formation of high-molecular-weight (HMW) triacylglycerols (TAG), as well as the esterification of C16:0 and C18:0 at the sn-2 position and of C18:0 and C18:1 cis-9 at the sn-1,3 positions in TAG structures. Highly saturated HMW TAG proportions increased milk solid fat content at 20, 25, and 30°C, which may affect processing of milk fat and high-fat dairy products. https://doi.org/10.3168/jds.2021-21083.

Effect of alsD deletion and overexpression of nox and alsS on diacetyl and acetoin production by Lacticaseibacillus casei during milk fermentation. By Tian et al., page 2868. This study explored the effects of the modifications of 3 genes—the NADH oxidase gene (nox), the acetolactate synthase gene (alsS), and the acetolactate decarboxylase gene (alsD)—on the production of diacetyl and acetoin by Lacticaseibacillus casei TCS strains during milk fermentation. We found that the yields of diacetyl and acetoin were higher in milk fermented with these recombinant strains than in milk fermented with original strains. The modification of multiple genes had a synergistic effect, leading to greatly increased synthesis of diacetyl and acetoin by L. casei during milk fermentation. These results provide new insight into the biosynthesis of diacetyl and acetoin by lactic acid bacteria and provide a theoretical basis for the future optimization of flavor production in fermented milk. https://doi.org/10.3168/jds.2021-21163.

Development of a risk assessment model to predict the occurrence of late blowing defect in Gouda cheese and evaluate potential intervention strategies. By Qian et al., page 2880. Late blowing defect in cheese is a spoilage concern caused by Clostridium tyrobutyricum, leading to financial losses for cheese manufacturers. We developed a modeling framework to predict the appearance of late blowing defect in Gouda cheese during aging. Within this framework, sensitivity analysis indicated that the maximum growth rate of C. tyrobutyricum and the concentration required for defects to occur are the most important variables. Results of what-if scenarios suggested that implementation of bactofugation or microfiltration is the most effective intervention strategy. The digital tool developed could be deployed to help cheese manufacturers manage the risk of late blowing defect. https://doi.org/10.3168/jds.2021-21206.

Characterization of autochthonal yeasts isolated from Spanish soft raw ewe milk protected designation of origin cheeses for technological application. By Merchán et al., page 2931. Torta del
Casar and Queso de la Serena cheeses are manufactured without thermal treatment and starter microorganisms, resulting in an unpredictable microbial dynamic throughout the cheese, which leads to great variability. Therefore, it is necessary to develop strategies to guarantee their quality, homogeneity, and unique sensory characteristics. Tailoring a starter culture including selected autochthonous strains is a possible way to overcome these problems. Our results showed that a wide diversity of yeast is involved in the ripening of these cheeses. Their characterization evidenced that 9 strains presented great potential to be selected for the development of an adjunct culture including selected autochthonous strains for technological application. https://doi.org/10.3168/jds.2021-21368.

Multiclass and multi-residue screening of mycotoxins, pharmacologically active substances, and pesticides in infant milk formulas through ultra-high-performance liquid chromatography coupled with high-resolution mass spectrometry analysis. By Izzo et al., page 2948. Infant milk formulas are complementary foods that occupy a special place in childhood feeding. Infants are considered a susceptible age group, exposed to the highest levels of potentially toxic substances. Due to an infant’s low body weight, a smaller quantity of contaminants could be enough to provoke adverse effects. In the current study, we developed a multi-residue method for the identification of mycotoxins, pharmacologically active substances, and pesticides in infant milk formulas. The in-house validated method could be proposed for the simultaneous identification of contaminants during routine analysis of infant milk formulas, reassuring consumers about the safety of purchased foods. https://doi.org/10.3168/jds.2021-21123.

Formation and characterization of noncovalent ternary complexes based on whey protein concentrate, high methoxyl pectin, and phenolic acid. By Zhang et al., page 2963. Whey protein concentrate, high methoxyl pectin, and phenolic acid (chlorogenic acid or rosmarinic acid) noncovalent ternary complexes were prepared at 3 different pH values (4, 4.5, and 5). The ternary complexes showed good stability and phenolic acid–protecting ability, strong 2,2-diphenyl-1-picrylhydrazyl and 2,2’-azinobis(2-ethylbenzothiazoline-6-sulfonate) radical scavenging ability, and good inhibition of growth of Escherichia coli and Staphylococcus aureus. Data may provide useful information for the practical application of the ternary systems in beverage and other foods on market. https://doi.org/10.3168/jds.2021-21088.

A new method for producing superior set yogurt, focusing on heat treatment and homogenization. By Ichimura et al., page 2978. We investigated the effects of homogenization on the curd structure of set yogurt made by extended shelf life (ESL) processing (heat treatment at 130°C for 2 s). The curd strength of the yogurt was negatively correlated with fat globule size. A microscopy analysis indicated that the smaller fat globules reinforce the network structure. The yogurt made by ESL processing and 35 MPa homogenization had sufficient curd strength and a significant sensory evaluation score. The combination of ESL processing and homogenization at 35 MPa is a novel and useful method for manufacturing set yogurt. https://doi.org/10.3168/jds.2021-21326.

German consumer evaluations of milk in blind and nonblind tests. By Kresova et al., page 2988. In the present research, we found that the perceived taste of different milk types differs among respondents, not only according to the type of milk, but also according to credence-good attributes. Organic milk was rated to test better when respondents knew that it was organic milk than when under blinded tasting. Long-life milk tasted better under blinded tasting than when consumers knew that it was long-life milk. The present study can enhance the decision-making process of dairy companies for developing and introducing new dairy products to the market. https://doi.org/10.3168/jds.2021-20708.

Children’s perceptions of fluid milk with varying levels of milkfat. By Keefer et al., page 3004. This study identified children’s liking and ability to differentiate among milks with different milk fat contents. In the absence of visual cues, children had no milkfat-related preference for unflavored milk but had distinct preferences for chocolate milk with at least 1% milkfat. These results suggest approaches to increase child acceptance of the milks currently served in school meal programs. https://doi.org/10.3168/jds.2021-20826.

Chemiluminescence sensors based on molecularly imprinted polymers for the determination of organophosphorus in milk. By Pan et al., page 3012. Chemiluminescence combined with molecularly imprinted polymer microtitration can be used as an efficient, rapid, and low-cost method for determining of organophosphorus residues in foods with complex substrates such as milk. The method established in this study saves time and effort, and can be reused, which shows the potential of large-scale application in milk quality control. https://doi.org/10.3168/jds.2021-21213.

The effect of dietary rumen-protected trans-10,cis-12 conjugated linoleic acid or a milk fat-depressing diet on energy metabolism, inflammation, and oxidative stress of dairy cows in...
**early lactation. By Bayat et al., page 3032.** Feeding a rumen-protected conjugated linoleic acid (CLA)-supplemented diet or a higher starch and oil-containing diet (HSO) effectively reduced milk fat secretion without compromising milk production in dairy cows during the first 112 d of lactation. The HSO diet reduced feed intake, whereas it increased inflammatory markers and oxidative stress. However, the increase in plasma glucose and paraoxonase levels with the HSO diet may imply a better ability of the liver to cope with the metabolic demand after parturition. Energy balance was numerically higher during wk 3 and 7 in cows fed CLA and HSO compared with the control diet. https://doi.org/10.3168/jds.2021-20543.

**Comparison of Molly and Karoline models to predict methane production in growing and dairy cattle. By Kass et al., page 3049.** The mechanistic models Karoline and Molly were evaluated against published data for their ability to predict methane production. A data set was generated that consisted of 267 treatment means from 55 studies in which methane was measured using the respiration chamber technique. Regression analysis showed that both models predicted methane production reasonably well, but the Karoline model predicted methane production better than the Molly model; the prediction errors were smaller and the residuals were less related to factors known to influence CH₄ production. https://doi.org/10.3168/jds.2021-20806.

**Effects of increased doses of lysine in a rumen-protected form on plasma amino acid concentration and lactational performance of dairy cows fed a lysine-deficient diet. By Donkin et al., page 3064.** The use of rumen-protected amino acids (AA) is a well-established method to increase metabolizable protein and AA composition in lactating dairy cows. The supplementation of incremental amounts of a rumen-protected Lys to dairy cows fed with a corn-based Lys-deficient diet and its bioavailability were evaluated in 2 companion studies. Overall, supplementation of lactating dairy cows with rumen-protected Lys did not alter Lys plasma concentration, decreased plasma His concentration, and had no effects on milk production and composition. https://doi.org/10.3168/jds.2021-20823.

**Growth performance, digestibility, blood metabolites, ruminal fermentation, and bacterial communities in response to the inclusion of gallic acid in the starter feed of preweaning dairy calves. By Xu et al., page 3078.** With increasing public concern about the negative effects of antibiotics, countries worldwide have banned and limited the application of antibiotics in animal feed to reduce the potential generation of antibiotic-resistant pathogenic bacteria. Therefore, the identification of efficacious and economical antibiotic alternatives for the treatment of numerous calfhood stresses and diseases has gained increasing attention from researchers. As an alternative to antibiotics, phytochemical compounds reduce the potential production of antibiotic-resistant pathogenic bacteria in animals and their products. Gallic acid is a bioactive phenolic compound that exhibits pharmacological and health benefits, and has good antioxidant, antiinflammatory, and antibacterial properties. Therefore, the objective of this study was to evaluate the effects of gallic acid on growth performance, nutrient digestibility, plasma metabolites, rumen fermentation, and bacterial communities in rumen fluid and feces of Holstein dairy calves. https://doi.org/10.3168/jds.2021-20543.

**Effects of replacing magnesium oxide with calcium-magnesium carbonate with or without sodium bicarbonate on ruminal fermentation and nutrient flow in vitro. By Agustinho et al., page 3090.** Magnesium oxide (MgO) is the most commonly used magnesium source in dairy diets and has shown alkalizing properties. However, it is expensive and inconsistent, depending on its source. Studies evaluating the effects of calcium-magnesium carbonate \([\text{CaMg(CO}_3\text{)}_2]\) combined with sodium bicarbonate (NaHCO₃) are limited. Therefore, our objective was to evaluate the effects of replacing MgO with CaMg(CO₃)₂ when both were combined or not with NaHCO₃ on ruminal fermentation. We observed that independent of NaHCO₃ inclusion, CaMg(CO₃)₂ had similar mineral solubility, ruminal pH, and total volatile fatty acid concentration compared with MgO. https://doi.org/10.3168/jds.2021-20995.

**Abomasal infusion of different exogenous emulsifiers alters fatty acid digestibility and milk fat yield of lactating dairy cows. By Prom et al., page 3102.** We evaluated the effects of abomasal infusion of emulsifiers on fatty acid digestibility of lactating dairy cows. All emulsifiers examined were polysorbates, nonionic surfactants, consisting of a polyethoxylated sorbitan esterified with fatty acids. Treatments were abomasal infusions of water only or 30 g/d of different emulsifiers as follows: polysorbate-C16:0, polysorbate-C18:0+C16:0, and polysorbate-C18:1. Only polysorbate-C18:1 increased the digestibility of total fatty acids. This suggested that the predominant fatty acid present in the polysorbate affects its ability to improve fatty acid digestibility. https://doi.org/10.3168/jds.2021-21315.

**Replacing concentrates with a high-quality hay in the starter feed of dairy calves: II. Effects on the development of chewing and gut fermentation, and selected systemic health variables. By**
Poier et al., page 3113. Optimal starter feeding in dairy calves should support growth, rumen development, rumination behavior while minimizing the risk of ruminal acidity and hyperkeratosis. This research aimed to evaluate the influence of the calf starter feed's composition (forage-only vs. a forage-concentrate mixture and hay quality) on rumen development, rumination, and health of rearing calves. The study showed that feeding high-quality hay alone resulted in improved rumination variables as well as ruminal and fecal fermentation profile without increasing the risk of ruminal acidosis. https://doi.org/10.3168/jds.2021-21346.

Effects of rumen-protected glutamate supplementation during the periparturient period on digestibility, inflammation, metabolic responses, and performance in dairy cows. By Hisadomi et al., page 3129. The objective of this study was to evaluate the effects of feeding rumen-protected glutamate during the periparturient period on apparent total-tract digestibility, inflammation, metabolic responses, and production performance of dairy cows. Feeding rumen-protected glutamate increased nutrient digestibility, feed intake, and decreased mobilization of body fat and protein immediately after calving, but did not reduce inflammation nor increase milk production. Glutamate is an amino acid that can be synthesized in the body, and its dietary requirement is not established in dairy cows. However, our findings suggest that glutamate may be insufficient immediately after calving when nutrient demands increase with the onset of lactation. https://doi.org/10.3168/jds.2021-21357.

Evaluating the effect of finely ground, dry-rolled, and crumbled corn grain on performance, feeding behavior, and starch digestion in Holstein dairy heifers. By Malekkhahi et al., page 3142. We evaluated the effects of mechanical processing (finely ground or dry rolled) and thermal processing (crumbled) of corn on total-tract starch digestibility and performance of young dairy heifers. Thirty-six pen-housed heifers were fed starter diets based on ground, rolled, or crumbled corn for 60 days. Feeding crumbled corn increased starch digestibility, molar proportion of ruminal propionate, and blood insulin-like growth factor-1 concentration, promoting the skeletal growth of heifers. In addition, feeding crumbled corn improved average daily gain in Holstein dairy heifers compared with other diets. https://doi.org/10.3168/jds.2021-21416.

Physical and economic performance of dairy cows managed within contrasting grassland-based milk production systems over 3 successive lactations. By Ferris et al., page 3153. Diverse grassland-based milk production systems were examined over 3 successive lactations. Milk output per cow largely reflected differences in concentrate inputs. Jersey crossbred cows produced a similar yield of milk solids as heavier Holstein cows. Even at relatively similar stocking rates (cows/hectare), diverse grassland-based milk production systems were associated with very different levels of performance on a per cow and per hectare basis. Differences between systems in gross margin per cow/year were relatively modest. https://doi.org/10.3168/jds.2021-20315.

Farmers’ preferences for adopting on-farm concentration of raw milk: Results from a discrete choice experiment in Germany. By Weissgerber and Hess, page 3176. This study investigated farmers’ willingness to pay for an on-farm membrane filtration plant to concentrate raw milk on their dairy farms. Estimations revealed that individual farm characteristics, such as an adequate milk price, had an effect on the likelihood of adoption. These results could be used to back the development and dissemination of filtration plants at farm level. https://doi.org/10.3168/jds.2021-20528.

Economics of timed artificial insemination with unsorted or sexed semen in a high-producing, pasture-based dairy production system. By Walsh et al., page 3192. Synchronization of ovulation for timed artificial insemination (TAI) can improve the calving profile in seasonal, pasture-based systems. Sexed semen (SS) use can increase genetic gain through increased selection intensity. This study evaluated the economics of TAI with unsorted and SS in seasonal pasture-based dairy systems. On average, programs that adopted both TAI and SS generated greater economic profit and genetic gain compared with TAI only or artificial insemination based on estrus detection, with unsorted semen. However, both technologies also increased variability in physical and financial performance. Farm managers must weigh these risk factors alongside the potential profit when implementing TAI and SS in pasture-based systems. https://doi.org/10.3168/jds.2021-20170.

The use of milk Fourier-transform mid-infrared spectroscopy to diagnose pregnancy and determine spectral regional associations with pregnancy in US dairy cows. By Khanal and Tempelman, page 3209. We investigated the utility of milk mid-infrared (MIR) spectral data for pregnancy diagnosis of dairy cows and to infer associations of MIR wavelengths with pregnancy at various stages. Although the accuracy of early diagnoses seemed too low to be of practical use, we determined various MIR regions to be strongly associated with pregnancy, even at early stages of pregnancy. We also demonstrated that adaptively partitioning the MIR spectrum into windows, with each window containing highly cor-
related wavenumber absorbances, led to stronger and more stable associations with pregnancy status than associations with individual wavenumbers. https://doi.org/10.3168/jds.2021-21079.

Body growth of replacement dairy heifers from 3 distinct genetic groups from commercial Brazilian dairy herds. By Busanello et al., page 3222. Few recent data on dairy heifer body growth are available, especially from breeds other than Holstein. Furthermore, data on dairy cattle growth in tropical regions are scarce. Our study focused on describing the growth patterns of Jersey, Holstein, and Holstein × Gyr cattle reared on commercial dairy farms in Brazil. Our results indicate target body weight and height (withers and hip) for recommended ages at first breeding and first calving, as well as mature body weight for these 3 genetic groups. These results can be used to guide farmers to set rearing targets in tropical regions. https://doi.org/10.3168/jds.2021-21197.

Economic premiums associated with Mycobacterium avium ssp. paratuberculosis-negative replacement purchases in major dairy-producing regions. By Rasmussen et al., page 3234. Johne’s disease, or paratuberculosis, is an infectious disorder mainly associated with dairy cattle and sheep that burdens animal health and results in significant losses for producers. This study used Markov chain Monte Carlo methods to estimate the economic premiums associated with purchasing Mycobacterium avium ssp. paratuberculosis (MAP)-negative replacements relative to purchasing replacements with unknown MAP infection status across a range of major dairy-producing regions. It was estimated that an average benefit of $76 is associated with a MAP-negative replacement purchase, equivalent to an economic premium of 13% of aggregated replacement prices. Greater benefits and premiums were estimated in MAP-negative herds that avoid infection. https://doi.org/10.3168/jds.2021-21224.

Public attitude toward and perceptions of dairy cattle welfare in cow-calf management systems differing in type of social and maternal contact. By Sirovica et al., page 3248. Early cow-calf separation followed by individual housing for calves is standard practice on most dairy farms. There is some evidence that early cow-calf separation and individually housing calves may not resonate with the public, but little is known about how separation followed by group housing of calves or rearing calves with a foster cow would be perceived. Canadian and American participants in this study appeared to value the mother cow-calf relationship and disapproved of cow-calf management systems that involved separating calves from their mothers, suggesting alternatives that still involve early separation will not be acceptable. https://doi.org/10.3168/jds.2021-21344.

Genetic analyses of blood β-hydroxybutyrate predicted from milk infrared spectra and its association with longevity and female reproductive traits in Holstein cattle. By Lou et al., page 3269. Blood β-hydroxybutyrate, a key indicator of ketosis, varies drastically in dairy cows during early lactation and might affect reproductive performance and longevity in high-producing dairy cows. The main objectives of the current study were to estimate genetic parameters for predicted blood β-hydroxybutyrate based on milk Fourier-transform mid-infrared spectroscopy and to investigate its association with important reproductive and longevity traits in Holstein cattle. β-Hydroxybutyrate was found to be heritable (range: 0.10 to 0.13) and highly genetically correlated across parities. In summary, our findings lay the foundation for the design of a more balanced selective breeding strategy in high-yielding Holstein cattle. https://doi.org/10.3168/jds.2021-20389.

Genetic effects of heat stress on milk fatty acids in Brazilian Holstein cattle. By Dauria et al., page 3296. The temperature-humidity index was used as an environmental variable to investigate the influence of heat stress in the genetics of milk fatty acids (FA) in Brazilian Holstein cattle. Unsaturated FA traits showed higher heritability estimates under heat stress compared with general conditions (without heat stress), and saturated FA traits did not differ between heritability estimates under heat stress and general conditions. For genetic evaluation of heat stress, we revealed a genotype-by-environment interaction in genetic analysis of the FA milk profile. https://doi.org/10.3168/jds.2021-20914.

Comparison of a single-step with a multistep single nucleotide polymorphism best linear unbiased predictor model for genomic evaluation of conformation traits in German Holsteins. By Alkhoder et al., page 3306. A single-step genomic evaluation considers all phenotype, genotype, and pedigree data jointly and should result in a more accurate genomic prediction than the current multistep genomic model. We applied the single-step model to the conformation traits of German Holsteins and compared with the current multistep genomic model in prediction correlation and bias of genomic prediction. A total of 875,252 genotyped Holstein animals were considered in the single-step evaluation. Via a validation study, we could demonstrate that the single-step model had a higher correlation of prediction and greater average and larger variance in genomic breeding values. In our
study, no overprediction of genomic breeding values of young animals was found for the conformation traits in German Holsteins.
https://doi.org/10.3168/jds.2021-21145.

Genome-wide associations for heat stress response suggest potential candidate genes underlying milk fatty acid composition in dairy cattle. By Bohlouli et al., page 3323. Genomic breeding values for milk fatty acids at distinct climatic levels reflecting thermoneutral and heat stress conditions, as well as heat stress response, were used as pseudophenotypes in genome-wide associations and gene annotation approaches. Especially in the challenging period in early lactation under heat stress, genetic mechanisms for fatty acids indicated environmental sensitivity (i.e., larger additive genetic and chromosome-wide variances as well as pronounced single nucleotide polymorphism effects and annotated candidate genes with well-known effects in relation to stressors).
https://doi.org/10.3168/jds.2021-21152.

Exploiting genetic variability in the trajectory of lactation yield and somatic cell score with each progressing parity. By Williams et al., page 3341. Despite improvements in reproductive performance, the average productive life of most dairy cows remains ≤4.5 lactations, suggesting that risk factors for culling may be shifting from poor fertility to low milk yield or high somatic cell score. The present study identified genetic differences in the trajectory of lactation yield and somatic cell score across parities. These differences suggest that selection for cows that maintain high yields and low somatic cell score throughout their lifetime is possible.
https://doi.org/10.3168/jds.2021-21306.

Assessment of the performance of different imputation methods for low-coverage sequencing in Holstein cattle. By Teng et al., page 3355. Low-coverage sequencing (LCS) has been proposed as a cost-effective approach for genomic analysis, but whether LCS is suitable for livestock, especially Holstein cattle, has received less attention. Here, we evaluated the imputation performance of LCS data of Holstein cattle. This study indicated the promising potential of LCS for genomic analysis in Holstein cattle. The LCS strategy offered a powerful method for further agricultural breeding.
https://doi.org/10.3168/jds.2021-21360.

Danish cattle veterinarians’ perspectives on antimicrobial use: Contextual and individual influencing factors. By Skjølstrup et al., page 3377. Understanding what influences veterinary treatment and prescribing behavior from the veterinarian’s perspective is important for informing future actions to reduce antimicrobial use in livestock farming. In this study, we investigated the perspectives of cattle veterinarians from a country with a low average level of antimicrobial use and with extensive legal control over antimicrobial use within the dairy industry.
https://doi.org/10.3168/jds.2021-20981.

β-Hydroxybutyrate impairs the release of bovine neutrophil extracellular traps through inhibiting phosphoinositide 3-kinase–mediated nicotinamide adenine dinucleotide phosphate oxidase reactive oxygen species production. By Liu et al., page 3405. High concentrations of β-hydroxybutyrate inhibit neutrophil extracellular traps, thereby contributing to immune dysfunction in ketotic dairy cows. In vitro experiments allowed us to determine that β-hydroxybutyrate impairs neutrophil extracellular traps release by inhibiting phosphoinositide 3-kinase–nicotinamide adenine dinucleotide phosphate oxidase production of reactive oxygen species. Our findings can help us better understand mechanisms leading to immune dysfunction in ketotic dairy cows during the peripartal period.
https://doi.org/10.3168/jds.2021-21174.

A high-concentrate diet provokes inflammation, endoplasmic reticulum stress, and apoptosis in mammary tissue of dairy cows through the upregulation of STIM1/ORAI1. By Meng et al., page 3416. The objective of this study was to determine whether a high-concentrate diet can induce STIM1/ORAI1–mediated inflammation and injury in the mammary tissue of dairy cows. We found that a high-concentrate diet induced subacute ruminal acidosis, which induced STIM1/ORAI1–mediated inflammation by activating the store-operated calcium entry channel. Feeding a high-concentrate diet also induced endoplasmic reticulum stress and apoptosis, which are a threat to the health of dairy cows and a public concern.
https://doi.org/10.3168/jds.2021-21187.

The effect of environmental temperature on average daily gain in preweaned calves: A randomized controlled trial and Bayesian analysis. By Hyde et al., page 3430. Previous research has suggested that environmental temperature is likely associated with growth rates in preweaning calves. This trial randomly allocated 79 calves to 1 of the following 4 groups: no jacket and no heat lamp, heat lamp but no jacket, jacket but no heat lamp, or both heat lamp and jacket. Environmental temperature was recorded using data loggers. There was a strong effect of increased environmental temperature on growth rates. Heat lamps (1 kW) increased the pen temperature by around 5°C, and calves housed under heat lamps grew around 90 g/d faster than those not under a heat lamp.
https://doi.org/10.3168/jds.2021-21199.
Defining clinical diagnosis and treatment of puerperal metritis in dairy cows: A scoping review. By Garzon et al., page 3440. Currently discrepancies on case definition for clinical diagnosis of puerperal metritis in dairy cattle can result in misdiagnosis and unnecessary treatment of animals. This scoping review evaluated clinical criteria used in the diagnosis definition of puerperal metritis available in the current literature. Findings from this study demonstrated disparity in robust and consensus criteria to diagnose puerperal metritis in the literature and the need for future research that supports a standardized definition of the disease. https://doi.org/10.3168/jds.2021-21203.

Heat treatment of colostrum at 60°C decreases colostrum immunoglobulins but increases serum immunoglobulins and serum total protein: A meta-analysis. By Malik et al., page 3453. The present meta-analysis demonstrated that heat treatment of colostrum (≤60°C) improved the immune status of calves. Heat treatment at a low temperature permitted an increase of 2.65 g/L in serum immunoglobulin G concentration compared with raw or frozen colostrum, which is of high interest for the cattle industry. The higher performance of calves, including decreased morbidity and mortality, can be expected with higher serum immunoglobulin G levels associated with colostrum heat treatment (≤60°C).
https://doi.org/10.3168/jds.2021-21231.

The effect of transdermal flunixin meglumine on blood cortisol levels in dairy calves after cauterity disbudding with local anesthesia. By Röder et al., page 3468. The objective of this study was to evaluate the effect of transdermal flunixin meglumine on plasma cortisol levels after cauterity disbudding with local anesthesia in dairy calves. A sham disbudding procedure was performed first to determine cortisol levels related to the manipulation. Plasma samples were collected at different time points before and after sham disbudding and disbudding to assess the calves’ stress response. Treatment with transdermal flunixin meglumine resulted in decreased plasma cortisol concentration but had no detectable effect on calves’ lying behavior after cauterity disbudding.
https://doi.org/10.3168/jds.2021-21257.

β-Hydroxybutyrate inhibits apoptosis in bovine neutrophils through activating ERK1/2 and AKT signaling pathways. By Song et al., page 3477. High concentrations of β-hydroxybutyrate (BHB) may inhibit neutrophil apoptosis and contribute to systemic inflammation in ketotic dairy cows. The mechanisms whereby BHB regulates neutrophil apoptosis are unclear. In the present study, BHB inhibited mitochondrial-mediated apoptosis in bovine neutrophils. By inhibiting ERK1/2 or AKT activity in vitro, we further demonstrated that BHB-induced inhibition of neutrophil apoptosis is mediated by these kinases. Overall, these findings provide a theoretical basis for the understanding of systemic inflammation in ketotic cows. https://doi.org/10.3168/jds.2021-21259.

Quarter-level analyses of the associations among subclinical intramammary infection and milk quality, udder health, and cheesemaking traits in Holstein cows. By Pegolo et al., page 3490. We demonstrated that increased somatic cell count in culture-negative milk samples and presence of pathogen-specific intramammary infection were associated with reduced milk quality, alteration in udder health indicators, and detrimental effects on cheesemaking traits. Prototheca infection seemed to be associated with the greatest impairment in milk quality and cheesemaking aptitude.
https://doi.org/10.3168/jds.2021-21267.

Effect of different fatty acids on the proliferation and cytokine production of dairy cow peripheral blood mononuclear cells. By Vanacker et al., page 3508. During the transition period, dairy cows often experience negative energy balance, which induces metabolic and immunological disturbances caused by the increase in blood nonesterified fatty acids (NEFA) concentration among others things. In this study, we evaluated the effect of 11 fatty acids (palmitoleic, myristic, palmitic, stearic, oleic, linoleic, docosahexaenoic, conjugated linoleic, lauric, eicosapentaenoic, and linolenic acids) as well as a mix that represented the NEFA profile observed during the transition period on proliferation and cytokine secretion of lymphocytes. Overall, our study confirmed that NEFA have a negative effect on some lymphocyte functions, and that their inhibitory effect on cytokine secretion increases with the degree of unsaturation.
https://doi.org/10.3168/jds.2021-21296.

Estimating the nonlinear association of online somatic cell count, lactate dehydrogenase, and electrical conductivity with milk yield. By Bonestroo et al., page 3518. Sensors measuring indicators of mastitis in milk are common in herds with automatic milking systems. Using results from these sensors, this study examined the association between somatic cell count, lactate dehydrogenase, and electrical conductivity with milk production. We found complex relationships between milk production and mastitis indicators, such that milk production decreased at an increasing rate after a specific threshold of mastitis indicators. These relationships can be used to more accurately model milk yield loss associated with mastitis.
https://doi.org/10.3168/jds.2021-21351.
Effect of dry-off management on milking behavior, milk yield, and somatic cell count of dairy cows milked in automated milking systems. By France et al., page 3544. The objective of this study was to investigate the effect of dry-off management of cows milked in automated milking systems on milk yield, milking behavior, and somatic cell count. Overall, the results suggest that reducing both milking frequency and feed quantity provided in the automated milking system is the most efficient method to decrease milk yield before dry-off, without negatively influencing milking frequency or milk yield and quality in the next lactation.

https://doi.org/10.3168/jds.2021-21383.

Cattle farmer psychosocial profiles and their association with control strategies for bovine viral diarrhea. By Prosser et al., page 3559. Psychosocial factors that influence how people make decisions that affect their health, many of which have not been investigated in livestock infectious disease control, were explored using multiple validated scales in a survey of United Kingdom cattle farmers. Feeling close to veterinarians, a lack of trust in other farmers, motivation to control infectious disease, the knowledge and understanding of how and why to control disease, and the time and money to do so were all associated with proactive control of bovine viral diarrhea. These findings have implications for the successful control of bovine viral diarrhea in the United Kingdom.

https://doi.org/10.3168/jds.2021-21386.

Streptococcus dysgalactiae ssp. dysgalactiae in Norwegian bovine dairy herds: Risk factors, sources, and genomic diversity. By Smistad et al., page 3574. Streptococcus dysgalactiae is an important udder pathogen in bovine dairy herds, but few studies have systematically investigated risk factors and bacterial sources of this bacterium. Its main reservoir and principal modes of transmission are largely unknown. Hence, targeted prevention of intramammary infections caused by Strep. dysgalactiae has been challenging, with negative consequences for farmer economy, animal welfare, and antimicrobial use. In this study, we aimed to elucidate the epidemiology of Strep. dysgalactiae by investigating risk factors, sources, and genomic diversity in bovine dairy herds.

https://doi.org/10.3168/jds.2021-21471.

Role of diacylglycerol O-acyltransferase (DGAT) isoforms in bovine hepatic fatty acid metabolism. By Yang et al., page 3588. High fatty acid concentrations during fatty liver induce lipid accumulation (triacylglycerol, TAG) and damage of hepatocytes. We used in vivo and in vitro analyses with liver biopsies or isolated primary hepatocytes to investigate specific functions of DGAT1 and DGAT2 in the context of fatty acid metabolism. The data suggested that DGAT1 is particularly relevant in the context of hepatocyte TAG synthesis from exogenous fatty acids. Disruption of both DGAT1 and DGAT2 in vitro altered lipid homeostasis, channeling fatty acids toward oxidation and generation of reactive oxygen species. Both DGAT isoforms play a role in promoting fatty acid storage into TAG and lipid droplets to protect hepatocytes from oxidative damage.

https://doi.org/10.3168/jds.2021-21140.

Response to kisspeptin and gonadotropin-releasing hormone agonist administration in Holstein-Friesian dairy heifers with positive or negative genetic merit for fertility traits. By Flay et al., page 3601. We investigated the functionality of the hypothalamus-pituitary-gonadal axis in peripuberal Holstein-Friesian dairy heifers with divergent positive (POS) or negative (NEG) genetic merit for fertility traits. The earlier onset of puberty in POS heifers was associated with a greater plasma luteinizing hormone response to a gonadotropin-releasing hormone (GnRH) agonist (buserelin) challenge at 10 mo of age, when heifers were prepubertal. Our results indicate that the gonadotropin responsiveness to a GnRH agonist is more advanced in POS than in NEG heifers.

https://doi.org/10.3168/jds.2021-21394.

Pregnancy status predicted using milk mid-infrared spectra from dairy cattle. By Tiplady et al., page 3615. Knowledge of pregnancy status is important for effective herd management of dairy cattle. Using Fourier-transform mid-infrared data to predict pregnancy is of interest, because alternative methods for determining pregnancy status are costly and time consuming. This study compared pregnancy prediction models based on milk spectra using differing strategies for classifying pregnant and nonpregnant records. We show that in pasture-based seasonal-calving herds, confounding between pregnancy status and lactation stage can produce misleading results. For models where the effect of this confounding was reduced, prediction accuracies were not sufficiently high to be used as a sole indicator of pregnancy status for herd management.

https://doi.org/10.3168/jds.2021-21516.

High-digestible silages allow low concentrate supply without affecting milk production or methane emissions. By Álvarez et al., page 3633. Harvest maturity is among the most important factors altering silage digestibility. Moreover, concentrate fed with silages can affect production and the environment, but the magnitude of this effect depends on silage digestibility. This study showed that lower concentrate levels can be supplied to cows when feeding high-digestible silages without compromising milk production. In addition, increasing concentrate showed a higher milk production response in cows fed low-digestible silages,
which agrees with the tested meta-analysis. Regardless of silage digestibility, methane emissions increased with increasing concentrate intake, whereas methane per unit of intake and milk decreased with increasing intake.
https://doi.org/10.3168/jds.2021-21479.

**Symposium review: Adipose tissue endocrinology in the periparturient period of dairy cows.** By Häussler et al., page 3648. In addition to its role in energy storage, adipose tissue (AT) is a highly active metabolic and endocrine organ. During late pregnancy and early lactation, AT is exposed to major changes in dairy cows. When energy is limited, AT releases fatty acids into the circulation. Molecules released by AT—so-called adipokines—act in an endo-, para-, and autocrine manner, being integrated into regulation of the whole body’s functions. Knowledge about protein and lipid adipokines as well as cytokines in the metabolism of periparturient cows is limited; thus, we summarized the current literature regarding selected adipokines and cytokines in periparturient dairy cows.
https://doi.org/10.3168/jds.2021-21220.

**Symposium review: Mechanistic insights into adipose tissue inflammation and oxidative stress in periparturient dairy cows.** By Zachut and Contreras, page 3670. During the periparturient period, lipolysis in adipose tissues (AT) mobilizes fatty acid reserves to meet energy needs of the dairy cow. Lipolysis generates free radicals and induces a remodeling process characterized by an inflammatory response in AT. When lipolysis is intense, inflammation limits the antioxidant defenses in AT, and oxidative stress develops. In a vicious cycle, AT inflammation and free radicals protract lipolysis and vice versa, predisposing cows to disease. This review summarizes current knowledge on the mechanisms that modulate AT inflammatory responses and oxidative stress during the periparturient period of dairy cows at the transcriptomic and proteomic levels.
https://doi.org/10.3168/jds.2021-21225.

**Symposium review: The role of adipose tissue in transition dairy cows: Current knowledge and future opportunities.** By Mann, page 3687. Adipose tissue (AT) is a caloric reservoir with a central role in the adaptation to lactation when its mobilization supports milk production. Body condition scores are determined visually or automatically by cameras based on cow contours but may not correlate highly with visceral AT mass, particularly during times of rapid accretion or loss. During late pregnancy and in early lactation, AT has effects on production, reproduction, and disease risk. Remodeling of AT in response to lipolysis postpartum is characterized by immune cell infiltration. Fetal programming of AT has been demonstrated in other species, but data are sparse in cattle.
https://doi.org/10.3168/jds.2021-21215.